



## **Hotspots and Trends of Environmental, Social and Governance (ESG) Research: A Bibliometric Analysis**

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### **ABSTRACT**

This paper examines environmental, social, and governance literature using bibliometrics. The analysis uses Scopus documents. Bibliometric analysis helps researchers understand a study domain's theoretical foundations, identify earlier research findings, and identify future research directions. This study used bibliometric methods like authors' citation analysis, papers' co-citation analysis, references' co-citation analysis, journals' co-citation analysis, co-occurrence keyword cartography analysis, and ESG publication trend and evolution analyses. This study evaluates 201 Scopus-indexed ESG studies. The researchers conducted bibliometric analysis using VOS viewer. This study found and identified seven key clusters: environmental, ESG, sustainability disclosure, corporate social responsibility, social, ESG performance, and company performance. It also highlights the rise in ESG citations and papers. Due to its considerable publication output and citation impact, "Business Strategy and the Environment" contributes to environmental, social, and governance (ESG) research. This report also suggests various research possibilities in this area. The study's findings have practical implications for environmental, social, and governance (ESG) issues, notably addressing how adopting ESG principles into a firm's plan of action affects its corporate and financial strategies. This article covers significant environmental, social, and governance (ESG) topics and their relation to ESG activities. This study synthesizes influential authors, countries, organizations, and journal sources in the ESG disclosure literature to analyze its evolution. This presents a potential avenue for future scholarly investigations to concentrate on this subject matter.



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## **1. Introduction**

The pursuit of a sustainable development path that can satisfy the needs of the present generation without compromising the well-being of future generations is not a novel undertaking. Climate change and the shift to a sustainable development model in general have gained prominence in recent years. A business should aim to generate profit while simultaneously upholding fundamental objectives, such as fair remuneration for employees, respect for ethical and social values and environmental preservation, in accordance with the European Central Bank's (ECB, 2020) guidelines on sustainable financing (Galletta, Mazzù, & Naciti, 2022). The idea that well-being must take into account certain characteristics, such as fairness, both within and across generations, and sustainability, was also emphasized in the 2030 agenda of the United Nations for Sustainable Development, released in 2015 (Connor, 2015). The Paris Agreement, which was signed that same year Connor (2015), acknowledged the need to hasten economic de-carbonization and protect the environment for the sake of current and future generations. Europe has prioritized the Sustainable Development Goals (SDGs) as the foundation of its long-term strategies to become carbon neutral by 2050 (Galletta et al., 2022).

ESG disclosure, which can provide persuasive evidence of a company's commitment to environmental and social transparency, has been a crucial component of investors' financial decisions during the past ten years (Chauhan & Kumar, 2018; Ellili, 2022; Esty & Karpilow, 2019). Rating agencies such as Moody's, Fitch, and Standard & Poor's, which use firms' ESG assessments in order to help them improve their ratings and scores, have also taken an interest in this idea. In 2013, the United Nations Global Compact conducted a study of 1,000 chief executive officers (CEOs) from various regions across the globe. A study conducted by Albertsen (n.d.) found that over 93% of CEOs indicated the vital role of environmental, social, and governance (ESG) matters in their respective firms' performance (Pinkel & Albertson, 2005). Credit rating agencies have incorporated ESG aspects into their methodology. In recent times, credit rating agencies have exhibited a commitment to integrating ESG considerations into their credit rating methodologies. The commitment was reaffirmed by their endorsement of the Principles of Responsible Investment (PRI), as documented by (Khan, 2022). The European Commission is committed to tackling sustainability concerns in the financial industry by working towards establishing a comprehensive framework for carbon disclosure and ESG rules. Several groups of experts focusing on sustainable finance, have been constituted by the Commission (Crifo, Forget, & Teyssier, 2015).

Companies with ESG-practices perceive low ESG related risks as they are not confronted with situations such as lawsuits, accidents, or interference of the government in management practices, resulting in a lack of ESG practice implementation in the firm's operations (Crifo et al., 2015). Nevertheless, corporations must exercise control over it in order to mitigate any detrimental long-term consequences (Henisz & McGlinch, 2019). According to Moody's, about 33% of private sector firms consider ESG risk to be a substantial credit factor (Khan, 2022).

Although the creation of ESG ratings may appear to be an artificial change, it is one of the fundamental changes needed to create a company environment that values social responsibility (Khan, 2022). The level of ESG investment is already significant and is also experiencing growth. The Bank of America predicts that ESG funds will see a staggering \$200 trillion influx over the next 20 years (Stevens, 2019). Rating agencies are increasing their vigilance as the financial consequences of ESG-related concerns become more evident. The significance of the ESG indicators has already been demonstrated by instances like share price declines and bankruptcy brought on by a failure to consider ESG risk.

In recent years, due to the explosion of software tools and transdisciplinary approaches, interest in bibliometric analysis has significantly increased. Researchers can find trends in many study topics, as well as journal performance, using this analytical approach. By conducting

bibliometric analysis, this paper has highlighted the prevailing ESG issues that have been extensively covered in the existing literature. Additionally, it has identified some gaps in the literature and suggested prospective avenues for future research (Ellili, 2022).

This study addresses the following questions:

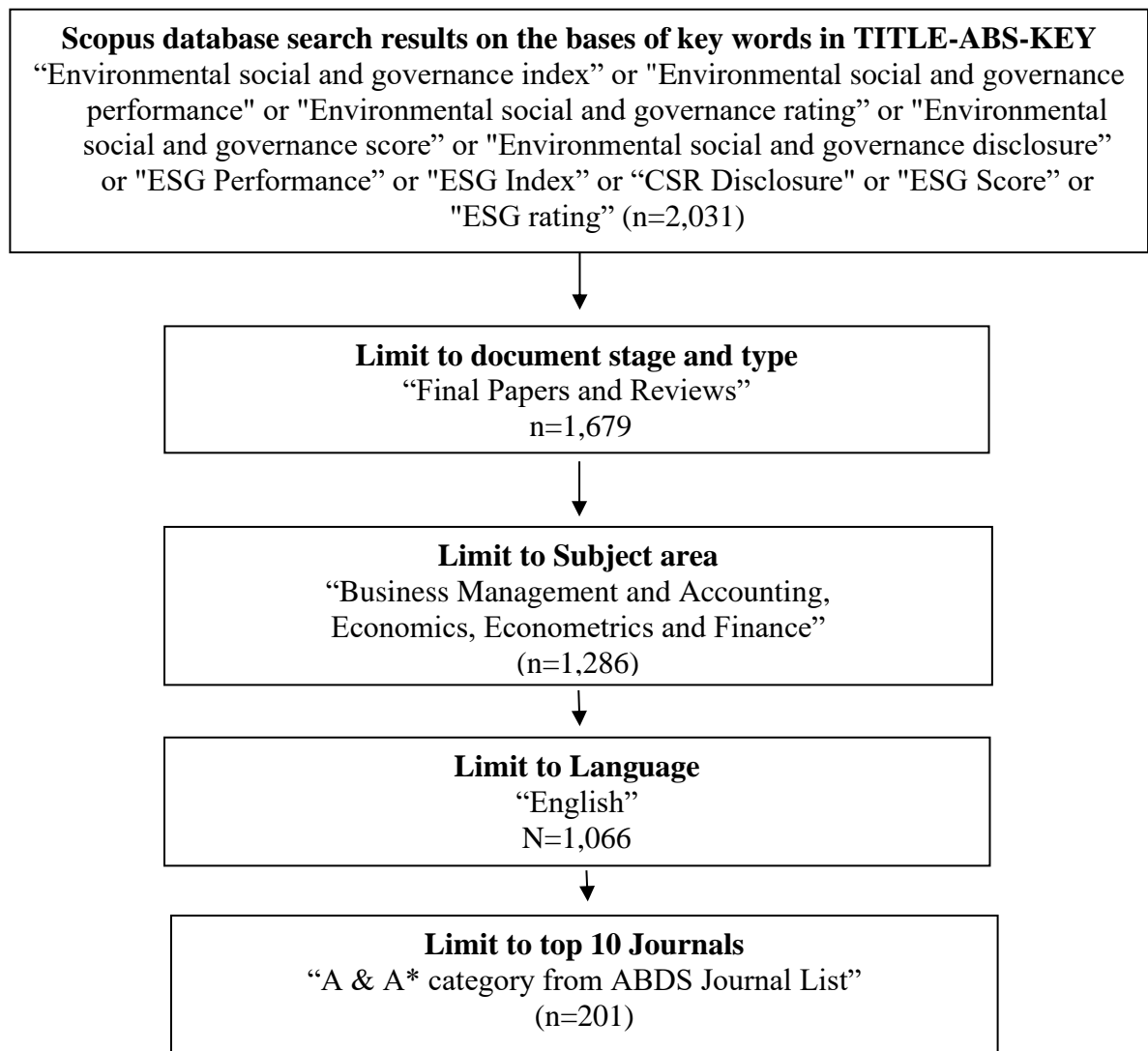
- i. What has been the general tendency in publications about ESG disclosure over time?
- ii. Which authors, groups, and nations have made the biggest contributions to the study of ESG disclosure?
- iii. Which academic papers have received the maximum number of citations in ESG the disclosure field?
- iv. Which references are most frequently mentioned in scholarly works on ESG disclosure?
- v. Which academic journals are most frequently cited in articles discussing ESG disclosures?
- vi. What are the most popular ESG disclosure document keywords and topics?
- vii. How are different countries collaborating in research on ESG globally?

Questions two to five were addressed through the implementation of bibliometric analyses, while two VOS viewer-based cartographic analyses were used to answer question six.

## **2. Methodology and Data**

An extensive statistical investigation of a specific issue can enhance a researcher's comprehension of the fundamental information and framework within a subject field (Wan & Dawod, 2022). In a bibliometric analysis, keywords, publications, references, and even the productivity of authors, nations, and organizations are analyzed. Bibliometric analysis enables researchers to concisely characterize the present state and emerging patterns in study fields. This analysis also provides valuable guidance and recommendations for future research endeavors (Gursoy, Chi, Lu, & Nunkoo, 2019). We analyzed the current state and growth patterns of ESG research using a bibliometric approach, and we offered recommendations and proposals for further study. Visual analyses of ESG were created with the help of VOS viewer, a bibliometric visualization program that is frequently used for data analysis and visualization (Wan & Dawod, 2022). The publication data was acquired from the Scopus database.

The Scopus database has been recommended as an appropriate choice for bibliometric analysis in a number of research studies. For instance, exporting data from the Scopus database is easier than from the Web of Science (WOS) database. Exporting more than 500 papers from WOS required manual procedures, whereas the Scopus database offers a wider range of papers in the business and management domains (Aksnes & Sivertsen, 2019; Farrukh, Raza, Meng, & Wu, 2022). Therefore, Scopus proved to be more appropriate for bibliometric analyses than the WOS (Farhan & Iqbal, 2021). The study conducted a search for various terms related to environmental, social, and governance, such as "environmental social and governance index," "environmental social and governance performance," "environmental social and governance rating," "environmental social and governance score," "environmental social and governance disclosure," "CSR Disclosure," "ESG Performance," "ESG Score," "ESG Index," and "ESG Rating." The search was conducted using the title, abstract, and keywords of articles in the SCOPUS database. In accordance with the initial findings, 2031 documents were published until March 2023. We did not impose a timeframe restriction because the purpose of this report is to analyze the general trajectory of ESG research. The data were further scrutinized based on the following criteria: (1) final stage documents, including articles and review papers, are selected; (2) based on Scopus subject categories, for analysis, the "business, management, and accounting" and "economics, econometrics and finance" categories are the only ones that are considered; and (3) papers in the English language were considered; (4) the top 10 "A" category journals from the ABDC journal list were selected. Finally, 201 research articles and review papers were downloaded for further analysis. The figure below presents the search criteria of the documents for the study.



**Figure 1: Selection Process of Documents to Be Included in the Study**

### **3. Results and Discussion**

#### **3.1. Publications Trend Analysis**

The objective of temporal feature analysis is to show the growth process of the study issue. A significant number of publications on ESG have been published between 2005 and 2023. The number of papers produced each year is shown in Fig. 2, and it is clear that this number has substantially increased in recent years, particularly the last four. Some significant research organizations and scholars emerged following the introduction of the Global Impact Investing Network (GIIN) in 2009, and their studies primarily focused on the impact of domestic market features, like CEO traits, nation attributes, and gender, on ESG. In 2005, the first research on ESG disclosures was released. From 2005 to 2019, this field's growth was extremely slow, with no more than 15 papers being produced annually. There were only 62 papers published in the selected journals in the first 15 years from the initiation of the study in 2005, while 143 papers were published in the last four years, and until the month of May 2023, they were considered for this study. The quantity of publications has progressively increased in recent years, which demonstrates that scholars are paying more and more attention to the idea of ESG.

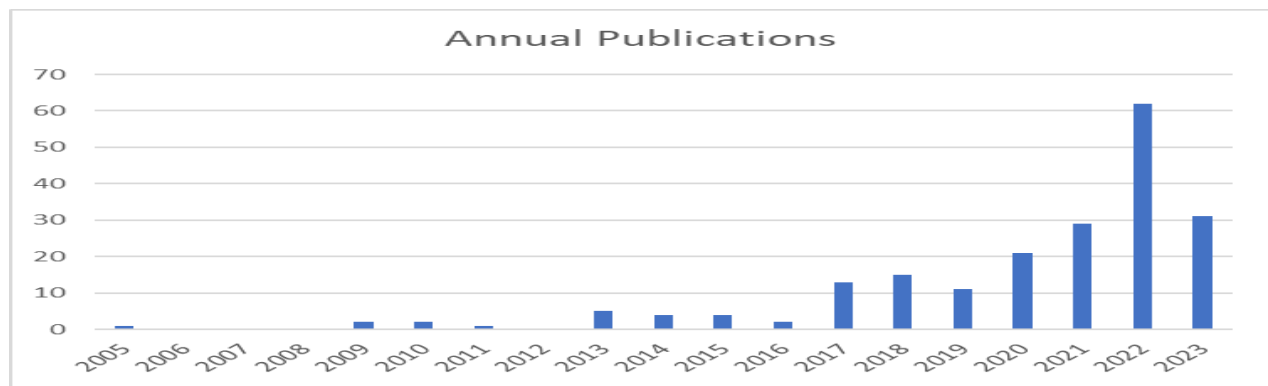


Figure 2: Annual and Cumulative Publications between 2005-2023’s 1<sup>st</sup> Quarter.

### 3.2. The Notable Authors, Organizations, and Countries

The most influential top 10 authors, along with their total citations, total publications, year of first publication, document h-index, Scopus author ID, organizations, and nations for which they worked, are listed down in Table 1. It shows that the top 10 authors, which include two authors from the US and two from Taiwan, while the other six authors are from six other nations, represent developing countries in ESG disclosure research.

**Table 1**  
**Contributions in ESG Research by top 10 Authors**

Author	Scopus author ID	Year of 1 <sup>st</sup> publication	Total publication	Document h-index	Total citation	Current affiliation	Country
1 <b>Barros, Victor</b>	57209655598	2019	20	6	96	ISEG Lisbon School of Economics and Management, Lisbon, Portugal	Portugal
2 <b>Goodell, John W.</b>	24068577200	2008	113	22	2,657	University of Akron, Akron, United States	United States
3 <b>Rezaee, Zabihollah</b>	6603153872	1994	102	27	2,516	University of Memphis, Memphis, United States	United States
4 <b>Atif, Muhammad</b>	5720506090	2019	16	10	455	Macquarie Business School, North Ryde, Australia	Australia
5 <b>Broadstock, David C.</b>	16300891900	2006	50	21	1,767	National University of Singapore, Singapore City, Singapore	Singapore
6 <b>Caiazza, Stefano</b>	17233433500	1002	12	6	123	"Università degli Studi di Roma "Tor Vergata", Rome, Italy"	Italy
7 <b>Chen, Hsiaomin</b>	57210561073	2019	3	2	48	Chihlee University of Technology, Banciao, Taiwan	Taiwan
8 <b>Chen, Yimin</b>	8253368700	2004	30	13	525	National University of Kaohsiung, Kaohsiung, Taiwan	Taiwan
9 <b>Cheng, Louis T.W.</b>	26643557800	1994	73	22	1,627	"The Hang Seng University of Hong Kong"	Hong Kong
10 <b>Cho, Charles H.</b>	23487673100	2006	77	26	4,668	Schulich School of Business, Toronto, Canada	Canada

Note. The tables demonstrate the top ten authors, who have published most of the articles in the ESG field, on the bases of search criteria set by the author.

### 3.3. The Most Cited Articles

The top ten ESG-related articles from the Scopus database between 2005 and 2021 are examined in this section. Table 2 represents the title of the most cited papers published in the top ten A and A\* category journals on the ABDC journal list. Among these papers, most are related to ESG disclosure, performance, and integrated reporting. This table also represents the total citations of the selected documents from the top 10 journals with journal names as well as the percentage of total publications published by each journal.

**Table 2**  
**Journals with Most Contributions in ESG Research**

	Journal Name	Total Citations	Total Publications%	The most cited article	Time cited
1	Journal of Business Ethics	4808	41/201 (20.39%)	"Determinants of corporate social responsibility disclosure ratings by Spanish listed firms"	660
2	Journal of Cleaner Production	1104	36/201 (17.91%)	"Sensitive industries produce better ESG performance: Evidence from emerging markets"	210
3	Finance Research Letters	535	36/201 (17.91%)	"The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China"	223
4	Business Strategy and the Environment	1331	27/201 (13.43%)	"The Influence of Board Composition on Sustainable Development Disclosure"	190
5	Meditari Accountancy Research	376	15/201 (7.46%)	"Integrated reporting and integrated thinking in Italian public sector organizations"	134
6	International Review of Financial Analysis	155	14/201 (6.96%)	"Gender-diverse board and the relevance of voluntary CSR reporting"	56
7	Journal of Portfolio Management	181	10/201 (4.97%)	"Foundations of ESG investing: How ESG affects equity valuation, risk, and performance"	83
8	Global Finance Journal	397	8/201 (3.98%)	"ESG performance and firm value: The moderating role of disclosure"	284
9	Technological Forecasting and Social Change	62	8/201 (3.98%)	"Corporate transformation toward Industry 4.0 and financial performance: The influence of environmental, social, and governance (ESG)"	30
10	Emerging Markets Review	109	6/201 (2.98%)	"Do investors value the nonfinancial disclosure in emerging markets?"	37

Note. The table represents the top journal among the list of journals selected for this research paper. The table also shows the total number of citations of the articles selected from these journals as well as the research articles with most number of citations.

### 3.4. The Most Cited Reference Journals

This section presents the top 10 reference journals identified by the bibliographic coupling analysis.

**Table 3**  
**List of Top Journals in ABDC Journal List with No. of Publications**

	Journal Name	ABDC Category	Number of Publications	Cite-Score 2022	Publisher
1	Journal of Business Ethics	A	41	11.8	Springer Nature
2	<b>Journal of Cleaner Production</b>	A	36	18.3	Elsevier
3	Finance Research Letters	A	36	10.7	Elsevier
4	Business Strategy and the Environment	A	27	17.7	Wiley-Blackwell
5	Meditari Accountancy Research	A	15	4.9	Emerald Publishing
6	International Review of Financial Analysis	A	14	9	Elsevier
7	Journal of Portfolio Management	A	10	2.1	Pageant Media
8	Global Finance Journal	A	8	4.9	Elsevier
9	Technological Forecasting and Social Change	A	8	16.9	Elsevier
10	Emerging Markets Review	A	6	6.5	Elsevier

Note. This table demonstrate the top 10 journals selected for this study, showing the classification of journals in the ABDC journal list as well as number of publications from each journal, cite score of the journal as per 2022, and the name of the publisher.

Table 4 presents the top 10 journals together with the corresponding number of publications published on ESG disclosures. All of these selected journals are ranked in the A category in the ABDC journal list. The majority of papers on ESG disclosure are published by Elsevier, followed by Springer Nature. The leading journals include "Journal of Business Ethics," "Journal of Cleaner Production," "Finance Research Letters," and "Business Strategy and the Environment," which have the most papers (41, 36, 36, and 27) and citations (as reported in table 2) are 1808, 1104, 535, and 1331, respectively.

### 3.5. Important Countries in ESG Research

This section focuses on the prominent and noteworthy nations in the domains of ESG research. Over the past few decades, ESG research has received contributions from more than 50 countries and regions. Researchers from both developed and developing countries have published articles with an emphasis on ESG. The top 10 nations for publishing papers, according to Table 5, are the United States, China, Italy, Australia, France, the United Kingdom, Germany, India, Spain, and Portugal. The United States is the nation with the greatest productivity in terms of published articles in this field, with 201 papers published to the end of the first half of 2023, followed by China, Italy, Australia, the United Kingdom, and other countries.

**Table 4**  
**Geographical Contributions in ESG Research**

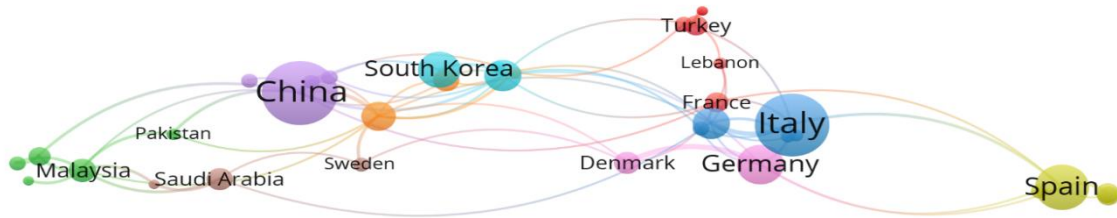
Sr. No	Countries	No. of documents	Percentage Contribution (%)
1	United States	35	17.41
2	China	32	15.92
3	Italy	29	14.43
4	Australia	24	11.94
5	United Kingdom	22	10.95
6	France	18	8.95
7	Germany	15	7.50
8	India	9	4.48
9	Spain	9	4.48
10	Portugal	7	3.48

Note. This table represents the top countries contributing most in the field of study. Table also represents the number of documents produced by the countries as well as percentage contribution of each country.

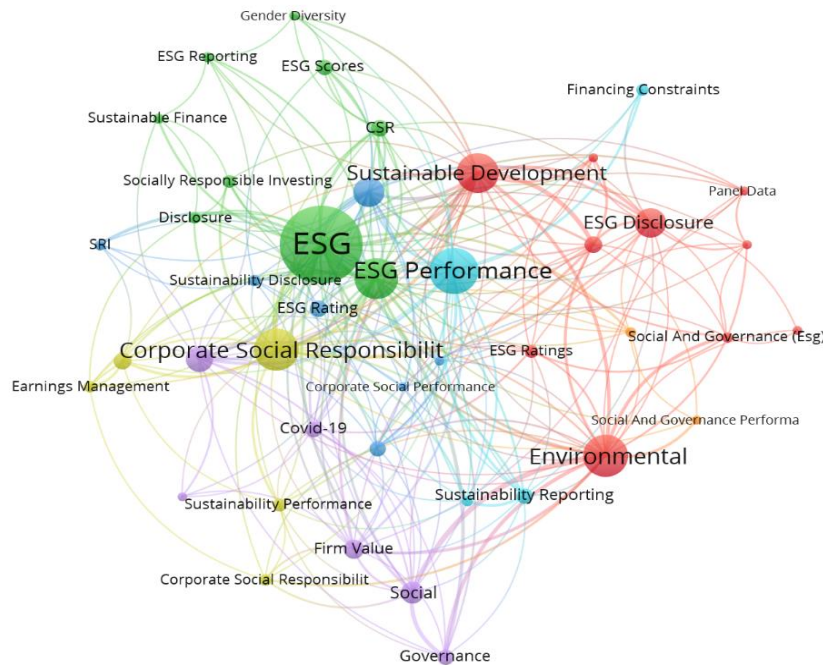
### 3.6. Co-authorship Map and Country Analysis

The visualization of co-authorship among countries provides a comprehensive overview of the key contributors in the field of environmental, social, and governance (ESG) on a worldwide level. The authors employ Fig. 3 to visually represent a co-authorship analysis, thereby emphasizing the interconnectedness of countries within the specific domain of study. The analysis criteria established by the researchers stipulated that each country must have a minimum of three published articles, each with at least eight citations. Out of the total of 57 countries examined, 35 countries met these requirements. The analysis identifies and delineates nine distinct clusters, each of which signifies a network of countries engaged in collaborative efforts. The clusters that have been highlighted are red (France, Latvia, Lebanon, Poland, and Turkey), green (Malaysia, Indonesia, Pakistan, Taiwan, and the United Arab Emirates), blue (Egypt, Italy, the Netherlands, Tunisia, and the United Kingdom), yellow (Colombia, Portugal, Romania, and Spain), purple (Brazil, China, Hong Kong, and Thailand), cyan (Chile, South Korea, and the United States), yellow orange (Australia, Canada, and New Zealand), bronze (Saudi Arabia, Sweden, and Yemen), and orchid (Denmark and Germany). Table 5 displays the list of countries engaged in the study of ESG-related articles. There are 10 countries with the highest number of publications in the field as well as percentage contributions. The United States tops the list with 35 publications and a 17.41% contribution; China and Italy are second and third,

respectively, in terms of the highest number of publications as well as percentage contributions, which shows the strong influence of these countries in the field of ESG-related research.



**Figure 3: Co-authorship Analysis**



**Figure 4: Key-word Co-occurrence**

### 3.7. Key Word Co-Occurrence

The technique of keyword co-occurrence analysis uses text mining methodologies to establish connections between phrases. This approach demonstrates a high level of efficacy in managing extensive quantities of unstructured data and effectively tackles challenges related to data mining. Identify the terms that occur with high frequency in a given text (Jalal, 2019). The keyword co-occurrence networks were created using VOSviewer software (Van Eck & Waltman,



2010), using bibliometric approaches frequently used in the literature (De Bakker, Groenewegen, & Den Hond, 2005). This analysis involves the calculation of the co-occurrence of terms across research topics, research hotspots, and research structure (Wan & Dawod, 2022). Following the cutoffs established in earlier bibliometric research Callon, Courtial, and Laville (1991), we first filtered the data to include only those keywords that appeared at least five times in the articles. Author keywords were chosen as the statistical items for keyword analysis in this study. This study identified a total of 43 keywords with the highest link strength, which satisfied the minimum occurrence requirement of 5 out of the 572 keywords used for co-occurrence mapping in VOS viewer. There was a total of seven clusters, with a combined link strength of 528 and a total of 262 links.

In the field of scholarly inquiry, looking at the connections between "ESG" (Environmental, Social, and Governance) and other terms in the study shows interesting details about how these ideas are connected. Upon evaluating the robustness of these relationships through the analysis of link quantity, a variety of identifiable trends become apparent. First and foremost, ESG has strong keyword links, showing research interest. ESG is strongly linked to "corporate governance," with 33 links. This reveals an abundance of studies on how ESG principles intersect with corporate governance practices and how environmental, social, and governance factors affect company decisions and performance. ESG's strong relationship with "environmental" at 25 and "sustainability" at 28 links highlights a growing body of research on ESG's environmental impacts and business sustainability policies.

In addition, ESG has an established connection with "Corporate Social Responsibility (CSR)," with 26 linkages connecting the two concepts indicating a consistent alignment of ESG principles and CSR actions. This link indicates that researchers have concerns about the extent to which businesses care about social and environmental issues while developing CSR strategies. Monitoring and assessing ESG performance is significant for businesses and investors due to the strong correlation between ESG and its own "ESG Performance" indicators. Furthermore, ESG also has a strong association with other key terms like ESG Performance, Corporate Governance, ESG Disclosure, Financial Performance, Firm Value, and Social, having more than 15 link strengths.

### **3.8. Discussion**

The current research employed bibliometric analysis as a methodological approach to investigate the current state of research on the topic of environmental, social, and governance (ESG). This analysis focused on several aspects, including the contributions of researchers in terms of authors, journals, subject areas, and country. The study aimed to uncover trends and gaps within this domain. The concept of ESG has received significant attention over the past two decades due to its utmost significance. The findings of the study emphasize Barros, Goodell, Razaee, Atif, and Broadstock as the individuals who have made the most significant contributions to this particular field of study. The United States (US) is identified as the most influential country among nations, with China and Italy closely following. Both China and Italy demonstrate a substantial number of publications. Notable and leading scholarly journals in this field include "Journal of Business Ethics," "Journal of Cleaner Production," "Finance Research Letters," and "Business Strategy and the Environment." These works have significantly influenced the development of the discourse pertaining to ESG.

The findings of the study highlight the broad exploration and acknowledgment of words such as sustainability, corporate social responsibility, sustainable development, environment, ESG performance, corporate governance, ESG, disclosure, and financial performance in the existing literature. The topics of stakeholder engagement, ESG ratings, sustainability performance, corporate financial reporting, sustainability performance, and earnings management have gained a moderate level of attention in the existing studies. Following are the

topics or areas that have gained relatively less attention in the literature, like sustainable investment, cost of capital, sustainable finance, financing constraints, and socially responsible investments (SRI), and so greater investigation is required in these topics when studying ESG.

Therefore, it is important for future researchers to consider these topics for a comprehensive understanding of them. It is imperative to acknowledge that the present analysis relies on literature that encompasses the first half of 2023. Considering the ever-evolving nature of research, it is crucial to recognize the potential for new publications to arise beyond the designated time period of our knowledge.

#### **4. Conclusion**

This study presents a detailed bibliometric analysis that aims to explore the topic of environmental, social, and governance (ESG). The study covered a wide range of issues to comprehensively understand the subject matter. The initial focus of the inquiry was to identify patterns of collaboration and the geographical distribution of countries and publications. This study offers a complete analysis of the relationships between authors and documents within the global field of ESG. The results of the study provided significant contributions to the understanding of global cooperation and information sharing in this particular domain.

Moreover, the research identified crucial publishing institutions and examined their networks of collaboration. The present investigation has shown substantial findings pertaining to prominent institutions and their contributions to the progression of research on ESG. Finally, the research report provided insight into the co-word analysis of keywords, illuminating the prevailing patterns in research themes pertaining to ESG. Through the process of evaluating the simultaneous presence of terms, the inquiry revealed significant patterns and associations within the scholarly body of work.

To sum up, our bibliometric analysis of research on environmental, social, and governance (ESG) issues helps us learn more about the global situation, the networks of people working together, and the new trends in this area. The results of this study establish a robust basis for future research endeavors, furnishing scholars and practitioners with important perspectives as they explore relevant subjects and contribute to the current body of literature on ESG.

The objective of this study was to elucidate the progression of environmental, social, and governance (ESG) factors and engage in a discussion on research relevant to ESG. The study offers an overview of ESG-related research trends based on 201 research papers found in the Scopus database that were published in "A category journals" of the ABDC journal list. Publications have been growing over the last 4 years, and it is predicted to continue. We have identified countries (e.g., China, Italy, and the USA) that have a huge number of publications and strong collaborations in ESG-related research with other countries. Furthermore, we have identified the top 10 journals publishing ESG-related papers, the top 10 most influential authors in this field, their total number of publications, total number of citations, Scopus ID's, h-index, and their current affiliation with the universities or institutions. We also identify the most cited research paper published in each top-listed journal. Finally, we created co-authorship countries map and a key-word co-occurrence map with the help of VOSviewer software, which represent the collaborating countries in the ESG-related research and frequently occurring key-words, respectively.

Academic research suggests that scholars are increasingly recognizing ESG as a comprehensive framework for analyzing sustainability and are placing greater emphasis on examining the interconnections among these elements. This study may help the researchers find new exciting areas of research by connecting pertinent subtopics or by using other grouping strategies in the literature. Numerous studies are concentrating more and more on the impact

of ESG behavior on a company's risk, performance, value, and capital cost. Approximately 50% of the authors included in the top 10 of this review originated from the United States, Taiwan, and Canada.

The Journal of Business Ethics and the Journal of Cleaner Production were the journals that published the highest number of articles. The examination of keyword co-occurrence unveiled several research issues, including ESG disclosures, ESG ratings, and their effects on the cost of capital, financial performance, company value, sustainable investment, and sustainable performance. In addition to the impact of different factors on ESG, this paper explores the interconnections between ESG and corporate social responsibility (CSR), sustainability, and ESG investing. The findings of our study have demonstrated the importance of conducting research on environmental, social, and governance (ESG) factors.

### **Authors' Contribution**

Qalb E Abbas: conceived the presented idea and discussed the results and contributed to the final manuscript.

Fouzia Hadi Ali: encouraged Qalb E Abbas to complete the study and supervised the research process and discussed the results and contributed to the final manuscript.

Sabra Munir: encouraged Qalb E Abbas to complete the study and supervised the research process and discussed the results and contributed to the final manuscript.

Zubair Arshad: discussed the results and contributed to the final manuscript.

### **Conflict of Interests/Disclosures**

The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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