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Bibliometric insights into ESG and economic development: Trends and thematic analysis with R and VOSviewer

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Keywords

ESG practices

Economic development,

Bibliometric analysis,

Sustainable development

Abstract

Bibliometric analysis is used in this study to examine how research on economic development and environmental, social and governance (ESG) has changed from 2011 to 2025. Tools such as R software and VOSviewer were employed to identify key trends, research performance, and scholarly contributions in this domain. The analysis focuses on countries, collaboration networks, prominent writers, and sources. It identifies key journals, prominent academics, noteworthy publication trends, and nations that have significantly influenced ESG-related research. Additionally, co-word analysis and thematic mapping revealed five prominent clusters, each being unique intersections between ESG and economic development with broader research themes. The authors acknowledge several limitations, including the restricted time frame of 2011–2025, reliance on a single database, and language constraints that may have excluded relevant non-English literature. Despite these limitations, the research offers a comprehensive overview of ESG and economic development scholarship. This study provides a fundamental analysis for scholars, decision-makers and practitioners who want to comprehend how ESG principles affect sustainable economic growth and decision-making.

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1. Introduction

Environmental problems, such as pollution, soil erosion, and ozone layer depletion, have captured the attention of the world as never before because of their catastrophic effects on ecosystems and human in recent years. For instance, the World Health Organization has warned that air pollution causes 1.5 million premature deaths in South and Southeast Asia each year (Taylor, 2019). Similar concerns are also reflected in discussions about climate change. Over the past four decades, the average temperature in the Asia–Pacific region has been rising alarmingly. It is projected to climb six degrees Celsius by the end of the century, according to recent estimates by the Asian Development Bank and the Potsdam Institute for Climate Impact Research (Thin, 2017). As rising temperatures increase the risk of floods, alongside more intense typhoons and rainfall, there will be far-reaching adverse consequences for societal wellbeing and economic stability in the region (Prakash, 2018), leading to damage to homes and losses for businesses. It is increasingly clear that habitat loss and environmental degradation are caused by rapid development. This problem is the primary reason why many nations are vulnerable to natural disasters if left unchecked. The concept of ESG (environmental, social, governance) refers to a set of criteria used to assess an organisation's operations regarding sustainability and ethical practices. Stakeholders, investors, and regulators frequently use ESG to evaluate a company's long-term performance and societal impact. The history of ESG dates back to the 1960s and 1980s, with the rise of socially responsible investing (SRI) during the civil rights and anti-apartheid movements. By the 1990s, the rise of corporate social responsibility (CSR) was evident, focusing on philanthropy, ethical practices, and stakeholder engagement. The term “ESG” was formalised in the 2000s with the UN Principles for Responsible Investment. In the 2010s, ESG gained mainstream adoption, with firms like BlackRock and Goldman Sachs integrating it into their strategies. The 2020s saw the introduction of the Sustainable Finance Disclosure Regulation and Corporate Sustainability Reporting Directive, making ESG central to discussions on climate change, inequality, and corporate accountability. ESG emphasizes the importance of enterprises pursuing financial performance, environmental protection, social responsibility, and improved corporate governance to create a win-win situation between enterprises and society by contributing to society (Institute of Cost

Accountants of India, 2019). Investigating whether business ESG benefits help to economic development is extremely important from a practical standpoint. ESG is rapidly growing on a global scale and has attracted much scholarly attention. In numerous papers, the economic effect of ESG advantages has been thoroughly examined. ESG benefits may significantly affect a company's performance and value (Friede et al., 2015; Li et al., 2018). Among other things, it lowers business risks (Albuquerque et al., 2019; Broadstock et al., 2021), lowers financing costs for businesses (El Ghoul et al., 2011; Lins et al., 2017; Tan et al., 2020), boosts investment efficiency (Benlemlih and Bitar, 2018), encourages corporate innovation (Broadstock et al., 2020), and eases financial constraints (Ng & Rezaee, 2015). Researchers can find new publication trends, nations, journals, authors, and potential study fields with themes by using bibliometric analysis (Donthu et al., 2021a, b). Using bibliometric analysis enhancement techniques like visualisation, the present writers performed quantitative bibliometric analysis, including performance analysis with prolific research elements like authors, citations, journals, institutions, countries, and regions (Donthu et al., 2021b). Based on the above justification, the research questions that we intend to answer in this study are:

RQ1: What are the current ESG and Economic Development trends in publications, citations, journals, authors, and connected countries?
RQ2: What is the thematic structure of ESG and Economic Development research, how has it evolved, and what are the latest breakthroughs in this field of study?
RQ3: What are the gaps and research questions that demand more investigation in the ESG and economic development domain?

Previous studies have explored the structure of ESG research using bibliometric data, but few researchers have examined how the benefits of ESG can affect economic development. In this study a bibliometric analysis is used to explore the link between ESG and economic development and contribute to the literature on ESG by adding a new dimension. In future, researchers in this

field can explore how the adoption of ESG practices can contribute to economic development therefore a bibliometric study is necessary to comprehend the expansion of ESG research in recent years. The VosViewer and Biblioshiny package from R studio are used to separate and classify the data into relevant groups to enhance visualisation. We then discuss the shortcomings of bibliometric analyses and upcoming developments in ESG. Crucially, our survey could determine the current research subjects and interests of scholars involved in ESG. We sought to improve knowledge of ESG through bibliometrics, which might assist academics in spotting ESG trends and provide novice researchers and investors with a foundational understanding of ESG. The limitations of bibliometric studies and future trends were then addressed, which may help academics broaden their search for new subjects in the ESG research area.

This paper is organised as follows: Section 2 discusses the background of the study, and Section 3 explains the design and methodology used for the bibliometric analysis. Section 4 presents the findings and interpretation of the bibliometric analysis. Section 5 deals with the conclusion of the study, while Section 6 discusses the limitations and recommendations.

2. Theoretical background

ESG initiatives and investments are growing, integrating ESG considerations into corporate decision-making and sustainable policies. Integrated reporting is a leading approach to achieving the UN's Sustainable Development Goals (Hassani & Bahini, 2022). ESG is rapidly growing globally and has received widespread scholarly attention. The economic effect of ESG benefits has been extensively. Existing literature finds that ESG advantages might have a significant effect on firm value and firm performance (Friede et al., 2015; Li et al., 2018). In 2013, the United Nations Global Compact surveyed 1,000 CEOs globally. Nearly 93% of the CEOs who responded said that environmental, social, and governance (ESG) issues were essential to their company's success (UN, 2019). ESG practices signify environmental, social and governance factors serving as metrics for evaluating organisational non-financial performance. Climate change, global

warming, and the loss of natural resources are just a few of the environmental issues that are discussed in relation to environmental practices. Social practices, on the other hand, align with initiatives to eliminate societal issues pertaining to diversity, labour standards, inequality, and human rights and finally, governance practices include management-employee relations, policy planning, board composition, and business ethics. The adoption of the Sustainable Development Goals (SDGs) has raised awareness of the importance of ESG practices during the past ten years, and has drawn significant attention from both research and practice (Hwang et al., 2021). Ng, Ly and Chan et al., (2020) examine the connection between financial development and ESG performance in Asia, revealing a positive relationship between financial development and ESG success. Dayal et al. (2024) investigated how ESG scores influence firm performance and risk in 31 countries, finding a non-linear pattern in which ESG initiatives may initially reduce performance but lead to improved outcomes over time. Da Hyun et al. (2024) investigated the relationship between ESG aspects and company performance in the worldwide hospitality industry, as well as the effect of national economic development. They find that businesses in more developed nations typically do better in terms of sustainability. The study also emphasizes how different ESG components have varying effects on firm performance, underscoring the significance of taking each dimension into account separately when assessing sustainability outcomes. In a comparative analysis, David et al. (2024) looked at how ESG measures affected economic activities in Europe and developing nations between 1960 and 2021. The study finds that better-developed ESG practices in European countries are positively correlated with higher GDP levels, which reflects societal norms that place a high priority on sustainability. Considering these results, the authors stress that to improve ESG performance, region-specific policies that consider the distinct cultural and economic circumstances of developing nations are required. ESG practices minimise wealth disparities through efficient resource allocation (Alam et al., 2017; Cracolici et al., 2010; Kim et al., 2018), increase productivity (Deng et al., 2023), and prevent the needless expenses of environmental deterioration and climate change (Ozcan et al., 2020; Stern, 2007). Kaur and Dhiman (2025) found that after the Covid-19 pandemic and Paris conference, there was a sharp increase in research on green finance and financial literacy, which eventually

fosters responsible financial behaviours aligned with ESG and supports economic development by promoting sustainable investments, improving resource efficiency, and encouraging long-term value creation. Gidage and Bhide (2025) found a positive correlation between ESG principles and progress towards the SDGs in 12 developing nations. In addition to this, Loang (2024) demonstrates the significance of sustainable practices in economic decision-making by showing that ESG factors have a major effect on economic development in emerging markets, especially through investments in renewable energy and the detrimental effects of carbon emissions on consumer confidence and market performance. Economic growth accelerated this progress, emphasizing the need to integrate ESG frameworks into economic development strategies for long-term development outcomes. Since ESG practices are the cornerstone of sustainable development, there has been a lot of interest in and funding for research on them in recent years, particularly after the Covid-19 pandemic. This study has made use of bibliometric analysis to provide a thorough understanding of the extension of ESG research from a variety of natural and visual perspectives. Large amounts of unstructured data are pulled from databases for bibliometric analysis so as to classify the research growth into known themes, find gaps in the literature, and create qualitative and quantitative overviews.

3. Methodology

Bibliometrix is an open-source program from R Studio that encompasses a range of bibliometric analysis techniques, designed for quantitative research in scientometrics and bibliometrics (Aria & Cuccurullo, 2017). Bibliometrics analysis is a quantitative method used to determine the growth and trends of literature in a field. It involves science mapping and performance analysis, which assess the performance of articles over time and the structure and development of the study field. Co-citation analysis uses citations to assist in identifying the most important publications and authors in a field of study. Evolution analysis is a method used by researchers to comprehend the evolution of the field throughout time and its possible future directions (Ding & Yang, 2020). VOSviewer, a free program, is used to create and view bibliometric maps based on co-occurrence

or co-citation data. In contrast to programs like SPSS and Pajek, which are frequently used for bibliometric mapping, VOSviewer is dedicated to the graphical display of bibliometric maps (Van Eck & Waltman, 2010). The Bibliometrix R package, developed on an open-source platform, offers a variety of quantitative research methods, including integrated data visualisation capabilities, statistical algorithms, and superior numerical operations. We conducted a metrological analysis of literature on "ESG and economic development" from 2011 to 2025 using VOSviewer and Biblioshiny from the R package.

3.1 Keywords and tools

A brief list of documents about "ESG and economic development" from Elsevier Ltd's Scopus source database is shown in Figure 1, which also illustrates the document navigation method. 276 documents were found using the first step's search for "ESG and economic development" taking the data from 2011-2025, while 237 were found using the second step's restriction to business management, social sciences, econometrics and finance, economics texts and arts and humanities. Step 3 documents were restricted to final stage publication exclusively, yielding 212 English-language documents. VOSviewer software was then used to analyse the 212 research papers for this bibliometric analysis.

3.2 Selection of documents

The process of selecting the final 212 documents for bibliometric analysis using VOSviewer and Biblioshiny (R software) is presented in the flowchart given in Figure 1.

4. Findings and interpretation

The findings of this study using the VOSviewer and Biblioshiny (R software) are discussed under the analysis on publications, keyword analysis, author analysis and country wise analysis.

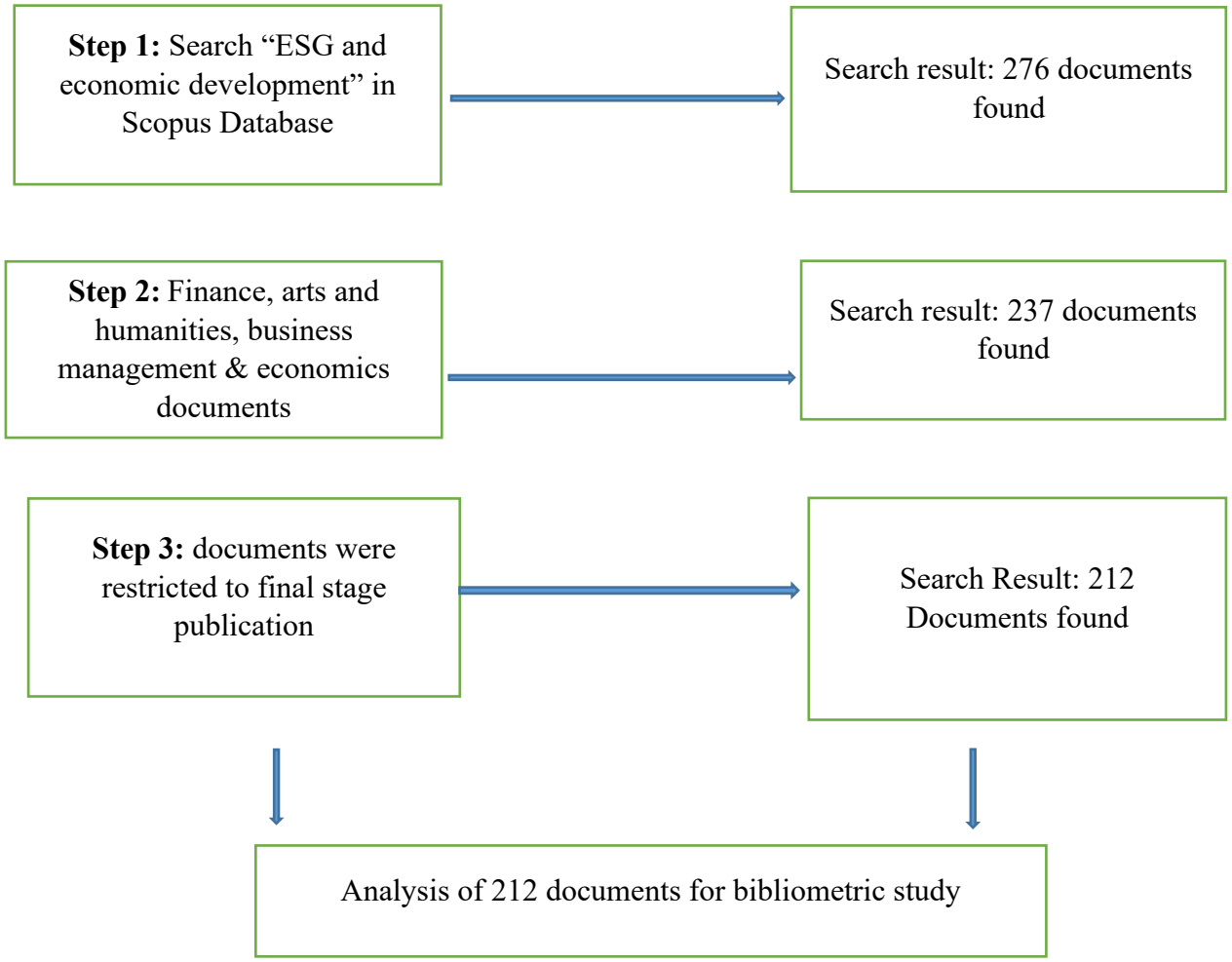
4.1 Mapping analysis on publications

To examine the trend, growth, distribution and characteristics, the publication analysis is presented. The publication trend, the top 10 most cited documents and the leading journals depicts the rising trend in the publications on ESG and economic development.

4.1.1 The number of ESG and economic development publications from 2011 to 2025 (Scopus data)

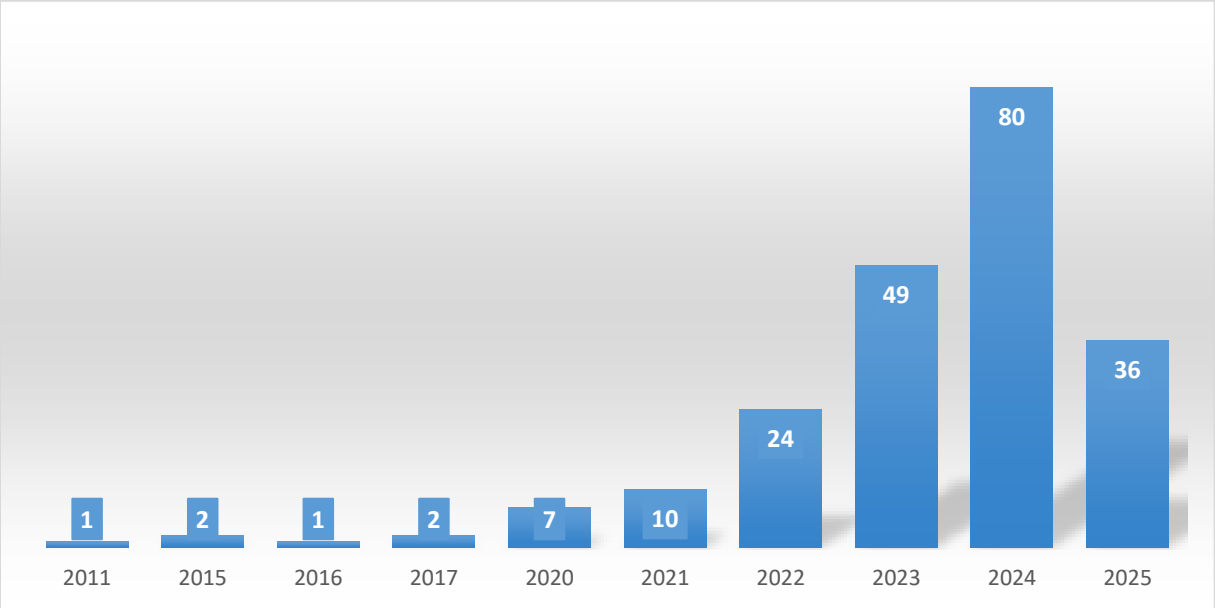
The number of publications on ESG and Economic development has increased over the period of 14 years shown visually clearly illustrates how the topic has become a research hotspot in recent years, with a noticeable upward trajectory in publications, signalling both academic and policy relevance.

Figure 1: Selection of documents



Source: Scopus (authors compiled)

Figure 2: Publication trend of ESG and economic development over the years



Source: Compiled by authors using MS Excel

Figure 2 presents the number of publications related to ESG and economic development indexed in Scopus from 2011 to 2025. The number of publications was consistently low from 2011 to 2017, with only one or two studies per year, indicating limited academic interest during that period. However, starting in 2020, there was a noticeable increase, with publication numbers climbing steadily—from seven in 2020 to 10 in 2021, then doubling to 24 in 2022. The trend peaked in 2024 with 80 publications, followed by 49 in 2023 and 36 in 2025 (noting that the 2025 data may still be incomplete). This dramatic post-2020 growth reflects a significant shift in research priorities, probably influenced by global emphasis on sustainability and responsible governance in response to climate challenges and the Covid-19 pandemic.

4.1.2 Top 10 most cited documents

The top cited documents highlight the most influential research in the field of ESG that has contributed to introducing new methodologies and models that later studies find significant. These work are considered essential by the researchers as it gives the direction and shaping the intellectual structure.

Table 1. Top 10 most cited documents

Rank	Document	Title	Authors	Journal	Citations
1	Lin (2021)	Varieties in state capitalism and corporate innovation: Evidence from an emerging economy	Lin, Y. (Rebecca), Fu, X. (Maggie), & Fu, X.	*Journal of Corporate Finance*, *67*, April 2021, 101919	174
2	Karim (2021)	A novel measure of corporate carbon emission disclosure, the effect of capital expenditures and corporate governance	Yang, Q., Du, Q., Razzaq, A., & Shang, Y.	*Journal of Environmental Management*, *290*	155
3	Yang (2022)	How volatility in green financing, clean energy, and green economic practices derive sustainable performance through ESG indicators? A sectoral study of G7 countries	Yang, Q., Du, Q., Razzaq, A., & Shang, Y.	*Resources Policy*, *75*, March 2022, 102526	149
4	Ting (2020)	Corporate social performance and firm performance: Comparative study among developed and emerging market firms	Ting, I. W. K., Azizan, N. A., Bhaskaran, R. K., & Sukumaran, S. K.	*Sustainability*	101
5	Daugard (2022)	Global drivers for ESG performance: The body of knowledge	Daugaard, D., & Ding, A.	*Sustainability*	91
6	Wang (2023b)	Institutional ownership heterogeneity and ESG performance: Evidence from China	Wang, Y., Lin, Y., Fu, X., & Chen, S.	*Finance Research Letters*, *51*, January 2023, 103448	79
7	Crespi (2020)	The determinants of ESG rating in the financial industry: The same old story or a different tale?	Crespi, F., & Migliavacca, M	*Sustainability*	77
8	Lu (2016)	Multicriteria decision analysis to develop effective sustainable development strategies for enhancing competitive advantages: Case of the TFT-LCD industry in Taiwan	Lu, I.-Y., Kuo, T., Lin, T.-S., Tzeng, G.-H., & Huang, S.-L.	*Sustainability*	65

9	He (2023)	How does the environmental protection tax law affect firm ESG? Evidence from the Chinese stock markets	He, Y., Zhao, X., & Zheng, H.	*Energy Economics* , *127*, Part A, November 2023, 107067	60
10	Liao (2023)	Financial report comment letters and greenwashing in environmental, social and governance disclosures: Evidence from China"	Liao, F., Sun, Y., & Xu, S.	*Energy Economics*, *127*, Part B, November 2023, 107122	57

Source: compiled by authors using VOSviewer

The data given in Table 1 reveals that the most influential document in this list is Lin (2021) with 174 citations, followed closely by Karim (2021) with 155 and Yang (2022) with 149. These works probably offer foundational insights or widely adopted methodologies in their respective research areas. Older documents such as Ting (2020)**,** Crespi (2020)**,** and Lu (2016) continue to be heavily cited, suggesting lasting relevance or seminal contributions to the field. More recent publications like He (2023) and Liao (2023) also appear in the top 10, indicating they may present timely or emerging perspectives that are rapidly gaining academic attention. This mix of older foundational texts and newer influential works suggests a dynamic scholarly environment where both legacy and innovation shape current research directions.

4.1.3 Top leading journals

The top leading journals were analysed using VOSviewer and the Biblioshiny package in R to understand the total number of documents and citations, which was helpful to identify the concentration of research that reflects intellectual structure and academic influence in the field of ESG and economic development.

Table 2: Top leading journals of ESG and economic development

Source	Documents	Citations
E3S Web of Conferences	10	53
Energy Economics	8	185
Environmental Science and Pollution Research	9	111
Finance Research Letters	6	106
Frontiers in Environmental Science	5	43
International Review of Financial Analysis	5	55
Journal of Environmental Management	9	334
Resources Policy	6	222
Sustainability (Switzerland)	40	821

Source: authors' work

Table 2 shows that with 40 papers and 821 citations, *Sustainability (Switzerland)* is the top journal by a margin showing its primary importance in releasing ESG-related economic development research. Other journals like the *Journal of Environmental Management, Resources Policy,* and *Energy Economics* have fewer publications but still receive a high number of citations, meaning their articles are influential. Journals such as *Environmental Science and Pollution* Research and *Finance Research Letters* are also important contributors. However, most journals have very low or no "link strength," which means they are not often cited together with other sources in the field, showing limited connection between them.

4.2 Keyword analysis

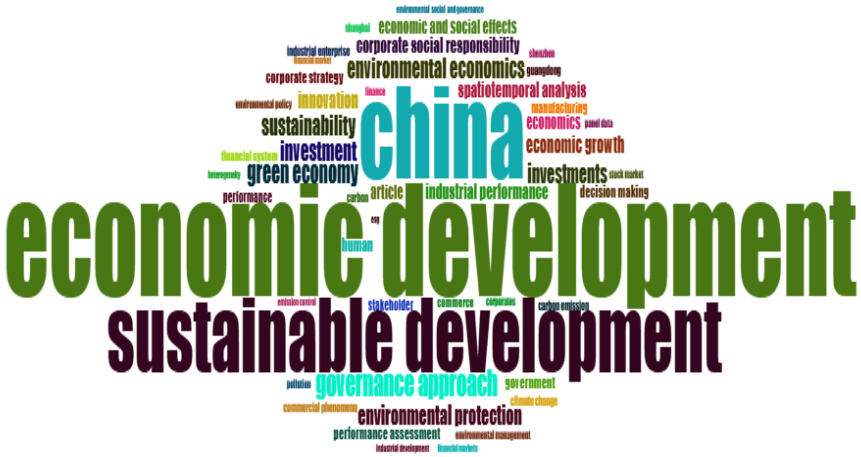
To identify the major research themes, hotspots and evolving trends and the keyword co-occurrence analysis has been presented in the paper

4.2.1 Frequent keywords

Word clouds in Biblioshiny are visual representations of frequently used phrases in a bibliometric dataset, such as abstract terms, title words, or keywords. They help identify popular study topics

and themes, making them useful for exploratory data analysis. Word clouds are particularly useful for academics to understand scholarly work structure and emphasize dominating or emerging topics.

Figure 3 Word cloud



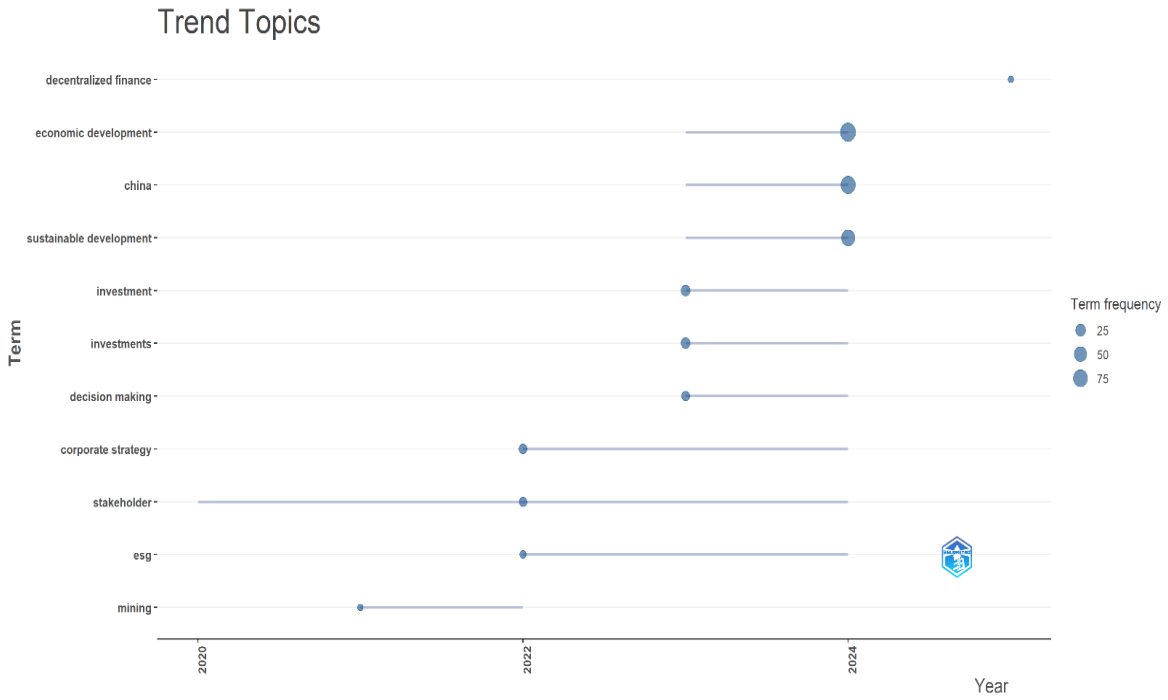
Source: Biblioshiny R Studio

The most common terms associated with sustainable and economic development are graphically summarised in this word cloud image in Figure 3, which was probably taken from a compilation of scholarly publications. While the presence of "sustainable development" underscores its pivotal significance in literature, the largest word, "economic development", suggests it is the subject most discussed in the dataset. Given how boldly "China" appears, it is likely that much of the research either concentrates on or employs China as a key case study. Other noteworthy terms that illustrate significant themes in the sector are "governance approach", "green economy", "investment", "environmental protection", and "corporate social responsibility". Further, terms such as "policy", "innovation", "environmental economics", and "economic growth" indicate subtopics and methodological stances. Overall, the word cloud indicates a noteworthy interdisciplinary focus, frequent talks on governance and policymaking, and a strong emphasis on striking a balance between environmental sustainability and economic success.

4.2.2 Trend topics

The trending research topics are based on how often certain terms appeared. The largest bubbles represent the most frequently mentioned topics.

Figure 4: Trend topics



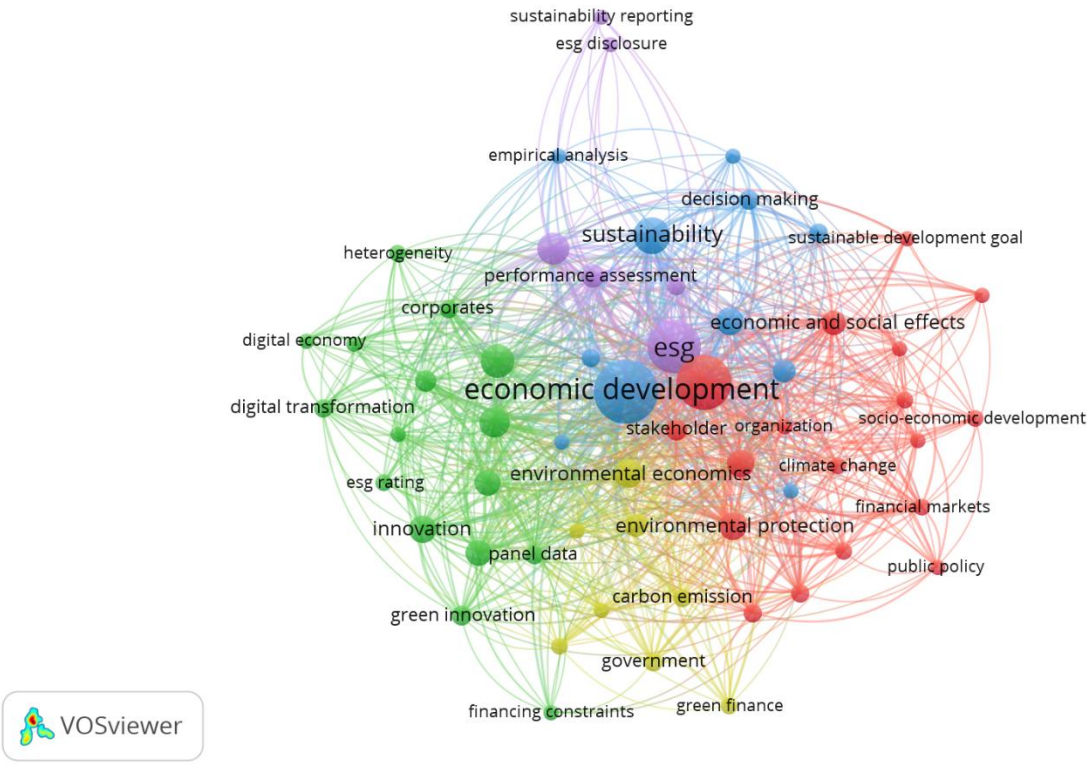
Source: Biblioshiny (R Studio)

Further, Figure 4 shows that over time from 2020 to 2024I, the most popular terms were "economic development," "China," and "sustainable development," each appearing very often in discussions in 2024. Other topics such as "investment," "corporate strategy," "stakeholder," and "ESG" also started gaining attention, especially from 2022 onwards. Earlier terms such as "mining" and "stakeholder" were mentioned before 2022, but newer terms like "decentralised finance" only started appearing in 2024. This shows a growing interest in sustainability, investment strategies, and ESG-related themes in recent years.

4.2.3 Thematic structure of ESG and economic development using co-occurrence analysis

After eliminating key word duplications including, "China", "human", "performance", and "financial market", the authors chose suitable keywords for the study. Five clusters were identified through the study of co-occurrences; the first was red, the second was green, the third was blue, and the fourth was yellow and purple.

Figure 5: Co-occurrences of keywords



Source: VOSviewer (compiled by authors)

Cluster 1 (Red) – Environmental and socio-economic governance

In cluster 1 there are 18 items and most of them are related to environmental and socio-economic governance in Figure 7. The focus of this cluster is on macro-level themes that relate ESG to more general social, environmental, and regulatory factors. This cluster focuses on macro-level themes

related to environmental, social and governance factors, including pollution, environmental preservation, and climate change. It highlights ESG's interaction with financial systems, governance, socioeconomic development, and sustainable development goals. Stakeholders, organisations, and commerce link institutional and operational involvement in sustainable practices. ESG serves as a guiding principle for environmental regulation and sustainable economic transformation, highlighting policy and societal issues.

Cluster 2 (Green) – Technological and industrial ESG practices

Cluster 2, the green nodes, have 16 items, and the majority of the keywords are digitalisation, innovation, and industrial transformation in ESG contexts, focusing on data-driven strategies, ESG performance, and green development. It includes corporates, manufacturing, and industrial performance, suggesting a business-centric lens on ESG implementation. This cluster represents the operational and technological integration of ESG in business and industrial settings.

Cluster 3 (Blue) – Economic theory and decision-making

This cluster 3 is highlighted in blue colour, having 11 items of keywords that explore the theoretical and empirical foundations of ESG in economics, focusing on economic development, growth, environmental management and financial performance. It suggests analytical approaches to ESG, highlighting the link between economic reasoning and sustainability outcomes, and reflects research and academic discourse within economic modelling, performance, and management contexts.

Cluster 4 (Yellow) – Policy and emission control

Cluster 4, which has eight items, is highlighted in light yellow. Most of these items are terms connected to topics that deal with the economic levers and policy tools used to execute ESG. The cluster highlights policy instruments and economic levers used to implement ESG, including carbon emission, emission control, and mitigation, green finance, government, and environmental economics, and corporate strategy and industrial development. It demonstrates policy-driven ESG action focused on emissions reduction, green investment, and regulatory economics.

Cluster 5 (Purple) – ESG disclosure and governance

The cluster having 6 items emphasizes the core governance and transparency elements of ESG, including corporate governance, sustainability reporting, ESG disclosure, and performance assessment, emphasizing accountability, transparency, and governance frameworks in companies' disclosure and assessment of ESG commitments.

4.3 Author analysis

To identify the influential authors and knowledge leaders contributing to the field of ESG and economic development the author analysis includes the top cited authors with the density visualisation and the most relevant authors based on the number of documents, authors productivity through the Lotka's law, average citation per year has been analysed.

4.3.1 Top cited authors

The citation analysis of authors and researchers is one of the most effective methods for assessing the effect of a particular field of study.

Table 3: Top cited authors

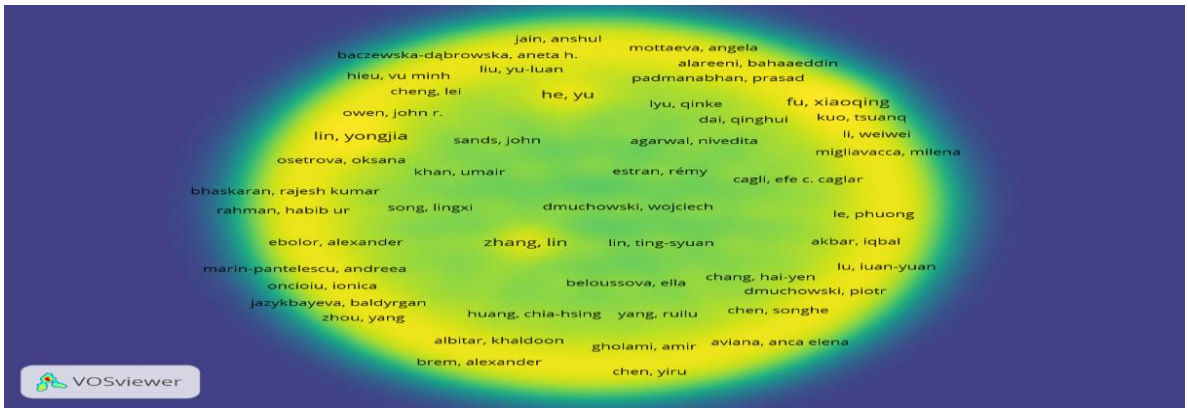
Author	Documents	Citations
Fu, Xiaoqing	2	253
Lin, Yongjia	2	253
He, Yu	2	73
Zhang, Lin	2	41
Xi, Lei	3	3
Ponomareva, Alena	2	2
Romanova, Olga	2	2
Wang, Hui	2	2
Kulueva, Chinara R.	2	1

Source: Compiled by authors

Table 3 displays the top-referenced writers in the fields of economic development and ESG. Notably, Fu Xiaoqing and Lin Yongjia stand out for their great effect – despite having only two publications apiece, they have acquired a stunning 253 citations, demonstrating that their study is well recognised and important. He Yu also demonstrates substantial participation, with 73 citations from only two works. Several authors, including Mhlanga David, Romanova Olga, and Ponomareva Alena, have published several documents but has received little or no citations,

indicating that their work is either newer or less visible in the academic world. Interestingly, Xi Lei has the most documents (3) but the fewest citations (3), indicating productivity but limited reach for the time being. The Figure 12 below is the density visualisation of the highly cited authors with maximum 15 citations with respect to one document. In the centre, names such as He, Yu**,** Fu, Xiaoqing**,** Zhang, Lin, and Lin, Yongjia, which are written in larger font sizes this means these authors have more publications or stronger connections (like co-authorships or similar research topics).

Figure 6: Density visualisation of highly cited authors

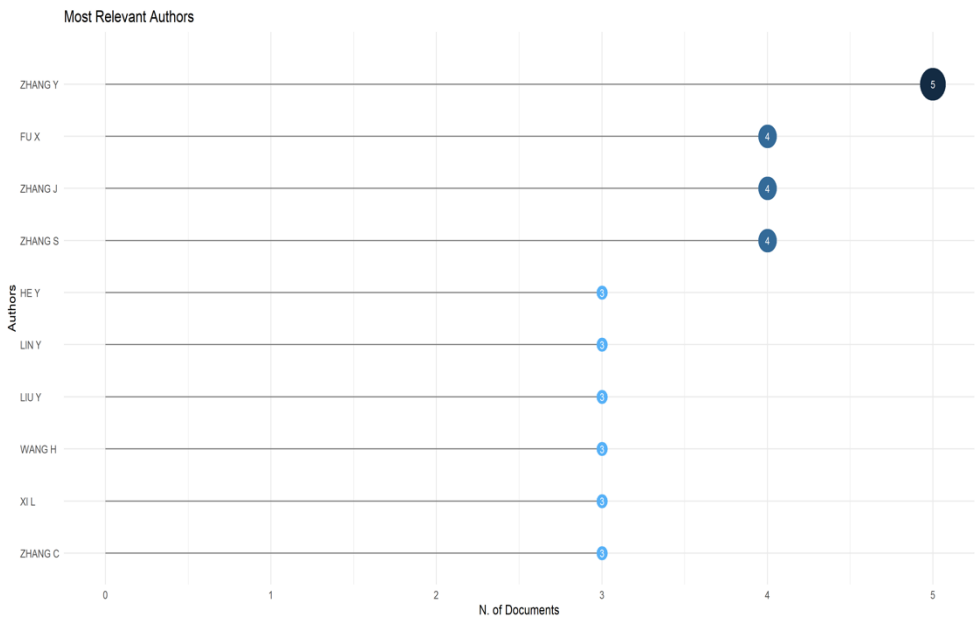


Source: Vosviewer

4.3.2 Most relevant authors based on number of documents

The most relevant authors based on the number of documents is obtained from Biblioshiny. The chart presents the authors who have written the most documents on ESG and economic development as research area. The size and colour of the dots in the figure shows how many documents each author has published — larger and darker dots mean more publications. Overall, this chart helps us quickly understand who the key authors are in this research field based on how many papers they have written.

Figure 7: Most relevant authors based on number of documents



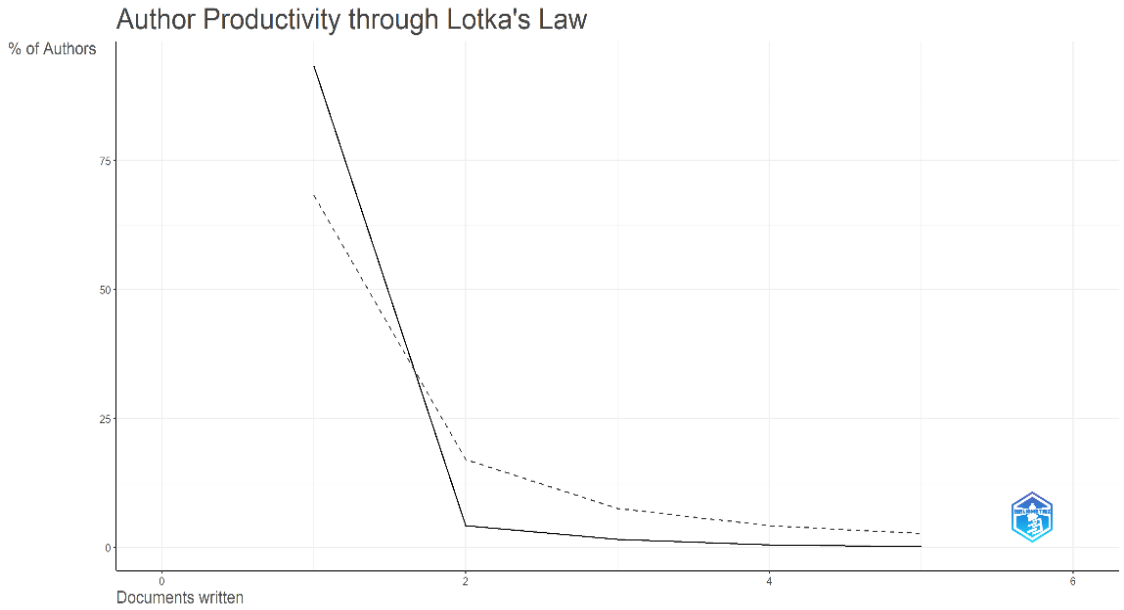
Source: Biblioshiny (R studio)

In Figure 7, the names of the authors are listed on the y-axis and the number of documents they have written is shown along the x-axis. Each dot represents an author's contribution. The farther the dot is to the right, the more papers that author has written. Zhang is the most active author, with five documents. Fu, Zhang, and Zhang have each written 4 documents, making them also important contributors. Other authors like He, Lin, Liu, Wang, Xi, and Zhang have written three or fewer papers.

4.3.3 Lotka's law

Lotka's law is a bibliometric principle that characterises how frequently authors publish in a certain topic. It claims that the proportion of authors who publish n publications is roughly $1/n^2$ of those who publish a single paper. To put it another way, the majority of authors only publish once, while a select few are extremely productive and publish more frequently.

Figure 8: Author's productivity through Lotka's law



Source: Biblioshiny (R studio)

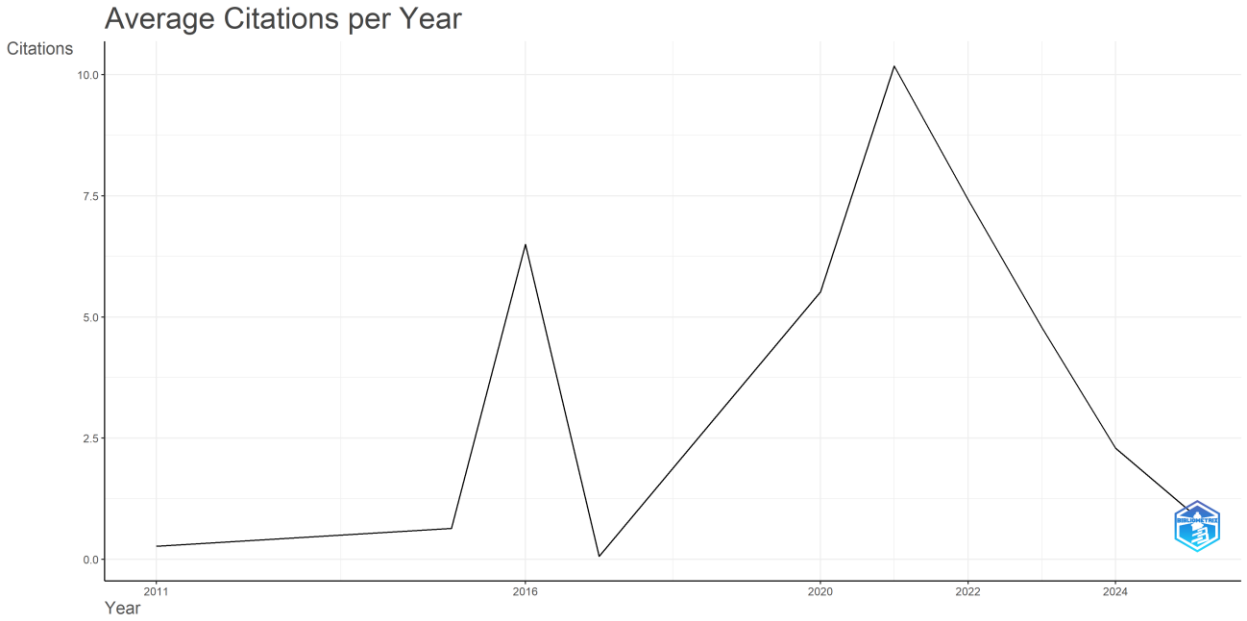
Figure 8 visualises author productivity according to Lotka's law. The x-axis represents the number of documents written by authors, while the y-axis shows the percentage of authors who have written that many documents. The solid line reflects the observed distribution, and the dotted line represents the theoretical distribution predicted by Lotka's law. The chart shows that a majority of authors (almost 90%) have written only one paper, while very few have published multiple papers. As the number of documents increases, the percentage of authors decreases sharply. This supports Lotka's law, which emphasizes that scientific productivity is heavily skewed, with a small number of authors contributing most of the literature.

4.3.4 Average citation per year

Average citation per year normalises the citation counts and allows the fair comparison between the older and newer studies. It gives the current relevance of the research and sustained effect of

publications over time and additionally helps to identify the topics gaining rapid attention. It is useful for authors and journals to know the quality and effect of the publications rather than the quantity. The average citation per year is given in the figure below highlighting the effect of the research in ESG and Economic development over the period.

Figure 9: Average citations per year



Source: Biblioshiny (R Studio)

Figure 9 shows the average number of citations per year from 2010 to 2025. At the beginning, the number of citations was very low and slowly increased until around 2016, when it suddenly spiked to a higher average. After that, there was a sharp drop in 2017, followed by a steady rise again, reaching the highest point in 2021. This peak suggests that the research during that year was widely recognised and cited. However, after 2021, the average citations started to fall sharply, dropping significantly by 2025. This decline could mean that newer articles are either too recent to be cited often or haven't had as much effect as those from earlier years.

4.4 Country-wise analysis

To know which countries are dominating in the contribution of the research field and the contribution of the emerging countries it is necessary to perform the country wise analysis. In our study we found that China is leading in the field of research on ESG and economic development with maximum number of documents and citations.

4.4.1 Country-wise bibliographic coupling

Country wise bibliographic coupling is important to explain how and why the countries are connected in the research area. It combines the geographic and intellectual sharing among the nations with similar research agendas and theoretical foundations which is essential in interdisciplinary areas like ESG, finance, economics and sustainability.

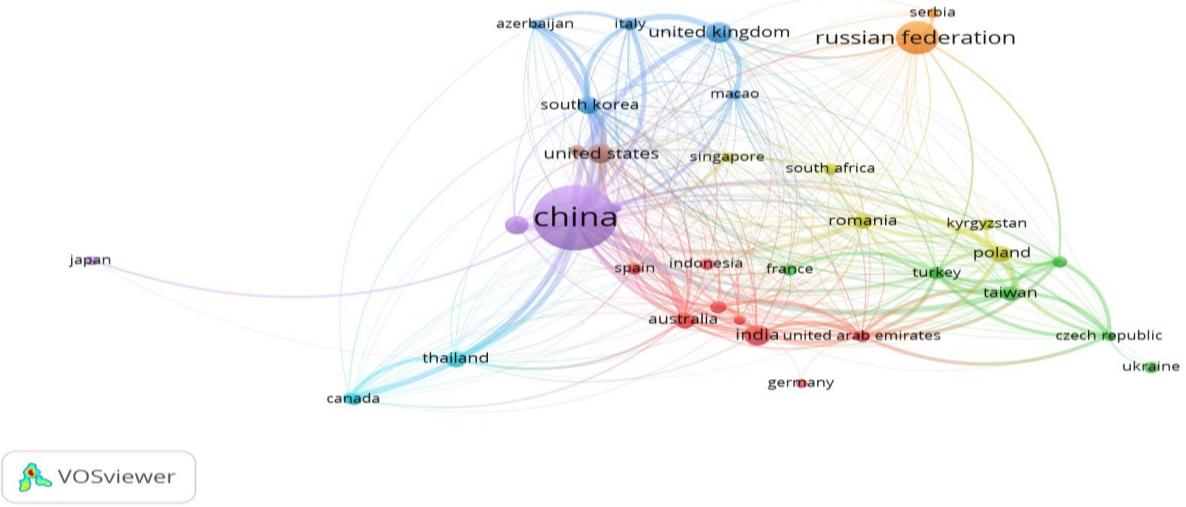
Table 4: Country-wise bibliographic coupling

ID	Country	Documents	Citations	Total link strength
1	Australia	6	198	653
2	Azerbaijan	2	5	506
3	Brazil	3	9	108
5	Canada	3	17	125
7	China	94	1184	4259
9	Czech Republic	2	0	581
11	France	3	82	151
12	Germany	2	56	2
14	Hong Kong	3	40	473
15	India	10	56	385
16	Indonesia	3	30	34
18	Italy	4	96	704
19	Japan	2	8	34
23	Kyrgyzstan	3	1	169
27	Macao	2	219	363
28	Malaysia	8	36	432
32	New Zealand	2	1	370
36	Poland	6	86	861
39	Romania	5	47	570
40	Russian Federation	25	87	267
41	Saudi Arabia	4	125	375
42	Serbia	2	8	108
43	Singapore	2	1	156
45	South Africa	3	0	75
46	South Korea	7	77	1053
47	Spain	3	28	193
48	Switzerland	3	0	0
49	Taiwan	5	96	854
50	Thailand	6	28	437
51	Turkey	4	96	751
52	Ukraine	3	25	10
53	United Arab Emirates	3	102	1006
54	United Kingdom	10	379	808
55	United States	9	54	819
57	Uzbekistan	3	0	613
58	Viet Nam	2	126	319

Source: VOSviewer (compiled by authors)

Table 4 displays the contributions of several countries to ESG and economic development research. China is by far the most prominent, with 94 documents and over 1,100 citations, demonstrating its strong position in the subject. It also has the highest total link strength (4259), indicating that its research is well-connected and referenced internationally. Countries such as the United Kingdom, Poland, Taiwan, and the United States have tremendous activity, both in papers and strong citation networks. Interestingly, Macao stands out with only two documents but a high citation count (219), demonstrating that even little contributions can have a significant effect. Meanwhile, certain countries, such as Uzbekistan and the Czech Republic, have no citations but very large link strengths, which may indicate collaborative relevance rather than academic recognition. South Korea, Italy, and Turkey are the countries that have a good balance of output, effect, and connectedness. Overall, the findings reveal that ESG research is becoming a truly global effort, with some countries clearly leading in influence and collaboration.

Figure10: Country-wise bibliographic coupling of ESG and economic development



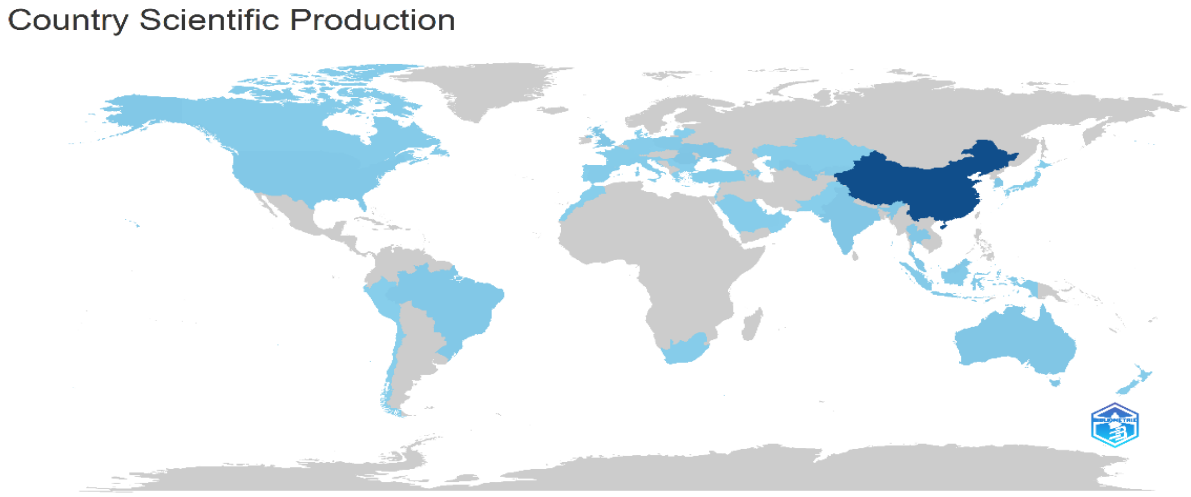
Source: VOSviewer (complied by authors)

It is visible in Figure 10 that China is centrally connected, with links to countries such as the United States, the United Kingdom, South Korea, India, and many more, demonstrating its worldwide reach. Clusters of different colours show groups of countries that work more closely together—for example, Russia and Serbia are in one cluster, while India, Australia, and the UAE are in another. Countries such as Japan and Canada are more on the outskirts, implying that they are involved but not as well connected as others. Overall, this map demonstrates that ESG research is not only expanding, but also becoming a highly collaborative worldwide effort, with China at the forefront of global cooperation.

4.4.2 Countries' scientific production

It helps to identify the leading and emerging nations in the research field highlighting the concentration of the research activity in a particular area. A country's scientific production is the total number of research publications in a country in a particular research area and period. It shows the geographical distribution of output in the research area.

Figure 11: Word map with countries' scientific production



Source: Biblioshiny (R studio)

Figure 11 visualises country-wise scientific production, where the intensity of the blue colour indicates the volume of research output. Darker blue shades represent countries with higher scientific article production, while lighter shades show comparatively lower levels of research activity. From the diagram, China leads in scientific production, followed by other active contributors such as India, the United States, Australia, and Brazil. Several European and Asian countries also show moderate research output. In contrast, grey-shaded regions have minimal or no recorded scientific publications in the dataset. This map provides a quick overview of global research contributions, highlighting regions with strong academic and research engagement.

5. Discussion and Conclusion

Environmental protection and rapid economic development are now being aligned due to concerns about sustainability. The number of articles published on ESG has increased during the last few decades. This paper's aim is to increase the body of knowledge in ESG and related disciplines of study. To do this, a bibliometric study was conducted using VOSviewer and the R Bibliometrix package. The relational technique for bibliometric studies uses five primary techniques: conceptual analysis, keyword co-occurrence analysis, publication mapping analysis, citation analysis and bibliographic coupling analysis. Two hundred and 12 documents from Scopus were used for these analyses. According to the keyword co-occurrence analysis, the terms “sustainability”, “green innovation” and “sustainable development” were the most often occurring in the documents. These terms were exclusively associated with “ESG”, “social economic development”, and “environment economics”, as well as with “sustainable reporting”, “innovation”, and “environmental protection” and “corporate social responsibility” as related topics. Similar findings were also obtained from the R Studio study in conceptual structure. The citation analysis reveals that Lin (2021), Yang (2022), Karim (2021), Ting (2020) were among the most cited documents related to ESG and economic development. *Sustainability (Switzerland)*, *Journal of Environmental Management*, *Resources Policy*, and *Energy Economics* are the top leading journals publishing articles related to ESG and economic development. In country-wise bibliographic coupling analysis, China stands out as the leading contributor in this field, with an impressive 94 publications and more than 1,100

citations. This not only reflects the country's strong presence in the research community but also highlights its global influence. China's research is highly interconnected, as shown by its highest total link strength of 4,259—suggesting its work is widely referenced and integrated into international studies. Meanwhile, other countries like the United States, United Kingdom, Poland and Taiwan are also making significant strides. They're not only producing a substantial number of papers but are also deeply embedded in global citation networks, underscoring their active and effective role in advancing the field. The results are intended to serve as a foundation for future research development and collaboration among authors, affiliated universities, and countries, as well as to direct and inspire researchers in the areas of ESG, economic development, and green innovation. This study is an attempt to acknowledge ESG as a significant field of study in and of itself. The bibliometric study and debate of ESG and economic development highlight numerous research opportunities for regulatory institutions and researchers. There is a significant research deficit in integrating economic development and ESG, which presents a potential for research in the future in this field. The bibliometric analysis revealed that the literature on ESG is broad and incorporates interdisciplinary perspectives.

6. Limitations and future directions

In this study, the authors employed data from the Scopus database; however, for a more thorough coverage of the research subject, other databases such Web of Science, Lens, Pub med, and others can be used. While conducting searches with just the term "ESG and economic development", a smaller number of papers were found. This implies that a broader analysis that includes "ESG" along with a few additional keywords can provide future academics with some fresh perspectives. Since 2011, there's a rise in ESG publications on economic development, but many dimensions remain underexplored. This paper provides a bibliometric analysis but should not replace rigorous review methodologies. It offers a foundational overview of ESG and economic development research. While it identifies publication trends and research gaps, it lacks depth in research quality, causality, or policy implications. The analysis is a foundational step, highlighting existing research trends and under-researched areas, and aiming to stimulate further scholarly inquiry.

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