

Greenwashing vs Transparency: A Bibliometric Perspective

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ABSTRACT

Greenwashing and transparency have emerged as two competing yet interconnected paradigms in the discourse on corporate sustainability. While greenwashing represents the manipulation or exaggeration of environmental performance, transparency reflects a firm's commitment to honest, verifiable disclosure. This study employs a bibliometric analysis using VOSviewer to map the intellectual structure, thematic evolution, and collaborative patterns in the academic literature related to these two concepts. Based on a curated dataset from the Scopus database covering publications from 2000 to 2024, the analysis applies co-authorship, citation, co-word, and country collaboration techniques to uncover key contributors, emerging topics, and research gaps. Findings reveal that greenwashing remains a dominant theme, deeply embedded in literature on ESG, accountability, and sustainability reporting, while transparency is increasingly linked to digital technologies and financial instruments aimed at ensuring reporting credibility. Thematic clusters show evolving interest in areas such as green finance, blockchain, and supply chain transparency. Author and institutional networks reflect growing international collaboration, though notable disparities exist in geographic representation. This study contributes to a clearer understanding of the academic field and provides a foundation for future interdisciplinary research aimed at combating greenwashing and promoting transparent corporate sustainability practices.

Keywords: *Greenwashing, Transparency, Sustainability Reporting, ESG, Bibliometric Analysis.*

1. INTRODUCTION

In recent decades, the growing public concern over environmental sustainability has led to increased pressure on corporations to adopt green and socially responsible practices. This global shift has been reflected in the surge of environmental, social, and governance (ESG) frameworks, sustainability reporting, and green marketing initiatives across industries [1], [2]. Consequently, firms are increasingly expected not only to reduce their environmental footprint but also to communicate their efforts transparently to stakeholders, including consumers, investors, and regulators. This emphasis on corporate environmental responsibility has fostered a research boom on sustainability communication, accountability, and organizational legitimacy.

However, the rise of sustainable branding and ESG disclosures has not been without controversy. A significant concern is the phenomenon of greenwashing, where firms exaggerate or falsely portray themselves as environmentally friendly to gain reputational benefits without making substantial changes to their operations [3]. Greenwashing undermines trust in corporate sustainability efforts and can mislead consumers and investors, leading to inefficient resource allocation and reputational risks. The blurred line between genuine environmental responsibility and strategic image management has sparked critical debates within academic, regulatory, and public domains [4].

In contrast to greenwashing, corporate transparency in sustainability reporting involves the honest, complete, and verifiable disclosure of environmental practices and impacts. Transparency is foundational to stakeholder trust, effective policy-making, and accountability [5]. Numerous

frameworks and standards such as the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), and Task Force on Climate-related Financial Disclosures (TCFD) have emerged to standardize environmental disclosures and mitigate the risks of selective or misleading reporting. Yet, the voluntary nature of many reporting mechanisms leaves ample room for opportunistic behavior and inconsistent quality [6], [7].

The duality between greenwashing and transparency presents a complex challenge for researchers and practitioners alike. While both concepts are frequently examined within the fields of business ethics, sustainability, and corporate governance, their intersection remains underexplored through a comprehensive, longitudinal, and comparative lens. Existing studies often focus on either the motivations and typologies of greenwashing or the institutional drivers of transparency, rarely integrating the two to understand their co-evolution and thematic divergence over time [8]. Additionally, the rapidly growing volume of literature necessitates a systematic mapping to distill dominant themes, identify influential scholars, and highlight knowledge gaps.

Bibliometric analysis offers a valuable methodological approach to uncover the intellectual structure and thematic evolution of scholarly discussions surrounding greenwashing and transparency. By examining co-authorship patterns, keyword co-occurrence, and citation networks, researchers can trace how the discourse has expanded, interlinked, or fragmented over time. Previous bibliometric studies have separately addressed environmental reporting and sustainability communication, but few have directly compared or contrasted the bodies of literature on greenwashing and transparency within the sustainability domain. Hence, there is a timely need to synthesize and visualize how academic attention to these two contrasting concepts has developed and interacted across time, disciplines, and geographies [9].

Despite the rising academic interest in both greenwashing and transparency, there remains a lack of integrative bibliometric analysis that systematically examines their development as competing or complementary constructs in sustainability research. The literature is dispersed across multiple journals, regions, and disciplines, leading to thematic fragmentation and conceptual ambiguity. This gap hinders a holistic understanding of the scholarly landscape and obscures potential synergies or tensions between the two narratives. Without a comprehensive mapping, it is difficult to assess whether the field is evolving toward greater convergence, divergence, or theoretical maturity. This study aims to provide a bibliometric analysis of the evolution, thematic patterns, and scholarly networks within the literature on greenwashing and transparency in sustainability reporting.

2. METHODS

2.1 Data Source and Collection

This bibliometric study utilized the Scopus database as the primary source for data collection due to its extensive coverage of peer-reviewed academic literature across disciplines. The search strategy involved identifying publications that explicitly addressed the themes of greenwashing and transparency in sustainability reporting. The following Boolean search string was employed to extract relevant literature from article titles, abstracts, and keywords: ("greenwashing" OR "green wash") AND ("transparency" OR "sustainability reporting" OR "environmental disclosure"). To ensure the quality and relevance of the dataset, the search was limited to journal articles and reviews published in English between 2000 and 2024, capturing both foundational studies and recent developments. All records were exported in CSV format, including metadata such as authors, titles, abstracts, keywords, source titles, affiliations, citations, and references.

2.2 Analytical Tools and Techniques

The bibliometric analysis in this study was conducted using VOSviewer (version 1.6.x), a specialized software designed for constructing and visualizing bibliometric networks. This tool enabled a multi-dimensional exploration of the literature through four main analytical techniques. Co-authorship analysis was employed to map collaboration patterns among individual scholars, institutions, and countries, revealing prolific contributors and key geographic clusters within greenwashing and transparency research. Citation and co-citation analyses were conducted to identify the most frequently cited authors, articles, and journals, thereby uncovering the intellectual foundations and conceptual linkages of the field. In parallel, keyword co-occurrence (co-word) analysis was used to detect dominant and emerging research themes based on author-supplied keywords; VOSviewer applied full counting with a minimum occurrence threshold of five keywords to ensure robust thematic clustering. Finally, thematic clustering and visualization techniques—using network maps and density plots—were applied to interpret the field's structure, with each cluster qualitatively labeled based on prominent keywords and representative literature to capture evolving research directions and conceptual interrelations.

2.3 Inclusion and Cleaning Criteria

The initial dataset was manually screened to remove duplicate entries, conference papers, editorials, and irrelevant publications that did not substantially address greenwashing or transparency in sustainability reporting. The final dataset consisted of $N = 500$ documents. Standardization of author names, institutional affiliations, and keyword terms was performed to improve the accuracy of the visual network outputs.

3. RESULTS AND DISCUSSION

3.1 Network Visualization

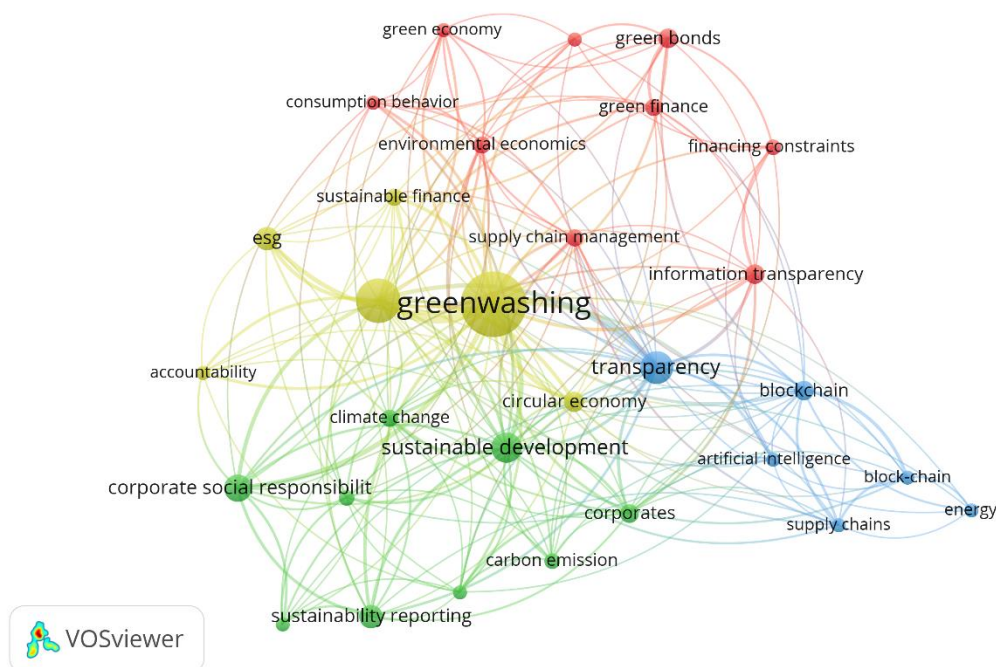


Figure 1. Network Visualization

Source: Data Analysis Result, 2025

The visualization presents a keyword co-occurrence network that maps the thematic landscape of research connecting greenwashing and transparency within sustainability discourse. The size of the nodes reflects the frequency of keyword usage, while the proximity and strength of the connecting lines indicate the degree of co-occurrence between keywords across publications. Based on color-coded clustering, the network reveals several distinct yet interconnected thematic domains, offering valuable insights into the structure and evolution of the literature. At the center of the map, the keywords “greenwashing” and “transparency” emerge as the two most dominant terms, indicating their pivotal role and frequent usage within the analyzed corpus. “Greenwashing” is linked to keywords such as ESG, accountability, and corporate social responsibility, suggesting that much of the literature frames greenwashing as a critique of superficial ESG practices and weak corporate disclosure mechanisms. On the other hand, “transparency” is closely connected to more technology-oriented and systems-level keywords like blockchain, artificial intelligence, and information transparency, indicating a growing interest in how digital tools can enhance or enforce transparent sustainability reporting.

The green cluster, which includes keywords like sustainable development, sustainability reporting, carbon emission, and climate change, appears to bridge the two central nodes. This cluster likely represents a foundational discourse focused on environmental impact measurement and sustainability reporting mechanisms. The interlinkage of greenwashing and transparency through sustainable development suggests that both are often discussed in the broader context of achieving long-term ecological balance and meeting global climate goals. The red cluster positioned at the top of the map is centered around economic and financial themes, including green finance, green bonds, environmental economics, and financing constraints. This grouping illustrates a body of literature concerned with the financialization of sustainability and the risks of greenwashing in green investment instruments. The presence of terms like green economy and consumption behavior further signals an intersection with macroeconomic and behavioral studies, highlighting how greenwashing can influence or distort sustainable consumption patterns. The blue cluster on the right reflects an emerging stream of literature focused on technological innovation and supply chain transparency. Keywords like blockchain, energy, artificial intelligence, and supply chains indicate a shift toward data-driven governance and traceability solutions. This suggests that researchers are increasingly exploring how digital tools can mitigate greenwashing by enabling more transparent, auditable, and real-time sustainability disclosures, especially in complex global supply chains.

3.2 Overlay Visualization

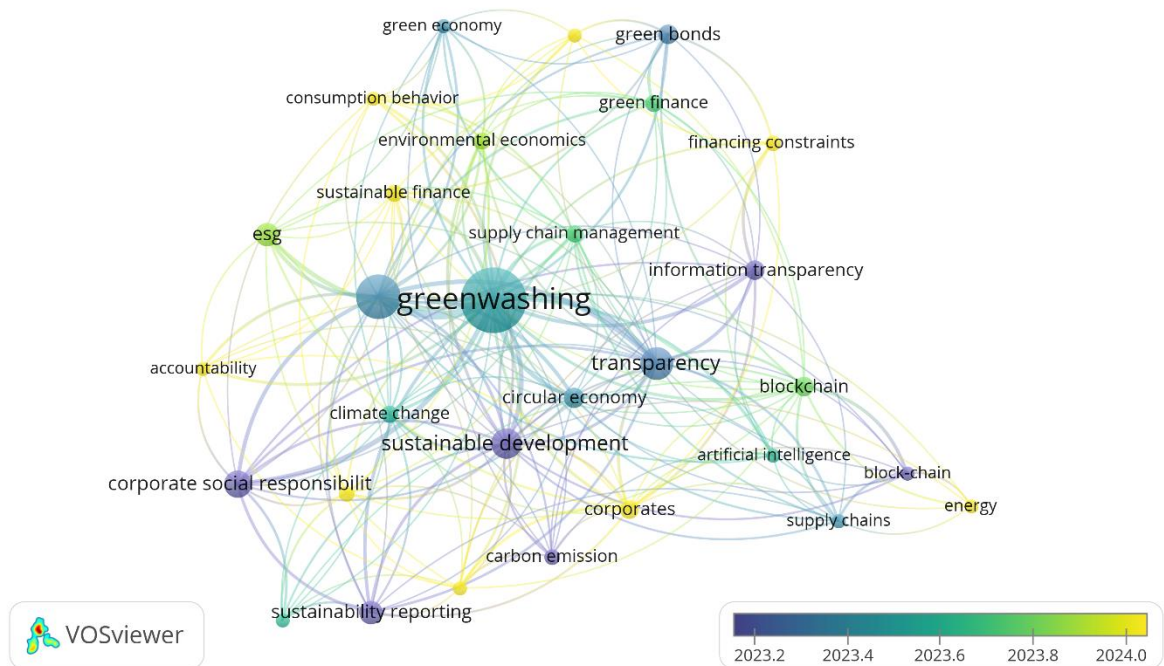


Figure 2. Overlay Visualization
Source: Data Analysis Result, 2025

The overlay visualization above illustrates the temporal evolution of keyword usage in the literature on greenwashing and transparency. The color gradient—from dark blue (early 2023) to yellow (late 2024)—indicates the average publication year of documents using each keyword. The central keywords such as “greenwashing,” “transparency,” and “sustainable development” appear in green and blue shades, suggesting that they have been consistently studied throughout 2023 and into early 2024, serving as the thematic backbone of this domain. These core terms also exhibit dense interconnections, reaffirming their foundational role in shaping discussions around ESG, corporate sustainability, and public accountability. Emerging themes are more evident in the yellow-colored nodes, indicating more recent research focus. Keywords such as “green bonds,” “green economy,” “carbon emission,” and “supply chain management” are located at the periphery and are shaded yellow, signifying that these areas have gained scholarly attention more recently—likely influenced by global policy shifts, carbon regulation mechanisms, and the expansion of green finance tools. Their peripheral position suggests that while they are gaining momentum, they are not yet central to the scholarly network, reflecting new but still-developing research frontiers. Conversely, dark blue nodes such as “orporate social responsibility” and “sustainability reporting” indicate older but foundational concepts, possibly reaching a level of thematic maturity or saturation. These terms continue to link closely with both “greenwashing” and “transparency,” implying that they laid the groundwork for more recent inquiries into corporate behavior and disclosure practices.

3.3 Citation Analysis

Table 1. The Most Impactful Literatures

Citations	Authors and year	Title
650	[10]	Scrutiny, norms, and selective disclosure: A global study of greenwashing
267	[11]	Bad greenwashing, good greenwashing: Corporate social responsibility and information transparency

Citations	Authors and year	Title
166	[12]	ESG performance and corporate risk-taking: Evidence from China
134	[13]	Corporate uptake of the Sustainable Development Goals: Mere greenwashing or an advent of institutional change?
100	[14]	Public perceptions of environmental, social, and governance (ESG) based on social media data: Evidence from China
87	[15]	An Integrated Framework to Assess Greenwashing
73	[16]	Towards sustainable development: Coupling green marketing strategies and consumer perceptions in addressing greenwashing
68	[17]	How to define (net) zero greenhouse gas emissions buildings: The results of an international survey as part of IEA EBC annex 72
61	[18]	Sustainable development and greenwashing: How blockchain technology information can empower green consumers
61	[19]	ESG Risk Disclosure and the Risk of Green Washing

Source: Scopus, 2025

3.4 Density Visualization

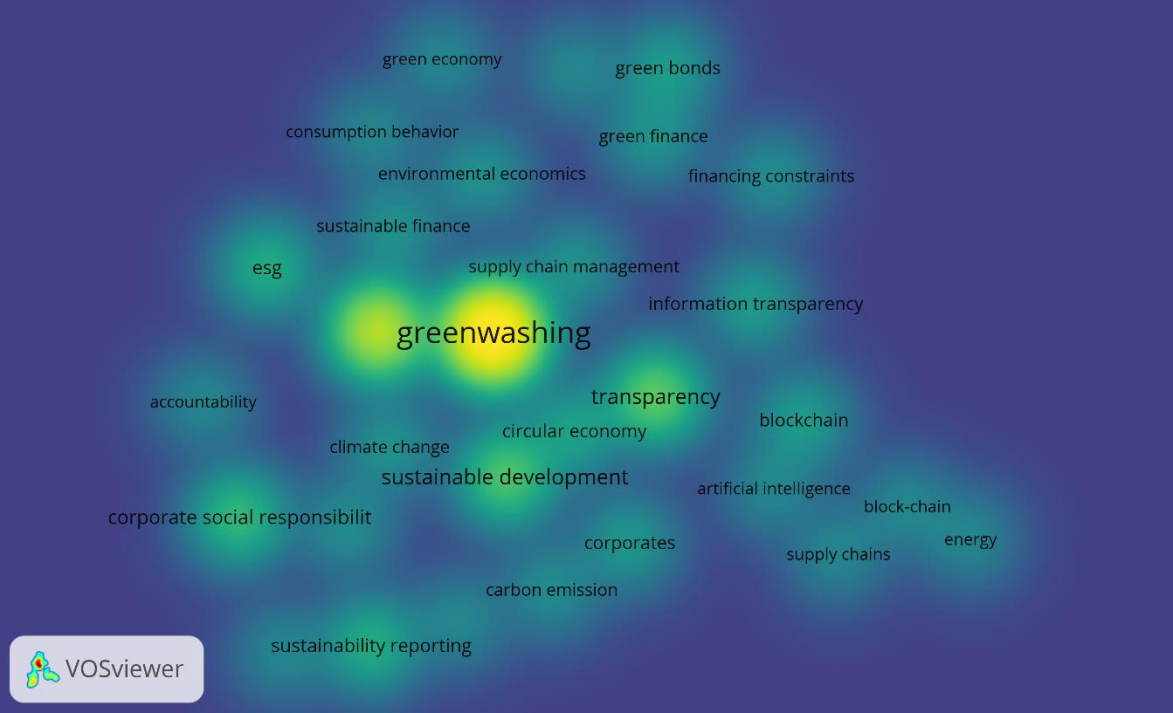


Figure 3. Density Visualization
Source: Data Analysis Result, 2025

The heatmap visualization illustrates the density of keyword occurrences and co-occurrences within the greenwashing and transparency research corpus. The color gradient—from blue (low frequency) to yellow (high frequency)—highlights areas of intensive scholarly focus. Notably, “greenwashing” stands out as the most frequently occurring and centrally connected term, indicated by the bright yellow hotspot at the center of the map. Closely surrounding it are “sustainable development,” “transparency,” “ESG,” and “climate change,” all of which appear in shades of green, signaling moderate to high relevance and frequent co-occurrence in publications. This clustering indicates that research on greenwashing is deeply embedded within broader

sustainability discourse and corporate governance frameworks. Peripheral keywords such as “blockchain,” “artificial intelligence,” “green bonds,” and “energy” appear in cooler blue-green tones, suggesting emerging or less explored areas in the literature. While these terms are gaining visibility, they have not yet reached the frequency or centrality of the core sustainability terms. Their presence, however, points to technological and financial innovations becoming increasingly important in discussions about transparency enforcement and green investment mechanisms.

3.5 Co-Authorship Network

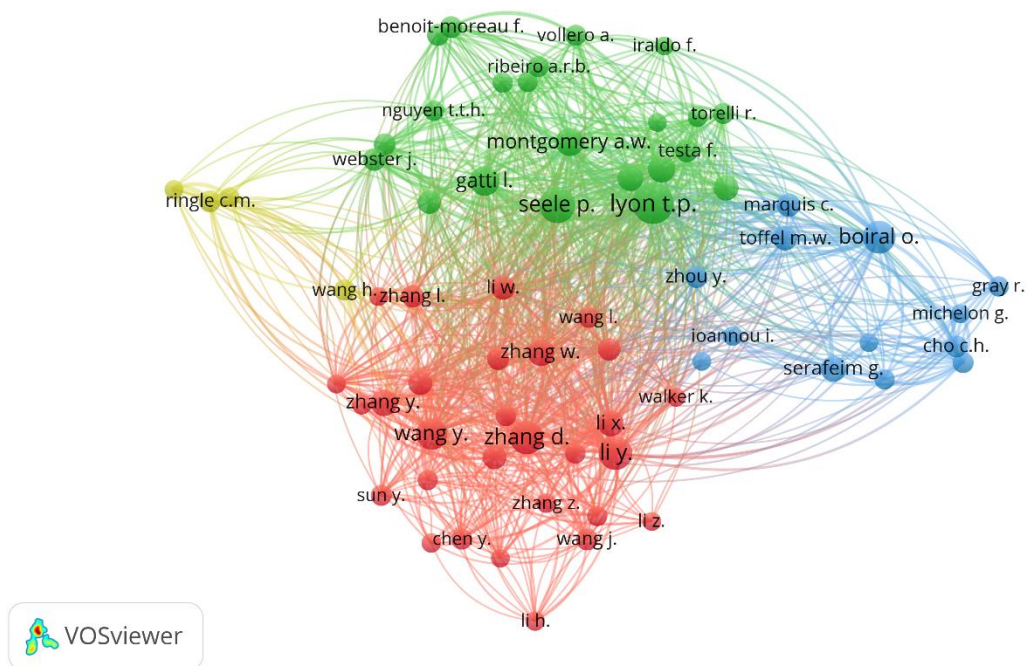


Figure 4. Author Visualization

Source: Data Analysis Result, 2025

The co-authorship network visualization reveals the collaborative structure among leading researchers in the fields of greenwashing and transparency. Each node represents an individual author, with the size indicating publication frequency and the lines denoting co-authorship links. The map is divided into several distinct clusters, each color-coded to represent tightly-knit author communities. The red cluster, led by prolific authors like Zhang D., Wang Y., and Li Y., shows a dense internal collaboration network, indicating strong research ties, likely centered in East Asia. The green cluster—featuring Lyon T.P., Seele P., and Gatti L.—reflects a broad network of scholars contributing to sustainability communication and greenwashing legitimacy frameworks. The blue cluster, which includes Boiral O., Michelon G., and Gray R., appears to focus more on corporate transparency, accountability, and ESG reporting, particularly within Western institutions. Notably, cross-cluster connections indicate growing international and interdisciplinary collaboration, bridging regional silos and advancing integrated perspectives on corporate sustainability discourse.

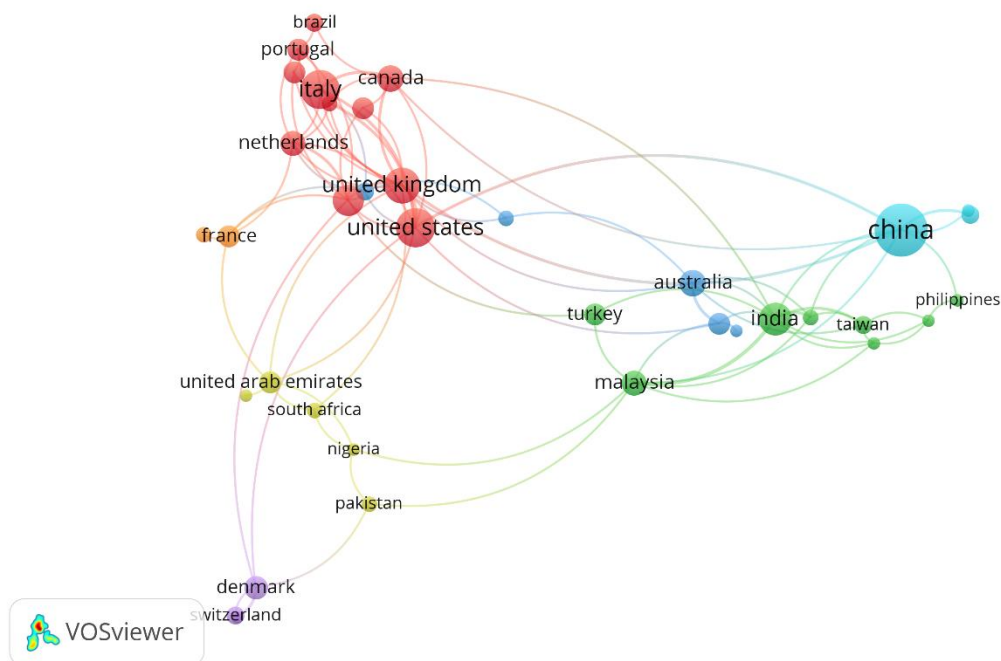


Figure 5. Country Visualization

Source: Data Analysis Result, 2025

The country co-authorship network visualization illustrates the geographical distribution and international collaboration in greenwashing and transparency research. Countries are represented as nodes, with size indicating the volume of publications and lines showing co-authorship links. China stands out with the largest node, indicating its dominant role in publication output, particularly in the Asia-Pacific region. It is closely connected with India, Australia, Malaysia, and Taiwan, reflecting strong regional collaboration. Meanwhile, the United States, United Kingdom, Italy, and Canada form a dense and highly interconnected Western cluster, showcasing active partnerships across North America and Europe. Countries like France, the Netherlands, and Portugal also appear integrated into this Western academic network. The visualization reveals that while Western nations have historically dominated the research space, Asia is rapidly emerging as a central hub, led by China and India, signaling a shift toward more globalized and diversified scholarly engagement in sustainability discourse.

Discussion

1. Centrality of Greenwashing in Scholarly Discourse

The keyword co-occurrence analysis places “greenwashing” at the thematic core of the network, indicating its prominence and frequency across the academic literature. It is closely associated with terms such as *ESG*, *accountability*, and *corporate social responsibility*, underscoring the critical discourse around firms' legitimacy strategies and reputational management in the face of rising environmental scrutiny. The centrality of greenwashing reflects the broader concern that organizations may exploit sustainability narratives without substantial performance improvements, leading to stakeholder deception and erosion of public trust [20]. The proximity of greenwashing to transparency, sustainable development, and sustainability reporting shows that these concepts are not treated in isolation but are thematically interwoven. In particular, *sustainability reporting* is seen both as a potential solution to greenwashing and, paradoxically, as a tool that can be manipulated for image management [21]. This duality is central to current debates, where the distinction between genuine and symbolic sustainability performance is often ambiguous and difficult to evaluate.

2. Transparency as a Growing Counter-Narrative

While greenwashing dominates in volume, transparency emerges as a critical counter-narrative in the literature, gaining traction in connection with emerging technologies and governance frameworks. The keyword map shows transparency's alignment with terms like *blockchain*, *artificial intelligence*, and *information transparency*, reflecting recent academic interest in how digital technologies can enhance verifiability and accountability in corporate disclosures (Saberi et al., 2019). Such trends indicate a shift from purely behavioral or normative solutions toward *system-level interventions* using traceable, immutable data systems. Moreover, transparency is closely tied to discussions on the circular economy, supply chain governance, and carbon emissions, suggesting that its application extends beyond financial disclosures into operational and environmental dimensions. The increasing scholarly focus on blockchain-enabled transparency illustrates how researchers are exploring the intersection of sustainability, digitalization, and policy design. These studies offer a promising path for reducing information asymmetry and strengthening the integrity of sustainability claims.

3. Temporal Evolution and Emerging Themes

The overlay visualization adds a dynamic temporal lens to this analysis. Core themes such as *greenwashing*, *sustainable development*, and *corporate social responsibility* are shaded in blue and green, signaling their historical dominance and conceptual maturity. In contrast, newer topics like *green bonds*, *green finance*, and *supply chain management* appear in yellow, indicating recent scholarly interest—especially in the context of the post-COVID recovery and the accelerating climate finance agenda [22]. This chronological mapping confirms that the field is expanding and diversifying, moving from foundational discussions of firm behavior and stakeholder expectations to more granular analyses of financial instruments, regulatory tools, and consumer behavior. For example, the emergence of “green bonds” and “financing constraints” as keywords suggests growing attention to how capital markets and financial disclosures intersect with both greenwashing risks and transparency mechanisms. This evolution reflects an increasing acknowledgment that green finance, while essential for global climate goals, may itself be vulnerable to misrepresentation and requires robust governance.

4. Author and Institutional Collaboration Patterns

The co-authorship map further reveals structural dynamics within the scholarly community. Three major clusters are identifiable: one centered around Western scholars such as Lyon T.P., Seele P., and Boiral O.; another dominated by Zhang D., Wang Y., and Li Y.; and a third group of multidisciplinary researchers including Montgomery A.W. and Gatti L.. The Western cluster tends to focus on theoretical and conceptual framing of greenwashing, drawing from institutional theory and legitimacy theory, while the East Asian cluster appears more empirical and data-driven, often leveraging quantitative techniques to evaluate corporate disclosure quality and ESG ratings. Notably, the interconnectedness of these clusters suggests growing international collaboration, especially between Asian and Western institutions. This is a positive development, as it encourages methodological cross-pollination and the integration of diverse perspectives. However, some degree of fragmentation persists, particularly between clusters using normative frameworks and those grounded in financial or technological paradigms. Bridging these methodological and epistemological divides remains a key challenge for the field's future development.

5. Geographical Distribution and Country-Level Networks

The country co-authorship analysis confirms a geopolitical shift in the locus of sustainability research. While the United States, United Kingdom, Italy, and Canada form a tightly connected Western bloc, China emerges as the largest node in terms of publication output, indicating its rapid rise in research capacity and scholarly visibility. Moreover, China shows strong collaborative ties

with India, Australia, Malaysia, and Taiwan, reflecting regional integration and academic investment in sustainability topics. This finding aligns with broader trends of increased research funding and policy focus on green development in Asia. However, despite high output, the visibility and citation impact of some Asian countries remain relatively lower, possibly due to language barriers, publication in regional journals, or limited participation in global policy discussions. Addressing these challenges will require deeper engagement with international frameworks and standards, as well as efforts to improve the quality and accessibility of published work. In contrast, emerging economies such as Nigeria, Pakistan, and the Philippines have smaller nodes and limited co-authorship links, indicating underrepresentation in the global sustainability discourse. Future research initiatives and funding mechanisms should aim to enhance inclusivity by supporting scholars from these regions, who often face context-specific sustainability challenges but lack the institutional backing for global visibility.

6. Thematic Clusters and Knowledge Integration

The co-word cluster analysis also reveals four major thematic groupings: (1) *institutional legitimacy and stakeholder theory*; (2) *financial innovation and green investment*; (3) *technology and transparency enforcement*; and (4) *climate change and operational sustainability*. These clusters, while distinct, are increasingly converging around shared concerns of credibility, measurement, and verification in sustainability practices. This convergence opens up opportunities for integrated research that combines behavioral insights with technological solutions, such as using AI-driven tools to audit ESG reports, or applying blockchain to trace carbon emissions along global supply chains. Nonetheless, the field still suffers from terminological inconsistency, with terms like “greenwashing,” “symbolic disclosure,” “selective transparency,” and “legitimacy signaling” often used interchangeably. This conceptual overlap can dilute analytical precision and make cross-study comparison difficult. There is a growing need for theoretical synthesis and standardization, potentially through meta-reviews or conceptual mapping exercises that unify diverse strands of the literature.

7. Future Directions

The findings of this bibliometric analysis suggest several promising directions for future research. First, scholars should deepen their engagement with emerging technologies to explore how digital tools can operationalize transparency and detect greenwashing in real time. Second, more longitudinal and comparative studies are needed to assess the effectiveness of policy interventions such as mandatory ESG disclosures or sustainable finance taxonomies. Third, the field would benefit from cross-disciplinary collaboration, integrating insights from law, behavioral science, data analytics, and environmental economics. Finally, addressing global inequalities in knowledge production is essential. While China and Western countries dominate the literature, many developing nations face acute sustainability challenges and offer unique empirical settings for studying the dynamics of greenwashing and transparency. Enhancing academic inclusion, promoting open access publication, and supporting South–South cooperation can foster a more equitable and globally relevant research agenda.

CONCLUSION

This bibliometric study provides an in-depth exploration of the scholarly landscape surrounding greenwashing and transparency within the context of sustainability discourse. By employing VOSviewer for co-authorship, citation, co-word, and country collaboration analyses, the study uncovers key intellectual trends, thematic clusters, and geographic distributions. The findings highlight that greenwashing remains a central concern in sustainability research, closely associated with issues of ESG reporting, corporate legitimacy, and stakeholder deception. Transparency, while somewhat newer, has rapidly gained importance—particularly in connection with digital

technologies such as blockchain and AI aimed at enhancing disclosure integrity. The evolving temporal patterns indicate a shift from normative and theoretical discussions to more applied and interdisciplinary research, bridging environmental economics, supply chain management, and technological innovation. While China and Western countries dominate in output and collaboration, regional disparities remain, emphasizing the need for more inclusive global research networks. Moving forward, the field would benefit from greater integration across disciplines, harmonization of conceptual frameworks, and a stronger emphasis on practical mechanisms to counter greenwashing and strengthen corporate transparency.

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