

A systematic literature review on drivers and barriers for supply chain decarbonization

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Abstract

Climate change presents a major disruption to natural ecosystems and a critical challenge for both the global community and academic research. In response, achieving net-zero supply chains has become a key priority within Sustainable Supply Chain Management (SSCM). While prior studies have proposed conceptual frameworks to integrate sustainability into supply chains, many lack a solid theoretical foundation. Thus, scholars have highlighted the need for theory-driven research to deepen understanding in this area.

This paper addresses this gap by conducting a systematic literature review focused exclusively on organizational and managerial theory-grounded studies. The research identifies the key drivers and barriers that influence supply chain decarbonization strategies. A multi-level perspective is employed to analyze how these forces operate across institutional, supply chain, and firm-level domains.

The study offers both theoretical and managerial contributions. It enhances the field of Green Supply Chain Management (GSCM) by systematically mapping factors shaping decarbonization through a rigorous theoretical lens. From a managerial standpoint, it delivers insights to help practitioners develop strategies for the net-zero transition.

Framing of the research. *In recent decades, the transition to net-zero supply chains has gained increasing attention in sustainable supply chain management (SSCM) research (Ghadge et al., 2020; Vimal et al., 2022; L. Xu et al., 2023; Hettler & Graf-Vlachy, 2024). Foundational studies by Seuring & Müller (2008) and Carter & Rogers (2008) established conceptual frameworks for integrating sustainability across supply chains. Subsequent research has examined low-carbon supply chains (Shaharudin et al., 2019), cultural influences on carbon-neutral capabilities (Ambekar et al., 2019) and challenges in building resilient net-zero supply chains (Vimal et al., 2022).*

While these contributions provide valuable insights, many lack a strong theoretical foundation, prompting calls for theory-driven research in this context (Sarkis et al., 2011; Allen et al., 2021; Seuring et al., 2022). Some scholars have sought to address this gap. Daddi et al. (2018) explored the application of organizational theories in climate change studies, while Kannan (2021) reviewed theoretical approaches in sustainable procurement. Similarly, Todaro et al. (2020) examined theories in environmental management systems, and Govindan et al. (2024) analyzed theoretical trends in SSCM.

The application of management theories is essential for framing and explaining complex phenomena in SSCM, given the field's multi-stakeholder nature, multi-level analyses (product, company, supply chain), and intersection of environmental, economic, and social dimensions (Govindan et al., 2024). Additionally, Mishra et al. (2022) identified a critical research gap, highlighting both the need for supply chains-focused studies in the context of the net-zero transition and theory-driven research.

Purpose of the paper. *Our study aims to understand the factors that influence supply chain decarbonization strategies, ensuring scientific rigor by including only studies grounded in recognized management and organizational theories. By adopting a systematic literature review (SLR) approach, we address the need for theory-driven research in the field of supply chain decarbonization. To this end, we pose the following research question:*

RQ: What are the main drivers and barriers that influence the development of a carbon-neutral strategy at the supply chain level?

The main contributions are twofold. First, it advances theoretical understanding of supply chain decarbonization by systematically mapping the factors shaping this transition through a rigorous theoretical lens. Second, it offers practical contributions by providing science-based insights to support practitioners in developing strategies that effectively take into consideration all the relevant factors and mechanism influencing climate change mitigation strategies at the supply chain level.

Methodology. *This study employs a SLR approach to ensure methodological rigor and minimize researcher bias in the inclusion and exclusion of studies. Following Pittaway et al. (2004) and Rousseau et al. (2008), the SLR approach*

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offers a high level of transparency, allowing for replicability and clear communication of the review process. Moreover, this methodology is particularly suited for synthesizing evidence across a diverse body of literature (Crowther & Cook, 2007). The review was conducted in line with the guidelines proposed by Tranfield et al. (2003).

Data collection. The data collection process was iterative, involving the identification of relevant sources through the application of carefully selected keywords. The datasets consulted were Scopus and ISI Web of Science, two widely recognized databases that provide comprehensive and reliable results (Harzing & Alakangas, 2016; Liao et al., 2017). The query was designed to capture studies related to climate change mitigation at the supply chain level, with a focus on contributions to organizational and management theories. The search algorithm employed was: ("climate change" OR "net zero" OR "carbon neutral*" OR "decarbon*") AND ("supply chain*" OR "value chain*" OR SSCM OR SCM OR "scope 3) in titles, abstract and keywords. This broad query ensured the inclusion of diverse yet relevant studies, reducing the risk of excluding pertinent literature. Denyer & Tranfield (2009) emphasize the importance of a broad spectrum of studies in an SLR to mitigate researcher value judgments and threats to validity. To ensure the quality of the included studies, only articles published in journals listed in the AJG (formerly ABS) 2024 rankings were selected. Knowing that this choice reduces the inclusiveness and breadth of the review, we decided to include only higher-impact journals as they contain state-of-the-art research and set the future agenda (Keupp et al., 2012; Savino et al., 2017), thereby ensuring coverage of dominant themes and debates. Following Williams et al. (2024), we selected the AJG list due to its broad interdisciplinary focus. The list provides a quality ranking of sustainability-focused journals and includes wide range of journals, stretching across fields that are either central or salient to business and management studies.

The research domain was restricted to articles categorized under business, management, economics, social and environmental sciences, and econometrics. Additionally, the selection was limited to peer-reviewed journal articles and review articles written in English, with no restrictions on the time span. The initial query was executed in September 2023 and updated in November 2024, yielding 724 papers from Scopus and 773 from ISI Web of Science. After removing duplicates, 1,033 unique articles remained for further analysis.

Tab. 1: Summary of SLR criteria

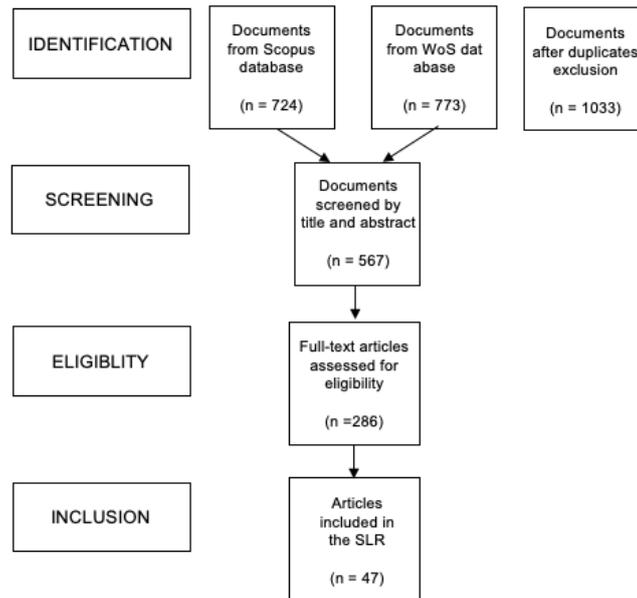
Database	Scopus; Web of Science
Time period	None selected*
Search fields	Title, Author, Keywords
Search keywords	("climate change" OR "net zero" OR "carbon neutral*" OR "decarbon*") AND ("supply chain*" OR "value chain*" OR SSCM OR SCM OR "scope 3)
Research domain	Scopus: Business, Management and Accounting; Social Sciences; Economics, Econometrics and Finance; Environmental Science Web of Science: Environmental Sciences Ecology; Business Economics; Operations Research Management Science
Publication Title	Only AJG (former ABS) listed journals
Document type	Article or Review Article
Language	English

Data extraction and synthesis. In the data extraction and synthesis stage, a structured framework for data analysis was developed, along with the identification of key research themes (Rousseau et al., 2008). This stage involved screening abstracts to identify relevant literature and establish clear inclusion and exclusion criteria. Studies were excluded if they lacked a management or organizational theory in their theoretical background, did not analyze the supply chain as the unit of analysis, adopted a broader sustainability perspective unrelated to climate change mitigation, or applied macroeconomic rather than managerial approaches. In the first phase, titles and abstracts were screened, resulting in the retention of 567 documents, while 180 studies were excluded for not meeting the inclusion criteria.

The second phase involved a full-text assessment of 286 papers, systematically coding the sample for the presence of organizational and management theories. The Excel software facilitated systematic categorization and filtering. The classification was based on established frameworks (Defee et al., 2010; Sarkis et al., 2011; Chicksand et al., 2012; Touboulis & Walker, 2015; Daddi et al., 2018; Todaro et al., 2020; Del Gesso & Lodhi, 2024), identifying 30 organizational and management theories.

The eligibility phase resulted in a final dataset of 47 papers.

Fig 1: Screening process



Results. A thematic analysis was conducted adopting a qualitative approach to identify and examine the main drivers and barriers against climate change mitigation strategies within SCM. The analysis is grounded in established organizational management theories, ensuring both theoretical rigor and relevance. The entire process was facilitated using Excel software, which enabled systematic categorization, filtering, and evaluation of the critical variables and concepts.

The following sections will provide a deeper understanding of the main drivers and barriers to supply chain decarbonization. These forces are grouped in three main categories encompassing the different domains in which they emerge, including the broad institutional context, the supply chain level, and the firm level.

Drivers

We conceptualize drivers as internal or external pressures that necessitate or motivate change within an organization. They create a sense of urgency, compelling organizations to initiate change to maintain competitiveness or compliance (Fig 1).

At the institutional level, regulatory, governmental and legal frameworks play a key role in driving supply chain decarbonization (Kolk & Pinkse, 2004; Cristina De Stefano et al., 2016; Furlan Matos Alves et al., 2017; Liu et al., 2020; Linares-Rodriguez et al., 2022; Harahap et al., 2023; Deng et al., 2024; Dohale et al., 2024). However, Oyewo et al. (2024) argue that high-quality policy formulation and implementation - characterizing effective governance - do not necessarily lead to carbon reduction unless it addresses properly scope 3 emissions.

Market dynamics also serve as institutional drivers. Consumer preferences, market capacity, and green trust encourage firms to adopt decarbonization strategies (Zu et al., 2018; Niu et al., 2022; Zhou et al., 2023). Competitive pressures (Deng et al., 2024), environmental crises (Touboulie et al., 2018), and the pursuit of environmental legitimacy (Deng et al., 2024) further reinforce decarbonization efforts. Additionally, shareholders and stakeholders exert influence, particularly through salience (Kolk & Pinkse, 2004) and legitimacy (Block et al., 2024).

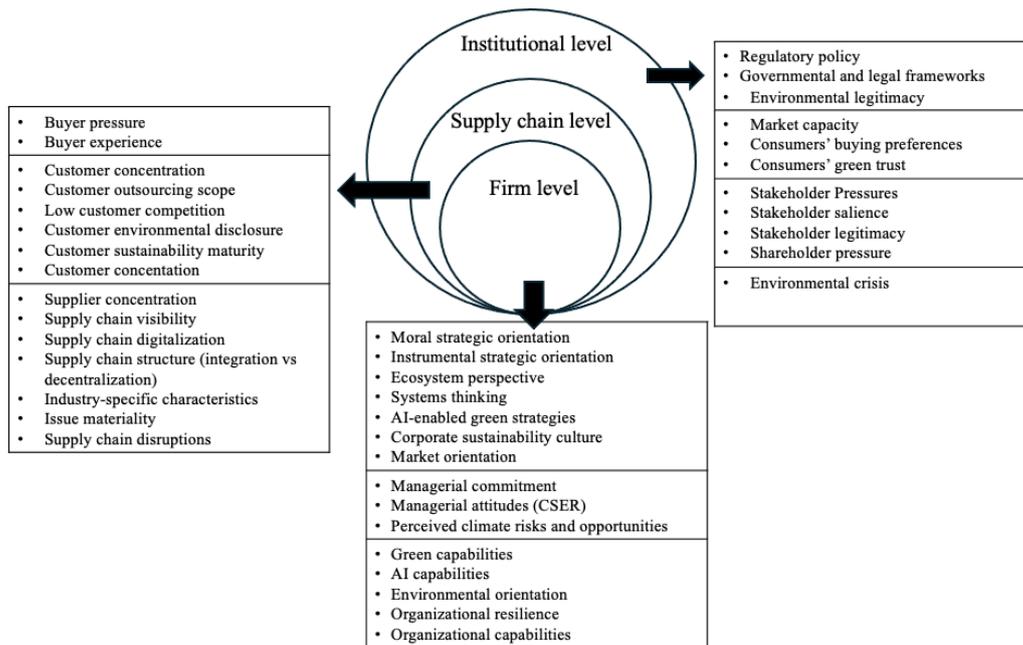
At the supply chain level, buyer and customer-related pressures significantly impact decarbonization. Buyers exerting strong pressure or that have experience can drive suppliers toward carbon reduction (Damert & Baumgartner, 2018; Eggert & Hartmann, 2021). Customer-related drivers include customer concentration (Xu et al., 2024), customer outsourcing scope (Liu et al., 2020), low customer competition and customer-base environmental disclosure (Song et al., 2024). Downstream customer characteristics, such as customer concentration, sustainability maturity, and shifts in power as a result of sustainability-related maturity also influence the transition (Theien et al., 2014; Xu et al., 2024). Similarly, supplier concentration fosters supply chain decarbonization (Xu et al., 2024). Structural and contingency factors within the supply chain also drive change. Supply chain visibility and digitalization act as indirect driver (Balci & Ali, 2024; Li et al., 2025), while supply chain integration presents mixed findings: some studies indicate internal and external integration as a driver (Balci & Ali, 2024; Javed et al., 2024), whereas Chen & Wang (2017) argue that decentralized structures better support emissions reduction. Industry-specific characteristics, issue materiality and supply chain disruptions also emerge as drivers (Eggert & Hartmann, 2021; Kolk & Pinkse, 2007; Furlan Matos Alves et al., 2017).

At the firm level, several strategic and managerial factors drive decarbonization efforts. Lintukangas et al. (2023) distinguish firms with moral motives, integrating climate change into corporate strategy and influencing public policy,

from firms with instrumental motives, which prioritize emissions reduction due to sectoral GHG intensity and reputational concerns. Moreover, the adoption of an ecosystem perspective and systems thinking facilitates carbon neutrality (Man et al., 2024; Papadonikolaki & Anumba, 2024), while AI-enabled green business strategies significantly accelerate this transition (Chotia et al., 2024). Managerial commitment and corporate culture play a critical role, as do managers' attitudes toward corporate social and environmental responsibility (Damert et al., 2018). These authors show that also perceived climate-related risks and opportunities influence firms' proactive engagement in decarbonization.

Finally, a growing body of literature highlights organizational capabilities as key drivers of supply chain decarbonization. Studies identify green capabilities, environmental orientation, AI capabilities, market orientation, resilience, and broader organizational capabilities as enablers of carbon neutrality (Akter et al., 2024; Block et al., 2024; Man et al., 2024; Song et al., 2024). These capabilities enhance firms' ability to navigate regulatory challenges, develop innovative low-carbon solutions, and integrate decarbonization into long-term business strategy.

Fig 1. Drivers towards supply-chain decarbonization across the institutional, supply-chain and firm level.



Barriers

In our conceptualization, encompass the challenges, uncertainties, and opposing forces that hinder or prevent supply chains from achieving decarbonization goals (Fig 2).

At the institutional level, economic and market-related barriers significantly obstruct the transition to carbon neutrality. Uncertainty in the returns of decarbonization investments, and energy market volatility create financial risks that discourage action (Miklautsch & Woschank, 2022; Niu et al., 2022). Additionally, Harahap et al. (2023) identified other institutional barriers in infrastructure constraints, carbon lock-in, carbon leakage and low consumer willingness to pay for certain low-carbon products, such as sustainable fuels. Similarly, resource constraints, including limited access to renewable energy sources, negatively impact scope 3 decarbonization efforts (Sharma et al., 2024).

Regulatory challenges also emerge as critical barriers. Regulatory uncertainty, policy variability among different regions, lack of standardization, and absence of regulatory incentives weaken firms' commitment to decarbonization (Cristina De Stefano et al., 2016; Damert & Baumgartner, 2018). At the social level, resistance from established regimes and societal opposition slow progress (Harahap et al., 2023; Man et al., 2024). Additionally, information asymmetry among stakeholders hinders coordination and decision-making, particularly for scope 3 emissions (Niu et al., 2022). Finally, leveraging on system's theory, Papadonikolaki & Anumba, (2024) investigated the impact of joint complexity stemming from policy-related, social and technical forces - analyzing the interaction between data complexity and software system together with human and organizational factors.

At the supply chain level, structural factors pose significant barriers. Vertical and spatial complexity, limited visibility, fragmentation, and underdeveloped green supply chain networks limit firms' ability to coordinate decarbonization efforts (De Stefano & Montes-Sancho, 2024; Li et al., 2025; Sharma et al., 2024). Resource constraints and limited access to critical raw materials represent a contingent constraint (Furlan Matos Alves et al., 2017). Additionally, supply chain carbon uncertainty creates risk-averse decision-making, delaying decarbonization pathways (Belhadi et al., 2024).

Relational barriers also play a crucial role. Conflicting goals among supply chain partners, difficulties in finding win-win solutions and the misalignment of sustainability priorities challenge collaborative decarbonization efforts (Chen

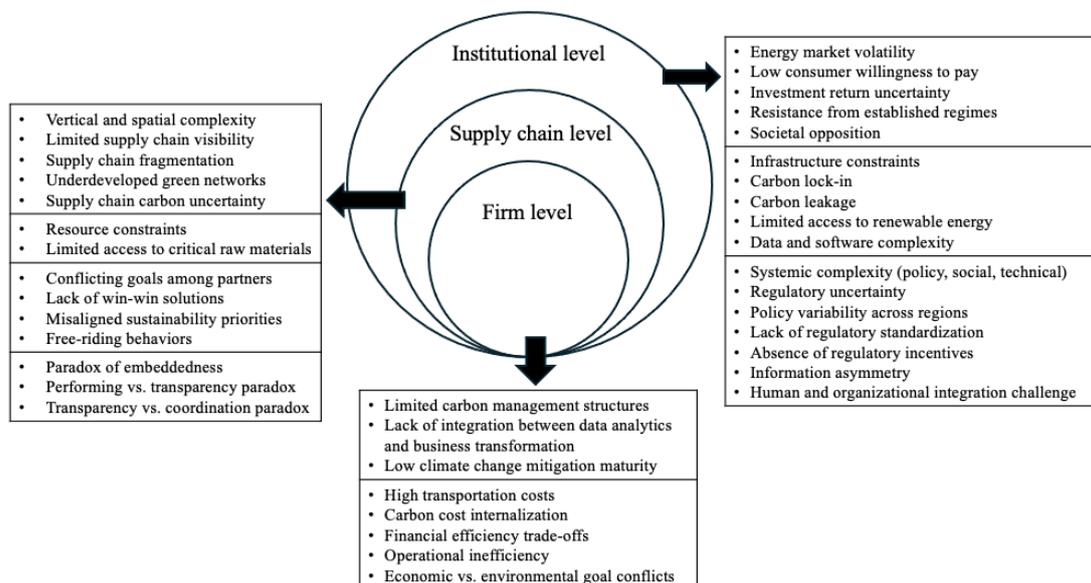
& Wang, 2017; Miklautsch & Woschank, 2022). Man et al. (2024) conceptualize this misalignment of goals as an interoperability challenge, where stakeholders operate under conflicting sustainability schemas. Furthermore, free-riding behaviors undermine collective efforts, as some firms benefit from sustainability initiatives without actively contributing (Kang & Tan, 2023).

Drawing on paradox theory, the paradox of embeddedness has been identified as another key barrier (Dahlmann et al., 2023). This paradox arises at the intersection of the performing paradox - where firms struggle between sustainability transparency and performance improvements - and the organizing paradox, where supply chain transparency conflicts with coordination efforts. These tensions complicate firms' ability to implement effective carbon reduction strategies.

At the firm level, organizational constraints hinder decarbonization efforts. Limited carbon management structures and lack of integration between data analytics and business transformation slow progress (Furlan Matos Alves et al., 2017; Belhadi et al., 2024). Firms in the early stages of climate change mitigation management face additional obstacles in establishing robust decarbonization strategies (Chiappetta Jabbour et al., 2015; Li et al., 2025).

Economic and financial constraints also emerge as major barriers. High transportation costs and internalization of carbon-related costs add financial burdens (Miklautsch & Woschank, 2022), while achieving financial and operational efficiency remains challenging (Sharma et al., 2024). Trade-offs between economic and environmental goals further complicate firms' ability to commit fully to decarbonization strategies (Mahapatra et al., 2021).

Fig 2. Barriers against supply-chain decarbonization across the institutional, supply-chain and firm level.



Research limitations. This study is grounded in a rigorous and robust sample, including only AJG-listed journal articles explicitly referring to management theories as their theoretical background. This methodological choice ensures credibility and alignment with established research standards. However, few criticalities can be identified.

The first limitation of this study, as it remains a work in progress, is the absence of a structured framework for the interpretation and visualization of drivers and barriers. While the analysis identifies and categorizes these factors, their integration into a cohesive framework is yet to be developed. This limitation also extends to the theoretical dimension of the study. Although the sample includes only articles that explicitly reference management theories, the current version does not establish a direct connection between these theories and the identified drivers and barriers.

Managerial implications. This study provides valuable insights for practitioners navigating the decarbonization of entire supply chains, offering evidence-based guidance grounded in high-rigor academic research. By synthesizing findings from AJG-listed journal articles, it delivers a comprehensive perspective on the factors influencing the net-zero transition.

Specifically, the study outlines both internal and external drivers that initiate and shape change, alongside barriers that generate uncertainty or threaten transition success. This holistic understanding equips supply chain managers with a structured view of the dynamics at play, enabling them to design strategies that align with the complexity and scale of the challenge. Recognizing the interplay between these factors allows firms to anticipate risks and mitigate barriers, ultimately enhancing the feasibility and resilience of supply chain decarbonization efforts.

Originality of the paper. This study provides valuable original contributions both from a practical and theoretical perspective. Beyond the managerial insights outlined in the previous section, its theoretical originality lies in advancing

the field of Green Supply Chain Management (GSCM) by offering new evidence on the factors shaping supply chain decarbonization.

To the best of the authors' knowledge, no prior literature review has systematically structured the state of the art on supply chain decarbonization strategies with a rigorous theoretical approach. This study uniquely builds on recognized management and organizational theories, ensuring a theory-driven examination of the topic. Furthermore, it comprehensively maps drivers and barriers - capturing both forces that stimulate and facilitate supply chains toward carbon neutrality and those that hinder this transition. Unlike existing studies, it adopts a multi-level perspective, analyzing how these factors operate across different domains: the institutional environment, the supply chain and the single firm levels. By integrating these dimensions, this research advances theoretical understanding and provides a solid foundation for future studies on the role of management theories in guiding supply chain decarbonization.

Key words: Climate change mitigation; Supply Chain Decarbonization; Literature Review; Management theories; Drivers; Barriers

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