

Bibliometrics-based Visualization Analysis of Environment Social Governance

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Abstract— Businesses take part in ESG initiatives to increase profits and demonstrate to the market that they are compliant. The literature is full of contradicting findings and paradoxes, which makes it difficult to draw a clear connection between ESG and firm financial performance. This research delves into the paper-level metrics of literature pertaining to environmental, social, and governance (ESG) topics. To achieve this aim, we have adopted a systematic approach that incorporates the PRISMA protocol, VOS Viewer, AIR Studios and Scopus Analyze results for an extensive analysis. Our analytical framework is based on a vast dataset obtained from Scopus which covers the period between 2013 and 2023. Utilizing data from 2057 ESG papers found in Scopus database, our study employs VOSviewer, AIR Studios and Scopus Analyze results to present a bibliometric review of publications' citation structure as well as funding sponsors, universities, countries involved in research work on this issue along with journals authors and keywords related to it. The study's findings highlight the growth of scholarly attention given to the intersection on ESG. ESG disclosure has an impact on a company's financial and market performance both in healthy markets and in times of crisis. Numerous facts are presented in this article, such as co-authorship, highly cited works, citations, keyword distribution, top authors at the journal and institution levels, and the most important publications and authors. The many phases of this subject of study as well as the new research directions that warrant further investigation are well-illustrated by the bibliometric analysis. Finally, research trends and a future research framework are proposed based on the research gap identified in this review.

Index Terms— ESG Disclosure, Environment, Social, Governance.

I. INTRODUCTION

Environmental Social Governance (ESG) would be given increased focus by academics and industry in a world full of uncertainty. Environmental, Social, and Governance is referred to as ESG. These non-financial aspects are being used by investors more frequently in their analytical process to find growth opportunities and substantial

hazards. ESG is predominantly employed in sustainable investing techniques in the investment business because of capital market focus (Spulbar et al., 2019). Research by PwC's on 2021 of 325 investors from around the world and analysts with more than US\$11.6 trillion in combined assets under management shows that ESG is now a profitable consideration for investors globally, 49 percent said that would be willing to divest from companies that have never acted on ESG issues, 59 percent said the lack of action on ESG issues made it possible to challenge executives' pay deals, while a full third said investors had taken action. A total of 79 percent of respondents said the way companies manage ESG risks and opportunities is an important factor in making investment decisions (Lata & Kumar, 2022a).

Presently, the majority of ESG regulations are optional, requiring simply that business behaviour be disclosed, rather than outlining precise measures and results. However, applying ESG theory has become a large business for the practitioners, consultants, and managers working in the field; substantial contracts are awarded to businesses providing ESG-related services, and financial experts sell the idea. ESG discloses more information concerning management policies, procedures, and performance that represent the openness of the management of financial and non-financial (Greenwald, 2010). Achieving long-term success while protecting our environment and cultures, which will foster growth and provide value. ESG disclosure may boost their credibility, brand awareness, and reputation (Liang et al., 2018). Lee & Rhee (2023) examined the influence of corporate ESG management on brand loyalty. The findings indicated that social and governance initiatives positively impact brand image, attitude, and loyalty.

Analyzed the impact of corporate ESG management on the brand, and their results showed that social and governance activities have a positive effect on brand loyalty, image, and attitude.

ESG has becoming increasingly important for companies as they prioritize sustainability and social responsibility in their operations and decision-making. The implementation of ESG practices exhibits diverse growth patterns across the globe. Developed nations such as Europe, United States, United Kingdom, Canada, New Zealand and Malaysia and China have mandated ESG regulations. Notably, in Malaysia since 2016 all public listed companies are required to report on their ESG performance, rendering it a pioneer in implementing this form of disclosure requirement. The proliferation of obligatory ESG regulations worldwide is pivotal to this trend with more anticipated in the future.

The ESG plays a key role in the most problematic area, which is the energy sector. This is the reason the energy industry are at the forefront of ESG Improvement (Nitlarp & Kiattisin, 2022). The societal ramifications of emphasizing ESG undoubtedly constitute a moral requirement. With \$10 trillion in assets under management, BlackRock holds the title of largest investment manager in the world. As of February 2021, coal and consumable fuels made up 0.36% of S&P Global's total investments, while oil and gas made up 2.55%. The investments are significant despite these tiny percentages; in the energy industry, they amount to over \$255 billion and \$36 billion, respectively. While not the only option, investing in renewable resources is undoubtedly a good way to protect the environment. Energy exploration and production (E&P) companies have a plethora of options for aligning themselves with ESG ideals that go well beyond the products they produce. The majority of the big integrated energy businesses are almost there.

This empirical literature offers considerable, which must be controlled to make sense of what has previously been done and what should be prioritized in further research. This study aims to fill this gap by investigating empirical research on ESG. Numerous reviews of the literature have already been done (Lata & Kumar, 2022b). For instance, a systematic literature evaluation based on bibliographic coupling was carried out by Khan in 2022. They conducted a content analysis of the literature on firm performance and ESG disclosure. Setiawan et al. (2023) carried out a bibliometric analysis that examined accounting research and climate change in a study that was comparable to this one. Lagasio & Cucari (2019)'s meta-analysis of research on the function of corporate governance in sustainability reporting is one of the few meta-analytic studies available. The second step follows the choice of keywords. Keywords are shortlisted after reviewing the pivotal papers in the field of ESG and are finalized after discussion with experts in the area. The third, analyzed to eligibility and inclusion the articles. Additionally, the study compiled the empirical results of the earlier literature and carried out a meta-analysis.

II. METHOD

The present study employed bibliometric analysis as a fundamental approach to augment our comprehension of the correlation between environmental, social, and governance (ESG) and financial performance. To address the research inquiries, the investigators followed the four distinct stages outlined within the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Figure 1). These phases consist of identification, screening, eligibility, and inclusion. The authors cited several

relevant studies to support their methodology, including works by Hansen et al. (2022), Kuckertz & Block (2021), and Rojas Molina et al. (2023). By utilizing bibliometric analysis in conjunction with PRISMA protocol, this study aims to provide valuable insights of ESG that can be utilized by practitioners and scholars alike.

The Scopus database is a good choice for bibliometric analysis, according to a number of research studies (Nawaz et al., 2020). For instance, it is easier to export data from the Scopus database than it is from the WOS database (Farrukh et al., 2021). WOS exporting more than 500 papers requires manual activities, and a larger selection of business and management papers may be found in the Scopus database (Aksnes & Sivertsen, 2019). As a result, Scopus proved to be more appropriate for bibliometric analysis when compared to the Web of Science database (WoS) (Farhan & Iqbal, 2021). What sets Scopus apart from WoS is that the former allows access to all of its material with only one subscription that doesn't require any modifications, and it offers

Several important aspects are taken into account during the identification step, such as the kind of source, search engine, categories, language, time period, and keywords (Díaz Tautiva et al., 2022). This study only looks at journal papers; books, book chapters, and conference proceedings are not included (Harsanto & Firmansyah, 2023) because of their poor value in the theoretical and empirical debates. This research uses the Scopus database alone in relation to the search engine. This study focuses on the disciplines of Business, Management and Accounting, Economics, Econometrics, and Finance within the spectrum of search categories. The search is conducted only in English to prevent linguistic prejudice (Alatawi et al., 2023; Gulluscio et al., 2023; Stechemesser & Guenther, 2012). These are set to ensure a comprehensive and high-quality review (Ibrahim et al., 2022) and non-English research was separately reviewed by authors with appropriate language skills (Nguyen et al., 2020). Finally, the keywords used included the following: “ESG”, “Environment social governance”, “ESG Disclosure”, “Environment Social Governance Disclosure”.

Two bibliometric techniques—co-occurrence and co-authorship—are used in this work. The fundamental premise is that a tight association between the chosen terms is shown by frequent co-occurrences of those words (Zupic & Čater, 2014). The technique known as co-occurrence analysis concentrates on situations in which two or more keywords occur together in texts or articles. Through bibliometric networks, this investigation of the interconnections between terms in the literature aids in the visualization of conceptual connections (Callon et al., 1983). Conclusions on the advancement of accounting and research on climate change are derived from the co-occurrence study. Co-authorship analysis, the second technique, investigates author partnerships in the creation of articles involving two or more writers. Co-authors were authors who worked together on the study and co-wrote articles. The patterns of collaboration among authors are shown by this approach, providing insights into academic collaborative networks including people and institutions. The co-authorship analysis produces findings about the factors influencing ESG advancement. This enhances the approach taken to address the research questions.

This bibliometric analysis adheres to the recommendation made by Garza-Reyes (2015). Because the procedure follows a set of clear steps and is methodical, other researchers can duplicate it. A mind-mapping technique that illustrates the boundaries of knowledge may also be used to complete a bibliometric study (Tranfield et al., 2003). Bibliometric analysis, which focuses on quantitative research in books, journal articles, and other written publications, is often utilized in a variety of fields (Heersmink et al., 2011). The bibliometric analysis steps in this study will be divided into four sections: establishing the search terms, generating preliminary search results, gathering preliminary data statistics, and data analysis (Garza-Reyes, 2015).

In order to carry out the four aforementioned studies, we utilize VOSviewer to create the networks within the ESG literature and Bibliometric in conjunction with the Biblioshiny package in the R programming, which aids in understanding the influential structure of the literature. The bibliometric package of R and the VOSviewer software are commonly utilized in previous research to evaluate bibliometric data (Khan, 2022). Developed in 2009 primarily for literature data, VOSviewer is a free Java software programming created by Van Eck and Waltman of The Centre for Science and Technology Studies (CWTS) at Leiden University in the Netherlands. The integrated development environment (IDE) for R is called RStudio. It has a console, a syntax-highlighting editor that allows for direct code execution, and tools for managing workspaces, history, sketching, and debugging. These tools can generate visual images of the literature, and graphs can show hotspots, emerging trends and intelligent networks in the research field.

The final search query employed was as follows (28 December 2023):

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( TITLE-ABS-KEY ( "esg" ) OR TITLE-ABS-KEY ( "environment social governance" ) OR TITLE-ABS-KEY ( "esg disclosure" ) OR TITLE-ABS-KEY ( "environment social governance disclosure" ) ) AND PUBYEAR > 2013 AND PUBYEAR < 2024 AND ( LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "ECON" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( SRCTYPE , "j" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ) AND ( LIMIT-TO ( PUBSTAGE , "final" ) ) .
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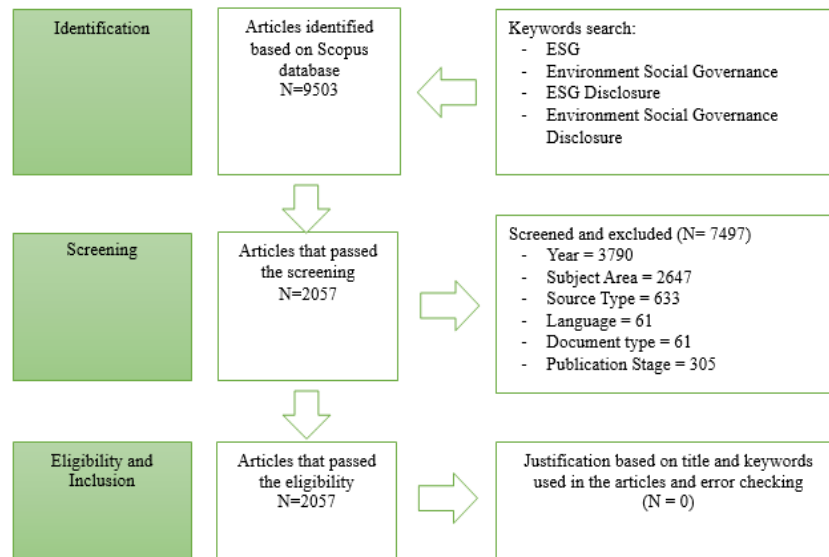


Figure 1. Research protocol

III. RESULT AND DISCUSSION

A. Publication Trend

The yearly number of publications discussing governance, social, and environmental issues, as well as ESG disclosure and its effects, is depicted in Figure 2. The trajectory of publications in the field of ESG research from 2014 to 2023 is depicted in the image. The findings displayed here demonstrate a broad rising trend in subject publishing. To some extent, the ongoing rise in articles also illustrates the significance of ESG in academics. The number of publications is clearly on the rise, with an average of 205 documents released each year. There was a notable uptick in 2021, with a 135% rise in papers ($n = 313$); in 2022, there was a 45% increase in documents ($n = 250$).

As can be shown, there has been a significant growth in the quantity of documents in the ESG sector since 2014. Article over the last five years have accounted for 90% of all articles inside the Scopus database. This phenomena is directly associated with the global community's focus on environmental preservation and corporate social responsibility. It also demonstrates that academics are becoming more and more interested in the issue of ESG, which supports the validity of this article's theme.

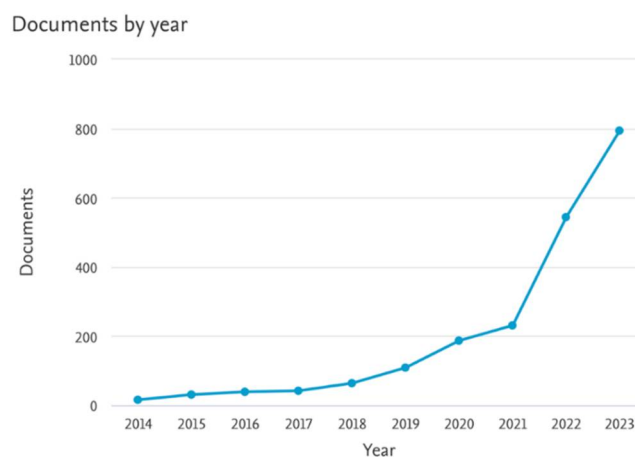


Figure 2. Evolution in the Number of Articles Production

In the context of environmental, social, and governance (ESG), we look at the most successful and significant nations in this area. during 80 nations and areas have now made major contributions to ESG or HC research

during the last few decades. Papers with an ESG subject have been produced by both developed and developing nations among them. The bulk of the top 10 paper-publishing nations are, on average, industrialized nations. The reason for this is that the nation's focus on environmental issues, business ethics, and regional economic growth are positively correlated. In terms of paper publication, Table 1 lists the top ten nations, with the United States ranking first in productivity.

TABLE I. TOP 10 MOST CONTRIBUTING COUNTRIES

Country	Documents
United States	57
United Kingdom	52
India	45
Malaysia	35
France	33
Italy	33
China	27
Spain	27
Indonesia	25
Australia	23

On the table 1 shows that, in the United S, there are organizations (universities) with a higher interest in ESG n in other countries. This also highlights the fact that universities are the centre of ESG studies. Over the past decade, the United States emerged as a leading country in terms of publications, boasting a total of 57 documents, followed by the United Kingdom with 52 documents, United Kingdom with 52 documents, India with 45 documents and Malaysia with 35 documents.

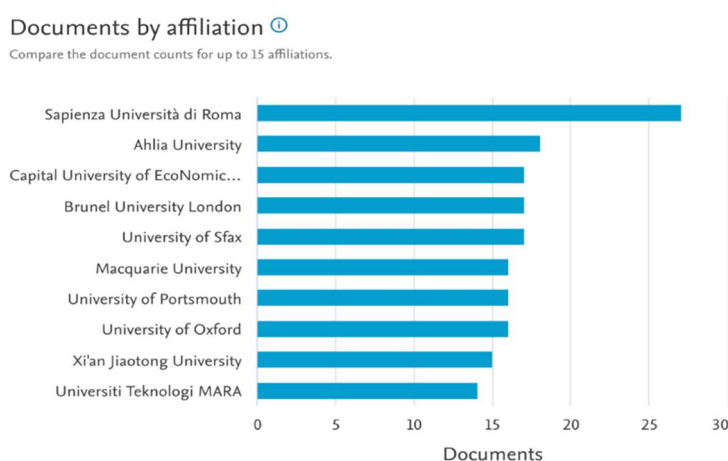


Figure 3. Top 15 Organizations contributing to research on ESG

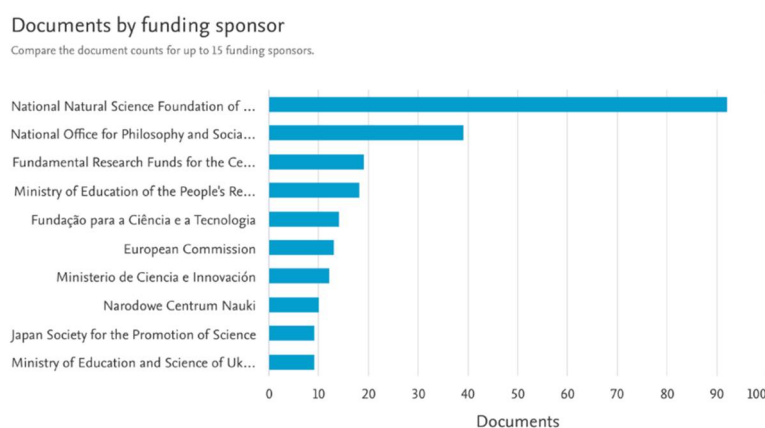


Figure 4. Top 10 Organizations (Funding Sponsor) contributing to research on ESG

Regarding the number of publications, the Sapienza Universita' in Roma (Italy), the Ahlia University (Bahrain), Capital University of Economics and Business (China) have made substantial contributions to research on this topic area over the past decade, each producing 22, 18, and 17 articles, respectively (as shown in Figure 3). Macquarie University (Australia), University of Portsmouth (UK) and University of Oxford (UK) contributed 16 publications.

B. Journal Analysis

TABLE II. TOP 10 JOURNALS BY ANNUAL PRODUCTION

Journals	Documents
Finance Research Letter	127
Corporate Social Responsibility And Environmental Management	77
Business Strategy And The Environment	75
Journal Of Cleaner Production	68
Journal Of Sustainable Finance And Investment	62
International Review Of Financial Analysis	41
Journal Of Portfolio Management	38
Journal Of Risk And Financial Management	36
Journal Of Business Ethics	29
Cogent Business And Management	27

Documents per year by source

Compare the document counts for up to 10 sources.

Compare sources and view CiteScore, SJR, and SNIP data

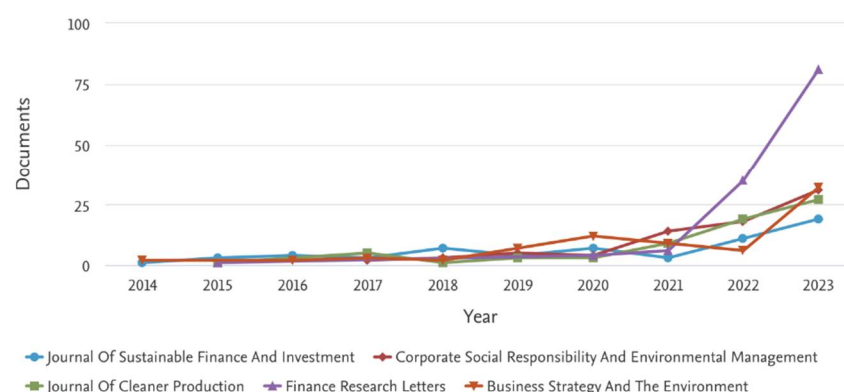


Figure 5. Documents per year by source

The 156 journals published the 466 papers that are included in the database. The journals that have the most documents are displayed. The top 10 journals with the most relevant subject publications are displayed in Table 2. These journals publish 24% of the publications that were discovered. With 80 articles, Finance Research Letters is the journal with the most publications out of all of them. These show how these two journals are at the top in the ESG field.

The yearly number of publications from the top 10 journals in the area of ESG during the previous ten years is shown graphically in Figure 5. The only journal that continuously grew its number of publications year between 2013 and 2023 among the chosen journals was The Environment and Journal of Business Strategy; this trend peaked in 2023 after stagnating in 2020 and 2021. Studies on ESG published in a number of journals showed notable variations. Journal of Intellectual Capital, for example, only released one piece on this subject in 2017. In the years that followed, it dropped to two articles from its peak of eight documents published in 2018–2019. In 2020, the Journal of Risk and Financial Management published one paper on this subject; in the years that followed, that number rose to two. Figure 5 indicates that there were variations in yearly publications in every journal. While the Journal of Business Ethics regularly published articles on accounting and climate change, other new publications released similar studies in the middle of the decade. The overall number of publications in a few journals decreased in 2020–2021. This might have an impact on the amount of research focused on climate change since it overlaps with the COVID-19 epidemic, during which the majority of universities—as the organizations with the greatest number of publications—conducted remote learning.

C. Keyword Co-Occurrences

We examined the co-occurrence of keywords and subject trends of themes in order to determine the future study directions for ESG in the field of management and economic research. The most sophisticated way to start an academic paper is using keywords. Scholars may easily identify research hotspots and future paths for their area by looking at the co-occurrence of terms in it. Figure 6 illustrates the creation of a term co-occurrence graph in VOSviewer for this investigation. Out of all 1525 terms, we only included 89 that fulfil our minimal criteria of 5 occurrences for analysis. Using term co-occurrence analysis, a scientific discipline may construct a network of related themes.

A graphical representation of the co-occurrence network derived from bibliometric analysis with VOSviewer is shown in Figure 6. There are nodes and edges in this bibliometric network (van Eck & Waltman, 2014). Larger nodes indicate more in-depth study on certain topics. Circular nodes represent keyword occurrences (Donthu et al., 2021). The number of times the keyword appears in this map is indicated by the size of the node. The more thick edges indicate greater or more frequent correlations between nodes. Edges, which connect lines between nodes, depict linkages and their strength within the research (Donthu et al., 2021). The separation between two nodes and the thickness of the line that connects them define the strength of co-occurrence between keyword pairs. In addition, the intensity of the interaction between two nodes is indicated by their closeness. According to Farrukh et al. (2021), keyword clusters are represented by the color of the nodes. These clusters often comprise co-occurring terms and can be regarded as large study subjects in the area. The thematic areas of attention in the field of ESG from 2013 to 2023 seem to be summarized by five basic groups.

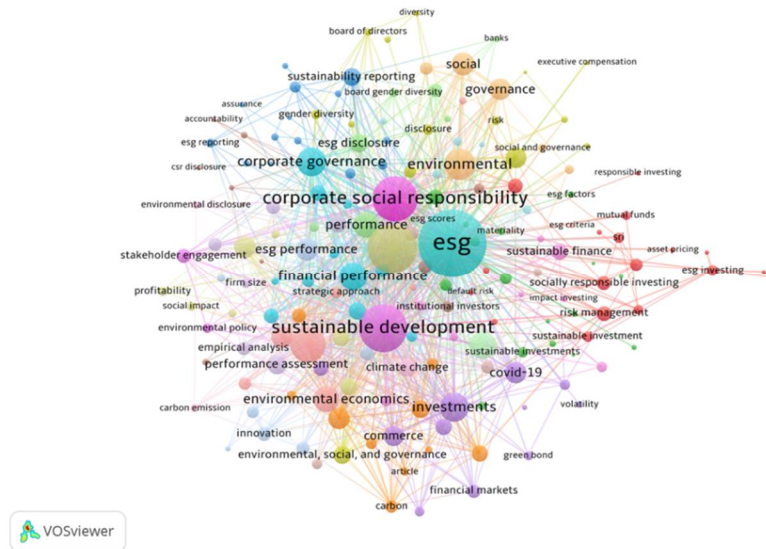


Figure 6. Network analysis of co-occurrences

Figure 7 represents keyword density visualization, keywords are represented by their label in a similar way as in the network visualization. The density of items at each position is represented by a color in the keyword density visualization. The default color scheme is blue, green, and yellow. A point's hue approaches yellowness in direct proportion to the quantity of objects nearby and the greater the weights of those nearby items. In reverse, a point's hue approaches blue the less items it borders and the lower their respective weights.

The keywords that appear in the number that the color represents depends on the density of items. The more intense hues show that there has been a significant increase in research. As a result, we can see that the term with less frequent occurrence is represented by an un-concentrated hue, indicating that further research is needed to fully explore this issue and make it a possible topic for future study. Stakeholder engagement efficiency, organizational performance, and social and governance are a few instances of these terms. These study subjects give academics the chance to pinpoint a possible subject that would make a fresh addition to the field of environmental science and governance.

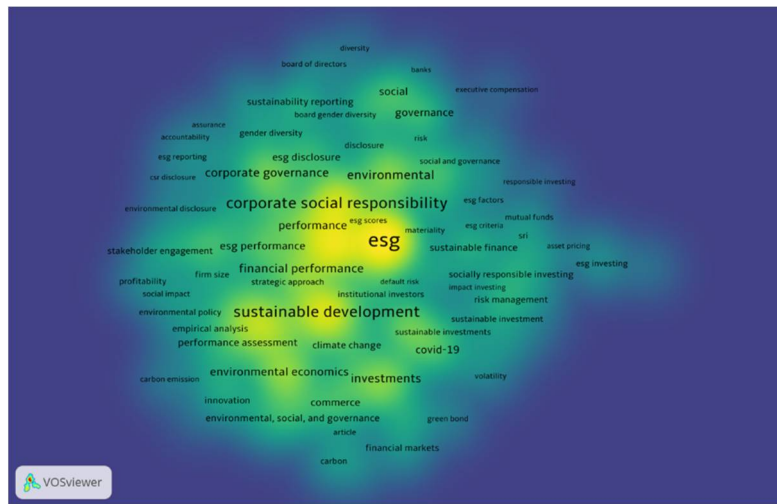


Figure 7. Keyword density visualization

TABLE III. TOP 15 MOST FREQUENTLY USED KEYWORDS

<i>Labels</i>	<i>Occurrences</i>	<i>Total Link Strength</i>
ESG	184	1523
Corporate Social Responsibility	160	1405
Sustainable Development	180	1388
Sustainability	150	1374
Financial Performance	139	1260
Corporate Financial Performance	132	1223
ESG Disclosure	135	1206
Industrial Performance	123	1197
Governance Approach	120	1191
Environmental	117	1178
Investment	111	1172
Sustainable Finance	108	1156

D. Co-Authorship Analysis

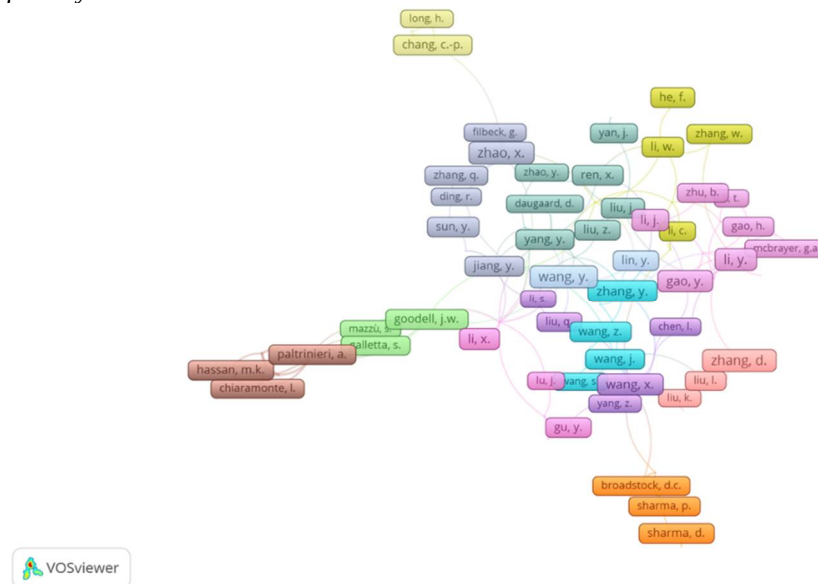


Figure 8. Network analysis of co-authorship

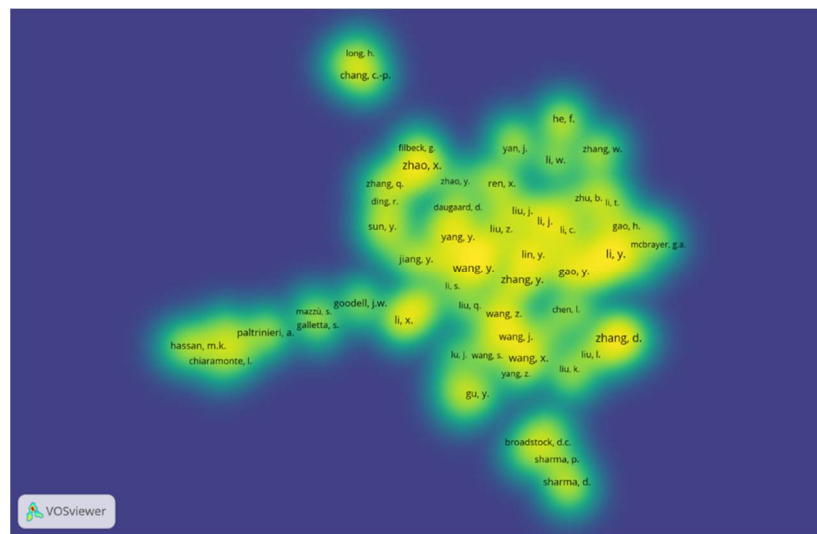


Figure 9. Author density visualization

The hues purple, red, light blue, green, blue, and yellow in Figure 8 graphically reflect the six unique clusters within the author network. The writers' categorization according to particular ESG study topics or emphasis points is indicated by these clusters. Important details about network density are also shown in Figure 9. The measure of network density provides insight into the degree of network integration by indicating how much an edge connects the nodes in a given network. A higher network density denotes a higher number of connections between different nodes, indicating a higher degree of author relationships and interaction within the network. Comparatively speaking, Buallay showed a much greater network density.

Since then, the scientific community has been more interested in environmental and biodiversity concerns, as seen by the significant rise in publications on the topic (Global Reporting Initiative, 2011). The addition of new environmental efficiency indicators to the Global Reporting Initiative (GRI) in 2011 may have an impact on this trend. The goal of the GRI is to lower greenhouse gas emissions. The rise in publications in 2011 may possibly be related to mandatory disclosure laws enforced by several countries, which have prompted further research to be conducted (United Nations, 2017).

IV. CONCLUSION

In the subject of ESG, there are a few research that are based on literature reviews. The main research streams' highlights are given based on analysis and a careful reading of the literature. The research on ESG may be divided into three categories: the financial consequences of non-financial information disclosure, corporate governance as a driver of non-financial information disclosure, and business characteristics that impact ESG. In order to lessen the liability of being foreign, companies planning to cross list on other stock markets are required to provide additional ESG information (Del Bosco & Misani, 2016; Yu & Luu, 2021). The quality and quantity of ESG disclosure are controlled by the company's internal control system, according to existing corporate governance literature. Numerous studies have demonstrated that ESG disclosure has an impact on a company's financial and market performance both in healthy markets and in times of crisis.

In conclusion, implementation of ESG has been thoroughly discussed and evaluated. Through critical analysis, it can be concluded that the subject matter is complex and multifaceted especially to sharpen the future agenda and the necessities on this area. It is crucial to approach the topic with an open mind and without bias, as this will enable a more objective evaluation of the evidence from the evidence and data availability. Financial performance mentioned as the final objective of ESG implementation was derived from various aspects that are inter-correlated one to another on their relation to ESG. The study's discoveries underscore the surge of scholarly interest in examining the intersection on ESG.

The outcomes are especially pertinent to governance policymakers. Based on our findings, one could deduce that cultivating positive relationships on ESG and shareholders is a viable method of promoting social cohesion. Furthermore, it is imperative to persist in examining this subject matter and accumulating fresh substantiation as it emerges, since this can facilitate shaping forthcoming resolutions and regulations particularly for specialized sectors such as oil and gas companies within designated nations. In general, although this topic may be

disputable and intricate, it is crucial to participate in productive dialogues and endeavour toward discovering resolutions that are advantageous for all stakeholders concerned in the immediate future.

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