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Article

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Administrative Sciences

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Suggested Citation: Cherono, Vivian; Miah, Md Tota; Rudná, Ildikó; Csaba, Szűcs (2025) : Beyond the hype: A systematic exploration of emerging thematic trends and persistent challenges in combating greenwashing across global supply chains, Administrative Sciences, ISSN 2076-3387, MDPI, Basel, Vol. 15, Iss. 5, pp. 1-27,
<https://doi.org/10.3390/admsci15050173>

This Version is available at:

<https://hdl.handle.net/10419/321317>

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Beyond the Hype: A Systematic Exploration of Emerging Thematic Trends and Persistent Challenges in Combating Greenwashing Across Global Supply Chains

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Abstract: This study aimed to determine how research has highlighted greenwashing in supply chains by identifying emerging themes and pinpointing gaps that must be addressed in combating greenwashing in global supply chains. Using the PRISMA framework, 58 papers published up to 2024 were critically examined. Through this review, five key emerging themes are presented: standardization of regulatory policies, technological innovations for transparency, environmental, social, and governance (ESG) criteria, the role of NGOs in monitoring greenwashing incidences, and industry-specific case studies. The study also identified a dearth of research on industry-specific cases, regional disparities, the implementation of technological innovations for supply chain transparency, and the role of supply chain stakeholders in reducing greenwashing, with only a few papers highlighting NGOs and government. We propose a conceptual framework for combating greenwashing and to promote sustainability in global supply chain operations, paving the way for further academic exploration. We also suggest solutions as well as a guide for future researchers to explore areas that are still underdeveloped and offer recommendations to supply chain policymakers on addressing greenwashing.



Received: 5 February 2025

Revised: 28 April 2025

Accepted: 30 April 2025

Published: 3 May 2025

Citation: Cheronon, V., Miah, M. T., Rudnák, I., & Csaba, S. (2025). Beyond the Hype: A Systematic Exploration of Emerging Thematic Trends and Persistent Challenges in Combating Greenwashing Across Global Supply Chains. *Administrative Sciences*, 15(5), 173. <https://doi.org/10.3390/admsci15050173>

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Keywords: greenwashing; supply chains; systematic review; PRISMA; transparency; environmental; social; and governance (ESG); standardization

1. Introduction

In recent years, greenwashing has been a topic of debate on sustainability in global supply chains. The increasing environmental awareness, intensification of climate change, stakeholders' demands for environmentally responsible practices, and government regulations have driven the local and international companies to adopt more sustainable operations to mitigate the environmental damage. The concern for sustainability is not new for companies, as they use United Nations Sustainable Development Goals (SDGs) for benchmarking and communicating their sustainability performance (Lashitew, 2021). Mostly, the environmental practices across the supply chain have led firms to become more accountable both socially and environmentally by integrating the measurement and reporting of corporate sustainability. These practices have become a potential source of competitive advantage, encouraging companies to incorporate environmental concerns at both the company and supply chain level (Arouri et al., 2021). The concept of greenwashing

refers to a practice where companies exaggerate, fabricate, or convey a false impression about their environmental commitment (de Freitas Netto et al., 2020). It is the disparity between environmental disclosure and actual implementation that has gained substantial research focus (Z. Liu et al., 2023b). The term emerged as a topic in the mid-1980s, when environmental activist Jay Westerfield criticized hotels for promoting towel reuse as part of a water conservation effort without implementing broader environmental initiatives (Vollero, 2022). During the 1990s, critics accused companies like Nike and Walmart of profiting from exploitative practices in their supply chains, such as child labor practices and poor working conditions, to which most businesses responded by denying responsibility (Fritz, 2018). Zara faced allegations of greenwashing after launching a pre-owned clothing initiative that critics claimed amounted to little more than lip service (Munir & Mohan, 2022). It is evident that there is a lack of consumer awareness, and little is known about the consequences of this ignorance (Volschenk et al., 2022). Hence, transparency is crucial in the development of resilient and sustainable supply chains as well as for maintaining sound corporate governance (McGrath et al., 2021). Past studies manifest greenwashing in global supply chains differently across regions and sectors. In China, retailers were found to exaggerate the environmental benefits and selectively disclose compliance data in food supply chains. There are misleading environmental claims and the use of non-renewable materials in the fashion and food industries in Italy (Q. Chen & Duan, 2023). Greenwashing scandals are prevalent across supply chains, often involving the hiding of upstream suppliers' practices while exaggerating the environmental benefits of products sold to consumers (de Jong et al., 2020). Thus, consumer concerns about the environment in the recent past have pushed companies to implement sustainable practices, particularly given the growing demand for environmentally friendly products (Bernini et al., 2024). Stakeholders worldwide are showing increased interest in sustainable business practices, leading to greater demands for transparency regarding corporate operations' environmental and social impacts. Additionally, corporate claims of environmental performance have significantly increased. The rise of sustainability as a business concept in developing countries has also led to increased greenwashing practices, which impede genuine sustainable progress.

Many scholars have explored greenwashing through various lenses, particularly in sector-specific studies, such as Nugraha et al. (2024) in the food industry, Yameen et al. (2024) in banking sectors, and Adhikari (2024) in organizational branding. They expose how greenwashing manifests differently across the industries and reveal consumer perception. Recent bibliometric reviews also suggest that there is growing interest in further exploration of conceptual clarity and deeper exploration in both developed and developing nations (Z. Huang et al., 2025). A detailed summary of relevant studies and their gaps is presented in Table 1. Despite many reviews existing, there has been a growing number of studies focusing on the need for transparency in global supply chains and integration of the ESG agenda for supply chain performance (Truant et al., 2024). Investment analysis and decisions increasingly utilize ESG as a tool to evaluate the sustainability and societal impact of a firm's investment (Waas, 2021). Growing stakeholder pressure and European Union (EU) laws have forced many supply chain-leading companies to step up their supply chain-related verification procedures in connection with environmental, social, and governance (ESG) topics (Peter, 2021). Furthermore, NGOs' role in advancing transparency by strengthening awareness and knowledge dissemination (Brun et al., 2020) and technology such as blockchain in the supply chain through its ability to promote traceability and transparency (Walker, 2019) need further exploration in academic areas. Thereby, this systematic literature review aims to enhance the existing knowledge base on greenwashing in global supply chains by emphasizing the current trends and emerging themes for further research. The review therefore serves two objectives. The first objective

is to explore new and emerging topics explored in research papers, while the second is to identify the gaps that still require attention to reduce greenwashing in supply chains. To achieve the objectives, the study formulated the two research questions. (1) What are the new and emerging thematic groups identified in recent literature on greenwashing in global supply chains? (2) What gaps remain unaddressed in preventing greenwashing in supply chains?

Table 1. Summary of previous reviews.

Authors	Methodology	Articles	Database	Main Findings
(Galletta et al., 2024)	SLR (PRISMA)	19	Scopus and Web of Science (WoS)	- identifies the accusation that banks have overemphasized greenwashing in their sustainable practices and commitment of environmental goals.
(Adhikari, 2024)	Bibliometric analysis	576	Web of Science	- provides the damaging effects of greenwashing practices on organizations' brands and images.
(Montgomery et al., 2024)	Topic modeling	38	Web of Science, EBSCO, Scopus	- summarizes changes in greenwashing research into three key phases: (a) 1.0 static communication; (b) 2.0 dynamic management; and (c) 3.0 narratives about the future.
(Santos et al., 2024a)	Bibliometric analysis	310	Web of Science	- identifies the impacts of greenwashing on branding and consumer attitudes and intentions.
(Vangeli et al., 2023)	Systematic literature review	68	Scopus and Web of Science (WoS)	- contributes to a modern understanding of greenwashing through a new framework and interdisciplinary perspective.
(Y. Liu et al., 2023a)	Systematic literature review	121	Scopus and Web of Science (WoS)	- explains the external governance environments and internal governance mechanisms.
(W. Wang et al., 2023)	Bibliometric analysis	594	Web of Science	- interprets the definitions and concepts, influencing factors, consequences, and governance model.
(Inês et al., 2023)	SLR	19	Scopus	- assesses sustainable strategy and preventing greenwashing along the supply chain.
(de Freitas Netto et al., 2020)	SLR (PRISMA)	42	Scopus and Web of Science (WoS)	- provides a classification of greenwashing: firm-level executional, firm-level claim, product-level executional, and product-level claim.
(Gatti et al., 2019)	Systematic literature review	94	ABI/Inform Global database, Google Scholar	- evaluates the role of corporate social responsibility in facilitating the diffusion of greenwashing.

The study used the PRISMA framework to assess 58 peer-reviewed articles and derive the findings and conclusions. The PRISMA statement provides a 27-item checklist considered necessary for the transparent reporting of a systematic review with the help of a three-phase procedural diagram (Sarkis-Onofre et al., 2021). The findings will provide additional insights into the direction of sustainable supply chain management research while also offering suggestions for unexplored areas. This will help inform policymakers' decisions on where to target and which sectors to support. Finally, by addressing the issue of greenwashing, this paper aims to advance the environmental goals of SDGs by monitoring the global adoption of the sustainability concept, particularly in the academic sector. The paper is structured as follows. Section 1 introduces the paper, while Section 2 provides an overview of the persistence of greenwashing and the global impact of supply chains and greenwashing. Section 3 outlines the methodology applied, and Section 4 presents the results. Section 5 discusses the results, and Section 6 concludes with limitations and recommendations for future research.

2. Literature Reviews

2.1. Persistence of Greenwashing

Greenwashing has evolved as a strategic communication tool for corporations to be environmentally responsible (Vollero & Siano, 2024). Greenwashing is growing due to the globalized nature of supply chains and the rising demand for sustainable consumption. Many corporations continue to engage in greenwashing as they use sustainability as a shield against their transparency and accountability, often influenced by stakeholders (Zervoudi et al., 2025). That study also argues that sustainability often outpaces actual expectations. Examples of this are most prevalent in leading fashion, energy, agriculture, and logistics sectors. Recent empirical studies across multiple industries explored structural factors that impact greenwashing in global supply chains, such as selective sustainability disclosures in the fashion industry (Jestratijevic et al., 2024), manipulated green claims in agriculture and e-commerce, and less consumer trust and exposure risk in the manufacturing industry (Dong et al., 2023). Studies also found various strategies used by countries. For example, green procurement policies and environmental credit rating have been effective in China in improving ESG performance. Such actions reduce deceptive practices where green finance infrastructure is well developed (C. Wang, 2024). In the Netherlands, digitalization like blockchain systems enhances accountability in the textile sector (Tolentino-Zondervan & DiVito, 2024). Leadership and eco-awareness in Thai service supply chains (Jermisittiparsert et al., 2019) and strict quality control and microplastic policies in Italian fashion supply chains (Blasi et al., 2024) play pivotal roles in combating greenwashing practices. Evident in the prior study, there is misalignment between corporate environmental claims and actual practices. This is because of a lack of uniformity, regulatory gaps, and inadequate accountability systems, allowing companies to continue with greenwashing practices. The high cost of supervision and low efficiency reduces the participation of government agencies, giving room to certified companies not to continue to implement the standards for which they were certified (Jin et al., 2018). One study also claimed that government greenness subsidies encourage enterprises to engage in greenwashing (Zhang et al., 2024). Also, transactional leadership places a strong emphasis on obedience to authority and encourages them to greenwashing behaviors (Blome et al., 2017).

2.2. The Global Impact of Greenwashing in Supply Chains

Greenwashing within supply chains is a prevalent issue, especially among companies facing intense competition and those heavily focused on brand awareness and profitability. It is particularly common in enterprises owned by large institutional investors that realize

a short-lived increase in sales and profits (Shi et al., 2024). Greenwashing affects businesses and their stakeholders at various points along the supply chain, necessitating careful management to mitigate potential damage. There are two primary types of greenwashing: direct and indirect. Direct greenwashing occurs at the company level and typically results in higher blame attribution, diminished brand trust, and a decrease in investment potential. Indirect greenwashing, on the other hand, involves a supplier falsely claiming to be sustainable, which has a less severe impact on the buyer company (Y. Wang & Jung, 2025). However, when a supplier's unsustainable practices conflict with the company's sustainability claims (known as vicarious greenwashing), the damage to the company's reputation and stakeholder trust can be significant (Gatti et al., 2021). One study explained that corporations often face accusations of greenwashing due to the lack of comprehensive quantitative data on the environmental impact of supply chains. Some of these corporations use corporate social responsibility and sustainability reports as a form of damage control after environmental incidents rather than as a genuine effort toward transparency (Sneideriene & Legenzova, 2025). Those committed to genuine sustainability reporting tend to do so using vague language or limited examples (Peng et al., 2024). For instance, during the COVID-19 pandemic in Bangladesh, one study highlighted the failure of multinational companies to adhere to sustainability standards of ensuring workers' fair treatment and working conditions in the garment industry (Reza & Du Plessis, 2022). Another study also identified industries most vulnerable to greenwashing include automotive, industrial manufacturing, and beauty/cosmetics, which together account for 65.7% of greenwashing cases. Companies in these sectors frequently employ ambiguous terms such as "natural" or "eco-friendly," commonly known as "fluffy language," to deceive consumers, often giving a false sense of environmental responsibility. The combination of this communication strategy, weak regulatory frameworks, and corporate non-compliance results in misleading advertising, consumer distrust, and a decline in corporate accountability (Netsai, 2023). Greenwashing has also affected companies like Starbucks, which has long marketed itself as a leader in fair trade policies. However, the company also faced backlash for attempting to block Ethiopian coffee farmers from trademarking their products to reduce costs. Despite its popularity for good-quality coffee and efforts at corporate social responsibility (CSR), it has been accused of selling only a small portion of Fairtrade International-certified coffee while marketing its coffee as sourced sustainably in its entirety (Sleiman, 2015). Volschenk et al. (2022) explored the global impact of greenwashing in African countries, revealing that 94% of South African products labeled as "green" were examples of greenwashing. The largest share of these misleading claims came from cosmetics and baby products targeting new mothers and women in general, highlighting growing international concerns about the practice (Torelli et al., 2020). Companies frequently develop formal codes of conduct outlining their commitment to sustainability to attract investors and build credibility. This does not necessarily imply that they are purposefully deceiving others, even though it may be interpreted as a calculated attempt to enhance their public image. Instead, they are making an intentional attempt to gain trust from consumers, including investors and customers, in their way of thinking (Miller et al., 2020).

2.3. Combating Greenwashing in Global Supply Chains

Several strategies are required to achieve true sustainability within supply chains and reduce greenwashing. Emerging digital transformations like artificial intelligence (AI), social media (SIoT), and blockchain technology (BCT) have increased supply chain transparency and performance, which can be useful to prevent greenwashing (Khan et al., 2020; Nygaard & Silkoset, 2023). When consumers become aware of greenwashing, they are willing to pay a premium for a product. "Greenwash penalties" are a move aimed

at rejecting greenwash products (Volschenk et al., 2022). A global code of conduct in international supply chains supported by independent audits and reporting could lead to internationally recognized certifications. This would ensure compliance among participants in global supply chains and help eliminate unethical practices (Michael & Helms, 2018). Tackling the growing complexity of such large-scale environmental challenges requires the combined efforts of researchers from various disciplines. This collaborative approach supports knowledge creation, acquisition, and development, which are essential for addressing environmental issues and improving supply chain transparency (Wibeck et al., 2022). Collaboration with suppliers on environmental issues plays a crucial role in reducing information distortion across the green supply chain. This collaboration increases investment in pollution prevention technologies (Feng et al., 2020). Companies that adopt sustainable practices in supply chains aim to ensure social and economic equity, reduce waste, utilize resources wisely, and eliminate the environmentally damaging impacts from suppliers, productions, goods, or customers (Mukherjee et al., 2016). An illustrative example comes from Nestlé's experience in 2010, when Greenpeace accused the company of sourcing palm oil from unsustainable suppliers. The damage to Nestlé's reputation was severe, but the company leveraged the crisis to implement a long-term, sustainable supply chain management system (Pizzetti et al., 2021). Reverse logistics, a key strategy in sustainable supply chains, involves recapturing value from returned items or ensuring proper disposal to reduce environmental impacts. This practice can enhance customer satisfaction, foster loyalty, and increase environmental awareness while reducing costs and ensuring compliance with legal requirements (González-Viralta et al., 2023). As environmental responsibility can be a source of competitive advantage, integrating authentic environmental practices across the supply chain allows firms to capitalize on growing consumer demand for corporate accountability (Rivera et al., 2023). Government support, particularly through grants to NGOs, can also play a pivotal role in combating greenwashing by compelling retailers to disclose their suppliers' environmental practices.

NGOs can conduct thorough audits and investigations, holding retailers accountable for their environmental claims. However, a balanced approach to ensure the audits are effective without overwhelming retailers improves supply chain transparency. Governments and interested parties should collaborate in the collection and sharing of information on environmentally friendly business practices and the effects of producing goods and services (Markham et al., 2014).

3. Materials and Methods

3.1. Systematic Review and PRISMA Framework

A systematic review accumulates all pertinent evidence to address the research questions. Developing appropriate research questions is a crucial step in conducting a systematic review (Xiao & Watson, 2019). The current study aimed to address the questions "What are the new and emerging thematic groups identified in recent literature on greenwashing in global supply chains?" and "What gaps remain unaddressed in preventing greenwashing in supply chains?" These questions facilitated the extraction of keywords and the collection of data during the review process. A systematic review is a structured and transparent process that provides a comprehensive and unbiased summary of existing research, ensuring the identification, assessment, and synthesis of all relevant studies to address specific research questions, minimizing bias and enhancing the reliability of the findings (Shaheen et al., 2023). In contrast, a traditional review is more flexible, subjective, narrative, and lacking standardized protocols, which can lead to less transparency and comprehensiveness and often reflect the reviewer's personal perspective (Mohamed Shaffril et al., 2021).

3.2. PRISMA Framework and Quality Assessment

To conduct the study systematically, we follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The study integrated and modified the PRISMA framework for its widespread usage and systematic, user-friendly approach (Miah et al., 2024). The PRISMA model is predominantly used in health-care research to provide clinical practice guidelines and inform clinical decision-making under a specific methodological approach and protocol (Cooper et al., 2018; Moher et al., 2015). The model is also widely used in other disciplines like supply chain management (Badhwar et al., 2024) and social science literature (Silva, 2024). It offers a standardized method for reporting the identification, screening, and inclusion of studies (Boaye Belle & Zhao, 2023). This framework also ensures the methodological soundness and reproducibility of the review process, along with the overall quality and transparency of the review. In accordance with PRISMA guidelines, checklists are provided in the Supplementary Materials (see Table S1). The established guidelines that support the inclusion of multiple reviewers in selecting and extracting data were also followed to reduce the likelihood of bias in the review process (Uttley et al., 2023). Conversely, Cochrane recommendations suggest employing multiple reviewers reduces the risk of biases (Sterne et al., 2019). Two independent authors were assigned to screen titles, abstracts, and available full texts, adhering to the predefined inclusion and exclusion criteria. Both authors performed this screening to prevent individual bias and to ensure the inclusion of relevant studies. In the case of any disagreement, the authors followed established protocols and discussed the differences to reach a consensus (Shaheen et al., 2023). Two more reviewers also examined the extracted articles, their interpretation, presentation of results, discussion, and conclusion. Moreover, this approach to unanimity building is a recognized technique in systematic reviews that enhances the reliability of decisions (Yusop et al., 2022).

3.3. Keyword Selection and Data Analysis

The framework used for literature collection began with the identification phase, which involved a comprehensive search of peer-reviewed articles available on the Scopus database (Figure 1). Scopus is used more extensively than Web of Science due to its wider journal coverage and less selectivity. This comprehensive coverage makes Scopus appealing to academics performing systematic scholarly article reviews (Singh et al., 2021). Scopus also covers most Web of Science journals, making it a more inclusive database for scholars. Additionally, to obtain the highest-quality data, a separate Content Selection and Advisory Board meticulously chose books, journal articles, and conference proceedings from Scopus (Baas et al., 2020). In the identification phase, the search terms (“greenwashing”) AND (“supply chain*” OR “logistics” OR “Procurement” OR “warehous*” OR “inventor*” OR “transport*” OR “distribution”) were used to identify titles, abstracts, and keywords to cover the broad scope of study. The search strategy aimed to identify and retrieve a minimal, yet highly relevant number of publications. Initially, the database yielded 125 articles covering every possible combination of keywords in abstracts, titles, or keywords. The initial screening criteria included articles only in business, economics, and environmental science discipline to deeply focus on greenwashing in global supply chains. These subject areas provide the most relevant theoretical and empirical insights on greenwashing practices. Articles from unrelated disciplines or with marginal relevance to greenwashing were excluded to ensure the thematic patterns. Only articles written in English were selected, as it is the dominant language in academic publishing, which enhances global reach and engagement with academic practitioners. The search was also restricted to articles published between 2010 and 2024. In this stage, 59 documents were excluded after further screening and 66 papers proceeded to assessment of eligibility for final selection. Exclusion criteria were

applied to include only peer-reviewed articles to ensure the quality of publications. Such publications undergo a rigorous peer-review process and are characterized by scientific methodologies and empirical studies, often offering high-quality and reliable research findings. Thus, the study excluded conferences proceedings, books, and book chapters. These exclusions helped to refine the dataset to focus on greenwashing in global supply chains and uphold quality standards (Baas et al., 2020). Table 2 details the inclusion and exclusion criteria. The authors downloaded and exported all 66 relevant papers, including their abstracts, keywords, and other citation data, to an Excel spreadsheet, enabling each author to independently review and select studies for further analysis. The next stage involved reviewing these papers for quality and relevance. Additionally, 8 articles were excluded for the following three reasons: (1) missing abstracts or author information, (2) lack of relevance to the concept of greenwashing in supply chains, and (3) absence of the required keywords in the title or abstract. Finally, the authors manually examined all the relevant papers based on the research questions stated in the Introduction and included 58 papers after this rigorous selection process. To summarize and analyze the papers, Microsoft Excel 2019 was utilized to categorize each theme based on the main findings from the papers. In Appendix A, each identified theme, the main findings, and sources are presented. The authors labeled the emerging themes manually after preparing the summary table in Excel.

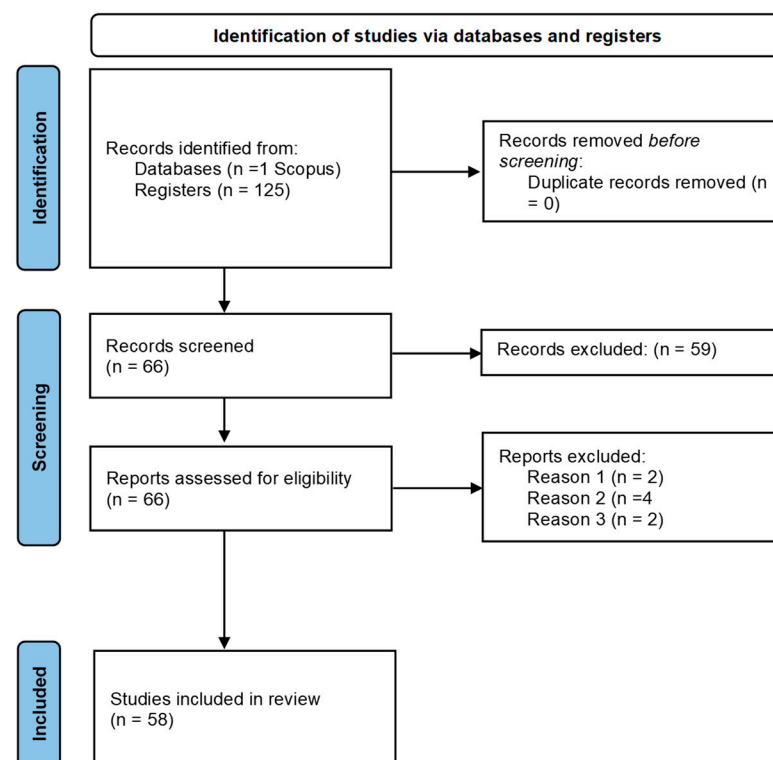


Figure 1. PRISMA flow diagram for systematic literature reviews. Adapted from Page et al., 2021.

Table 2. Inclusion and exclusion criteria.

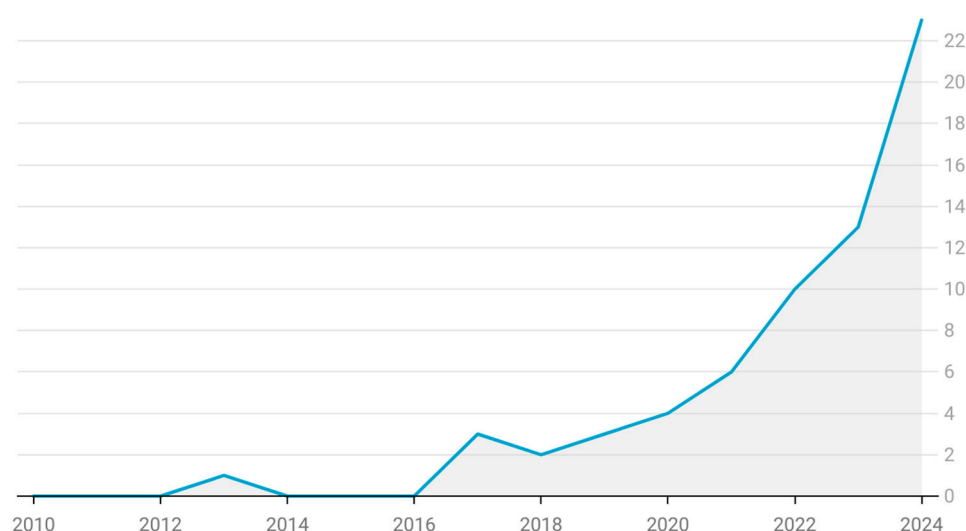
Keywords	("greenwashing") AND ("supply chain*" OR "logistics" OR "procurement" OR "ware-hous*" OR "inventor*" OR "transport*" OR "distribution")	
Database	Scopus	
Criteria	Inclusion	Exclusion
Years	2010–2024	Full calendar years excluding 2025
Document Types	Peer-reviewed journal articles	-Conference papers, review papers, book chapters, and notes -Documents with incomplete information or not relevant to greenwashing
Subject areas	Business management, accounting, economics, econometrics, finance and environmental sciences	Other unrelated disciplines (engineering, computer science etc.)
Language	English	Non-English (Spanish)
Final record	58	59

4. Results

To begin with, the data from reviewed papers were analyzed descriptively to show trends in year of publication and regional distribution in terms of countries implicated in greenwashing.

4.1. Descriptive Analysis

Figure 2 shows that between 2010 and 2015, the number of published articles was relatively low, with some years showing almost no publications at all. This marks the beginning of a steady, albeit slow increase in publications on greenwashing. However, a sharp increase in published articles began in 2019, a trend that continued into 2024. This instant surge is an indication of an increase in environmental awareness and scrutiny after COVID-19, as well as increasing demands for accountability from consumers (Tseng et al., 2019).

**Figure 2.** Annual distribution of articles (source: authors).

4.2. Country Contribution

Figure 3 demonstrates the regional scientific publications related to greenwashing in supply chains. Europe had the highest number of publications, 44% of the total, followed by

Central and South Asia at 30%, North America at 23%, and sub-Saharan Africa at 1%. The USA had the highest contribution (10 documents) in scientific research in greenwashing, followed by China (9 documents). The disparity in scientific research comparing developed and developing nations is evident in our findings. The research focus in the USA and China slightly differs in terms of scope. In USA, authors focus more on corporate sustainability under consumer protection law, while in China, the issue is often contextualized in terms of mass industrialization and global supply chains. In Europe, research has been carried on stringent regulatory frameworks such as the European Union's Corporate Sustainability Reporting Directive (CSRD). The results also indicated developing nations in Africa and South Asia lacked scientific contributions due to economic and political constraints.

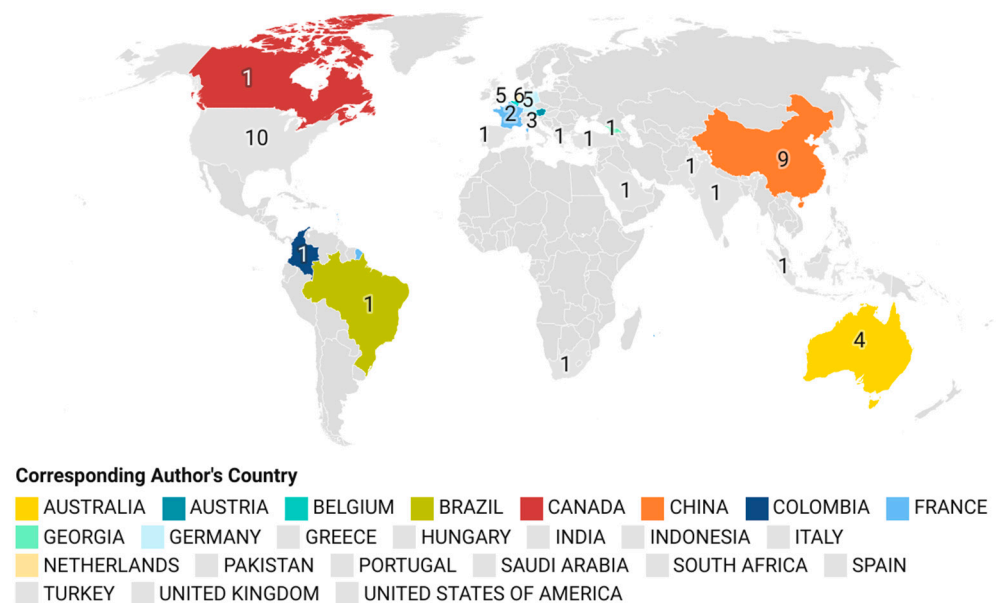


Figure 3. Regional scientific contributions (source: authors).

4.3. Emerging Themes and Gaps

The study presents a thorough evaluation of the literature to extract the emerging themes, unexplored research areas, and main findings. Five emerging themes—(1) standardization of regulatory policies, (2) technological innovations for transparency, (3) environmental, social, and governance (ESG) criteria, (4) role of NGOs, and (5) industry-specific cases—were identified by critically analyzing 58 peer-reviewed articles (see Appendix A). The authors employed manual thematic analysis by closely reading the abstract of all studies, which were then cross-checked by all authors to ensure quality and relevance. We identified recurring patterns, concepts, and focus areas by assessing each paper's main contributions and their suggested gaps. This approach is effective, as the abstract concisely summarizes the key findings, including methodology and future research directions. The authors classified the common ideas into broader thematic zones. As can be seen in Appendix A, the first theme had 18 papers, the second 5 papers, the third 16 papers, the fourth 3, and the fifth 16. The process of identifying themes in global supply chains was based mostly on recent data and followed the guidelines of Snyder (2019). We processed these guidelines in Microsoft Excel to group the themes, which were later validated by considering each author's feedback and suggestions.

As illustrated in Appendix A, in following standardized policies of corporate social responsibility and business ethics, some regions uphold strict standards, while others may have relaxed or poorly enforced policies, which in turn creates inconsistencies in how businesses operate and their impact on society and the environment. This finding points

to a lack of uniform policy adoption (Johnsson et al., 2020). Additionally, in the second theme, blockchain has been touted for improving transparency, but there is little focus on alternative technologies or its environmental footprint. ESG criteria are widely discussed, but the social and governance aspects remain underexplored, indicating a significant gap in this domain. On the other hand, NGOs play a significant role in sustainability, though their endorsement of weaker labeling standards can inadvertently contribute to greenwashing. This theme suggests the need for meticulous regulatory policy, addressed in the first theme, and should be integrated with ESG standards (Q. Chen & Duan, 2023). Industry-specific cases also address the need for transparent reporting, accountability, and governance reforms to step up greenwashing in different industries. Based on these findings, this study addresses the first research question to extract potential greenwashing themes that require further academic studies. The results of this section highlight the challenges and opportunities for more comprehensive approaches to sustainability.

5. Discussion and Implications

Each theme identified is thoroughly discussed in this section, followed by answering research question two. Based on the findings and gaps identified in the literature, we present a conceptual framework (see Figure 4) that synthesizes the key drivers and enablers of greenwashing behavior in global supply chains. This framework was designed through thematic analysis and guided by well-established theories, including stakeholder theory, political corporate social responsibility (CSR), and the triple bottom line (TBL) concept. The framework serves as an analytical tool to assess how different factors interact to facilitate or mitigate greenwashing behavior. It can be a useful framework for practitioners such as industry experts, academicians, researchers, and policymakers to understand greenwashing-enabling factors and drivers. It provides valuable insights into how corporate strategies, technological innovations, and regulatory policies interact and differ from country to country. The framework advances existing greenwashing literature by critically engaging with previous models, such as the integrated framework for greenwashing (Nemes et al., 2022) and comprehensive framework from macro- and microlevel perspectives (Z. Huang et al., 2025). Another study developed a conceptual framework based on a normative or subjective basis, often comprising firm-level and product-level factors (Dorfleitner & Utz, 2024). Unlike existing models, this framework recognizes the evolving nature of greenwashing, influenced by technological innovations, regulatory policies, governance structures, and sociopolitical contexts. Through this framework, the study suggests integration of technological solutions like blockchain and IoT as both enablers and mitigators of greenwashing, acknowledging that these tools can be misused in low-governance contexts where the regulatory framework is weak, especially in developing countries. The inclusion of industry-specific cases provides various stakeholders, NGOs, and consumers a solid understanding that different sectors face unique challenges while combating greenwashing regionally and locally. Thus, this section is designed according to the themes and drivers given in the framework to discuss the proposed research questions.

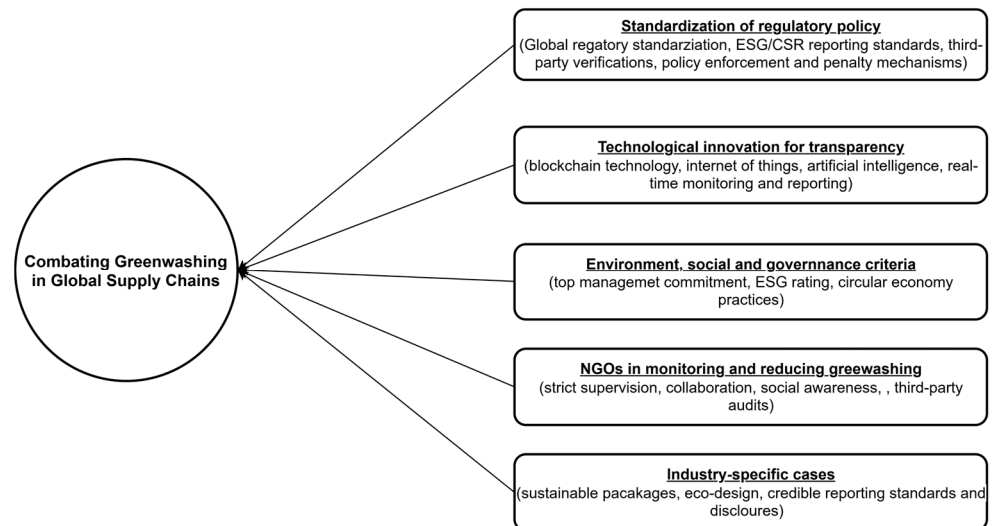


Figure 4. Conceptual framework for combating greenwashing in supply chains (source: authors).

RQ1: *What are the new and emerging thematic groups identified in recent literature on greenwashing in global supply chains?*

(1) Standardization of Regulatory Policies

Companies around the globe operate under different regulations and rules of the land. Evident in past studies is that there is an absence of universally adopted sustainability frameworks such as ESG or CSR reporting standards (Dong et al., 2023), fragmented legal systems (Lewis, 2016), and regional cultural differences, which creates inconsistency in environmental compliance, reporting, and enforcement (Z. Huang et al., 2025). Standardization of regulatory policy should be founded on transparency and the accountability of enterprises. Thus, there should be established guidelines that bring uniformity to different spheres of company operations. Implementing more stringent sustainability standards on global supply chains across countries regardless of their economic status should be a priority (Smith et al., 2024). Failure to meet these standards may result in customer rejection or missed regulatory opportunities. Policies in certain regions, such as the European Union’s stringent climate regulations, pose compliance challenges for non-resident enterprises, especially those connected to the Belt and Road Initiative (Peter, 2023). A universal sustainability standard can also offer producers a “safe harbor” from regulatory enforcement by tailoring approaches to reduce environmental and worker safety impacts. In the future, a global approach is necessary to ensure a sustainable supply chain network and prevent greenwashing (Molin et al., 2023). Europe’s stringent regulatory frameworks, e.g., the EU Corporate Sustainability Reporting Directive (CSRD), push companies to adopt more transparent sustainability reporting practices. Results also show (see Figure 3) much scientific research from EU countries, especially Germany and the Netherlands. Moreover, researchers in this region have a long history of engaging with sustainability frameworks such as the Global Reporting Initiative (GRI) and ISO standards, which could explain their dominance in this field. This regulatory pressure fosters a strong academic environment for studies on greenwashing. Currently, there is no universal ESG reporting standard, which could encourage the greenwashing trend. In the agri-food sector, for instance, bridging the gap between perceived and actual sustainability requires a more standardized ESG reporting system and SMEs being encouraged to adopt these standards (Toscano et al., 2022). Challenges such as the absence of uniform systems, information overload, greenwashing, and lack of transparent disclosure impede the efficiency and reliability of sustainability

communication and the goals of businesses and consumers in the food chain (Cao et al., 2023). Several low-carbon initiatives have been put into place to solve environmental sustainability issues, but some critics believe they are largely being used for image-building and greenwashing rather than to advance urban sustainability and meet SDG targets (Abubakar & Alshammari, 2023). However, the findings of this theme can be a pathway for developing countries to adopt research strategies that explore unexplored areas, regions, and situational variables to enhance academic and scientific representation. From a global supply chain perspective, there is a need for transnational regulatory alignment to reduce greenwashing risks, enhance trust in sustainability claims, and level the playing field for both multinational corporations and SMEs.

(2) Technological Innovations for Transparency

The demand for consumers to know the origin of products, particularly expensive goods like food, medicine, and artifacts, has increased supply chain transparency over time. These consumers expect businesses to substantiate their claims. Therefore, technological innovations can play a significant role in implementing green practices in supply chain operations (Burki, 2018). Blockchain has emerged as an important tool for ensuring transparency throughout a product's life cycle in the supply chain, particularly in the circular economy context. It offers transparency, traceability, verification, and immutability, addressing limitations such as the lack of standardized frameworks, information overload, and unreliable sustainability reporting (M. M. Hasan et al., 2023). It also protects consumers against greenwashing along supply chains by providing reliable, transparent, and tamper-proof data (Nygaard, 2024). However, this optimistic narrative requires critical assessment from a theoretical perspective. Existing theory, such as social-technical perspectives, argues that technological solutions do not operate in a vacuum. Institutional, economic, and political context often shape technological functionality and efficacy. As evident in China, digital technology can serve as a strategic tool to mitigate ESG greenwashing, but is often challenged by internal control and financial constraints. One study suggested regulated, transparent, dynamic, and resilient capital market flows to support technological changes to tackle these challenges (Z. Li et al., 2024). However, the deployment of such technologies can lead to unintended consequences, such as institutional weakness limiting the enforceability of rules and norms in low-governance contexts. One study claimed that the absence of external governance in certain South Asian markets allows companies to make vague or misleading eco-labeling claims without third-party audits. This indicates that regions lack the regulatory infrastructure to support the transparency process (Novrizal, 2024). Overcoming issues related to standardization, regulatory clarity, data privacy, integration with existing systems, cost, and trust is essential for realizing the full potential of blockchain in promoting genuine sustainability practices (Silkose & Nygaard, 2025). Therefore, both human and non-human actors can contribute to the outcomes of technological benefits. Otherwise, digital tools may become symbolic or performative, used to signal compliance rather than genuine action. The essence of this theme also aligns with previous research urging growing interest in AI-driven sustainability tools in increasing transparency in supply chains (Moodaley & Telukdarie, 2023). Still, there is a lack of sufficient information on blockchain's scientific and administrative implementation in the current literature (Francisco & Swanson, 2018). Currently, the lack of comprehensive understanding limits the adoption of blockchain in research and management. End-user campaigns should be conducted to promote awareness of the benefits of using technology. The development of user-friendly applications or websites allows consumers to scan QR codes on products, hence linking them to blockchain records of detailed product information. Because blockchain is pseudonymous rather than anonymous, using it could pose consumer privacy concerns (Pun et al., 2021). Therefore, technological transparency should be conceptualized

not merely as a technical problem, but as a sociopolitical challenge requiring integrated governance frameworks, stakeholder accountability, and contextual sensitivity. To address these concerns, innovative solutions such as zero-knowledge proofs (ZKPs) and secure multiparty computation (SMPC) have the capacity to enhance privacy in transactions—a necessity for industries (Gilbert, 2024). It is therefore necessary to integrate alternative methods such as the Internet of Things (IOT) for reliable, transparent, and secure data from across the supply chain (Asif & Gill, 2022). There should be a balance that promotes transparency of companies while at the same time reducing restrictions that come with technological advancements (Egorova et al., 2024). With proper harnessing of technology in supply chains, cases of greenwashing will reduce, as evidenced from various studies covered in this review.

(3) Environmental, Social, and Governance (ESG) Criteria

Globally, many businesses are adopting ESG standards, because these have proven helpful in measuring their performance (Ahmad et al., 2024). Such actions follow the growing demands for transparency and accountability from investors and consumers, which inform their purchasing and investment decisions (Subramoniam et al., 2022). When applying ESG criteria, it is important to prioritize the social aspect of the supply chain as it expedites the achievement of ESG objectives (Baid & Jayaraman, 2022). Consumer awareness is a more powerful factor in curbing greenwashing and compelling businesses to adopt sustainable practices throughout their supply chains than depending only on regulatory interventions. It is essential, therefore, that every company, regardless of industry, complies with ESG criteria to ensure global sustainability (Matakanye et al., 2021). Due to the critical role of ESG in supply chain management, managers should prioritize operational and environmental performance over short-term financial benefits to reduce carbon emissions and promote social development (Zeng et al., 2022). Through circularity education and training, negative perceptions can be changed, allowing managers to engage with other stakeholders in developing plans and partnerships for circular economy systems (Yamoah et al., 2022). In every company, the top management is solely responsible for ensuring that sustainability efforts bear fruit through their positive attitude towards ESG criteria. This incentivizes employers who champion sustainability. There should be more creation of sustainability awareness for managers. While businesses have excelled in addressing social and human rights issues (the “S” in ESG), environmental concerns (the “E” in ESG) are still in their infancy. Despite passing several robustness tests, there may still be a missing link between climate change views and ESG ratings, which at times are reflected in executives locating their headquarters in regions where the concept of climate change is not commonly recognized (Q. Huang & Lin, 2022). Decarbonization efforts to reduce greenhouse gas (GHG) emissions and aiming to achieve carbon-neutral (net-zero) production are a crucial part of the ESG standards used in the fight against climate change (Leschhorn, 2022).

(4) Role of Nongovernmental Organizations (NGOs) in Monitoring and Reducing Greenwashing Incidences

NGOs are significant external stakeholders when it comes to intermediaries between corporations and local communities. They can bridge institutional gaps and advocate for stronger regulations, raising public awareness and promoting environmental practices at the root level (Dempere et al., 2024). The notion of NGOs’ role has been discussed in different theories. For example, in stakeholder theory, their role in influencing organizational legacy and public trust is emphasized. NGO involvement in pressuring companies to adopt and communicate sustainability efforts is crucial: one study argued for greater transparency and corporate accountability, which is often accomplished through public campaigns and raising public attention (Crapa et al., 2025). In the realms of Habermasian

dialogue and political corporate social responsibility, NGOs are viewed not merely as critics but also as co-creators of ethical discourse. The argument is that NGOs need to dominate narratives and push for greater accountability, especially when voluntary frameworks such as GRI and ISO are used ambiguously. These theoretical insights highlight that governance with businesses can contribute to global regulation and provide public goods (Frynas & Stephens, 2015). A study by Gatti et al. (2019) criticized voluntary CSR standards lacking binding commitment and strict supervision from external board members and corporate stakeholders. On the other hand, Schäfer et al. (2024) found that NGOs' influence can shift corporate norms with regard to sustainable procurement and traceability and promote supply chain transparency by sharing knowledge and raising awareness. Empirical evidence supports this potential effectiveness of NGOs in many ways. NGOs' auditing effectiveness always motivates buyers to insist on disclosure by suppliers and contributes to the sustainability of the supply chain (S. Chen et al., 2019). These external observers often criticize companies for prioritizing green communication over concrete environmental actions. Many NGOs do not fully trust CSR or sustainability reports due to the lack of third-party verification (Wichianrak et al., 2023). Private regulators, including certification agencies and NGOs, require additional support to effectively enforce sustainability regulations, with one potential avenue being through transnational coalitions. As a result, the need for NGOs to collaborate with other organizations, multinational companies, and governments to achieve milestones in the development and adoption of responsibility codes and standards is also significant. Unfortunately, when NGOs fail to maintain their commitment to multi-stakeholder initiatives, they risk contributing to greenwashing by endorsing labeling programs that fall short of existing public regulations (Partzsch et al., 2019). In the current regulatory environment, a multi-stakeholder approach involving managers, lawmakers, and NGOs could effectively reduce greenwashing by making firms' environmental performance clearer, making it easier for people to learn about greenwashing and aligning structures, processes, and incentives within firms. NGOs must therefore act as whistleblowers by properly scrutinizing and forcing the exposure of bad actors in the supply chain (Nygaard, 2023).

(5) Industry-Specific Cases

This theme indicates that greenwashing is not a uniform phenomenon. The practices of greenwashing across the globe vary significantly among industries and are often influenced by sector-specific supply chain structures, regulatory frameworks, and stakeholder expectations (Forliano et al., 2025). As such, understanding industry-specific cases in global contexts is crucial for designing effective countermeasures in supply chains. One study explored various industries that use greenwashing in their operations and found that firms in highly polluting industries with high transaction costs and weak industry rivalry are likely to engage in supply chain network centrality and corporate greenwashing activities (Gürçam, 2022). Despite its significance, the global airline industry's efforts to achieve net zero greenhouse gas emissions are still affected by corporate greenwashing (Amankwah-Amoah et al., 2023) and a lack of clear elimination strategies (Hemmings et al., 2023). When external pressures are coupled with an internal rise in risk tolerance, a greenhouse gas (GHG)-intensive company is more likely to take climate change initiatives beyond legal requirements. However, it is crucial to monitor how companies' declared commitments to the transition align with their actions to prevent accusations of greenwashing (Abubakar & Alshammari, 2023). To speed up the transition to cleaner and more sustainable energy sources, investments in fossil fuels should be significantly reduced. Manufacturers of building materials have been accused of engaging in greenwashing behaviors through their media disclosures, leading to consumer skepticism (X. Li & Ding, 2024). In the construction industry, for instance, which is notorious for environmental pollution, contractors,

through their interaction with project managers and external supervisors, tend to adopt greenwashing behaviors to gain ecological credibility (He et al., 2020). While CSR has been viewed as a tool for differentiating businesses in a competitive environment, some dishonest businesses may take advantage of this to make green claims (Zervoudi et al., 2025). Trust and information sharing, therefore, play a key role in bridging the gap between sustainability and greenwashing. Fashion brands selectively disclose information on their sustainability efforts. This is due to a lack of strict reporting systems, allowing them to engage in window dressing and greenwashing. The same applies to grocery retailing companies who still face challenges in reporting the true picture for fear of compromising the credibility of the company (Saber & Weber, 2019). Firms that deal with the resale of preowned apparel have been accused of greenwashing in their resale business models for failures to specify environmental benefits (Vedantam et al., 2021). Certain certification programs of agricultural commodities may not reflect significant changes, and this could lead to greenwashing (DeFries et al., 2017). The coffee sector, for instance, is affected by a number of sustainability issues that can only be addressed through the implementation of standardized indicators consistent with the Sustainable Development Goals (Bager & Lambin, 2020). Online retailers have also been noted to lack credibility in their sustainability labeling (Gossen et al., 2022). Most industries communicate only what they feel comfortable sharing, leaving behind other crucial information. This sometimes puts consumers in a situation of using goods and services from companies that they do not necessarily trust. Such efforts of consumer awareness could in turn push enterprises to genuinely go green.

RQ2: *What gaps remain unaddressed in preventing greenwashing in supply chains?*

Despite the rise in research on greenwashing in supply chains, several unresolved issues still hinder the effective prevention of deceptive practices. Our second question sought to point out the existing gaps in the research on greenwashing in supply chains using the contents of Figure 3 and Table 1 as points of reference. Figure 3 indicates a significant deficiency in greenwashing research from developing countries, with only 1% of the total publications addressing this topic. It is alarming that the reviewers established no single research paper related to greenwashing in supply chains of African countries. While authors such as Pizzetti et al. (2021) from Italy and Dobos and Éltető (2023) from Hungary reflect Europe's strong involvement in sustainability discussions, regions like Asia and Africa still lag with fewer contributions, and this can be attributed to economic and political constraints that limit researchers' contributions to the global body of greenwashing literature (Matakanye et al., 2021). Most researchers from developing countries cannot afford to pay the publication fees charged by high-ranking journals. They instead are forced to either forgo this or publish in journals that are not recognized, hence missing out on their chance to inform the world of what is happening in their countries in terms of greenwashing in supply chains. From a few documented studies, such as the South African case, where it was established that 94% of green-advertised products were greenwashing, the most prevalent being cosmetics and baby products targeting new mothers and women in general (Pindela, 2014), it is clear that there is a lot more to be unraveled in Africa as far as greenwashing in supply chains is concerned. Green consumption has received little attention in sub-Saharan Africa despite its significance, with an emphasis only on emerging economies (South Africa and Nigeria) and the higher socioeconomic groups (Traoré et al., 2023). Most of the greenwashing publications have solely focused in South Africa, leaving behind the rest of the countries in the continent, and this therefore calls for more efforts to be put into research to determine the state of the phenomenon in Africa so that the necessary precautions can be put in place to reduce its occurrence. Many are the negative impacts that some products have had on the health of the people in developing countries,

including in Africa. Recent marketing strategies in Asia and Africa have associated dairy consumption with healthy bones, but new studies have demonstrated that its impacts on human health are not very positive (Zaida, 2021).

Only a few countries globally have researched greenwashing in supply chains, including China (Miller et al., 2020), the United States of America (Schmidt et al., 2022), Germany, and the Netherlands (Boermans et al., 2024). This indicates a dire need to research this matter globally, as sustainability is a global concern due to the Sustainable Development Goals (SDGs) and the adverse effects of climate change. Despite suggestions from previous studies and industry-specific cases, it is still evident that only a few recent studies have met this requirement, with only a few industry-specific greenwashing cases, such as coffee (Bager & Lambin, 2020), fashion and textiles (Mitra & Maulik, 2023), and energy (Jokumsen et al., 2023), as well as established organizations, leaving behind new enterprises (Neumann, 2021). Instead, some have repeated similar studies following a certain common course, leaving behind many unexplored sectors, hence limiting sustainability efforts through research.

Another observation is that greenwashing is rampant everywhere and is almost inevitable, despite the harsh penalties imposed. To solve this and ensure the continuity of enterprises, this paper suggests that greenwashing companies can be harnessed to become greening champions, a move that can be seen as turning a lemon into lemonade. Most NGOs responsible for overseeing sustainability regulations are based in developed countries, raising concerns about the lack of involvement from NGOs in developing nations (Partzsch et al., 2019). Companies are adopting several strategies, including monitoring coalitions with NGOs to monitor labor and environmental standards in their global supply chains (Bremer & Udovich, 2001). Still, the limited participation of local NGOs impedes this. To address this issue, governments in developing countries should provide financial and policy support to establish and grow local NGOs that can actively address greenwashing and promote sustainability. Additionally, there is a huge dearth in articles related to the role of NGOs in combating greenwashing, which is a dent in the promotion of whistleblowing mechanisms.

6. Conclusions

This systematic review concludes that the implementation of sustainability regulations across supply chains varies due to technological and socioeconomic contexts, governance practices, local cultures, and laws. Therefore, we suggest the pursuit of uniformity across international supply chains to ensure effective compliance and reduce greenwashing practices. This paper contributes to the field by specifically highlighting contemporary themes, such as industry-specific cases and technological roles (blockchain), in a deeper understanding of greenwashing practices while interacting with the existing themes (ESG reports, standardized regulatory frameworks, and NGO involvement). The integration of technology such as blockchain and artificial intelligence (AI), as indicated in the various reviewed papers, has significantly improved traceability and transparency within supply chains, boosting trust among all the stakeholders involved in the network, and promotes sustainable industrial operations. However, this study demonstrates that greenwashing requires technological solutions as tools for enhancing sustainability transparency, but high costs and infrastructures pose challenges of integration in practice. Therefore, much-needed support is required for enterprises through incentives for effective transparency throughout their supply chains. More focus should also be on the use of alternative AI technologies and their integration into existing systems. As far as country- and industry-specific studies are concerned, there is still a huge gap in enforcing regulations, ESG reporting, and NGO involvement in developing regions in Africa and South Asia. Our findings emphasize the

need for a strong regulatory framework, as the study revealed a significant gap in research and poor governance structure in those regions to curb deceptive greenwashing practices and hold companies accountable for environmental initiatives. Such enforcement of regulations can enhance their ESG disclosures and reporting standards, ensuring greater accuracy and reliability of their environmental claims. Moreover, the proposed framework offers valuable insights for the development of theoretical understanding of various practitioners to understand the enablers and drivers of greenwashing in global supply chains. The framework can also be used for further empirical and theoretical investigations into how greenwashing mechanisms evolve across diverse industries and regions in academic discussions. These findings serve as a benchmark for future research and signify sustainability efforts from various stakeholders. In summary, the growing number of publications in the field of greenwashing in supply chains demonstrates the success of the global sustainability movement, as organizations, policymakers, and researchers continue to advocate for transparency and sustainability in their operations.

7. Limitations and Future Research

One limitation of this study is the exclusive use of articles from the Scopus database, which may have resulted in the omission of relevant papers available in other databases. Additionally, the selection of keywords and search criteria may have biased the inclusion of certain studies while overlooking others that used different terminology. Future studies could further integrate other popular databases, such as Web of Science and Google Scholar, or regional depositories. The current study also considered only peer-reviewed articles published in the English language, overlooking book chapters, conference papers, and other languages, which could provide more insights. Moreover, the need for modern assessment tools in reviewing papers and thematic coding using software like NVivo can help improve reproducibility. Despite these limitations, this paper provides a significant contribution that, when implemented, can help combat greenwashing in supply chains and promote sustainability. Moreover, industry-specific studies remain scarce, with the majority concentrating on the fashion, energy, and agri-food supply chains. Additional research is required in all other sectors that lack extensive coverage. There is also a significant research gap regarding greenwashing practices in developing countries, especially Africa. Many researchers are not able to publish in high-ranking journals due to the high cost charged by the journals. This has greatly limited access to information regarding greenwashing in the same countries, even though the practice is rampant. This paper therefore suggests that lasting solutions to this discrepancy be found so that developing countries are not left behind in the SDG journey. This can be through the creation of more databases that could be regionally based, as well as increasing funding and grants for researchers in these regions. Researchers from developing countries, especially those in the diaspora, should be encouraged to occasionally focus their research on their home countries as a means of highlighting and exposing critical issues such as the impact of greenwashing on the global community. Additionally, more research should be conducted on ways in which recent technological innovations such as artificial intelligence (AI) can be harnessed to promote sustainable supply chain management. Another area that requires further exploration is the development of a comprehensive model that integrates local and global regulatory initiatives to improve supply chain transparency. With the transition to ESG standards in global operations, a huge number of publications focus on consumer perception and regulatory frameworks, while only a few address how greenwashing within supply chains impacts climate change. This therefore highlights the need for critical research into how it undermines genuine climate action, particularly in high-impact industries. Future studies

can explore the role of different stakeholders, such as governments and management, in reducing greenwashing in supply chains.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/admsci15050173/s1>. Table S1. PRISMA Checklists.

Author Contributions: Conceptualization, V.C. and M.T.M.; methodology, M.T.M.; software, M.T.M.; validation, I.R. and S.C.; formal analysis, V.C.; investigation, V.C.; resources, V.C.; data curation, M.T.M.; writing—original draft preparation, V.C. and M.T.M.; writing—review and editing, V.C.; visualization, M.T.M.; supervision, S.C. and I.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The corresponding author will provide the datasets used in this research upon valid request.

Acknowledgments: We thank the Hungarian University of Agriculture and Life Sciences and the Doctoral School of Economic and Regional Sciences for their support of this research. We also thank the editor and the anonymous reviewers for their insightful and constructive comments.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Theme Extraction and Summary of 58 Papers

Emerging Themes	Main Findings	Gaps	References
Standardization of Regulatory Policies	<ul style="list-style-type: none"> Enforcement of standards, CSR codes, and business ethics varies across regions based on local norms and regulations. 	<ul style="list-style-type: none"> Lack of uniform adoption of standards leads to inconsistencies in compliance and implementation. Missing of global oversight framework that oversees the work private regulators. 	<p>(Abubakar & Alshammari, 2023; Bryant et al., 2020; DeFries et al., 2017; Van Der Ploeg & Vanclay, 2013; Cesareo & Pirotta, 2023; Ates, 2023; Runtuk et al., 2024; Hemmings et al., 2023; Dobos & Éltető, 2023; van Hoek & Udesen, 2024; Hoang et al., 2018; Tao et al., 2024; Zhao et al., 2024; Marrucci et al., 2022; Toscano et al., 2022; Zerbino, 2022; Peter, 2023; Miller et al., 2020)</p>
Technological Innovations for Transparency	<ul style="list-style-type: none"> Blockchain fosters trust, transparency, and accountability in supply chains by providing traceable, permanent records. 	<ul style="list-style-type: none"> Little exploration of alternative technologies. Lack of integration methods into existing systems. No analysis of blockchain's environmental impact. Classical prohibitions and restrictions. 	<p>(Jokumsen et al., 2023; Tolentino-Zondervan & DiVito, 2024; H. R. Hasan et al., 2024; Egorova et al., 2024; Dong et al., 2023)</p>

Emerging Themes	Main Findings	Gaps	References
Environmental, Social, and Governance (ESG) Criteria	<ul style="list-style-type: none"> Tracking every stage of the supply chain is crucial for ensuring ESG compliance and avoiding greenwashing. ESG rating convergence among firms makes investors hesitant, driving down economic and social welfare growth. Consumers who genuinely adhere to green principles promote suppliers' sustainability efforts. 	<ul style="list-style-type: none"> Social and governance aspects of ESG, such as labor and stakeholder engagement, are often overlooked. the 'E' in ESG remains in its nascency. 	<p>(Santos et al., 2024b; Sun et al., 2024; Yamoah et al., 2022; Lee et al., 2018; Boermans et al., 2024; Blaha et al., 2021; Xue et al., 2024; Pizzetti et al., 2021; Cui et al., 2024; Maalouf, 2024; Kopnina & Padfield, 2021; Uyar et al., 2020; Hora & Subramanian, 2019; S. Wang et al., 2024; Matakanye et al., 2021; Neumann, 2021)</p>
Role of NGOs	<ul style="list-style-type: none"> NGOs can inadvertently contribute to greenwashing if they endorse labeling programs that fall short of regulatory standards. 	<ul style="list-style-type: none"> Underdevelopment of private organizations capable of verifying compliance. Most NGOs are from developed countries with few to almost none from developing nations. 	<p>(Q. Chen & Duan, 2023; Kaplan & Perez, 2022; Partzsch et al., 2019)</p>
Industry-Specific Cases	<ul style="list-style-type: none"> Selective information disclosure encourages greenwashing practices in industries such as manufacturers, oil companies, and fashion brands raising suspicion among customers. Most airlines are accused of corporate greenwashing. Enterprises ought to support their sustainability claims with hard data. Some initiatives might put certification ahead of real reforms, which could result in greenwashing. 	<ul style="list-style-type: none"> Few industry-specific cases have been addressed. Significant governance gap between multinational companies and supply chains that needs immediate attention. 	<p>(X. Li & Ding, 2024; Jestratijevec et al., 2024; Vivas et al., 2024; Berrêdo et al., 2024; Reza & Du Plessis, 2022; Saber & Weber, 2019; Mills, 2009; DeFries et al., 2017; Bager & Lambin, 2020; Gossen et al., 2022; Amankwah-Amoah et al., 2023; Schmidt et al., 2022; Blome et al., 2017; Yousaf & Aqsa, 2023; Vedantam et al., 2021)</p>

References

- Abubakar, I. R., & Alshammari, M. S. (2023). Urban planning schemes for developing low-carbon cities in the Gulf Cooperation Council region. *Habitat International*, 138, 102881. [\[CrossRef\]](#)
- Adhikari, U. (2024). Greenwashing and its consequences in brand equity: A systematic bibliometric review. *Journal of Business and Management*, 8(1), 199–214. [\[CrossRef\]](#)
- Ahmad, H., Yaqub, M., & Lee, S. H. (2024). Environmental-, social-, and governance-related factors for business investment and sustainability: A scientometric review of global trends. *Environment, Development and Sustainability*, 26(2), 2965–2987. [\[CrossRef\]](#)
- Amankwah-Amoah, J., Debrah, Y., & Anang, S. (2023). Greening aviation in era of COVID-19: Towards conceptualizing and operationalizing decarbonization. *Journal of Environmental Management*, 326, 116649. [\[CrossRef\]](#)
- Arouri, M., El Ghoul, S., & Gomes, M. (2021). Greenwashing and product market competition. *Finance Research Letters*, 42, 101927. [\[CrossRef\]](#)
- Asif, M. S., & Gill, H. (2022). Blockchain technology and green supply chain management (GSCM)—Improving environmental and energy performance in multi-echelon supply chains. *IOP Conference Series: Earth and Environmental Science*, 952(1), 012006. [\[CrossRef\]](#)
- Ates, S. (2023). The credibility of corporate social responsibility reports: Evidence from the energy sector in emerging markets. *Social Responsibility Journal*, 19(4), 756–773. [\[CrossRef\]](#)
- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, 1(1), 377–386. [\[CrossRef\]](#)
- Badhwar, A., Islam, S., Tan, C. S. L., Panwar, T., Wigley, S., & Nayak, R. (2024). Unraveling green marketing and greenwashing: A systematic review in the context of the fashion and textiles industry. *Sustainability*, 6(7), 2738. [\[CrossRef\]](#)
- Bager, S. L., & Lambin, E. F. (2020). Sustainability strategies by companies in the global coffee sector. *Business Strategy and the Environment*, 29(8), 3555–3570. [\[CrossRef\]](#)
- Baid, V., & Jayaraman, V. (2022). Amplifying and promoting the “S” in ESG investing: The case for social responsibility in supply chain financing. *Managerial Finance*, 48(8), 1279–1297. [\[CrossRef\]](#)
- Bernini, F., Giuliani, M., & La Rosa, F. (2024). Measuring greenwashing: A systematic methodological literature review. *Business Ethics, the Environment & Responsibility*, 33(4), 649–667. [\[CrossRef\]](#)
- Berrêdo, P. D., dos Santos, O. M., Abdo, H., da Silva Macedo, M. Á., & Losekann, L. D. (2024). Energy transition: Assessing oil companies’ compliance with their disclosed environmental strategic positioning. *Corporate Social Responsibility and Environmental Management*, 31(4), 3517–3534. [\[CrossRef\]](#)
- Blaha, S., Lambrechts, W., & Mampaey, J. (2021). Twalk your talk: On the (non)-formative influence of corporate social responsibility communication on supply chain sustainability measures. *Sustainability*, 13(17), 9754. [\[CrossRef\]](#)
- Blasi, S., Fano, S., Sedita, S., & Toschi, G. (2024). A network perspective of cognitive and geographical proximity of sustainable tourism organizations: Evidence from Italy. *International Journal Of Contemporary Hospitality Management*, 36(2), 478–504. [\[CrossRef\]](#)
- Blome, C., Foerstl, K., & Schleper, M. C. (2017). Antecedents of green supplier championing and greenwashing: An empirical study on leadership and ethical incentives. *Journal of Cleaner Production*, 152, 339–350. [\[CrossRef\]](#)
- Boaye Belle, A., & Zhao, Y. (2023). Evidence-based decision-making: On the use of systematicity cases to check the compliance of reviews with reporting guidelines such as PRISMA 2020. *Expert Systems with Applications*, 217, 119569. [\[CrossRef\]](#)
- Boermans, D. D., Jagoda, A., Lemiski, D., Wegener, J., & Krzywonos, M. (2024). Environmental awareness and sustainable behavior of respondents in Germany, the Netherlands and Poland: A qualitative focus group study. *Journal of Environmental Management*, 370, 122515. [\[CrossRef\]](#)
- Bremer, J., & Udovich, J. (2001). Alternative approaches to supply chain compliance monitoring. *Journal of Fashion Marketing and Management: An International Journal*, 5(4), 333–352. [\[CrossRef\]](#)
- Brun, A., Karaosman, H., & Barresi, T. (2020). Supply chain collaboration for transparency. *Sustainability*, 12(11), 4429. [\[CrossRef\]](#)
- Bryant, A., Griffin, J. J., & Perry, V. G. (2020). Mitigating climate change: A role for regulations and risk-taking. *Business Strategy and the Environment*, 29(2), 605–618. [\[CrossRef\]](#)
- Burki, U. (2018). Green supply chain management, green innovations, and green practices. In H. Quadrat-Ullah (Ed.), *Innovative solutions for sustainable supply chains* (pp. 81–109). Springer International Publishing. [\[CrossRef\]](#)
- Cao, S., Xu, H., & Bryceson, K. P. (2023). Blockchain traceability for sustainability communication in food supply chains: An architectural framework, design pathway and considerations. *Sustainability*, 15(18), 13486. [\[CrossRef\]](#)
- Cesareo, F., & Pirota, G. (2023). Greenwashing in the fight against climate change. Substantive elements of private law and class action [Il greenwashing nella lotta al climate change. Fondamenti sostanziali giusprivatistici e tutela risarcitoria collettiva]. *BioLaw Journal*, (2), 217–235. [\[CrossRef\]](#)
- Chen, Q., & Duan, Y. (2023). Impact of information disclosure on global supply chain greenwashing: Is more information transparency always better? *Transportation Research Part E: Logistics and Transportation Review*, 178, 103288. [\[CrossRef\]](#)

- Chen, S., Zhang, Q., & Zhou, Y. (2019). Impact of supply chain transparency on sustainability under NGO scrutiny. *Production and Operations Management*, 28(12), 3002–3022. [CrossRef]
- Cooper, C., Booth, A., & Varley-Campbell, J. (2018). Defining the process to literature searching in systematic reviews: A literature review of guidance and supporting studies. *BMC Medical Research Methodology*, 18, 85. [CrossRef]
- Crapa, G., Roma, P., & Bruccoli, M. (2025). The influence of NGO-corporate relationship on environmental disclosure: Evidence from the fashion industry. *Corporate Social Responsibility and Environmental Management*, 32(2), 2104–2127. [CrossRef]
- Cui, F., Gao, X., & Wang, Z. (2024). The crowding-out effect of ESG practices on social welfare: Evidence from China. *Chinese Economy*, 57(2), 102–122. [CrossRef]
- de Freitas Netto, S. V., Sobral, M. F. F., Ribeiro, A. R. B., & da Luz Soares, G. R. (2020). Concepts and forms of greenwashing: A systematic review. *Environmental Sciences Europe*, 32(1), 19. [CrossRef]
- DeFries, R. S., Fanzo, J., Mondal, P., Remans, R., & Wood, S. A. (2017). Is voluntary certification of tropical agricultural commodities achieving sustainability goals for small-scale producers? A review of the evidence. *Environmental Research Letters*, 12(3), 033001. [CrossRef]
- de Jong, M. D. T., Huluba, G., & Beldad, A. D. (2020). Different shades of greenwashing: Consumers' reactions to environmental lies, half-lies, and organizations taking credit for following legal obligations. *Journal of Business and Technical Communication*, 34(1), 38–76. [CrossRef]
- Dempere, J., Alamash, E., & Mattos, P. (2024). Unveiling the truth: Greenwashing in sustainable finance. *Frontiers in Sustainability*, 5, 1362051. [CrossRef]
- Dobos, E., & Éltető, A. (2023). Regulation of the fashion supply chains and the sustainability–growth balance. *Sustainability Accounting, Management and Policy Journal*, 14(1), 101–129. [CrossRef]
- Dong, C., Huang, Q., Pan, Y., Ng, C. T., & Liu, R. (2023). Logistics outsourcing: Effects of greenwashing and blockchain technology. *Transportation Research Part E: Logistics and Transportation Review*, 170, 103015. [CrossRef]
- Dorfleitner, G., & Utz, S. (2024). Green, green, it's green they say: A conceptual framework for measuring greenwashing on firm level. *Review of Managerial Science*, 18(12), 3463–3486. [CrossRef]
- Egorova, M. A., Shpakovskiy, Y. G., Tsindeli, I. A., Ponomareva, D. V., Voronina, N. P., & Chelysheva, N. Y. (2024). New digital and other innovative tools for environmental protection, nature management and environmental safety for the purposes of antimonopoly and financial regulation. *Vestnik Sankt-Peterburgskogo Universiteta. Pravo*, 15(2), 527–543. [CrossRef]
- Feng, T., Jiang, Y., & Xu, D. (2020). The dual-process between green supplier collaboration and firm performance: A behavioral perspective. *Journal of Cleaner Production*, 260, 121073. [CrossRef]
- Forliano, C., Battisti, E., de Bernardi, P., & Klietnik, T. (2025). Mapping the greenwashing research landscape: A theoretical and field analysis. *Review of Managerial Science*. [CrossRef]
- Francisco, K., & Swanson, D. (2018). The supply chain has no clothes: Technology adoption of blockchain for supply chain transparency. *Logistics*, 2(1), 2. [CrossRef]
- Fritz, R. 2018. *From sweatshops to sustainability: The case study of Nike, Inc.* Available online: https://www.researchgate.net/publication/334388154_From_Sweatshops_to_Sustainability_The_Case_Study_of_Nike_Inc (accessed on 14 April 2025).
- Frynas, J. G., & Stephens, S. (2015). Political corporate social responsibility: Reviewing theories and setting new agendas. *International Journal of Management Reviews*, 17(4), 483–509. [CrossRef]
- Galletta, S., Mazzù, S., Naciti, V., & Paltrinieri, A. (2024). A PRISMA systematic review of greenwashing in the banking industry: A call for action. *Research in International Business and Finance*, 69, 102262. [CrossRef]
- Gatti, L., Pizzetti, M., & Seele, P. (2021). Green lies and their effect on intention to invest. *Journal of Business Research*, 127, 228–240. [CrossRef]
- Gatti, L., Seele, P., & Rademacher, L. (2019). Grey zone in—Greenwash out. A review of greenwashing research and implications for the voluntary-mandatory transition of CSR. *International Journal of Corporate Social Responsibility*, 4(1), 6. [CrossRef]
- Gilbert, C. G. M. A. (2024). Unlocking privacy in blockchain: Exploring zero-knowledge proofs and secure multi-party computation techniques. *GSJ*, 12(10), 1368–1392.
- González-Viralta, D., Veas-González, I., Egaña-Bruna, F., Vidal-Silva, C., Delgado-Bello, C., & Pezoa-Fuentes, C. (2023). Positive effects of green practices on the consumers' satisfaction, loyalty, word-of-mouth, and willingness to pay. *Heliyon*, 9(10), e20353. [CrossRef]
- Gossen, M., Jäger, S., Hoffmann, M. L., Bießmann, F., Korenke, R., & Santarius, T. (2022). Nudging sustainable consumption: A large-scale data analysis of sustainability labels for fashion in German online retail. *Frontiers in Sustainability*, 3, 922984. [CrossRef]
- Gürçam, S. (2022). The neoliberal initiative of the aviation industry to fight the climate crisis: Greenwashing. *International Journal of Environment and Geoinformatics*, 9(3), 178–186. [CrossRef]
- Hasan, H. R., Musamih, A., Salah, K., Jayaraman, R., Omar, M., Arshad, J., & Bosovic, D. (2024). Smart agriculture assurance: IoT and blockchain for trusted sustainable produce. *Computers and Electronics in Agriculture*, 224, 109184. [CrossRef]

- Hasan, M. M., Plamthottathil, R. K., Morshed, J., Sarkar, D., Hameed, N., & Cirstea, S. (2023, May 1–5). *Circulogy: An AI-enabled blockchain-based e-waste management framework using non-fungible tokens (NFT) to achieve net zero and imply the circular economy*. 2023 IEEE International Conference on Blockchain and Cryptocurrency, ICBC 2023, Dubai, United Arab Emirates. [\[CrossRef\]](#)
- He, Q., Wang, Z., Wang, G., Zuo, J., Wu, G., & Liu, B. (2020). To be green or not to be: How environmental regulations shape contractor greenwashing behaviors in construction projects. *Sustainable Cities and Society*, 63, 102462. [\[CrossRef\]](#)
- Hemmings, P., Mulheron, M., Murphy, R. J., & Prescott, M. (2023). Investigating the robustness of UK airport net zero plans. *Journal of Air Transport Management*, 113, 102468. [\[CrossRef\]](#)
- Hoang, P. C., McGuire, W., & Prakash, A. (2018). Reducing toxic chemical pollution in response to multiple information signals: The 33/50 voluntary program and toxicity disclosures. *Ecological Economics*, 146, 193–202. [\[CrossRef\]](#)
- Hora, M., & Subramanian, R. (2019). Relationship between positive environmental disclosures and environmental performance: An empirical investigation of the greenwashing sin of the hidden trade-off. *Journal of Industrial Ecology*, 23(4), 855–868. [\[CrossRef\]](#)
- Huang, Q., & Lin, M. (2022). Do climate risk beliefs shape corporate social responsibility? *Global Finance Journal*, 53, 100739. [\[CrossRef\]](#)
- Huang, Z., Shi, Y., & Jia, M. (2025). Greenwashing: A systematic literature review. *Accounting & Finance*, 65(1), 857–882. [\[CrossRef\]](#)
- Inês, A., Diniz, A., & Moreira, A. C. (2023). A review of greenwashing and supply chain management: Challenges ahead. *Cleaner Environmental Systems*, 11, 100136. [\[CrossRef\]](#)
- Jermisittiparsert, K., Joemsittiprasert, W., & Phonwattana, S. (2019). Mediating role of sustainability capability in determining sustainable supply chain management in tourism industry of Thailand. *International Journal of Supply Chain Management*, 8(3), 47–58.
- Jestratijevec, I., Uanhoro, J. O., & Rana, M. R. I. (2024). Transparency of sustainability disclosures among luxury and mass-market fashion brands: Longitudinal approach. *Journal of Cleaner Production*, 436, 140481. [\[CrossRef\]](#)
- Jin, J., Zhuang, J., & Zhao, Q. (2018). Supervision after certification: An evolutionary Game Analysis for Chinese environmental labeled enterprises. *Sustainability*, 10(5), 1494. [\[CrossRef\]](#)
- Johnsson, F., Karlsson, I., Rootzén, J., Ahlbäck, A., & Gustavsson, M. (2020). The framing of a sustainable development goals assessment in decarbonizing the construction industry—Avoiding “Greenwashing”. *Renewable and Sustainable Energy Reviews*, 131, 110029. [\[CrossRef\]](#)
- Jokumsen, M., Pedersen, T. P., Daugaard, M. S., Tschudi, D., Madsen, M. W., & Wisbech, T. (2023). Verifiable proofs for the energy supply chain: Small proofs brings you a long way. *Energy Informatics*, 6, 28. [\[CrossRef\]](#)
- Kaplan, Y., & Perez, O. (2022). Tort as meta-regulation: The liability of private transnational regulators. *University of Pennsylvania Journal of International Law*, 43(3), 667–719.
- Khan, H. Z., Bose, S., & Johns, R. (2020). Regulatory influences on CSR practices within banks in an emerging economy: Do banks merely comply? *Critical Perspectives on Accounting*, 71, 102096. [\[CrossRef\]](#)
- Kopnina, H., & Padfield, R. (2021). (Im)possibilities of “circular” production: Learning from corporate case studies of (un)sustainability. *Environmental and Sustainability Indicators*, 12, 100161. [\[CrossRef\]](#)
- Lashitew, A. A. (2021). Corporate uptake of the sustainable development goals: Mere greenwashing or an advent of institutional change? *Journal of International Business Policy*, 4(1), 184–200. [\[CrossRef\]](#)
- Lee, H. C. B., Cruz, J. M., & Shankar, R. (2018). Corporate social responsibility (CSR) issues in supply chain competition: Should greenwashing be regulated? *Decision Sciences*, 49(6), 1088–1115. [\[CrossRef\]](#)
- Leschhorn, F. (2022). Decarbonization in the minerals resources industry (part 1 of 2) [Die Dekarbonisierung in der Grundstoffindustrie (Teil 1 von 2)]. *World of Metallurgy—ERZMETALL*, 75(5), 273–283.
- Lewis, J. K. (2016). Corporate social responsibility/sustainability reporting among the fortune global 250: Greenwashing or green supply chain? In *Eurasian studies in business and economics* (pp. 347–362). Springer Science and Business Media B.V. [\[CrossRef\]](#)
- Li, X., & Ding, Z. (2024). Decision-making mechanisms of greenwashing behaviors of building materials manufacturers: A media disclosure and consumer skepticism perspective. *Environmental Technology & Innovation*, 35, 103705. [\[CrossRef\]](#)
- Li, Z., Miao, S., & Xu, L. (2024). Digital transformation and environmental, social, and governance greenwashing: Evidence from China. *Journal of Environmental Management*, 365, 121460. [\[CrossRef\]](#)
- Liu, Y., Li, W., Wang, L., & Meng, Q. (2023a). Why greenwashing occurs and what happens afterwards? A systematic literature review and future research agenda. *Environmental Science and Pollution Research*, 30(56), 118102–118116. [\[CrossRef\]](#)
- Liu, Z., Deng, Z., Davis, S., & Ciais, P. (2023b). Monitoring global carbon emissions in 2022. *Nature Reviews Earth & Environment*, 4(4), 205–206. [\[CrossRef\]](#)
- Maalouf, E. (2024). Achieving corporate environmental responsibility through emerging sustainability laws. *Asia Pacific Journal of Environmental Law*, 27(1), 64–99. [\[CrossRef\]](#)
- Markham, D., Khare, A., & Beckman, T. (2014). Greenwashing: A proposal to restrict its spread. *Journal of Environmental Assessment Policy and Management*, 16(04), 1450030. [\[CrossRef\]](#)
- Marrucci, L., Corcelli, F., Daddi, T., & Iraldo, F. (2022). Using a life cycle assessment to identify the risk of “circular washing” in the leather industry. *Resources, Conservation and Recycling*, 185, 106466. [\[CrossRef\]](#)

- Matakanye, R. M., Van Der Poll, H. M., & Muchara, B. (2021). Do companies in different industries respond differently to stakeholders' pressures when prioritising environmental, social and governance sustainability performance? *Sustainability*, 13(21), 12022. [\[CrossRef\]](#)
- McGrath, P., McCarthy, L., Marshall, D., & Rehme, J. (2021). Tools and technologies of transparency in sustainable global supply chains. *California Management Review*, 64(1), 67–89. [\[CrossRef\]](#)
- Miah, Md. T., Erdei-Gally, S., Dancs, A., & Fekete-Farkas, M. (2024). A systematic review of industry 4.0 technology on workforce employability and skills: Driving success factors and challenges in South Asia. *Economies*, 12(2), 35. [\[CrossRef\]](#)
- Michael, P., & Helms, M. M. (2018). Toward a global business standard for supply chain ethics. *IEEE Engineering Management Review*, 46(4), 112–121.
- Miller, V. V., Su, Q., Perez-Batres, L. A., & Pisani, M. J. (2020). China's green watch program: Beyond greenwashing. *Chinese Management Studies*, 14(4), 977–993. [\[CrossRef\]](#)
- Mills, E. (2009). A global review of insurance industry responses to climate change. *Geneva Papers on Risk and Insurance: Issues and Practice*, 34(3), 323–359. [\[CrossRef\]](#)
- Mitra, T., & Maulik, S. R. (2023). Fast Fashion—A Destructive Loop of Overconsumption. *Journal of the Textile Association*, 84(4), 239–245. [\[CrossRef\]](#)
- Mohamed Shaffril, H. A., Samsuddin, S. F., & Abu Samah, A. (2021). The ABC of systematic literature review: The basic methodological guidance for beginners. *Quality & Quantity*, 55(4), 1319–1346. [\[CrossRef\]](#)
- Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., Altman, D. G., Booth, A., Chan, A.-W., Chang, S., Clifford, T., Dickersin, K., Egger, M., Gøtzsche, P. C., Grimshaw, J. M., Groves, T., Helfand, M., . . . Whitlock, E. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, 4(1), 1. [\[CrossRef\]](#) [\[PubMed\]](#)
- Molin, M., Pizzol, L., Pesce, M., Maura, A., Civiero, M., Gritti, E., Giotto, S., Ferri, A., Liguoro, L., Bagnoli, C., & Semenzin, E. (2023). An integrated decision-making framework for corporate sustainability. *Corporate Social Responsibility and Environmental Management*, 30(3), 1145–1160. [\[CrossRef\]](#)
- Montgomery, A. W., Lyon, T. P., & Barg, J. (2024). No end in sight? A greenwash review and research agenda. *Organization & Environment*, 37(2), 221–256. [\[CrossRef\]](#)
- Moodaley, W., & Telukdarie, A. (2023). Greenwashing, sustainability reporting, and artificial intelligence: A systematic literature review. *Sustainability*, 15(2), 1481. [\[CrossRef\]](#)
- Mukherjee, A., Onel, N., & Nuñez, R. (2016). Business strategies for environmental sustainability. In *An Integrated Approach to Environmental Management*. Wiley. [\[CrossRef\]](#)
- Munir, S., & Mohan, V. (2022). Consumer perceptions of greenwashing: Lessons learned from the fashion sector in the UAE. *Asian Journal of Business Ethics*, 11(1), 1–44. [\[CrossRef\]](#)
- Nemes, N., Scanlan, S. J., Smith, P., Smith, T., Aronczyk, M., Hill, S., Lewis, S. L., Montgomery, A. W., Tubiello, F. N., & Stabinsky, D. (2022). An integrated framework to assess greenwashing. *Sustainability*, 14(8), 4431. [\[CrossRef\]](#)
- Netsai, M. (2023). *Greenwashing in business to business (B2B) context. Prevalence, motives, risks and mitigation strategies*. University of Agder.
- Neumann, T. (2021). Does it pay for new firms to be green? An empirical analysis of when and how different greening strategies affect the performance of new firms. *Journal of Cleaner Production*, 317, 128403. [\[CrossRef\]](#)
- Novrizal, M. (2024). Initiating the Implementation of eco-labelling to build the pivot of green economy growth in the Asean economic community. *Vietnamese Journal of Legal Sciences*, 10, 62–84. [\[CrossRef\]](#)
- Nugraha, W. S., Szakos, D., Süth, M., & Kasza, G. (2024). Greenwashing in the food industry: A systematic review exploring the current situation and possible countermeasures. *Cleaner and Responsible Consumption*, 15, 100227. [\[CrossRef\]](#)
- Nygaard, A. (2023). Is sustainable certification's ability to combat greenwashing trustworthy? *Frontiers in Sustainability*, 4, 1188069. [\[CrossRef\]](#)
- Nygaard, A. (2024). Green marketing and entrepreneurship. In *Green Marketing and Entrepreneurship*. Springer International Publishing. [\[CrossRef\]](#)
- Nygaard, A., & Silkoset, R. (2023). Sustainable development and greenwashing: How blockchain technology information can empower green consumers. *Business Strategy and the Environment*, 32(6), 3801–3813. [\[CrossRef\]](#)
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. [\[CrossRef\]](#)
- Partzsch, L., Zander, M., & Robinson, H. (2019). Cotton certification in Sub-Saharan Africa: Promotion of environmental sustainability or greenwashing? *Global Environmental Change*, 57, 101924. [\[CrossRef\]](#)

- Peng, X., Li, J., Tang, Q., Lan, Y.-C., & Cui, X. (2024). Do environmental scores become multinational corporations' strategic "greenwashing" tool for window-dressing carbon reduction? A cross-cultural analysis. *Business Strategy and the Environment*, 33(3), 2084–2115. [CrossRef]
- Peter, A. (2021). *CSR and Codes of Business Ethics in the USA, Austria (EU) and China and their Enforcement in International Supply Chain Arbitrations*. Springer Singapore. [CrossRef]
- Peter, A. (2023). Climate change and supply chain arbitrations: Impact of EU law on the BRI and non-EU entities. *Arbitration*, 89(4), 437–485. [CrossRef]
- Pindela, N. (2014, April 1). *Exploration of the extent of greenwashing in South African consumer products*. Available online: <https://www.semanticscholar.org/paper/Exploration-of-the-extent-of-greenwashing-in-South-Pindela/b6841c3ba9dbc7326b2ae12988272b31d614cb03> (accessed on 14 April 2025).
- Pizzetti, M., Gatti, L., & Seele, P. (2021). Firms talk, suppliers walk: Analyzing the locus of greenwashing in the blame game and introducing 'vicarious greenwashing'. *Journal of Business Ethics*, 170(1), 21–38. [CrossRef]
- Pun, H., Swaminathan, J. M., & Hou, P. (2021). Blockchain adoption for combating deceptive counterfeits. *Production and Operations Management*, 30(4), 864–882. [CrossRef]
- Reza, N., & Du Plessis, J. J. (2022). The garment industry in Bangladesh, corporate social responsibility of multinational corporations, and the impact of COVID-19. *Asian Journal of Law and Society*, 9(2), 255–285. [CrossRef]
- Rivera, L., Ortiz, N., Moreno, G., & Páez-Gabriunas, I. (2023). The Effect of company ownership on the environmental practices in the supply chain: An empirical approach. *Sustainability*, 15(16), 12450. [CrossRef]
- Runtuk, J. K., Ng, P. K., & Ooi, S. Y. (2024). Challenges and Solutions in working with green suppliers: Perspective from a Manufacturing industry. *Sustainability*, 16(20), 8744. [CrossRef]
- Saber, M., & Weber, A. (2019). Sustainable grocery retailing: Myth or reality?—A content analysis. *Business and Society Review*, 124(4), 479–496. [CrossRef]
- Santos, C., Coelho, A., & Marques, A. (2024a). A systematic literature review on greenwashing and its relationship to stakeholders: State of art and future research agenda. *Management Review Quarterly*, 74(3), 1397–1421. [CrossRef]
- Santos, C., Coelho, A., & Marques, A. M. A. (2024b). Unmasking supplier greenwashing: How information sharing and green trust shape clients' sustainability. *Baltic Journal of Management*, 19(4), 455–472. [CrossRef]
- Sarkis-Onofre, R., Catalá-López, F., Aromataris, E., & Lockwood, C. (2021). How to properly use the PRISMA Statement. *Systematic Reviews*, 10(1), 117. [CrossRef]
- Schäfer, N., Petersen, L., & Hörisch, J. (2024). The Interplay between supply chain transparency and NGO pressure: A quantitative analysis in the fashion industry context. *Journal of Business Ethics*, 192(4), 713–727. [CrossRef]
- Schmidt, S., Kinne, J., Lautenbach, S., Blaschke, T., Lenz, D., & Resch, B. (2022). Greenwashing in the US metal industry? A novel approach combining SO₂ concentrations from satellite data, a plant-level firm database and web text mining. *Science of the Total Environment*, 835, 155512. [CrossRef]
- Shaheen, N., Shaheen, A., Ramadan, A., Hefnawy, M. T., Ramadan, A., Ibrahim, I. A., Hassanein, M. E., Ashour, M. E., & Flouty, O. (2023). Appraising systematic reviews: A comprehensive guide to ensuring validity and reliability. *Frontiers in Research Metrics and Analytics*, 8, 1268045. [CrossRef]
- Shi, D., Lu, S., & Fang, Z. (2024). The effect of executive green human capital on greenwashing. *Research in International Business and Finance*, 71, 102461. [CrossRef]
- Silkoset, R., & Nygaard, A. (2025). Leveraging blockchain and smart contracts to combat greenwashing in sustainable development. *Sustainable Development, Online Version of Record*; [CrossRef]
- Silva, J. A. (2024). Corporate social responsibility (CSR) and sustainability in water supply: A systematic review. *Sustainability*, 16(8), 3183. [CrossRef]
- Singh, V. K., Singh, P., Karmakar, M., Leta, J., & Mayr, P. (2021). The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis. *Scientometrics*, 126(6), 5113–5142. [CrossRef]
- Sleiman, C. 2015. *In Starbucks we trust: Human rights and the illusion of the ethical cup of coffee*. Available online: <https://repository.gchumanrights.org/items/eb08f439-e3a0-4a68-a817-5b97163b3f3e> (accessed on 14 April 2025).
- Smith, E. K., Kolcava, D., & Bernauer, T. (2024). Stringent sustainability regulations for global supply chains are supported across middle-income democracies. *Nature Communications*, 15(1), 1049. [CrossRef]
- Sneideriene, A., & Legenzova, R. (2025). Greenwashing prevention in environmental, social, and governance (ESG) disclosures: A bibliometric analysis. *Research in International Business and Finance*, 74, 102720. [CrossRef]
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. [CrossRef]
- Sterne, J. A., Hernán, M. A., McAleenan, A., Reeves, B. C., & Higgins, J. P. (2019). Assessing risk of bias in a non-randomized study. In *Cochrane Handbook for Systematic Reviews of Interventions* (pp. 621–641). John Wiley & Sons, Ltd. [CrossRef]

- Subramoniam, R., Parameswaran, A., Ramanan, R., Sreekumar, R., & Cherian, S. (2022, November 7–11). *Generating trust using product genome mapping: A cure for ESG communication*. 2022 IEEE 1st Global Emerging Technology Blockchain Forum: Blockchain and Beyond, iGETblockchain 2022, Irvine, CA, USA. [\[CrossRef\]](#)
- Sun, Y., Shen, Y., & Tan, Q. (2024). The spillover effect of customers' ESG performance on suppliers' green innovation quality. *China Journal of Accounting Research*, 17(3), 100362. [\[CrossRef\]](#)
- Tao, M., Lin, B., & Poletti, S. (2024). From policy to practice: How China's emissions trading scheme shapes ESG greenwashing at the firm level? *Journal of Environmental Management*, 370, 122681. [\[CrossRef\]](#)
- Tolentino-Zondervan, F., & DiVito, L. (2024). Sustainability performance of Dutch firms and the role of digitalization: The case of textile and apparel industry. *Journal of Cleaner Production*, 459, 142573. [\[CrossRef\]](#)
- Torelli, R., Balluchi, F., & Lazzini, A. (2020). Greenwashing and environmental communication: Effects on stakeholders' perceptions. *Business Strategy and the Environment*, 29(2), 407–421. [\[CrossRef\]](#)
- Toscano, A., Balzarotti, M., & Re, I. (2022). Sustainability practices and greenwashing risk in the Italian poultry sector: A grounded theory study. *Sustainability*, 14(21), 14088. [\[CrossRef\]](#)
- Traoré, L., Belinga, B., & Lescuyer, G. (2023). A systematic review of the scope and patterns of green consumption in sub-saharan Africa. *Sustainability*, 15(8), 6343. [\[CrossRef\]](#)
- Truant, E., Borlatto, E., Crocco, E., & Sahore, N. (2024). Environmental, social and governance issues in supply chains. A systematic review for strategic performance. *Journal of Cleaner Production*, 434, 140024. [\[CrossRef\]](#)
- Tseng, M.-L., Islam, M. S., Karia, N., Fauzi, F. A., & Afrin, S. (2019). A literature review on green supply chain management: Trends and future challenges. *Resources, Conservation and Recycling*, 141, 145–162. [\[CrossRef\]](#)
- Uttley, L., Quintana, D. S., Montgomery, P., Carroll, C., Page, M. J., Falzon, L., Sutton, A., & Moher, D. (2023). The problems with systematic reviews: A living systematic review. *Journal of Clinical Epidemiology*, 156, 30–41. [\[CrossRef\]](#)
- Uyar, A., Karaman, A. S., & Kilic, M. (2020). Is corporate social responsibility reporting a tool of signaling or greenwashing? Evidence from the worldwide logistics sector. *Journal of Cleaner Production*, 253, 119997. [\[CrossRef\]](#)
- Van Der Ploeg, L., & Vanclay, F. (2013). Credible claim or corporate Spin?: A checklist to evaluate corporate sustainability reports. *Journal of Environmental Assessment Policy and Management*, 15(3), 1350012. [\[CrossRef\]](#)
- Vangeli, A., Małecka, A., Mitreğa, M., & Pfajfar, G. (2023). From greenwashing to green B2B marketing: A systematic literature review. *Industrial Marketing Management*, 115, 281–299. [\[CrossRef\]](#)
- van Hoek, R., & Udesen, T. (2024). Developing a benchmark for supplier code of conducts—Lessons learned from Bayer's journey towards sustainable procurement and research opportunities. *Benchmarking*, 31(4), 1163–1180. [\[CrossRef\]](#)
- Vedantam, A., Demirezen, E. M., & Kumar, S. (2021). Trade-in or sell in my P2P marketplace: A game theoretic analysis of profit and environmental impact. *Production and Operations Management*, 30(11), 3923–3942. [\[CrossRef\]](#)
- Vivas, K. A., Vera, R. E., Dasmohapatra, S., Marquez, R., Van Schoubroeck, S., Forfora, N., Azuaje, A. J., Phillips, R. B., Jameel, H., Delborne, J. A., Saloni, D., Venditti, R. A., & Gonzalez, R. (2024). A multi-criteria approach for quantifying the impact of global megatrends on the pulp and paper industry: Insights into digitalization, social behavior change, and sustainability. *Logistics*, 8(2), 36. [\[CrossRef\]](#)
- Vollero, A. (2022). Understanding greenwashing. In *Greenwashing* (pp. 1–20). Emerald Publishing Limited. [\[CrossRef\]](#)
- Vollero, A., & Siano, A. (2024). Strategic communication and greenwashing. Theoretical reflections and managerial implications. *Sinergie*, 42, 181–199. [\[CrossRef\]](#)
- Volschenk, J., Gerber, C., & Santos, B. A. (2022). The (in)ability of consumers to perceive greenwashing and its influence on purchase intent and willingness to pay. *South African Journal of Economic and Management Sciences*, 25(1), a4553. [\[CrossRef\]](#)
- Waas, B. (2021). The "S" in ESG and international labour standards. *International Journal of Disclosure and Governance*, 18(4), 403–410. [\[CrossRef\]](#)
- Walker, J. (2019). Transparency in the Supply Chain. In *Sustainable Development Goals* (pp. 275–284). John Wiley & Sons, Ltd. [\[CrossRef\]](#)
- Wang, C. (2024). The relationship between ESG performance and corporate performance—Based on stakeholder theory. *SHS Web of Conferences*, 190, 03022. [\[CrossRef\]](#)
- Wang, S., Wang, Z., & Li, B. (2024). Government green procurement and corporate ESG performance. *Journal of Cleaner Production*, 478, 143945. [\[CrossRef\]](#)
- Wang, W., Ma, D., Wu, F., Sun, M., Xu, S., Hua, Q., & Sun, Z. (2023). Exploring the knowledge structure and hotspot evolution of greenwashing: A visual analysis based on bibliometrics. *Sustainability*, 15(3), 2290. [\[CrossRef\]](#)
- Wang, Y., & Jung, S. (2025). The aftermath of greenwashing in the fashion industry: Chinese consumer responses to different types of greenwashing. *Asia Pacific Journal of Marketing and Logistics*. ahead-of-print. [\[CrossRef\]](#)
- Wibeck, V., Eliasson, K., & Neset, T.-S. (2022). Co-creation research for transformative times: Facilitating foresight capacity in view of global sustainability challenges. *Environmental Science & Policy*, 128, 290–298. [\[CrossRef\]](#)
- Wichianrak, J., Khan, T., Teh, D., & Dellaportas, S. (2023). Critical perspectives of NGOs on voluntary corporate environmental reporting: Thai public listed companies. *Sustainability*, 15(7), 6195. [\[CrossRef\]](#)

- Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Journal of Planning Education and Research*, 39(1), 93–112. [CrossRef]
- Xue, K., Chen, X., Sun, P., & Li, Y. (2024). Supply chain network centrality and corporate greenwashing behavior. *Finance Research Letters*, 70, 106357. [CrossRef]
- Yameen, J., Kijkasiwat, P., Hussain, A., Farooq, M. A., & Ajmal, T. (2024). Green finance in banking industry: A systematic literature review. *SN Business & Economics*, 4(8), 91. [CrossRef]
- Yamoah, F. A., Sivarajah, U., Mahroof, K., & Peña, I. G. (2022). Demystifying corporate inertia towards transition to circular economy: A management frame of reference. *International Journal of Production Economics*, 244, 108388. [CrossRef]
- Yousaf, M. A., & Aqsa, R. (2023). Integrating circular economy, SBTI, digital LCA, and ESG benchmarks for sustainable textile dyeing: A critical review of industrial textile practices. *Global Nest Journal*, 25(7), 39–51. [CrossRef]
- Yusop, S. R. M., Rasul, M. S., Mohamad Yasin, R., Hashim, H. U., & Jalaludin, N. A. (2022). An assessment approaches and learning outcomes in technical and vocational education: A systematic review using PRISMA. *Sustainability*, 14(9), 5225. [CrossRef]
- Zaida, W. (2021). The greenwashing: When the green argument is nothing but a disguise Case study: Greenwashing of dairy products in Asian and African countries. *La Revue Des Sciences Commerciales*, 20(1), 242–259. Available online: <https://asjp.cerist.dz/en/article/154198> (accessed on 14 April 2025).
- Zeng, H., Li, R. Y. M., & Zeng, L. (2022). Evaluating green supply chain performance based on ESG and financial indicators. *Frontiers in Environmental Science*, 10, 982828. [CrossRef]
- Zerbino, P. (2022). How to manage the Circular Economy Rebound effect: A proposal for contingency-based guidelines. *Journal of Cleaner Production*, 378, 134584. [CrossRef]
- Zervoudi, E. K., Moschos, N., & Christopoulos, A. G. (2025). From the corporate social responsibility (CSR) and the environmental, social and governance (ESG) criteria to the greenwashing phenomenon: A comprehensive literature review about the causes, consequences and solutions of the phenomenon with specific case studies. *Sustainability*, 17(5), 2222. [CrossRef]
- Zhang, Y., Zhang, H., Wu, K., & Shen, D. (2024). Governance of greenwashing behaviors: A perspective of heterogeneous firm types. *Energies*, 17(6), 1340. [CrossRef]
- Zhao, X., Huang, X., Liu, F., & Pan, L. (2024). Executive power discrepancy and corporate ESG greenwashing. *International Review of Financial Analysis*, 96, 103533. [CrossRef]

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