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Integrating resilience and sustainability in supply chains: a strategic evaluation framework

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Abstract: Over recent years, global supply chains have been and continue to be under significant pressure resulting from major disruptions largely driven by the consequences of the COVID-19 pandemic, persistent geopolitical instability. Supply chains are also increasingly asked to undergo structural transformations to comply with rising sustainability requirements due to accelerating impacts of climate change. Although resilience and sustainability in supply chain and logistics have been largely studied, existing research mainly addresses the two concepts separately and offers limited frameworks to evaluate their simultaneous effects on logistics decision levels. This article proposes an evaluation framework to assess the joint impact of sustainability and resilience practices within organisations' supply chains. A dual methodological approach is adopted, combining a quantitative literature review using bibliometric analysis (Bibliometrix, Scopus database, 65 selected publications) with a qualitative content review of existing frameworks. Key supply chain practices are identified and classified across strategic, tactical, and operational decision levels, and their cross-impacts are evaluated on resilience and sustainability. The results reveal a structural pattern: Strong synergies between resilience and sustainability arise from practices optimising information flows, collaborative practices with stakeholders, circular and efficiency-driven processes. However, some unavoidable trade-offs are identified such as network diversification and multi-sourcing, inventory buffering, material-flow redundancy strategies and just-in-time management, which enhance resilience but increase resource consumption and transport emissions. The proposed framework offers a cross-impact evaluation tool for managers to assess supply chain resilience and sustainability performance within their organisations and prioritise implementation of strong synergy practices while mitigating trade-offs.

1 Introduction

Nowadays, companies are increasingly seeking strong, agile, and adaptive supply chains in order to manage, anticipate, and mitigate unexpected disruptions. Supply chains are strongly facing multiple uncertainties including climate change issues, geopolitical conflicts, global health crises such as COVID-19, and deep digital transformation under the growing influence of artificial intelligence. In this context, [1] states that developing resilience capabilities offers significant advantages for supply chain management enabling organisations to adapt effectively to disturbances and ensure the continuity of operations. Parallely, strong effects of climate change leading to environmental degradation, growing stakeholder pressure concerning environmental and social responsibility, human rights, and workplace safety have emphasized the need to adopt sustainability principles across all stages of supply chain management [2] and [3].

This integration increases environmentally friendly improvements, reduces waste generation, enhances resource efficiency, strengthens supplier relationships, and ultimately reinforces consumer trust. Approaches based on robustness—such as lean practices, digital enablers, agility, and visibility—can effectively strengthen supply chain resilience. However, they may also generate conflicts with some sustainability objectives. Therefore, the two concepts of resilience and sustainability must be strategically and smartly integrated into unified supply chain management frameworks [4]. [5] develop the concept of reconfigurability that has also been identified as a critical capability to cope with disruptions and adapt to rapid changes in market conditions.

Literature on supply chain resilience and sustainability has been growing significantly in recent years; however, most studies address these two concepts separately or in disconnected ways. Research on resilience topic focused mainly on strategies and tools to anticipate, face and recover from disruptions, while sustainability works focus on integration in supply chains strategies of environmental impacts, social responsibility, and economic viability. Only a limited number

of papers have literally examined the link between resilience and sustainability in supply chain management and even develop tools and frameworks to help evaluate their combined effects.

Main existing models deal separately with sustainability-oriented strategies and resilience-enhancing practices at supply chain strategic, tactical and operational levels. This separation limits the interest for decision-makers facing the challenge of balancing long-term sustainability goals with mid and short-terms resilience objectives.

Therefore, managers need an integrated framework that assesses key practices in supply chain management for both resilience and sustainability, highlights potential synergies and trade-offs and help managers to design and operate supply chains that are robust in the face of growing disruptions and aligned with sustainable development objectives.

This paper aims to develop an evaluation framework capable of identifying and assessing resilience and sustainability key practices across supply chain decision levels. This research adopts a dual methodological approach combining bibliometric analysis and qualitative synthesis of existing frameworks to identify key supply chain practices and evaluate their interaction effects.

The main objective of this study is to conceptualise and structure a Supply Chain Assessment Framework (SCAF) that classifies practices according to their combined impact on resilience and sustainability: Strong synergies, synergies and trade-offs.

Accordingly, this study addresses the following research questions:

- RQ1: How resilience and sustainability have been addressed simultaneously in supply chain management within the existing scientific literature?
- RQ2: Which supply chain key practices generate synergies or trade-offs between resilience and sustainability?
- RQ3: How can these interactions be structured in an evaluation framework that supports managers in building resilient and sustainable supply chains?

2 Literature review

2.1 Trends on relation between resilience and sustainability

Recent research highlights a growing focus on synergies and trade-offs between supply chain resilience (SCRE) and supply chain sustainability (SCS). While these two dimensions were traditionally examined separately, several authors argue that their integration has become critical to face the escalating global disruptions and increasing sustainability demands. [4] demonstrate that certain practices—such as collaboration, agility, and digital visibility—can simultaneously enhance resilience and sustainability, while strategies like redundancy or high inventory levels improve continuity but at the cost of higher resource consumption. Similarly, [6] show how digital supply chain twins (DSCTs) enable end-to-end visibility and simulation of disruption scenarios, thereby strengthening resilience while simultaneously reducing waste and improving environmental and social outcomes. Sector-specific studies also highlight this link. For example, [7] propose a framework for resilient agri-food supply chains in the UAE, showing how integrating resilience capabilities with sustainability objectives directly supports food security strategies under conditions of scarcity and global volatility. [8] further extend the debate by developing a performance measurement framework that links social sustainability indicators with resilience, emphasizing that resilience-oriented practices must also account for human resources, community welfare, and stakeholder participation. Technological enablers play a central role in this integration, [9] argue that digital twins at the supply chain system level can enhance both resilience through disruption risk management and sustainability through waste reduction and carbon monitoring, though challenges remain regarding standardized measurement frameworks. Empirical evidence provided by [10] confirms that many strategies (e.g., multi-sourcing, supplier partnerships) strengthen both resilience and sustainability, while others (e.g., relocation or diversification) may lead to conflicts increasing costs or emissions. More recent contributions extend the analysis to operational strategies. [11] emphasize that post-COVID-19 operations must integrate green–lean practices, circular economy models, and local sourcing to simultaneously improve resilience and deliver sustainability outcomes. In another 2025 contribution [12] propose the Integrated Sustainable Operational Strategy (ISOS), which unites circularity, localization, and digital adaptation across macro, meso, and micro levels, framing adaptive capacity as the new definition of operational excellence.

2.2 Existing models and gaps

Recent literature addressing the integration of resilience and sustainability within supply chain management shows a steady evolution from descriptive and static models toward dynamic, digital, and system-oriented frameworks (Table 1). The work of [4] introduced a conceptual model structured around performance management, risk, and resilience strategies, emphasizing synergies and trade-offs between redundancy and sustainability. [6] operationalized these interactions through a *Digital Supply Chain Twin* that enables simulation and decision-making under disruption scenarios. In a regionalized approach, [6] developed a food security framework tailored to the UAE context, combining indicators, analytical models, and big data to ensure resilient and sustainable agri-food systems. From a measurement perspective, [8] proposed the *Socially Responsible Performance Measurement (SRPM)* framework, integrating the SCOR model and

blockchain technology to capture social sustainability and resilience dimensions simultaneously. Similarly, [9] conceptualized a three-dimensional *Digital Twin* classification framework extending from manufacturing to entire supply chains, highlighting the interlinkages between efficiency, resilience, and sustainability. Building on empirical insights, [10] advanced an integrative SCRE–SCS framework grounded in the Resource-Based View and Contingency Theory, showing that resilience and sustainability can be mutually reinforcing under collaborative governance. Finally, [11] proposed the *Integrated Sustainable Operational Strategy (ISOS)* framework based on Dynamic Capabilities and the Triple Bottom Line, merging circularity, localization, and digital adaptation to achieve systemic transformation toward resilient–sustainable operations. Overall, these frameworks converge toward a systemic vision in which resilience is not merely reactive but a structural component of long-term sustainability.

Table 1 Summary of existing frameworks addressing integration of sustainability and resilience in supply chain management

Reference	Framework Type	Theoretical Foundation	Key Dimensions	Methods / Tools	Main Contributions
[4]	Integrated conceptual framework	Performance and risk management	Resilience (anticipation, resistance, recovery); Sustainability (economic, social, environmental)	Systematic Literature Review (232 articles)	Integrates resilience and sustainability through performance, risk, and strategic alignment.
[6]	Simulation-based (Digital Supply Chain Twin)	Digital engineering; decision-making under uncertainty	Resilience and triple-bottom-line sustainability	Simulation (AnyLogistix)	Operationalizes resilient–sustainable strategies via digital twin simulation.
[7]	Food Security Analytical Framework	Systems thinking; food policy integration	Food security, resilience, sustainability	Indicators, scenario analysis, big data platform	Provides early-warning and vulnerability monitoring for sustainable agri-food systems.
[8]	SRPM (Socially Responsible Performance Measurement)	Resource-Based View; SCOR model; Blockchain technology	Social, economic, and resilience dimensions	Valuation methods (avoided cost, productivity, damage assessment)	Joint measurement of social sustainability and resilience impacts using digital transparency.
[9]	Digital Twin Framework	SCOR model; hierarchical supply chain systems	Efficiency, resilience, sustainability	Classification (digital model, shadow, twin)	Extends digital twin applications to system-level supply chains integrating sustainability goals.
[10]	SCRE–SCS Integration Framework	Resource-Based View; Contingency Theory	Strategies, barriers, metrics for SCRE–SCS integration	Mixed-method study (survey of 143 executives)	Empirical framework linking resilience and sustainability as complementary strategic capabilities.
[11]	ISOS (Integrated Sustainable Operational Strategy)	Dynamic Capabilities Theory; Triple Bottom Line; Systems Thinking	Circularity, localization, digital adaptation	Conceptual model with illustrative cases	Multi-level framework connecting resilience, sustainability, and industrial transformation.

3 Methodology

Research Design: This study adopts a dual approach including quantitative bibliometric analysis and qualitative content deep screening to assess the integration of resilience and sustainability in supply chains and logistics. The research process aims to design a framework to identify, classify and synthesise key supply chain practices generating synergies and trade-offs between resilience and sustainability dimensions.

Data Collection and selection criteria: The bibliometric analysis was conducted using the Scopus database, due to its broad coverage of peer-reviewed journals in supply chain, logistics and sustainability. The following search query was

applied on 28 November 2025 to “Keywords” index to capture studies explicitly addressing the intersection between resilience concept and sustainability in supply chain, with a framework perspective:

“Supply chain” AND “sustainab*” AND “resilien*” AND “framework” *,

After screening abstracts for relevance to the subject, 65 documents were retained for final analysis.

Inclusion criteria: Explicit focus on both resilience and sustainability, framework orientation, supply chain and logistics context.

Exclusion criteria: articles focusing only on resilience or sustainability and papers unrelated to frameworks.

Bibliometric analysis: The selected dataset (65 documents) was analysed using Bibliometrix (R package) with focus on key outputs such as Annual scientific production, most relevant sources and most frequent keywords. The quantitative mapping provides an overview of the intellectual structure and maturity of the research field.

Quantitative content analysis: Following bibliometric mapping, a qualitative content analysis was conducted to identify recurring supply chain practices and classify them according to

- Decision level
- Resilience practices
- Sustainability practices

Practices were extracted manually and cross-checked across frameworks to determine their accuracy. Each practice was evaluated according to its directional impact on resilience and sustainability (positive, neutral, negative) allowing classification into:

- Strong synergy (positive – positive)
- Synergy (positive – neutral or vice versa)
- Trade-off (negative – neutral or vice versa)
- Strong trade-off (negative – negative)

To reduce subjectivity, classification decisions were based on explicit arguments found in the reviewed literature.

4 Results

4.1 Bibliometric results

The output dataset of the bibliometric research comprised 65 documents covering the period 2012–2025, with a notable concentration of publications emerging after 2020.

Annual production: Annual production data show a sharp increase in contributions since 2024, with 13 articles in 2024 and 25 articles in 2025 (up to 28 November 2025) reflecting the growing interest of integrated approaches to global disruptions and sustainability challenges (Figure 1). In more detail, annual scientific production trends on supply chain resilience, sustainability, and frameworks, based on Scopus data up to 28 November 2025 shows very limited research activity between 2012 and 2020, with no more than three publications per year. From 2021 onwards, the number of studies increased steadily with four papers in 2022 and six papers in 2023. The real increase in interest started in 2024 with 13 papers. This trend is continuing in 2025 with 25 articles published until the 28th of November. This sharp growth shows the rising academic and managerial importance of developing conceptual frameworks that link resilience and sustainability in supply chain management. It also demonstrates that the topic has moved from a niche research area into a mainstream scholarly concern, driven by recent global disruptions and sustainability pressures.

Most Relevant Sources: The most relevant sources include *Sustainability (Switzerland)*, *Journal of Cleaner Production*, and *Review of Management Literature*, highlighting the diversification nature of this research domain (Figure 2). The results indicate that research is mainly concentrated in a limited number of journals, with *Sustainability (Switzerland)* emerging as the dominant journal, contributing with 11 articles to the panel which represents 17% of the set selected. *Journal of Cleaner Production* and *the Review of management literature* follow with 4 publications. *Sustainable Development* and *Computers and Industrial engineering* with 3 publications each. *Environment, development and sustainability*, *Ifac papersonline*, *Journal of environmental management*, *Procedia computer science* and *Resources, conservation and recycling* and with 2 publications each. The distribution highlights both the multidisciplinary nature of the topic with environmental management, industrial engineering, operations management and circular economy—and the growing relevance of sustainability and cleaner production journals as leading platforms for the field of this scope.

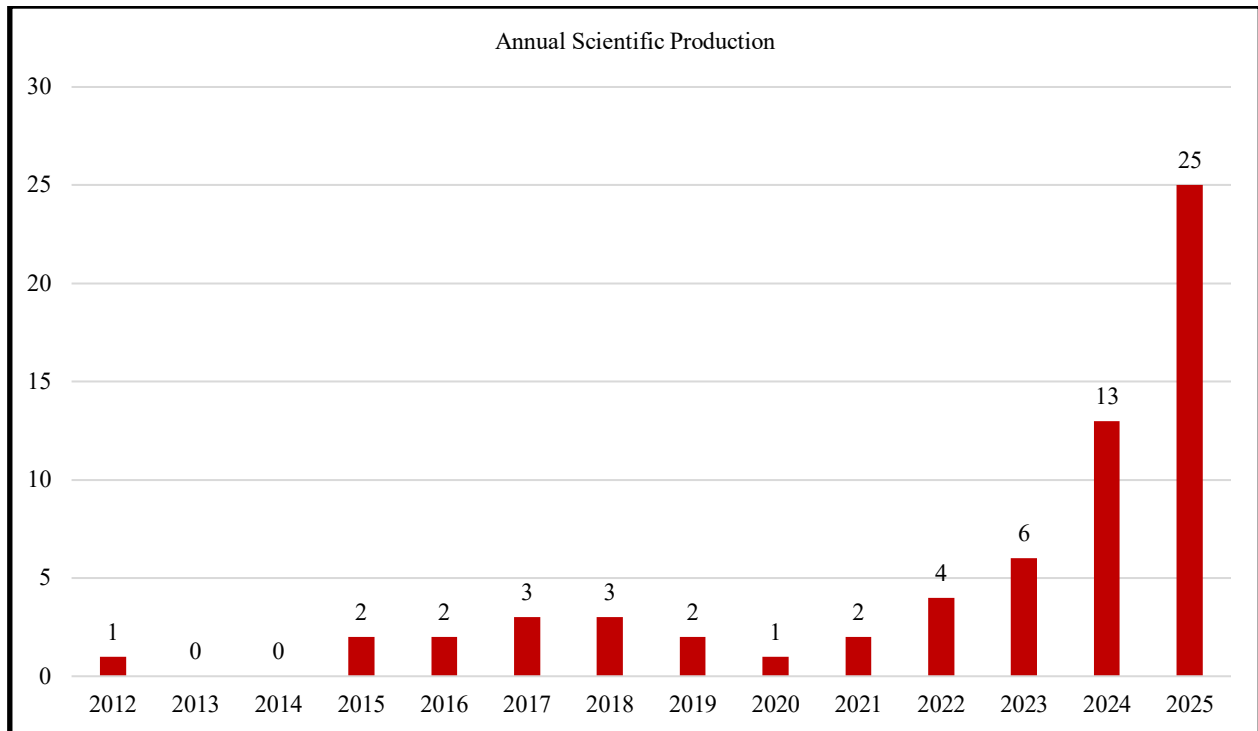


Figure 1 Annual scientific production

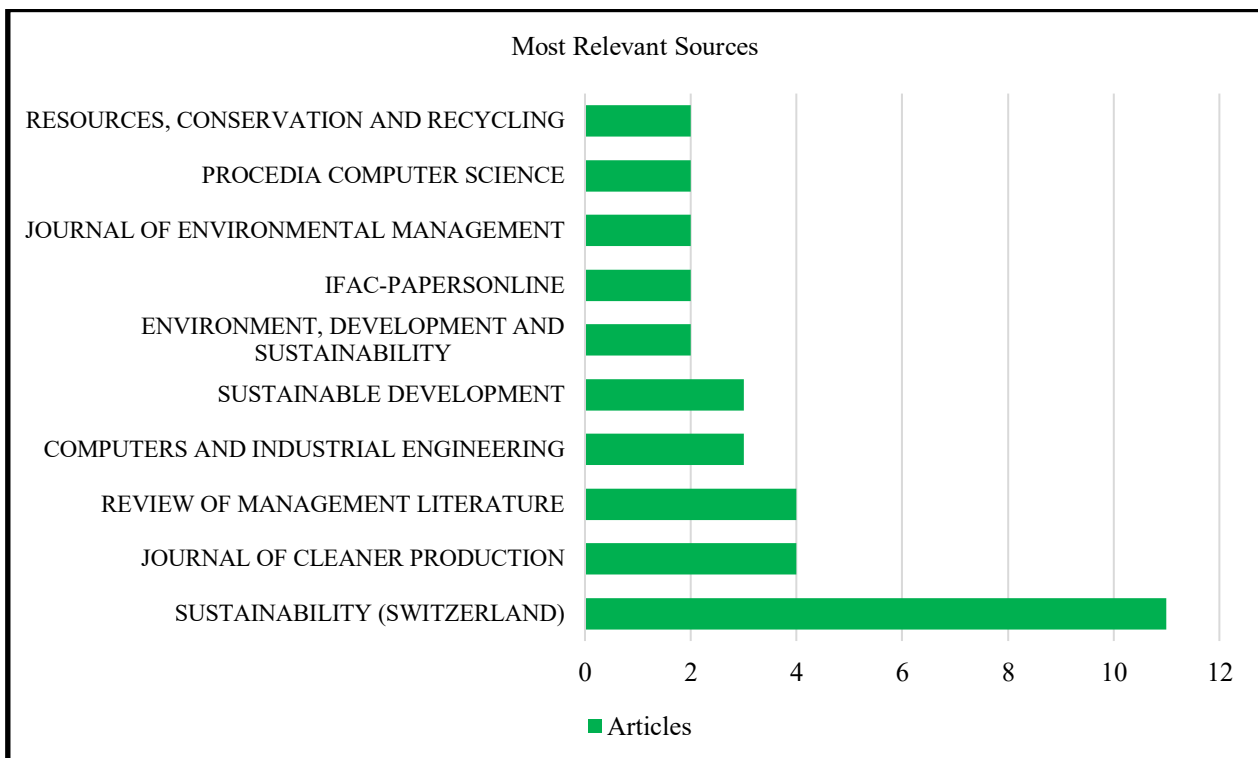


Figure 2 Most relevant sources

Most Frequent Words: Keyword analysis revealed strong clustering around “supply chain management,” “sustainability,” “resilience,” “conceptual framework” and “decision making” (Figure 3). The distribution of the most frequently occurring keywords within the Scopus dataset of November 28th, 2025, on supply chain resilience and sustainability frameworks reveals that “supply chain management” and “sustainability” dominate the panel with 34 occurrences each. “resilience” and “sustainable development” nearly follows with 33 occurrences each “Conceptual framework” and “conceptual frameworks” together appears 26 times in this review highlighting the academic trends to

structure investigations through theoretical and integrative models. “Supply chains” with 23 occurrences, “supply chain resilience” 13 occurrences, “supply chain resiliences” 9 occurrences and “supply chain” 7 occurrences emphasize the diverse formulations used to describe supply chain resilience related capabilities.

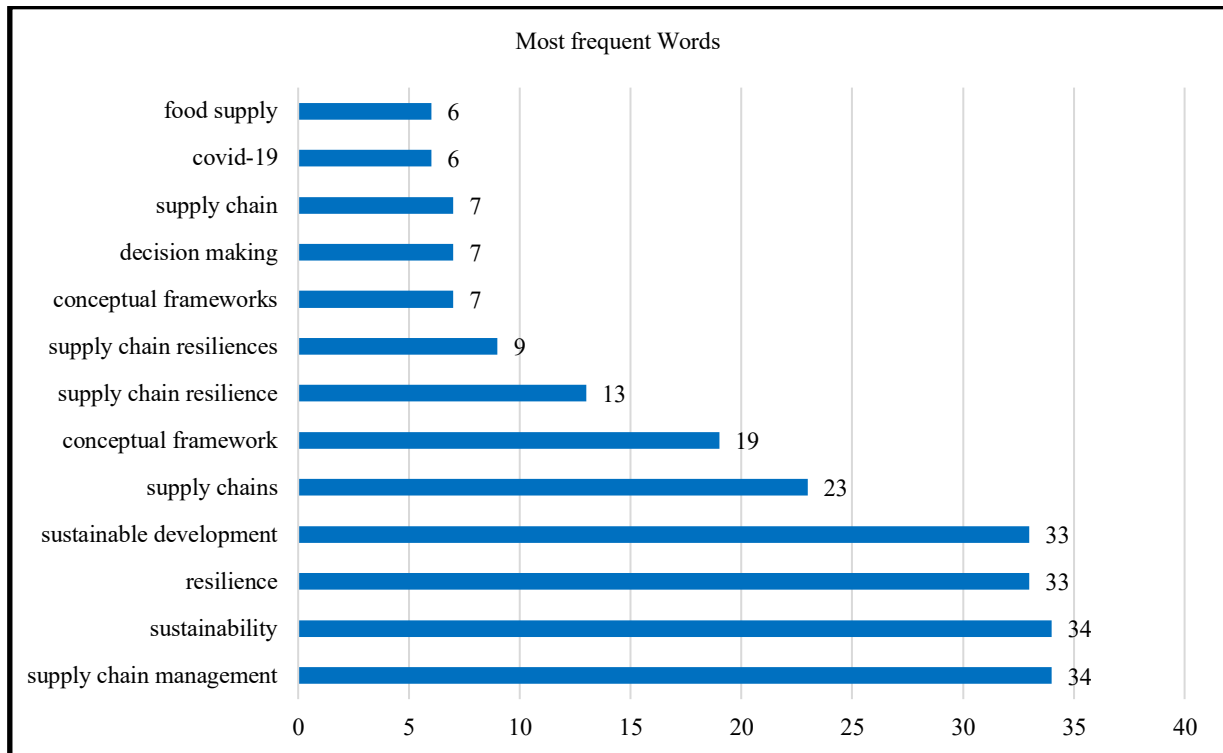


Figure 3 Most frequent keywords

4.2 Proposed strategic evaluation framework

The Proposed Supply Chain Assessment Framework SCAF provides an approach for assessing resilience and sustainability in supply chain management that will support companies’ management decisions in building strong and sustainable supply chains. In the first step, the SCAF classifies supply chain practices across strategic, tactical, and operational levels. In the second step the impact of resilience and sustainability is classified positive, neutral or negative. In the third step, the practice is identified as a Strong Synergy when the two impacts are positive; it is identified as synergy if one impact is positive and the other is neutral; it is identified as trade-off if one of the impacts is negative; the last case is when the two impacts are negative, then the practice is considered as a strong trade-off.

SCAF dimensions: Table 2 shows the three dimensions of the framework and their description.

Table 2 SCAF dimensions

Dimensions	Description
Decision Levels	Strategic, Tactical, and Operational levels
Resilience Capabilities	Adaptive and transformative capacities ensuring continuity and recovery from disruptions.
Sustainability Dimensions	Environmental, social, and economic performance consistent with the Triple Bottom Line.

SCAF Strategic Level assessment: Table 3 shows that at the strategic level, Strategic partnerships & collaboration with stakeholders and Digital transformation & Artificial Intelligence analytics emerge as strong integrators, Compliance with Regulatory Policies increase synergies while Network diversification and multi-sourcing strategies is identified as a trade-off.

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Table 3 SCAF strategic level assessment

Strategic Practices	Resilience Impact	Sustainability Impact	Synergies / Trade-offs
Strategic partnerships & collaboration with stakeholders	Positive: Reinforces relational resilience and knowledge sharing	Positive: Improves social sustainability (trust, inclusion)	Strong Synergy
Network diversification and multi-sourcing	Positive: Increases redundancy and flexibility	Negative: May increase carbon footprint due to longer logistics routes	Trade-off
Digital transformation & Artificial Intelligence analytics	Positive: Enhances visibility and anticipatory capability	Positive: Supports energy efficiency, waste reduction, transparency	Strong Synergy
Compliance with Regulatory Policies	Neutral: Ensures legal stability but does not improve ability to adapt, recover, or respond to disruptions.	Positive: Set environmental and social standards and drive proactive sustainability efforts.	Synergy

SCAF Tactical Level assessment: At tactical level, Supplier development programs and Localization of key suppliers' practices are strong integrators. Development of process agility and flexibility, adoption of Circular economy practices and Risk management are also important integrators practices. Inventory buffering represents a trade-off since it increases energy and resource consumption (Table 4).

Table 4 SCAF tactical level assessment

Tactical Practices	Resilience Impact	Sustainability Impact	Synergies / Trade-offs
Supplier development programs	Positive: Improves recovery capacity and redundancy	Positive: Promotes local employment and social welfare	Strong Synergy
Localization of key suppliers	Positive: Reduces exposure to global disruptions	Positive: Lowers transport emissions	Strong Synergy
Process Agility and Flexibility	Positive: Reduces process variability	Neutral: Does not inherently contribute to sustainability.	Synergy
Inventory buffering	Positive: Enhances robustness against demand shocks	Negative: Increases waste and storage energy consumption	Trade-off
Circular economy adoption	Neutral: Builds adaptive capacity through reverse logistics	Positive: Reduces resource consumption, promotes eco-efficiency	Synergy
Risk Management	Positive: Helps identify, assess, and mitigate risks proactively, reducing vulnerability and enhancing preparedness.	Neutral: Does not directly drive sustainability improvements unless explicitly focused on environmental and social factors.	Synergy

SCAF Operational Level assessment: At operational level, Lean manufacturing practices and Artificial Intelligence tools are strong integrators. Energy-efficient production scheduling and Preventive maintenance using IoT sensors are also important integrators practices. High inventory levels and just in time management represents a trade-off since it increases energy and resource consumption (Table 5).

Table 5 SCAF operational level assessment

Operational Practices	Resilience Impact	Sustainability Impact	Synergies / Trade-offs
High inventory levels	Positive: Enables fast recovery	Negative: May generate idle capacity and resource waste	Trade-off
Just-in-Time management	Negative: Minimizes inventory, making supply chains highly vulnerable to disruptions.	Neutral : Reduces waste and excess inventory, it can also increase frequent transportation, leading to higher carbon.	Trade-off

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Energy-efficient production scheduling	Neutral: May impact adaptive flexibility	Positive: Reduces carbon emissions	Synergy
Lean manufacturing development	Positive: Enhances efficiency and flexibility, reducing waste and improving adaptability in crises.	Positive: Focuses on waste reduction and efficient resource use, lowering the environmental impact of production.	Strong Synergy
Preventive maintenance using IoT tools	Positive: Prevents disruptions and downtime	Neutral: May reduce material waste and extends asset life	Synergy
Artificial Intelligence	Positive: Enhances predictive capabilities, allowing faster responses to disruptions.	Positive: Enhances resource efficiency and predictive maintenance, reducing waste and energy consumption.	Strong Synergy

Framework visualisation: Table 6 helps visualisation the framework by illustrating the relationship between Resilience and Sustainability across three organisational levels: Strategic, Tactical, and Operational. It is divided into five columns representing different degrees of alignment between resilience and sustainability:

- Horizontal Axis: Shows a continuum from Resilience (left) to Sustainability (right). Columns indicate whether actions create trade-offs or synergies between resilience and sustainability.
- Vertical Axis: Divided into three organisational levels. Strategic Level, Tactical Level and Operational Level
- Colour Coding:
 - Red: Trade-Off actions / Orange: Synergy actions / Green: Strong Synergy actions

Table 6 Framework visualisation

	Trade-Off: Resilience Oriented	Synergy: Resilience Oriented	Strong Synergy: Both Resilience & Sustainability	Synergy: Sustainability Oriented	Trade-Off: Sustainability Oriented
Strategic Level	Network diversification and multi-sourcing		Strategic partnerships & collaboration with stakeholders Digital transformation & Artificial Intelligence analytics	Compliance with Regulatory Policies	
Tactical level	Inventory buffering	Process Agility and Flexibility Risk Management	Supplier development programs Localization of key suppliers	Circular economy adoption	
Operational Level	High inventory levels	Preventive maintenance using IoT tools	Lean manufacturing development Artificial Intelligence	Energy-efficient production scheduling	Just-in-Time management

5 Discussion

5.1 Framework managerial contribution

The Supply Chain Assessment Framework (SCAF) identifies which practices strengthen both resilience and sustainability simultaneously, practices that enhance only resilience without decreasing sustainability and vice-versa and also clarifies where conflicts and trade-offs arise. On strategic level, the findings confirm that the strategic partnerships and collaboration with stakeholders create stronger synergy as it reinforces relational resilience and knowledge sharing and also improves social sustainability through trust and inclusion. digital transformation and AI analytics also create stronger synergies since they enhance visibility and anticipatory capability and support transparency. Compliance with regulatory policies also emerges as a synergy as it ensures legal stability but does not necessarily improve ability to adapt, recover, or respond to disruptions. On the other hand, practices like network diversification and multi-sourcing, remain a

trade-off as they protect against market disruptions but can conflict with sustainability goals through higher resource consumption. On tactical level, SCAF identifies practices like supplier development programs and localization of key suppliers as Strong Synergy since they improve recovery capacity and redundancy, promote local employment and social welfare, reduce exposure to global disruptions and lower transport emissions. Practices like process agility and flexibility, inventory buffering, circular economy adoption and risk management are identified as synergies since they reduce process variability and waste, build adaptive capacity, assess and mitigate risks. However, the findings point out inventory buffering as a persistent trade-off as it increases waste, storage capacities and energy consumption. On operational level, lean manufacturing development and AI emerge as strong synergies by enhancing efficiency, flexibility and predictive capabilities while focusing on waste reduction and efficient resource use. Energy-efficient production scheduling and preventive maintenance with IoT tools emerge as a synergy by reducing carbon emissions and waste and preventing disruptions and downtimes. By contrast, high inventory levels and just-in-time (JIT) management illustrate two opposite forms of trade-offs since it generates idle capacities and increases frequent transportation leading to higher carbon emissions and environmental degradation.

The findings highlight an important structural insight stating that synergies tend to cluster around practices that enhance collaboration, information flow using AI tools, circularity, and process efficiency, while trade-offs often arise from practices that rely on material and logistics redundancy.

This interpretation is consistent with the systemic understanding of distribution and supply logistics, where logistics performance depends on the coordinated management of material, information and financial flows across strategic, tactical and operational levels [13].

5.2 Framework implementation

To help the implementation of the Supply Chain Assessment Framework (SCAF), we suggest to start the process by assessing supply chain with regards to resilience and sustainability. This will link the conceptual framework to managerial decision-making. The following steps outline the main stages and conditions for effective application within organisations' supply chain.

Step 1 – Define Scope of the supply chain to assess: Organisations should begin by clearly delimiting the boundaries of their supply chain system (e.g., activity, process extent, geographic, and key partners).

Step 2 – Mapping of Practices: Managers should identify existing supply chain practices within their organisations and boundaries identified in step 1. Then classify them as strategic, tactical, and operational levels and map them to the SCAF:

- Practices such as Strategic partnerships & collaboration with stakeholders, Network diversification and Multi-sourcing, Digital transformation & Artificial Intelligence analytics and Compliance with Regulatory Policies will be classified as strategic.
- Supplier development programs, Localization of key suppliers, Process Agility and Flexibility, Inventory buffering, Circular economy adoption and Risk Management will be classified as Tactical practices.
- High inventory levels, Just-in-Time management, Energy-efficient production scheduling, Lean manufacturing development, Preventive maintenance using IoT tools, Artificial Intelligence will be classified as operational practices.

Step 3 – Data Collection: Managers should collect quantitative and qualitative data on each practice to help assess implementation of such practice. Quantitative Data could be collected through existing KPI within the organisation. Additional data could be gathered from external sources, sectorial analysis or through qualitative questionnaires.

Step 4 – Assessment: For each identified practice, managers evaluate the degree of influence on resilience capabilities and sustainability dimensions (economic, environmental, and social) and state whether this practice is implemented, to be enhanced or to be mitigated. Table 3, Table 4 and Table 5 can be used to qualify synergies and/or trade-offs.

Step 5 – Conditions for successful implementation:

- Leadership Commitment: Executive support ensures that resilience–sustainability integration becomes an organisational priority rather than a short-term project.
- Cross-Functional Collaboration: Integrating sustainability and resilience requires the active participation of multiple departments (procurement, operations, logistics).
- Monitoring, Learning, and Continuous Improvement the SCAF should not be treated as a static assessment tool but as a dynamic management mechanism.

5.3 Limitations and future research

Resilience and sustainability to be addressed jointly: Given the growing complexity of global supply chains, resilience and sustainability should be integrated simultaneously rather than treated separately or as competing objectives. A joined approach enables companies to address both short-terms objectives resilience oriented and long terms objectives sustainability oriented.

Strong synergies exist between resilience and sustainability: Collaborative partnerships, supplier development, digital transformation, and circular economy initiatives simultaneously strengthen resilience capacities and enhance sustainability performances. These synergies align short-term responsiveness with long-term sustainability goals.

Structural trade-offs remain unavoidable and must be mitigated: Despite existing synergies, certain trade-offs persist. Practices that enhance resilience—such as diversification or inventory buffering—may increase environmental impacts, whereas lean and just-in-time approaches improve sustainability but heighten vulnerability. These tensions require balanced strategic management.

The Supply Chain Assessment Framework (SCAF) as the core contribution: SCAF offers a dual approach that simultaneously assess resilience and sustainability across strategic, tactical, and operational levels. It helps visualise interactions, prioritize high- and medium-synergy practices, and mitigate unavoidable trade-offs.

Limitations and directions for future research: Although useful, SCAF remains conceptual and lacks empirical validation. Future studies should operationalize it through measurable indicators and composite indices. Additionally, sector-specific differences are not fully captured, indicating the need for comparative analyses across industries and regions.

6 Conclusion

This article highlights the need to assess supply chain resilience and sustainability together, rather than treating them as separate or competing objectives. Through a combination of quantitative bibliometric analysis and qualitative review of existing frameworks, this article shows that academic interest in resilience–sustainability integration emerged significantly since 2020, especially since 2024. Existing studies mostly focus on conceptual alignment or specific tools. To address this gap, this article introduces the Supply Chain Assessment Framework (SCAF).

The main contribution of this article is the development of the SCAF, which introduces a cross-impact evaluation logic based on decision level and flow-based practices assessment.

The findings reveal strong synergies cluster around practices enhancing flows, collaboration, digitalisation, circularity and process efficiency, whereas trade-offs typically stem from material-flow redundancy, logistics network diversification, multi-sourcing and inventory buffers.

From a managerial perspective, SCAF enables managers to design more resilient and sustainable supply chain configurations. However, the framework remains conceptual and needs empirical validation through KPIs and also sector and region-specific applications.

Overall, the research advances a more integrated, balanced and systemic perspective on resilient and sustainable supply chain management.

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Review process

Single-blind peer review process.