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TRENDS AND EVOLUTION OF ESG IN EDUCATION: A BIBLIOMETRIC REVIEW

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ABSTRACT

This study presents a comprehensive bibliometric analysis of the research landscape surrounding Environmental, Social, and Governance (ESG) issues within the context of education. Drawing upon 303 documents indexed in the Scopus database between 2004 and 2024, and employing analytical tools such as VOSviewer and Biblioshiny, the study maps the intellectual structure, thematic evolution, and collaborative networks of this emerging interdisciplinary field. The analysis reveals six major thematic clusters, spanning ESG performance, sustainable finance, governance frameworks, and digital transformation in higher education. Leading contributions originate from institutions in China, the United States, and several European nations, with the journal Sustainability identified as the most influential publication outlet. Keyword co-occurrence and bibliographic coupling analyses demonstrate a shift from foundational sustainability discourse to more advanced topics such as quality assurance, policy integration, and technological innovation. The findings offer actionable insights for researchers, policymakers, and educational institutions aiming to embed ESG principles into university curricula, governance practices, and long-term strategic planning. Furthermore, this study contributes to the growing body of knowledge by outlining a structured roadmap for future research at the intersection of ESG and education.

KEYWORDS: *ESG in Education, Bibliometric Analysis, Higher Education Governance, Sustainability Trends, VOSviewer*

1. INTRODUCTION

Environmental, Social, and Governance (ESG) issues lie at the core of sustainable development, aiming to foster a balanced relationship between human advancement and ecological preservation (Wan & Dawod, 2022). As an integrated framework, ESG reflects the convergence of economic growth, environmental responsibility, and social equity. Initially introduced in the context of corporate performance evaluation, ESG has gained widespread attention for its role in driving responsible investment, enhancing transparency, and promoting long-term value creation (Wan et al., 2023). Its rising prominence has transcended corporate boundaries and entered the realm of education, where institutions are recognizing their dual responsibility - as both educators and practitioners of sustainability.

The concept of ESG evolved from Socially Responsible Investment (SRI) movements in the 1960s and 1970s, fuelled by increasing public awareness of environmental degradation, labour issues, and ethical governance in the post-industrial era (Khurshid & Islam, 2024). The term "Environmental, Social, and Governance" was formally introduced in the landmark 2004 United Nations report *Who Cares Wins*, which underscored the relevance of ESG in sustainable investment decision-making (UN, 2004). Since then, ESG has developed into a guiding principle for organizations including educational institutions in integrating sustainability into their strategic vision.

As global challenges such as climate change, social inequality, and ethical leadership become more pressing, higher education institutions (HEIs) are increasingly expected to prepare future leaders capable of addressing these multifaceted issues. This transformation reflects not only regulatory expectations but also growing societal demand for accountability, transparency, and ethical behaviour in both business and academia (Alenezi & Alanazi, 2024). Consequently, the integration of ESG principles into university governance and academic curricula is no longer optional but essential.

Recent studies underscore the significance of ESG reporting as a mechanism for enhancing institutional transparency and stakeholder trust. Strong ESG performance is often associated with improved financial outcomes and increased investment attractiveness (Wong, 2017; Ktk et al., 2017; Syed, 2017). Accordingly, frameworks developed by organizations such as the Global Reporting Initiative (GRI), the International Integrated Reporting Council (IIRC), and the Sustainability Accounting Standards Board (SASB) have been adapted to support ESG implementation in the educational sector (Ellili, 2022). These guidelines facilitate structured integration of ESG into teaching, research, and institutional operations, thereby nurturing a culture of sustainability.

Importantly, ESG's social dimension intersects with efforts to promote Diversity, Equity, and Inclusion (DEI) in educational environments. According to Esteves-Miranda et al. (2021), embedding DEI within ESG frameworks contributes to more inclusive academic spaces that reflect the diversity of

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contemporary society. This alignment enhances not only educational quality but also institutional credibility.

Higher education institutions serve as both influencers and enablers in promoting ESG awareness. They shape the next generation of ethical leaders while simultaneously embedding sustainability into their own practices (Nguyen & Pham, 2021). Recent bibliometric studies reveal a growing scholarly interest in ESG's role in education, exploring themes such as sustainable teaching models, academic governance, and social responsibility in universities (Chen et al., 2024; Smith et al., 2023).

In response to this emerging research landscape, the present study conducts a comprehensive bibliometric analysis of 303 Scopus-indexed publications from 2004 to 2024. Using advanced tools such as Biblioshiny and VOSviewer, this analysis aims to reveal the intellectual structure, research trends, and collaboration patterns within the domain of ESG and education. The objective is to provide foundational knowledge for new researchers and strategic insights for educators, policymakers, and institutional leaders. Specifically, the study addresses the following research questions:

1. What are the publication trends in the field of ESG and education?
2. Which countries, journals, authors, institutions, collaborations, and topics have contributed most significantly to the field?
3. What are the most frequent keywords, and which thematic areas dominate the discourse on ESG in education?
4. What are the most cited scholarly works in this domain?

The remainder of this paper is organized as follows. Section 2 discusses the prior literature. This is followed by the methodology and literature selection process in Section 3. The results and discussion of the bibliometric analysis are presented in Section 4. Finally, the conclusions are presented in the last section.

2. LITERATURE REVIEW

The integration of ESG principles into educational frameworks has garnered significant attention in recent years, reflecting a broader societal shift toward sustainability and responsible governance. ESG, once primarily associated with corporate accountability and green investment strategies, is now being examined in the context of academic institutions, both as a field of scholarly inquiry and as a guiding principle for institutional governance.

Recent bibliometric analyses have revealed a growing body of literature focused on ESG disclosure and its implications for corporate performance. For instance, a systematic review of ESG disclosure papers identified four major clusters: corporate social responsibility, corporate strategy, financial performance, and environmental economics (Pathan & Mohanty, 2024). This indicates a trend towards understanding how ESG factors influence not only corporate governance but also educational practices and policies.

Moreover, the increasing number of publications on ESG topics suggests a rising interest among researchers and educators in exploring the intersection of sustainability and education. The literature indicates that educational institutions are increasingly viewed as critical players in promoting ESG values, thereby preparing students to engage with complex sustainability challenges (Huang et al., 2023). Studies have shown that educational institutions that incorporate ESG values into their programs can enhance students' understanding of sustainability issues and their implications for business practices (Ellili, 2022). This integration not only prepares students for future careers but also contributes to the broader goal of achieving sustainable development goals (SDGs) (Hieu & Hai, 2021) (Ellili, 2022).

For instance, a study by Khurshid and Islam (2023) employed bibliometric methods to analyze ESG research trends from 1992 to 2023, highlighting the increasing volume of publications and the emergence of key themes such as ESG disclosure, corporate governance, and sustainability reporting (Khurshid & Islam, 2024). Similarly, Wan et al. (2022) identified research hotspots in ESG literature, including the financial outcomes of ESG practices and the relationship between ESG and corporate social responsibility (CSR). These findings underscore the importance of ESG as a critical area of inquiry within educational contexts.

Bibliometric analysis has proven invaluable for mapping research landscapes and identifying trends in emerging fields like ESG in education, providing quantitative insights into the evolution, structure, and dynamics of scholarly knowledge production (Supriyadi & Dahlan, 2022) (Ghufrooni,2024). Recent bibliometric studies in educational contexts have employed sophisticated tools such as VOSviewer, Bibliometrix, and CiteSpace to analyze publication patterns, citation networks, and keyword co-occurrences, revealing the conceptual structure and intellectual development of various research domains(Ghufrooni,2024).For example, a comprehensive bibliometric analysis of design thinking in STEM education examined 812 documents from the Scopus database, identifying significant year-over-year increases in research output and revealing the United States as the most productive country in terms of both publications and citations. These methodological approaches including database selection, search strategies, filtering criteria, and visualization techniques provide valuable frameworks for investigating the development of ESG research in educational contexts (Supriyadi & Dahlan, 2022) (Ghufrooni,2024). By applying similar methodological rigor to the study of ESG in education, researchers can identify influential publications, leading scholars, institutional collaborations, and conceptual clusters that shape this emerging field (Ghufrooni,2024) (Tumewang et al.,2024).

A recent bibliometric analysis of ESG in Islamic banks synthesized 753 articles from 1988 to 2023, revealing an increasing trajectory in the volume of literature and identifying Muslim-majority countries with robust regulatory frameworks as leading the discourse, though interest from Muslim-minority countries was also emerging. This suggests that cultural, regulatory, and regional factors may significantly influence the adoption and study of ESG principles across different contexts, including education (Tumewang et al.,2024).

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A study on innovation in higher education implementation of autonomous learning identified 26 high-quality studies from an initial pool of over 100,000 publications, revealing that autonomous learning practices developed significantly during the COVID-19 pandemic, supported by technological and communication tools that facilitated access to information while still requiring essential teacher guidance (Mares Ruiz et al., 2024). Similarly, bibliometric analysis of flipped classroom methodologies in higher education examined 2,054 documents published between 2012-2022, identifying the United States as the leading contributor to this research area and noting exponential growth in citations, particularly for publications addressing the development of 21st-century skills highly relevant to sustainability literacy (Rakhmalinda,2024). Research on brain function and critical thinking in education has further demonstrated the interconnectedness of cognitive processes and sustainability education, with bibliometric analysis revealing "critical thinking" as the most frequently cited topic in this domain and suggesting the need for further research integrating brain-based learning with critical thinking to improve students' capacity for addressing complex sustainability challenges (Sesrita et al.,2024). These educational innovations provide valuable frameworks for integrating ESG principles into teaching and learning processes, fostering the development of sustainability mindsets and competencies among students (Ruiz et al., 2024).

Despite this growing interest, the evolution of ESG research within the education sector remains underexplored. While bibliometric reviews have extensively examined ESG trends in finance and corporate governance, limited research has mapped the thematic patterns of ESG in education. This study aims to address this gap by conducting a comprehensive bibliometric review of ESG literature within the education sector.

3. METHODOLOGY AND DATA

This study adopted a bibliometric approach, combining quantitative and qualitative methods to analyze the research landscape of ESG within the education sector. Bibliometric analysis enables the evaluation of keywords, references, publications, authors, and institutional productivity, thereby mapping current trends and identifying future research directions (Lu et al., 2019; Zhao et al., 2021). Figure 1 presents the PRISMA flow diagram of the selection process. Data were retrieved from the Scopus database in March 2025 using the Boolean search string TITLE-ABS-KEY (“ESG” AND “Education”), targeting article titles, abstracts, and keywords. Scopus was chosen for its wide coverage and consistent updates, making it the most comprehensive repository of peer-reviewed research outputs (Marzuki et al., 2023; Sharma et al., 2023). The initial search yielded 303 documents.

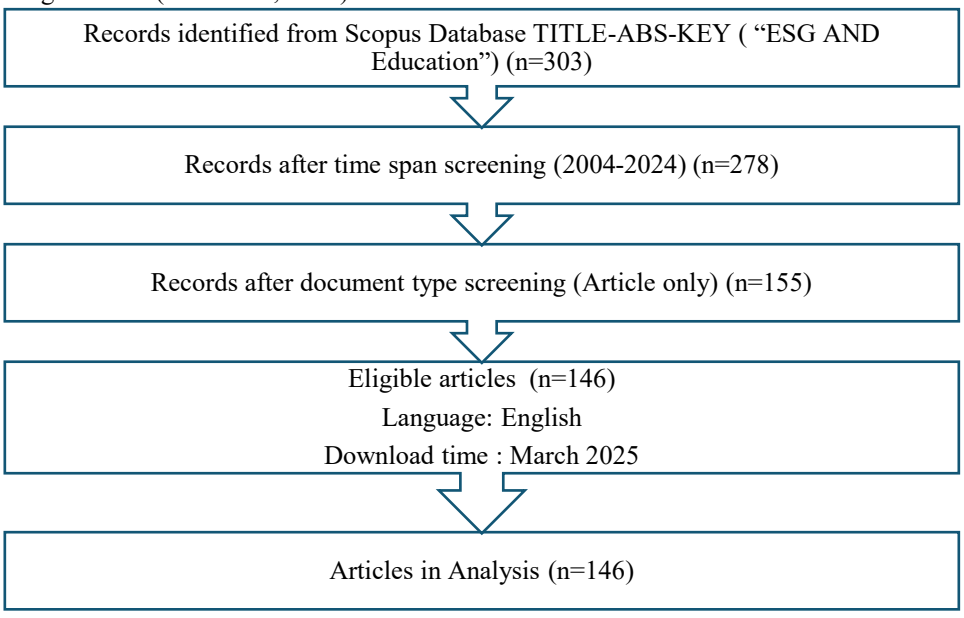


Figure 1. ***PRISMA diagram showing the number of documents at each stage of the screening process.***
Source: Created by the author.

Following the PRISMA guidelines (Yang & Xiu, 2023), a three-stage screening process refined the dataset: (i) exclusion of pre-2004 records (marking the UN’s *Who Cares Wins* report as the formal start of ESG), leaving 278 articles; (ii) restriction to journal articles only, reducing the count to 155; and (iii) inclusion of English-language publications, resulting in 146 articles for final analysis. The dataset was analyzed using Biblioshiny (a graphical interface of the Bibliometrix R package) and VOSviewer, enabling the construction of co-authorship, keyword co-occurrence, and citation networks (Derviş, 2019; Mohanty et al., 2023). These tools provided insights into publication trends, influential authors, institutions, and conceptual structures in ESG-related educational research.

4. RESULT AND ANALYSIS

4.1 Descriptive characteristics of the data

The descriptive statistics of the sample data highlights key elements of the dataset, providing complete insights into absolute and cumulative publishing and citation patterns, as well as significant information on average annual citations. Table 1 summarizes the bibliometric profile of ESG and education research from 2004–2024, covering 146 journal articles across 110 sources authored by 447 scholars. The high

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annual growth rate (25.99%) and the average document age of 3.6 years indicate that this is a rapidly emerging field, with most contributions concentrated in recent years. Collaboration is a defining feature, as reflected by an average of 3.29 co-authors per paper and 26.03% international co-authorship, underscoring the global and interdisciplinary nature of the research.

The corpus has an average of 10.72 citations per article, showing a moderate but increasing impact. The presence of over 500 unique keywords highlights thematic diversity, spanning sustainability, governance, social responsibility, and higher education practices. Collectively, these statistics suggest that ESG in education is a dynamic, growing, and globally relevant research domain, characterized by both scholarly collaboration and conceptual breadth.

Table 1. ***Descriptive statistics of the sample data***

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2004:2024
Sources (Journals, Books, etc)	110
Documents	146
Annual Growth Rate %	25.99
Document Average Age	3.6
Average citations per doc	10.72
References	8017
DOCUMENT CONTENTS	
Keywords Plus (ID)	537
Author's Keywords (DE)	554
AUTHORS	
Authors	447
Authors of single-authored docs	19
AUTHORS COLLABORATION	
Single-authored docs	20
Co-Authors per Doc	3.29
International co-authorships %	26.03
Document Types	
article	146

Source: Created by the author based on biblioshiny analysis

4.2 Analysis of publications

The purpose of analysing temporal characteristics is to reflect the origin and development process of the research topic. During 2004–2024, a large number of papers on ESG and education were published. Fig. 2 shows the number of publications published every year, and it can be seen that this number has increased dramatically, especially in the last four years. The number of articles grew steadily, with more than 20 articles published between 2010 and 2018. The total number of publications from 2019 to 2024 was 118. These results show that the concept of ESG in education sector is receiving increasing attention from researchers.

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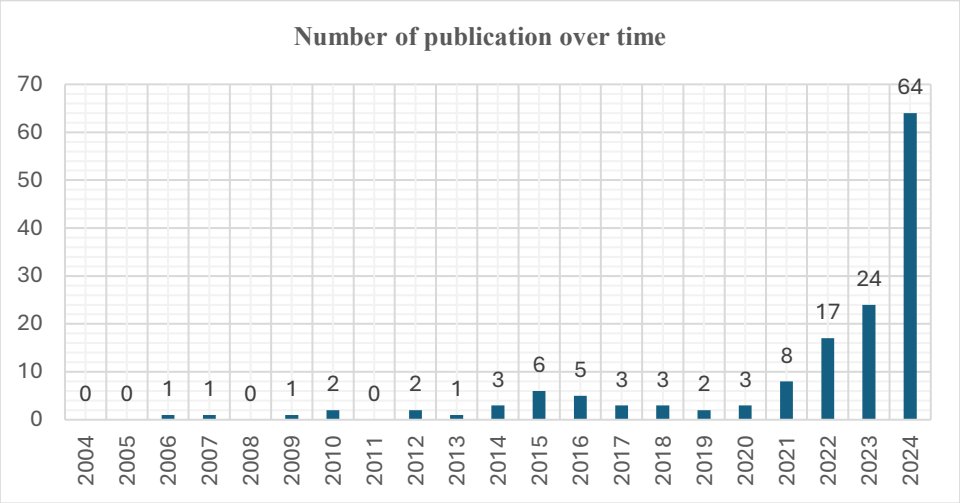


Figure 2. ***Evolution over time of the number of publications related to ESG and Education.***
Source: Created by the author.

4.3 Analysis of citation structure

4.3.1 Evolution over time of the number of citations

The citation data for ESG and education-related articles from 2004 to 2024 reveals a clear trend of growing academic interest in this interdisciplinary field. Citation data from 2004–2024 shows a clear growth trajectory in ESG-and-education research. From 2004 to 2011, citations were minimal, indicating the topic's emerging status. Interest began to rise from 2012, with steady growth through 2015 and a notable peak of 137 citations. After a stable period between 2016 and 2020, citations surged dramatically post-2021, reaching 292 in 2022, 309 in 2023, and an unprecedented 531 in 2024. This sharp increase reflects the influence of global sustainability goals, climate change awareness, social justice movements, and calls for institutional transparency. Overall, the trend underscores ESG's evolution from a niche subject to a central theme in educational research and governance.

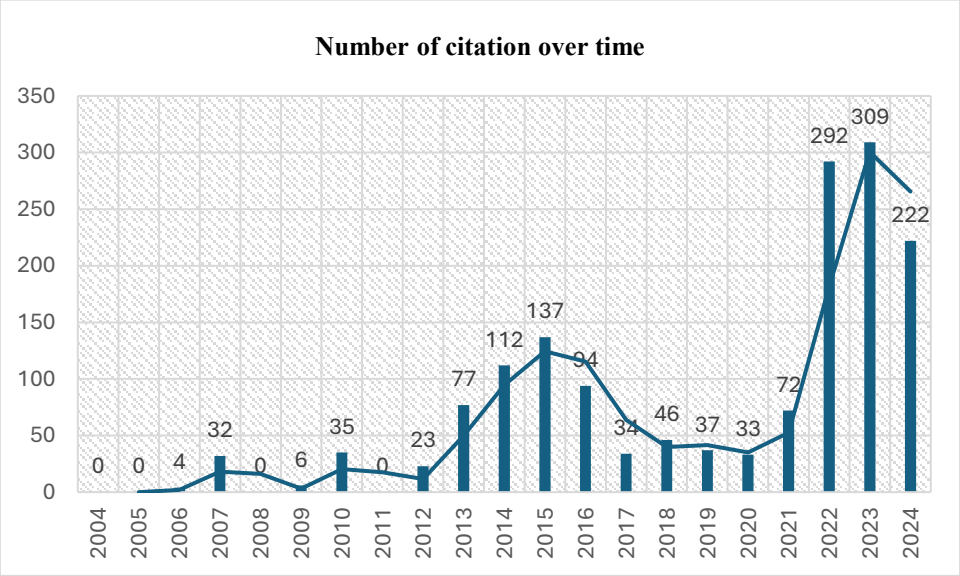


Figure 3. ***Evolution over time of the number of citations.***
Source: Created by the author.

4.3.2 Top 10 cited papers

Table 2 presents a ranking of eleven academic articles based on their total citation counts and average citations per year, illustrating their relative influence within their respective fields. The top-ranked paper, with 91 citations, explores the relationship between mandatory corporate social responsibility (CSR) expenditure and stock market liquidity, highlighting its significance in financial and corporate governance research. Several highly cited articles focus on ESG topics, notably one with 83 citations that examines the global trends and national perspectives on ESG impacts and sustainable investments. The emphasis on ESG and CSR-related studies reflects a strong scholarly interest in sustainability and responsible investing, which are increasingly prioritized in both academic discussions and practical applications. The citations per year metric further emphasizes the ongoing relevance of these works, with some papers, such as those on ESG performance in China and the impact of digital ESG, maintaining high citation rates year after year. Overall, the table 2 indicates that research on ESG, CSR, and sustainable investing is very influential, suggesting that these topics are central to current academic discourse and likely to remain prominent in future investigations.

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Table 2. ***Top 10 cited papers about ESG and Education during 2004-2024***

Rank	Total citations	Title	Author	Citations per paper (C/Y)
1	91	Mandatory CSR expenditure and stock market liquidity	Roy P.P.; Rao S.; Zhu M.	22.75
2	83	Serious games and the development of an entrepreneurial mindset in higher education engineering students	Bellotti F.; Berta R.; De Gloria A.; Lavagnino E.; Antonaci A.; Dagnino F.; Ott M.; Romero M.; Usart M.; Mayer I.S.	6.92
3	77	Concurrent training in elite male runners: The influence of strength versus muscular endurance training on performance outcomes	Sedano S.; Marín P.J.; Cuadrado G.; Redondo J.C.	5.92
4	76	Environmental, social, and governance (ESG) model; impacts and sustainable investment – Global trends and Poland's perspective	Dmuchowski P.; Dmuchowski W.; Baczewska-Dąbrowska A.H.; Gworek B.	25.33
5	51	Exploring Factors that Influence Social Retail Investors' Decisions: Evidence from Desjardins Fund	Diouf D.; Hebb T.; Touré E.H.	5.10
6	51	A gamified collaborative course in entrepreneurship: Focus on objectives and tools	Antonaci A.; Dagnino F.M.; Ott M.; Bellotti F.; Berta R.; De Gloria A.; Lavagnino E.; Romero M.; Usart M.; Mayer I.	4.64
7	50	ESG Performance, Demographic Trend, and Labour Investment Efficiency in China	Su J.; Xue L.	25.00
8	40	From ESG to DESG: The Impact of DESG (Digital Environmental, Social, and Governance) on Customer Attitudes and Brand Equity	Puriwat W.; Tripopsakul S.	10.00
9	36	The impact of ESG risks on corporate value	Cohen G.	12.00
10	34	Systems approach to environment, social and governance (ESG): Case of Reliance industries	Singhania D.M.; Saini D.N.	8.50

Source: *Created by the author.*

4.3 Analysis of Authors

Table 3 shows the top 10 most productive authors in ESG and education research. Rosa MJ is the most productive with 4 papers and consistent impact (H- and G-index = 4). Chan Y-K demonstrates the strongest influence relative to output, with the highest citations per paper (21.33) and M-index (0.600). Authors like Hsieh M-Y, Kohoutek J, Manatos MJ, and Sarrico CS contribute steadily with three publications each, showing balanced productivity and citation impact. In contrast, Antonaci A, Bellotti F, and Berta R have only two papers but exceptionally high citation averages (67 per paper), suggesting landmark contributions despite lower H- and M-indices. Overall, the table highlights both steady contributors and authors with fewer but highly impactful works shaping the ESG-education field.

Table 3. The 10 most productive authors writing on ESG and Education

Rank	Authors	Total papers	Total citation	Citation per paper	H index	G index	M index
1	Rosa MJ	4	52	13.00	4	4	0.333
2	Chan Y-K	3	64	21.33	3	3	0.600
3	Hsieh M-Y	3	49	16.33	2	3	0.500
4	Kohoutek J	3	33	11.00	3	3	0.250
5	Manatos MJ	3	45	15.00	3	3	0.273
6	Sarrico Cs	3	38	12.67	3	3	0.273
7	Abu Dayyeh Bk	2	10	5.00	2	2	0.400
8	Antonaci A	2	134	67.00	2	2	0.167
9	Bellotti F	2	134	67.00	2	2	0.167
10	Berta R	2	134	67.00	2		

Source: Created by the author.

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The figure 4 titled "Authors' Production over Time" illustrates the publication trends and impact of the ten most productive authors in the field of ESG and Education from 2014 to 2024. Authors such as ROSA MJ, KOHOUTEK J, and SARRICO CS have maintained steady, long-term contributions, reflecting sustained engagement with the field. In contrast, HSIEH M-Y and CHAN Y-K have entered more recently (post-2021) but produced high-impact work, with HSIEH M-Y's 2022 publications standing out for both volume and citations. Meanwhile, ANTONACI A, BELLOTTI F, and BERTA R made concentrated contributions around 2014 - 2015 that remain highly cited, despite limited recent activity. Overall, the figure shows a mix of consistent long-term output and impactful short-term contributions, each playing a vital role in advancing ESG-in-education research.

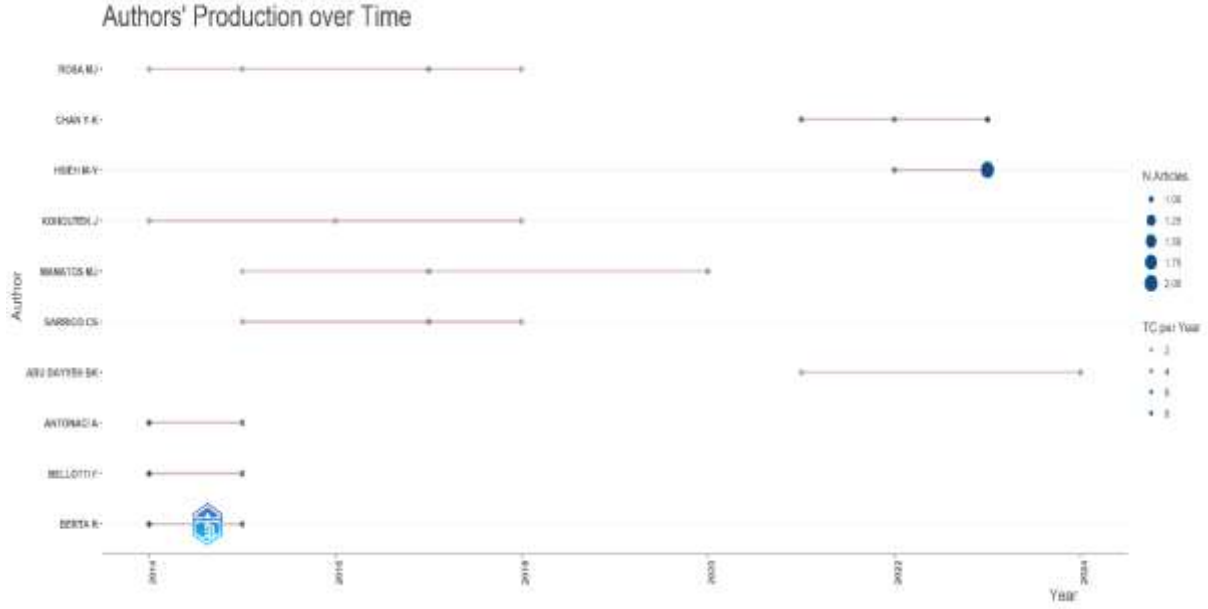


Figure 4. ***Authors' Production over Time***

Source: Created by the author.

4.4 Analysis of universities and countries

Figure 5 titled "Most Relevant Affiliations" presents the most relevant affiliations in ESG and education research. São Paulo State University leads with 8 publications, followed by the Mayo Clinic with 7, indicating strong institutional engagement. National Formosa University, Overweight Obesity and Metabolism Clinic, and Texas State University each contributed 5 papers, reflecting consistent output. Other institutions, such as Bialystok University of Technology, University of Genoa (DITEN), Federal University of Santa Maria (UFSM), Lyon, and Matej Bel University, produced 1 paper each, representing more limited but potentially specialized contributions. Overall, the field is dominated by a few highly productive institutions, while others add niche perspectives.

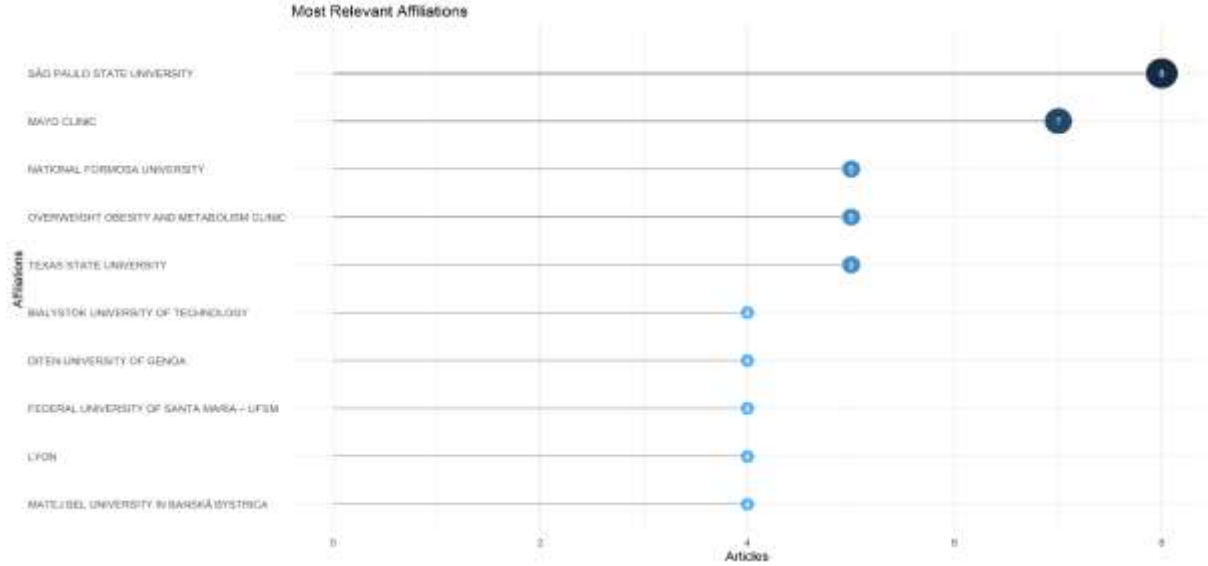


Figure 5. ***Most Relevant Institutions***

Source: Created by the author.

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The figure 6 titled "Affiliations' Production over Time" illustrates the publication trends of key institutions involved in ESG and education research between 2007 and 2024. Mayo Clinic stands out as the earliest and most consistent contributor, with output rising sharply after 2016 and stabilizing at eight publications, reflecting long-term leadership in the field. São Paulo State University entered in 2018, steadily increasing its work and reaching five publications by 2021. Texas State University and the Overweight Obesity and Metabolism Clinic joined after 2020, showing rapid growth in recent years. National Formosa University made a late but notable entry just before 2024, quickly reaching five publications, suggesting a new and active research presence.

Overall, the figure illustrates both sustained contributions from established institutions and a wave of newer entrants, reflecting the field's global expansion and diversification.

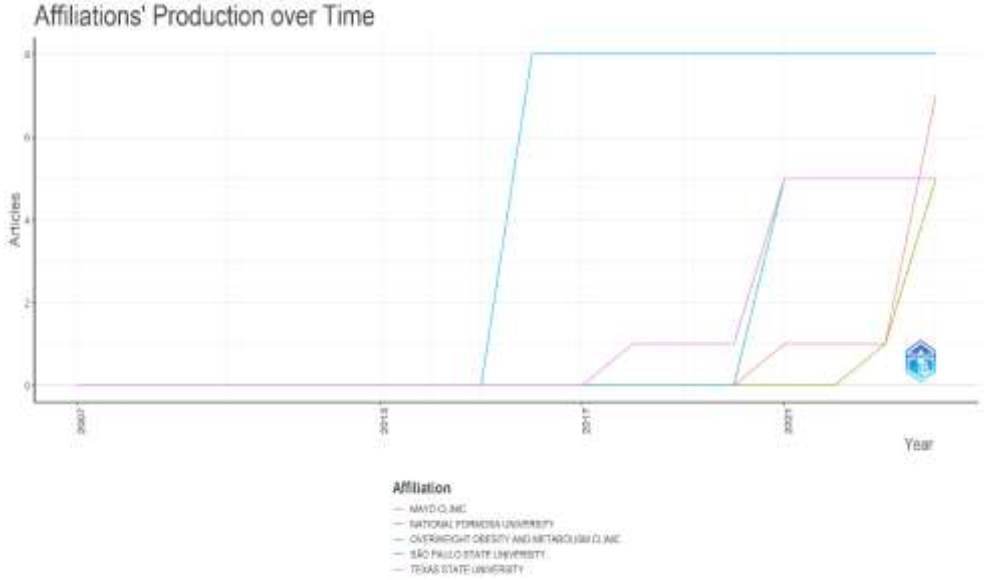


Figure 6. ***Affiliations' production over time***

Source: Created by the author.

The table 4 showcases the top 10 most productive and influential countries contributing to research at the intersection of ESG and education, based on the number of documents published, total citations received, and citations per paper (C/P), which indicates the average impact of each country's research output.

Table 4 shows that China leads in ESG-and-education research output with 25 publications, though its impact per paper (C/P 6.40) is moderate. The United States follows with 12 papers and a stronger influence (C/P 10.42). Several European nations Spain (C/P 32.50), Netherlands (C/P 30.33), Italy (C/P 26.33), and UK (C/P 20.88)-achieve high citation impact despite publishing fewer papers, reflecting the quality and influence of their contributions. Portugal (C/P 14.29) also shows notable influence, while Brazil and Australia have moderate performance. India, with 6 papers but the lowest C/P (2.33), indicates a need to strengthen research quality, visibility, and international collaboration. Overall, China dominates in volume, but Europe clearly leads in per-paper research influence within ESG-and-education scholarship.

Table 4. ***Top 10 productive and influential countries involved in ESG research and Education***

Rank	Country	Documents	Citations	Citations per paper (C/P)
1	China	25	160	6.40
2	United States	12	125	10.42
3	Italy	9	237	26.33
4	Brazil	8	59	7.38
5	Spain	8	260	32.50
6	United Kingdom	8	167	20.88
7	Australia	7	48	6.86
8	Portugal	7	100	14.29
9	India	6	14	2.33
10	Netherlands	6	182	30.33

Source: *Created by the author.*

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4.5 Analysis of Journals

Table 5 shows the top 10 journals publishing ESG-in-education research, assessing output, citations, and impact. Sustainability leads in volume with 15 articles (C/P 13.2), while Quality in Higher Education has fewer papers but the highest C/P (13.4), indicating strong influence. Among Elsevier titles, *Finance Research Letters* (C/P 6.7) outperforms *Resources Policy* (C/P 1.5) in impact. The *International Journal of Sustainability in Higher Education* and *Quality – Access to Success* have moderate influence, while *Revista de Gestão Social e Ambiental* shows minimal engagement (C/P 0.3). Notably, the *European Journal of Education* (C/P 25.5) and *Higher Education Policy* (C/P 11.5) stand out for high impact despite low output. Overall, Sustainability dominates in productivity, while journals like *European Journal of Education* and *Quality in Higher Education* excel in per-article influence, reflecting ESG's interdisciplinary and growing academic relevance.

Table 5. ***Top 10 productive journals publishing on Environmental, Social and Governance***

Rank	*Sources*	*Articles*	*Citations*	*Citations per paper (C/P)*	*Publisher*
1	Sustainability (Switzerland)	15	198	13.2	MDPI
2	Quality in Higher Education	5	67	13.4	Routledge
3	Resources Policy	4	6	1.5	Elsevier Ltd
4	Finance Research Letters	3	20	6.7	Elsevier Ltd
5	International Journal of Sustainability in Higher Education	3	16	5.3	Emerald Publishing
6	Quality - Access to Success	3	14	4.7	SRAC - Romanian Society for Quality
7	Revista De Gestao Social E Ambiental	3	1	0.3	ANPAD
8	European Journal of Education	2	51	25.5	Wiley-Blackwell
9	Economics And Environment	2	1	0.5	Wydawnictwo Ekonomia i Srodowisko
10	Higher Education Policy	2	23	11.5	Palgrave Macmillan Ltd.

Source: Created by the author

Figure 7 shows that Sustainability has emerged as the leading source for ESG-in-education research, with a sharp productivity surge beginning in 2019 and reaching 15 articles by 2024. *Quality in Higher Education* displayed steady growth from 2006 to 2019 but has since plateaued at 5 publications. Other journals, such as *Quality – Access to Success*, *Resources Policy*, and *Revista de Gestão Social e Ambiental*, show minimal or stagnant contributions. Meanwhile, *Finance Research Letters* and the *International Journal of Sustainability in Higher Education* became more active after 2020, indicating a recent expansion of the field's publishing base. Overall, Sustainability dominates recent output, and the post-2020 rise across several journals highlights growing academic momentum in ESG-related education research.

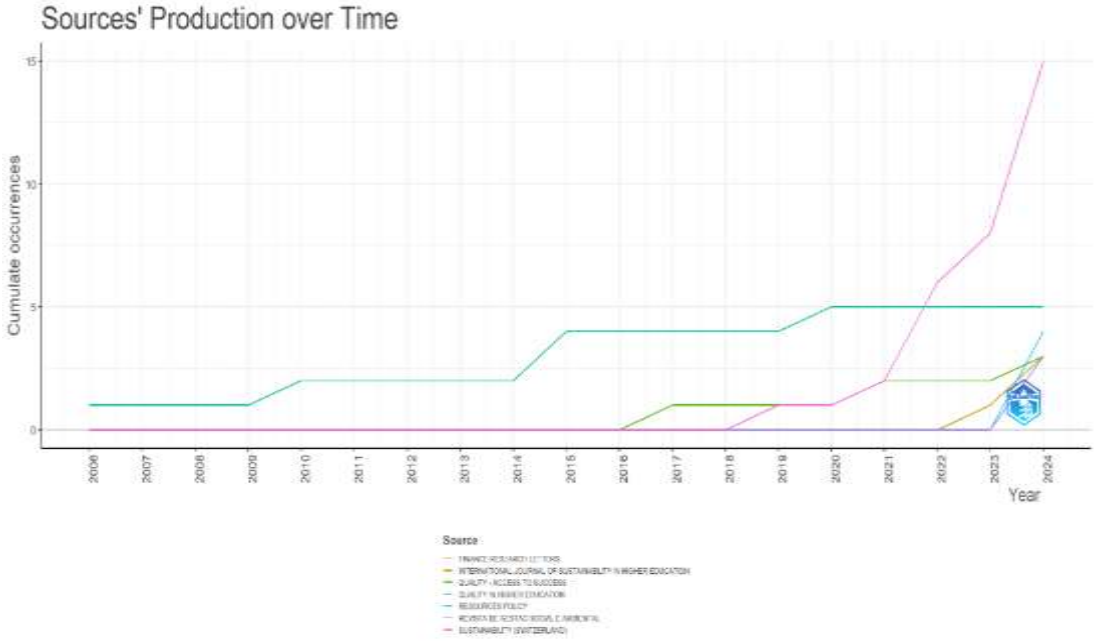


Figure 7: ***Source's production Over time***

Source: Created by the author.

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Table 6 highlights the local scholarly impact of the top 10 journals publishing on ESG in the educational context. Sustainability (Switzerland) emerges as the leading source, with the highest H-index (8), G-index (13), and total citations (198), reflecting both productivity and influence since 2019. Quality in Higher Education, an early contributor (since 2006), shows moderate influence (H-index 4), though its long publication span reduces its M-index. Several journals including European Journal of Education, Higher Education Policy, and Journal of Business Ethics maintain modest but consistent impact (H-index 2). Newer sources such as Finance Research Letters and Management of Environmental Quality demonstrate strong early citation success with high M-indices, signalling emerging relevance. By contrast, journals like Resources Policy, Obesity Surgery, and Quality - Access to Success show lower citation impact despite multiple publications. Overall, Sustainability dominates the field, while recent entrants indicate growing momentum and diversification of ESG-related educational research.

Table 6. ***Top 10 Sources local impact by H-index***

Source	H Index	G Index	M Index	TC	NP	PY start
Sustainability (Switzerland)	8	13	1.143	198	13	2019
Quality In Higher Education	4	5	0.2	67	5	2006
European Journal of Education	2	2	0.125	51	2	2010
Finance Research Letters	2	3	0.667	20	3	2023
Higher Education Policy	2	2	0.167	23	2	2014
Journal Of Business Ethics	2	2	0.2	71	2	2016
Management Of Environmental Quality: An International Journal	2	2	1	34	2	2024
Obesity Surgery	2	2	0.4	10	2	2021
Quality - Access to Success	2	3	0.222	14	3	2017
Resources Policy	2	2	1	6	4	2024

Source: Created by the author.

4.6 Three field plot

The three-field plot presented in figure 8 visually maps the relationships between authors (AU), their respective countries (AU_CO), and the journals (SO) in which their research on *ESG and Education* has been published. It reveals how scholarly contributions are distributed geographically and across academic publication outlets. On the left side of the diagram, individual authors are displayed, showing a wide distribution of contributors across various nations.

Italy stands out as a leading contributor, with authors such as Antonaci A, Bellotti F, and Berta R publishing across diverse journals. Portugal (Rosa MJ, Sarrico CS, Manatos MJ) and Taiwan (Hsieh M-Y, Chan Y-K) also show strong representation, while the United States and Brazil maintain notable publication links. Among journals, Sustainability is the most prominent platform, attracting contributions from multiple countries and authors, underscoring its central role in the field. Other outlets, including *Resources Policy*, *Obesity Surgery*, and *Finance Research Letters*, reflect the interdisciplinary scope of the research. Overall, the plot shows a globally connected scholarly network, with Italy, Portugal, and the U.S. as key hubs driving ESG-in-education discourse.

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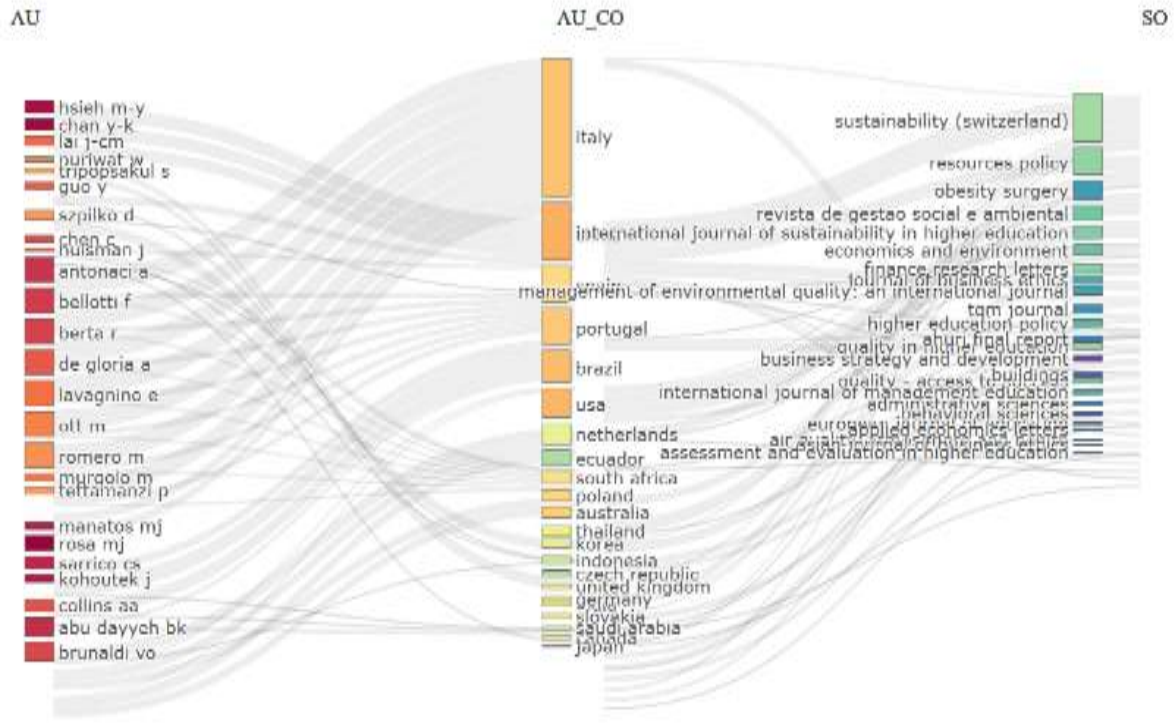


Figure 8. ***Three field plot***

Source: Created by the author.

4.7 Analysis of Keywords

Table 7 highlights the top 30 author keywords in ESG-and-education research, with **"ESG"** as the most frequent (39 occurrences, Total link strength 41), confirming its central role and strong links to related themes. In Cluster 1, terms like Sustainability, CSR, Corporate Governance, and Social Responsibility reflect ESG's integration with sustainable development in academic and corporate contexts. Higher Education and Higher Education Institutions emphasize the sector-specific focus of many studies. Cluster 4 keywords such as Quality Assurance, European Standards and Guidelines, and Bologna Process point to regulatory frameworks shaping ESG adoption, while Cluster 2 terms like Governance and Environmental highlight broader institutional concerns.

Finance-related keywords in Cluster 3, including Sustainable Finance and Financial Literacy, link ESG to financial governance and education. Cluster 5 topics, such as ESG Performance and Board Diversity, indicate emerging interest in measurable outcomes and governance diversity. Finally, terms like Digital Transformation, Quality Management, and SDGs illustrate the role of innovation, quality frameworks, and global policy alignment, showcasing ESG as a multidisciplinary and globally relevant field in education research.

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Table 7. ***Top 30 Author keyword***

	Cluster	Frequency	Total Link Strength
ESG	1	39	41
Higher Education	6	13	13
Quality Assurance	4	10	15
Sustainability	1	9	19
ESG Performance	5	8	7
Corporate Social Responsibility	1	6	8
Higher Education Institutions	4	6	12
Corporate Governance	1	5	7
Governance	2	5	14
Sustainable Finance	3	5	4
CSR	3	4	5
Environmental	2	4	9
European Standards And Guidelines	4	4	8
Social	2	4	11
Sustainable Development	2	4	4
Board Diversity	5	3	2
Bologna Process	4	3	6
China	5	3	4
Digital Transformation	3	3	3
Education	1	3	2
ESG Investment	5	3	1
Financial Education	3	3	4
Financial Literacy	3	3	4
Financial Performance	2	3	4
Portugal	4	3	8
Quality	6	3	4
Quality Management	6	3	5
Social Responsibility	1	3	4
Standards	6	3	5
Sustainable Development Goals	2	3	7

Source:Created by the author

4.8 Science Mapping Analysis

Science mapping is a key component of bibliometric analysis, used to visualize the structure, dynamics, and evolution of scientific research. It involves the spatial representation of relationships between various bibliometric entities such as authors, keywords, journals, institutions, or countries based on their co-occurrence or citation patterns in scholarly publications. Science mapping goes beyond simply counting publications or citations; it helps uncover hidden patterns, intellectual structures, and thematic trends within a research field.

4.8.1 Co-occurrence analysis of keywords

The major purpose of keyword co-occurrence analysis is to provide a form of content analysis which allows the identification of connections between keywords from a selected sample of publications. According to Fakhar Manesh et al. (2021), the significance

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of this analysis lies in the opportunity to identify thematic areas grouped into thematic clusters so that the main theoretical or foundational topics of the research field can be depicted.

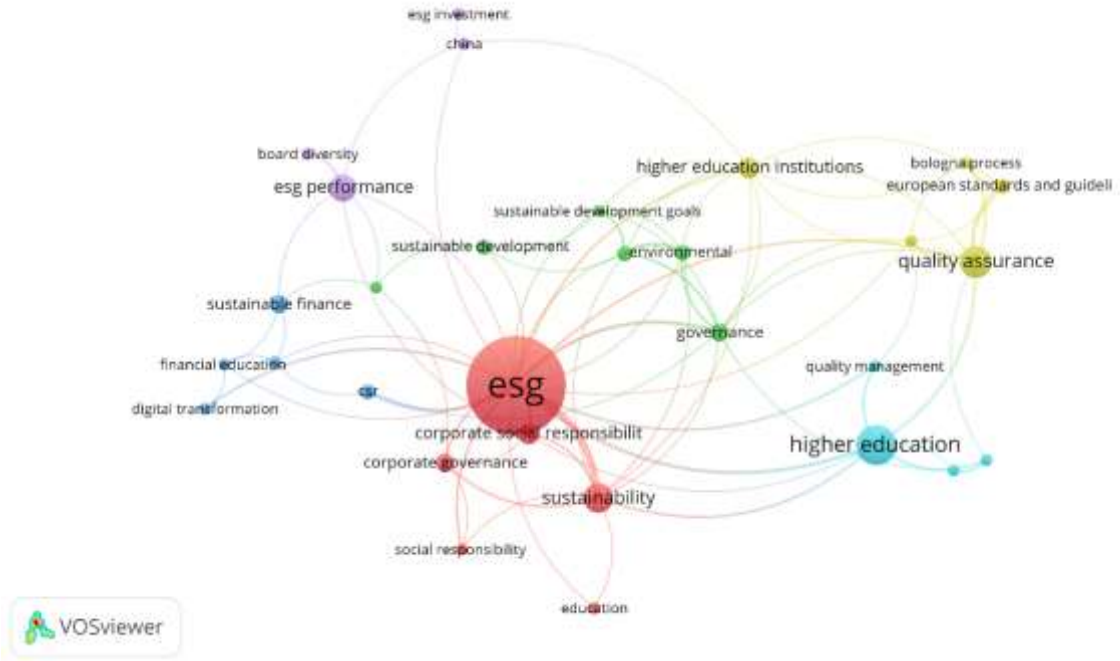


Figure 9. ***Co-occurrence network of major author keywords.***

Source: Created by the author

In the present analysis, based on a minimum occurrence threshold of 3, a total of 30 keywords were selected from an initial pool of 554 author keywords related to ESG research in the context of higher education. The most frequently occurring keywords include *ESG* (39 occurrences), *Higher Education* (13), *Quality Assurance* (10), *Sustainability* (9), and *ESG Performance* (8). These terms reflect the dominant themes and focal areas within the literature.

To illustrate the relationships among these high-frequency keywords, Figure 9 presents a co-occurrence network map generated using VOS viewer, where each cluster is color-coded to represent a unique thematic area. This enriched visualization reveals that the ESG research landscape in higher education is divided into six thematic clusters, each addressing a specific dimension of the field:

- ***Cluster 1 (Red) Foundations of ESG Ethics and Sustainability:*** This is the most dominant cluster with *ESG* as the central and most frequent keyword, forming the core around which other terms revolve. It has 39 occurrences and 21 linkages overall, with a total link strength of 41. Additional terms that are part of this cluster are Corporate Social responsibility, corporate Governance, Social responsibility, Sustainability and Education. The cluster shows strong internal linkages between *corporate social responsibility* and *sustainability*, suggesting a close relationship between ethical business practices and long-term value creation.
- ***Cluster 2 (Green) Environmental Sustainability and Global Policy Frameworks:*** Governance is the focal point of Cluster 2, which has 5 occurrences, 10 linkages, and a total link strength of 14. Key keywords in this cluster include *sustainable development*, *sustainable development goals*, *environmental*, social and Financial Performance. Focused on governance, sustainable development goals, and environmental performance, this cluster connects ESG strategies with global ecological policies. It highlights shared responsibility across sectors and aligns ESG with international frameworks.
- ***Cluster 3 (Blue) ESG Finance and Digital Educational Innovation*:** This cluster focuses on the growing integration of corporate social responsibility (CSR), financial literacy, and digital transformation within the broader ESG and sustainability framework. Terms like *financial education* and *financial literacy* emphasize the role of educating individuals particularly consumers, students, and employees about sustainable financial behaviour and responsible investing. The presence of "digital transformation" introduces a technological dimension to ESG, highlighting how digital tools and innovations are reshaping sustainability reporting, impact assessment, and access to sustainable finance. It also indicates a shift in ESG discourse toward inclusive, tech-enabled solutions that foster responsible financial and social behaviour at both institutional and grassroots levels.
- ***Cluster 4 (Yellow) Regulatory Quality and Standards in Higher Education:*** Cluster 4 highlights the regulatory and governance frameworks that shape ESG integration within higher education institutions. It consists of 9 occurrences, 8 linkages, and a total link strength of 14. The central terms in this cluster include *quality assurance*, *Bologna Process*, *Portugal*, *European standards and guidelines*, and *quality management*.

  At its core, this cluster underscores the institutional and policy-level mechanisms designed to ensure academic

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quality and accountability. It focuses on policy frameworks ensuring academic accountability and ESG compliance, with a strong emphasis on quality management in universities.

- ***Cluster 5 (Purple) Measurement and Geopolitical Aspects of ESG Performance:*** ESG performance is the main focus of Cluster 5, which has 8 occurrences, 6 linkages, and a total link strength of 7. Cluster 5 emphasizes the measurement of ESG performance through metrics like board diversity and ESG investment, with a focus on regional variations particularly China. It highlights a shift toward more data-driven, context-specific evaluations of ESG practices, linking governance, demographics, and financial decision-making within global sustainability frameworks.
- ***Cluster 6 (Cyan) Academic Quality and Institutional Governance:*** Cluster 6 centres on the role of higher education institutions in advancing ESG principles through structured internal processes, quality mechanisms, and academic governance frameworks. Higher Education is the main keyword of cluster 6, with a total of 13 occurrences, 7 linkages, and a total link strength of 13. It highlights the critical role of higher education institutions in embedding ESG principles through internal quality assurance, governance frameworks, and alignment with global standards. Universities are portrayed as proactive agents in fostering ESG values via curriculum, strategy, and institutional practices, reinforcing their role in shaping sustainable and responsible societies.

As shown in figure 10, overlay visualisation maps can also be used to observe temporal trends in keyword usage. In such visualisations, colours range from blue (earlier years) to yellow (recent years), helping identify shifts in research focus over time. Based on such temporal analyses in other studies, it has been observed that ESG literature has evolved from basic ethical and environmental themes to more complex discussions involving performance metrics, institutional accountability, and digital transformations in sustainability reporting.

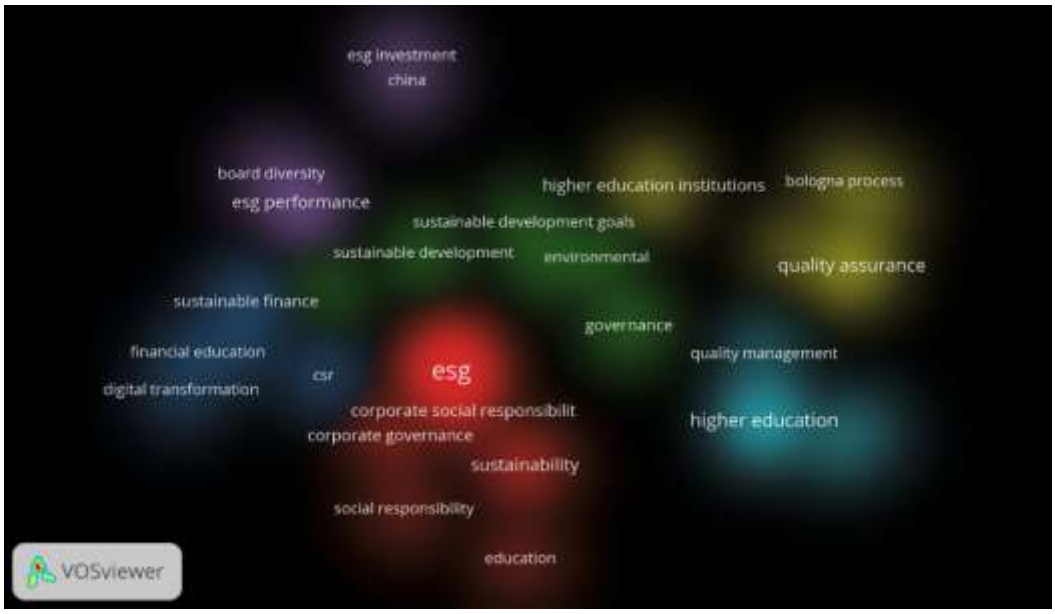


Figure 10. ***The co-occurrence of keywords density diagram using cluster density***

Source: created by the author

In conclusion, this co-occurrence network provides valuable insights into the conceptual structure and evolutionary trajectory of ESG-related research in higher education, reflecting its transition from foundational sustainability concepts to more nuanced themes such as quality standards, governance models, and financial literacy.

4.8.2 Co-Authorship Analysis

The analysis of Figure 11 and Table 8 together offers a comprehensive view of the collaborative landscape in the field of ESG and Education. Figure 10 illustrates a co-authorship network divided into two primary clusters, highlighting how scholars are grouped based on shared research interests and publication partnerships. The red cluster is characterized by tightly knit collaborations among authors such as Jerez, Jonathan, Cabrera, David, and Romero, Ginesio, suggesting the presence of a cohesive research team. Similarly, the green cluster includes researchers like Al Annam, Karim, Mrad, Rudy, and Gala, Khushboo, who also demonstrate strong internal collaboration.

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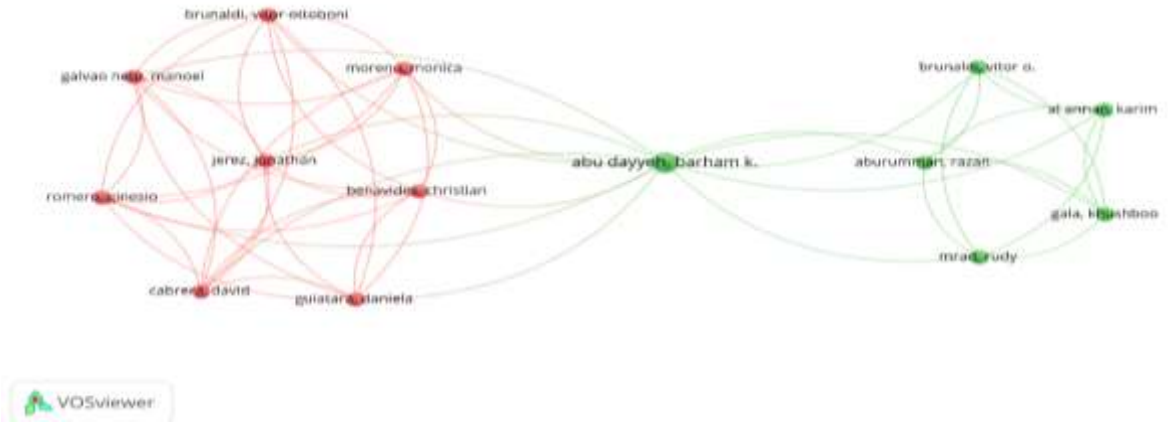


Figure 11. ***Co-Authorship Analysis of selected sample in the field of ESG and Education***

Source: Created by the author based on the VOSviewer analysis.

Table 8 complements this visual by identifying the top 10 most collaborative authors, ranked by the number of documents, citations, and total link strength. Authors like Jan Kohoutek, Maria J. Manatos, and Maria J. Rosa appear as the most prolific, each contributing three publications. Meanwhile, Abu Dayyeh, Barham K., although authoring only two documents, exhibits the highest total link strength (13), aligning with his central bridging role observed in Figure 11. His presence across both clusters signifies his importance in facilitating cross-group collaboration, making him a key connector in the field.

Together, the figure and table reveal not only who the influential and well-connected researchers are, but also how scholarly networks are formed and sustained. While some authors stand out for their productivity and impact, others play crucial roles in linking otherwise separate academic communities, ultimately fostering a more integrated and collaborative research environment around ESG in education.

Table 8. ***Top 10 most collaborative authors in the selected sample in the field of ESG and Education***

Rank	Author	Documents	Citations	Total Link Strength
1	Kohoutek, Jan	3	33	3
2	Manatos, Maria J.	3	45	5
3	Rosa, Maria J.	3	38	7
4	Sarrico, Cláudia S.	3	38	7
5	Abu Dayyeh, Barham K.	2	10	13
6	Chan, Yung-Kuan	2	48	6
7	Chen, Pengfei	2	17	8
8	Collins, Alyson A.	2	52	8
9	Feng, Zhiwen	2	17	8
10	Hsieh, Ming-Yuan	2	24	6

Source: *Created by the author based on the VOSviewer analysis.*

Note: In this case, the total link strength represents the total strength of the co-authorship links between a given author and other authors.

4.8.3 Bibliographic coupling

bibliometric coupling investigates the connections between publications to understand the significance of documents in a dataset in terms of their network position. According to Caputo et al. (2021), bibliographic coupling occurs when two documents cite a common third document, suggesting that they potentially debate a common topic. Thus, bibliographic coupling allows for the analysis of connections between publications, providing insights into the significance of publications in the selected dataset in terms of their networking positioning.

In terms of the bibliographic coupling analysis of journals, considering a minimum threshold of two documents per journal, the resulting set contained 15 journals that met the threshold. Table 9 presents the top ten journals in terms of link strength. It should be noted that the Journal of Sustainability is far from other journals that are the most influential journal in this research field. Continuing with the bibliographic coupling from the authors' perspective and considering a minimum threshold of three articles per author, the resulting set contained 21 authors who met the threshold.

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Table 9. ***Top 10 journals in terms of bibliographic coupling link strength***

Rank	Source	Documents	Citations	Total Link Strength
1	Sustainability (Switzerland)	15	198	19
2	International Journal of Sustainability in Higher Education	3	16	7
3	Journal Of Business Ethics	2	71	7
4	Quality In Higher Education	5	67	5
5	Economics And Environment	2	1	4
6	Quality - Access to Success	3	14	4
7	Higher Education Policy	2	23	3
8	International Journal of Management Education	2	21	3
9	Management Of Environmental Quality: An International Journal	2	34	3
10	Revista De Gestao Social E Ambiental	3	1	2

Source: Created by the author based on the VOS viewer analysis.
Note: In this case, the total link strength represents the total strength of the bibliographic coupling links between a given journal and other journals.

Table 10 presents the authors with the highest classified bibliographic coupling link strengths, based on the total link strength of the bibliographic coupling. According to Caputo et al. (2021), the highest strength of bibliographic coupling links means that these authors have a higher centrality in the network of citations and are intensively included in conversations.

Table 10. ***Top 10 authors in terms of bibliographic coupling link strength.***

Rank	Author	Documents	Citations	Total Link Strength
1	Chen, Pengfei	2	17	344
2	Feng, Zhiwen	2	17	344
3	Wang, Hsuanpo	2	17	344
4	Yu, Hsinchang	2	17	344
5	Yuan, Yichuan	2	17	344
6	Murgolo, Michael	2	21	302
7	Tettamanzi, Patrizia	2	21	302
8	Rosa, Maria J.	3	38	288
9	Sarrico, Cláudia S.	3	38	288
10	Manatos, Maria J.	3	45	222

Source: Created by the author based on the VOS viewer analysis.
Note: In this case, the total link strength represents the total strength of the bibliographic coupling links between a given author and other authors.

Figure 12 presents the bibliographic coupling network overlay of countries involved in ESG and education research, while Table 11 lists the top 10 countries based on bibliographic coupling link strength, along with their document count and citation numbers. Together, these visuals provide a comprehensive view of the global research landscape, highlighting both influence and collaborative alignment.

At the centre of both the table and the network diagram is China, which emerges as the most prominent contributor in terms of both quantity and scholarly connection. In Figure 11, China is shown as a large, well-connected node with numerous links to countries like the United States, United Kingdom, and South Korea, indicating its strong bibliographic coupling and cross-national academic engagement. Table 11 confirms this dominance, ranking China first with 25 documents and a total link strength of 1,250, showcasing both volume and interconnection.

The United Kingdom, Italy, and the United States also occupy central and brightly coloured nodes in Figure 11, indicating recent and active participation (as shown by the overlay colour gradient from blue to yellow, reflecting publication years closer to 2024). Table 11 backs this up, ranking these countries among the top four in terms of link strength, confirming that they are intellectually aligned with other prolific researchers and deeply embedded in shared scholarly discourse.

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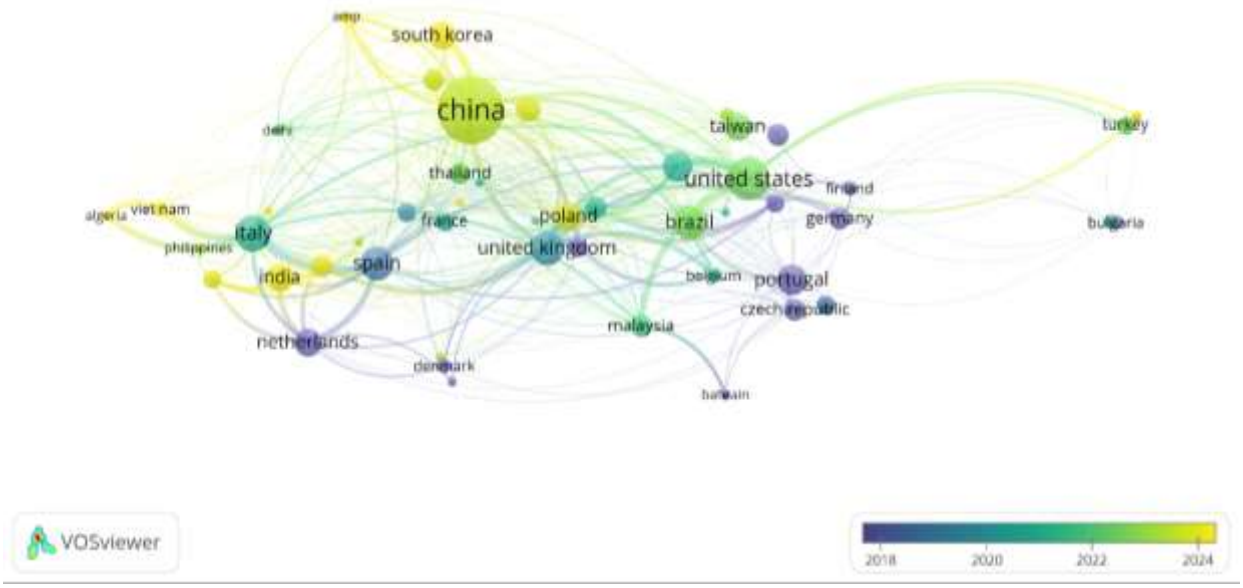


Figure 12. ***The bibliographic coupling network overlay diagram of the countries.***
Source: Created by the author based on the VOS viewer analysis.

Countries such as Spain, Australia, and the Netherlands though not always the most prolific in publication volume are shown to have dense linkages in the network and high coupling strengths in Table 11. Spain, for example, has only 8 documents but a high citation count (260) and a strong link strength of 753, indicating influential and well-referenced research.

Table 11. ***Top 10 countries in terms of bibliographic coupling link strength***

Rank	Country	Documents	Citations	Total Link Strength
1	China	25	160	1250
2	United Kingdom	8	167	1100
3	Italy	9	237	904
4	United States	12	125	788
5	Spain	8	260	753
6	Australia	7	48	653
7	Netherlands	6	182	619
8	South Africa	4	10	537
9	Poland	6	79	511
10	Romania	3	43	462

Source: Created by the author based on the VOS viewer analysis.
Note: In this case, the total link strength represents the total strength of the bibliographic coupling links between a given country and other countries.

Interestingly, South Africa, Poland, and Romania appear with modest document counts, but still make the top 10 in Table 11. This suggests that their work, though limited in volume, is highly aligned with global literature and contributes meaningfully to international research conversations. In Figure 11, their positions are connected to more dominant countries, reinforcing this observation.

Moreover, the colour gradient in Figure 11 (from blue to yellow) highlights the evolution of research contributions over time. Countries like Turkey, India, and Vietnam, appearing in brighter yellow, are relatively newer entrants to the field, reflecting the emergence of ESG and education research in developing regions - a trend likely to expand further.

5. CONCLUSION

This study offers a comprehensive bibliometric analysis of the evolution, scope, and intellectual structure of ESG research within the context of education over the past two decades. By employing data from the Scopus database and leveraging tools such as VOS viewer and Biblioshiny, the study identified key contributors, influential countries, collaborative networks, and emerging thematic clusters. The results reveal a significant growth in ESG-related research output since 2018, with a notable concentration of publications and citations in countries like China, the United States, Italy, and the United Kingdom.

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The co-occurrence and bibliographic coupling analyses uncovered six distinct thematic clusters, reflecting the interdisciplinary nature of ESG scholarship ranging from foundational ethics and corporate social responsibility to sustainable finance, quality assurance in higher education, and digital transformation. The research also highlights the role of higher education institutions as both subjects and agents of ESG integration, particularly through quality frameworks and governance mechanisms (Manesh et al., 2021; Velte, 2017). Furthermore, bibliographic coupling revealed substantial intellectual overlap among countries, indicating the development of a globally interconnected ESG research landscape, with China emerging as a central node of scholarly influence.

Ultimately, this study contributes to the understanding of ESG's academic trajectory within the educational domain and provides a roadmap for scholars and policymakers seeking to align institutional strategies with sustainable development objectives.

6. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Despite its contributions, this study is not without limitations. First, the bibliometric dataset was derived exclusively from the Scopus database, which, although comprehensive, may exclude relevant literature indexed in Web of Science, Google Scholar, or regional databases. This reliance could result in the underrepresentation of non-English publications and emerging scholars from developing economies (Donthu et al., 2021).

Second, while bibliometric techniques offer valuable insights into publication patterns and intellectual structures, they are limited in capturing the contextual depth and theoretical nuances present in qualitative ESG studies. For instance, keyword co-occurrence and citation analyses may overlook the causal relationships and conceptual frameworks underpinning ESG integration in education (Fang et al., 2018).

Third, this study focused on author-defined keywords, which, while useful, may vary in consistency and terminology, potentially affecting the clustering accuracy. Additionally, temporal analyses may be influenced by delayed indexing or citation lags, particularly for recently published works.

Future research could address these limitations by adopting mixed-method approaches, incorporating content analysis, and expanding the dataset to include other bibliographic repositories. Moreover, comparative studies across regions and institutional types could offer deeper insights into the practical implementation and policy relevance of ESG in higher education.

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