

Original Research Article

Research on corporate ESG and low carbon development: A bibliometric analysis

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Abstract: Corporate ESG and low-carbon development have been key topics in ESG research. Analyzing Web of Science data, the study revealed a slow increase in relevant publications from 2017, with sharp growth starting in 2020, where Chinese researchers lead the contributions. The highly cited papers cover ESG, carbon emissions, policies, governance, and performance, highlighting policy and supervision as key drivers of corporate ESG and low-carbon development.

Keywords: ESG; Low carbon development; Bibliometric; Research foundation; Research frontiers

1. Introduction

The 19th CPC National Congress emphasized „building a market-oriented green technology innovation system“ and promoting „green development and lifestyles.“ It introduced an „innovation-driven development strategy“ to achieve these goals. In 2019, the Guiding Opinions on Building a Green Technology Innovation System were released, followed by the 2023-2025 Implementation Plan. These policies support green development, with enterprises playing a crucial role as both consumers of environmental resources and drivers of green innovation. Therefore, studying how to enhance corporate green technology innovation is of significant practical importance for advancing the high-quality development of China’s green economy^[1]. ESG (Environmental Protection, Social Responsibility, and Governance) has gained attention as a tool for implementing the national „dual carbon“ strategy and evaluating corporate sustainability. It helps companies adopt greener practices, enhance corporate responsibility, and improve governance, driving economic transformation and high-quality development. ESG aligns closely with several key development goals of China^[2]. By analyzing corporate ESG and low-carbon development literature, the author identified a lack of comprehensive reviews and the need to analyze research trends. This study extracted literature from Web of Science, using bibliometrix and VOSviewer for bibliometric and mapping analysis, revealing key research needs and offering insights to enhance research in this field.

2. Data and methods

2.1. Data source

The English literature for this study was sourced from WoS Core, which is indexed by SCIE and SSCI. WoS is a widely used authoritative English literature database.

Based on the research topic, the search keywords for the English literature were defined as „ESG and (low carbon or carbon neutral or carbon emission).“ As of January 2024, a total of 234 research papers were identified, covering the time span from 1993 to 2024. After manually reviewing the topics and abstracts of these papers, those with less relevance to the research theme were excluded, resulting in a final set of 133 papers^[3].

2.2. Research methods

Bibliometric analysis is an important method for studying trends and hot topics in a research field^[4-6]. In this study, the bibliometrix package was used to conduct performance analysis of research on corporate ESG and low-carbon development^[7]. The bibliometrix software is a bibliometric and citation analysis tool based on the R programming language, developed by Massimo and Corrado in 2007.

In addition, VOSviewer visualization software was used to analyze the research progress and hotspots in green finance standards. VOSviewer, developed by Van Eck and Waltman at the Centre for Science and Technology Studies of Leiden University in the Netherlands in 2009, is a Java-based literature visualization tool. It uses “co-occurrence clustering” to identify research hotspots and can present different visualizations, including network visualization (cluster view), overlay visualization (label view), and density visualization (density view)^[8].

Before importing the filtered literature into the software for analysis, synonyms for keywords were standardized. For example „carbon emission“, „CO2 emission“, and „greenhouse-gas emissions“ were unified as „carbon emission“. After importing the literature, the following keyword filtering parameters were set in VOSviewer: the minimum co-occurrence count for keywords was set to 5, and the top 30 keywords with the highest co-occurrence were retained.

3. Quantitative analysis of ESG role in corporate low-Carbon development

3.1. Performance analysis

3.1.1. Journal analysis

Before 2020, article publication increased slowly, but from 2020 onward, growth accelerated. In 2023, publications rose to 70, a 259% increase from 27 in 2022. By January 2024, 15 articles had been published, and the trend predicts 180 articles for the year. This shows a surge in research on ESG and corporate low-carbon development.

The literature distribution is concentrated, with the top 10 journals accounting for 35.5% of total publications. Leading is sustainability with 20 articles, followed by business strategy and the environment and journal of cleaner production with 8 each, and energies and environmental science and pollution research with 6 each.

China leads with 51 articles (38.3%), followed by the UK and the US with 13 each (9.77% and 9.02%, respectively). South Korea has 11 articles (8.27%) and Australia 8 articles (6.02%). This reflects increased domestic research output on ecological and low-carbon development.

3.1.2. Research direction analysis

The top five research directions based on the WOS literature are ESG performance, carbon emission, sustainable development, climate change, and China, with a combined proportion of 88.1%. This indicates that the degree of overlap between research directions is relatively low, with research distributed across various academic disciplines such as environmental science, economics, and management. It also reflects that ESG and low-carbon development are focal points across different sectors of society.

3.1.3. Analysis of highly cited literature

Highly cited literature reveals influential research perspectives in the field of green finance standards and provides valuable insights for future studies. presents the top 10 most frequently cited papers. These papers focus on several research directions:

- 4 papers investigate the role of external investors and internal governance in corporate ESG and low-carbon emissions (Serial Numbers 1, 2, 7, 8).
- 2 papers examine the relationship between corporate ESG and financial performance (Serial Numbers 3, 9).
- 4 papers explore the impact of policies and the adoption of new technologies on ESG and low-carbon development (Serial Numbers 4, 5, 6, 10).

Most highly cited papers in corporate ESG and low-carbon development are by Chinese scholars, reflecting their high research productivity and international recognition.

3.2. Research mapping analysis

Research hotspots are topics with strong interconnections over time, indicated by high-frequency keywords. After standardizing keywords through synonym replacement as described in Section 2.2, co-occurrence and cluster analysis were conducted. These analyses revealed potential themes and hot research topics in corporate ESG and low-carbon development.

3.2.1. Keyword Co-occurrence analysis

Keywords in a paper are high-level abstractions of the research focus. The frequency of co-occurrence of keywords indicates their importance and relevance within the research network on corporate ESG and low-carbon development. A higher frequency of co-occurrence signifies a stronger connection between the keywords.

shows the keyword co-occurrence cluster map, where larger nodes represent higher frequencies of occurrence for those keywords., the top 10 research topics with the highest co-occurrence density include ESG, carbon emissions, governance, performance, impact, corporate social responsibility, climate change, ESG performance, management, and social responsibility.

In terms of research content, ESG and carbon emissions are central to the search, indicating that many studies focus on these areas. The relationships between the keywords in the map can be categorized as follows:

1. Regulatory relationship: corporate ESG and low-carbon emissions are important regulatory targets for external supervision and internal governance.
2. Demand relationship: addressing climate change and social responsibility are key goals that corporate ESG and low-carbon emissions aim to achieve.
3. External relationship: corporate ESG and low-carbon goals influence various aspects of a company, including management, disclosure, innovation, sustainability, and market value.

3.2.2. Keyword cluster analysis

The keyword co-occurrence network visualization in VOSviewer explains the clustering of keywords. which includes three main clusters, “#1: carbon emissions, corporate performance, and market value (TS=138)”, “#2: ESG performance, innovation, and sustainable development (TS=134)”, and “#3: regulation, social responsibility, and climate change (TS=120)”.

Cluster #1: carbon emissions, corporate performance, and market value (TS=138), this is the most prominent cluster, with a total co-occurrence strength of 138. It primarily focuses on research hotspots related to carbon emissions, performance, and firm value. Haque et al. (2020) found that for 4,379 European companies, the announcement of carbon reduction plans and policies, as well as carbon disclosure, positively impacts firm value. However, the actual level of carbon emissions does not have a significant effect on firm value^[9].

Cluster #2: ESG performance, innovation, and sustainable development (TS=134), this cluster has a total co-occurrence strength of 134 and revolves around ESG performance, innovation, and management. A study by Ren et al. (2023) indicated that digital technologies impact corporate ESG performance through green innovation, especially for heavy carbon-emission industries with low digitalization and profitability. Zhao et al. (2018) found that ESG is a significant risk factor that can affect corporate profitability and has a substantial impact on management and decision-making

Cluster #3: regulation, social responsibility, and climate change (TS=120), with a total co-occurrence strength of 120, this cluster focuses on governance, corporate social responsibility, and climate change. Haque (2017) discovered that board independence and member diversity are positively associated with corporate carbon emission plans, but not significantly related to actual carbon emissions. Additionally, Chen et al. (2022) found that green subsidy policies significantly promote corporate green technology upgrades and reduce carbon

emissions . This indicates that government regulatory policies are more effective than internal corporate governance in addressing issues related to social responsibility and climate change.

4. Conclusion

Research on corporate ESG and low-carbon development has seen growing attention and has become a research hotspot, especially over the last three years. This study conducted bibliometric analysis querying researches from WOS database (2017–2024) with the subject „ESG and (low carbon or carbon neutral or carbon emission)“ and. Three key clusters were analyzed, revealing two potential directions for future research expansion.

Firstly, research should focus on how to regulate, incentivize, and constrain companies to better implement low-carbon development and assume social responsibility. The Key areas include establishing effective policies to ensure genuine carbon reduction and enhancing environmental transparency through stronger supervision, enforcement, and punitive measures for non-compliance with disclosure requirements.

Moreover, incentive policies for companies with strong ESG evaluations, such as tax reductions and green financing, can boost environmental performance. However, a standardized ESG evaluation framework is lacking, leading to inconsistent report quality and challenges in industry comparisons. Research should focus on effective policies to enhance disclosure, encourage self-discipline, and improve environmental performance.

Second research area is how technological innovation affects corporate ESG performance and profitability. In the reviewed literature, Ren et al. (2023) examined the impact of digital technologies on ESG performance and profitability of high carbon emission companies [10]. Research like this can encourage similar companies to adopt technological innovations to reduce carbon emissions and enhance ESG performance. Expanding on this, more studies can explore the effects of various technological innovations on ESG performance across different industries. For instance, how companies can effectively adopt current popular technologies such as clean energy, carbon capture and storage, recycling, smart cities, and intelligent transportation, and what impact these technologies have on their ESG performance and profitability. Such research can provide reliable evidence and guidance for the development of low-carbon technologies, promoting the green transformation and sustainable development of the economy.

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