

Mapping the Intellectual and Thematic Landscape of Greenwashing Research: A Bibliometric and Thematic Analysis

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and Thematic
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Greenwashing Research
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Abstract

This study employs a two-stage approach combining bibliometric and thematic analysis to explore the scholarly development of greenwashing research. Bibliometric data were extracted from the Scopus database using the keyword "greenwashing" without time restrictions and analyzed using the Bibliometrix package in R studio web interface Biblioshiny. The analysis mapped scientific production trends, collaboration networks, key journals, and thematic clusters. Results show a sharp rise in greenwashing research post-2017, with China, the USA, the UK, and Italy as leading contributors. Key publication outlets include Sustainability, Business Strategy and the Environment, and the Journal of Cleaner Production.

Thematic analysis of the ten most-cited articles revealed central debates around corporate motives, regulatory gaps, consumer skepticism, and stakeholder communication. Foundational scholars and emerging research on digital activism and Asian markets were identified. This study provides an integrated view of green washing scholarship and highlights directions for future search toward greater transparency and accountability.

Keywords: Greenwashing, Bibliometric Analysis, Thematic Analysis, Biblioshiny, R software

1. Introduction:

Greenwashing refers to the practice where companies or organizations present a false or exaggerated image of environmental responsibility to appeal to eco-conscious consumers without making substantial efforts toward sustainability. It involves misleading claims about environmental practices or the environmental benefits of products and services (Delmas & Burbano, 2011). Although greenwashing has been around for decades, it has gained significant attention recently due to the increasing consumer demand for sustainable and ethically produced goods (Lyon & Montgomery, 2015).

The trend of green washing is intensifying today because of heightened environmental awareness, stricter regulations, and the growing profitability of the "green" market segment. In their race to capitalize on the growing environmental movement, companies often find it easier and cheaper to invest in marketing themselves as sustainable rather than genuinely transforming their operations (Guo et al., 2020).

Furthermore, the complexity and ambiguity of sustainability claims make it difficult for consumers to verify the authenticity of such messages, providing an opportunity for greenwashing to proliferate (de Freitas Netto et al., 2020). As climate change and environmental degradation become more pressing global issues, stakeholders, including consumers, investors, and regulatory bodies, increasingly scrutinize corporate sustainability claims, making greenwashing a critical and highly discussed phenomenon in today's marketplace.

Greenwashing presents significant challenges for businesses, consumers, and policymakers. One major issue is the erosion of consumer trust; when companies falsely claim environmental responsibility, it also leads to skepticism toward genuinely sustainable brands (Delmas &



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Burbano, 2011). Furthermore, regulatory gaps often allow misleading marketing claims to go unchecked, especially in regions lacking stringent environmental advertising standards (Parguel, Benoît-Moreau, & Larceneux, 2011). The lack of standardized definitions for terms like "eco-friendly" and "green" complicates enforcement and accountability (TerraChoice, 2010). Another challenge is that greenwashing can distort market competition, giving an unfair advantage to firms investing more in marketing than in actual sustainable practices (Walker & Wan, 2012).

To address these challenges, several interventions have been proposed and implemented. Stronger regulatory frameworks are essential; for example, the Federal Trade Commission's (FTC) "Green Guides" provide guidelines to prevent deceptive environmental claims (Federal Trade Commission, 2012). When credible and transparent, third-party certifications and eco-labelling schemes also serve as critical interventions to authenticate sustainability claims (Testa et al., 2015). Moreover, corporate transparency initiatives, such as mandatory sustainability reporting standards (e.g., GRI Standards), encourage companies to disclose verifiable environmental data (Global Reporting Initiative, 2016).

Consumer education so plays a pivotal role, empowering individuals to critically assess green claims and demand greater corporate accountability (Leonidou & Skarmas, 2017). Together, these interventions aim to curb greenwashing and foster a marketplace that genuinely supports sustainable development.

Greenwashing, the practice where companies falsely promote their products or policies as environmentally friendly, poses serious challenges to society. It misleads consumers into believing they are making sustainable choices, ultimately eroding public trust in genuine environmental initiatives (Delmas & Burbano, 2011). By masking unsustainable practices under a veneer of green marketing, corporations delay real progress toward environmental goals and create confusion about genuine sustainability (Lyon & Montgomery, 2015). In the long term, greenwashing can lead to widespread cynicism, where consumers grow sceptical of all corporate environmental claims, reducing the effectiveness of legitimate sustainability efforts (Nyilasy, Gangadharbatla, & Paladino, 2014). Furthermore, it may result in the misallocation of resources, with investments flowing toward superficially green businesses rather than genuinely sustainable innovations, thus hindering broader environmental and social development goals (Walker & Wan, 2012). At a societal level, this phenomenon undermines policy efforts and societal movements aimed at combating climate change, potentially exacerbating environmental degradation and delaying critical interventions needed for planetary health (Marquis, Toffel, & Zhou, 2016). Therefore, addressing greenwashing through stronger regulations, corporate accountability, and consumer education is crucial to ensure that sustainability claims are credible and impactful.

Given the growing scholarly interest in understanding the dynamics of greenwashing and its societal implications, it is essential to systematically map the existing literature and identify key research trends, influential contributions, and emerging themes. To address this need, the present study sets out two primary research objectives: first, to conduct a comprehensive bibliometric analysis that uncovers the intellectual structure, key authors, journals, collaborations, and citation patterns in the field of greenwashing research, and second, to perform a thematic analysis that identifies, classifies, and interprets the core themes and conceptual developments shaping this area of study. Together, these approaches offer a holistic overview of the evolution of green washing research, highlight gaps for future investigation, and provide actionable insights for scholars, practitioners, and policymakers engaged in environmental communication and corporate sustainability.

Novel Contribution of the Study

This study offers a novel and methodologically robust contribution to greenwashing scholarship by conducting a comprehensive bibliometric and thematic synthesis of publications indexed in the Scopus database over the period 1997-2025. Using the Biblioshiny interface of the Bibliometrix R-package, the analysis systematically applies performance analysis, science

mapping, co-citation networks, keyword co-occurrence analysis, thematic evolution mapping, and trend analysis to uncover the intellectual structure and longitudinal development of the field. Unlike prior narrative or limited systematic reviews, this study integrates quantitative bibliometric techniques with qualitative thematic interpretation to identify core knowledge clusters, influential authors and sources, collaboration patterns, and emerging research fronts.

Importantly, the study moves beyond descriptive growth metrics to reveal the epistemic evolution of greenwashing research—from early conceptualization and definitional debates to more sophisticated inquiries into corporate strategic behaviour, regulatory governance gaps, stakeholder and consumer responses, and technological verification mechanisms. By organizing fragmented streams of literature into a coherent intellectual framework, the research reduces conceptual dispersion and clarifies interdisciplinary linkages across business ethics, sustainability science, marketing, public policy, and information systems. Furthermore, by identifying methodological limitations, underexplored sectors, geographical imbalances, and emerging digital validation tools such as artificial intelligence and blockchain, the study develops a forward-looking research agenda grounded in empirical evidence.

Through this integrative, longitudinal, and science-mapping approach, the manuscript provides an original, data-driven intellectual cartography of greenwashing research, thereby advancing theoretical consolidation, methodological rigor, and strategic direction within the domain.

2. Research Methodology:

2.1 Research Questions

RQ1: What are the major publication trends and most influential authors, journals, institutions, and countries contributing to greenwashing research?

RQ2: What are the key collaboration networks and citation patterns among researchers studying greenwashing?

RQ3: How has the volume and focus of greenwashing research evolved?

RQ4: What are the dominant themes and conceptual clusters emerging greenwashing literature?

2.2 Research Objectives:

To conduct a bibliometric analysis to map the intellectual structure of greenwashing research by identifying prolific authors, core journals, influential papers, collaboration networks, and citation dynamics.

1. To analyze the evolution of greenwashing literature over time, highlighting publication trends and shifts in research focus.

2. To perform a thematic analysis of the selected literature to identify key themes, theoretical frameworks, methodologies, and major findings related to greenwashing.

3. Methodology:

This study adopts a two-stage methodological approach combining bibliometric analysis and thematic analysis to explore the scholarly landscape on greenwashing. In the first stage, bibliometric data were extracted from the Scopus database, one of the most comprehensive and widely recognized repositories of peer-reviewed research. The keyword "greenwashing" was used to search with intitles, abstracts, and key words without any time restrictions to capture the full evolution of research on the topic. The search was conducted in [insert month and year], and only articles published in peer-reviewed journals were considered to ensure the quality and reliability of the dataset.

The bibliometric analysis was performed using R software, specifically employing the Bibliometrix package and its web interface, Biblioshiny. Bibliometrix allows for detailed scientific mapping by analyzing authorship patterns, source impact, keyword co-occurrence networks, citation structures, and thematic evolution. Biblioshiny further facilitated user-friendly visualization of the bibliometric indicators such as the most prolific authors, highly cited papers, active countries, collaboration networks, and thematic clusters.

From the complete set of articles retrieved, the top10 most highly cited research articles were selected based on total citation counts provided by Scopus. In the second stage of the study, a qualitative thematic analysis was conducted on these top 10 articles to deepen the understanding of the major themes, theoretical frameworks, and empirical findings that shape greenwashing research. Recurring themes, conceptual models, methodologies, and key debates were identified and categorized through carefully reading and coding these articles. This dual approach - quantitative bibliometric mapping followed by qualitative thematic exploration - provided a robust, comprehensive insight into greenwashing scholarship's structural and conceptual dimensions.

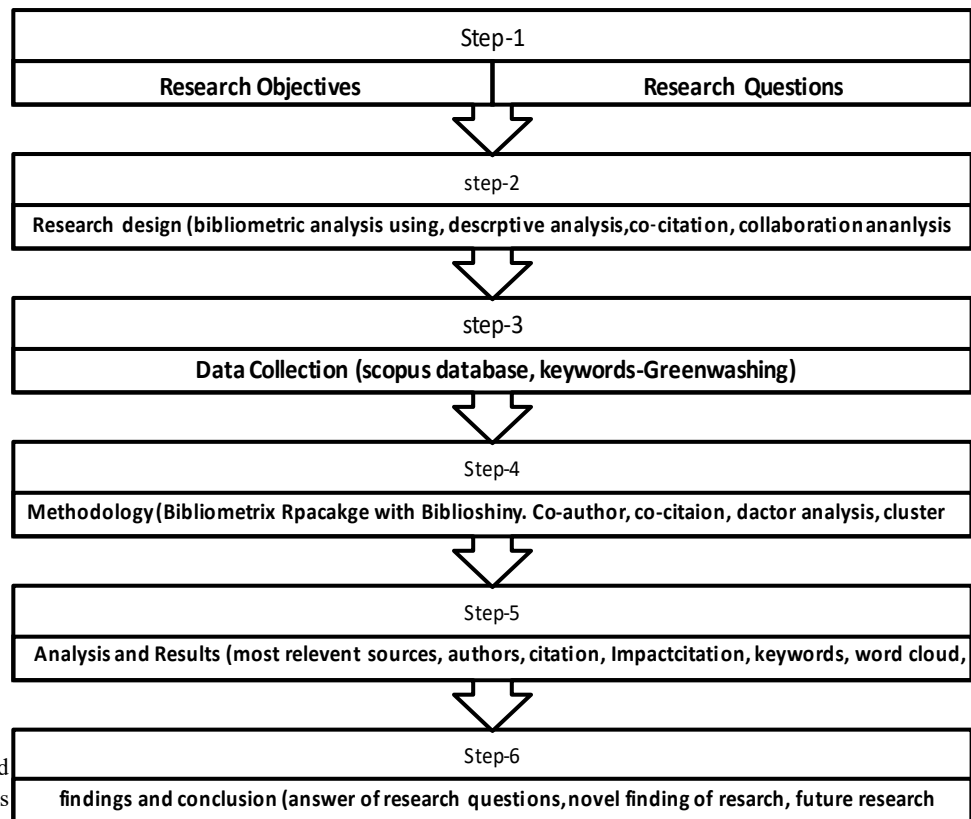


Fig. 1: Bibliometrics And Science Mapping Process

Basis	Insertion Criteria	Omission Criteria
Database	Scopus	Other Data Base
Publication Period	1997-2025 (n=2079)	Before 1997 (n=0)
Subject Area	Social Science, Economics, Econometrics, Finance, Accounts, Business	Other subject areas (n=425)
	Management, Multidisciplinary and Humanities (n=1654)	
Document Types	Articles, Book Chapters, (n=1456)	Grey Literature (n=198)
Source Type	Journals (n=1381)	Books, Conference Proceedings, Doctoral Thesis, Dissertation. (n=75)
Publication Stage	Final stage (n=1242)	In process (n=139)

Table 1: Data Filtration Process in Scopus Database.

4. Analysis and Interpretations

4.1 : Main Information

Description	Results
MAININFORMATIONABOUT DATA	
Timespan	1997:2025
Sources(Journals,Books, etc)	625
Documents	1242
AnnualGrowthRate %	20.06
DocumentAverage Age	3.08
Averagecitationsper doc	26.11
References	69615
DOCUMENT CONTENTS	
KeywordsPlus(ID)	1487
Author'sKeywords (DE)	3234
AUTHORS	
Authors	2812
Authorsofsingle -authored docs	249
AUTHORS COLLABORATION	
Single -authored docs	273
Co -AuthorsperDoc	2.73
Internationalco -authorships%	24.32
DOCUMENT TYPES	
article	1082
book chapter	160

Table 2: Main information
of the dataset

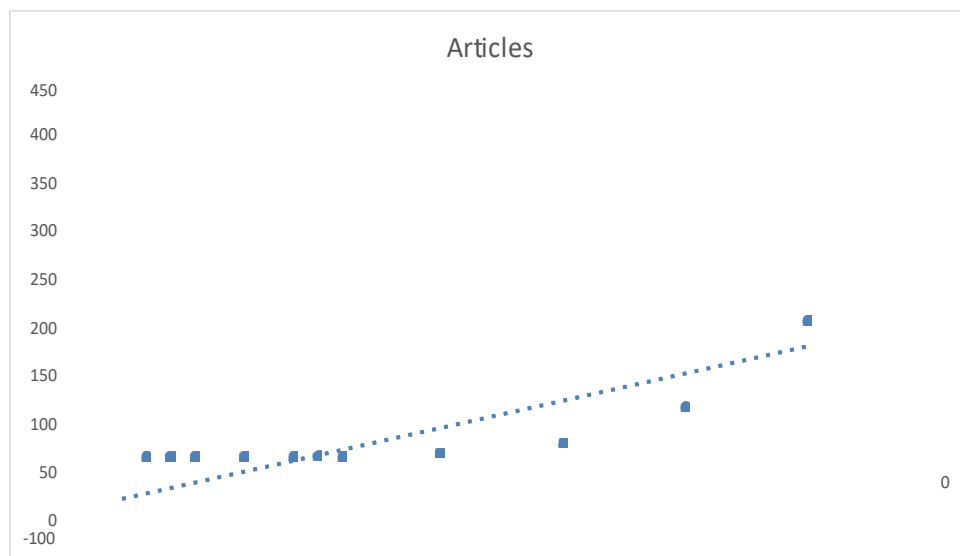


Fig. 2:
AverageProductionperyear

The publication trend in greenwashing research can be divided into distinct phases. During the early years(1997-2006), activity wasminimal,with most years recording either zeroor only one article.This limited output likely reflects the emerging or niche nature of the research area, with limited academic interest, fewer researchers, and challenges in attracting attention.

The period from 2007 to 2016 marked a slow growth phase. Article production increased gradually, from 2 publications in 2007 to 18 in 2016, suggesting growing awareness and academic interest. This period may also have been shaped by early foundational work and the initial availability of funding that slowly began to build momentum.

A rapid growth phase followed between 2017 and 2021. During this time, publication numbers accelerated significantly, with major year-on-year jumps—from 29 articles in 2017 to 80 by 2021. This trend indicates a breakthrough moment for greenwashing research, driven by increased international collaboration, more conferences and funding opportunities, and greater practical relevance.

From 2022 to 2024, the field experienced exponential expansion. The number of articles surged to 137 in 2022, 196 in 2023, and 392 in 2024. This explosive growth suggests that greenwashing has become a main stream and highly impactful research area, possibly recognized as critical to technology, policy, and global sustainability efforts. Large-scale collaborations and societal relevance are likely fueling this surge in publications.

As for 2025, preliminary data show 167 articles published so far. Although this figure appears lower compared to 2024, it is likely that data collection is still in progress, and the final number could match or even surpass previous records.

Overall, the research area follows a classic S-curve pattern, starting with a low adoption phase, moving into rapid growth, and possibly heading toward future stabilization. The current trend points to a highly dynamic and attractive field for new researchers. Looking ahead, the field may either stabilize at a high output level or plateau once the major thematic areas are comprehensively explored.

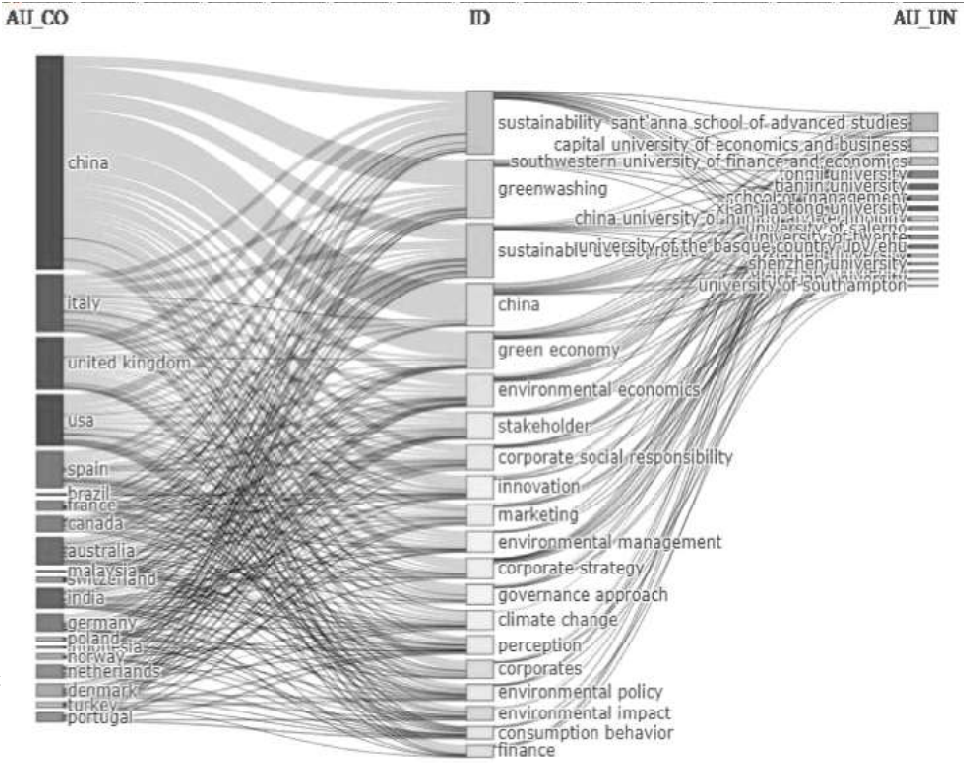
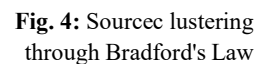


Fig. 3: Three Fields Plot

The Sankey diagram presents a detailed visualization of the global research landscape on greenwashing and related topics. It connects countries (AU_CO), research themes (ID), and affiliated universities (AU_UN), revealing the geographical and thematic distribution of scholarly output.

China is the leading contributor to greenwashing literature, with numerous connections to sustainability, green economy, and environmental economics. Chinese universities such as the Southwestern University of Finance and Economics, Capital University of Economics and Business, and Shanghai Jiao Tong University appear prominently, aligning with previous findings that Asian nations are key players in sustainability research (Zhang & Zhou, 2020). The next most significant contributors are China, Italy, the United Kingdom, the USA, and



- Sustainability (Switzerland)
- Business Strategy and the Environment
- Journal of Cleaner Production
- Finance Research Letters
- Corporate Social Responsibility and Environmental Management

The steep decline after the core area highlights that only a handful of journals consistently publish on greenwashing, while many others contribute sporadically. Analysis suggests a highly specialized and concentrated field of scholarly production. Given the dominance of journals like *Sustainability* and *Business Strategy and the Environment*, these sources should be prioritized for literature reviews, citation searches, and research positioning within the green washing discourse. Studies published here are likely more visible and influential in shaping academic and practical understanding of the subject (Podsakoff et al., 2005).

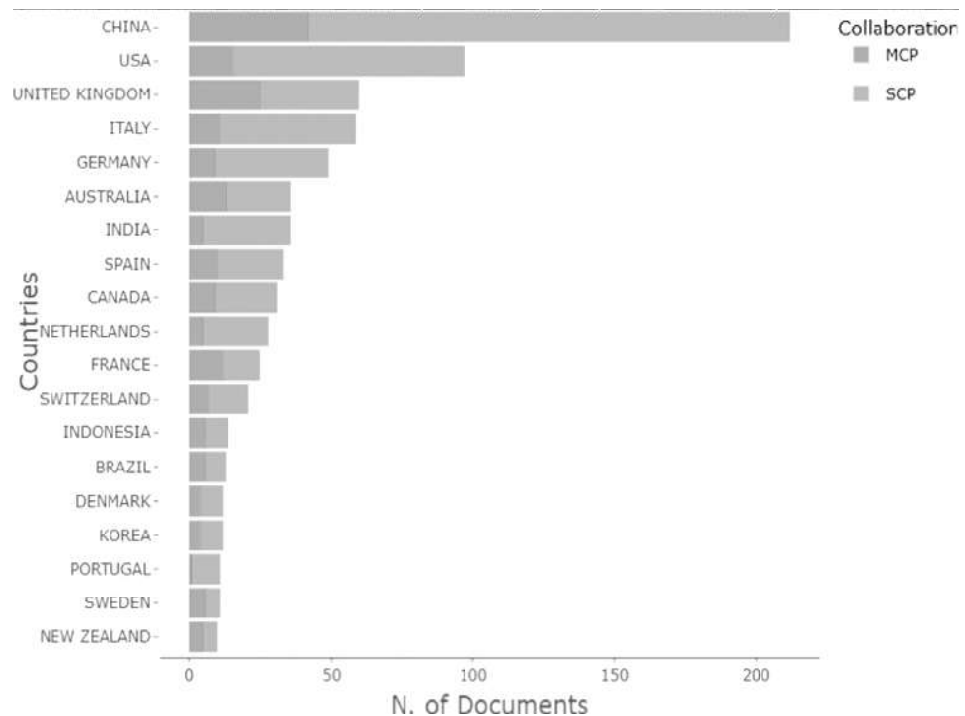


Fig. 5: Corresponding Author's Country

Interpretation of Corresponding Author's Country Analysis

This bar chart displays the geographic distribution of corresponding authors based on the number of documents published. It also distinguishes between:

- SCP (Single Country Publications-tealbars):All authors from the same country.
- MCP (Multiple Country Publications-pinkbars):International collaborations.
- The bibliometric analysis reveals several key observations regarding country-level contributions to greenwashing research. China emerges as the dominant country, producing over 200 documents. However, most of these are single-country publications (SCP), suggesting a strong domestic research base but relatively limited international collaboration. The United States follows closely, but with an otable proportion of multiple-country publications (MCP), indicating a stronger inclination towards international research partnerships than China. The United Kingdom, Italy, and Germany round out the top five contributors, each maintaining a balanced yet smaller volume of publications.
- Patterns of international collaboration further highlight that countries such as the United Kingdom, France, the Netherlands, and Australia demonstrate a higher proportion of MCPs, reflecting greater openness to cross-border academic partnerships. Switzerland and Sweden also show strong international collaboration despite producing a comparatively lower number of total publications.
- Emerging research nations like India, Indonesia, and Brazilha vegaine dvisibility among the top contributing countries, reflecting their growing presence in the global research landscape. However, their MCP proportions remain relatively low, suggesting their international collaboration networks are still developing.
- Regional trends also emerge: European countries such as the Netherlands, France, and Switzerland exhibit a more collaborative research culture, while many Asian countries, including China, India, Korea, and Indonesia, display a stronger tendency toward domestic-focused research output.

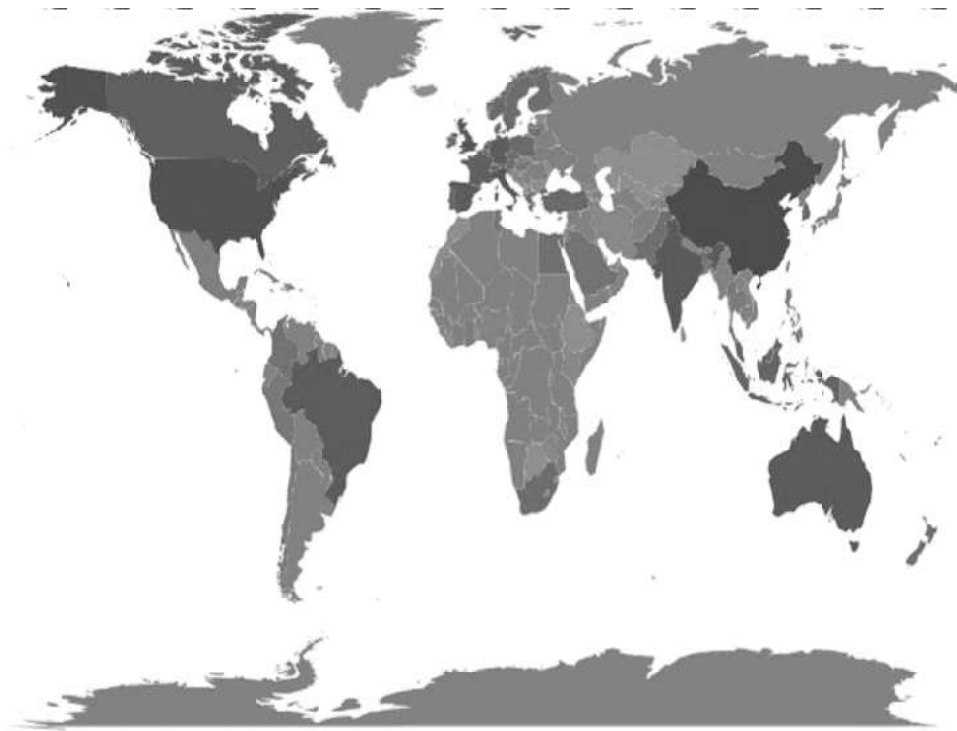


Fig. 6: Country Scientific
Production

region	Freq
CHINA	700
USA	377
UK	226
ITALY	191
INDIA	162
AUSTRALIA	152
BRAZIL	136
SPAIN	125
GERMANY	118
CANADA	105

Interpretation of World Scientific Productionby Country

The world map of scientific production highlights the geographic distribution of research output based on the number of documents published by each country. Countries are shaded in varying tones of blue, with darker shade representing higher levels of publication activity and lighter shades indicating lower contributions.

China leads overwhelmingly with 700 publications, firmly establishing itself as the dominant contributor to global research output. The USA follows with 377 publications, maintaining a strong presence but at a noticeably lower volume than China. The United Kingdom, with 226 publications, and Italy, with 191, also stand out as significant contributors. Other important players include India (162 publications), Australia (152), Brazil (136), Spain (125), Germany (118), and Canada (105), showcasing a broad yet concentrated global research landscape.

Global coverage reveals that North America, Western Europe, East Asia, and Australia are densely shaded in darker blues, reflecting intense research activity. South America is also notably represented by Brazil, Argentina, and Chile contributions. In contrast, Africa shows limited participation, with significant contributions from South Africa and a few other nations. Across Asia, strong outputs are observed from China, India, Japan, and South Korea, underscoring the region's growing research influence.

Under represented region sare evident, with much of Africa, Central Asia, and parts of the Middle East appearing largely grey on the map, indicating minimal or no recorded publications.

Regional trends highlight the Asia-Pacific region as an emerging research powerhouse driven by China, India, Australia, and Japan. Europe demonstrates wides pread and balanced participation, especially from countries like the United Kingdom, Italy, Germany, France, and Spain. Meanwhile, the USA and Brazil primarily dominate research production in the Americas.

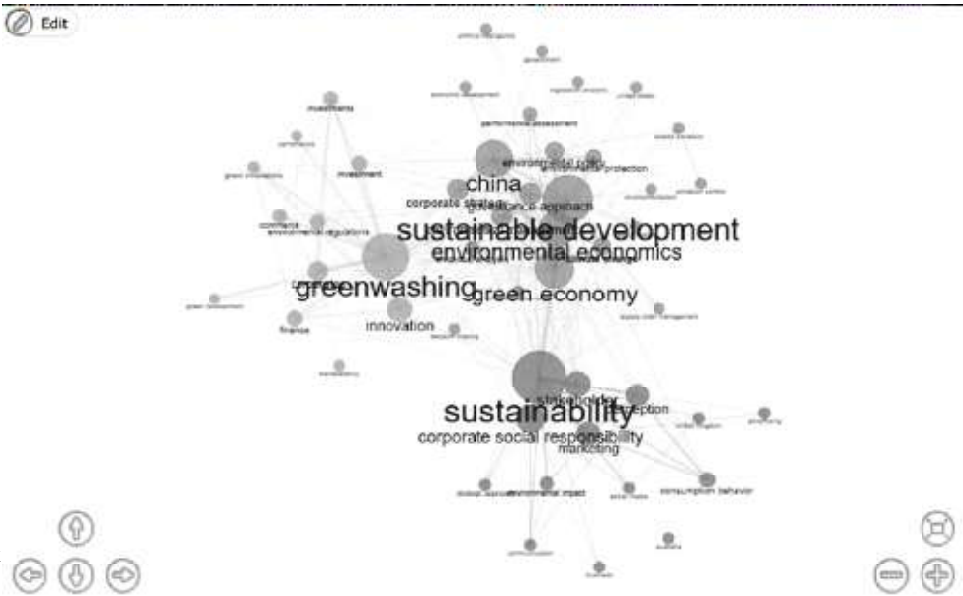


Fig. 7: Co-occurrence
Network

Interpretation of Co-occurrence Network Visualization

The co-occurrence network illustrates the intellectual structure surrounding research topics like sustainability, greenwashing, sustain able development, and environmental economics. The size of the nodes reflects the frequency of the keywords, while the thickness of the connecting lines shows the strength of their co-occurrence (Van Eck & Waltman, 2010).

Three major the matic clusters can be identified based on colour:

1) Green Cluster (Greenwashing and Innovation Focus):

Keywords such as greenwashing, innovation, investments, finance, and environmental regulations dominate this cluster.

It suggests a body of research investigating the intersection of green investment, regulatory frameworks, and deceptive corporate sustainability practices (Delmas& Burbano, 2011).

The tight connection simply astrong interdisciplinary dialogue between environmental regulation, finance, and corporate behaviour.

2) Red Cluster (Sustainability, Marketing, and Consumer Behavior Focus):

Central terms like sustainability, corporate social responsibility (CSR), marketing, stakeholder perception, and consumption behaviour highlight research examining how organizations communicate sustainability efforts and how these efforts are perceived by stakeholders (Parguel, Benoit-Moreau, & Larceneux, 2011).

This cluster is more consumer-and communication-oriented, focusing on the strategic use of sustainability in branding and advertising.

3) Blue Cluster (Policy and Environmental Economics Focus):

With keywords like sustainable development, environmental policy, climate change, environmental protection, and China, this cluster reflects research on sustainability's macroeconomic and policy aspects.

The prominence of China emphasizing role in global environmental governance and sustainable economic practices (Zhang & Wen, 2008).

Topics such as performance assessment, climate change, and environmental economics reveal as strong policy and empirical analysis orientation.

Across clusters, sustainability, greenwashing, and sustainable development are the most significant bridging concepts, linking corporate strategies, consumer behaviour, policy development, and economic analysis (Bocken et al., 2014). The network also highlights global dimensions through terms like the United States, the United Kingdom, and Australia, suggesting a comparative perspective in research.

The visualization demonstrates the growing complexity and interdisciplinarity of research in sustainability-related fields, where corporate behaviour, regulatory responses, and consumer expectations interact dynamically.

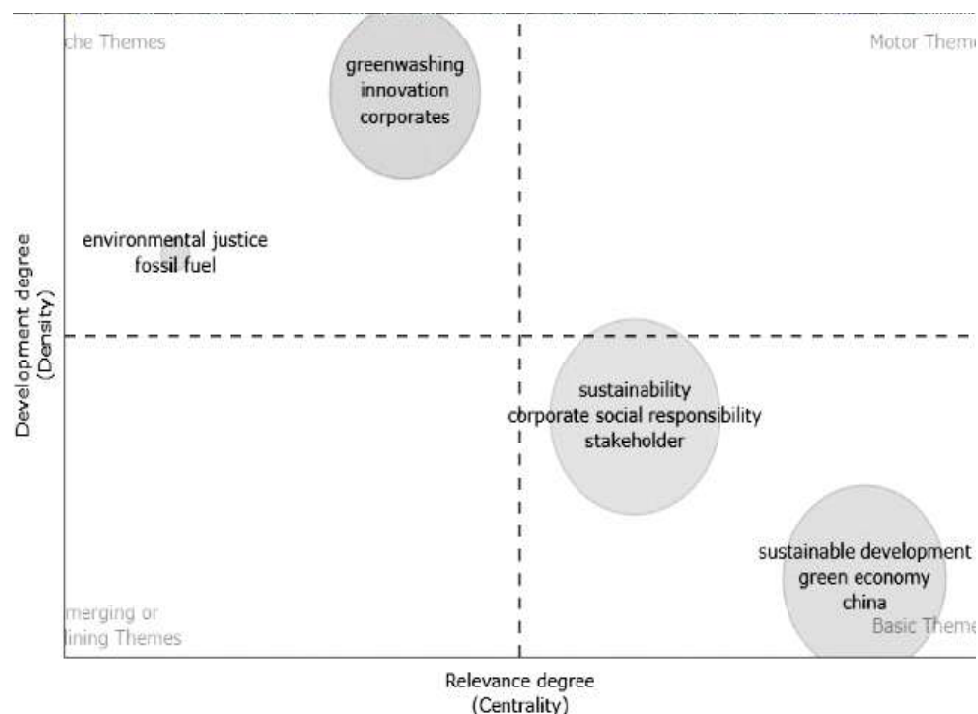


Fig. 8: ThematicMap

The thematic map, constructed using Callon et al.'s (1991) strategic diagram framework, classifies key research areas based on two dimensions: density, representing the degree of theme development, and centrality, representing the degree of thematic relevance. The analysis reveals four distinct thematic categories.

First, the niche themes, characterized by high density but low centrality, include greenwashing, innovation, and corporate practices. The themes are highly internally coherent, indicating strong development within themselves, but are less connected to the broader research field, suggesting specialized yet somewhat isolated lines of inquiry (Cobo et al., 2011).

Interestingly, no themes currently occupy the motor themes quadrant, which would require both high density and high centrality. This absence suggests that, although some topics are well-developed, none yet dominate and integrate the field at a central level.

Basic themes showing high centrality but low density include sustainable development, green economy, and research focus on China. These topics are found at the center and are highly relevant to the field but remain underdeveloped, signifying a need for deeper academic labor and theoretical expansion (Cobo et al., 2011).

Emerging or declining themes, defined by low density and low centrality, are represented by environmental justice and fossil fuels. Their current position could reflect areas in the early stages of academic exploration or those losing prominence over time (Zupic & Šter, 2015).

Additionally, transversal themes such as sustainability, corporate social responsibility (CSR), and stakeholder issues appear near the center of the thematic map. These moderately developed and moderately central topics are important bridges linking various areas within the greenwashing discourse, highlighting their integrative role in the conversation about environmental and corporate ethics.

The thematic map suggests that while corporate greenwashing and innovation are strongly developed, broad foundational concepts such as sustainable development and the green economy require further analytical attention to evolve into dominant motor themes that can drive the field's future direction.

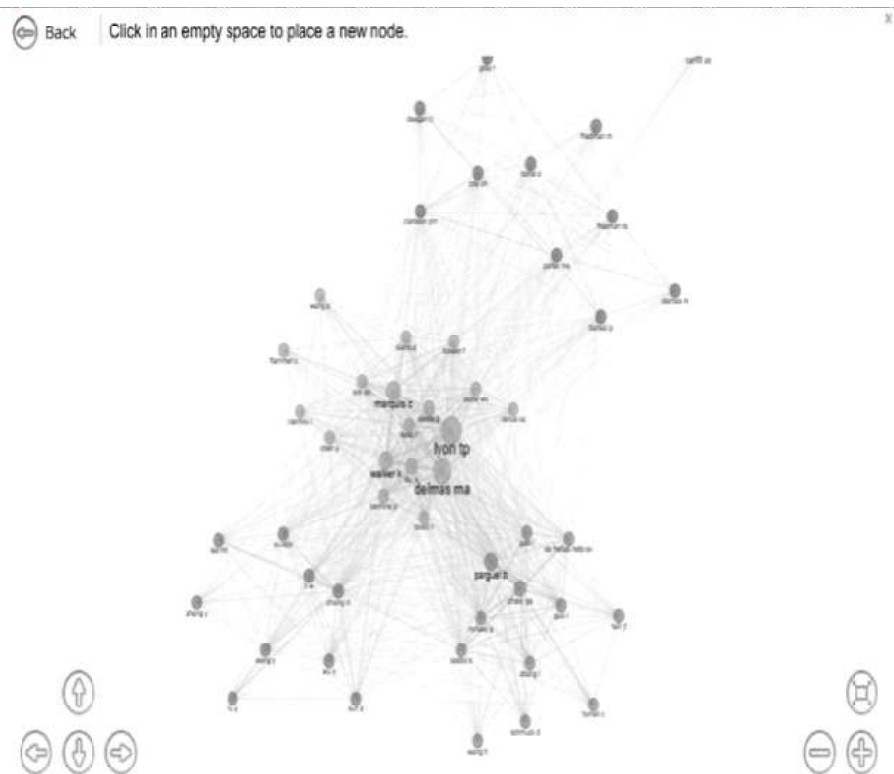


Fig. 9: Co-citation Network

Interpretation of Co-citation Network Map

The co-citation network analysis maps the intellectual structure of the greenwashing research field by examining how frequently authors are cited together. The visualization reveals several tightly interconnected clusters representing distinct but related research streams.

At the centre lies the Central Core Cluster (green nodes), which includes key authors such as Lyon T.P., Delmas M.A., Marquis C., and Walker K. This group is the most densely connected, indicating that their work forms the intellectual heart of the field, particularly in areas concerning corporate environmental strategies, greenwashing behaviour, and sustainability governance. Other influential authors, such as Siano A., Bowen F., Laufer W.S., and Ramus C.A., show strong internal and cross-cluster citation ties, further reinforcing the centrality of this cluster.

Surrounding the core is a group of Classical or Foundational Theorists (red nodes) featuring scholars like Carroll A.B., Freeman R.E., Porter M.E., and Bansal P. These authors contribute foundational theories, such as stakeholder theory, corporate social responsibility (CSR), and competitive advantage through sustainability. Although slightly peripheral to the central greenwashing cluster, their conceptual influence remains strong and historically significant.

A separate Consumer Behavior and Marketing Cluster (blue nodes) also emerges, composed of authors such as Parguel B., Chen Y.S., Guo R., and Hair J.F. This cluster focuses on green consumerism, perceived greenwashing, purchase intentions, and sustainability marketing. The strong internal connectivity within this group suggests a concentrated research agenda around consumer responses to corporate sustainability claims.

Finally, an Emerging Asian Research Cluster (purple nodes) can be observed, with key contributions from Yu Q.P.Y., Zhang Y., and Wang Y. This cluster is more recent and focuses on green practices, CSR, and sustainability initiatives in China, highlighting the growing importance of Asian scholarship within the global research landscape.

The co-citation network indicates that a core group dominates the field focused on corporate environmental strategies, while classical CSR theorists continue to exert foundational conceptual influence. Meanwhile, new application-driven clusters, particularly those centred on consumer behaviour and Asian market dynamics, are gaining prominence and expanding the field's scope.

Country Collaboration Map



Fig. 10: Country
Collaboration Map

Interpretation of Global Research Collaboration Patterns

The international collaboration map visually presents the network of research partnerships among countries based on co-authored scientific outputs. Countries are shaded in varying tones of blue, where deeper shades indicate higher participation in international collaborations. Red arcs represent active collaboration links between countries, highlighting both regional and global partnerships.

Major collaboration hubs include the USA, United Kingdom, China, Australia, Germany, and Italy, prominently shaded and displaying numerous active connections. The USA, in particular, shows extensive collaboration ties spanning Europe, Asia, South America, and Australia, underscoring its central role in the global research network. Similarly, European countries demonstrate a dense web of intra-regional collaborations, especially among the United Kingdom, Germany, France, Spain, and Italy, reflecting a strong tradition of scientific networking within the region.

Regionally, Europe stands out for its high level of interconnectedness, while the Asia-Pacific region, including China, India, Australia, and Japan, is increasingly integrated into the global collaboration landscape. Latin America, led by Brazil, participate sactively, particularly through collaborations with the USA and European partners.

However, the map also highlights under represented regions. Most African nations remainless integrated into the global research network, with South Africa being a notable exception due to its visible international links. Similarly, Central Asia and parts of the Middle East exhibit limited collaboration activity, pointing to geographic gaps in global scientific exchange.

Regarding broader trends, the collaboration network reflects a strong North-North pattern, characterized by frequent partnerships between developed countries. Although South-South collaborations between developing nations appear weaker, emerging ties are visible, particularly among countries like India, Brazil, and South Africa.

The map illustrates that international research collaborations are dominated by a few highly interconnected countries and regions, with the USA and European countries acting as central nodes that facilitate multi-regional scientific exchanges. Strengthening collaborations with underrepresented regions, especially parts of Africa and Asia, represents a key opportunity for creating a more inclusive global research ecosystem.

5. Thematic Analysis:

The selection of the top 10 most-cited articles for thematic analysis was guided by established bibliometric principles that recognize highly cited publications as markers of intellectual influence and foundational impact within a research domain (Garfield, 1972; Small, 1973). Citation frequency is commonly used as an indicator of scholarly recognition and knowledge diffusion, reflecting the extent to which specific studies have shaped subsequent theoretical and empirical developments (Zupic & ater, 2015; Donthu et al., 2021).

In bibliometric research, highly cited works often constitute the "intellectual base" of a field, forming the conceptual backbone of co-citation networks and thematic clusters (Aria & Cuccurullo, 2017). Accordingly, the focused examination of the top 10 most-cited articles was intended to identify the core theoretical foundations and dominant paradigms underpinning greenwashing scholarship. This approach complements the broader science-mapping analysis of the full Scopus dataset (1997-2025), which provides structural breadth, while the targeted thematic analysis offers conceptual depth.

To enhance transparency, the methodological rationale for selecting highly cited publications as representative of foundational scholarship has been clarified in the revised manuscript.

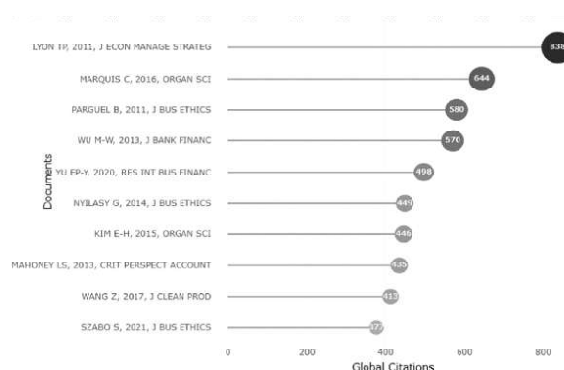


Fig. 11: Most globally cited documents:

Paper	Main Themes
Lyon & Montgomery (2011)	Corporate Strategy and Greenwashing: Firms use greenwashing as a Calculated strategic move, balancing reputation with regulatory risks. Focus on motivations behind deceptive environmental claims.
Marquis & Toffel (2016)	Institutional Pressures and Greenwashing: How external factors like NGOs, media, and regulation influence firms' likelihood to greenwash. Concept of organizational visibility.
Parguel, Benoît - Moreau, & Larceneux (2011)	Consumer Perception of Greenwashing: Development of a conceptual framework for understanding how consumers detect and react to Greenwashing in advertising.
Wu et al. (2013)	Financial Implications of Green Practices: Analyzes the relationship between corporate environmental disclosures and financial performance. Highlights in consistencies between green claims and real practices.
Yu, VanLuu, & Chang (2020)	ESG Performance and Greenwashing: Focus on environmental, social, and Governance (ESG) metrics and their vulnerability to manipulation for reputational gains.
Nyilasy, Gangadhar Batla, & Paladino (2014)	Advertising and Green Skepticism: Studies the effectiveness of green claims And consumer scepticism, proposing that greenwashing damages brand trust significantly.
Kim & Lyon (2015)	Regulation and Green Innovation: Exploration of how weak regulations incentivize greenwashing rather than genuine eco-innovation. Highlights Regulatory gaps.
Mahoney, Thorne, Cecil, & LaGore (2013)	Ethics and Accountability in Green Reporting: Critical view on ethical Lapses in Corporate Social Responsibility (CSR) reports. Discussion of "moral licensing" through green claims.
Wang, Li, & Zhao (2017)	Environmental Certification and Reality Check: Analysis of third-party certifications and their effectiveness in reducing greenwashing risks. Discusses the credibility of eco-labels.
Szabo & Webster (2021)	Systematic Review of Greenwashing Research: Comprehensive mapping of research themes, trends, and gaps. Highlights the need for more empirical Studies and standardized definitions.

Table 3: Thematic Analysis of Top Cited Papers on Greenwashing

Main Theme	Sub-Themes	Papers Highlighting It
Corporate Strategy and Motivations	Strategic greenwashing, balancing reputation vs. risks	Lyon & Montgomery (2011), Kim & Lyon (2015)
Institutional Pressures and Visibility	NGO activism, media scrutiny, Regulatory pressure	Marquis & Toffel (2016), Yu et al. (2020)
Consumer Skepticism and Trust	Green advertising, perceived deception, trust erosion	Parguel et al. (2011), Nyilasy et al. (2014)
Regulatory Gaps and Policy Failures	Weak standards, enforcement gaps, Brown washing risks	Kim & Lyon (2015), Mahoney et al. (2013)
Ethics and Moral Accountability	CSR ethics, moral licensing, fake Sustainability claims	Mahoney et al. (2013), Lyon & Montgomery (2011)
Effectiveness of Third-party Certifications	Credibility of eco-labels, Independent verification	Wang & Li (2017)
Financial and ESG Reporting Impacts	Financial performance, ESG greenwashing risks	Wu et al. (2013), Yu et al. (2020)
Research Gap and Methodological Issues	Definition confusion, need for empirical studies.	Szabo & Webster (2021)

Table 4: Thematic Table: Greenwashing Research (Top Papers)

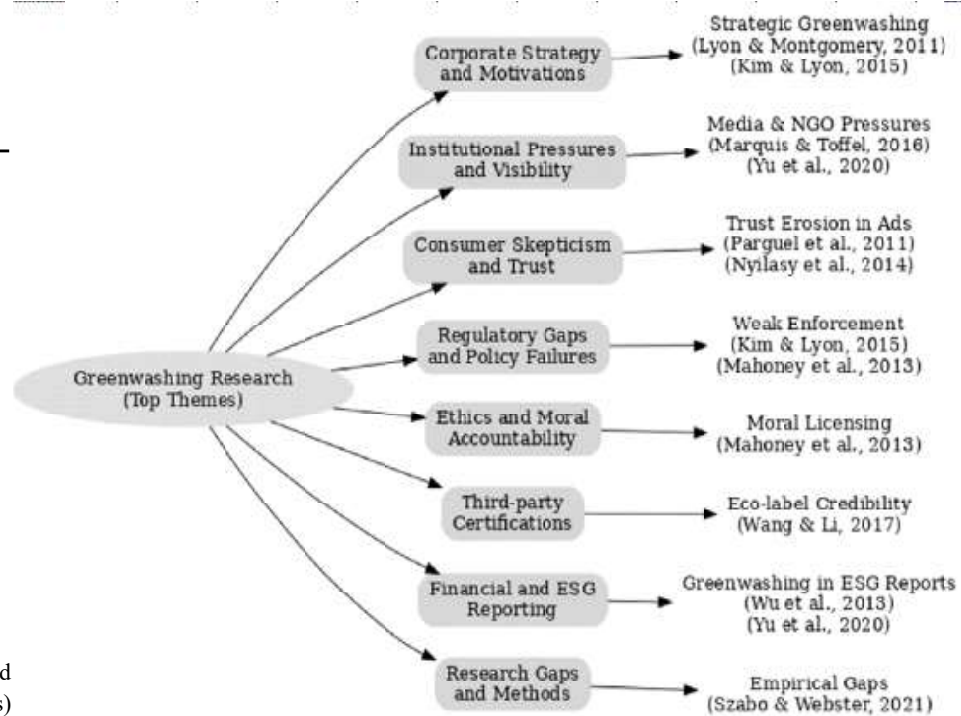


Fig. 12: Thematic mind map (Top Papers)

6. Result and Discussion:

The bibliometric analysis revealed that greenwashing has become an increasingly significant area of academic research, particularly from 2017 onward, with exponential growth recorded between 2022 and 2024. China emerged as the dominant country in greenwashing research output, followed by the USA, the UK, and Italy. Key journals contributing to this field include Sustainability (Switzerland), Business Strategy and the Environment, and Journal of Cleaner Production, which align with Bradford's Law of Scattering (Bradford, 1934). Author collaboration analysis highlighted that while countries like the USA and European nations exhibited strong international research collaboration networks, countries like China primarily published through domestic partnerships.

Thematic mapping and keyword co-occurrence analysis identified three major research clusters: (1) greenwashing and innovation in environmental finance and regulation (Delmas & Burbano, 2011), (2) corporate social responsibility (CSR) communication and stakeholder perception (Parguel, Benoît-Moreau, & Larceneux, 2011), and (3) sustainable development, environmental policies, and the economic impact of green initiatives (Zhang & Wen, 2008). Thematic analysis of the top 10 cited articles revealed that the core debates in the field revolve around corporate strategic motivations for greenwashing (Lyon & Montgomery, 2015), institutional pressures driving environmental disclosures (Marquis & Toffel, 2016), and the complex consumer responses to green marketing and perceived deception (Nyilasy, Gangadharbatla, & Paladino, 2014).

Importantly, scholars like Kim and Lyon (2015) emphasized how weak regulatory frameworks can inadvertently encourage superficial green initiatives rather than substantive environmental innovation. Studies on the effectiveness of third-party certifications (Wang, Li, & Zhao, 2017) pointed out that while eco-labels can mitigate greenwashing risks, their credibility depends heavily on the rigour of certification standards. The co-citation network indicated that foundational scholars such as Lyon, Delmas, and Freeman maintain a strong intellectual influence, with newer research clusters emerging around consumer scepticism and Asian

market dynamics (Yu, Van Luu, & Chang, 2020).

Despite the growing richness of this field, major research gaps persist. Szabo and Webster (2021) identified a lack of standardized definitions and the need for more empirical studies, particularly in developing economies where greenwashing dynamics might differ significantly. Moreover, future research should focus on understanding how digital media, ESG investing trends, an devolving global regulations are reshaping greenwashing practices.

Szabo and Webster (2021) provided an early bibliometric mapping of greenwashing research during its formative stage. The present study advances this foundation by analysing Scopus-indexed publications from 1997-2025, thereby capturing the field's recent phase of rapid expansion and thematic diversification. Using advanced science-mapping techniques in Biblioshiny (Bibliometrix R-package), including co-citation, conceptual structure, and thematic evolution analyses, the study moves beyond descriptive metrics to reveal the dynamic transformation of the field's intellectual architecture. The identification of emerging frontiers such as AI-enabled verification, blockchain-based transparency, ESG integration, and regulatory enforcement mechanisms further distinguishes this contribution and provides a structured, forward-looking research agenda.

7. Conclusion:

Through bibliometric and thematic analyses, the study provides a widespread overview of greenwashing research's rational and thematic landscape. Bibliometric verdicts reveal that greenwashing has progressed from a niche academic interest to a globally significant research field characterized by rapid growth, especially in the past decade. Thematic analysis of the most cited papers emphasizes that corporate strategic behaviour, regulatory inadequacies, consumer scepticism, and ethical concerns a reat the heart of scholarly considerations around greenwashing.

The growing pervasiveness of greenwashing emasculates consumer trust and market fairness and poses serious risks to the global sustain ability agenda (Delmas & Burbano, 2011; Lyon & Montgomery, 2015). As such, academic research plays a vigorous role in exposing deceptive practices and influential regulatory frameworks and informing public attentiveness. Future studies should continue to discourse methodological gaps, explore sector-specific greenwashing phenomena, and analyze the role of emerging technologies like AI and blockchain in authenticating environmental claims. Combating greenwashing requires a multidisciplinary effort that bridges business ethics, environmental science, policy-making, and consumer behaviour research. This study aims to support a more transparent, accountable, and sustainable global marketplace by highlighting existing contributions and pointing toward future directions.

The integration of bibliometric and thematic analyses advances understanding of greenwashing research by moving beyond descriptive aggregation toward structural and conceptual synthesis. Bibliometric techniques, implemented through science-mapping tools, quantitatively identify patterns of knowledge production, intellectual linkages, citation networks, and thematic clustering across a large corpus of literature. These methods reveal the latent structure of the field, including dominant research streams, interdisciplinary connections, and temporal shifts in scholarly focus. However, bibliometric outputs alone remain largely relational and statistical in nature.

The incorporation of qualitative thematic analysis complements these quantitative insights by interpreting the substantive content, theoretical foundations, and conceptual orientations of the identified clusters. This dual approach enables not only the detection of influential research streams but also the explanation of how and why these streams have evolved over time. Thematic interpretation contextualizes network patterns, clarifies conceptual overlaps, and identifies normative, methodological, and empirical gaps that may not be evident through citation metrics alone.

By systematically integrating structural mapping with conceptual synthesis, the study

transforms dispersed findings into a coherent intellectual framework. This approach facilitates theory consolidation, reveals emerging frontiers such as technology-enabled verification mechanisms and ESG integration, and identifies underexplored domains requiring empirical attention. Consequently, the combined methodology produces an analytically grounded intellectual cartography of the field, offering explanatory depth, developmental insights, and a strategic research agenda rather than merely summarizing existing scholarship.

8. Implication of the study:

8.1 Theoretical Implications:

This study contributes to the theoretical consolidation of greenwashing research by integrating fragmented scholarly streams into a coherent intellectual framework. Through longitudinal science mapping (1997-2025), the analysis clarifies the evolution of dominant paradigms—from early legitimacy-based and definitional debates to contemporary discussions centered on ESG integration, regulatory governance, stakeholder scepticism, and technology-enabled verification mechanisms. By identifying core knowledge clusters and emerging conceptual trajectories, the study enhances theoretical clarity, reduces disciplinary fragmentation, and supports the development of a more integrated sustainability and corporate accountability discourse.

8.2 Methodological Implications:

Methodologically, the study demonstrates the value of combining bibliometric science-mapping techniques (via Biblioshiny in the Bibliometrix R-package) with qualitative thematic analysis. This integrative approach moves beyond descriptive performance indicators by uncovering the latent intellectual structure, thematic evolution, and conceptual interconnections within the field. The research highlights the importance of longitudinal and network-based analyses for examining rapidly expanding domains and encourages future scholars to adopt multi-method evidence synthesis techniques to improve analytical rigor, transparency, and replicability in sustainability research.

8.3 Practical Implications:

From a practical perspective, the findings provide actionable insights for policymakers, regulatory authorities, corporate managers, and sustainability auditors. The identification of dominant research themes and emerging frontiers—such as AI-driven environmental claim verification, blockchain-enabled transparency systems, and cross-sector regulatory enforcement—underscores the need for stronger accountability mechanisms and standardized reporting frameworks. By clarifying areas of regulatory inadequacy and consumer vulnerability, the study supports evidence-based policymaking and strategic corporate governance practices aimed at reducing deceptive environmental communication and strengthening stakeholder trust.

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