Environment, Development and Sustainability
https://doi.org/10.1007/s10668-024-04548-y

Visualization of global research trends and future research directions of greenwashing by using bibliometric analysis

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Received: 17 August 2023 / Accepted: 16 January 2024

Abstract
The primary objective of this study is to conduct a bibliometric analysis of Greenwashing Research conducted till date indexed in Scopus. The study aims to discern publication trends, prominent authors, leading countries contributing to the field, influential articles, and noteworthy journals in greenwashing research. The bibliometric analysis was conducted using 260 documents from the Scopus database from 1984 to 2023. The study encompasses articles published in journals categorized as "A*," "A," "B," or "C," according to the Australian Business Deans Council (ABDC) journals list of 2022. The analysis utilized the VOS viewer software to examine and visualize the relationships and patterns within the collected literature. 2022 was the most productive year, with 61 publications displaying a notable increase in Research focusing on greenwashing; notably, Parguel emerged as the most prolific author. Countries such as the United States, United Kingdom, France, China, Italy, and Germany have substantially contributed to this research topic. This paper delves into the realm of Greenwashing practices and behavior, elucidating their connections to sustainability. This study is significant to academicians, marketers, scholars, and policymakers. The future research directions suggested by the researcher in the present study may have implications for attaining Sustainable development goal no. (12), dealing with Sustainable Production and Consumption. This novel study on greenwashing is the first extensive bibliometric analysis conducted on the subject of Greenwashing within this expansive timeframe (1984–2023).

Keywords Greenwashing · Greenwashing perception · Bibliometric analysis · Sustainable development · Sustainable development goals

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Published online: 26 February 2024

1 Introduction

Protecting and conserving the resources and environment worldwide is regarded as one the most significant environmental challenges most businesses and consumers face. It entails adopting sustainable practices, conserving natural resources, and mitigating pollution to preserve ecological balance (Vintró et al., 2014). However, a phenomenon known as greenwashing has emerged amidst the pursuit of environmental protection. Greenwashing refers to the deceptive practices employed by some entities to create an illusion of environmental responsibility while engaging in activities detrimental to the planet, as Delmas and Burbano (2011) stated. This insidious tactic undermines genuine environmental progress by misleading consumers and diluting the significance of authentic sustainability initiatives. Therefore, it is essential to foster transparency, enforce stringent regulations, and promote consumer awareness to combat greenwashing effectively and ensure that genuine efforts towards environmental preservation receive the recognition and support they deserve (Testa et al., 2018). Doing so can foster a culture of genuine sustainability and pave the way for a truly ecologically conscious future.

The concept of sustainability has garnered significant attention within the business realm for an extended period. It is essential to attain sustainable development goals using environmentally friendly products (Singh et al., 2022). There is an unprecedented urgency for businesses to incorporate sustainable development objectives into their operations. This impetus arises from the United Nations' active promotion of the Sustainable Development Goals (SDGs), urging organizations to integrate sustainable practices within their strategic plans. The heart of this issue revolves around the changing perceptions of consumers, moving away from traditional values towards those that prioritize environmental conservation (Kautish et al., 2021) argue that there is a pressing need to prohibit the indiscriminate use of the term "sustainability scourge." This shift reflects a growing consciousness among consumers, demanding greater accountability and genuine commitment to sustainable practices from businesses and industries. As companies navigate this changing landscape, aligning their strategies with these evolving consumer values is imperative to remain relevant and responsible in today's market.

However, a notable challenge arises as "greenwashing," which pertains to the lack of a definitive methodology for verifying the actual climate-friendliness of products or investments (Marcatajo, 2021). Due to the absence of a universally adopted global standard or definition for environmental performance, adherence to environmentally acceptable practices remains voluntary. Consequently, identifying products or services that align with recognized environmental standards poses a considerable challenge. Moreover, the need for more transparency regarding environmental disclosures about firms further compounds this issue, as insufficient data exists to comprehensively examine the impact of environmental standards implementation by Delmas and Burbano (2011).

In order to examine the available literature on a subject matter, bibliometric indicators are emerging as valuable techniques for assessing the research performance of a theme. Several authors in the past have used bibliometrics as an analysis tool across disciplines, including- management (Podsakoff et al., 2008), entrepreneurship (Landström et al., 2012), innovation (Fagerberg et al., 2012), and accounting (Merigó & Yang, 2015). These studies examined broad overviews of the respective research field and included analysis of leading researchers, countries, and institutions (Björk et al., 2014). In contrast to peer review, the bibliometric approaches can be used to easily evaluate a large number of publications. In this regard, the authors of the current study aimed to gain deeper insight into the topic

"greenwashing" through a bibliometric study of the published research articles available from Scopus indexed database and attempted to discover answers to the following research questions:

RQ1: What are the latest research publication trends in the field of greenwashing through Keyword, Author, Country, and Source analysis?

RQ2: What are future research areas in the field of greenwashing?

This study has a dual-fold objective. Firstly, it seeks to illuminate the prevailing global research trends surrounding the phenomenon of greenwashing. Secondly, the study endeavors to discern and delineate potential future research trajectories within the realm of greenwashing. It aims to guide and inspire forthcoming research endeavors by identifying unexplored areas and emerging trends, fostering a deeper understanding and more nuanced exploration of this critical subject. In order to achieve the intended goal of the study, the authors conducted a bibliometric review of data extracted from Scopus on Greenwashing research in social sciences. The researchers used bibliometric data on greenwashing research to answer the framed research questions using the VOS viewer software package (Bhattacharyya, 2023).

The outlined structure begins with Sect. 2, providing a concise overview of the methodology employed. Section 3 delves into the findings derived from this methodology, while Sect. 4 engages in an in-depth discussion. Subsequently, Sect. 5 outlines potential avenues for future Research, while Sect. 6 delineates the implications derived from the study's outcomes. Finally, Sect. 7 encapsulates the conclusions drawn, acknowledging the limitations inherent in the study. Following this structured approach, the study offers actionable insights and recommendations beneficial to stakeholders navigating the evolving landscape of consumer perceptions and sustainable practices.

2 Research methodology

The purpose of the research article is to evaluate the research progress in the area of greenwashing. The bibliometric analysis was performed to attain this objective. Bibliometric analysis is a well-known and easy-to-use tool for conceptually mapping the research topic (Kumar et al., 2020). Various bibliometric analysis methodologies used by the researchers are authorship, bibliographic coupling, co-word analysis, co-citation, and citation analysis to get the results from the information on the biographic data (Donthu et al., 2021). This bibliometric technique leads to the appropriate study of bibliographic data, diagrammatical visualization, and analysis of the data obtained from various sources like Scopus (Donthu et al., 2021; Zupic & Čater, 2015). In this study, the bibliometric analysis is also performed in order to gain significant insights related to the trends in the publication of the research articles, the most famous authors in this field, the top sources, and the most influential articles (Eduardsen & Marinova, 2020; Ren et al., 2020; Singh & Walia, 2022).

2.1 Inclusion–exclusion criteria for bibliographic data

The document search string in the Scopus database focused on the topic of the study, "greenwashing." Fig. 1 displays the inclusion–exclusion criteria used to arrive at the final corpus of 260 research articles. Initially, 863 results were extracted from the Scopus database using the search term ***("Greenwashing" OR "Green washing" OR "Green Washed" OR "Green sheen").***

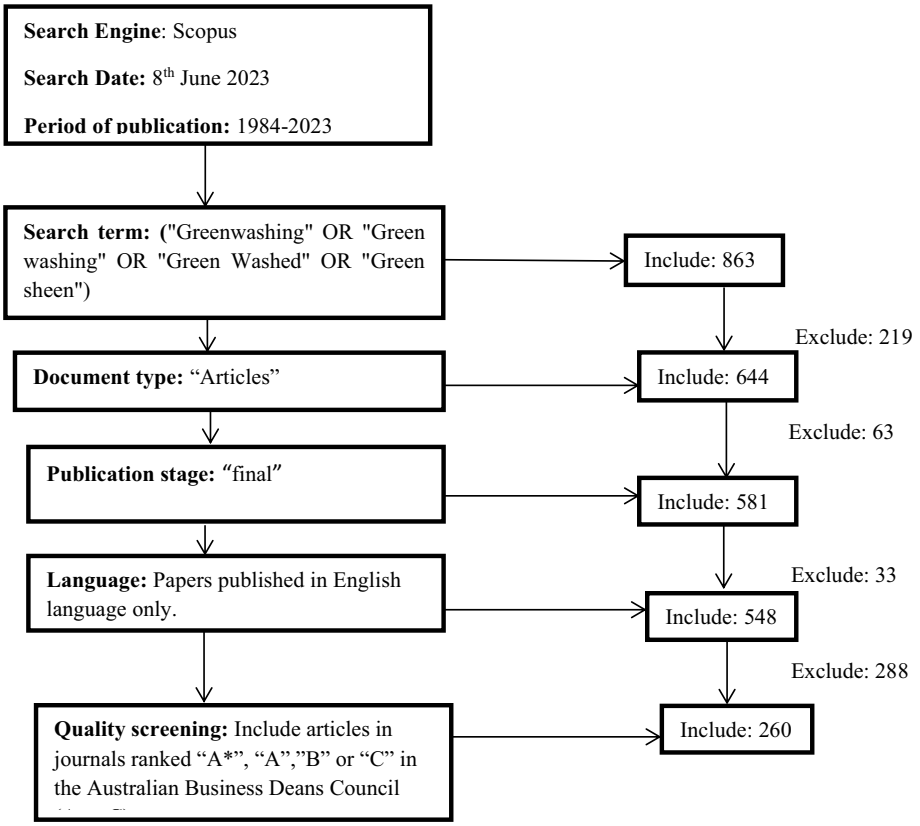

Fig. 1 Search and inclusion–exclusion criteria

In relation to phase 1, the criteria proposed by Chen and Xiao (2016) were adopted to define the keywords at the macro level. The extracted results were again filtered from the selected database at the micro level. The Boolean operation used to retrieve the bibliometric data is described below:

TITLE-ABS-KEY (("Greenwashing" OR "Green washing" OR "Green Washed" OR "Green sheen")) AND PUBYEAR > 1983 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (LANGUAGE, "English"))

As presented, the authors meticulously refined numerous records by employing 'titles, abstracts, and author-provided keywords' for an extensive contemporary investigation. Initially, our search using keywords yielded *863 results*. Subsequently, the next filter of *document type as article* was applied, resulting in *644 articles*. Further refinement based on *the final stage of publication* produced *581 articles*, and *English language* selection yielded *548 articles*. The downloaded data from Scopus or any other online source is prone to error or inaccuracies (Donthu et al., 2021). Hence, the data extracted need to be refined to avoid erroneous diagnoses. The extracted data was then scrutinized for duplicate and redundant entries; final quality assurance of the study was done by including *the research articles that are published in only A*, A, B, and C category journals as per (ABDC) Australian*

Business Deans Council, journal list 2022 which were manually performed yielding a final set of *260 articles* for analysis.

3 Findings

The output of the bibliometric analysis performed on the extracted literature is discussed in this section. The analysis begins with a brief description of the bibliometric data used, followed by a detailed examination of various analysis fields related to sources (journals), authors, keywords, and citations (Ul-Durar et al., 2023). The VoS viewer user interface is applied to perform bibliographic coupling to obtain network visualization for various parameters of interest (Mulet-Forteza et al., 2018). This method helps identify bibliometric links between fields of study. The analysis demonstrates the research publication trends, most influential authors, top countries, top-cited articles, and popular journals for greenwashing.

3.1 Publication trends on greenwashing research

Figure 2 displays the publication trend of greenwashing Research by mapping all the research articles against their corresponding year of publication. Figure 2 indicates that the first article on greenwashing was published in 2005. The most productive years are 2022 (61 research articles), 2023 (42 research articles), 2021 (34 research articles), 2020 (24 research articles), 2018 (20 research articles), 2019 (18 research articles), 2017 (14 research articles), 2014 (11 research articles), 2015 (10 research articles), 2016 (8 research articles), 2012 (6 research articles), followed by five research articles published in 2013.

3.2 Most prominent authors with the maximum number of total citations

The influence of any research contribution is judged by its citation score (Tsay, 2014). The productivity and impact of an author or journal are judged through citations, which decide the h-index, g-index, and m-index (Ding & Cronin, 2011; Egghe, 2006; Hirsch,

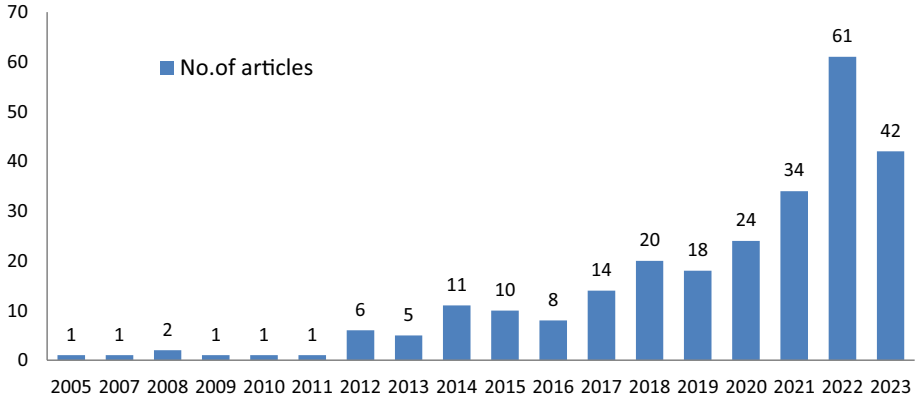

Fig. 2 Research publication trends of the research articles

2005; Tsay, 2014). Table 1 highlights the 15 most influential authors with the maximum number of citations. Parguel B. is the foremost author in greenwashing Research, amassing 499 citations across two publications. Font X. closely follows Parguel B. as the second leading author in greenwashing Research, garnering 414 citations distributed across five publications. Wang Z. holds the third position with 397 citations from 3 publications, followed by Sarkis J. securing the fourth spot with a substantial contribution of 391 citations from 2 publications. Benoit-Moreau F. and Larceneux F. occupy the joint fifth position, each boasting 386 citations from one publication. Testa F. closely follows with 344 citations across three publications. Moving down the list, Marquis C., Toffel M.W., and Zhou Y. are noteworthy, with 294 citations, each contributing through 1 publication. Cecil L., Lagore W., Mahoney L.S., and Thore L. significantly contribute to greenwashing Research, accumulating 292 citations with one publication each. Iraldo F. follows closely with 283 citations from 2 publications within the realm of greenwashing Research.

3.3 Results based on countries, having maximum citations

Figure 3 showcases the country-wise analysis in the context of maximum total citations. Based on the results, it can be seen that greenwashing in the United States has published 57 research articles with 2651 total citations, displaying that it is the leader in writing research papers on this topic of greenwashing. The United Kingdom has published 27 research articles with 1203 total citations. The results indicate that in the future, there is scope for Research on this topic of "greenwashing," especially in India, as it has only seven research documents with a total of 156 citations.

Table 1 15 most influential authors having maximum citations

TC (Total Citations)	Author	TP (Total Publications)
499	Parguel B	2
414	Font X	5
397	Wang Z	3
391	Sarkis J	2
386	Benoit-moreau F	1
386	Larceneux F	1
344	Testa F	3
294	Marquis C	1
294	Toffel M.W	1
294	Zhou Y	1
292	Cecil L	1
292	Lagore W	1
292	Mahoney L.S	1
292	Thorne L	1
283	Iraldo F	2

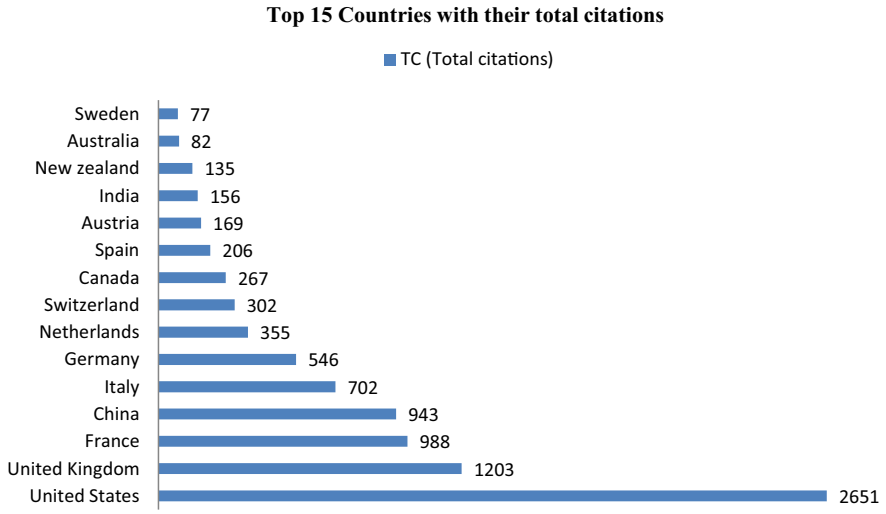

Fig. 3 Top 15 countries with the maximum number of total citations

3.4 Top 15 research articles on greenwashing with maximum number of total citations

Although many research articles are written on greenwashing, Table 2 illustrates the most popular research articles related to greenwashing. The top research article by Parguel et al. (2011), the title of the research article "How Sustainability Ratings Might Deter 'Greenwashing': A Closer Look at Ethical Corporate Communication," has 386 total citations. This article studies how corporations use Corporate Social Responsibility (CSR) to improve their image. The second popular article was written by Marquis et al. (2016) with 294 total citations. The article titled "Scrutiny, norms, and Selective Disclosure: A Global Study of Greenwashing" studies how companies mask their true performance and display transparency in their corporate acts. The third most popular article, "A research note on standalone corporate social responsibility reports: Signaling or greenwashing?" with 292 total citations, by Mahoney et al. (2013) in this article revealed that the CSR performance scores are higher the firms that willingly issue standalone CSR Reports. The fourth most popular article with 271 total citations, "Perceived Greenwashing: The Interactive Effects of Green Advertising and Corporate Environmental Performance on Consumer Reactions." written by Nyilasy et al. (2014), studies the green advertising effect and a corporation's environmental performance effect on the brand attitudes and purchase intentions of the consumers. The fifth most prevalent article, "Legitimizing Negative Aspects in GRI-Oriented Sustainability Reporting: A Qualitative Analysis of Corporate Disclosure Strategies." has 253 citations. Hahn and Lülfs (2014) discuss six legitimation strategies related to symbolic and substantial management. The sixth most cited article, with 245 total citations, is "Corporate Social Responsibility Governance, outcomes, and Financial Performance." Wang and Sarkis (2017) suggest that corporate social responsibility outcomes play a vital role in influencing the financial performance of the companies. The seventh most popular article, having 218 total citations, is "Greenwash vs. Brownwash: Exaggeration and undue modesty in Corporate Sustainability Disclosure" Kim and Lyon (2015). The

Table 2 The top 15 research articles on the topic of greenwashing with maximum total citations

(TC) Total Citations	Authors	Year	Title of the research papers
386	Parguel	2011	"How Sustainability Ratings Might Deter 'Greenwashing': A Closer Look at Ethical Corporate Communication"
294	Marquis	2016	"Scrutiny, norms, and selective disclosure: A global study of greenwashing."
292	Mahoney	2013	"A research note on standalone corporate social responsibility reports: Signaling or greenwashing?"
271	Nyilasy	2014	"Perceived Greenwashing: The Interactive Effects of Green Advertising and Corporate Environmental Performance on Consumer Reactions"
253	Hahn	2014	"Legitimizing Negative Aspects in GRI-Oriented Sustainability Reporting: A Qualitative Analysis of Corporate Disclosure Strategies"
245	Wang	2017	"Corporate social responsibility governance, outcomes, and financial performance"
218	Kim	2015	"Greenwash vs. Brownwash: Exaggeration and undue modesty in corporate sustainability disclosure"
211	Font	2012	"Corporate social responsibility: The disclosure-performance gap"
202	Testa	2018	"Internalization of environmental practices and institutional complexity: Can stakeholder's pressures encourage greenwashing?"
201	Siano	2017	"More than words": Expanding the taxonomy of greenwashing after the Volkswagen scandal
183	Henninger	2016	"What is sustainable fashion?"
181	Zhang	2018	"The influence of greenwashing perception on green purchasing intentions: The mediating role of green word-of-mouth and moderating role of green concern"
163	Sirieix	2013	"Consumers' perceptions of individual and combined sustainable food labels: A UK pilot investigation"
159	Rahman	2015	"Consequences of "greenwashing": Consumers' reactions to hotels' green initiatives"
154	Berrone	2017	"Does Greenwashing Pay Off? Understanding the Relationship Between Environmental Actions and Environmental Legitimacy"

study shows that the choice between greenwashing and brownwashing is affected by corporate output growth, deregulation, and low profits under deregulation. The eighth most prevalent article, having 211 total citations, is "Corporate Social Responsibility: The disclosure-performance gap" (Font et al., 2012). This study focuses on CSR policies and practices in ten international hotel groups that are particularly important to the European leisure market. The ninth most cited article, having 202 total citations, is "Internalization of Environmental Practices and Institutional Complexity: Can Stakeholder's Pressures Encourage Greenwashing?" (Testa et al., 2018). This article displays the determinants proposed by Environmental Management Systems (EMS) essential in internalizing proactive environmental management. The tenth most popular article, having 201 total citations, "More than words": Expanding the taxonomy of greenwashing after the Volkswagen scandal (Siano et al., 2017). The research article broadens the greenwashing concept by introducing a term known as "deceptive manipulation." The eleventh most popular article, "What is sustainable fashion?" has 183 citations (Henninger et al., 2016). The Research interprets the results through a matrix of key criteria and studies sustainable fashion in a person. The twelfth most popular article has 181 citations, "The influence of greenwashing perception on green purchasing intentions: The mediating role of green word-of-mouth and moderating role of green concern" (Zhang et al., 2018). The study demonstrates that the greenwashing perceptions of the consumers have a negative impact on GPI (green purchasing intentions), and the firms should avoid greenwashing practices to ensure an increase in sales. The thirteenth most popular article has 163 citations, "Consumers' perceptions of individual and combined sustainable food labels: A UK pilot investigation" (Sirieix et al., 2013). The study centers on evaluating UK consumers' perceptions of sustainable labels compared to non-sustainable ones. Additionally, it aims to investigate consumer responses to various sustainable labels, exploring how individuals react to different types of sustainable labeling within the UK market. The fourteenth most popular article, "Consequences of "Greenwashing": Consumers' Reactions to Hotels' Green Initiatives," has 159 total citations (Rahman et al., 2015). This study proposed a model recognizing the ulterior motives that cause skepticism among consumers about the hotel's environmental claims, which impacts the consumer's intention to revisit the hotels. The fifteenth most cited article, having 154 total citations, "Does Greenwashing Pay Off? Understanding the Relationship between Environmental Actions and Environmental Legitimacy." This study reveals the situations, in which greenwashing can rebound (Berrone et al., 2017).

3.5 Leading journals for greenwashing research

Table 3 illustrates that the top journals in greenwashing are "The Journal of Business Ethics" and "The Journal of Cleaner Production," with 2230 and 1136 total citations, with 20 and 26 as total publications. It can be seen in the table that the Business Strategy and the Environment journal has published the maximum number of papers from the years 2020–2021. It also highlights that out of 20 top journals, four journals are of the A* category, comprising 20% of the top 20 journals, 11 of the A category comprising 55% of the top 20 journals, 3 of the B category comprising 15% of top 20 journals and 2 in C category comprising of 10% of top 20 journals as shown in Table 3. Thus, this showcases that researchers have good publication scope in these reputed journals.

Table 3 Top 20 leading journals for greenwashing research

Journals	TC	TP	ABDC journal	2005–2014	2015–2017	2018–2019	2020–2021	2022–2023
"Journal of business ethics"	2230	20	A	5	6	4	3	2
"Journal of cleaner production"	1136	26	A		4	3	8	11
"Business strategy and the environment"	700	20	A		1	2	10	7
"Organization science"	512	2	A*		2			
"Corporate social responsibility and environmental management"	385	12	C		1	2	4	5
"Tourism management"	304	3	A*	1		1		1
"Critical perspectives on accounting"	292	1	A	1				
"Journal of business research"	241	4	A		1		1	2
"Journal of advertising"	203	3	A	1		2		
"Journal of sustainable tourism"	191	2	A*	1		2		
"Journal of fashion marketing and management"	183	1	B		1			
"International journal of contemporary hospitality management"	175	3	A	1	1			1
"International journal of consumer studies"	163	1	A	1				
"International journal of advertising"	147	6	A		1		1	4
"Journal of business and technical communication"	125	3	C	1		1	1	
"Public relations review"	124	1	A	1				
"Energy policy"	118	2	A	1			1	
"Research in international business and finance"	114	1	B				1	
"Corporate communications"	110	2	B	1		1		
"Management science"	87	2	A*				1	1

Note TC—(Total Citations); TP—(Total Publication)

3.6 Bibliographic coupling of greenwashing research

Bibliographic coupling analyzes the relationship between different aspects concerning standard references, such as authors, documents, and sources (Park et al., 2019; Small, 1973). Figure 4 illustrates the network visualization derived from bibliographic coupling, depicting document connections. Table 4 exhibits Cluster 1, highlighting the theme of "Perceptions of Sustainable Development and Greenwashing." Cluster 2 showcases the theme of "Corporate Social Responsibility," while Cluster 3 represents "Environmental Ethics and Greenwashing." Cluster 4 focuses on "Corporate Legitimacy about Greenwashing."

Additionally, the table demonstrates the most cited article within each cluster. Table 5 presents the results of bibliographic coupling categorized as Cluster 1, Cluster 2, Cluster 3, and Cluster 4. A comprehensive discussion of these clusters is presented below.

Cluster 1 encapsulates the overarching theme of "Sustainable development and greenwashing perception," focusing on the interplay between sustainable practices and the perception of greenwashing in various industries and investigating how green advertising and environmental performance affect brand attitudes and green purchase intention. On the other hand, (Henninger et al., 2016) examine the term sustainable fashion and its importance for organizations, various experts, and consumers in the market. Cluster 2 highlights the "Corporate Social Responsibility" theme, examining how companies engage with social initiatives and ethical practices within their operations (Mahoney et al., 2013) elaborated on the correlation between companies exhibiting more robust social and environmental performance and their ability to produce more comprehensive Corporate Social Responsibility (CSR) reports. Meanwhile (Hahn et al., 2014), delineate the association between corporate sustainability performance and the creation of corporate sustainability reports. Cluster 3 revolves around "Environmental ethics and greenwashing," exploring the ethical considerations and perceptions surrounding environmentally responsible behavior and potential instances of greenwashing (Marquis et al., 2016). Has explains the circumstance which leads to selective disclosure in corporate activities and limited transparency.

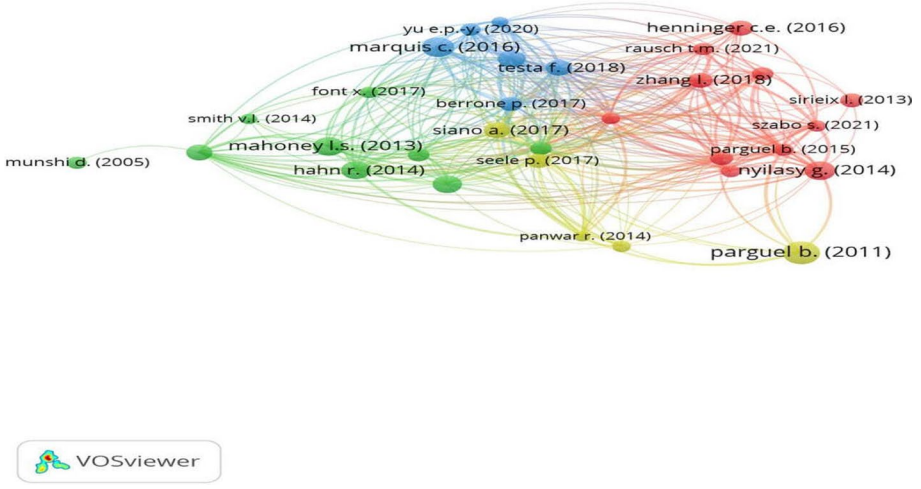

Fig. 4 Network visualization through bibliographic coupling based on documents (*Note* The above-seen clusters display the themes derived through bibliographic coupling based on documents. Cluster 1 = Red nodes; Cluster 2 = Green nodes; Cluster 3 = Blue nodes; Cluster = Yellow nodes)

Table 4 Thematic clusters of greenwashing research

Theme	Author	Year	Title	Total Citations
Sustainable development and Greenwashing perception	Nyilash	2014	"Perceived Greenwashing: The Interactive Effects of Green Advertising and Corporate Environmental Performance on Consumer Reactions"	271
	Henninger	2016	"What is sustainable fashion?"	183
Corporate social responsibility	Mahoney	2013	"A research note on standalone corporate social responsibility reports: Signaling or greenwashing?"	292
	Hahn	2014	"Legitimizing Negative Aspects in GRI-Oriented Sustainability Reporting: A Qualitative Analysis of Corporate Disclosure Strategies"	253
Environmental ethics	Marquis	2016	"Scrutiny, norms, and selective disclosure: A global study of greenwashing"	294
	Kim	2015	"Greenwash vs. Brownwash: Exaggeration and undue modesty in corporate sustainability disclosure"	218
Corporate legitimacy	Parguel	2011	"How Sustainability Ratings Might Deter 'Greenwashing': A Closer Look at Ethical Corporate Communication"	386
	Siano	2017	"More than words": Expanding the taxonomy of greenwashing after the Volkswagen scandal	201

Table 5 The results of bibliographic coupling categorized as Cluster 1, Cluster 2, Cluster 3 and Cluster

Clusters	Authors
Cluster 1	Nyilasy (2014), Henninger (2016), Parguel (2015), Szabo (2021), Sirieix (2013), Zhang (2018), Rausch (2021), De vries (2015), Rehman (2015), Schmuck (2018) and Torelli (2020)
Cluster 2	Mahoney (2013), Hahn (2014), Munshi (2005), Font (2017), Font (2012), Smith (2014), Du (2015), Wang (2017) and Wang (2018)
Cluster 3	Marquis (2016), Yu (2020), Testa (2018), Berrone (2017), Dahlmann (2019) and Kim (2015),
Cluster 4	Parguel (2011), Siano (2017), Seele (2017), Panwar (2014) and Schoeneborn (2013)

Meanwhile, Kim and Lyon (2015) discuss the theory of organization information disclosure and the driver that leads to exaggeration. Finally, Cluster 4 centers on the theme of "Corporate legitimacy about greenwashing," investigating how a company's credibility and legitimacy are influenced by its handling of accusations of greenwashing and sustainable practices (Parguel et al., 2011) research indicates that companies employ corporate ethical marketing practices and engage in Corporate Social Responsibility (CSR) to enhance their corporate image. On the other hand (Siano et al., 2017), investigate various forms of greenwashing behaviors concerning corporate social responsibility, shedding light on deceptive manipulations within corporate practices.

These clusters offer unique perspectives that delve into various dimensions of sustainability, ethics, and corporate conduct. They provide specific frameworks for scrutinizing the intricacies of greenwashing and responsible business practices within a larger context. By exploring these distinct lenses, researchers can gain comprehensive insights into how businesses navigate environmental responsibility, ethical considerations, and sustainable practices while addressing challenges related to greenwashing and promoting responsible conduct.

3.7 Thematic trends of greenwashing research

Further studying the underpinning and the topics derived by co-citation analysis and bibliographic coupling, we developed thematic tendencies in greenwashing research studies using co-occurrence analysis. The author's keywords were used for the same. These keywords are chronologically filtered to know the main greenwashing developments that feature at least three articles in the review corpus. Figures 5, 6, 7 and 8 depicts this theme of research growth. The Research on greenwashing *between 2005 and 2014*, as depicted in Fig. 5, predominantly centered on the environment and sustainable development (green nodes). This research era's focal points revolved around greenwashing, green marketing, and sustainability (red nodes). Notably, during this early stage, there was a growing recognition of the importance of consumer awareness concerning green marketing and sustainability, signifying the emergence of these concepts in academic exploration. Research conducted *between 2015 and 2017* on greenwashing, as illustrated in Fig. 6, focuses on sustainability and corporate social responsibility (red nodes). Notably, there was a heightened emphasis on studies related to greenwashing in China during this period, signifying an emerging and notable trend. Moreover, corporate social responsibility gained increased significance during this timeframe. Research conducted *between 2018 and 2020* in greenwashing studies encompassed various themes, as depicted in Fig. 7.

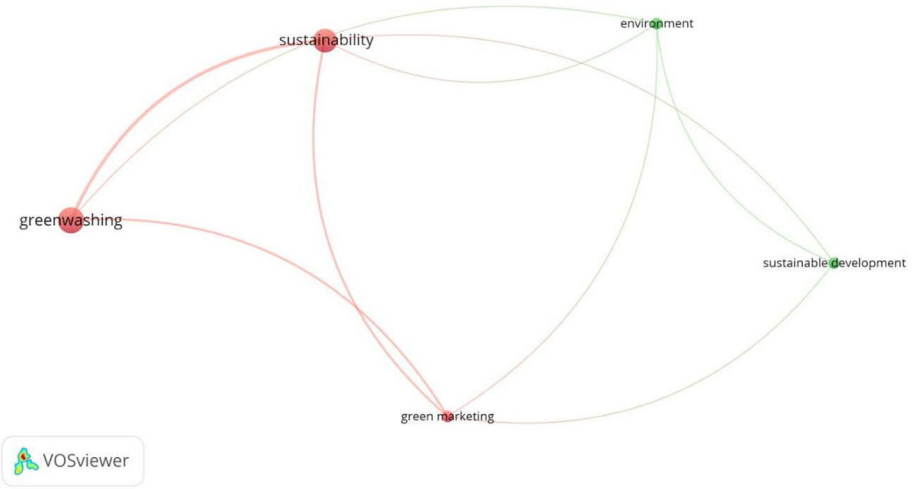

Fig. 5 Influential topics in the year 2005–2014 (*Note* Green nodes = environment and sustainable development, Red nodes = greenwashing, green marketing and sustainability)

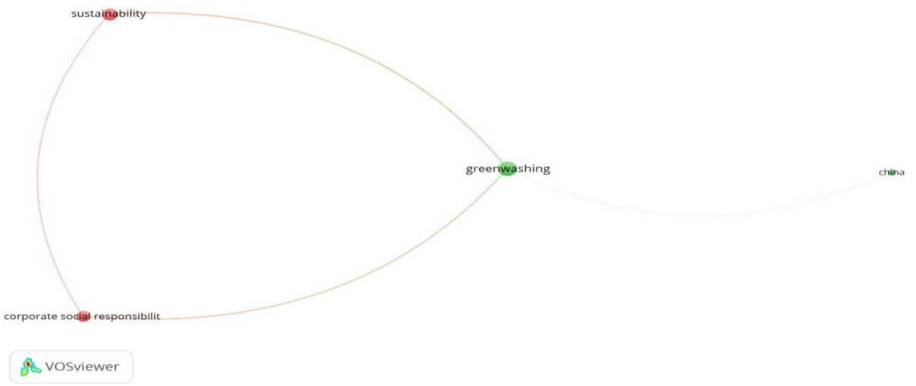

Fig. 6 Influential topics in the period of 2015–2017 (*Note* Green nodes = greenwashing and China, Red nodes = sustainability and corporate social responsibility)

This included exploration into greenhouse gas emissions, environmental performance, corporate social responsibility, and greenwashing (green nodes). Additionally, there was a focus on environmental policy, stakeholder engagement, sustainability, corporate social responsibility, and sustainable development (red nodes). Furthermore, attention was directed toward Corporate social responsibility, Environmental, Social, and Governance (blue nodes), and green marketing (yellow nodes). These findings suggest that the research scope expanded to encompass broader environmental and sustainable development themes during this timeframe. The studies performed on greenwashing *between 2021 and 2023* are shown in Fig. 8. During this period, significant emphasis was placed on exploring themes such as green marketing, climate change, sustainable finance, and greenwashing (green nodes) in Academic Research. There was also a focus on environmental performance, green bonds, corporate governance, financial performance, and certification (red nodes).

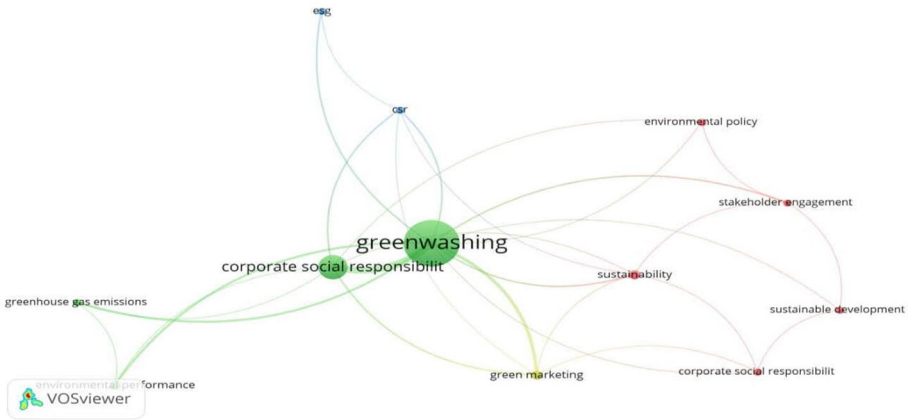

Fig. 7 Influential topics in the year 2018–2020 (*Note* Green nodes = greenhouse gas emissions, environmental performance, corporate social responsibility and greenwashing; Red nodes = environmental policy, stakeholder engagement, sustainability, corporate social responsibility and sustainable development; Blue nodes = CSR and ESG (Environmental, Social and Governance); Yellow nodes = green marketing)

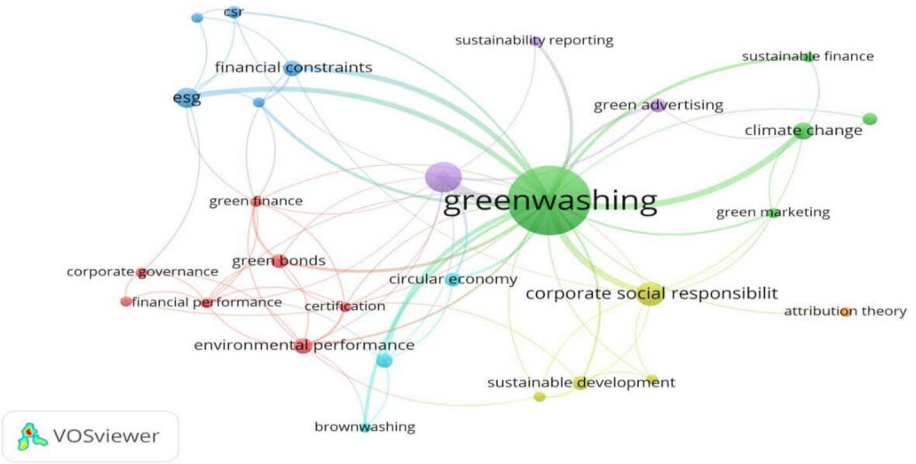

Fig. 8 Influential topics in the year 2021–2023 (*Note* Green nodes = green marketing, climate change, sustainable finance and greenwashing; Red nodes = environmental performance, green bonds, green finance, corporate governance, financial performance, certification; Blue nodes = CSR and ESG (Environmental, Social and Governance), financial constraints, brownwashing, circular economy; Purple nodes = green advertising and sustainability reporting; Yellow nodes = corporate social responsibility, attribution theory and sustainable development)

Additionally, attention was given to Corporate Social responsibility and Environmental, Social, and Governance, financial constraints, brainwashing, and the circular economy (blue nodes). Topics related to green advertising and sustainability reporting (purple nodes) were also prominent. Particularly noteworthy was the considerable Research devoted to studying the phenomenon of greenwashing, promoting sustainability reporting, and assessing environmental performance within this timeframe.

There is a critical need for studies dedicated to developing and implementing stringent policies. Research in this area should focus on formulating robust policies and analyzing their effective execution. Understanding the challenges, assessing the feasibility, and evaluating the outcomes of implementing such policies will ensure their success in addressing various issues, particularly sustainability, environmental protection, and social welfare. These studies will contribute to attaining Sustainable Development Goal 12 (Responsible production and consumption) of the 2030 agenda, which strives to promote sustainable consumption and production patterns and to take urgent action to combat climate change and its impacts on sustainable development.

4 Discussion

This Research offers an extensive analysis of global research patterns related to greenwashing, utilizing data obtained from publications indexed in Scopus. The study encompasses 260 articles published in journals categorized as "A*," "A," "B," or "C," according to the Australian Business Deans Council (ABDC) journals list of 2022. From 1984 to 2023, the study aims to discern publication trends, prominent authors, top journals, leading countries contributing to the field, influential articles, and noteworthy journals in greenwashing Research. Employing the VOSviewer software, bibliographic coupling was utilized to identify publication themes, trends, and hot topics within greenwashing. This comprehensive analysis enhances researchers' understanding of prevailing research subjects and advancements in the field.

Between 2021 and 2023, there has been a notable increase in Research focusing on greenwashing, alongside a substantial emphasis on advocating sustainable development practices. Parguel emerged as the most prolific author in contributing to greenwashing Research. One of the noteworthy research papers titled "How Sustainability Ratings Might Deter 'Greenwashing': A Closer Look at Ethical Corporate Communication." garnered 386 citations, indicating its significant impact in the field. The "Journal of Cleaner Production" also stood out as the publication with the most articles related to greenwashing Research. On the other hand, the "Journal of Business Ethics" received the highest number of citations for Research on greenwashing. Countries such as the United States, the United Kingdom, France, China, Italy, and Germany have substantially contributed to this research topic, signifying their involvement and interest in advancing knowledge and understanding of greenwashing. *From 2005 to 2014,* the Research primarily focused on various facets, including the environment, sustainable development, greenwashing, green marketing, and sustainability. Shifting to the period *between 2015 and 2017*, studies concentrated on sustainability, corporate social responsibility, and greenwashing. Subsequently, *from 2018 to 2020*, Research expanded to encompass diverse themes such as greenhouse gas emissions, environmental performance, corporate social responsibility, environmental policy, stakeholder engagement, sustainability, CSR, ESG (Environmental, Social, and Governance), and green marketing. Moreover, spanning *from 2021 to 2023*, research interests further broadened to include topics like green marketing, climate change, sustainable finance, greenwashing, environmental performance, green bonds, green finance, corporate governance, financial performance, Corporate Social responsibility, Environmental, Social, and Governance, financial constraints, brownwashing, circular economy, green advertising, sustainability reporting, corporate social responsibility, and sustainable development.

These evolving research trends over the years reflect the widening scope and increased depth of investigations into various aspects of greenwashing, sustainability, corporate conduct, and environmental issues within academic studies.

5 Future research directions

Considering greenwashing studies from the past context, it is essential to know the future research areas of concern. Through an analysis of pertinent literature, this study aims to set a foundation for the emerging research growth on greenwashing. This groundwork will enable future researchers to explore the significant contributors of studies on greenwashing practices worldwide.

Harnessing technology for the advancement of sustainable development is pivotal. Future research topics should contribute towards achieving Sustainable Development Goal 12 of the 2030 Agenda, which strives to promote sustainable consumption and production patterns. Exploring how technological innovations can be utilized to optimize resource usage, minimize waste, foster eco-friendly production methods, and encourage responsible consumption behaviors will be crucial for realizing the objectives outlined in SDG 12. Research in this realm will facilitate the transition towards more sustainable practices and systems globally.

Future researchers should prioritize analyzing the alignment of corporate practices with the Sustainable Development Goals (SDGs). It is crucial to evaluate these alignments' impact on societal well-being and their contribution to environmental preservation. Understanding how corporate strategies, operations, and initiatives correspond with the SDGs will offer valuable insights into their effectiveness in tackling social and environmental challenges. This analysis will aid in quantifying the concrete contributions made by businesses toward advancing overarching sustainability goals. It will significantly contribute to attaining Sustainable Development Goal 13 of the 2030 agenda to take urgent action to combat climate change and its impacts on sustainable development. Another vital domain could be investigating corporate behavior when transitioning towards environmentally friendly practices. This Research could explore how companies navigate and adapt their strategies, operations, and policies while embracing environmentally conscious initiatives. Understanding the motivations, challenges, and outcomes of corporate efforts toward sustainability can provide valuable insights into the dynamics and impact of businesses' green endeavors on the environment and society.

Future research studies could explore consumers' perceptions of greenwashing, examining how these perceptions influence consumers' attitudes toward green products and subsequently affect their intention to purchase green products. Moreover, the impact of personality traits and demographic variables (age, gender, occupation, income, and education) can be studied as a moderator between consumers' greenwashing perceptions and their attitudes towards green products. Additionally, researchers could identify the factors contributing to consumers' perceptions of greenwashing.

6 Implication of the study

The current Research has significant implications for academicians, scholars, marketers, and policymakers. It offers a comprehensive understanding of the established Research within this field. Individuals can access these articles to address the ongoing challenges faced in academia and industry by identifying the influential contributors or substantial

contributions to this area of Research. Moreover, this knowledge will enable them to identify the gaps existing in the current body of literature and pinpoint potential directions for future Research, aiding in the planning and executing upcoming studies. Additionally, this understanding will assist scholars in effectively publishing their work in high-impact journals. Marketers can cultivate customer loyalty benefits by steering transparent greenwashing practices and actively promoting sustainable development. Such an approach fosters sustainable business development and contributes to sustainable growth. Marketers can build consumer trust by prioritizing genuine sustainability efforts over misleading marketing tactics, leading to long-term loyalty. This strategy benefits businesses and plays a vital role in fostering a more sustainable future. Integrating greenwashing and sustainable development into the curriculum is essential to advance quality education. This inclusion will raise awareness among students and academics about the advantages of producing green products, thereby contributing significantly to achieving Sustainable Development Goals No. 12 and 13. Such education will empower individuals with the knowledge and understanding necessary to support environmentally friendly manufacturing and production practices, fostering a more conscientious approach to sustainable development.

6.1 Policy implications

The government needs to strictly follow the punishment mechanism and strengthen the supervision and inspection of local enterprises to discover any greenwashing practices. It will help to improve the transparency of the firm's environmental performance; a multi-stakeholder supervision system that includes the government, society, and the public should be established to monitor greenwashing. The government should immediately implement punishment measures for greenwashing enterprises. To improve the local government's enthusiasm for controlling greenwashing, it is also necessary to strengthen the assessment ability of government officials on indicators such as local green development and innovation capabilities. Enhancing corporate social responsibility (CSR) initiatives is imperative. A more substantial commitment to CSR leads to increased psychological costs for engaging in greenwashing practices.

6.2 Social implications

The findings of this current study have the potential to offer valuable guidance for researchers seeking to undertake more comprehensive investigations into the behavior and practices associated with Greenwashing. Moreover, these insights can play a pivotal role in assisting policymakers in formulating effective policies, particularly in non-sustainable activities, where Greenwashing is a significant concern. Moreover, it provides insight for the marketer to follow green practices for long-term sustainable growth and development.

7 Conclusion

The current research study employs bibliometric analysis to uncover citation patterns, co-citation networks, and other crucial insights within "Greenwashing." This study utilizes the Scopus-indexed database, covering a substantial timeframe from 1984 to 2023, offering a comprehensive overview of research trends, thematic mapping, influential authors, top-contributing countries, and prominent journals in the field. Notably, this is the first

extensive bibliometric analysis conducted on the subject of Greenwashing within this expansive timeframe. Including articles from ABDC Journals enriches the analysis, providing valuable insights into this research area. The thematic mapping diagrams presented in this study elucidate key themes within Greenwashing Research, offering guidance and direction for future researchers seeking to delve deeper into this domain. The researcher has outlined future research directions that align with achieving Sustainable Development Goal (SDG) No. 12, aimed at promoting sustainable consumption and production patterns. Additionally, these directions are designed to contribute to SDG 13, which involves urgently combating climate change and its impacts, thereby fostering sustainable development. This Research addresses crucial challenges by advocating for more sustainable consumption, production, and climate change mitigation practices, emphasizing their vital role in achieving broader sustainability goals.

The study is limited to data extracted from the Scopus-indexed database for the bibliometric analysis. In the future, researchers can do combined studies of bibliometric analysis using the Scopus database and the Web of Sciences, as many quality publications are published in either. Moreover, using bibliometric analysis on the Science Citation Index (SCI), Social Sciences Citation Index (SSCI), and publications listed in the Australian Business Deans Council (ABDC) can offer valuable insights into the research landscape within high-quality publications.

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