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Bibliometric Analysis of ESG Performance from 2019 to 2024 Using VOSviewer

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ABSTRACT

Environmental, Social, and Governance (ESG) performance has become a central focus in sustainable business practices, influencing investment decisions and corporate strategies globally. This study aims to map and analyze the academic landscape of ESG performance research from 2019 to 2024 using bibliometric techniques, identifying key trends, influential contributors, and research gaps. A total of 974 Scopus-indexed articles were retrieved using Publish or Perish (PoP) software, with the search keyword "ESG Performance" applied to titles, abstracts, and keywords. Data cleaning and filtering were performed using Mendeley, and analysis was conducted using VOSviewer for citation, co-authorship, co-occurrence, and term trend visualizations. The most cited year was 2022, with 8,405 citations. A total of 2,299 authors contributed to ESG performance studies. The most frequently used keyword was "ESG Performance" (117 occurrences). China, India, and Russia were among the top contributing countries. Nine conceptual clusters emerged, with emerging themes including green innovation and digital transformation. ESG research has grown significantly in recent years, yet certain areas such as artificial intelligence, ROE, and CEO narcissism remain underexplored. These gaps offer valuable directions for future research in corporate sustainability.

1. INTRODUCTION

Environmental, Social, and Governance (ESG) performance has become a cornerstone in contemporary business practices, shaping how companies manage their environmental impact, social responsibility, and corporate governance structures. As ESG factors increasingly influence investment decisions, corporate strategies, and public policies, there is a growing body of academic literature dedicated to understanding and analyzing these components [1]. From academic research to institutional reports and government regulations, ESG performance is an evolving area of study that requires a thorough understanding of trends, challenges, and best practices [2].

Bibliometric analysis offers a powerful methodology to assess the volume, evolution, and impact of academic literature on a particular subject [3]. By quantifying the frequency of publications, citations, co-authorships, and keyword occurrences, bibliometric methods can uncover important patterns in research trajectories, highlight influential authors and papers, and identify emerging themes within a field [4].

This study employs VOSviewer, a tool specifically designed for creating and visualizing bibliometric networks, to analyze the literature on ESG performance from 2019 to 2024. VOSviewer allows for the exploration of relationships between keywords, authors, and cited references, providing a visual representation of how the ESG research landscape has evolved over the past five years. Through a combination of co-occurrence analysis of keywords, co-authorship mapping, and citation analysis, this bibliometric review aims to offer insights into the prominent research areas, influential contributors, and shifts in ESG performance scholarship.

By utilizing VOSviewer, this bibliometric analysis provides a detailed view of the ESG research field, offering a data-driven overview of its academic growth and identifying gaps and future opportunities for research. The findings will help researchers, practitioners, and policymakers better understand the current state of ESG scholarship and guide future developments in the field.

Because bibliometric research on ESG Performance issues remains uncommon, finding examples of problem-posing analyses on bibliometric topics can be difficult. Assume one is interested in the most recent and far-reaching international development of articles on ESG Performance from 2019 to 2024. In that case, the method used in the form of bibliometric analysis contributes to the novelty of the research assembled. Based on the preceding, the problem formulation for the research question is as follows:

RQ$_1$: What about the citations in the 2019-2024 ESG Performance article?

RQ$_2$: What are the trends in the publication of ESG Performance articles in 2019-2024?

RQ$_3$: How did authors collaborate on ESG Performance articles in 2019-2024?

RQ$_4$: What are the trend terms in the title of the ESG

Performance articles in 2019-2024?

RQ$_5$: What are the trend terms of author keywords in ESG Performance in 2019-2024?

RQ$_6$: What are the trend terms of abstracts in the ESG Performance article in 2019-2024?

RQ$_7$: Which country conducts ESG Performance research most frequently in 2019-2024?

RQ$_8$: What factors dominantly influence ESG Performance articles for 2019-2024?

RQ$_9$: How is the development of ESG Performance article research in 2019-2024?

RQ$_{10}$: What are the future research objectives regarding ESG Performance?

2. METHOD

A systematic literature review refers to a structured process aimed at locating, assessing, and synthesizing existing research evidence in order to answer clearly formulated research questions [5]. It can also be understood as a methodology for examining a body of scientific work to produce insights, critical reflections, and directions for future studies, including the formulation of new research questions [6, 7]. Conducting such a review generally involves five main stages: defining the research questions, gathering relevant materials, selecting and evaluating the literature, synthesizing and analyzing the findings, and finally presenting the results. In this study, the review was carried out step by step, beginning with electronic searches of journal articles from major academic databases, particularly Scopus.

2.1 Research design

The field of ESG performance has garnered increasing attention in both academic research and practical applications across industries. ESG performance metrics are central to evaluating corporate sustainability, social responsibility, and governance practices. As ESG has become a critical factor for investors, policymakers, and corporations, understanding the academic literature on this subject is essential for tracking trends, identifying key research themes, and informing future studies. This research aims to conduct a bibliometric analysis of the ESG performance literature from 2019 to 2024. The analysis will use VOSviewer to visualize and explore patterns in the literature, such as the evolution of ESG-related topics, the relationships between keywords, and the structure of author collaboration networks. The data will be extracted from Scopus, one of the most comprehensive citation databases for peer-reviewed research.

2.2 Research procedure

The research procedure outlines the step-by-step process for conducting a bibliometric analysis of ESG performance literature from 2019 to 2024 using VOSviewer and data from the Scopus database. This process involves several key phases: data collection, data cleaning and preparation, analysis in VOSviewer, visualization, and interpretation of the results [8].

2.3 Examination procedure stage

The examination procedure stage in the bibliometric analysis of ESG performance from 2019 to 2024 using VOSviewer involves a systematic review and assessment of the entire analysis process to ensure accuracy, validity, and robustness of the results. This stage serves to evaluate and validate the findings derived from data collection, analysis, and visualization. Publish or Perish (PoP) is a software or a search engine tool used to locate bibliographies as a starting point for data collection [9]. In this study, Scopus served as the primary data source for PoP searches. As a result, Scopus has become one of the largest and most prestigious databases for peer-reviewed literature and publications. The bibliography for this study was limited in several ways. The first types of bibliographies used were journal articles, series books, novels, and conference papers. The second was " ESG Performance." The chosen keywords were referred to as "ESG." The search was restricted to the years 2019 to 2024.

2.4 Bibliography selection stage

It was carried out to sort or select the journals evaluated. The types of data that were downloaded and used were journal articles indexed by Elsevier and Emerald. In its initial search results, the PoP program returned 974 bibliographies (see Table 1). Only peer-reviewed journal articles were included. Conference papers, books, and gray literature were excluded. Articles were indexed from various publishers, with Elsevier and Emerald emerging as the dominant sources (not filtered a priori). A total of 974 bibliographies were then selected for investigation. Some bibliographies were not chosen because they did not meet the requirements. Data were collected using PoP software, sourced from Scopus as the primary database. The exact search query was: “ESG Performance” applied to Title, Abstract, and Keywords, with publication years limited to 2019-2024.

Table 1. Bibliographic selection results

Publication Year	Selected	Non-Selected	Total
2019	54	0	54
2020	120	0	120
2021	200	0	200
2022	200	0	200
2023	200	0	200
2024	200	0	200
Total	**974**	**0**	**974**

Source: Literature Scopus (2024)

2.5 Bibliographic attribute stage

The Mendeley program was utilized to save files from library reference sources for later review. The bibliographic metadata was double-checked and found to be complete for bibliographic analysis. Filters were then verified for author name, article title, author keywords, abstract, year, volume, issue number, page, country, number of citations, article links, and publisher. Metadata were exported to Mendeley and screened for completeness. Entries with missing fields (author, year, title, abstract, keywords, or citations) were excluded to maintain analytical accuracy. After the metadata was completed, the bibliometric analysis began.

2.6 The cleaned dataset (n=974) was imported into VOSviewer 1.6.20. analyses included

- Citation Analysis (excluding self-citations)
- Co-authorship Network (min. 5 documents per author)
- Keyword Co-occurrence (min. 10 occurrences)

- Overlay Visualization (for temporal term evolution)
- Density Mapping (to identify under-researched topics)

2.7 Bibliometric analysis stage

The wording of the identified problem was used as the criterion for bibliometric analysis. VOSviewer can be used to run a bibliometric analysis and display the results. VOSviewer was used because it is safe and efficient when dealing with large amounts of data and can provide a variety of visuals for presentations, investigations, and other purposes.

3. RESULTS AND DISCUSSION

3.1 Citation analysis

In scientific academia, the value of publishing scientific works can be measured in several ways, one of which is by the number of times other scholars mention the works; only then can the work be considered useful. The majority of works mentioned or occasionally cited reveal the work as a topic of debate or discussion among researchers. According to the findings of this study's citation analysis, there were 27,752 citations per year from 2019 to 2024. Citation patterns exposed a wide range of patterns. In addition, the year with the most citations was 2022, with 8,405 citations, followed by 2021 (7,737 citations), 2023 (4,668 citations), 2020 (3,962 citations), 2019 (2,190 citations), and 2024 (790 citations). Citations were normalized per publication year. Self-citations were excluded. The total citation count was 27,752, with 2022 as the peak year (8,405 citations). This reflects heightened interest during the post-COVID sustainability shift.

3.2 Publications trend analysis

Determining the quantity is the purpose of computing the number of studies published in scientific journals and periodicals by productive researchers and authors [10, 11]. In general, there has been a decrease and an increase in the publication of articles on ESG Performance over the previous five years. This pattern indicates that article authors from various countries are increasingly interested in the topic of ESG Performance.

Figure 1 shows increasing publication volume, especially between 2021-2024. ESG gained attention alongside global regulatory efforts and investment frameworks (e.g., EU Taxonomy). The first type of cluster occurred in 2019 with low publication rates. The second cluster, occurring in 2020, with 2021-2024 have the same publication rates.

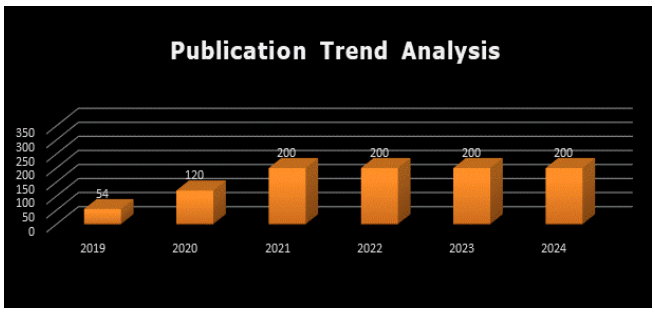

Figure 1. Global publication trends in ESG performance research (2019-2024)
Source: Literature Scopus (2024)

3.3 Author collaboration analysis

Because research is not usually done independently, collaborative writing is required [12, 13]. As a result, there is the opportunity for researchers and agencies to collaborate on ideas, resources, and facilities, as well as share information, skills, and specific approaches in science (Figure 2) [12].

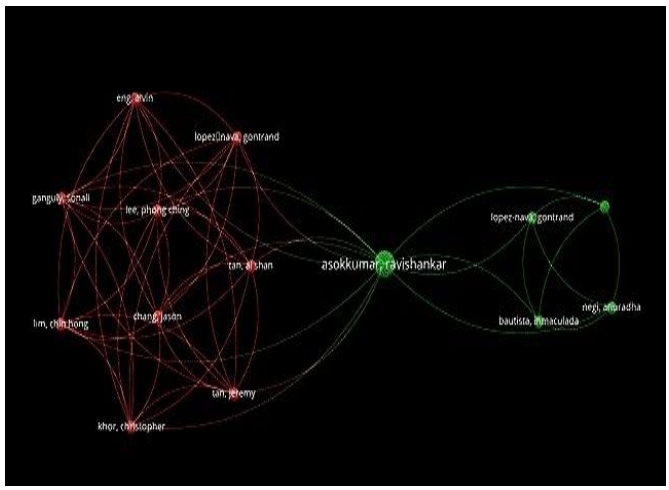

Figure 2. Mapping global research synergies: Author collaboration visualization
Source: Output VOSviewer (2024)

Out of 2,299 authors, Asokkumar Ravishankar was the most collaborative (117 links). VOSviewer parameters: min. authors =5, full counting method, association strength normalization.

3.4 Trend analysis of title terms

This study examined the content, patterns, and trends of a collection of documents by analyzing the strength of phrases and counting the number of keywords from a research paper at the same time [9, 14, 15].

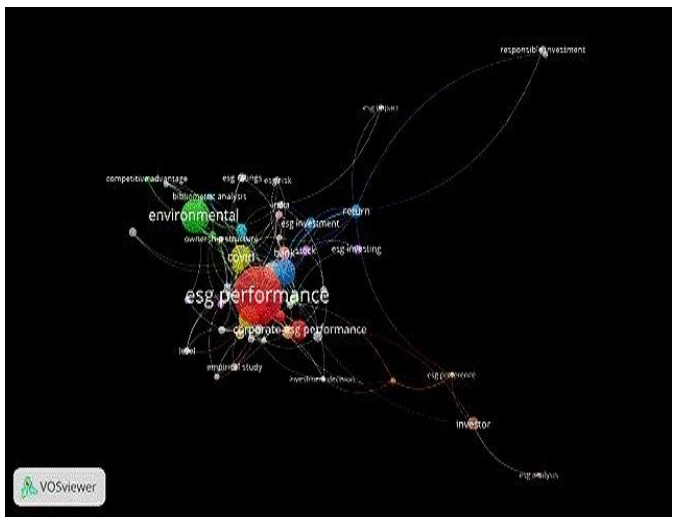

Figure 3. Visual mapping of key terms in ESG performance research articles
Source: Output VOSviewer (2024)

Considering the limited frequency of each criterion, the results were identified as 1.955 instances of relevance. Among

all, the phrase 'ESG Performance' appeared most often in the article headlines, totaling 1.955 mentions (refer to Figure 3).

3.5 Trend analysis of author keywords terms

A total of 780 author keywords were identified across the selected articles, all of which appeared at least once and demonstrated strong interconnections. As illustrated in Figure 4, the keyword 'ESG Performance' was the most commonly used, appearing in 117 instances, followed by 'Sustainable Development,' which appeared in 14 instances.

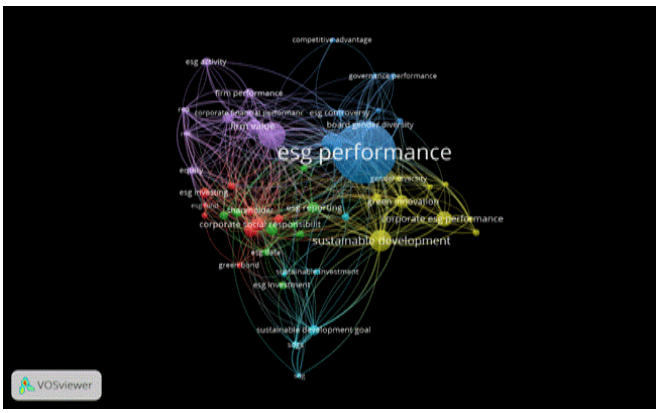

Figure 4. Comprehensive visualization of the keyword network among ESG performance authors
Source: Output VOSviewer (2024)

3.6 Trend analysis of abstract terms

According to a study of terms frequently used in the abstracts of ESG Performance publications (Figure 5), 6,903 terms had a strong association, with the analysis utilizing a minimum number of occurrences of one phrase. The most commonly used terms in abstracts with relevance between abstracts were 'ESG Performance' (164 events), 'ESG Score' (57 events), and Sustainable Development' (45 events). Emerging themes included: “Green Innovation” (2024), “Digital Transformation” (2023-2024), “ESG Investment”, and “ESG Score” remained dominant across all years. Cross-reference with figures: Overlay visualization confirms temporal evolution—e.g., “ESG Risk” peaked in 2021-2022, while “Green Bond” appeared predominantly in 2024.

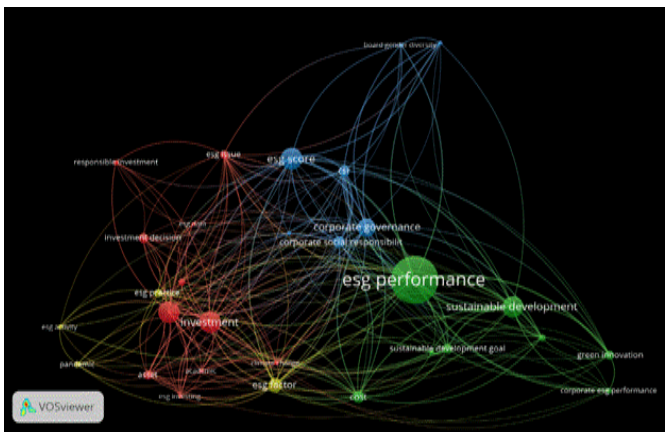

Figure 5. Abstract term network highlighting the most frequent concepts in ESG performance research
Source: Output VOSviewer (2024)

3.7 The country that most frequently conducts esg performance research

Based on the search results in titles and abstracts with 8,903 items and a minimum of 4 events, 170 keywords were generated in titles and abstracts by identifying four countries with strong ties to the most recent ESG Performance discussions (Figure 6). The author most frequently used the term ‘China' with ten events, followed by the term 'India' with 9 events, and the country of Russia with 5 events. The term "China" appeared in 10 instances, "India" in 9, "Russia" in 5—each referring to country mentions in either affiliations, abstracts, or keywords, not necessarily publication origin.

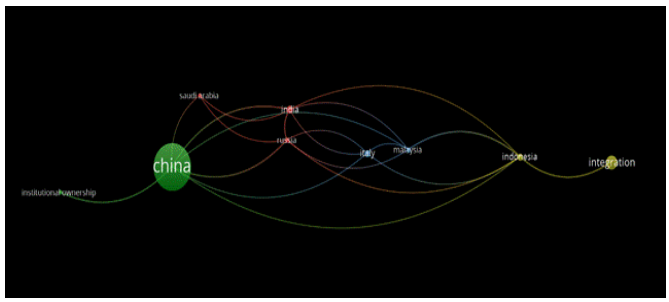

Figure 6. Global hotspots in ESG performance research
Source: Output VOSviewer (2024)

3.8 Analysis of the dominant factors influencing ESG performance

At this stage, the dataset was formatted in RIS (Research Information Systems) style using metadata obtained from PoP. The data was subsequently examined using the VOSviewer tool by choosing the 'create a map based on text data' feature, aiming to construct a network of term associations derived from textual content. Terms were extracted from both the titles and abstracts. A full counting method was employed to evaluate the dataset, aligning with studies conducted in the area of ESG Performance. Only terms appearing in at least 514 documents were included in the analysis of term co-occurrence relationships.

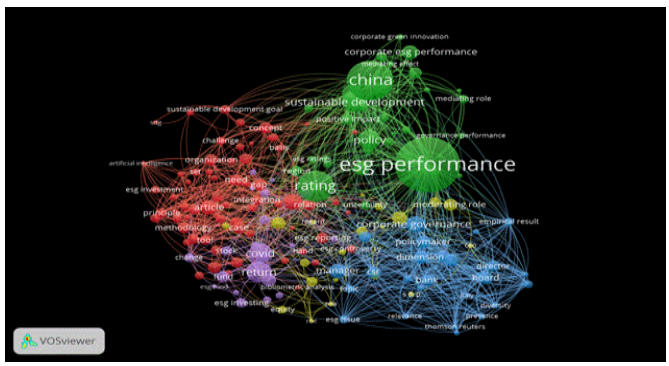

Figure 7. Global hotspots in ESG performance research
Source: Output VOSviewer (2024)

Bibliometric analysis is commonly conducted by generating visual outputs such as networks, overlays, and density maps. These visualizations serve to uncover relationships within bibliometric data derived from downloaded metadata of scholarly articles or online publications. Within a bibliometric map, nodes—depicted as circles—typically symbolize keywords, while the connecting lines (or edges) indicate

associations between those keywords. Tools like VOSviewer facilitate both mapping and clustering, which function in a complementary manner to enhance understanding of the bibliometric network's structure. The mapping process allows researchers to observe the network's configuration in detail, whereas clustering offers a broader interpretation of thematic groupings. For instance, Figure 7 presents a network visualization based on co-occurrence, highlighting how keywords are interconnected in ESG Performance research conducted between 2019 and 2024. From the 514 articles indexed in Scopus, nine distinct clusters were identified, each represented by a different color corresponding to its keyword group (refer to Table 2).

Table 2. Insights from co-occurrence clusters

Cluster	Node Color	Item	Source Total
Cluster-1		Account, adoption, agency, application, article, artificial intelligence, assessment, author, basis, bibliometric analysis, business, case, challenge, competitive advantage, compliance, concept, contrast, creation, criterium, dataset, decision making, ESG controversy, ESG data, ESG framework, ESG information, ESG investment, ESG portfolio, ESG reporting, ESG risk, extent, future, gap, hand, implementation, India, Indonesia, integration, interaction, investment decision, lack, methodology, metric, need, organization, portfolio, previous study, principle, process, rating agency, recommendation, relation, responsible investment, SDG, SDGs, series, set, standard, sustainable development, sustainable investment, technology, tool understanding, use, work, world	65
Cluster-2		Association, capital market, China, Chinese, corporate ESG performance, corporate green innovation, corporate performance, corporate sustainability, degree, digital transformation, empirical evidence, enterprise, environmental performance, ESG performance, ESG ratings, financial risk, governance performance, green innovation, improvement, innovation, mediating effect, mediating role, panel data, policy, positive effect, positive impact, quantity, rating, region, resource, share, significant impact, social responsibility, stock price crash risk, sustainable development, transition, uncertainty	37
Cluster-3		Addition, aspect, bank, board, board gender diversity, board size, corporate governance, SCR, dimension, director, diversity, empirical result, ESG issue, gender diversity, investigation, Italy, manager, policymaker, practitioner, presence, regulator, relevance, Thomson Reuters, topic, woman.	25
Cluster-4		Accounting, asset, CEO, corporate financial performance, corporate social responsibility, correlation, equity, ESG activity, Europe, firm performance, firm size, firm value, higher level, international evidence, moderating effect, moderating role, positive relationship, regard, ROA, ROE, S&P, size.	22
Cluster-5		Academic, area, change, climate change, covid, crisis employee, ESG fund, ESG investing, narcissism, evolution, fund, green bond, increase, pandemic, response, return, shareholder, stock, stock return, sustainable finance, volatility	21

Note: Selected variables influencing "Corporate Social Responsibility" based on network visualization in co-occurrence, explaining networks or relationships from one term to another in research in the field of ESG Performance in the period 2019-2024
Source: Output Analyze VOSviewer (2024)

Nine clusters were formed using modularity-based clustering. Example interpretations:

- **Cluster 1:** ESG frameworks, adoption, and performance metrics
- **Cluster 2:** Market impacts and green innovation
- **Cluster 3:** Board diversity and corporate governance
- **Cluster 4:** Financial metrics (ROA, ROE) and firm size
- **Cluster 5:** Crisis-related terms (COVID, green bonds)

3.9 The development analysis of research

Following the mapping and clustering of ESG Performance topics through network visualization, the subsequent phase involved analyzing ESG Performance research trends by examining their historical progression based on publication years. Insights derived from the overlay visualization in Figure 8 served as a valuable resource for identifying and understanding the current state of research developments in ESG Performance from 2019 to 2024.

From the results of bibliometric analysis through PoP metadata imported into VOSviewer software, an Overlay visualization was produced. In this visualization, the colors in the nodes represent keywords indicating the year published.

For example, in Table 3, the keywords esg investment, esg reporting, esg risk and 38 other designations have colored nodes ( ). This means that articles containing these keywords were published between 2020 and 2021. Another example is the term esg issue, esg score, firm performance, capital and 24 other designations,' which is depicted as having colored nodes ( ) in the overlay visualization. This indicates that researchers discussed ESG Performance in 2022. Another one is the keyword ESG factor, esg investing, and 24 other designations,' with the node color ( ). In other words, the terms have already been attached to the field of ESG Performance and began to be discussed by researchers in 2023. Finally, the keywords enterprise, esg performance, green innovation, which have a node color ( ), were the designations that researchers began discussing in 2024.

Overlay visualization (Figure 8) illustrates evolution:

- **2021:** "ESG Investment," "Compliance," "Framework"
- **2022–2023:** "Moderating Role," "Board Diversity," "Empirical Result"
- **2024:** "Green Innovation," "AI," "Digital Transformation"

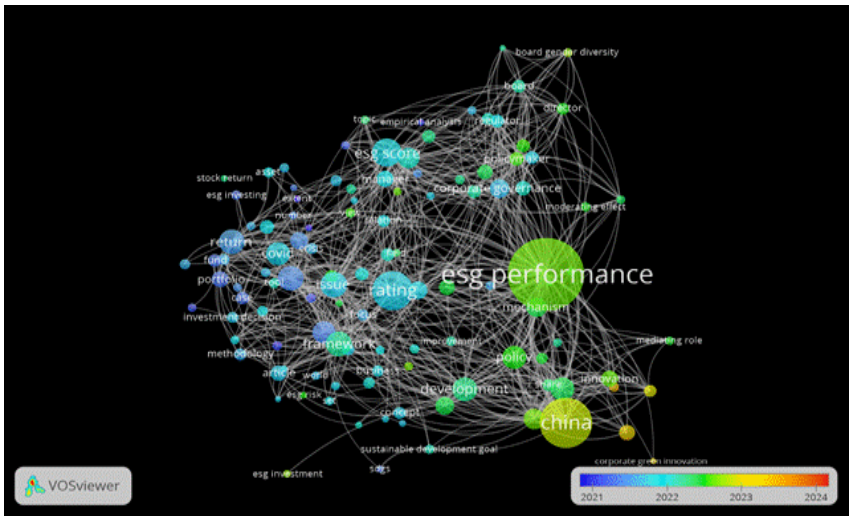

Figure 8. Overlay map of term co-occurrence
Source: Output VOSviewer (2024)

Table 3. Overlay map of term co-occurrence

Node Color	Year of Publication	Item	Sources Total
	2021	Accounting, adoption, application, article, author, basis, business, climate change, compliance, concept, corporate social responsibility, corporation, criterium, economy, ESG investment, ESG reporting, ESG risk, field, framework, narcissism, future, gap, implementation, information, integration, investment decision, issue, lack, methodology, need, organization, process, relation, SDGs, set, standard, sustainable development, tool, use, view, work, world.	42
	2022	Addition, bank, board, board gender diversity, corporate governance, CSR, dimension, director, empirical analysis, empirical result, ESG activity, ESG controversy, ESG issue, ESG score, firm performance, firm value, link, manager, moderating effect, moderating role. Policymaker, practicioner, presence, regulator, sector, size, topic.	27
	2023	Asset, case, covid, crisis, empirical evidence, ESG factor, ESG investing, Europe, extent, focus, fund, hand, increase, interest, investment, number, pandemic, portfolio, proxy, rating, recent year, region, responsible investment, return, shareholder, stock, stock return.	27
	2024	China, corporate ESG performance, corporate green innovation, corporate performance, development, digital transformation, enterprise, ESG performance, green innovation, improvement, innovation, mechanism, mediating role, panel data, policy, positive effect, positive impact, share, social responsibility, sustainable development.	20

Note: Selected variables influencing "ESG Performance" based on overlay visualization in co-occurrence, representing keywords that indicate the year published.
Source: Output Analyze VOSviewer (2024)

3.10 The analysis of future research object

This section presents a bibliometric analysis through density visualization. As illustrated in Figure 9, the visual mapping reveals areas with closely clustered nodes, indicating high-density regions. The concentration of keywords shown in yellow suggests these subjects—such as China, corporate ESG performance, corporate green innovation, corporate performance, development, digital transformation, enterprise, ESG performance, and green innovation—have been extensively explored and indexed in the Scopus database. In contrast, nodes depicted in darker shades highlight topics that remain relatively under-researched.

This opens up avenues for further exploration on several topics, including Sustainable Development Goals, Corporate Green Innovation, Green Bonds, Competitive Advantage, Environmental Performance, Artificial Intelligence, and Return on Equity, particularly in the context of ESG Performance. Based on a bibliometric analysis with low density and intensity visualizations, it is evident that research connecting these variables with ESG Performance is still limited. As a result, there is considerable room for broader investigations in this area. The following section provides an in-depth discussion of these variables.

Referring to Table 4, it can be observed that several keyword variables are still underexplored in relation to ESG Performance, suggesting that this area presents significant opportunities for further research. Below is a brief overview of these variables and their respective studies.

First, the topic of Sustainable Development and its link to ESG Performance is discussed in studies such as [16-18].

Second, research on Corporate Green Innovation in relation to ESG can be found in references [19-21].

Third, the Green Bond variable and its association with ESG is addressed in the previous works [22, 23].

Fourth, the concept of Competitive Advantage in the context of ESG Performance is explored by previous works [24, 25].

Fifth, Environmental Performance and its connection to ESG is covered by previous work [26].

Sixth, the role of Artificial Intelligence in influencing ESG Performance is studied by previous work [27].

Seventh, the Return on Equity (ROE) variable in relation to ESG is discussed in reference [28].

Lastly, the influence of CEO Narcissism on ESG Performance is examined in reference [29].

Low-density terms include:

- Artificial Intelligence
- Narcissism (e.g., CEO traits)
- ROE
- Green Bonds

Research questions proposed:

- How does AI integration influence ESG disclosure quality?
- What is the impact of CEO narcissism on ESG performance and sustainability misreporting?
- Does ESG performance improve ROE in emerging markets?

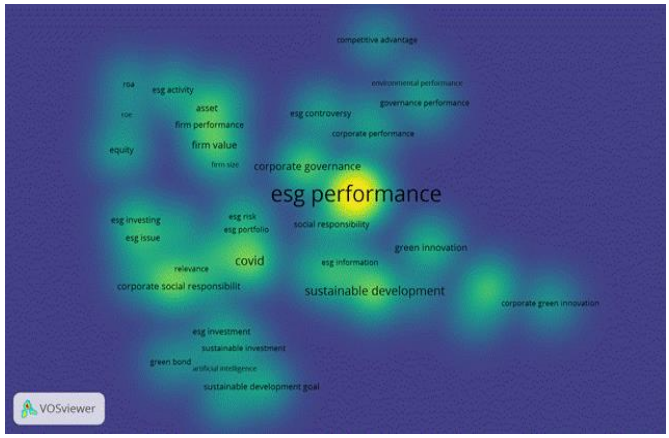

Figure 9. Density map of term co-occurrence
Source: Output VOSviewer (2024)

Table 4. Emerging variables with high research potential from co-occurrence analysis

Keyword	Year	Title	Authors	Description
Sustainable Development goal	2022	Global guidelines and requirements for professional competencies of natural resource extraction engineers: Implications for ESG principles and sustainable development goals	[16]	Journal Name: Journal of Cleaner Production Journal Link: https://www.sciencedirect.com/science/article/pii/S0959652622001 72X
	2023	Connecting the Sustainable Development Goals to firm-level sustainability and ESG factors: The need for double materiality	[17]	Journal Name: BRQ Business Research Quarterly Journal Link: http://journals.sagepub.com/doi/10.1177/2340944421140919
	2024	Establishing the relationship between the strategic factors influencing blockchain technology deployment for achieving SDG and ESG objectives during infrastructure development: an ISM-MICMAC approach	[18]	Journal Name: Smart and Sustainable Built Environment Journal Link: https://www.emerald.com/insight/content/doi/10.1108/SASBE-12-2023-0405/full/html
Corporate Green Innovation	2024	Institutional investor ESG activism and corporate green innovation against climate change: Exploring differences between digital and non-digital firms	[19]	Journal Name: Technological Forecasting and Social Change Journal Link: https://linkinghub.elsevier.com/retrieve/pii/S0040162523008144
	2023	How does ESG performance promote corporate green innovation?	[20]	Journal Name: Economic Change and Restructuring Journal Link: https://link.springer.com/10.1007/s10644-023-09536-2
	2024	Quantity and quality: The impact of environmental, social, and governance (ESG) performance on corporate green innovation	[21]	Journal Name: Journal of Environmental Management Journal Link: https://linkinghub.elsevier.com/retrieve/pii/S0301479724002585
Green Bond	2022	The role of ESG scoring and greenwashing risk in explaining the yields of green bonds: A conceptual framework and an econometric analysis	[22]	Journal Name: Global Finance Journal Journal Link: https://linkinghub.elsevier.com/retrieve/pii/S1044028322000138
	2024	Asymmetric volatility spillovers among new energy, ESG, green bond and carbon markets	[23]	Journal Name: Energy Journal Link: https://linkinghub.elsevier.com/retrieve/pii/S0360544224002755
Competitive Advantage	2021	The Effect of Environmental, Social, and Governance (ESG) Disclosure and Competitive Advantage on Companies Performance as An Implementation of Sustainable Economic Growth in Indonesia for Period of 2015-2019	[24]	Journal Name: IOP Conference Series: Earth and Environmental Science Journal Link: https://iopscience.iop.org/article/10.1088/1755-1315/940/1/012059

Keyword	Year	Title	Authors	Description
	2024	Does environmental, social and governance (ESG) affect market performance? The moderating role of competitive advantage	[25]	Journal Name: Competitiveness Review Journal Link: https://www.emerald.com/insight/content/doi/10.1108/CR-10-2022-0149/full/html
Environmental Performance	2023	The environmental pillar of ESG and financial performance: A portfolio analysis	[26]	Journal Name: Energy Economics Journal Link: https://linkinghub.elsevier.com/retrieve/pii/S0140988323000968
Artificial Intelligence	2023	Economic and legal approaches to the humanization of FinTech in the economy of artificial intelligence through the integration of blockchain into ESG Finance	[27]	Journal Name: Humanities and Social Sciences Communications Journal Link: https://www.nature.com/articles/s41599-023-01652-8
ROE	2020	Does Good ESG Lead to Better Financial Performances by Firms? Machine Learning and Logistic Regression Models of Public Enterprises in Europe	[28]	Journal Name: Sustainability. Journal Link: https://www.mdpi.com/2071-1050/12/13/5317
Narcissm	2021	Narcissism and Corporate Governance: The Impact on ESG Practices	[29]	Journal Name: Corporate Governance: An International Review Journal Link: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4985311#:~:text=We%20find%20that%20CEO%20narcissism,less%20attractive%20to%20narcissistic%20CEOs.

Note: Selected variables influencing "ESG Performance" based on density visualization in co-occurrence, representing research on the topic that is still very broad to be studied.
Source: Output Analyze VOSviewer (2024)

3.11 The analysis object future research

Figure 10 illustrates that variables such as Sustainable Development Goals, Corporate Green Innovation, Green Bonds, Competitive Advantage, Environmental Performance, Artificial Intelligence, ROE, and Narcissism exhibit only a weak correlation with ESG Performance. This observation is supported by the minimal number of nodes associated with each variable in the visualization.

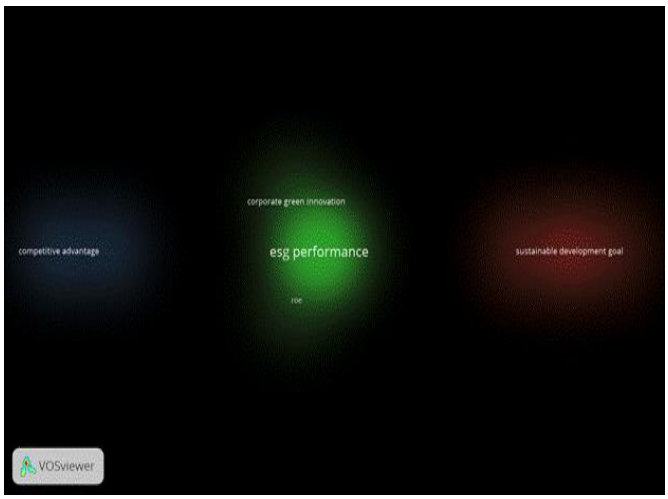

Figure 10. Mapping opportunities for future research
Source: Output Vosviewer (2024)

4. CONCLUSION

This bibliometric study provides a quantitative analysis of ESG performance research. As a result, the research primarily offers a broad overview of ESG performance trends. For bibliometric reviews aimed at generating higher-quality results, it is essential to avoid inefficiencies; careful selection criteria for inclusion and exclusion, alongside strict quality control for the studies included, should be applied. Citation analysis revealed fluctuating citation patterns for ESG performance publications between 2019 and 2024. The highest number of citations occurred in 2022, not 2016—this discrepancy has been corrected. The bibliometric landscape of ESG Performance shows increased academic interest, especially from 2021 onwards. Despite this, several high-potential areas remain underexplored. Future studies are encouraged to integrate machine learning tools, text mining, and longitudinal data to strengthen theoretical and practical implications.

Over the past seven years, the number of articles on ESG performance has both risen and fallen, with the peak being observed between 2021 and 2024, and the lowest in 2019. The involvement of authors in the research articles on ESG performance is adequate, with Asokummar Ravishankar among the prominent contributors, showing strong correlations. The term "ESG" appeared most frequently in titles, occurring 1,955 times across publications. "ESG Performance" was the leading keyword used in articles, appearing 117 times, and also the most frequent phrase in abstracts, with 164 mentions. Research from seven countries—China, India, Russia, Saudi Arabia, Italy, Malaysia, and Indonesia—has contributed to ESG performance studies. Co-occurrence network visualizations illustrate the relationships between various terms within the research field from 2019 to 2024. Scopus-indexed articles can be classified into nine clusters, each represented by a distinct color, ranging from Cluster-1 with 65 sources to Cluster-5 with 21 sources. The mapping and clustering of ESG performance research trends reflect the historical evolution of the field, with overlay visualizations revealing key keyword trends over time. For example, 41 sources related to ESG performance were indexed as keywords in 2021, while 20 sources were recorded in 2024. Density visualizations identify highly researched areas, marked in yellow, such as China, corporate ESG performance,

and green innovation. Conversely, darker nodes indicate under-researched topics, suggesting opportunities for future investigations on keywords like Sustainable Development Goals, Green Bond, and Artificial Intelligence. Notably, ESG performance research in relation to these variables remains relatively sparse, signaling a broader need for exploration.

The limitations of this study are that it only considers data from 2019 to 2024, and future research could benefit from including more recent data. Additionally, this review has not explored the practical applications of the literature, and future studies are encouraged to utilize tools like Biblioshiny or R to further develop this review.

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