International Journal Administration, Business & Organization
Vol. 7 (1), 2026: 430-449 | E-ISSN 2721-5652
Available at https://ijabo.a3i.or.id/index.php/ijabo

A Bibliometric Analysis of Sustainable Supply Chain Management Literature: Insights From the Web of Science Database

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ABSTRACT

This study presents a comprehensive bibliometric review of the open-access sustainable supply chain management (SSCM) literature, analyzing 5,866 articles indexed in the Web of Science. It aims to map the field's intellectual structure, evolution, and emerging research trends using techniques such as performance analysis, co-citation analysis, keyword co-occurrence and thematic evolution analysis. The findings indicate a rapid expansion of SSCM research, particularly since 2010, driven by growing interest in integrating sustainability into supply chain practices. While early studies primarily emphasized environmental concerns under the green supply chain paradigm, recent research adopts a more holistic perspective that incorporates economic, environmental and social dimensions. Emerging themes include circular economy practices, digitalization and Industry 4.0, resilience and risk management and sustainable innovation. The analysis further identifies distinct developmental phases in the SSCM literature, from conceptual foundations to empirical and methodological advancement. Additionally, the results reveal a divergence between collaboration intensity and citation impact: although a core group of authors dominates publication output, highly cited work is often produced by more dispersed scholars. This suggests that scholarly influence in SSCM is largely driven by interdisciplinary and conceptually innovative contributions, offering important implications for future research and collaboration strategies.

Keywords: Sustainable Supply Chain Management; Bibliometric Analysis; Literature Review; Green Supply Chain Management; Research Mapping

Received: 30 March 2026
Accepted: 06 May 2026
Available online: 07 May 2026

DOI: 10.61242/ijabo.26.741

JEL Classifications: Q56, M2, L6, Q01

INTRODUCTION

The increasing complexity of global production networks, coupled with growing environmental and social concerns, has positioned sustainability as a central issue in contemporary management research. The concept of sustainability gained prominence with the publication of the World Commission on Environment and Development (WCED) report, which defined sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987:43). Since then, sustainability has evolved into a multidimensional construct encompassing environmental integrity, economic viability and social equity, commonly conceptualized as the triple bottom line (Elkington, 1997).

In parallel, supply chain management (SCM) has emerged as a critical organizational function in an increasingly globalized economy. SCM is broadly defined as the integration and management of material, information and financial flows across organizations to deliver products and services efficiently (Mentzer et al., 2001). Traditional SCM research has primarily focused on cost efficiency, responsiveness and operational performance. However, the expansion of global supply chains has intensified concerns regarding environmental degradation, resource depletion and social inequalities embedded within supply networks.

The convergence of these two domains has led to the emergence of sustainable supply chain management (SSCM) as a distinct field of study. SSCM extends conventional SCM by incorporating sustainability principles into supply chain processes and decision-making. One of the most widely cited definitions describes SSCM as the management of material, information and capital flows, as well as cooperation among firms along the supply chain, while simultaneously addressing economic, environmental and social objectives (Seuring & Müller, 2008). This integrative perspective reflects a shift from a narrow focus on environmental practices toward a more holistic sustainability-oriented framework.

The development of SSCM as an academic field can be traced to the late 1990s and early 2000s, when increasing regulatory pressures, stakeholder expectations and corporate social responsibility initiatives prompted firms to adopt environmentally and socially responsible supply chain practices. Early research largely emphasized environmental management practices such as eco-design, reverse logistics and pollution reduction (Srivastava, 2007). Over time, the literature expanded to include broader sustainability considerations, including labor conditions, ethical sourcing and community impacts, reflecting the growing importance of social sustainability within global supply chains (Carter & Rogers, 2008; Ahi & Searcy, 2013).

Despite the rapid growth of SSCM research, the field remains fragmented, with diverse theoretical perspectives, methodological approaches and thematic emphases. Previous review studies have highlighted the need for systematic analyses that map the intellectual structure and evolution of SSCM literature over time (Seuring & Müller, 2008; Touboulic & Walker, 2015). In this context, bibliometric analysis has emerged as a powerful methodological tool for synthesizing large volumes of academic publications and identifying key trends, influential contributions and emerging research directions.

Although prior bibliometric studies have examined SSCM literature (e.g., Fahimnia et al., 2015; Nimsai et al., 2020; Theeraworawit et al., 2022), most analyses are limited by narrower datasets, earlier temporal coverage or broader inclusion strategies that combine subscription-based and open-access publications without distinguishing publishing models. This study extends prior research by focusing exclusively on 5,866 open-access SSCM articles indexed in Web of Science between 2003 and 2026, enabling a systematic examination of how open-access publishing structures knowledge

 DOI: https://doi.org/10.61242/ijabo.26.741

production, journal concentration, collaboration patterns and thematic evolution in SSCM.

Accordingly, the purpose of this study is to provide a comprehensive bibliometric analysis of sustainable supply chain management literature based on a large dataset of publications indexed in the Web of Science database. By examining approximately 5,866 articles, this study aims to (i) identify the most influential authors, journals and publications, (ii) map the intellectual and conceptual structure of the field and (iii) analyze the chronological evolution of research themes. In doing so, the study seeks to contribute to the consolidation of SSCM knowledge and to provide a structured foundation for future research in this rapidly evolving domain.

LITERATURE REVIEW

Foundation and Definitions

Sustainable supply chain management (SSCM) has evolved as a multidisciplinary field integrating sustainability principles into supply chain processes, decision-making and inter-organizational coordination. The conceptual foundation of SSCM is rooted in the broader sustainability paradigm defined by the World Commission on Environment and Development (WCED, 1987), which emphasizes intergenerational equity and long-term resource stewardship. This perspective has been operationalized through the triple bottom line (TBL) framework, encompassing environmental, economic and social dimensions (Elkington, 1997). Within the context of supply chains, sustainability requires the integration of these three dimensions across material, information and financial flows, extending beyond firm boundaries to include upstream and downstream actors (Mentzer et al., 2001; Seuring & Müller, 2008).

One of the most widely cited definitions of SSCM is provided by Seuring and Müller (2008), who conceptualize it as the coordinated management of supply chain flows while simultaneously achieving environmental, social and economic objectives. This definition has been repeatedly validated in subsequent reviews and bibliometric studies as the dominant conceptual reference point in SSCM research (Ahi & Searcy, 2013; Fahimnia et al., 2015). Ahi and Searcy (2013), through a systematic comparison of definitions, argue that SSCM represents a conceptual extension of green supply chain management (GSCM), broadening its scope to include social sustainability alongside environmental concerns. Similarly, Carter and Rogers (2008) emphasize that SSCM should be understood as a strategic capability that enhances long-term organizational performance by integrating risk management, transparency and stakeholder engagement. These definitions collectively highlight SSCM as both an operational and strategic construct embedded in inter-organizational networks.

Historical Development

The development of SSCM literature can be traced through a gradual transition from environmentally oriented supply chain practices to a holistic sustainability framework. Early research in the 1990s and early 2000s primarily focused on environmental management practices within supply chains, such as pollution reduction, waste minimization and eco-design, forming the basis of GSCM (Srivastava, 2007; Sarkis et al., 2011). This phase was largely driven by increasing regulatory pressure and environmental awareness, leading firms to integrate environmental considerations into procurement, production and logistics activities (Zhu & Sarkis, 2004; Vachon & Klassen, 2006).

The late 2000s marked a critical turning point in the evolution of the field with the emergence of SSCM as a distinct research domain. The seminal work of Seuring and

 DOI: https://doi.org/10.61242/ijabo.26.741

Müller (2008), based on a review of 191 articles, demonstrated that early SSCM research was heavily dominated by environmental concerns, with relatively limited attention to social sustainability (Brandenburg et al., 2019). Around the same time, Carter and Rogers (2008) introduced a theoretical framework linking sustainability to supply chain performance, emphasizing the strategic importance of sustainability integration. These contributions collectively established SSCM as a legitimate and growing field within operations and supply chain management.

From 2010 onwards, SSCM research expanded significantly in scope and theoretical depth. Scholars began incorporating diverse theoretical perspectives, including stakeholder theory, institutional theory and the resource-based view, to explain the adoption and outcomes of sustainability practices in supply chains (Touboulic & Walker, 2015; Koberg & Longoni, 2019). During this period, social sustainability emerged as an important research dimension, addressing issues such as labor conditions, human rights and ethical sourcing in global supply chains (Ahi & Searcy, 2013; Mani et al., 2016). At the same time, empirical and modeling studies gained prominence, reflecting the increasing maturity of the field.

In recent years, SSCM research has further evolved to incorporate emerging paradigms such as the circular economy, digital transformation and supply chain resilience. The circular economy perspective has been particularly influential, shifting the focus from linear production systems to closed-loop supply chains emphasizing reuse, recycling and resource efficiency (Theeraworawit et al., 2022). Additionally, technological advancements such as Industry 4.0, big data analytics and blockchain have been identified as key enablers of sustainable supply chain practices, enhancing transparency, traceability and decision-making capabilities (Yu et al., 2022). These developments indicate a transition toward more integrated, technology-driven and system-oriented approaches to SSCM.

Influential Research in SSCM

The SSCM literature is characterized by a set of highly cited foundational studies that have shaped its intellectual structure. Among these, Seuring and Müller (2008) remains the most influential, providing a comprehensive conceptual framework that integrates sustainability dimensions into supply chain management. Similarly, Carter and Rogers (2008) contributed a widely cited theoretical model linking SSCM to firm performance and competitive advantage, highlighting the strategic relevance of sustainability initiatives.

Srivastava (2007) is another seminal contribution, offering one of the earliest and most cited reviews of green supply chain management, which laid the groundwork for subsequent SSCM research. Building on these foundations, Pagell and Wu (2009) introduced a more comprehensive theory of SSCM, emphasizing the need to move beyond trade-offs toward truly sustainable supply chains. Empirical contributions such as Zhu and Sarkis (2004) and Vachon and Klassen (2006) further advanced the field by examining the relationship between environmental practices and supply chain performance.

Bibliometric and scientometric studies provide additional insight into the most influential works and scholars in SSCM. For instance, co-citation analyses identify key contributors such as Seuring, Sarkis, Govindan, Zhu, and Klassen as central figures in the field (Nimsai et al., 2022). These studies also highlight core publications that have shaped SSCM discourse, including works on institutional pressures, green practices and supply chain integration (Zhu et al., 2005; Vachon & Klassen, 2006; Özkan, 2025). Moreover, recent bibliometric reviews emphasize the interdisciplinary nature of SSCM research,

 DOI: https://doi.org/10.61242/ijabo.26.741

drawing from operations management, environmental science and strategic management literature (Fahimnia et al., 2015; Brandenburg et al., 2014).

Dominant Research Trends and Research Gaps

The SSCM literature has evolved around several interconnected research streams. First, environmental sustainability remains a central theme, focusing on green procurement, eco-friendly design, reverse logistics and emissions reduction (Srivastava, 2007; Sarkis et al., 2011). These practices are often associated with regulatory compliance and cost efficiency, reflecting the early focus of SSCM research. We can argue that in the second stream, social sustainability has gained increasing attention, particularly in the context of global supply chains. Issues such as labor standards, human rights and ethical sourcing have become critical concerns, driven by stakeholder pressure and corporate social responsibility initiatives (Mani et al., 2016; Koberg & Longoni, 2019). However, compared to environmental sustainability, currently this dimension remains less developed and offers significant research opportunities. Third stream, which consists of economic sustainability and performance outcomes constitute another important research agenda. Studies have examined the relationship between sustainability practices and firm performance, suggesting that SSCM can enhance competitiveness through innovation, risk reduction and improved stakeholder relationships (Carter & Rogers, 2008; Golicic & Smith, 2013). This stream reinforces the strategic importance of sustainability in supply chain management. Research in the fourth stream argue that governance and collaboration mechanisms are critical for the successful implementation of SSCM. Supply chain sustainability requires coordination among multiple stakeholders, including suppliers, regulators and customers, as well as the adoption of standards, certifications and monitoring systems (Seuring & Müller, 2008; Touboulic & Walker, 2015). These mechanisms help address information asymmetries and ensure compliance with sustainability requirements. Fifth and last, emerging research streams focus on innovation, digitalization and circular economy integration. Recent studies highlight the role of advanced technologies and new business models in enabling sustainable supply chains, particularly in the context of closed-loop systems and resource efficiency (Theeraworawit et al., 2022). Scholarly efforts in this stream indicate a shift toward more dynamic and technology-driven approaches to SSCM.

Despite the substantial growth of SSCM literature, several challenges and research gaps remain. First, the field continues to face conceptual ambiguity, particularly regarding the integration of social sustainability and the operationalization of sustainability metrics (Ahi & Searcy, 2013; Touboulic & Walker, 2015). Second, there is a need for greater methodological diversity, including longitudinal and multi-level studies that capture the complexity and dynamics of supply chains. While quantitative modeling approaches have advanced significantly, they often focus on environmental and economic dimensions, with limited consideration of social factors (Brandenburg et al., 2014). Third, emerging themes such as digitalization, circular economy and resilience require further theoretical and empirical exploration. Although recent studies highlight their importance, the integration of these concepts into SSCM frameworks remains incomplete (Yu et al., 2022) . Finally, there is a need for more interdisciplinary research that bridges gaps between operations management, sustainability science and strategic management. In this context, we argue that bibliometric analysis provides a valuable methodological approach for synthesizing the rapidly expanding SSCM literature, identifying key research trends and mapping the intellectual structure of the field. By analyzing a large dataset of publications, this study contributes to addressing these gaps and advancing the understanding of SSCM research.

 DOI: https://doi.org/10.61242/ijabo.26.741

RESEARCH METHOD

Data & Approach

Authors used a bibliometric analyses approach to examine open-access papers published in the Web of Science (WoS) database on sustainability in supply chain management. Data was collected from the sub-database of the Science Citation Index Expanded (SCI-E), Emerging Sources Citation Index (ESCI), Social Science Citation Index (SSCI), Art & Humanities Citations Index (AHCI) sourced from the Web of Science Core Collection (WoS) database on March, 16, 2026. The search technique included the search query '(TS=(Supply chain management) *AND* TS=(Sustainability)' and a Boolean search was conducted. Full and exact WoS query used in the study is shared in Table 1 below, including the filters.

Table 1: WoS Search Query & Filters

TS=("supply chain management") AND TS=("sustainability")
Indexes = SCI-EXPANDED, SSCI, ESCI, AHCI
Document types = Article
Access type = Open Access
Timespan = 2003–2026
Search date = March 16, 2026

Source: Authors (2026)

A total of 15117 publications were found, but after the exclusion criteria were applied, 5866 open-access publications that comprised the study were discovered. The data were examined using software *RStudio* (Biblioshiny) (Team RC. RA language and environment for statistical computing, R Foundation for Statistical. C). The study deliberately focuses on open-access publications because open-access models have become increasingly influential in sustainability scholarship, particularly through high-volume journals such as Sustainability. Restricting the sample to open-access articles enables examination of knowledge production under contemporary open dissemination regimes while ensuring full metadata accessibility and reproducibility. The data evaluation was undertaken to span the time frame from 2003, that the first research published in this subject, until now in order to attain a holistic interpretation incorporating keywords, titles and abstracts. The language of publishing was not differentiated and only open-access papers and articles research were chosen. The analysis of data was carried out by excluding publications from the research, including proceeding papers, letters, corrections, books, book chapters and editorial materials.

RESEARCH RESULT

As a result of a comprehensive study, 15,117 publications were identified between 2003 and 2026. However, only 5,866 articles that were open-access and classified as “articles” were included in the bibliometric analysis. Fig 1. illustrates the temporal evolution of document growth in the bibliometric analysis of studies concerning sustainability in supply chain management and an increasing global scientific research interest in the research streams is visible.

Figure 1, depicting annual scientific production in sustainable supply chain management (SSCM) reveals a clear and structured growth trajectory of the field, which can be interpreted in distinct developmental phases consistent with prior bibliometric studies (Fahimnia et al., 2015; Seuring & Müller, 2008). First, the period between 2003 and approximately 2010 reflects a nascent stage, characterized by extremely low publication output. This aligns with the early phase of the literature where research was largely embedded within green supply chain management (GSCM) and had not yet fully

 DOI: https://doi.org/10.61242/ijabo.26.741

evolved into a distinct SSCM domain (Srivastava, 2007; Sarkis et al., 2011). The limited number of publications suggests that sustainability considerations were still peripheral to mainstream supply chain research during this time. Second, the period from 2011 to 2016 represents an emergent growth phase, during which the number of publications begins to increase gradually. This trend corresponds with the consolidation of SSCM as a research field following seminal conceptual contributions (e.g., Seuring & Müller, 2008; Carter & Rogers, 2008). Increasing regulatory pressures, stakeholder awareness and corporate sustainability initiatives likely contributed to the steady rise in academic output during this period (Ahi & Searcy, 2013).

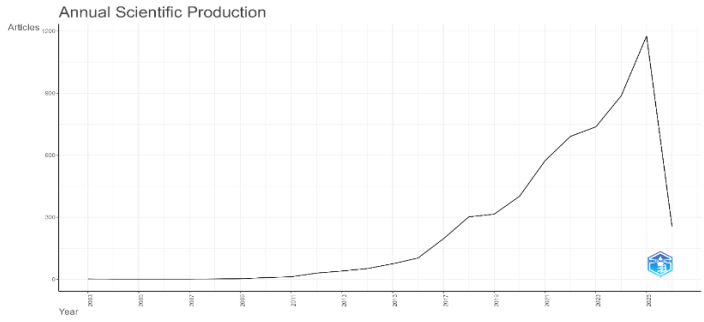

Figure 1: Annual Scientific Production of Articles
Source: Authors (2026)

A more pronounced shift is observed from 2017 onwards, marking a rapid expansion phase. The number of publications increases sharply, indicating heightened scholarly interest and the maturation of SSCM as a mainstream research area. This surge is consistent with broader global developments, including the adoption of the United Nations Sustainable Development Goals (SDGs) in 2015, which significantly accelerated sustainability-related research across disciplines (Koberg & Longoni, 2019). Additionally, the growing integration of circular economy principles, digital technologies (e.g., Industry 4.0) and resilience thinking into supply chain research has further stimulated academic output (Brandenburg et al., 2014).

The peak observed around 2024–2025 suggests that SSCM research has reached a high level of academic maturity and visibility, with annual publications approaching or exceeding 1,000 articles. This reflects not only the expansion of the field but also its increasing interdisciplinarity and relevance to global challenges such as climate change, resource scarcity and ethical sourcing (Sasikumar & Nair, 2025). Finally, the sharp decline in 2026 should be interpreted with caution. This drop is most likely an artifact of incomplete data for the current year, rather than an actual decrease in research activity. Bibliometric datasets frequently exhibit such patterns for the most recent year due to indexing delays and publication lags (Donthu et al., 2021).

Table 2 below provides important insights into the geographical distribution of scientific impact in sustainable supply chain management (SSCM) by combining total citation counts with average citations per article. When interpreted jointly, these two indicators allow for a more nuanced understanding of both research productivity and research influence across countries (Donthu et al., 2021; Fahimnia et al., 2015).

Table 2: Total & Average Citation of Countries

Country	Total Citation	Average Article Citations
United Kingdom	30428	50,60
China	20202	26,50
Italy	12935	31,90
USA	9846	34,40

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Germany	7239	35,50
India	6483	26,10
Netherlands	6058	44,90
Australia	5368	31,40
Spain	5002	21,20
France	4180	32,70

Source: Authors (2026)

In terms of total citations, the United Kingdom clearly emerges as the most influential country, with 30,428 citations, significantly outperforming all other countries. This indicates a strong and well-established research tradition in SSCM, likely supported by leading institutions and sustained publication output. China follows with 20,202 citations, reflecting its rapidly expanding research capacity and growing presence in global SSCM scholarship. European countries such as Italy, Germany and the Netherlands also demonstrate substantial citation impact, highlighting the strong role of European academia in sustainability-related research (Koberg & Longoni, 2019).

However, total citation counts alone do not fully capture research quality or influence. When examining average citations per article, a different pattern emerges. The United Kingdom again ranks first (50.60), confirming not only high productivity but also high impact per publication. Notably, the Netherlands ranks second in average citations (44.90), despite having lower total citations, suggesting that its research output is particularly influential and widely recognized. Similarly, Germany (35.50) and the United States (34.40) exhibit strong average citation performance, indicating consistent production of high-quality and impactful studies. In contrast, countries such as China (26.50), India (26.10), and Spain (21.20) display relatively lower average citation rates despite considerable total citation counts. This pattern may reflect a high volume of publications with more heterogeneous impact, a phenomenon commonly observed in rapidly expanding research systems (Fahimnia et al., 2015). It may also indicate differences in research maturity, international collaboration and journal placement strategies.

Another important observation is the strong performance of smaller but research-intensive countries. For example, the Netherlands demonstrates a high average citation rate relative to its total output, suggesting a focus on high-impact publications and international collaboration networks, which are known to enhance citation performance (Donthu et al., 2021). Similarly, France and Australia maintain relatively balanced profiles, combining moderate total citations with solid average citation levels. These findings are consistent with prior bibliometric studies, which emphasize that SSCM research is geographically concentrated in developed economies, particularly in Europe and North America, while emerging economies are increasingly contributing to the expansion of the field (Koberg & Longoni, 2019; Brandenburg et al., 2014).

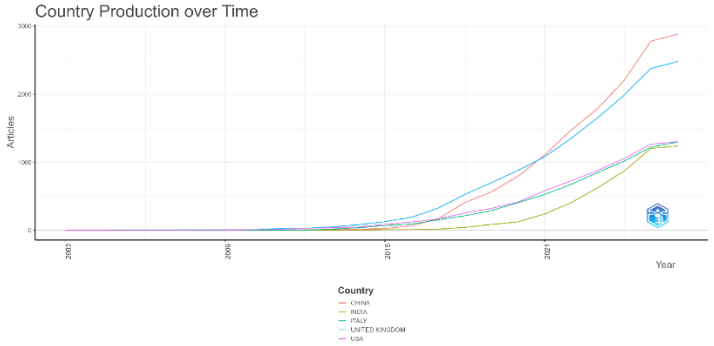

Figure 2 : Article Production of Countries Over Time
Source: Authors (2026)

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Figure 2 below illustrating country-level publication output over time in sustainable supply chain management (SSCM) provides a clear comparative view of how national research contributions have evolved. The trends observed are consistent with the broader expansion and globalization of SSCM research documented in prior bibliometric studies (Fahimnia et al., 2015; Koberg & Longoni, 2019). First, across all countries, the figure reveals a common temporal pattern characterized by slow initial growth followed by rapid acceleration after approximately 2015. This aligns with the global surge in sustainability-related research following increased regulatory attention, corporate sustainability initiatives and the introduction of the United Nations Sustainable Development Goals (SDGs) in 2015, which significantly stimulated academic output (Koberg & Longoni, 2019; Donthu et al., 2021).

Among the countries, China exhibits the most dramatic growth trajectory, particularly after 2017. While its publication output was relatively modest in earlier years, it overtakes other countries and becomes the leading contributor by the early 2020s. This pattern reflects China's expanding investment in research and development and its increasing emphasis on sustainability and environmental policy within industrial and supply chain contexts (Zhu & Sarkis, 2004; Sarkis et al., 2011). The steep growth curve also suggests a high-volume publication strategy, consistent with patterns observed in emerging research-intensive economies. The United Kingdom demonstrates a strong and steady growth pattern, maintaining a leading position throughout most of the observed period. Unlike China's late surge, the UK shows consistent early engagement and sustained expansion, indicating a mature and stable research ecosystem in SSCM. This is consistent with its high citation impact observed in previous analyses and reflects its role as a key contributor to foundational SSCM research (Seuring & Müller, 2008; Ahi & Searcy, 2013).

The United States follows a similar but slightly more moderate trajectory, with steady growth over time and a notable increase after 2015. While it does not surpass China or the UK in total output in recent years, its consistent upward trend reflects its continued importance in high-quality SSCM research, often characterized by strong theoretical and empirical contributions (Carter & Rogers, 2008; Golicic & Smith, 2013). European countries such as Italy display a gradual and consistent increase in publication output, particularly after 2016. Italy's trajectory suggests a growing engagement with SSCM research, likely influenced by European Union sustainability policies and funding mechanisms that promote environmental and circular economy research (Brandenburg et al., 2014). The relatively smooth growth curve indicates stable development rather than rapid expansion.

In contrast, India shows a delayed but accelerating growth pattern, with minimal output in the early years followed by a sharp increase after 2018. This suggests that SSCM research is a relatively newer but rapidly developing field within the Indian academic context. The recent upward trend indicates increasing research capacity and engagement with global sustainability challenges, although the overall output remains lower compared to leading countries. Another important observation is the convergence trend after 2020, where multiple countries (e.g., USA, Italy, India) show synchronized growth patterns. This convergence reflects the globalization of SSCM research, with sustainability becoming a universally relevant topic across both developed and emerging economies (Koberg & Longoni, 2019).

Overall, the figure highlights a shift from geographically concentrated research (dominated by Western countries) toward a more globally distributed knowledge production system, with China emerging as a dominant contributor in terms of volume. At the same time, traditional leaders such as the United Kingdom and the United States

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maintain strong and consistent contributions, suggesting a balance between research maturity and expansion within the SSCM field. Figure 3 below demonstrates author based collaboration networks in SSCM.

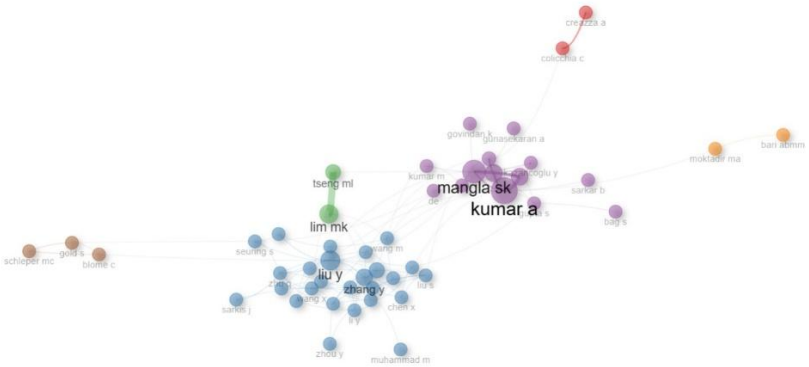

Figure 3 : Author Based Collaboration Networks in SSCM
Source: Authors (2026)

The author collaboration network provides a rich structural representation of intellectual and social interactions within the sustainable supply chain management (SSCM) field, revealing both core research clusters and collaboration patterns. When interpreted through a bibliometric lens, the figure highlights the presence of central authors, clustered communities and varying degrees of network cohesion, which are typical characteristics of a maturing research domain (Donthu et al., 2021; Fahimnia et al., 2015).

First, the network exhibits a clustered structure, indicating that SSCM research is organized around distinct collaborative communities rather than a fully integrated global network. Each color-coded cluster represents a group of authors who frequently collaborate with one another. This pattern suggests the presence of thematic or regional research groups, often shaped by shared institutional affiliations, geographical proximity or common research interests (Touboulic & Walker, 2015; Koberg & Longoni, 2019). Such clustering is consistent with prior findings that SSCM research, while global, still tends to develop within semi-autonomous scholarly communities.

A particularly notable feature is the presence of highly central and influential authors, such as Kumar A., Mangla S.K., and Liu Y., who appear as large and well-connected nodes within the network. In bibliometric terms, node size and connectivity indicate high publication output and strong collaborative ties, suggesting that these authors act as knowledge hubs within the field. Their central positions imply a significant role in shaping research agendas, facilitating collaboration, and disseminating knowledge across the network (Donthu et al., 2021). This observation aligns with previous bibliometric studies identifying certain scholars as key drivers of SSCM research development (Fahimnia et al., 2015). The network also reveals the existence of bridging authors, who connect otherwise separate clusters. For example, authors such as Lim M.K. appear to link different groups, indicating their role as intermediaries facilitating knowledge transfer between research communities. Such bridging positions are critical in enhancing the integration of fragmented research streams and promoting interdisciplinary collaboration (Touboulic & Walker, 2015). The presence of these connectors suggests that while the field is somewhat fragmented, there are mechanisms enabling intellectual exchange across clusters.

At the same time, the figure shows several peripheral or weakly connected clusters, where small groups of authors have limited interaction with the broader network. These peripheral nodes may represent emerging research groups, niche topics or

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regionally concentrated collaborations that have not yet fully integrated into the global SSCM research community (Koberg & Longoni, 2019). The existence of such isolated clusters indicates opportunities for future collaboration and network expansion. Another important observation is the coexistence of established and emerging scholars within the network. Established authors tend to occupy central positions with dense connections, while newer researchers appear at the periphery with fewer collaborative ties. This structure reflects a core–periphery network pattern, which is commonly observed in scientific fields undergoing rapid growth and consolidation (Donthu et al., 2021).

Overall, the collaboration network suggests that SSCM research is moderately cohesive but still fragmented, with strong internal collaboration within clusters and comparatively weaker connections across them. This indicates that while the field has developed a solid intellectual foundation, there remains significant potential for greater international and inter-cluster collaboration, which could enhance knowledge integration and theoretical advancement. Table 3 lists the most cited open-source articles within SSCM research domain.

Table 3: Open-Access SSCM Articles with the Most Citations

Authors	Articles	Citation
Lehmann J; et al. 2020,	The concept and future prospects of soil	1079
Papargyropoulou E; et al.2014	The food waste hierarchy as a framework for the management of food surplus and food waste	1033
Zhu Q, Sarkis J; et al. 2007	The moderating effects of institutional pressures on emergent green supply chain practices and performance	853
Ivanov D, 2022	Viable supply chain model: integrating agility, resilience and sustainability perspectives-lessons from and thinking beyond the COVID-19 pandemic	779
Pagell M, Shevchenko A; 2014	Why Research in Sustainable Supply Chain Management Should Have no Future	594
Luthra S, Mangla SK; 2018	Evaluating challenges to Industry 4.0 initiatives for supply chain sustainability in emerging economies	587
Hughes L, et al. 2019	Blockchain research, practice and policy: Applications, benefits, limitations, emerging research themes and research agenda	536
Ibn-Mohammed T, et al. 2021	A critical analysis of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies	532
Ivanov D, 2020	'A blessing in disguise' or 'as if it wasn't hard enough already': reciprocal and aggravate vulnerabilities in the supply chain	511
Jabbour CJC, and Jabbour ABLD; 2016	Green Human Resource Management and Green Supply Chain Management: linking two emerging agendas	511

Source: Authors (2026)

A comparative analysis of the author collaboration network and the most cited articles reveals a notable divergence between research productivity and scholarly impact within the sustainable supply chain management (SSCM) literature. The co-authorship network indicates that the field is structured around several densely connected clusters of prolific authors, such as Kumar, Mangla and Liu, who occupy central positions and demonstrate strong collaborative engagement. These authors contribute significantly to the volume and continuity of SSCM research, reflecting well-established research communities and ongoing collaborative relationships (Donthu et al., 2021; Fahimnia et al., 2015).

However, the analysis of the most cited open-access articles suggests that high citation impact is not necessarily concentrated within these core collaboration clusters. Instead, the most influential works are distributed across a broader and more

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heterogeneous set of authors, many of whom are not prominently positioned within the co-authorship network. For instance, highly cited studies by Lehmann et al. (2020) and Papargyropoulou et al. (2014) focus on environmental and food waste issues, while works by Ivanov (2022) emphasize supply chain resilience and viability and Hughes et al. (2019) explore blockchain applications. This indicates that SSCM's intellectual impact is significantly shaped by interdisciplinary and boundary-spanning contributions.

This divergence highlights the existence of dual knowledge structures within the SSCM field. On the one hand, a core collaborative network drives sustained publication output and incremental knowledge development. On the other hand, high-impact contributions often emerge from conceptual, methodological or contextual innovations that extend beyond the immediate SSCM domain. Such works tend to attract a wider academic audience and achieve higher citation counts due to their relevance across multiple research areas, including circular economy, digital transformation and crisis management (Koberg & Longoni, 2019; Brandenburg et al., 2014).

Furthermore, many of the most cited articles are conceptual or agenda-setting in nature, providing frameworks, critical perspectives or integrative models that shape subsequent research directions. For example, Pagell and Shevchenko (2014) challenge the future trajectory of SSCM research, while Luthra and Mangla (2018) and Jabbour and Jabbour (2016) integrate emerging themes such as Industry 4.0 and green human resource management into the SSCM discourse. These contributions illustrate that citation impact is often associated with theoretical novelty, timing and cross-disciplinary relevance, rather than merely the frequency of collaboration.

Overall, the findings suggest that SSCM research is characterized by a partial decoupling between collaboration intensity and citation influence. While collaborative networks are essential for sustaining research productivity, the most influential contributions frequently arise from innovative and interdisciplinary studies that transcend established collaboration structures. This underscores the importance of fostering not only strong research networks but also intellectual diversity and cross-domain integration in advancing the SSCM field. Table 4 below demonsrates the journals with most open-access SSCM research published.

Table 4: Number of Open Access SSCM Articles Based on Journal Name

Sources	Articles
Sustainability	1142
Journal of Cleaner Production	236
Business Strategy and The Environment	187
Cleaner Logistics and Supply Chain	99
Internatıonal Journal of Production Economics	77
Annals of Operations Research	70
Sustainable Futures	68
International Journal of Operations & Production Management	65
Production Planning & Control	62
Supply Chain Management-An International Journal	62

Source: Authors (2026)

The most striking finding is the overwhelming dominance of Sustainability (1,142 articles), which accounts for more than four times the output of the second-ranked journal (Journal of Cleaner Production). From an academic perspective, this warrants critical scrutiny. First, Sustainability (MDPI) is a mega-journal with a high-volume, gold open-access model. The figure of 1,142 articles suggests that a significant portion of recent SSCM research is being funneled into a single, high-speed publication venue. This indicates a systemic pressure on researchers (particularly early-career academics and

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those in research assessment exercises) to prioritize publication velocity and volume over the traditional "slow science" approach of niche journals. Second, while sustainability is a reputable journal with a legitimate peer-review process, its inclusion in this list raises questions about whether the data reflects a genuine intellectual migration toward the journal's scope or a strategic publication pattern driven by the "publish or perish" culture.

We can argue that, the field of SSCM exhibits a highly skewed concentration of output. The top three journals (Sustainability, JCLP, BSE) account for the vast majority of the corpus. Journals like Annals of Operations Research (70) and International Journal of Operations & Production Management (65) represent the "long tail." Notably, IJOPM and Supply Chain Management: An International Journal show comparatively modest counts. This suggests that SSCM research is currently situated more in environmental science and corporate sustainability silos (e.g., JCLP, BSE) than in the traditional operations management (OM) silos. Researchers in OM departments may treat sustainability as a sub-theme, whereas researchers in environmental science or sustainability departments treat it as the core theme. Figure 4 visualises the most common keywords in open access SSCM research.

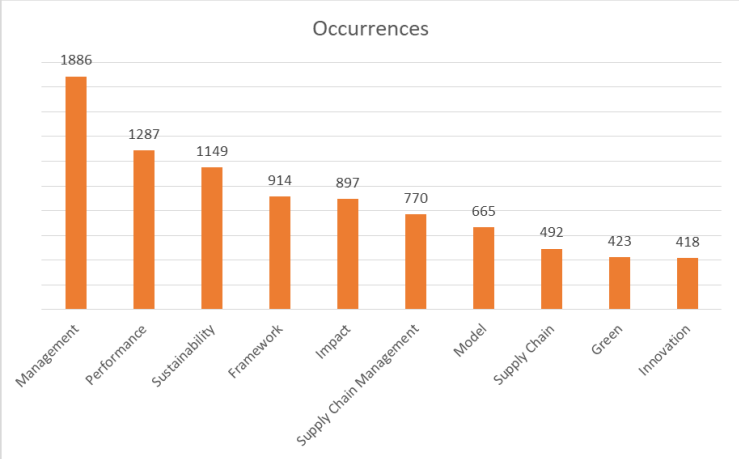

Figure 4: Most Common Keywords in Open Access SSCM Research
Source: Authors (2026)

The top three keywords *Management* (1,886), *Performance* (1,287) and *Sustainability* (1,149) form the conceptual backbone of the field. Management reflects the field's embeddedness in broader management studies, emphasizing decision-making, coordination and governance across supply chains. Performance indicates a strong evaluative orientation: research is heavily concerned with measuring outcomes and establishing causal links between sustainable practices and performance metrics. Sustainability as a keyword is almost tautological in SSCM research, but its high frequency underscores that the field treats sustainability as the overarching normative goal rather than merely a contextual variable. The near equivalence in frequency among these three suggests that the dominant research paradigm is one where management practices are studied for their sustainability performance outcomes.

The keywords *Framework* (914) and *Model* (770) rank fourth and seventh, respectively. Their prominence signals a field in a phase of theoretical consolidation. Researchers are actively engaged in proposing conceptual frameworks (often integrating theories such as stakeholder theory, resource-based view, or institutional theory) and developing analytical or simulation models (e.g., optimization, system dynamics, structural equation modeling). The distinction may also reflect methodological camps: "framework" often appears in conceptual/qualitative papers, while "model" tends to appear in quantitative or operations research–oriented contributions. Their co-occurrence

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in the top ten indicates that SSCM research places a premium on structured, replicable analytical approaches.

For the supply chain management side of the concept, two variants appear: *Supply Chain Management* (770) and *Supply Chain* (492). Their separate listing is methodologically important. It suggests that a substantial portion of the literature explicitly positions itself within the discipline of supply chain management, whereas the shorter term "Supply Chain" may appear in papers that focus on operational or logistical aspects without emphasizing the management discipline per se. If combined, the total frequency of "supply chain" related keywords would exceed 1,200, reinforcing that SSCM research remains firmly anchored in supply chain constructs rather than drifting into generic sustainability studies.

The keyword *Impact* (897) ranks fifth. This aligns with the performance orientation: a large body of research seeks to quantify the environmental or social impacts of supply chain activities, often using life-cycle assessment or carbon-footprinting methods. The keyword *Green* (423) on the other hand ranks ninth. Its lower frequency relative to "sustainability" is notable. Historically, "green supply chain management" (GSCM) was the precursor term, focusing on environmental issues. The shift toward "sustainability" (which encompasses social and economic pillars) appears complete in the keyword lexicon. The continued presence of "green" suggests a persistent sub-stream focused narrowly on environmental aspects, but it is now secondary. The keyword *Innovation* (418) appears tenth. Its inclusion in the top ten is significant: it indicates growing scholarly interest in how sustainable supply chains drive or require innovation. However, its frequency remains lower than more established constructs, suggesting that innovation is an expanding rather than a fully matured theme.

From a critical perspective, the absence of certain keywords is as informative as their presence. Social dimensions (e.g., labor rights, human rights, social responsibility) do not appear in the top ten. This aligns with the well-documented bias in SSCM literature toward environmental and economic performance, often at the expense of social sustainability. Circular economy / circular is notably absent, despite its rapid growth in recent years. This may indicate that the dataset covers an older time window, or that circular economy research has not yet penetrated the keyword set at the same volume as core terms. Resilience or risk—themes that have gained prominence post-pandemic—are also missing, suggesting that the keyword analysis reflects a longer-term corpus where these were not yet dominant. Figure 5 represents a three field plot illustrating the bibliometric relationships among sources, key concepts and countries.

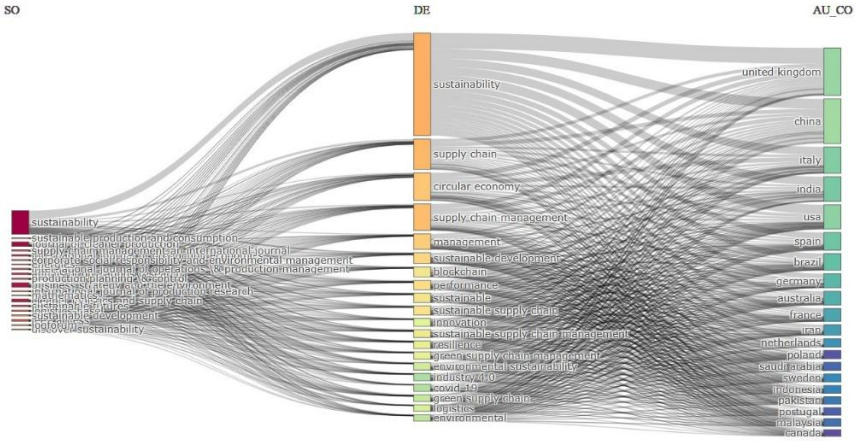

Figure 5: Three-field plot illustrating the bibliometric relationships among sources, key concepts, and countries
Source: Authors (2026)

 DOI: https://doi.org/10.61242/ijabo.26.741

First column on the left represents journals while middle column represents research topics and/or keywords. The final column on the right symbolises author's national affiliations. The thickness of the links represents the strength of association—e.g., how many articles from a given journal use a given keyword, or how many articles from a given country publish on a given topic.

For the source (journal) – keyword relationship, it is visible that Sustainability, as a mega-journal, publishes across nearly all SSCM topics. Its links will appear widespread, covering both mainstream terms (e.g., "supply chain management") and emerging themes ("blockchain," "industry 4.0," "circular economy"). This breadth, however, may come at the cost of thematic specialisation. In contrast, journals such as Journal of Cleaner Production and Business Strategy and the Environment likely show stronger links to specific clusters: JCLP to "cleaner production," "life cycle assessment" and "circular economy"; BSE to "corporate strategy," "stakeholder theory" and "governance." The presence of keywords like "model" and "framework" will be strongly linked to International Journal of Production Economics, Annals of Operations Research and International Journal of Operations & Production Management. These sources are traditional operations management / operations research outlets and their links signal a distinct methodological camp (e.g., quantitative modeling, simulation and optimization) within SSCM.

Keyword – country relationship likely shows a handful of dominant countries, with China, the United States, the United Kingdom and possibly Italy, Germany or Australia appearing as the largest nodes. The thickness of links between keywords and countries reveals geographic patterns of research emphasis. China will show strong links to keywords such as "green supply chain management," "performance," "industry 4.0" and "circular economy." Chinese research output in SSCM is enormous and often focuses on empirical surveys, environmental performance measurement and the adoption of digital technologies in manufacturing contexts. The United States will likely be strongly associated with "management," "framework," "sustainability" and "supply chain management." U.S. research tends to emphasize theoretical development, strategic management perspectives and sometimes resilience, the latter being a theme that has grown post-pandemic. The United Kingdom and Western Europe will probably show stronger links to "sustainable development," "policy," "circular economy" and "social sustainability" (though the latter is notably underrepresented in the keyword list). European research often engages with regulatory frameworks, circular economy policy and broader sustainability transitions. Emerging economies (e.g., India, Brazil, Malaysia) may appear as smaller nodes, often linked to "green supply chain," "performance" and "developing countries", indicating a focus on how sustainability practices are implemented in industrialising contexts.

The near absence of "social sustainability" and "human rights" from the keyword list, despite their presence in some country-specific research, suggests that even country-level specialisation has not yet elevated these themes into the mainstream of the SSCM keyword lexicon. The field remains heavily tilted toward environmental and economic dimensions across all major publishing countries.

Figure 5 can also be used to analyze source (journal) – country relationships. Sustainability will likely show links to a very wide range of countries, especially China, the U.S. and Europe, because it is an open-access journal that attracts submissions globally. However, due to its open-access model and rapid publication, it may also be linked to countries with high publication pressure (e.g., developing nations where open-access fees are covered by institutional agreements). Journal of Cleaner Production, being a long-standing, hybrid journal, will also show a broad geographic footprint but

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with particularly thick links to China and Europe, reflecting its strong readership and author base in environmental engineering and industrial ecology communities. Traditional operations management journals (IJOPM, IJPE, SCMJ) will likely show stronger links to the U.S., UK and other Western countries, reflecting the historical concentration of operations management scholarship in these regions. This geographic disparity may indicate that mainstream operations management journals have been slower to attract and publish SSCM research from emerging economies, despite the latter's high overall output.

Alternatively, the field plot can be interpreted as a core-periphery map. The largest nodes in the middle column (keywords) represent the conceptual core of the field. Based on our previous keyword data, this core includes "management," "performance" and "sustainability." In the plot, these core keywords will be connected to nearly all sources and many countries, indicating that they function as universal themes. Conversely, more specialised or recent keywords such as "blockchain," "industry 4.0," "eco-innovation" and "resilience" will appear as smaller nodes with more selective links. For example, blockchain and industry 4.0 are likely linked to Sustainability, JCLP and perhaps Cleaner Logistics and Supply Chain but weakly linked to traditional OM journals. They also show geographic concentration in China, Italy and India, where there is active research on digital supply chain transformation. Resilience, despite its practical importance, may not yet be deeply embedded in the core keyword set, suggesting that the integration of resilience and sustainability is still a developing frontier.

The three field plot also offers insights into the epistemological structure of SSCM research. First fragmentation can be interpreted as fragmentation across sources. The three-field plot often reveals that different source communities engage with different sets of keywords. For example, the Journal of Cleaner Production cluster include "life cycle assessment," "circular economy" and "environmental impact," whereas the Business Strategy and the Environment cluster include "corporate social responsibility," "stakeholder engagement" and "competitive advantage." This fragmentation indicates that SSCM is not a unified field but rather a trading zone where engineering, environmental science and management traditions meet but do not fully integrate. Second fragmentation visible is the geographic fragmentation. Plot shows thick links between specific countries and specific sources (e.g., Chinese authors publishing predominantly in Sustainability and JCLP, while US/UK authors publish more in IJOPM and SCMJ). This suggessts a geographic division of labor that may limit cross-fertilisation. Such a pattern can have implications for the global relevance of findings, as locally validated theories may not be tested across diverse institutional contexts.

While a three field plot is visually powerful, we have to note its limitations. First of all, the plot aggregates data across years. It does not show how relationships have shifted. Second, links are typically based on frequency of co-occurrence, not on influence. A journal that publishes many articles with a given keyword may not necessarily be the most influential in shaping that topic. Finally, the country field often represents the corresponding author's affiliation, which in many cases reflects a single country even for international collaborations. This can overstate the contribution of countries with large numbers of corresponding authors (e.g., China) and understate the collaborative nature of the field.

DISCUSSION

The findings of this bibliometric analysis provide important insights into the structural characteristics and developmental dynamics of sustainable supply chain management

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(SSCM) research. First, the observed rapid growth and concentration of publications suggests that SSCM has transitioned from an emerging topic into a consolidated research domain. The dominance of *Sustainability* as a publication outlet reflects the increasing role of open-access mega-journals in accelerating knowledge dissemination, but it also raises concerns regarding epistemic centralization and potential homogenization of research agendas. At the same time, the continued relevance of specialized journals indicates the persistence of disciplinary boundaries within the field.

Second, the thematic structure identified through keyword co-occurrence analysis reinforces the notion that SSCM remains anchored in performance-oriented and environmentally focused paradigms. While the emergence of topics such as circular economy, blockchain and Industry 4.0 signals an ongoing transformation, their relatively peripheral position during the study period suggests that the integration of digitalization and advanced sustainability concepts into mainstream SSCM research is still incomplete. This finding aligns with the broader literature emphasizing the gradual convergence of sustainability and digital transformation, rather than a fully realized synthesis. Third, the geographically uneven distribution of research output highlights structural asymmetries in global knowledge production. The prominence of China, the United States and Western Europe reflects differences in institutional capacity, research funding and policy priorities. Moreover, the distinct thematic specializations observed across these regions suggest that SSCM knowledge is shaped by context-specific drivers, including regulatory environments, industrial structures and technological capabilities. This polycentric yet fragmented landscape supports the interpretation of SSCM as a "trading zone," where multiple epistemic communities interact without achieving full theoretical integration.
In addition, the divergence between collaboration intensity and citation impact offers a nuanced perspective on scientific influence within the field. While dense co-authorship networks facilitate productivity and knowledge exchange, highly cited contributions tend to emerge from more diverse and less centralized scholarly configurations. This finding underscores the importance of conceptual novelty and interdisciplinary approaches in advancing SSCM research, suggesting that impactful scholarship may depend less on network centrality and more on intellectual differentiation.

Taken together, these results imply that SSCM is characterized by both maturation and fragmentation. The field exhibits a stable conceptual core and established publication infrastructure, yet remains heterogeneous in its theoretical foundations and methodological approaches. For future research, greater integration across disciplinary boundaries, increased engagement with underrepresented regions and deeper incorporation of emerging technologies into sustainability frameworks appear critical for advancing the field.

Specifically, authors hope that this study would contribute to the existing SSCM literature in three ways. First, it provides the most up-to-date longitudinal mapping of open-access SSCM research through 2026. Second, it identifies structural concentration effects associated with open-access publishing, including the dominance of mega-journals such as Sustainability. Third, it demonstrates a divergence between co-authorship centrality and citation influence, suggesting that impactful SSCM scholarship is often driven by interdisciplinary novelty rather than collaboration density.

CONCLUSION

This bibliometric study analyzed 5,866 open-access articles on sustainable supply chain management (SSCM) indexed in the Web of Science (WoS) database between 2003 and 2026, using RStudio for data processing and visualization. By examining geographical

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contributions, author based collaboration networks, journal output, keyword co-occurrence and a three-field plot (sources, keywords, countries), the analysis reveals the intellectual structure, geographic concentration and thematic evolution of the field within the selected timeframe.

The findings indicate a field characterized by high concentration and fragmentation. A single journal, *Sustainability*, accounts for the largest share of publications—a dominance that reflects the growing influence of open-access mega-journals in shaping research output. At the same time, a cluster of specialised journals (*Journal of Cleaner Production*, *Business Strategy and the Environment* and traditional operations management outlets) anchor distinct methodological and thematic communities. Keyword analysis confirms a conceptual core centred on management, performance and sustainability, while emerging themes such as circular economy, blockchain and industry 4.0 remain peripheral within the 2003–2026 window, suggesting that their rapid growth occurred in subsequent years.

The three-field plot further illustrates a polycentric but geographically imbalanced research landscape. China, the United States and Western Europe emerge as the dominant publishing regions, each exhibiting distinct thematic specialisations: environmental performance and digital technologies in China, strategic and theoretical approaches in the United States and policy-oriented circular economy research in Europe. Links between sources and keywords reveal that the intellectual structure of SSCM is not monolithic but rather a trading zone where engineering, environmental science and management traditions converge without full integration.

Author collaboration network and citation analysis reveal a clear distinction between collaboration intensity and citation impact within the SSCM domain. While a core group of authors dominates the co-authorship network through frequent collaboration and high publication output, the most highly cited studies are often produced by a more dispersed set of scholars. This indicates that scholarly influence is frequently driven by interdisciplinary and conceptually novel contributions**,** rather than by position within dense collaboration networks.

This bibliometric study also provides additional contributions to SSCM research in several ways. First of all, study extends SSCM bibliometric literature by demonstrating that knowledge production is increasingly shaped by publication model dynamics, particularly the concentration effects associated with open-access mega-journals. Second, it makes the fact clear that SSCM is not a unified discipline but a hybrid intellectual domain linking operations management, sustainability science and strategic management. Third and last, citation impact in SSCM scholarship is not synonymous with network centrality, suggesting innovation emerges from boundary-spanning scholarship.

The findings of this bibliometric analysis generate several implications for managers and policymakers seeking to advance sustainable supply chain management practices. From a managerial perspective, the strong concentration of SSCM research around environmental performance and operational efficiency suggests that firms continue to prioritize sustainability primarily through measurable environmental outcomes such as emissions reduction, waste minimization and resource efficiency. While these priorities remain important, managers should adopt a more holistic perspective by integrating social sustainability considerations—including labor conditions, supplier ethics, human rights and community impacts—into supply chain strategies. From a policy perspective, the geographical concentration of SSCM scholarship in China, the United States and Western Europe highlights the need to support research capacity and knowledge transfer in underrepresented regions. Policymakers should encourage interdisciplinary funding schemes, international research

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collaborations and regulatory frameworks that promote not only environmental compliance but also social sustainability standards across supply chains. Furthermore, public incentives for open-access publishing and sustainability-related innovation may help democratize knowledge dissemination while accelerating the diffusion of best practices across industries and national contexts.

Several limitations should be considered when interpreting these results. First, the study is restricted to open-access articles indexed in the Web of Science. This excludes subscription-based articles, conference proceedings, books and book chapters, which may contain relevant theoretical and practical contributions. Consequently, the findings may overrepresent research published under open-access models—particularly mega-journals—and underrepresent work from traditions that rely on subscription or non-journal formats. Second, the analysis is confined to the 2003–2026 time period. The keyword and network patterns observed here are therefore a snapshot of current phase of the field and may not reflect its future dynamism. Third, reliance on author keywords introduces potential inconsistencies due to synonymy (e.g., "green supply chain management" vs. "environmentally sustainable supply chain") and the absence of standardised taxonomies. Additionally, the use of corresponding author country as a proxy for geographic contribution may understate international collaboration and misrepresent the role of co-authors from multiple nations. Finally, the study is descriptive rather than evaluative. It maps publication volume and co-occurrence but does not assess citation impact, theoretical contribution or research quality. Future work could extend this analysis by incorporating citation networks, a broader temporal scope and a more comprehensive set of publication types to provide a fuller picture of the field's evolution and influence.

Despite these limitations, our bibliometric analysis offers a systematic, empirically grounded view of the intellectual architecture of SSCM research, highlighting core journals, key concepts and geographic centres. It serves as a foundation for understanding how the field has since diversified and points to enduring structural characteristics—such as the dominance of performance-oriented, environmentally focused research—that continue to shape sustainable supply chain scholarship today.

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