

# BIBLIOMETRIC ANALYSIS OF SUSTAINABLE SUPPLY CHAIN PERFORMANCE

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## ABSTRACT

*This study provides a comprehensive overview of publication trends, key contributors, and emerging research directions in sustainable supply chain performance (SSCP). Using a bibliometric analysis of 741 Scopus-indexed peer-reviewed journal articles published between 2020 and 2025, the research examines how SSCP has evolved in terms of themes, methodologies, and sectoral focus. The findings reveal a growing global interest in SSCP, with contributions from both developed and developing economies. Three major research themes are identified: sustainability practices, technological advancement, and supply chain strategy. Key performance dimensions are categorised into economic, environmental, and social performance. The unique contribution of this study lies in offering the first holistic and large-scale bibliometric assessment of SSCP within high-quality journals, combined with a structured mapping of performance indicators and a proposed data-driven SSCP system, thereby filling a clear gap in existing literature. Future research directions include leveraging digital technologies, focusing on underexplored sectors and regions, and developing multi-dimensional performance models.*

**Keywords:** Sustainable Supply Chain Performance, Bibliometric Analysis, SPAR-4-SLR, Triple Bottom Line, Vosviewer, Sustainability Indicators.

## INTRODUCTION

The world had witnessed the COVID-19 pandemic in 2019, one of the worst global crises that devastated economies and societies (Remko, 2020). It caused the most severe financial collapse since the great depression, severely impacting both society and the economy (Paul & Chowdhury, 2021). Due to the pandemic, the supply chain (SC) worldwide was interrupted, creating unusual problems (Lekha Karmaker et al., 2021). Access to markets, goods and other resources due to COVID-19 lockdowns and restrictions got difficult. As a result, production companies had to adapt by implementing new regulations, adjusting to changing customer demands, and following strict operational practices to manage their SC operations more effectively and efficiently (Engelenburg et al., 2019). Companies were under tremendous pressure from the stakeholders to adopt sustainable production (M. R. Ali et al., 2024) to manage the disaster created by COVID-19. As a result, the global crisis had a direct impact on the sustainable development goals set for 2030 (Karunathilake, 2021). Apart from sustainability gaining importance due to the pandemic, it has also evolved as an important area in recent years. Many organisations have started integrating environmental sustainability into their operations (Rinaldi et al., 2021). Moreover, organisations are shifting their

focus from pure economic gains to sustainability by incorporating both social and environmental aspects. Thus, the economy has evolved to align with economic, environmental, and social requirements to achieve holistic sustainability (Birkel & Muller, 2021).

Today, enhancing SC sustainability is widely acknowledged and increasingly incorporated into management practices, with some arguing that sustainability is more important than profitability in business (Desy Maryani, 2022). SC sustainability has emerged due to growing public awareness of social and environmental issues, along with the enforcement of stricter environmental laws and regulations in various countries (Oubrahim et al., 2022). Intensifying competition within SCs, evolving customer demand patterns, and increasing pressure from various stakeholders have compelled companies to integrate higher levels of sustainability into their operations, ensuring long-term resilience and responsible business practices (Mani et al., 2020). Sustainability can drive businesses to rethink and transform their approach to managing SC (Zailani et al., 2024). Moreover, with global climate change, both manufacturers and customers are becoming more conscious of sustainability, driving manufacturing activities across the SC to be more eco-friendly and accelerating the shift from traditional SCs to sustainable ones (Seuring et al., 2022). The adoption of sustainable SCs with lower emissions, greater accountability, and enhanced transparency has become a key foundation for ensuring the stability and security of enterprise growth (Deng et al., 2024). Therefore, sustainable supply chain management (SSCM) seeks to integrate the issue of sustainability within SC, focusing on economic, environmental, and social goals (Rodríguez-González et al., 2022). As per Kumar et al., (2023), the SSCM concept has evolved to incorporate the economic, environmental and social aspects of the SC. Its primary goal is to improve supply chain performance (SCP), which is closely connected to sustainable development goals (Fu et al., 2022).

Performance measures play a vital role in SC by assessing progress toward set objectives and finding performance gaps. In the updated definition of SCM, beyond the transfer of goods, services, and information from suppliers to end customers, it also focuses on delivering customer value and promoting the sustainable development of the SC through a systematic process aimed at improving long-term SCP (Min et al., 2019). By integrating sustainable practices and principles into their operations, organisations can minimise waste and pollution, support local communities, ensure fair labour practices, reduce energy consumption, and strive for long-term operational and environmental sustainability (Oubrahim et al., 2023). In other words, sustainable SC benefits the environment as well as society and also enhances the company's financial performance by reducing costs and improving efficiency. Implementing practices that reflect socially responsible behaviour contributes to achieving sustainable performance (Ali et al., 2024). Sustainable supply chain performance (SSCP) is the degree to which a company aligns its SC practices with economic, environmental and social sustainability goals.

Today, SSCP encompasses three key dimensions of sustainability: economic, environmental and social performance. Economic sustainability performance aims to drive sales growth and increase profitability, with a key connection being the influence of social and environmental initiatives on sales volume and customer satisfaction (Yusuf et al., 2020). It can also be said that robust social and environmental initiatives increase the likelihood of customer loyalty to suppliers. Higher customer retention translates into greater sales and profitability, as satisfied customers tend to allocate a larger share of their purchases to the SCs. However, to ensure the long-term SSCP, enhancing productivity is crucial for expanding market share. Environmental sustainability performance focuses on minimising the consumption of natural resources, including materials, water, energy, and atmospheric impact, among others (Yusuf et al., 2020). Social sustainability performance serves as a bridge to achieving both environmental and economic sustainability (Yusuf

et al., 2020). Social performance is categorised into two main areas: social and human capital. Social capital involves respecting the rights of local communities, enhancing the quality of life without harming the environment, and preventing resource overexploitation. Human capital focuses on improving worker health and safety, promoting equality in the workplace, promoting diversity and inclusion, supporting sustainable development of skills, ensuring the welfare of the employee, and strengthening commitment Geyi et al., (2020).

To achieve well-balanced SSCP levels, one has to also follow the current technological trends, be aware of what is going on in the digital transformation front, and at the same time, focus appropriately on operational excellence (Mangla et al., 2020). Assessing and understanding overall SSCP is essential from both practical and theoretical perspectives. Integrating sustainability practices into SCs enables businesses to enhance customer focus, drive innovation, and optimise resource utilisation, capabilities, and productivity while upholding key environmental considerations (Junaid et al., 2022).

Despite the increasing research on SSCP, no study has undertaken a systematic analysis of how the field has evolved. Specifically, there has been limited study on the overall trends in SSCP research and gap identification. The absence of a comprehensive study examining the overall development of SSCP research has motivated the current study. This research primarily aims to perform a bibliometric analysis (BA) of the existing literature on SSCP, to address three subsequent research questions (RQs):

- RQ1. How has the research on SSCP evolved across various industry sectors, and who are the leading contributors in terms of authors, countries, and journals?
- RQ2. What are the research themes emerging in SSCP?
- RQ3. What are the future research directions based on the existing gaps in SSCP?

As per Paul et al., (2021) a systematic literature review should follow a structured protocol to ensure systematic planning, ease of implementation, and transparency. Therefore, this review adopts the “Scientific Procedures and Rationales for Systematic Literature Reviews” (SPAR-4-SLR) protocol, combined with BA. BA is a rigorous mathematical and statistical method used to analyse publication trends, key stakeholders, and the evolution of a research topic over a specific period (Nyakuma et al., 2021). This approach has been effectively employed for in-depth analysis across various research disciplines (Saikia et al., 2020). This article conducted a BA using VOS Viewer 1.6.20 version to present the developments of SSCP. VOS Viewer is an open-access software designed for constructing and visualising bibliometric networks (Arruda et al., 2022).

The remainder of the present article is structured in the following manner: Methodology is reported in section 2, analysis is covered in section 3, section 4 covers findings, section 5 covers future research directions, and section 6 presents study implications.

## LITERATURE REVIEW

Data selection using the “SPAR-4-SLR protocol” presented in Table I, consists of three main phases and six sub-phases.

In the first step, we used the Scopus database to find articles in the SSCP domain. Using the keywords “sustainable supply chain performance” OR “sustainability supply chain performance”, and restricting the period from 2020 to 2025, led to 1530 articles. The year 2020 was selected because, in 2019, the world witnessed the emergence of COVID-19, which significantly challenged the business world (Chen et al., 2021) leading to notable changes in business practices from 2020 onward, adding new direction in the field of SCP (Sharma et al., 2021) and hence, adoption of SSCP. Then the search was restricted to “Business” AND “Journal articles” as articles from academic

journals were only included in the study. After this, journals categorised as A\* and A-rated journals in the “Australian Business Deans Council (ABDC)” suggested list of 2023 were included in the study to maintain quality, leading to 571 articles, which were used for BA Table 1.

Table 1 SPAR-4-SLR PROTOCOL		
Assembling	Arranging	Assessing
<b>Identification</b>	<b>Organisation</b> <b>Organisational codes:</b> Citation, Reference, Journal Title, Article type, year, number of citations, keywords, country, and institution <b>Organising framework:</b> Bibliometric Analysis	<b>Evaluation</b> <b>Analysis used:</b> Bibliometric (n = 741) <b>Agenda:</b> Gap analysis
<b>Domain: SSCP</b>  <b>Research Question:</b> 1. How has the research on SSCP evolved across various industry sectors, and who are the leading contributors in terms of authors, countries, and journals?  2. What are the research themes emerging in SSCP?  3. What are the future research directions based on the existing gaps in SSCP?  <b>Source used:</b> Peer-reviewed journals <b>Quality of the Source:</b> Scopus	<b>Purification</b>  <b>Exclusion:</b> 1. Articles like papers submitted in conferences, book chapters, conference reviews, editorials, and notes 2. Duplicate articles <b>Inclusion:</b> 1. English Language articles 2. Restricted to “Business” AND “Journal articles”  3. Articles from Academic Journals 4. A* and A rated journals in the “Australian Business Deans Council (ABDC)” suggested list of 2023	<b>Reporting</b>  <b>Reporting convention:</b> figures and tables depicting research trends and visualisation analysis <b>Limitation:</b> English Language articles only included
<b>Acquisition</b>  <b>Year:</b> 2020 - 2025 for Bibliometric Analysis <b>Search keywords:</b> “sustainable supply chain performance” OR “sustainability supply chain performance”  <b>Search Result:</b> 5604		

Source(s) Table given by authors

## Research Gap

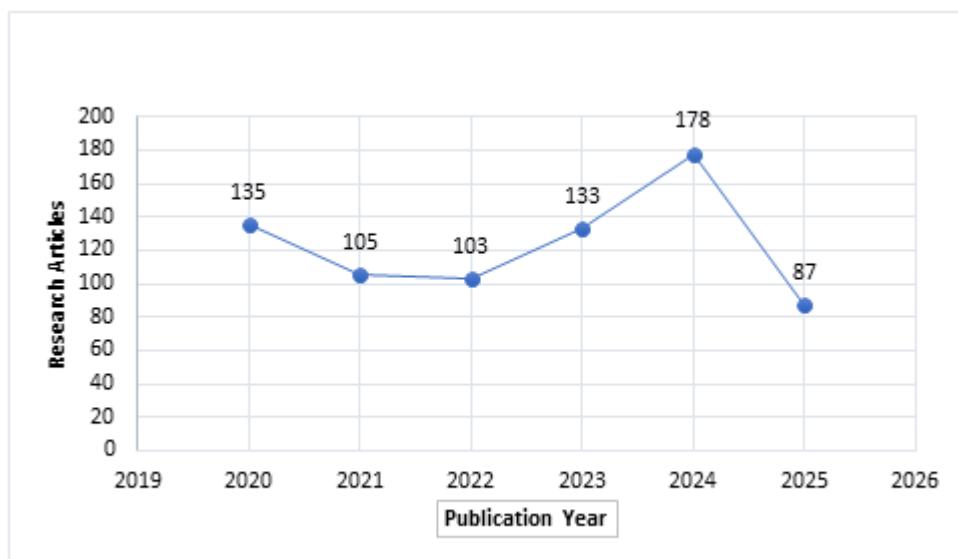
Despite the growing academic attention on SSCP, the existing literature still shows several important gaps. Most prior studies examine SSCP within specific industries, geographic regions, or thematic perspectives—such as green practices, circular economy, or digital transformation—without providing a consolidated understanding of how the field has evolved holistically. Additionally, earlier reviews are limited either by narrow temporal coverage or by focusing on conceptual discussions rather than large-scale bibliometric evidence. There is also a lack of systematic synthesis of the key performance dimensions and indicators used to measure SSCP across the triple bottom line. To address these gaps, the present study undertakes a comprehensive bibliometric analysis of 741 Scopus-indexed articles from high-quality journals published between 2020 and 2025, offering a unified overview of publication trends, influential contributors, dominant themes, and measurement perspectives. By doing so, this study fills the gap in understanding the intellectual structure, research evolution, and emerging directions in SSCP, thereby providing a more

integrated foundation for future research and practice Khanra et al., (2020).

## Research Results

### Publication trends

The research articles published in SSCP since 2020 are shown in Figure 1.



**FIGURE 1**  
**NUMBER OF RESEARCH ARTICLES PUBLISHED BETWEEN 2020 TO 2025**

Source(s) Figure given by authors

From Figure 1, it can be observed that, between 2020 and 2025, there has been a noticeable increase in publications related to SSCP. In 2020, the number of published articles was 135, followed by a slight decline to 105 in 2021 and 103 in 2022. However, the trend shifted upward in 2023 with 133 publications, reaching a peak of 178 in 2024. As of May 2025, 87 articles have been published, indicating continued research interest in this domain Van Hoek, (2020).

### Analysis of journals

The quality of research articles in the SSCP domain was analysed based on journals in which they were published. Table 2 shows the top 10 journals that published articles on SSCP with their citation count.

**Table 2**  
**INFLUENTIAL JOURNALS**

Journal	Citation	Number of Articles
Journal of Cleaner Production	10204	196
Business Strategy and the Environment	4159	80

Industrial Management and Data Systems	474	76
International Journal of Production Economics	3424	66
International Journal of Production Research	2586	46
International Journal of Logistics Management	1066	33
Production Planning and Control	807	32
Transportation Research Part E: Logistics and Transportation Review	1274	32
International Journal of Operations and Production Management	777	30
Supply Chain Management	1053	26

Source(s) Table given by authors

The “Journal of Cleaner Production” is the most influential journal with the highest number of publications and citation count due to its specialised focus on sustainability, ensuring the publication of documents with a clear sustainability scope. The “Business Strategy and the Environment” is the second most influential, also dedicated to sustainability. The remaining journals focus on production, operations, and SCM, integrating engineering, management, and economic perspectives. From 2020 to 2025, these top ten journals accounted for 617 out of 741 SSCP publications, contributing to 82% of the total output.

### Analysis of authors in SSCP

Table 3 shows the top authors with a minimum of 5 publications that actively studied SSCP between 2020 and 2025, along with their citation count.

Table 3 TOP AUTHORS WORKING ON SSCP RESEARCH (2020–2025)		
Authors	Articles	Citation
Sarkis, joseph	16	1351
Mangla, Sachin kumar	13	643
Bag, surajit	12	391
Govindan, kannan	12	763
Raut, Rakesh D.	11	789
Luthra, sunil	10	834
Mani, venkatesh	9	697
Chen, lujie	8	48
Silva, minelle e.	8	209
Venkatesh, v. g.	7	244
Kumar, anil	7	416
Bai, chunguang	7	746
Jia, fu	7	51
Sharma, mahak	7	441
Chowdhury, soumyadeb	7	923

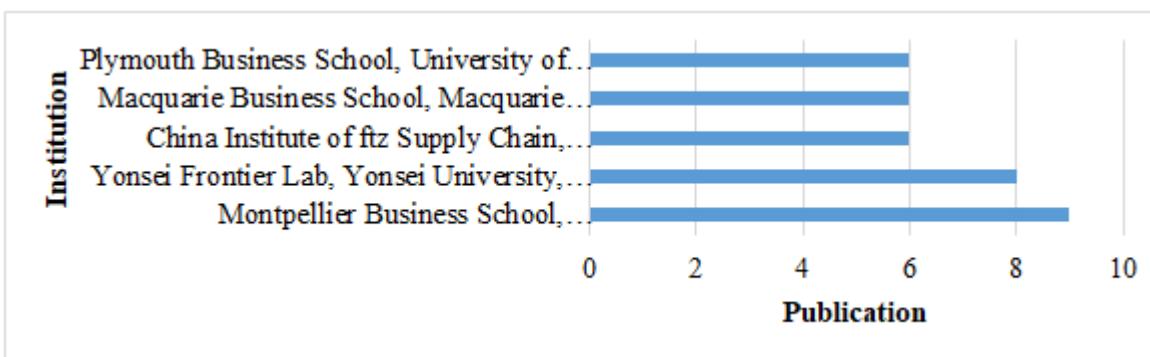
Source(s) Table given by authors

Sarkis, Joseph has the maximum number of publications (16) and the highest citation count (1351) in SSCP research. Mangla, Sachin Kumar, follows with 13 publications and 643 citations. The next highest citation count is 923, attributed to Chowdhury, Soumyadeb, who has 7 research articles.

### Top Institutions in SSCP

The top five institutions working on SSCP research between 2020–2025 are examined in

Figure 2.

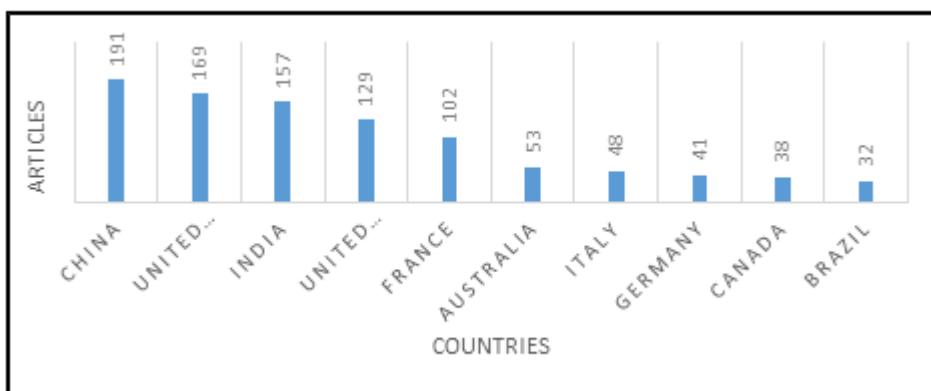


**FIGURE 2**  
**TOP INSTITUTIONS WORKING ON SSCP RESEARCH (2020–2025)**

Source(s) Figure given by authors

### Analysis of countries in SSCP

The top countries contributing towards SSCP research between 2020–2025 are represented in Figure 3.



**FIGURE 3**  
**TOP COUNTRIES CONTRIBUTING TOWARDS ON SSCP RESEARCH (2020–2025)**

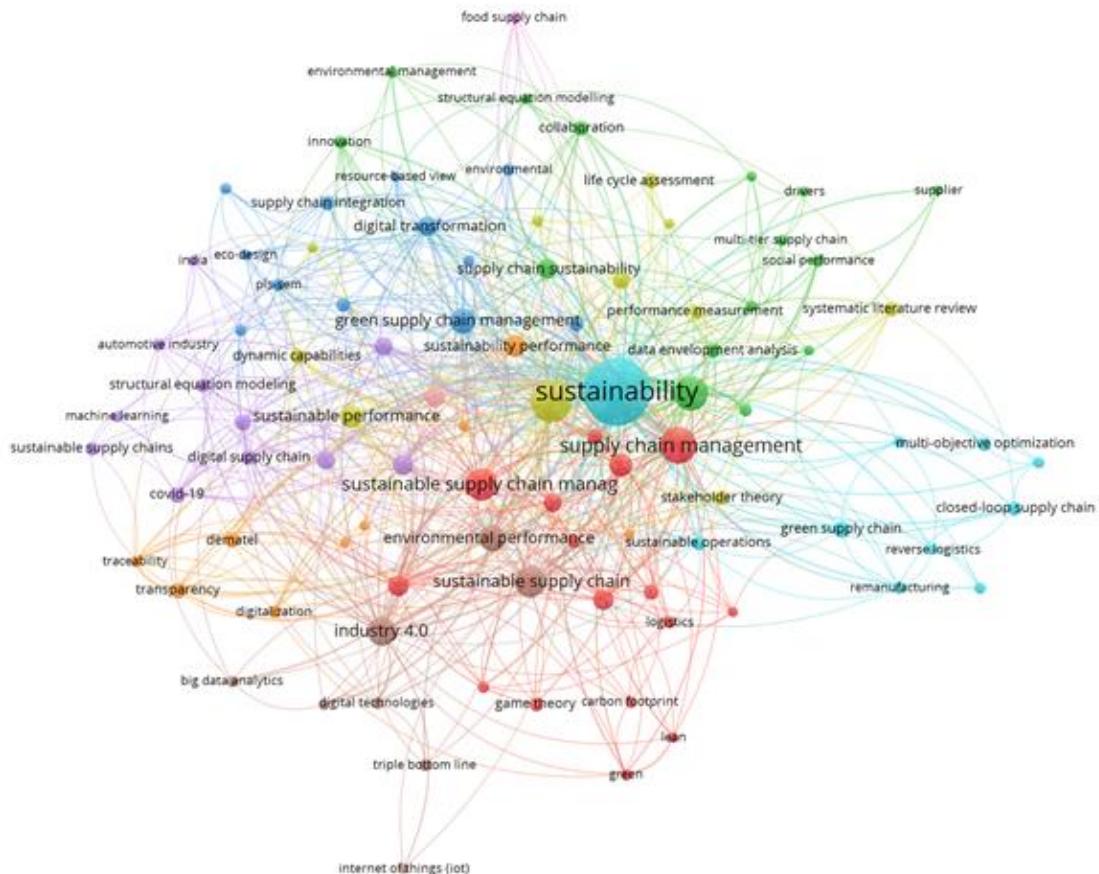
Source(s) Figure given by author

The analysis of research output in SSCP reveals a significant contribution from both developed and developing countries. Among the developed nations, the United Kingdom leads with 169 publications, followed by the United States, France, Australia, Italy, Germany, and Canada. These countries benefit from well-established research infrastructures, strong institutional support, and sustained investment in academic scholarship.

On the other hand, developing countries have also made remarkable contributions. China tops the overall list with 191 publications, highlighting its growing dominance and investment in research. India, with 157 publications, ranks third globally, and Brazil also contributes with 32 publications.

### Analysis of keyword co-occurrence

An analysis of the keywords assigned to each research article provides a snippet of the literature related to those studies (Sayantan et al., 2020). Hence, to understand the literature, keyword co-occurrence analysis is performed as the next step. Figure 4 presents a network visualisation of authors' keyword co-occurrence. A minimum occurrence threshold of 5 was set in VOS Viewer 1.6.20, resulting in 94 keywords.



**FIGURE 4**  
**NETWORK VISUALISATION OF AUTHORS' KEYWORD CO-OCCURRENCE**

Source(s) Figure given by author

The network visualisation map reflects the core themes and emerging research trends with dominant keywords including sustainability, circular economy, and SSCM, indicating a strong focus on sustainable development. Terms like Industry 4.0, environmental performance, green supply chain management (SCM), and social sustainability also appear prominently, emphasising the growing integration of advanced technologies in SSCP research.

## Findings

### Evolution in SSCP

The BA of SSCP reveals a dynamic and evolving research landscape. Publication trends peaked in 2020 with 135 studies, followed by a decline in 2021 and 2022, due to worldwide

disruptions triggered by the COVID-19 pandemic, which diverted research priorities and affected academic productivity. However, a strong resurgence was observed in 2023 with 133 studies followed by 178 publications in 2024. As of May 2025, 87 studies have already been published, indicating continued interest in sustainability-related SCP.

The geographical distribution analysis reveals significant contributions from both developed and developing nations. Developed countries bring in mature research ecosystems, institutional support, and long-standing policy frameworks focusing on sustainability. At the same time, developing countries such as China, India, and Brazil have shown growing engagement due to increasing environmental challenges, policy pressures, and the need to align with global trade and sustainability standards. This dual participation reflects a shared recognition of SSCP.

Keyword co-occurrence analysis points to concentrating attention on sectors like the automotive industry, logistics, and the food industry. These sectors are both resource-intensive and tightly regulated, making them priority areas for implementing and studying sustainable practices. The automotive sector, for instance, faces pressure to reduce emissions and adopt circular economy principles, while the food industry struggles with waste management and ethical sourcing. Logistics, as the backbone of global SCs, naturally attracts sustainability-focused innovation in transportation, packaging, and efficiency.

Also, the field is dominated by quantitative research, with qualitative approaches being relatively underutilised. This is attributed to the preference for data-driven analysis in sustainability metrics and performance assessments. However, qualitative methods like case studies and interviews can provide valuable insights into the social and behavioural aspects of sustainability, organisational change, and stakeholder engagement areas where quantitative research alone may not fully capture.

## Research Theme

The study identified performance indicators used to measure SSCP. It is divided into three dimensions: economic, environmental and social performance based on its common characteristics. The definition of the three dimensions and their respective indicators is presented in Table 4.

The keyword co-occurrence analysis helped identify three distinct themes. The following sections explore each theme in detail, highlighting its core focus and interrelationships with other themes.

## Sustainability

The analysis reveals that core sustainability frameworks and circular practices constitute a central focus within SSCM. Emphasising the triple bottom line, economic, environmental and social performance, these approaches integrate circular economy strategies to promote closed-loop systems that minimise waste and environmental harm. Keywords such as green SCM, eco-design, reverse logistics, and carbon footprint reflect a growing commitment to environmentally conscious operations. The presence of social sustainability and economic performance indicates an integrated view of sustainability that balances stakeholder expectations and profitability (Toni, 2025). Furthermore, keywords like climate change and carbon accounting highlight the increasing alignment of SC strategies with global environmental challenges.

Technological advancements, particularly the use of Internet of Things (IoT), blockchain, and big data analytics, are emerging as key enablers of sustainability. These tools enhance transparency and traceability across SCs, supporting the monitoring of emissions and material

Table 4 SSCP DIMENSIONS, DEFINITIONS, AND KEY PERFORMANCE INDICATORS			
SCP Dimension	Descriptions	Performance Indicators	Indicator Descriptions
Economic performance	Economic performance in SSCP refers to the financial viability and operational efficiency of SC activities, focusing on profitability, cost-effectiveness, and value delivery to stakeholders.(Shekarian et al., 2022)	Profit margin growth	Measures the increase in profitability relative to revenue over time.(Shekarian et al., 2022)
		Increase in market share	Assesses the company's sales growth relative to the total market sales. (Shekarian et al., 2022)
		Increase in return on net assets	Evaluates the efficiency in generating profit from net assets. (Shekarian et al., 2022)
		Zero-defect products	Aims for products free from defects, enhancing customer satisfaction and reducing costs. (Malhotra, 2024)
		Value-added services	Additional services that enhance product value and customer experience. (Malhotra, 2024)
		Eliminate late, damaged, and incomplete orders	Ensures timely and complete deliveries, reducing returns and increasing efficiency. (Malhotra, 2024)
		Respond to and solve problems	Ability to address and resolve issues promptly, maintaining operational continuity. (Malhotra, 2024)
		Deliver products on time	Timely delivery performance, critical for customer satisfaction and SC reliability.(Malhotra, 2024)
		Deliver precise quantities	Accuracy in order fulfilment, minimising discrepancies and inventory issues. (Malhotra, 2024)
		Deliver shipments of variable size frequently	Flexibility in handling varying order sizes and frequencies, adapting to customer needs.(Malhotra, 2024)
		Ability to deliver small lot sizes	Capability to manage and deliver smaller quantities efficiently, reducing inventory costs. (Malhotra, 2023)
		Minimise total product cost	Reducing overall costs associated with product manufacturing and delivery. (Malhotra, 2024)
Environmental	Environmental performance in SSCP evaluates the ecological impact of SC operations, focusing on resource	Minimise all types of waste	Eliminating waste in processes to enhance efficiency and sustainability. (Malhotra, 2024)
		Minimise channel safety stock	Reducing excess inventory held as a buffer and optimising stock levels. (Malhotra, 2024)
Environmental	Environmental performance in SSCP evaluates the ecological impact of SC operations, focusing on resource	Reduction in wastewater	Measures efforts to decrease pollutants released into the

performance	efficiency, waste reduction, and minimising environmental footprints. (Fianko et al., 2021)	and emissions	environment.(Shebeshe & Sharma, 2024)
Social performance	Social performance in SSCP pertains to the impact of SC activities on people and communities, emphasising fair labour practices, community engagement, and overall societal well-being. (Fernando et al., 2022)	Reduction in the use of toxic and harmful materials	Assesses the substitution or elimination of hazardous substances in processes. (Shebeshe & Sharma, 2024)
		Increased utilisation of equipment and materials	Enhancing the efficiency and lifespan of equipment and materials used. (Shebeshe & Sharma, 2024)
		Increased utilisation of recyclable materials	Promoting the use of materials that can be recycled and reducing waste (Shebeshe & Sharma, 2024)
		Increased reutilisation of resource recovery	Implementing processes to recover and reuse resources from waste streams. (Shebeshe & Sharma, 2024)
		Minimise all types of waste	Reducing waste generation across all SC activities.(Shebeshe & Sharma, 2024)
		Increased employee satisfaction	Measures the contentment and engagement levels of employees within the SC.(Fernando et al., 2022)
		Increased customer satisfaction	Assesses the fulfilment of customer expectations and service quality. (Fernando et al., 2022)
		Improved corporate image	Evaluates public perception and reputation of the company regarding its social responsibilities. (Fernando et al., 2022)
		Increased investment in social welfare	Tracks the resources allocated to community development and social programs. (Fernando et al., 2022)

Source(s) Table given by authors

Flows in real time (Owusu-Berko, 2025). Such capabilities are essential for implementing and scaling circular economy models. Corporate social responsibility (CSR) and collaborative practices further strengthen these efforts by promoting ethical conduct and stakeholder engagement. The linkages between CSR, transparency, and social sustainability underscore the need for inclusive governance and accountability mechanisms in sustainable operations.

Automotive, logistics, and food industries have demonstrated implementation of sustainability principles. Analytical techniques such as data envelopment analysis (DEA), multi-objective optimisation, and structural equation modelling are commonly applied to assess the impact of green initiatives on performance metrics (Toni, 2025). Additionally, lean, agile, and risk management strategies are frequently employed to support resource efficiency, operational flexibility, and resilience, reinforcing the transition toward sustainable SC.

## Emerging Technology

The integration of advanced digital technologies is reshaping modern SC, offering unprecedented opportunities to enhance transparency, efficiency, and sustainability. Technologies such as blockchain, IoT, big data analytics, machine learning, and digital platforms are at the forefront of this transformation, enabling real-time visibility and data-driven decision-making. For example, IoT sensors can monitor energy consumption or detect spoilage in perishable goods, while blockchain technology provides immutable records that enhance traceability and trust across SC partners (Kamble et al., 2020). These technologies support sustainability objectives by improving resource efficiency, optimising logistics, and reducing environmental impact.

Digitalisation also plays a critical role in implementing circular economy principles. Blockchain can verify eco-design claims and ensure product source, while artificial intelligence and big data analytics support predictive maintenance, waste reduction, and closed-loop material flows. In sectors such as automotive and food logistics, digital innovations like digital twins and real-time tracking systems help reduce waste and enhance responsiveness, contributing to both environmental and financial performance improvements. Moreover, digital transformation facilitates stakeholder collaboration through secure data-sharing platforms, fostering transparency and accountability in line with CSR goals (Kamble et al., 2020).

Despite the transformative potential of these technologies, challenges remain. Blockchain adoption, for instance, faces hurdles such as high implementation costs, data security risks, and the need for regulatory clarity. Effective integration requires strategic alignment, strong governance, and trust among SC actors to realise its sustainability benefits (Kamble et al., 2020). Furthermore, digital tools are increasingly being integrated with traditional analytical models such as PLS-SEM and simulation-based optimisation to evaluate and improve SSCP. These hybrid approaches provide a comprehensive means to assess the economic, environmental and social outcomes of digital innovation.

## SC Strategy

Kamble et al., (2020) emphasise that transparency and traceability are foundational elements of SSCM. Their research highlights blockchain's ability to enhance trust and efficiency by providing secure, transparent records that reduce transaction delays and minimise intermediaries, particularly in the agriculture SC. They further explain that blockchain facilitates farm-to-table traceability, supports fair labour practices, and enables digital collaboration via platforms like supplier portals and data-sharing networks. However, several challenges persist, including uncertainty in selecting appropriate blockchain solutions, trust and cybersecurity concerns, and the need for supportive regulation. Importantly, they argue that blockchain adoption alone is insufficient; strategic alignment and collaboration across stakeholders are critical for realising its full sustainability potential.

In parallel, broader studies suggest that collaborative partnerships foster innovation, such as the co-development of eco-friendly products and closed-loop systems that support reverse logistics. The integration of Industry 4.0 and emerging Industry 5.0 technologies, combining automation, analytics, and human-centric design, further enhances sustainability, resilience, and efficiency in SC. Circular economy practices such as recycling, remanufacturing, and resource optimisation contribute to environmental sustainability (Abdel-Basset & Mohamed, 2020). Risk management also plays a vital role in mitigating social, environmental, and business risks, with analytical methods such as simulation and game theory aiding decision-making in complex networks.

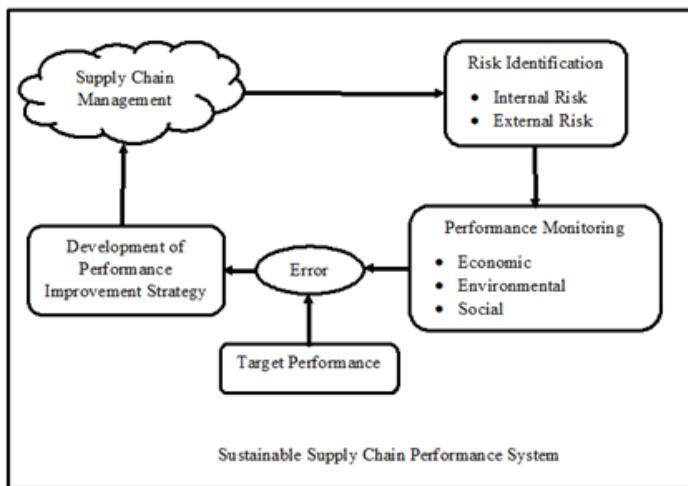
## Proposed Framework

The study proposes a sustainable SCP system that enables real-time monitoring, analysis, and

mapping of performance, as illustrated in Figure 5.

## Supply Chain Management

SCM includes the involvement of stakeholders in strategic partnerships. The framework emphasises the use of big data analysis to support transparent and real-time information sharing, enhanced pattern recognition, and identification of emerging trends, market fluctuations, changing customer demands, and potential disruptions.



**FIGURE 5**  
**SUSTAINABLE SUPPLY CHAIN PERFORMANCE SYSTEM**

Source(s) Figure given by authors

## Risk Identification

The second stage in the framework is the identification of risk using big data analysis across SC. These risks can be categorised into internal risks and disruption risks. The framework also facilitates the detection of the ripple effect, where disruptions in one part of the SC propagate and impact other interconnected areas.

## SCP System

As highlighted by Parast and Subramanian, (2021), SC risks significantly impact SCP. The framework incorporates a big data-driven SCP system that evaluates performance across economic, environmental and social sustainability dimensions operating through a four-stage process:

### Stage 1: Monitoring the Impact of Risks

This stage focuses on using big data analysis to monitor and map the impact of identified risks on specific sustainable SCP dimensions in real time.

### Stage 2: Comparing Actual and Target Performance

Once the affected sustainable SCP dimension is identified, it is compared with the target performance levels set by the organisation. The deviation between actual and target values helps in identifying specific errors within the performance metrics of that dimension.

### Stage 3: Development of performance improvement strategy

At this stage, firms can develop a strategy to take corrective measures for improvement within the performance system.

## DISCUSSION

The bibliometric results of this study provide important insights into how research on SSCP has evolved over the past years. The increasing publication trend after 2020 confirms that sustainability has become a core priority for SCs in response to global disruptions. This pattern aligns with earlier studies that identified sustainability adoption as a strategic response to uncertainty, competitive pressures, and climate commitments. The resurgence of publications in 2023–2024 indicates the shift from reactive crisis responses to more structured sustainability integration within SC.

The analysis of journals, authors, and countries highlights the multi-disciplinary and global nature of SSCP research. Prominent contributions from both developed and developing economies underscore a shared urgency in addressing sustainability transitions. The dominance of journals such as the *Journal of Cleaner Production* and *Business Strategy and the Environment* confirms that SSCP sits at the intersection of environmental management, operations, and SC strategy. Meanwhile, the strong participation of scholars from China, India, the UK, and the US reveals differences in sustainability priorities.

The sectoral patterns emerging from the analyses indicate that industries such as automotive, logistics, and food SCs are at the forefront of SSCP research. These industries face high environmental impacts and regulatory expectations, which explains the strong focus on circular economy, carbon reduction, and eco-design strategies. Moreover, the association of SSCP with risk management and resilience demonstrates that firms increasingly view sustainability not just as a compliance activity but as a long-term strategic capability that strengthens competitiveness and SC viability.

Finally, the proposed big data-driven SSCP framework aligns well with the overall direction of the literature. By integrating risk identification, performance monitoring, and corrective mechanisms, the model reflects the evolving expectation that sustainability must be measurable, data-driven, and embedded across the SC. The framework also addresses existing gaps in the literature, especially the need for multi-dimensional, real-time performance evaluation systems capable of adapting to disruptions and sustainability demands.

## CONCLUSION

This study conducted a comprehensive bibliometric analysis of SSCP using 741 peer-reviewed journal articles published between 2020 and 2025. The results provide an in-depth understanding of how SSCP research has evolved, its dominant themes, and the intellectual structure of the field. The analysis reveals a steady increase in research attention after the COVID-19 pandemic, highlighting sustainability as a strategic priority for firms and policymakers. The findings show that SSCP research is largely driven by contributions from both developed and developing countries, with China, the United Kingdom, and India leading in publication output. Three major thematic clusters were identified, sustainability practices, technological advancement, and supply chain strategy, each representing a critical driver of SSCP. The study also synthesises the SSCP dimensions commonly used in contemporary research, classifying economic, environmental, and social performance into

clear sets of indicators that serve as guiding metrics for both academics and practitioners. Furthermore, the proposed sustainable SCP system offers a structured and data-driven framework for monitoring risks and improving performance across the triple bottom line.

Future research can expand the scope of existing studies by building upon the findings from the present study in SSCP. One promising avenue involves the development of multi-dimensional performance metrics and decision models that jointly optimise economic, environmental and social goals under circular economy constraints. Scholars should apply advanced technologies, such as blockchain, artificial intelligence, and IoT, to operationalise circular practices. Blockchain, in particular, holds great potential for enabling sustainability through four main capabilities: promoting green behaviour via enhancing product lifecycle visibility, improving system efficiency, and strengthening sustainability reporting (Esmaelian et al., 2020). Future studies should refine decision-making models and regulatory frameworks to maximise blockchain's impact, focusing on its integration with broader IT infrastructures and strategic governance to advance sustainable development goals.

Additional research is needed to investigate the social dimension of sustainability, particularly labour equity, employee development, and community impact, and how CSR initiatives translate into measurable social performance metrics such as training programs and local engagement (Bag et al., 2020). Exploring how tailored training, cultural frameworks, and managerial initiatives enhance learning and SSCP is essential (M. R. Ali et al., 2025). Furthermore, research could address the influence of cultural, economic, and regulatory differences on ethical business practices, overdependence, and sustainability outcomes (Bag et al., 2024). Given the strong positive influence of agile capabilities on sustainability (Yusuf et al., 2020) future studies, should also examine the interplay between agility, traceability, responsiveness, and transparency, alongside capacity-related variables like warehousing, transportation loads, and political risks (Sundarakani et al., 2021).

Technological innovation should be leveraged further to develop predictive and adaptive tools. Integrating machine learning for demand-supply variability, dynamic inventory management, and emissions-optimised truck routing can significantly advance green operations. The development of digital twin models and agent-based simulations can capture real-world complexity, enabling firms to assess sustainability outcomes, such as carbon emissions, under various scenarios in real time. Future research should also explore how industry trends in human-centric automation can enhance worker safety and operational sustainability.

Additionally, studies should examine how evolving regulations (e.g., emission norms, food safety laws) shape sustainability strategies across sectors, including the role of public-private collaborations in compliance. Investigating the potential of digital coordination platforms to support lean-agile-secure SCs will offer valuable insights into how strategic decisions influence sustainability performance. Moreover, innovation through collaboration, such as co-developed green products or shared recycling logistics, can drive both resilience and market adoption.

Mixed research methodologies are recommended, combining quantitative and qualitative approaches to capture the multifaceted nature of sustainability. Incorporating robust and stochastic optimisation models will help account for uncertainties such as climate events and geopolitical risks. Game theory and negotiation models can also be employed to analyse trade-offs among SC actors, offering insights into how profit-driven and CSR-driven firms can align on green investments.

In terms of sectoral and geographical expansion, most existing research centres on the manufacturing sector, with limited focus on domains such as agri-food, textiles, pharmaceuticals, and services. Broadening the research to include these sectors, along with constructs like top management commitment, supplier engagement, and customer relationship management, can enrich our understanding of SSCP (Santoso et al., 2022). While SSCP research is relatively well-developed

in regions such as the UK, India, China, France, and the U.S., less-developed areas, particularly in Africa, remain significantly underexplored. Future studies should focus on these regions to provide a more balanced and globally representative understanding of sustainable SC practices.

Finally, studies should explore the relationship between energy consumption and SC costs, emphasising energy efficiency as a driver of competitiveness, product quality, and improved working conditions (Khan et al., 2019). Evaluating how big data capabilities support green product development and risk management within manufacturing firms could also offer new insights into the digital transformation of sustainable SC.

## Study Implications

### Theoretical Implications

This bibliometric study advances the theoretical foundations of SSCP by systematically analysing the literature in this domain. Mapping the evolution of research over time provides a comprehensive understanding of the field's intellectual structure, highlighting key themes, influential authors, and countries. One of the core theoretical contributions lies in the categorisation of sustainability dimensions into economic, environmental, and social performance, along with their related indicators.

Furthermore, the citation and keyword co-occurrence analyses reveal conceptual gaps and underexplored domains, particularly in social sustainability, multi-stakeholder collaboration, and the use of blockchain and artificial intelligence for enhancing transparency and traceability. These insights collectively open new theoretical avenues by encouraging scholars to build interdisciplinary frameworks that bridge sustainability, digital innovation, and collaborative governance in SC systems.

### Practical Implications

The findings of this bibliometric study hold several practical implications for SC managers, policymakers, and sustainability practitioners. By identifying key performance dimensions and indicators adopted in past literature, the study offers a benchmarking tool for organisations to design and assess their sustainable SC initiatives more effectively. The results emphasise actionable strategies in energy efficiency, waste minimisation, CSR execution, and reverse logistics, guiding firms to improve operational sustainability, reduce costs, and enhance stakeholder engagement. Importantly, the growing relevance of Industry 4.0 technologies presents new opportunities to enable transparency, product lifecycle tracking, and digital circular practices. Managers and decision-makers can leverage these technologies to operationalise sustainability goals and improve risk management through predictive analytics and real-time SC visibility. Additionally, future directions derived from the study suggest practical emphasis on hybrid decision-making approaches, capacity considerations, and sector-specific strategies, particularly in emerging economies and underexplored industries. Policymakers can utilise these findings to craft policies, frameworks, and incentives that facilitate collaboration, innovation, and traceability across the SC, contributing to broader sustainable development objectives.

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