

Evolution of Environmental Performance Research: A Comprehensive Bibliometric Analysis and Future Research Potential

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ABSTRACT: This study aims to analyze global research trends on corporate environmental performance over the last two decades and to identify potential directions for future studies. The method employed is bibliometric analysis using RStudio software, with data retrieved from the Scopus database covering the period 2004–2024. Data screening was conducted through the PRISMA method, resulting in 330 articles from 66 publication sources that met the inclusion criteria. The findings indicate an annual publication growth rate of 18.73% with an average of 69.66 citations per document. Author collaboration is also considerable, with an average of 3.18 authors per article and 43.94% involving international collaboration. Further analysis reveals that the most dominant topics are environmental management, environmental performance, and sustainable development, with growing emphasis on corporate sustainability. This study indicates that research on environmental performance is a worldwide effort with major consequences for sustainable business practices. The results provide valuable insights for future research directions, particularly in exploring environmental technology, green supply chain management, and environmental accounting, which can enrich the literature and support corporate sustainability strategies and policymaking.

KEYWORDS: Environmental Performance, Environmental Management, Corporate Sustainability, Bibliometric, R Studio

I. INTRODUCTION

The United Nations (UN) has set the Sustainable Development Goals (SDGs) target for 2030. The goal is to address various global challenges that include environmental, social, and economic issues. These targets encourage companies in various sectors to adopt sustainable business practices. Regulations and policies have been made so that companies can integrate environmental, social, and governance or ESG aspects in their business strategies. This integration aims to be in line with the commitment to achieve the SDGs targets, so that the company's environmental performance is one of the crucial components in achieving it.

Environmental performance highlights how an entity, be it an industry, an organization, or a project, interacts with the surrounding ecosystem (Iryanti, 2023) which in practice includes reducing emissions, efficient use of resources, and responsible waste management (Dobler et al., 2014). Technically, environmental performance refers to the outcomes associated with the release of byproducts into the natural environment, including emissions of air pollutants, wastewater discharge, as well as the creation of hazardous and toxic wastes (Earnhart, 2018). A company's environmental performance is evaluated based on its positive and negative impact on the environment. This assessment includes the company's compliance with environmental laws and regulations, as well as initiatives undertaken to reduce environmental damage and improve sustainability (Bag et al., 2024).

These practices are a tangible manifestation of the company's contribution to the SDGs, especially those related to environmental goals. The SDGs are related to environmental goals, namely Goal 6 (Clean Water and Sanitation), Goal 7 (Clean and Affordable Energy), Goal 12 (Responsible Consumption and Production), Goal 13 (Handling Climate Change), Goal 14 (Ocean Ecosystems), and Goal 15 (Terrestrial Ecosystems) (<https://sdgs.un.org>). Improving environmental performance directly supports the global sustainability agenda driven by the SDGs, while reducing environmental risks and building a stronger reputation in the eyes of stakeholders.

The company's valuation is now not only based on profitability, but also the ability to minimize the negative impact of operations on the environment. Pressure from various stakeholders such as investors, customers, and the government encourages companies to adopt eco-friendly practices. Zhang & Wellalage (2022) found that investors are likely to choose companies with strong environmental commitments. Mentioning that the millennial generation as consumers is more critical of sustainable business practices (Chatzopoulou & de Kiewiet, 2021). Environmental performance is not only related to regulatory compliance,

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but it is also a driver of competitive advantage. The ability of companies to preserve the environment by controlling environmental aspects is indispensable (Riadi, 2023). This condition accelerates the need for research on environmental performance as companies are faced with pressure to understand the impact of their operations on the environment and take responsible action (Hanggoro, 2023). Environmental risks lead to higher litigation costs and greater oversight from regulators, which have long-term consequences on the company's financial performance (Costa & Opore, 2024).

The results of the research Manrique & Martí-Ballester (2017) and Shatnawi et al. (2024) show that companies with good environmental performance tend to have stronger financial stability and reputation. These findings are in line with research (Nguyen et al., 2021) that states that the implementation of good environmental practices within the framework of stakeholder theory not only increases corporate accountability and transparency but can also strengthen reputation and financial performance. However, its implementation still faces challenges. The World Benchmarking Alliance (WBA) has released the Nature Benchmark which assesses how companies are reducing the negative impact of companies on nature and contributing to the protection of ecosystems. WBA research was conducted on 816 companies worldwide and more than 20 industries from 2022 to 2024 (<https://lestari.kompas.com>). Some important points of the research that have been carried out are contained in Table 1.

Table 1. Nature Banchmark's Findings

No.	Findings	Summary
1	Corporate Awareness	Corporate awareness is low, as only 5% of companies assess their impact on nature, and less than 1% understand their dependence on ecosystems.
2	Indigenous Peoples' Rights	13% of companies are committed to protecting the rights of Indigenous Peoples, even though companies manage 40% of the world's protected areas.
3	Water Management	72% of the world's population experiences water insecurity, but only 4% of companies set water pollution reduction targets.
4	Greenwashing plastic	43% of companies claim to reduce plastics, but only 7% have clear quantitative targets.
5	Sustainability Leadership	66% of companies set sustainability oversight at board level, yet only 2% have relevant expertise on biodiversity and climate.

Source: World Benchmarking Alliance (WBA)

The WBA's findings show that there is a gap between commitment and implementation in environmental performance. While some companies are starting to establish sustainability policies, but few companies truly understand the impact of their operations on nature. This gap is also reflected in the case of PT Timah (Persero) Tbk. Environmental negligence by the company caused ecological and economic losses of Rp 271 trillion (www.kompas.id). This case shows that poor environmental performance can have a wide impact, not only on the ecosystem but also on the national economy.

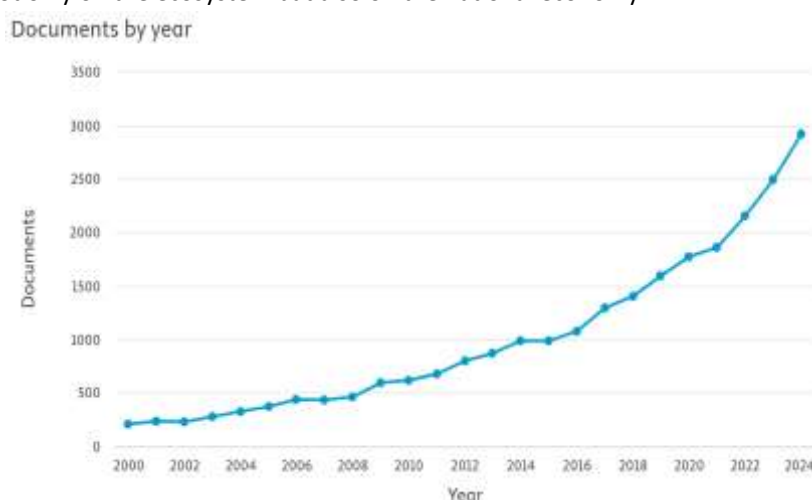


Figure 1. Trend of Publication

Research on the performance of the company's environment has developed significantly, as shown in Figure 1. The majority of research is still limited to case studies or financial impact analysis. Research mapping the development of this field is still unavailable. Research mapping on environmental performance is needed to find out the progress of research to date so that it

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can determine the next direction of research that can be explored. Accordingly, this research aims to explore two main research questions within the analysis.

RQ 1 : What are the development trends of environmental performance research globally?

RQ 2 : What are the potential topic for further research to be explored?

Therefore, this study aims to analyze the development of corporate environmental performance research globally. This analysis uses bibliometrics to find out publication trends, author collaborations, and current themes. The results are expected to provide a comprehensive overview of research developments and potential for further research that can be explored further. The findings of this study are also expected to be the basis for further research and policymaking.

II. THEORETICAL BACKGROUND

Stakeholder theory is a relevant framework in dealing with pressure from various parties. This theory emphasizes that a company needs to consider the various interests of internal and external stakeholders as part of its business strategy (Freeman & Evan (1990). The focus of this theory is the management of relationships with customers, suppliers, investors, local communities, and the environment (Miles, 2017; Paiva et al., 2024). This encourages organizations to be more responsive to the needs and demands of stakeholders (Mahajan et al., 2023).

Stakeholder theory explains how stakeholder engagement and pressures shape corporate environmental strategies. Optimal environmental performance is determined not only by internal policies but also by external expectations and demands that influence organizational behaviour (Reed, 2008; Reed et al., 2018). Pressures from internal stakeholders such as management and employees encourage firms to adopt proactive environmental strategies, particularly when supported by a shared vision and a sustainability-oriented organizational culture (Alt et al., 2015; Bouguerra et al., 2022; Singh et al., 2020). Conversely, external stakeholders, including regulators, NGOs, and customers, play a critical role in promoting the implementation of environmentally friendly practices and the adoption of circular economy principles (Baah et al., 2020; Hernández-Arzaba et al., 2022). Therefore, stakeholder engagement must be strategically, inclusively, and transparently designed to produce significant environmental impacts while simultaneously supporting the achievement of a company's long-term sustainability objectives (Colvin et al., 2020).

III. RESEARCH METHODS

This research is quantitative research using bibliometric analysis methods to explore research developments on the performance of the company's environment. This analysis was chosen to map the intellectual structure and trends of research through the processing of scientific data on a large scale (Donthu et al., 2021). Bibliometric analysis makes it possible to identify the latest developments in the field of research, analyze the productivity of authors and their collaboration networks, map the sources of publications and keywords.

The research data was obtained from the Sopus database which was accessed in January 2025 with the main keyword environmental performance. The entire analysis process is carried out using RStudio to ensure accuracy and ease of data visualization. The data that has been collected is then filtered using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) method which consists of three stages using the inclusion and exclusion criteria in Table 2 to obtain data in accordance with the research objectives. The overall data filtering process flow from identification, filtering, to the final document analyzed is visually summarized in the PRISMA diagram in Figure 2.

Table 2. Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Open Access	Documents with full open access	Documents other than overall open access
Time Period	Year 2004 - 2024	Before 2004
Subject	Business, Management, and Accounting	In addition to subject Business, Management, and Accounting
Document Type	Article	In addition to the article
Stages of Publication	Final	Not yet to the final stage
Keywords	Environmental performance, Environmental impact, CSR, Accounting	In addition to keywords Environmental performance, Environmental impact, CSR, Accounting
Language	English	In addition to English

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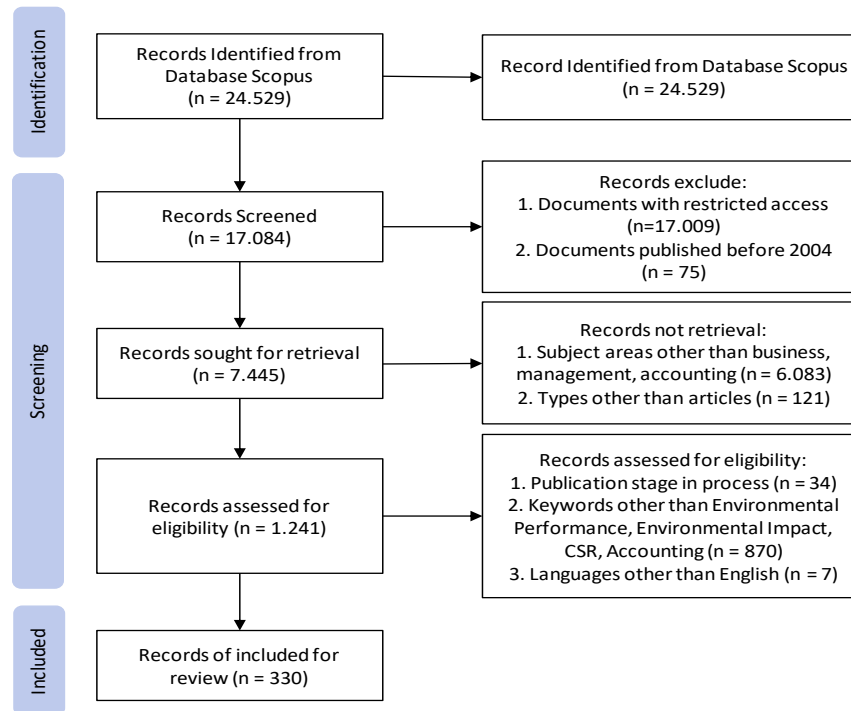


Figure 2. PRISMA Flowchart

IV. RESULTS AND DISCUSSION

A. The Development Trends of Environmental Performance Research Globally

A comprehensive overview of the characteristics of the dataset that is the basis for bibliometric analysis in the study is contained in Table 3. The data collected covered a period of approximately two decades, from 2004 to 2024, showing a long study span to identify developmental trends. A total of 330 documents were identified from 66 different publication sources during this period.

Tabel 3. Main Information

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2004:2024
Sources (Journals, Books, etc)	66
Documents	330
Annual Growth Rate %	18,73
Document Average Age	4,86
Average citations per doc	69,66
DOCUMENT CONTENTS	
Keywords Plus (ID)	1047
Author's Keywords (DE)	1087
AUTHORS	
Authors	911
Authors of single-authored docs	29
AUTHORS COLLABORATION	
Single-authored docs	33
Co-Authors by Doc	3,18
International co-authorships %	43,94
DOCUMENT TYPES	
article	330

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The growth of research in the field of corporate environmental performance shows a very positive trend. This is evidenced by the annual growth rate of 18.73%. On average, the documents in this dataset are almost 5 years old and each document has an average of 69.66 citations. The high number of citations indicates that research in the field of corporate environmental performance is not only massive in terms of quantity but also has a wide and significant impact in the scientific community, becoming an important reference for future studies. The aspect of collaboration between authors also stands out in this data. Table 3 shows an average of 3.18 authors per document. This figure far exceeds the research conducted by a single author, which only totals 33 documents. Furthermore, about 43.94% of the overall writing involved international collaborations. This high percentage of cross-border collaboration clearly emphasizes that environmental performance research is a global effort that involves contributions from various countries and researchers around the world.

The journals that publish the most articles related to environmental performance are. The journal has 79 documents and can be interpreted as the most cited source in this dataset. The difference in the number of documents with other journals is quite significant. This shows that this journal is the main source of research in this field. Journal sources other than the Journal of Business Strategy and the Environment are shown in Figure 3

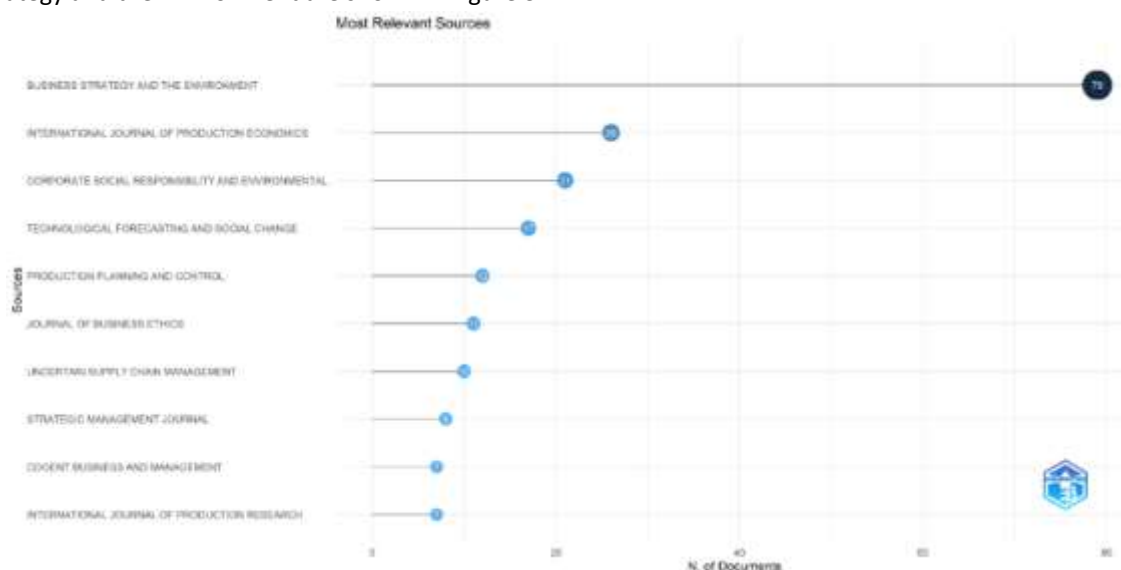


Figure 3. Most relevant sources processed with R studio

Figure 4 shows the most influential journals based on the total number of citations locally. The Journal of Business Strategy and the Environment and the International Journal of Production Economics have the highest H-index, indicating a strong influence in the literature on corporate environmental performance. The top 5 most productive journals (Figure 3) also have the highest impact, indicating the consistency of the research quality of the published articles.

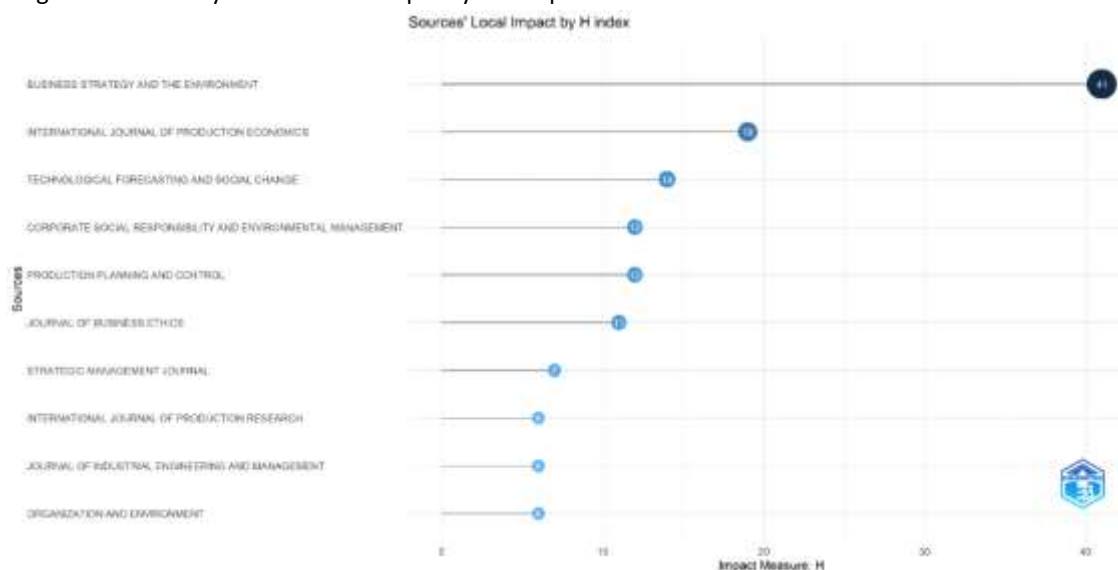


Figure 4. High-Impact Journals processed with R studio

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The productivity of authors for their publications throughout the research year is shown in Figure 5 which contains the 20 most productive authors. The blue dot is placed on the line according to the year in which the author has published the work, the larger the size of the circle, the more the number of publications. Meanwhile, the color concentration indicates the number of citations, the more intense the color, the more citations there are. Ntim CG is the most prolific writer with 8 documents from 2018 – 2022 followed by Garza and Kumar.

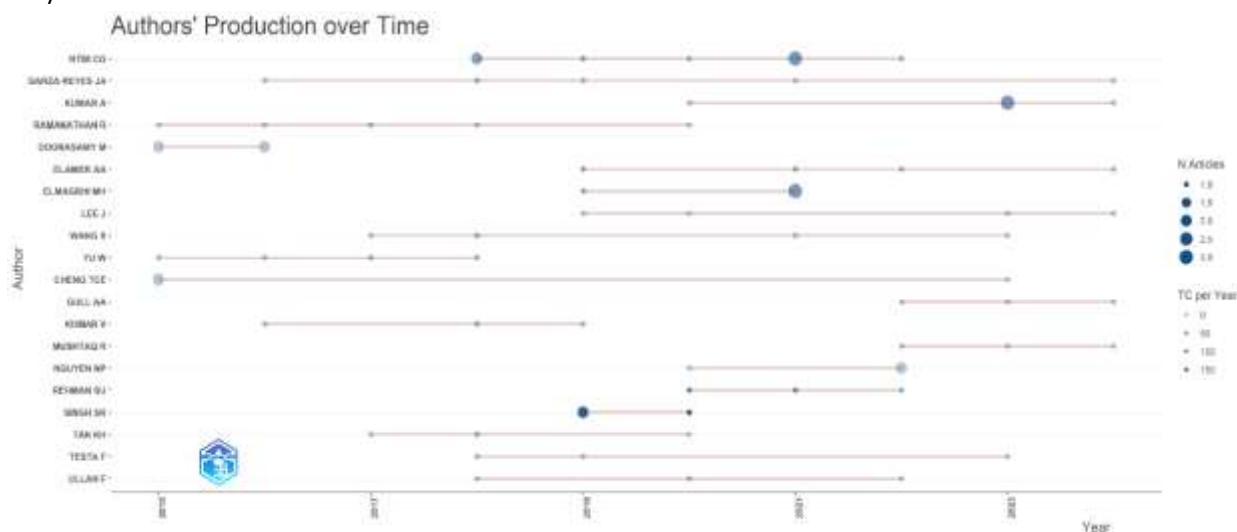


Figure 5. Authors’ production over time processed with R studio

Ntim is the most prolific author with the most published research, but the author with the most cited documents (Figure 6) is Singh SK (2020) in the journal Technological Forecasting and Social Change. Followed by Zhu Q (2007) in the International Journal of Production Research and Sharfman MP (2008) in the Strategic Management Journal. Based on the number of citations from each author who have several citations as many as 922, 897, and 813, it shows the contribution of the researchers to the research that has been conducted. The higher the frequency of citations, the more it shows that the topic has an important role in scientific research (Salato et al., 2023).

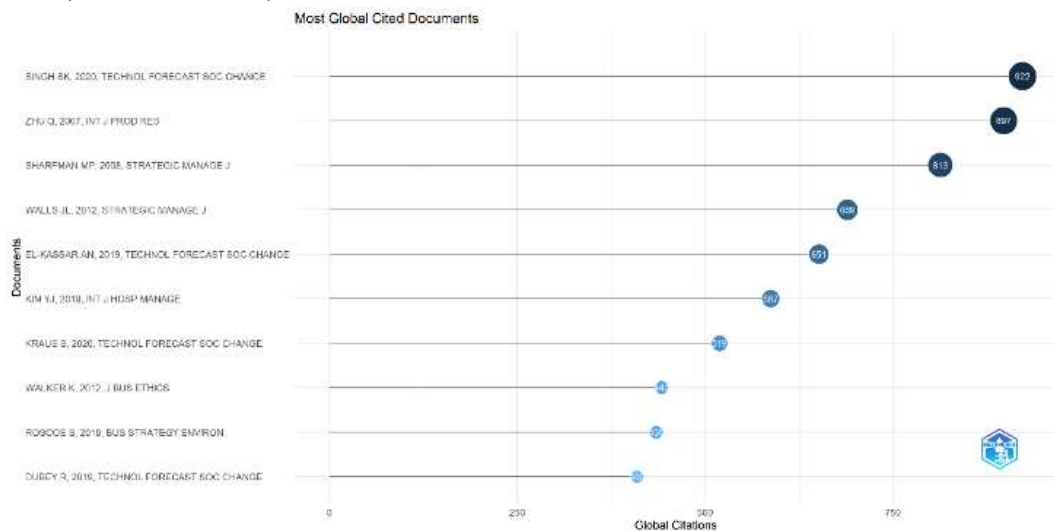


Figure 6. Most global cited document processed with R studio

The analysis of collaboration networks between countries in Figure 7 shows that the United Kingdom is a major centre in research on the performance of the company's environment. The country has extensive collaboration networks with China, India, France, the Netherlands, and several other countries. Meanwhile, countries such as Malaysia, Indonesia, and the United Arab Emirates are forming smaller regional collaboration clusters. Meanwhile, Canada, Germany, and Korea seem to form separate clusters. Ukraine is identified as a country with low collaboration involvement.

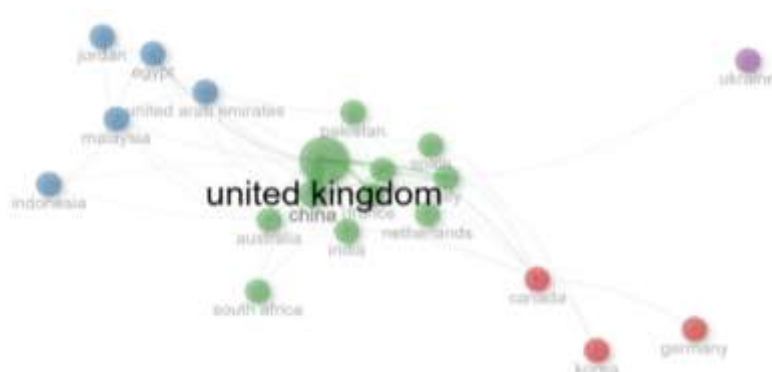


Figure 7. Collaboration countries processed with R studio

The analysis of citations in Figure 8 shows that the United Kingdom has the highest research impact based on the number of citations, which is 5,453 citations. The USA followed with 2,753 citations, and China with 2,498 citations. Other countries such as the United Arab Emirates, Italy, Canada, Netherlands, Australia, France, and Germany show the number of citations below 2,100. These results underscore the dominance of the United Kingdom in the global literature on corporate environmental performance, both in terms of collaboration and academic influence. The United Kingdom can become a knowledge production centre that is not only quantitatively active in publications but also contributes greatly to the referrals of another research in this field.

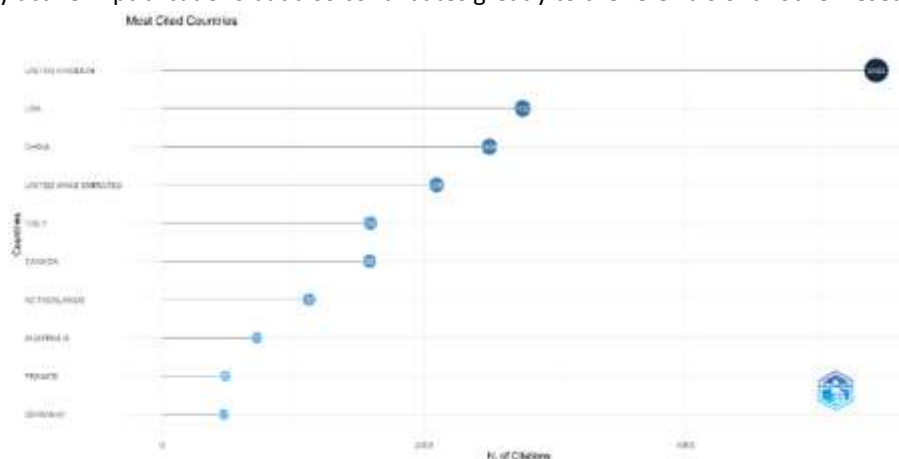


Figure 8. Countries with the most citations processed with R studio

Topic trend analysis and word cloud provide in-depth insights into the focus of enterprise environmental performance research. Figure 9 shows the trend topics that show the subject's development from 2018. The topic of sustainability began to emerge in 2019 and remains the discussion with the highest frequency to date. In addition, environmental technology was also identified as an important topic that emerged in 2022.

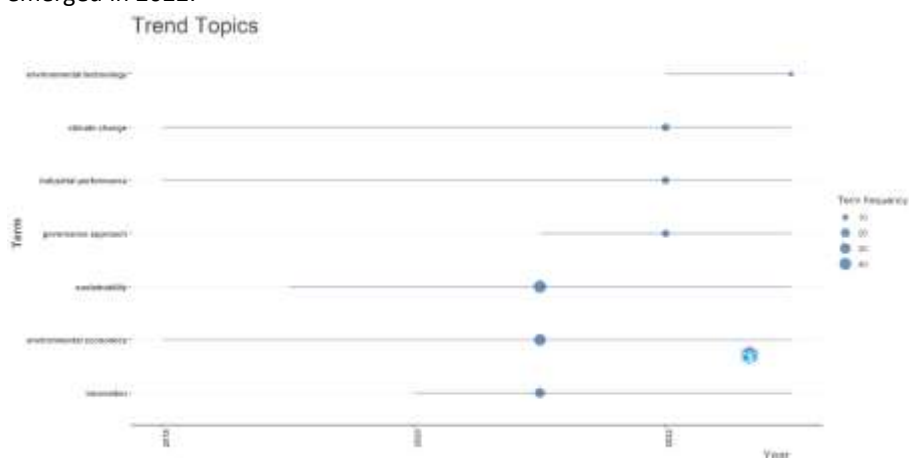


Figure 9. Trend topics processed with R studio

Word cloud visualization (Figure 10) complementarily confirms these findings. This visualization shows that environmental management is the most prominent term, followed by terms related to environmental performance and sustainability. This

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indicates that academic discussions in this field are significantly centred on environmental management as a key element to improve the company's performance in a sustainable manner.



Figure 10. Word cloud processed with R studio

The frequency of keywords analyzed in Figure 9 and Figure 10, overall reveals that research on corporate environmental performance focuses the most on the topic of environmental management with 133 appearances. Followed by environmental performance (74 appearances) and sustainable development (63 appearances). Concepts such as sustainability, environmental economics, and performance assessment are also quite dominant in the literature. The dominance of these topics reflects a shift in research focus towards solutions and a proactive approach to dealing with environmental issues in a business context.

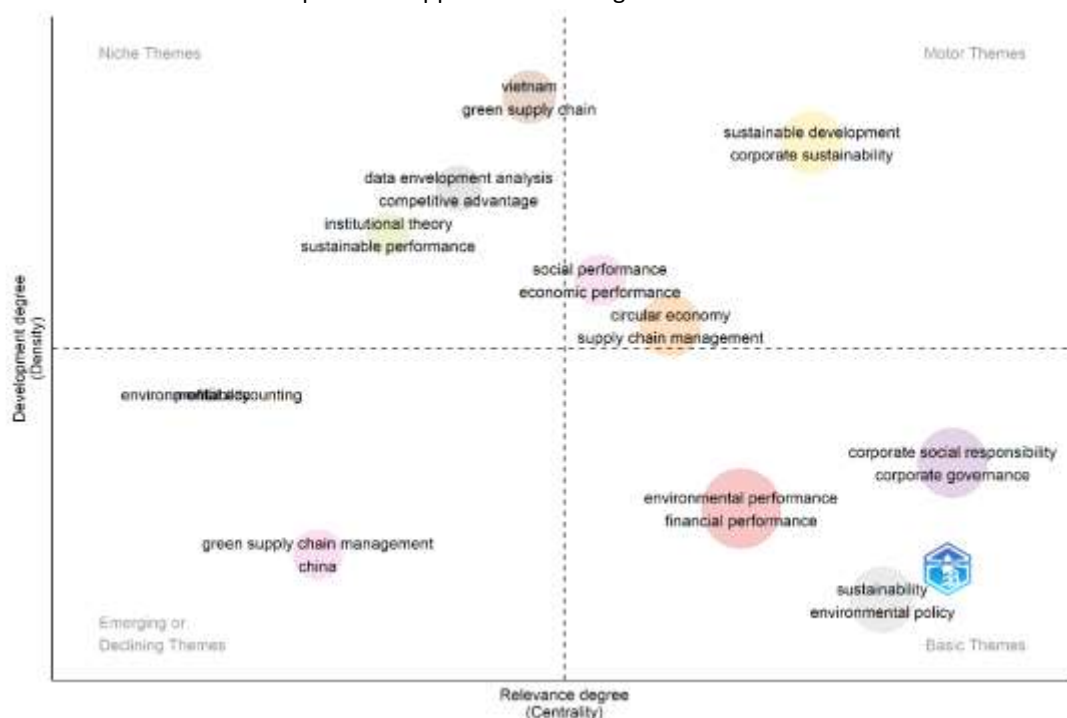


Figure 11. Thematic map processed with R studio

The thematic map at Figure 11 shows that research in this field is divided into four main categories based on the level of centrality and density of the topic. The motor themes, which are in the upper right quadrant, reflect a highly developed topic and have high relevance in this discipline. Concepts such as sustainable development and corporate sustainability are the centre of attention. This shows that companies are increasingly oriented towards sustainability as an integral business strategy.

The niche themes, located in the upper left quadrant, include themes such as data envelopment analysis and competitive advantage, are well developed but still have limited relevance to the main research. The basic themes, which are in the lower right quadrant, contain fundamental concepts such as corporate social responsibility, environmental performance, and financial performance. These themes form the basis for research on how companies manage their social responsibility and environmental impact, as well as how they affect overall financial performance. Emerging or declining themes in the lower left quadrant, indicate a shift in research focus. Topics such as environmental accounting, green supply chain management, and profitability indicate that the approach to environmental accounting and green supply chain management is undergoing developmental dynamics, both as a new trend and as a concept that is beginning to lose relevance in the academic literature or the theme is still relatively little studied. Overall, these findings indicate that research on corporate environmental performance increasingly emphasizes

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sustainability aspects and the integration of business strategies with Environmental, Social, and Governance (ESG) principles. Basic topics such as social responsibility and environmental performance remain key elements, while efficiency and competitiveness-based approaches are evolving as more specific areas of study.

B. The Potential Topic for Further Research to be Explored

An in-depth review of the specific contributions of the most cited articles can provide a richer understanding of the intellectual foundations of these themes. This analysis shows that the emergence of key themes in the thematic map is inseparable from the influence of fundamental works that are the main reference and shape the direction of development in this field of research. Research conducted by makes a fundamental contribution from an organization's internal perspective by integrating the domains of leadership, HR, and innovation. The study conducted by Singh et al. (2020) provides a fundamental contribution from the perspective of internal organizational dynamics by integrating the domains of leadership, human resources, and innovation. Their research demonstrates that green transformational leadership and green human resource management are critical antecedents that drive green innovation, ultimately enhancing environmental performance. These findings affirm that environmental performance is not merely the result of technical policies but rather the outcome of systematic cultural and leadership transformation within the organization. This conclusion aligns with the findings of Roscoe et al. (2019). Complementing this internal focus, El-Kassar & Singh (2019) expand the discussion by introducing contemporary variables, highlighting the role of green innovation as a key mediator between big data utilization and improved organizational performance, while emphasizing that the success of such technological initiatives heavily depends on managerial support and internal capabilities.

The study by Zhu & Sarkis (2007) provides an important foundation for understanding the drivers of environmental practices from an external perspective, identifying how institutional pressures moderate the adoption of green supply chain practices. This contribution is crucial as it shifts the focus from merely internal corporate initiatives to the broader business ecosystem, where pressures from governments, customers, and competitors become the main drivers of change. Meanwhile, from the strategic management domain, two key perspectives emerge. Sharfman & Fernando (2008) demonstrate that proactive environmental risk management can significantly reduce a firm's cost of capital. This argument provides a strong financial justification for managers to invest in environmental performance. On the other hand, Walls et al. (2012) critically questioning the direct relationship between corporate governance and environmental performance indicates the existence of complexity and contextual factors that need to be considered.

A comprehensive analysis of R-Studio's various visualization outputs provides valuable insights into the potential for further research in the field of enterprise environmental performance. This approach allows the formulation of prospective research directions and in accordance with the dynamics of current scientific development. Identifying this potential is crucial to charting the direction of relevant and innovative research going forward, ensuring continued academic contribution. Based on the topic trends and the resulting thematic map, some promising areas of exploration are presented in Table 4.

Table 4. Potential Topic for Further Research

Topics Identified	Further Research Exploration Directions
Environmental Technology	Innovation in environmentally friendly technologies, as well as more comprehensive sustainability implementation strategies in various industry sectors, for example through new technology adoption studies or analysis of the effectiveness of sustainability programs.
Sustainable Development, Corporate Sustainability	In-depth research on the effectiveness of sustainable business models, the measurement of the social and economic impact of corporate sustainability initiatives, as well as the drivers and drivers of the adoption of these practices in various cultural and regulatory contexts.
Data Envelopment Analysis, Competitive Advantage	Research on these analytical tools that can be applied more widely to measure environmental performance efficiency or how environmental performance can directly provide a competitive advantage in an increasingly environmentally conscious market. The integration of this theme with the larger theoretical framework is also a promising direction.
Corporate Social Responsibility, Environmental Performance, and Financial Performance	The research uses a more in-depth qualitative analysis of how companies formulate, implement, and evaluate their social responsibility and environmental impact in real practice, shifting away from just testing causal relationships.
Environmental Accounting, Green Supply Chain Management	The research can examine the adaptation and challenges of environmental accounting in the digital era, or the effectiveness of various green supply chain management approaches in reducing carbon footprint.

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The direction of research exploration presented in Table 4 not only reflects the identification of gaps and trends, but also becomes a strategic foundation for future scientific development. Each proposed topic offers a unique opportunity for researchers to make significant contributions, whether through the development of new theories, refinements of methodologies, or the provision of stronger empirical evidence. Focusing research on this area allows the academic community to accelerate understanding of how companies are able to manage their environmental impacts more effectively. This also allows the achievement of sustainable business goals. The implementation of this research direction is expected to produce innovative findings. The findings are not only academically relevant, but could also provide practical implications for policymakers, industry players, and other stakeholders in driving better corporate environmental performance globally.

V. CONCLUSION

Bibliometric results show that research in the field of environmental performance experienced significant growth with an annual growth rate of 18.73%. The trend shows that attention to environmental performance issues is increasing in line with the global push for sustainability. This study also found a high level of international collaboration (43.94%), indicating that this issue is a cross-country concern. The main themes of research that are widely studied include environmental management, environmental performance, and sustainable development, with the focus developing on the concepts of sustainability and corporate sustainability. Thematic maps can be used as a basis for determining the direction of future research. Topics such as environmental technology, corporate sustainability, green supply chain management, environmental accounting, and the relationship between environmental performance and financial performance emerged as promising research directions. This area opens opportunities for researchers to develop new theories, deepen methodologies, and provide stronger empirical evidence on the role of environmental performance in supporting the Company's sustainability.

This research has two main limitations. First, the analysis is carried out entirely based on meta data such as titles, abstracts, and keywords, without conducting a more in-depth analysis of the full content of the analyzed article. This can limit the understanding of the methodology, results, and substantive contributions offered by each study. Second, this study is descriptive and only maps research trends, without examining the cause-and-effect relationship between research topics and changes in regulations, business practices, or company performance dynamics.

Based on the findings and limitations of this study, there are several recommendations for future research. First, research with the theme of environmental performance is contained in the basic theme quadrant which means that this theme is very fundamental, so it needs to be explored more, not just to test the influence but to analyze qualitatively related to the way companies manage their social responsibility and environmental impacts. Second, further research that can combine bibliometric approaches with qualitative analysis or use Systematic Literature Review (SLR) analysis techniques to better understand the development of theories, concepts, and methodologies in environmental performance research based on previous studies.

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