The Evolution of Carbon Disclosure and Sustainability Research: A Bibliometric Study of Scopus-Indexed Publications

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Abstract
The increasing importance of climate change and sustainable development has encouraged greater attention to carbon disclosure as a tool for corporate environmental transparency. This study aims to analyze the evolution of carbon disclosure and sustainability research through a bibliometric approach. Data were collected from the Scopus database using the keywords "carbon disclosure" and "sustainability," resulting in 282 publications published between 2008 and 2026. Bibliometric analysis was employed to examine publication trends, influential authors, highly cited documents, leading journals, and keyword occurrences. The findings indicate a significant growth in publication output, particularly after 2020, reflecting increasing scholarly interest in the field. Sustainability, climate change, carbon disclosure, and sustainability reporting emerged as the dominant research themes. The study concludes that carbon disclosure research has evolved into a multidisciplinary field that supports sustainability objectives and provides valuable directions for future research.

Keywords: Carbon Disclosure, Sustainability, Bibliometric Analysis, Sustainability Reporting, Climate Change

INTRODUCTION

Climate change has become one of the most critical global challenges facing governments, businesses, and society. The increasing concentration of greenhouse gas (GHG) emissions resulting from industrial activities, transportation, and energy consumption has contributed significantly to global warming, environmental degradation, and climate-related disasters (IPCC, 2022). These environmental challenges have intensified stakeholder demands for greater corporate accountability and transparency regarding environmental impacts. Consequently, carbon disclosure has gained considerable attention as a mechanism through which companies communicate information about carbon emissions, climate-related risks, and mitigation strategies (Velte et al., 2020). Carbon disclosure enables stakeholders to evaluate a firm's environmental performance and commitment to addressing climate change (Hahn et al., 2015)

Alongside the growing concern for environmental issues, sustainability has become a central concept in both business practices and academic research. Sustainability emphasizes the integration of economic, social, and environmental objectives to create long-term value for organizations and society. As a result, companies are increasingly expected to demonstrate their commitment to sustainable development through transparent sustainability reporting practices. Borghei (2021) argued that carbon disclosure has evolved into an essential component of sustainability reporting because it provides relevant information regarding corporate environmental impacts. Similarly, recent studies have shown that the growing global emphasis on sustainability has substantially contributed to the expansion of carbon disclosure research across various disciplines, including accounting, management, finance, and environmental studies (Bazhair et al., 2022).

The importance of carbon disclosure has been reinforced by the emergence of various international initiatives and reporting frameworks. Global agreements and organizations such as the Paris Agreement, the Carbon Disclosure Project (CDP), the

Task Force on Climate-related Financial Disclosures (TCFD), and the International Sustainability Standards Board (ISSB) have encouraged companies to improve the transparency and quality of climate-related disclosures. Sustainability reporting is evolving toward more standardized and integrated reporting frameworks (Christensen et al., 2021). Furthermore, Ma et al. (2023) emphasized that carbon disclosure plays a strategic role in supporting the achievement of the Sustainable Development Goals (SDGs), particularly those related to climate action and sustainable development.

The growing relevance of carbon disclosure and sustainability has stimulated substantial academic interest over the past decade. Numerous studies have examined the determinants of carbon disclosure practices from various perspectives. Ben-Amar et al. (2017) found that board gender diversity positively influences corporate responses to sustainability initiatives and carbon disclosure practices. Likewise, Li et al. (2018) demonstrated that environmental legitimacy and green innovation encourage firms to disclose more comprehensive carbon-related information. Other studies have also highlighted the importance of stakeholder pressure, corporate governance mechanisms, and organizational characteristics in shaping carbon disclosure practices (Liesen et al., 2015; Bui et al., 2020).

In addition to investigating the determinants of carbon disclosure, scholars have explored its economic and financial implications. Corporate awareness of carbon-related risks influences the cost of debt financing (Jung et al., 2018). Similarly, Choi and Luo (2021) found that capital markets respond to greenhouse gas emission disclosures, indicating that carbon-related information has become increasingly relevant for investors' decision-making processes. These findings suggest that carbon disclosure is no longer viewed solely as a regulatory compliance mechanism but also as a strategic tool that may affect corporate value, reputation, and financial performance (Velte et al., 2020).

Despite the growing body of literature, existing studies have primarily focused on empirical investigations of the determinants and consequences of carbon disclosure. Velte et al. (2020) conducted a systematic review emphasizing governance-related determinants and financial consequences of carbon disclosure. Borghei (2021) reviewed the carbon disclosure literature through a systematic literature review approach, while Bazhair et al. (2022) examined the evolution of carbon disclosure research and identified future research directions. However, these studies provide limited quantitative evidence regarding the intellectual structure, publication trends, collaboration networks, influential authors, and thematic evolution of research that specifically connects carbon disclosure and sustainability.

This limitation highlights an important research gap. Although the number of publications on carbon disclosure and sustainability continues to increase, comprehensive bibliometric studies focusing on the intersection of these two topics remain relatively scarce. Bibliometric analysis has been recognized as an effective approach for evaluating the development of a research field by identifying publication patterns, citation structures, collaboration networks, and emerging research themes. Bibliometric analysis enables researchers to systematically assess scientific development and identify future research opportunities (Donthu et al., 2021). Likewise, Aria and Cuccurullo (2017) emphasized that bibliometric techniques facilitate science mapping and provide a comprehensive understanding of the intellectual structure of a research domain.

The urgency of this study is further supported by the increasing global attention to climate-related reporting and sustainability practices. Based on a search conducted in the Scopus database using the keywords “carbon

disclosure" and "sustainability," a total of 282 publications were identified during the period 2008–2026. The growing number of publications indicates increasing scholarly interest in understanding the role of carbon disclosure in achieving sustainability objectives. Nevertheless, limited research has systematically mapped the evolution of this literature using a bibliometric approach based on Scopus-indexed publications covering the last fifteen years.

Therefore, this study aims to analyze the evolution of carbon disclosure and sustainability research through a bibliometric approach using Scopus-indexed publications from 2008 to 2026. The novelty of this study lies in its comprehensive mapping of publication trends, highly cited articles, influential authors, leading journals, contributing countries, institutional affiliations, and keyword developments within the field of carbon disclosure and sustainability. Unlike previous studies that mainly employed systematic literature review approaches, this study provides a quantitative assessment of the intellectual structure and research dynamics of the field. Consequently, the findings are expected to contribute to the advancement of sustainability and carbon disclosure literature while offering valuable insights for researchers, practitioners, regulators, and policymakers regarding future research directions.

RESEARCH METHODOLOGY

This study employs a bibliometric approach to analyze the development of research on carbon disclosure and sustainability. Bibliometric analysis was selected because it provides a quantitative method for evaluating scientific publications, identifying research trends, citation patterns, collaboration networks, and the intellectual structure of a research field. According to Donthu et al. (2021), bibliometric analysis is an effective method for assessing the evolution of scientific knowledge and identifying future research opportunities. Furthermore, Aria and Cuccurullo (2017) emphasized that bibliometric techniques facilitate systematic science mapping and provide a comprehensive understanding of the knowledge structure within a particular research domain.

The data used in this study were obtained from the Scopus database, one of the largest and most widely recognized sources of scholarly publications. Scopus was selected because of its extensive journal coverage, high-quality metadata, and comprehensive bibliographic information, including authors, affiliations, citations, keywords, and publication sources (Donthu et al., 2021). Data collection was conducted in June 2026 using the keywords "carbon disclosure" and "sustainability" in the Title, Abstract, and Keywords (TITLE-ABS-KEY) search fields.

The inclusion criteria consisted of documents indexed in Scopus and published between 2008 and 2026. After the screening process, a total of 282 publications relevant to the research topic were identified and included in the analysis. The bibliographic data were subsequently exported in BibTeX format and prepared for bibliometric analysis using Biblioshiny. The bibliometrix package underlying Biblioshiny has been widely adopted in bibliometric research across various disciplines and is recognized as a standard tool for science mapping analysis (Aria and Cuccurullo, 2017).

Data analysis was conducted using Biblioshiny, a web-based interface of the Bibliometrix package developed in the R programming environment. Biblioshiny was chosen because it provides comprehensive bibliometric analysis features and interactive visualization tools that facilitate the exploration and interpretation of bibliographic data (Aria & Cuccurullo, 2017). The software enables researchers to perform performance analysis and science mapping efficiently without requiring advanced programming skills.

The bibliometric analysis consisted of two primary stages: performance analysis and science mapping. Performance analysis was conducted to evaluate publication characteristics, including annual publication trends, most productive authors, most influential articles, leading journals, contributing countries, institutional affiliations, document types, and citation performance. This analysis provides an overview of the growth and development of research on carbon disclosure and sustainability over the study period.

The second stage, science mapping, was performed to examine the intellectual structure and thematic development of the research field. This stage included keyword co-occurrence analysis to identify dominant and emerging research themes, co-citation analysis to explore relationships among influential references, and collaboration analysis to examine cooperation patterns among authors, institutions, and countries. Through these analyses, major research clusters, thematic trends, and potential future research directions were identified.

The research process consisted of several sequential steps, including keyword selection, data retrieval from the Scopus database, document screening, bibliographic data export, bibliometric analysis using Biblioshiny, and interpretation of the results. The findings are presented through tables, graphs, and network visualizations to provide a comprehensive overview of the evolution of carbon disclosure and sustainability research during the period 2008–2026.

RESULTS AND DISCUSSION

3.1 General Characteristics of the Literature

Table 1 presents the descriptive statistics of the literature analyzed in this study. A total of 282 documents related to carbon disclosure and sustainability were identified from the Scopus database during the period 2008–2026. These publications were distributed across 184 sources, including journals, conference proceedings, books, and book chapters, indicating the multidisciplinary nature of this research area. The dataset involved 700 authors, with 48 single-authored documents, while the average number of co-authors per document reached 2.83, suggesting that research in this field is predominantly conducted through collaborative efforts. Furthermore, international co-authorship accounted for 28.37% of total publications, reflecting the global relevance of climate change and sustainability issues that encourage cross-country academic collaboration, consistent with the observation of Donthu et al. (2021) that bibliometric indicators of collaboration reflect the extent to which scholarly communities engage across national boundaries.

The dataset also demonstrates a substantial level of scholarly influence and thematic diversity. The analyzed publications contained 849 author keywords, indicating a broad range of topics associated with carbon disclosure and sustainability. This diversity aligns with the argument of Bazhair et al. (2022) that carbon disclosure research spans multiple disciplines, including accounting, management, finance, and environmental studies. In addition, the documents had an average age of 4.66 years and received an average of 40.24 citations per document, suggesting that the field has attracted considerable academic attention and has become an important component of sustainability, environmental accounting, and climate-related disclosure literature (Velte et al., 2020). The annual growth rate of 15.56% further confirms that scholarly interest in this research area has increased significantly over time, corroborating the finding of Borghei (2021) that carbon disclosure has evolved into an essential dimension of sustainability reporting.

Figure 1 illustrates the annual scientific production of research on carbon disclosure and sustainability between 2008

and 2026. The results show that publication activity was relatively limited during the early years of the observation period. Between 2008 and 2012, the number of publications remained low, ranging from only one to two documents annually. A noticeable increase emerged in 2013, when publications rose sharply to 11 documents, followed by fluctuations between 2014 and 2018, during which annual publications varied between eight and eleven documents. Although the growth during this period was relatively moderate, it reflects the gradual expansion of academic interest in environmental transparency and sustainability reporting (Hahn et al., 2015).

Table 1. Descriptive statistics of the research dataset.

Indicator	Value
Time Span	2008-2026
Total Documents	282
Sources (Journals, Books, Proceedings)	184
Total Authors	700
Single-Authored Documents	48
International Co-Authorship	28.37%
Co-Authors per Document	2.83
Annual Growth Rate	15.56%
Author's Keywords	849
Average Document Age	4.66 Years
Average Citations per Document	40.24

Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

The increasing global emphasis on sustainability and environmental accountability during this period encouraged companies and researchers alike to focus more on carbon-related disclosure practices (Liesen et al., 2015).

A more substantial growth trend began after 2019, with the number of publications increasing from 14 documents in 2019 to 22 documents in 2021, 25 documents in 2022, and 31 documents in 2023. This upward trend coincided with increasing global attention to climate-related reporting, sustainability governance, and carbon management practices. The growing implementation of the Paris Agreement, the legally binding international treaty on climate change adopted by 195 parties in December 2015, has reinforced the urgency for corporate climate-related transparency (UNFCCC, 2015). In parallel, the increasing adoption of the Task Force on Climate-related Financial Disclosures (TCFD)recommendations, which were issued in 2017 to help companies disclose climate-related risks and opportunities in a consistent and comparable manner (TCFD, 2017), has further elevated scholarly and practitioner interest in carbon disclosure.

Furthermore, the rapid expansion of Environmental, Social, and Governance (ESG) reporting frameworks has encouraged both corporations and academics to address carbon disclosure issues more intensively (Christensen et al., 2021). Consequently, research examining the determinants, quality, and implications of carbon disclosure has expanded significantly during this period, as evidenced by the growing body of literature on governance mechanisms, stakeholder pressures, and financial consequences of corporate environmental transparency (Bui et

al., 2020; Choi and Luo, 2021; Jung et al., 2018).

The highest publication output was recorded in 2025, reaching 56 documents, which represents the peak of scientific production within the study period. This substantial increase may be associated with the growing global adoption of sustainability reporting standards, particularly following the establishment of the International Sustainability Standards Board (ISSB) by the IFRS Foundation in November 2021 at COP26 in Glasgow (IFRS Foundation, 2021). The ISSB issued its inaugural standards, IFRS S1 on General Requirements for Disclosure of Sustainability-related Financial Information and IFRS S2 on Climate-related Disclosures in June 2023, which came into effect for annual reporting periods beginning on or after January 2024 (IFRS Foundation, 2023). These developments further strengthened the importance of climate-related disclosure in corporate reporting practices and generated heightened academic interest in the field (Ma et al., 2023). Although the number of publications decreased to 27 documents in 2026, this decline should be interpreted with caution because the data collection period ended before the year was completed. Overall, the results indicate that research on carbon disclosure and sustainability has experienced rapid and sustained growth, remaining a dynamic field of study. The continuous increase in publication output demonstrates the growing importance of carbon disclosure as a critical mechanism for enhancing environmental accountability, supporting sustainability objectives, and addressing global climate change challenges (Aria and Cuccurullo, 2017; Donthu et al., 2021). These trends suggest that carbon disclosure will continue to attract growing scholarly attention in the years ahead (Bazhair et al., 2022).

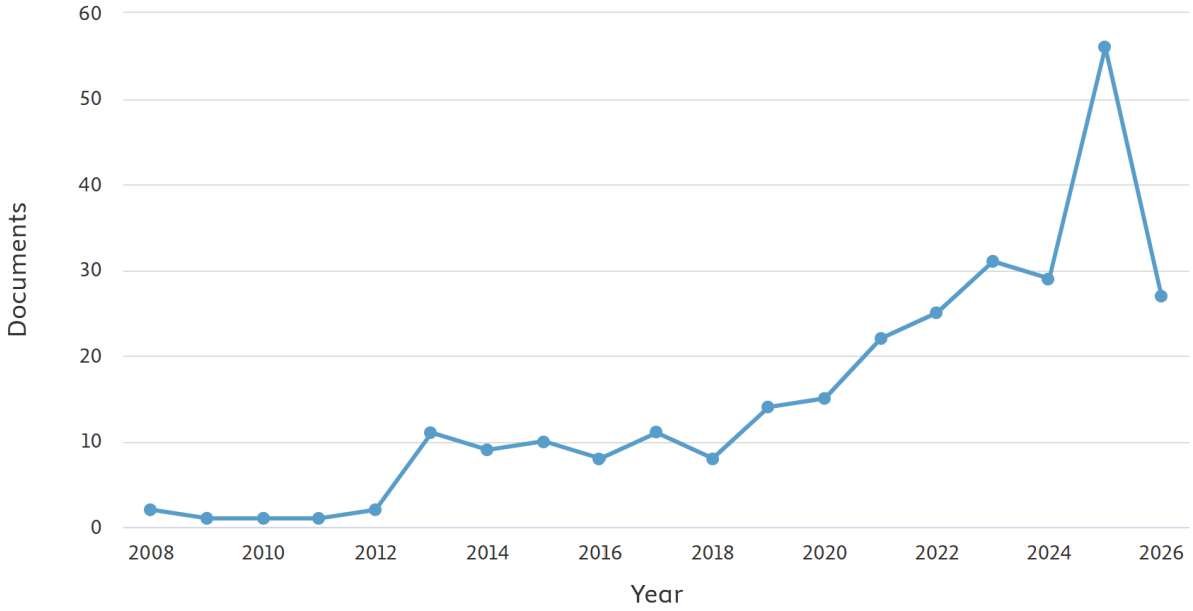


Figure 1. Document by year of publication.
Source: Authors compilation, 2026

3.1.1 General Characteristic of Sources

Table 2 presents the most relevant journals contributing to the development of carbon disclosure and sustainability research. Journal Business Strategy and the Environment was the most productive journal, publishing 18 articles with 1,160 total citations, followed by Journal of Cleaner Production with 12 articles and 918 citations, and Journal Sustainability (Switzerland) with

10 articles and 243 citations. These findings indicate that sustainability and environmental management journals play a central role in advancing the literature.

Several accounting and governance-related journals also contributed significantly to the field. Journal Corporate Social Responsibility and Environmental Management published 7 articles and received 522 citations, while Sustainability Accounting, Management and Policy Journal contributed 6 articles with 311 citations. This suggests that carbon disclosure has become an important topic within sustainability accounting and corporate governance research.

Although Journal of Business Ethics published only 4 articles, it recorded the highest citation impact with 2,332 citations, making it one of the most influential journals in the field. Similarly, British Accounting Review accumulated 532 citations from only 3 articles. Overall, the results demonstrate that research on carbon disclosure and sustainability is concentrated in high-impact journals focusing on sustainability, environmental management, accounting, and business ethics. This finding suggests that the topic has gained considerable academic recognition and continues to attract growing scholarly attention across multiple disciplines.

Table 2. Most relevant journals.

Source	Articles	Total Citation
Business Strategy and the Environment	18	1160
Journal of Cleaner Production	12	918
Sustainability (Switzerland)	10	243
Sustainability Accounting, Management and Policy Journal	6	311
Corporate Social Responsibility and Environmental Management	7	522
Journal of Business Ethics	4	2332
British Accounting Review	3	532
International Journal of Energy Economics and Policy	4	68
International Journal of Sustainable Development and Planning	7	34
Iop Conference Series: Earth and Environmental Science	5	33

Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

3.1.2. General Characteristics of Authors – Most Active Countries

Table 3 presents the most productive countries in carbon disclosure and sustainability research. The United States ranked first with 43 publications, followed closely by Australia (42 publications) and the United Kingdom (30 publications). These countries have long been at the forefront of sustainability reporting, environmental governance, and climate-related disclosure practices, which may explain their strong research productivity. Their well-established academic institutions, extensive research funding, and active participation in global sustainability initiatives have contributed to the continuous development of carbon disclosure studies. In terms of research impact, however, Canada emerged as the most influential country with 1,541 total citations despite producing only 16 publications, indicating that its studies have generated substantial academic attention and influence. Similarly, China recorded 907 citations from 26 publications, outperforming several countries with higher publication volumes.

This finding suggests that research influence is not solely determined by publication quantity but also by the relevance and quality of scholarly contributions.

The presence of developing countries such as Indonesia and Malaysia, each contributing 23 publications, further demonstrates the growing global interest in carbon disclosure research, particularly in regions facing increasing environmental challenges and sustainability pressures. Overall, the distribution of publications and citations indicates that carbon disclosure and sustainability have evolved into a truly international research field, attracting significant contributions from both developed and emerging economies while fostering knowledge exchange on climate accountability.

Table 3. Most productive countries.

Countries	Publications	TC
United States	43	818
Australia	42	381
United Kingdom	30	720
China	26	907
Indonesia	23	113
Malaysia	23	180
Canada	16	1541
India	15	36
France	13	153
Italy	12	170

Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

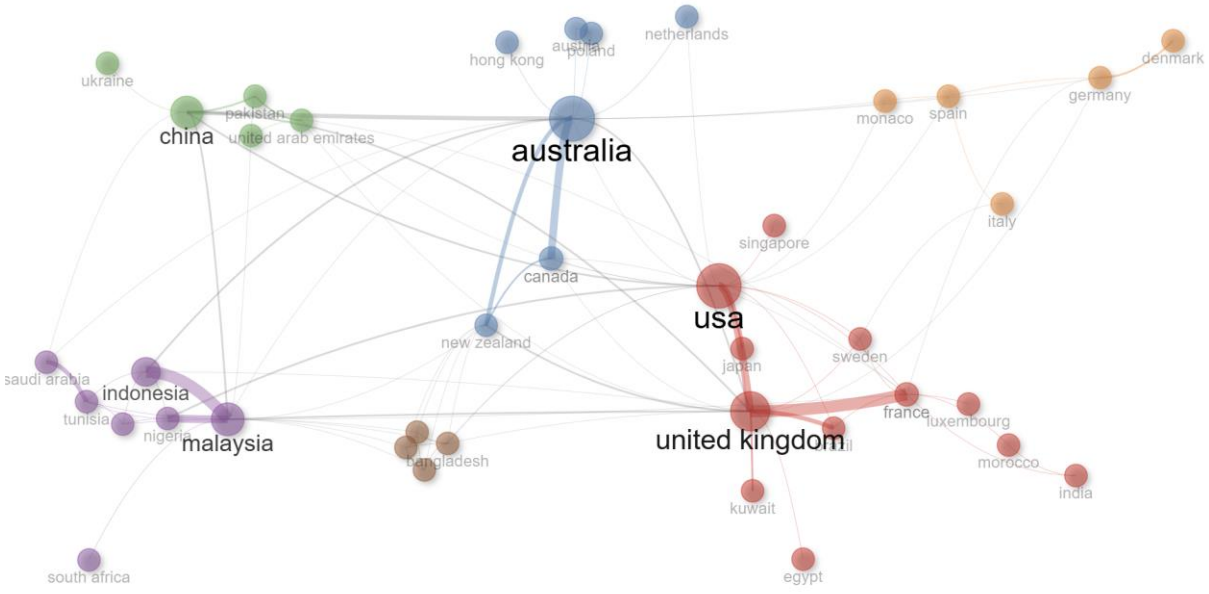


Figure 2. Country collaboration networks.
Source: Data processed in Biblioshiny, 2026

Figure 2 illustrates the collaboration network among countries in carbon disclosure and sustainability research. The network consists of several clusters represented by different colors, where node size indicates the level of scientific productivity and the connecting lines (edges) represent collaborative relationships between countries. The results show that the United States, Australia, and the United Kingdom occupy central positions within the network, indicating their dominant role in international research collaboration. Among these countries, the strongest collaboration appears between Australia and the United Kingdom, as well as between the United States and the United Kingdom, reflected by the thicker connecting lines. The figure also reveals active collaboration among Asian countries, particularly China, Malaysia, and Indonesia, which form a distinct cluster connected to the broader international network. The presence of multiple interlinked clusters suggests that research on carbon disclosure and sustainability has evolved into a global research agenda that transcends geographical boundaries. Such international collaboration is essential for addressing climate change issues, as it facilitates knowledge exchange, enhances research quality, and promotes the development of comprehensive solutions to sustainability and carbon disclosure challenges across different institutional and regulatory contexts.

3.1.3. General characteristics of authors – most active universities

Table 4 presents the most productive universities in carbon disclosure and sustainability research. Western Sydney University ranked first with nine publications, followed by Macquarie University with six publications, while The University of Queensland, Universitas Sebelas Maret, and Macquarie Business School each contributed five publications. The results indicate that Australian universities dominate the list, reflecting Australia's strong academic interest in sustainability, climate change, and environmental disclosure research. This finding is consistent with Australia's active role in promoting sustainability initiatives and climate-related reporting practices.

Table 4. Top productive universities.

University	Frequency
Western Sydney University	9
Macquarie University	6
The University of Queensland	5
Universitas Sebelas Maret	5
Macquarie Business School	5
Universiti Sains Malaysia	4
Universiti Tenaga Nasional	4
King Khalid University	4
Swinburne University of Technology	4
University of Sfax	4

Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

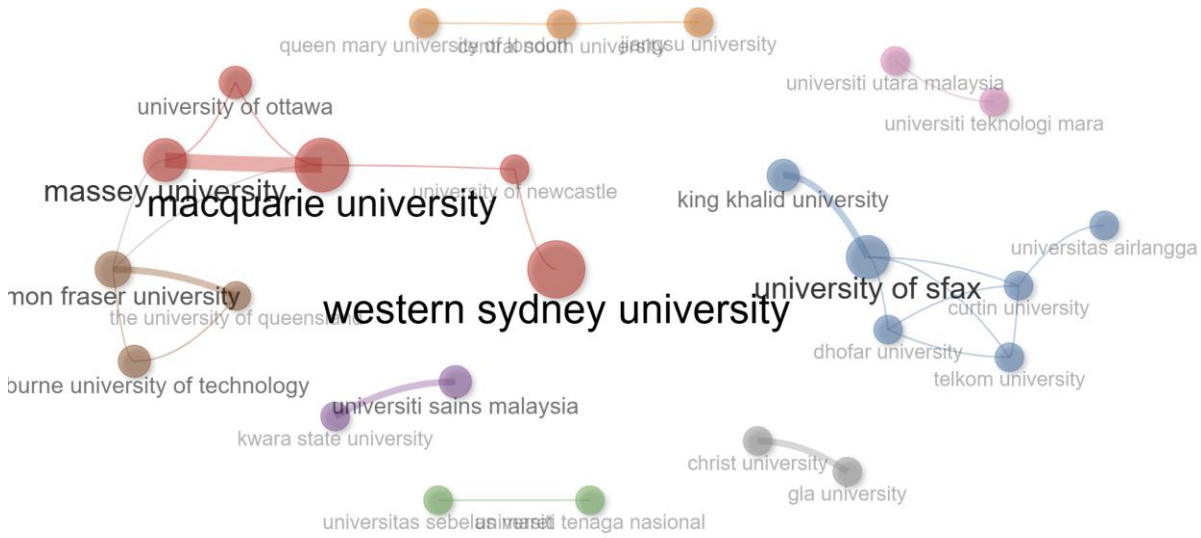


Figure 3. Universities collaboration networks
Source: Data processed in Biblioshiny

Figure 3 illustrates the collaboration network among universities in carbon disclosure and sustainability research. The network consists of several clusters that represent collaborative relationships between institutions, where larger nodes indicate higher research productivity and stronger involvement in the field, while connecting lines reflect co-authorship and research partnerships. The figure shows that Western Sydney University and Macquarie University occupy central positions within the network, confirming their status as the most productive institutions identified in Table 4. These universities maintain active collaborations with several other institutions, including the University of Newcastle, University of Ottawa, and Massey University. Another notable cluster is centered around the University of Sfax, which collaborates with institutions such as Curtin University, Telkom University, Dhofar University, and Universitas Airlangga, demonstrating the international nature of research cooperation in this field.

The presence of universities from different regions, including Indonesia, Malaysia, Saudi Arabia, and Tunisia, demonstrates that research on carbon disclosure and sustainability has attracted global academic attention. Universities such as Universitas Sebelas Maret, Universiti Sains Malaysia, Universiti Tenaga Nasional, King Khalid University, and University of Sfax have contributed significantly to the literature despite operating in diverse regulatory and institutional environments.

This suggests that carbon disclosure is increasingly recognized as an important research topic across both developed and developing countries. Furthermore, the diversity of contributing institutions highlights the growing commitment of higher education institutions to addressing climate change, promoting sustainability practices, and supporting the development of knowledge related to environmental accountability and corporate transparency.

3.1.4 General Characteristics of Authors – Most Active Authors

Table 5 presents the most productive authors in carbon disclosure and sustainability research based on the number of articles

published and total citations received. The results show that Bui B, Houqe MN, Tang Q, and Jaaffar AH emerged as the most prolific contributors, each authoring 4 articles within the dataset. Notably, Bui B and Houqe MN share an identical publication count of 4 articles and total citation count of 349, reflecting their strong collaborative research relationship. Their most influential joint work, alongside Zaman M, examined the effects of climate governance on carbon disclosure and corporate performance, demonstrating that board-level oversight and the frequency of carbon reporting to governing bodies significantly improve the quality of carbon disclosure and environmental accountability (Bui et al., 2020).

Tang Q with 4 articles and 293 total citations, is recognized as one of the leading experts in carbon accounting and reporting, having contributed extensively to understanding how firms manage and communicate carbon-related information to stakeholders (Tang and Luo, 2014). The relatively lower citation count of Jaaffar AH, despite sharing the same article output, suggests that his contributions are more recent and have not yet accumulated the same level of scholarly attention, which is consistent with the time-lag effect commonly observed in bibliometric studies (Donthu et al., 2021). Nevertheless, the emerging presence of such authors signals the continuous renewal of scholarly interest in carbon disclosure and sustainability research, particularly from developing country perspectives (Bazhair et al., 2022).

Table 5. Most relevant authors.

Authors	Articles	Total Citation	H-Index
Bui B	4	349	4
Houqe MN	4	349	4
Jaaffar AH	4	16	2
Tang Q	4	293	4
Ben-Amar W	3	1295	3
Callery PJ	3	60	3
Elijido-Ten EO	3	201	3
Elleuch Lahyani F	3	145	3
Gonzalez JM	3	168	3
Asif MS	3	54	2

Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

Among authors with 3 publications, Ben-Amar W stands out as the most influential, recording 1,295 total citations by far the highest citation count in the entire dataset, despite ranking equal in article output with Callery PJ, Elijido-Ten EO, Elleuch Lahyani F, and Gonzalez JM. This exceptional citation impact is primarily attributable to his seminal work on board gender diversity and corporate responses to sustainability initiatives, which demonstrated that firms with greater female representation on boards are more likely to voluntarily disclose climate-related information through the Carbon Disclosure Project (Ben-Amar et al., 2017). The disproportionate citation count of Ben-Amar W compared to other authors in this category underscores the foundational importance of corporate governance research in shaping the trajectory of carbon disclosure literature (Hahn et al., 2015). Authors such as Elijido-Ten EO (201 citations), Gonzalez JM (168 citations), and Elleuch Lahyani F (145 citations) have also made meaningful contributions, while Asif MS accumulated 54 citations and Callery PJ recorded 60 citations,

indicating emerging but growing scholarly impact in this research area (Aria and Cuccurullo, 2017). Collectively, these findings suggest that carbon disclosure and sustainability research has been driven by a relatively concentrated group of highly influential scholars whose works have laid the intellectual foundation for the field.

Figure 4 illustrates the collaboration network among authors in the field of carbon disclosure and sustainability research. The network consists of several clusters represented by different colors, indicating groups of authors who frequently collaborate and share similar research interests. In bibliometric network analysis, node size reflects the author's productivity and prominence within the network, while the connecting lines (edges) represent collaborative relationships between authors (Donthu et al., 2021).

The figure shows that several authors form relatively strong collaboration clusters, including Bui B–Houqe MN, Asif MS–Lau H–Hurriyet H–Mahakandala D, and González-González JM–Mateo-Márquez AJ–Zamora-Ramírez C. Among these, the collaboration cluster involving Asif MS, Lau H, Hurriyet H, and Mahakandala D appears to have the largest nodes, indicating a relatively higher level of research productivity and collaboration intensity. Similarly, Bui B and Houqe MN, who are among the most productive authors identified in Table 5, exhibit a strong collaborative relationship, reflecting their significant contribution to the development of carbon disclosure literature. Overall, the presence of multiple collaboration clusters suggest that research on carbon disclosure and sustainability is increasingly supported by cooperative scholarly efforts across institutions and countries, and facilitating knowledge exchange and contributing to the advancement of this rapidly growing research field.

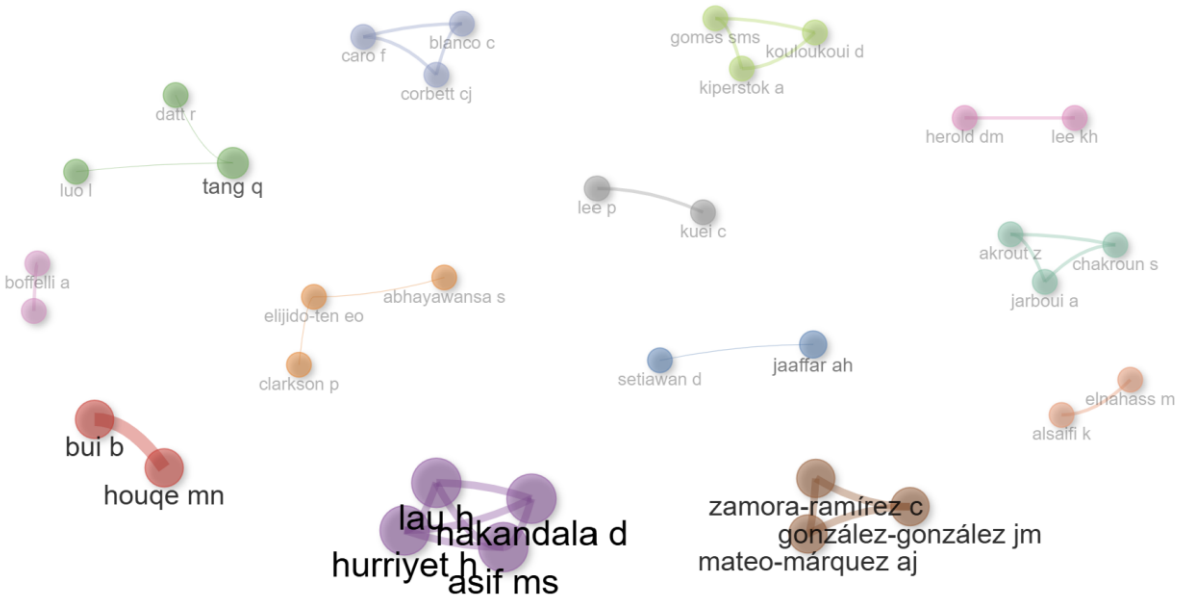


Figure 4. Authors collaboration networks.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

3.2 The Influential Studies and Themes of Research

Table 6 presents the ten most cited articles in the field of carbon disclosure and sustainability. Citation analysis is an important indicator in bibliometric studies because it reflects the academic influence and intellectual contribution of publications within a research domain.

Table 6. Top Cited Articles in Carbon Disclosure and Sustainability Research

No	Title	Authors	Year	Journals	TC	DOI
1	Board Gender Diversity and Corporate Response to Sustainability Initiatives: Evidence from the Carbon Disclosure Project	Walid Ben-Amar, Millicent Chang & Philip McIlkenny	2017	Journal of Business Ethics	950	10.1007/s10551-015-2759-1
2	Environmental Legitimacy, Green Innovation, and Corporate Carbon Disclosure: Evidence from CDP China 100	Dayuan Li, Min Huang, Shenggang Ren, Xiaohong Chen & Lutao Ning	2018	Journal of Business Ethics	704	10.1007/s10551-016-3187-6
3	Carbon Risk, Carbon Risk Awareness and the Cost of Debt Financing	Juhyun Jung, Kathleen Herbohn & Peter Clarkson	2018	Journal of Business Ethics	613	10.1007/s10551-016-3207-6
4	Difference in degrees: CEO characteristics and firm environmental disclosure	Ben W. Lewis, Judith L. Walls, Glen W. S. Dowell	2014	Strategic Management Journal	570	10.1002/smj.2127
5	Corporate environmental disclosures about the effects of climate change	Elizabeth Stanny, Kirsten Ely	2008	Corporate Social Responsibility and Environmental Management	408	10.1002/csr.175
6	A review of corporate sustainability reporting tools (SRTs)	Renard Y J Siew	2015	Journal of Environmental Management	308	10.1016/j.jenvman.2015.09.010
7	Board Effectiveness and the Voluntary Disclosure of Climate Change Information	Walid Ben-Amar, Philip McIlkenny	2015	Business Strategy and the Environment	290	10.1002/bse.1840
8	An analysis of Australian company carbon emission disclosures	Bo Bae Choi, Doowon Lee, Jim Psaros	2013	Pacific Accounting Review	285	10.1108/01140581311318968
9	Does stakeholder pressure influence corporate GHG emissions reporting? Empirical evidence from Europe	Andrea Liesen, Andreas G. Hoepner, Dennis M. Patten, Frank Figge	2015	Accounting, Auditing & Accountability Journal	273	10.1108/AAAJ-12-2013-1547
10	Climate governance effects on carbon disclosure and performance	Binh Bui, Muhammad Nurul Houqe, Mahbub Zaman	2020	The British Accounting Review	239	10.1016/j.bar.2019.100880

Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

The results show that the most influential studies have primarily focused on corporate governance, environmental legitimacy, stakeholder pressure, climate governance, carbon risk, and sustainability reporting. These themes have become the

intellectual foundation of contemporary carbon disclosure research and continue to shape subsequent scholarly discussions.

The most cited article was "Board Gender Diversity and Corporate Response to Sustainability Initiatives: Evidence from the Carbon Disclosure Project" by Ben-Amar et al. (2017), published in the Journal of Business Ethics, with 950 citations. This study demonstrated that gender diversity on corporate boards positively influences firms' responses to sustainability initiatives and carbon disclosure practices. The findings highlighted the importance of board composition in improving environmental accountability and transparency. The article has become a foundational reference for studies examining the relationship between corporate governance mechanisms and environmental disclosure practices.

The second most cited publication was Li et al. (2018), entitled "Environmental Legitimacy, Green Innovation, and Corporate Carbon Disclosure: Evidence from CDP China 100," which received 704 citations. The study emphasized that environmental legitimacy and green innovation encourage firms to provide more comprehensive carbon disclosures. Similarly, Jung et al. (2018) ranked third with 613 citations through their article "Carbon Risk, Carbon Risk Awareness and the Cost of Debt Financing." Their findings revealed that carbon-related risks influence financing decisions and are associated with the cost of corporate debt.

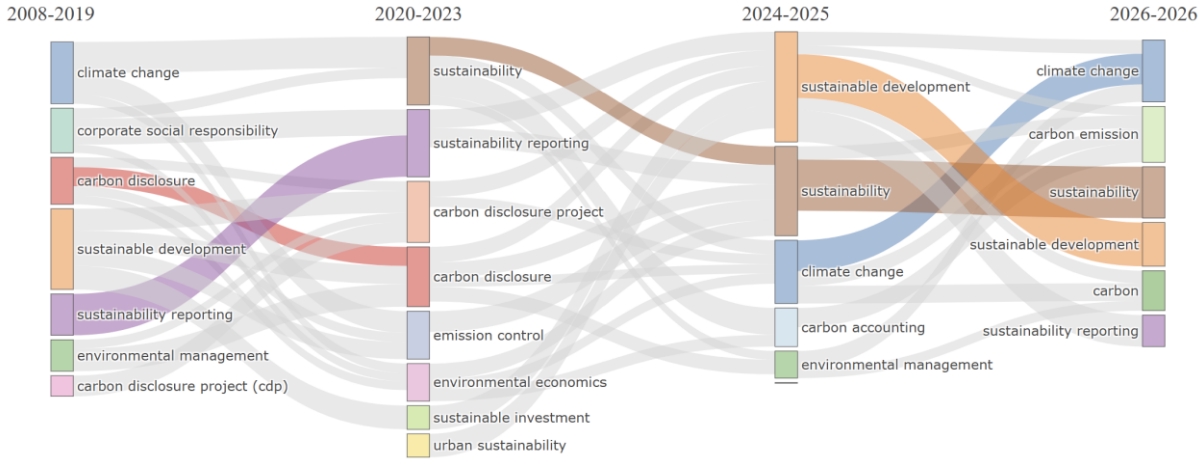


Figure 5. Thematic evolution.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

Several highly cited publications also explored the role of organizational characteristics and stakeholder influences in shaping disclosure practices. Lewis et al. (2014) found that chief executive officer (CEO) characteristics significantly influence environmental disclosure decisions, while Stanny and Ely (2008) highlighted the growing importance of climate change information in corporate environmental reporting. Furthermore, Liesen et al. (2015) demonstrated that stakeholder pressure plays a significant role in motivating companies to disclose greenhouse gas emissions information. These studies collectively support the arguments of stakeholder theory and legitimacy theory, suggesting that firms disclose environmental information to satisfy stakeholder expectations and maintain organizational legitimacy.

Overall, the ten most cited articles in this dataset collectively reflect the

multidisciplinary nature of carbon disclosure research, drawing on insights from corporate governance, environmental management, accounting, finance, and strategic management. The dominance of governance-related themes among the most cited articles is consistent with the observation of Velte et al. (2020) that board characteristics and governance mechanisms represent a central strand of the carbon disclosure literature. Furthermore, the continued influence of both early foundational studies, such as Stanny and Ely (2008), and more recent contributions, such as Bui et al. (2020), demonstrates the cumulative and evolving nature of knowledge development in this field (Bazhair et al., 2022).

Figure 5 shows the evolution of research themes in carbon disclosure and sustainability from 2008 to 2026. During 2008–2019, the literature focused on climate change, corporate social responsibility, carbon disclosure, and sustainable development. In 2020–2023, the discussion expanded to include sustainability, emission control, and environmental economics. During 2024–2025, themes such as sustainable development, sustainability, climate change, and carbon accounting became more prominent. Finally, in 2026, the dominant themes were climate change, carbon emission, sustainability, and sustainability reporting. These findings indicate that research has evolved from a primary focus on disclosure practices toward broader issues of sustainability, carbon management, and climate-related accountability.

3.3. Keywords Analysis and Future Directions

3.3.1 Keyword Co-occurrence Network

Figure 6 presents the visualization of the keyword co-occurrence network generated from the dataset of 282 publications on carbon disclosure and sustainability. Keyword co-occurrence analysis is a widely used bibliometric technique that maps the intellectual structure of a research field by identifying the frequency with which keywords appear together across publications, thereby revealing dominant research themes, thematic clusters, and conceptual linkages within the literature (Donthu et al., 2021). The network visualization in Figure 6 identified three distinct thematic clusters, each represented by a different color, which collectively reflect the multidisciplinary nature of carbon disclosure and sustainability research. The size of each node corresponds to the frequency of keyword occurrence, while the thickness of the connecting lines indicates the strength of co-occurrence relationships between keywords (Van Eck and Waltman, 2010).

The first cluster, represented in red, is the largest and most densely connected cluster in the network, centered on the keywords sustainability, climate change, carbon disclosure, and carbon emission. As presented in Table 7, climate change recorded the highest betweenness centrality of 111.60 within this cluster, followed closely by sustainability with a betweenness score of 108.46, indicating that these two keywords serve as the primary conceptual bridges connecting different research streams within the cluster. Carbon disclosure also demonstrated a substantial betweenness centrality of 64.49 and a PageRank score of 0.047, confirming its central role as the primary subject of inquiry within this thematic grouping.

In addition to these core keywords, the first cluster encompasses terms such as corporate governance, corporate social responsibility, environmental economics, stakeholder, carbon accounting, carbon performance, corporate strategy, emission control, and Indonesia. The co-occurrence of corporate governance and corporate social responsibility with carbon disclosure within the same cluster is consistent with the established body of literature demonstrating that governance mechanisms, including board

composition, audit committee quality, and ownership structure, are significant determinants of the quality and extent of corporate carbon disclosure (Bui et al., 2020; Hahn et al., 2015). The presence of stakeholder as a co-occurring keyword further reflects the influence of stakeholder theory in explaining why firms choose to disclose carbon-related information, as companies facing greater stakeholder pressure tend to produce more comprehensive environmental disclosures (Liesen et al., 2015). The appearance of Indonesia as a keyword within this cluster is particularly noteworthy, as it signals the growing scholarly interest in carbon disclosure practices in developing country contexts, suggesting an emerging research stream that examines how institutional environments, regulatory frameworks, and market conditions in emerging economies shape corporate carbon disclosure behavior (Bazhair et al., 2022).

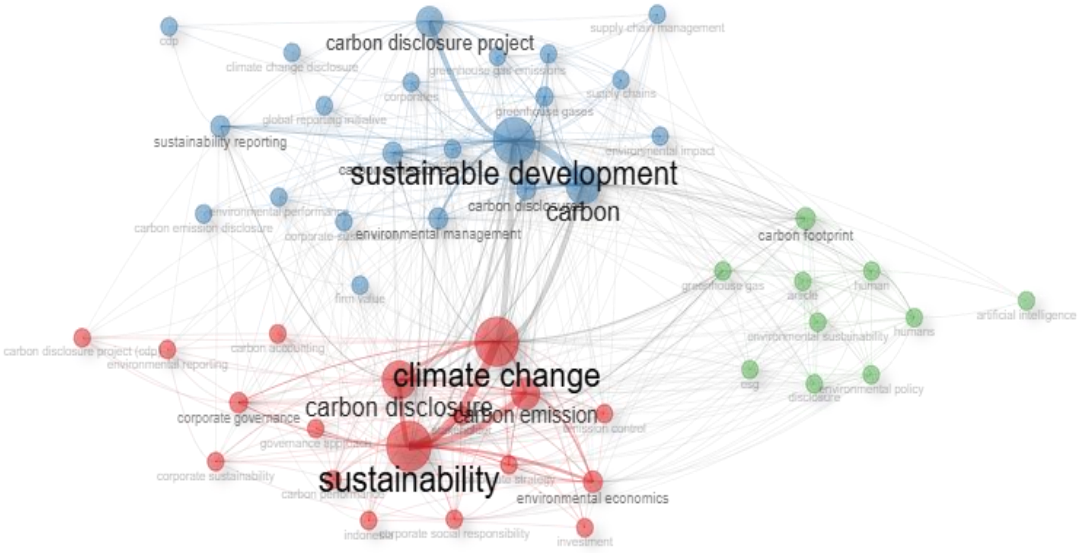


Figure 6. Visualization of co-occurrence network.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

The second cluster, represented in blue, is centered on the keywords sustainable development, carbon, and carbon disclosure project, with sustainable development recording the highest betweenness centrality in the entire network at 155.45 and a PageRank score of 0.069, making it the single most influential keyword across all three clusters. This finding underscores the centrality of sustainable development as the overarching conceptual framework within which carbon disclosure research is increasingly situated, reflecting the global emphasis on aligning corporate environmental practices with the United Nations Sustainable Development Goals (Ma et al., 2023). The keyword carbon also demonstrated a high betweenness centrality of 108.70 and a PageRank of 0.057, indicating its role as a key conceptual hub linking multiple research streams within this cluster.

Additional keywords in this cluster include sustainability reporting, carbon emissions, environmental management, carbon disclosures, greenhouse gases, environmental performance, greenhouse gas emissions, supply chain management, global reporting initiative, firm value, and climate change disclosure.

Table 7. Keyword selected for network parameters.

Node	Cluster	Betweenness	Closeness	PageRank
Sustainability	1	108.4646	0.017857	0.066361
Climate change	1	111.6043	0.018182	0.06504
Carbon disclosure	1	64.49409	0.016949	0.046997
Carbon emission	1	39.55813	0.016667	0.042432
Corporate governance	1	7.370264	0.013158	0.02092
Corporate social responsibility	1	3.185479	0.012987	0.017341
Environmental economics	1	7.222031	0.013514	0.025531
Corporate sustainability	1	0.911242	0.011765	0.010814
Stakeholder	1	3.926968	0.012987	0.019814
Carbon accounting	1	0.218563	0.011236	0.008409
Carbon performance	1	1.398464	0.012346	0.014258
Corporate strategy	1	3.522341	0.013158	0.019431
Emission control	1	0.853166	0.0125	0.014672
Carbon disclosure project (cdp)	1	0.142293	0.011236	0.007246
Indonesia	1	2.221615	0.011628	0.010103
Environmental reporting	1	0.381128	0.011111	0.007385
Governance approach	1	0.020964	0.010753	0.008789
Investment	1	0.142774	0.010989	0.008471
Sustainable development	2	155.4502	0.018868	0.068666
Carbon disclosure project	2	47.85821	0.015152	0.034603
Carbon	2	108.7032	0.017544	0.056509
Sustainability reporting	2	20.91998	0.013514	0.022137
Carbon emissions	2	13.48515	0.014286	0.026534
Environmental management	2	11.26732	0.013514	0.023204
Carbon disclosures	2	4.729782	0.013699	0.026748
Greenhouse gases	2	3.688736	0.012821	0.022211
Environmental performance	2	0.276278	0.011494	0.011357
Corporates	2	7.358707	0.012195	0.015573
Investments	2	1.19217	0.012658	0.016069
Environmental impact	2	0.993363	0.012346	0.013839
Greenhouse gas emissions	2	0.669491	0.012346	0.014497
Supply chain management	2	0.099687	0.011494	0.009783
Cdp	2	0.198906	0.009434	0.005153
Gas emissions	2	0.488152	0.012346	0.016246
Firm value	2	0.04	0.010204	0.004618
Global reporting initiative	2	0.181598	0.011111	0.008163
Supply chains	2	0.630669	0.0125	0.013272
Carbon emission disclosure	2	0.526504	0.010526	0.00656
Climate change disclosure	2	0.998593	0.010753	0.005801
Corporate-sustainability	2	0.942577	0.012195	0.01103
Carbon footprint	3	9.547014	0.014085	0.025933
Greenhouse gas	3	3.768729	0.013158	0.020026

Disclosure	3	0.819381	0.0125	0.013508
Environmental sustainability	3	1.029559	0.0125	0.014774
Human	3	4.676455	0.012821	0.020019
Article	3	0.794291	0.012195	0.015758
Environmental policy	3	0.703442	0.012195	0.013558
Humans	3	2.811786	0.012346	0.015198
Esg	3	0.511715	0.011905	0.009645
Artificial intelligence	3	0	0.010309	0.004993

Source: Data processed in Biblioshiny, 2026

The co-occurrence of sustainability reporting and global reporting initiative with carbon disclosure reflects the growing integration of carbon-related disclosures within broader sustainability reporting frameworks, consistent with the argument of Christensen et al. (2021) that sustainability reporting is evolving toward more standardized and integrated reporting practices. The presence of firm value as a co-occurring keyword in this cluster highlights the financial dimension of carbon disclosure research, with a growing number of studies examining whether carbon disclosure practices influence investor perceptions and corporate market valuation (Choi and Luo, 2021).

The third cluster, represented in green, is the smallest of the three clusters and is centered on keywords including carbon footprint, greenhouse gas, environmental sustainability, disclosure, environmental policy, ESG, human, and artificial intelligence. Among these, carbon footprint recorded the highest betweenness centrality of 9.55 and a PageRank score of 0.026, indicating its role as the primary conceptual anchor within this cluster. The co-occurrence of ESG with carbon disclosure and environmental policy reflects the increasing integration of environmental, social, and governance considerations into investment decision-making processes and corporate reporting practices, driven by the growing demand from institutional investors for comprehensive and comparable ESG information (IFRS Foundation, 2023).

The appearance of artificial intelligence as a keyword within this cluster, despite recording a betweenness centrality of zero and the lowest PageRank score of 0.005 in the network, is particularly significant as it signals the emergence of a nascent research stream exploring the application of artificial intelligence and machine learning technologies in the context of carbon disclosure, environmental monitoring, and sustainability reporting. Although this keyword currently occupies a peripheral position in the network, its presence suggests that the intersection of digital technologies and carbon disclosure is an emerging frontier that is likely to attract growing scholarly attention in future research (Bazhair et al., 2022).

Overall, the keyword co-occurrence analysis reveals that carbon disclosure and sustainability research is organized around three interconnected but distinct thematic orientations: governance and accountability mechanisms, sustainable development and reporting frameworks, and emerging environmental policy and technology applications. The high betweenness centrality scores of keywords such as sustainable development (155.45), climate change (111.60), carbon (108.70), and sustainability (108.46) confirm that these concepts serve as the primary intellectual bridges connecting different research communities within this field (Van Eck and Waltman, 2010). These findings are consistent with previous bibliometric studies on carbon disclosure that have identified governance, sustainability

reporting, and climate change as the dominant thematic pillars of the literature (Bazhair et al., 2022; Borghei, 2021).

The emergence of keywords such as artificial intelligence, ESG, and Indonesia within the network further suggests that future research in this field will increasingly explore the role of digital innovation, integrated reporting, and developing country perspectives in advancing carbon disclosure practices and sustainability objectives (Ma et al., 2023; Donthu et al., 2021).

3.3.2 Keyword Frequency and Research Themes

Figure 7 presents the word cloud of author keywords derived from the 282 publications in the dataset. The word cloud visualization provides an intuitive representation of keyword prominence, where the size of each term corresponds directly to its frequency of occurrence across the analyzed publications. The visual dominance of sustainability, carbon disclosure, climate change, sustainable development, and carbon disclosure project in the word cloud confirms that these concepts constitute the core intellectual pillars of the research field. The prominent positioning of carbon emission, corporate governance, corporate social responsibility, and sustainability reporting further reflects the interdisciplinary nature of carbon disclosure research, which spans environmental accounting, corporate governance, and strategic management perspectives.

The simultaneous prominence of both carbon disclosure and sustainable development in the word cloud is particularly noteworthy, as it reflects the growing recognition among scholars that corporate carbon disclosure practices are not merely compliance mechanisms but are increasingly viewed as strategic instruments for supporting the achievement of broader sustainability objectives, including the United Nations Sustainable Development Goals. The appearance of carbon footprint, greenhouse gases, carbon emissions, and environmental management as moderately prominent keywords further highlights the environmental science dimension of the literature, indicating that carbon disclosure research increasingly incorporates quantitative environmental metrics alongside qualitative governance and reporting considerations (Christensen et al., 2021).



Figure 7. Word Cloud of Author Keywords.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

Figure 8 presents the most relevant author keywords ranked by their frequency of occurrence across the dataset. The results confirm that sustainability is the most frequently occurring keyword, appearing in 79 documents, followed closely by climate change with 76 occurrences. Carbon disclosure ranked third with 62 occurrences, while sustainable development recorded 60 occurrences, positioning it as the fourth most prevalent keyword in the dataset. Carbon disclosure project appeared in 48 documents, carbon in 44, carbon emission in 36, sustainability reporting in 33, and both carbon emissions and corporate governance each recorded 25 occurrences, rounding out the top ten most relevant keywords.

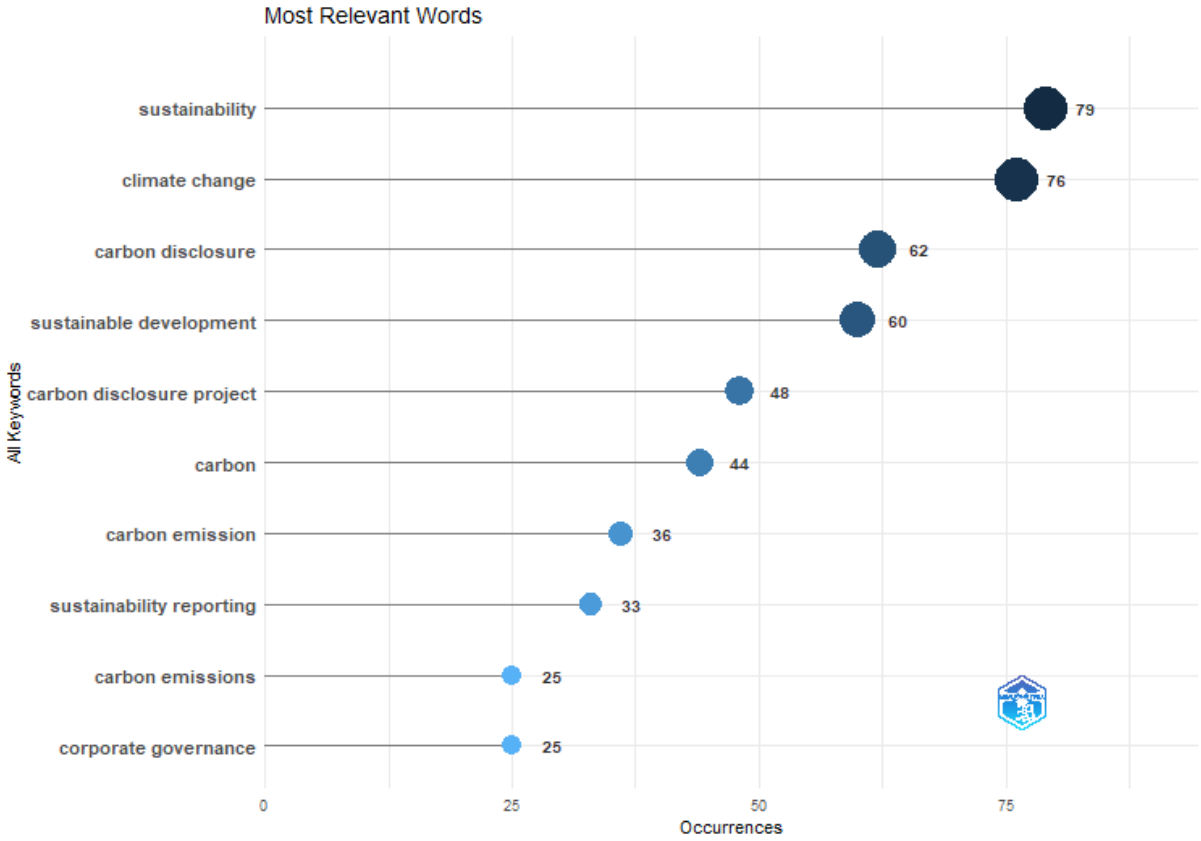


Figure 8. Most Relevant Words.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

The high co-occurrence frequency of sustainability and climate change alongside carbon disclosure confirms that the carbon disclosure literature has increasingly been framed within the broader context of climate change governance and sustainable development, consistent with the argument of Borghei (2021) that carbon disclosure has evolved into an essential component of corporate sustainability reporting. The prominence of carbon disclosure project as the fifth most frequent keyword reflects the central role of the CDP as a key data source and institutional framework in empirical carbon disclosure research, with numerous studies utilizing CDP survey responses to

examine the determinants and consequences of voluntary climate-related disclosures (Ben-Amar et al., 2017).

The frequency distribution of keywords in Figure 8 also reveals an important pattern regarding the evolution of research focus over time. The dominance of broad conceptual terms such as sustainability and climate change over more specific technical terms such as carbon emission and carbon accounting. This shift reflects the growing influence of international reporting standards and frameworks, including the TCFD recommendations and ISSB standards, which have encouraged researchers to examine carbon disclosure within an integrated sustainability reporting context rather than as an isolated environmental reporting practice (IFRS Foundation, 2023).

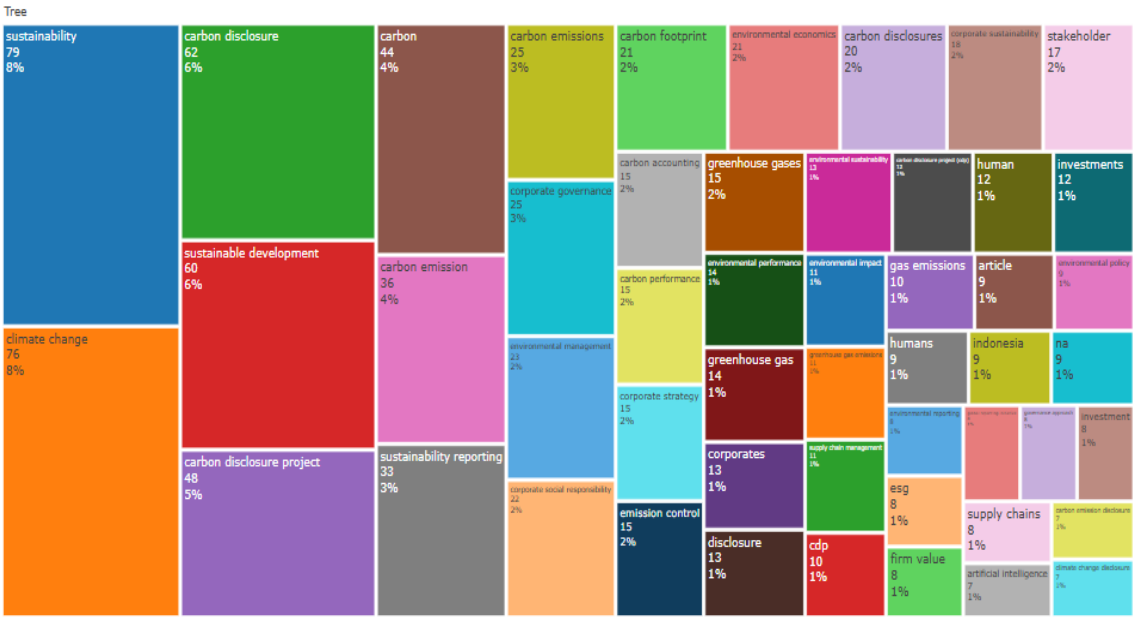


Figure 9. Treemap of Research Themes
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

Figure 9 presents the treemap visualization of research themes, where the size of each rectangle corresponds to the relative frequency of the associated keyword within the dataset. The treemap provides a hierarchical representation of thematic prominence, enabling a clear visual comparison of the relative importance of different research themes across the literature (Van Eck and Waltman, 2010). The results confirm the dominance of sustainability as the largest thematic block in the treemap, occupying the most prominent visual space, followed by climate change, carbon disclosure, carbon, and sustainable development as the next most prominent themes.

The treemap also reveals the presence of a diverse array of secondary and tertiary research themes that together reflect the multidisciplinary character of the carbon disclosure and sustainability literature. Themes such as carbon footprint, greenhouse gases, carbon emissions, sustainability reporting, environmental management, carbon disclosures, and greenhouse gas occupy moderately sized blocks, indicating their consistent but secondary role in the research landscape.

Taken together, the word cloud, keyword frequency chart, and treemap visualizations presented in Figures 7, 8, and 9 converge on a consistent finding. Carbon disclosure and sustainability research is dominated by a core set of themes centered on sustainability, climate change, carbon disclosure, sustainable development, and carbon emissions, while simultaneously accommodating a growing diversity of sub-themes that reflect the field's ongoing expansion into governance, financial implications, emerging technologies, and developing country contexts.

Future research should consider directing greater attention toward emerging themes such as ESG integration, artificial intelligence applications in sustainability reporting, and the role of carbon disclosure in specific developing country contexts, as these represent significant opportunities for advancing both theoretical and empirical contributions to the field (Ma et al., 2023; Velte et al., 2020).

3.3.2 Keyword Clustering Analysis

Figure 10 presents the keyword co-occurrence clusters, illustrating the conceptual structure of carbon disclosure and sustainability research based on the relationships among author keywords. The visualization identifies five major clusters, each representing a distinct research stream within the field. The red cluster is centered on sustainability, climate change, and carbon disclosure, indicating that these topics constitute the core focus of the literature and are strongly interconnected with issues such as carbon emissions, corporate governance, and corporate social responsibility. The blue cluster is dominated by sustainable development, carbon, and the Carbon Disclosure Project (CDP), reflecting extensive research on sustainability initiatives, carbon reporting frameworks, and greenhouse gas emissions. Meanwhile, the green cluster emphasizes environmental management, corporate sustainability reporting, and related environmental performance issues, whereas the purple cluster focuses on environmental sustainability and disclosure practices. A smaller orange cluster highlights emerging topics related to climate change mitigation, risk management, and commerce, suggesting the growing integration of environmental issues with corporate risk and business strategies.

Overall, the close connections among these clusters demonstrate that carbon disclosure research has evolved into an interdisciplinary field that integrates sustainability, climate change, environmental management, corporate governance, and reporting practices. The dense interconnections between clusters indicate that researchers increasingly examine carbon disclosure from multiple perspectives rather than as a standalone topic. This finding is consistent with previous bibliometric studies, which conclude that sustainability, climate change, and corporate disclosure have become the dominant themes shaping the development of environmental accounting and sustainability research (Donthu et al., 2021; Aria & Cuccurullo, 2017). Furthermore, the emergence of clusters related to climate change mitigation and environmental sustainability suggests promising directions for future studies, particularly those integrating ESG, artificial intelligence, carbon accounting, and corporate sustainability strategies in addressing global climate challenges.

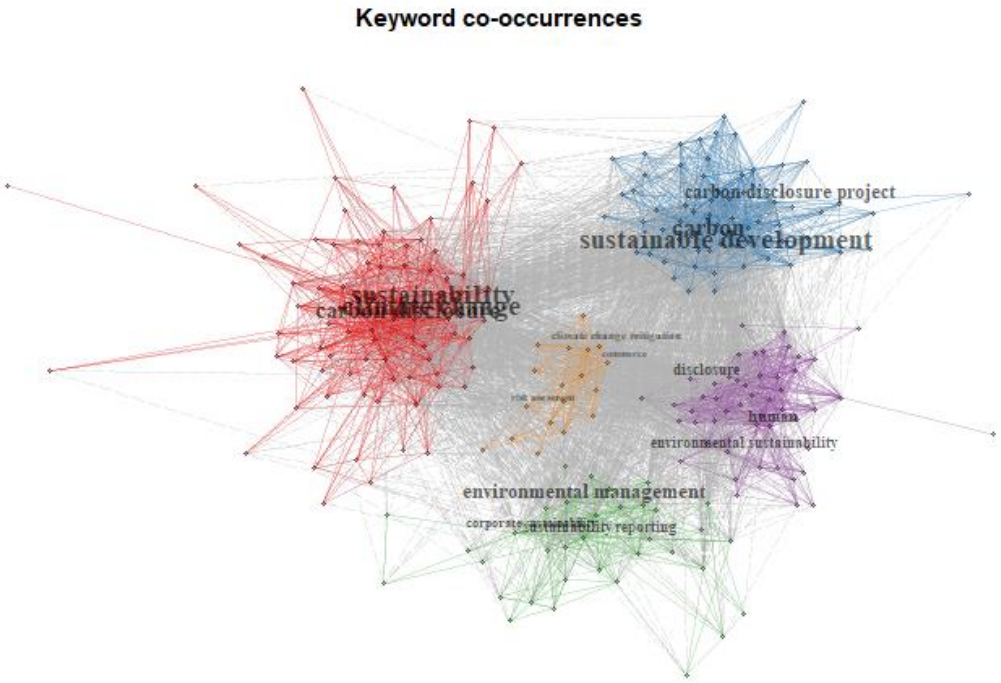


Figure 10. Keyword co-occurrence clusters.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026

3.4 Carbon Disclosure and Sustainability Research: Future Directions

3.4.1 Thematic Maps

Figure 11 presents the thematic map of carbon disclosure and sustainability research generated through strategic diagram analysis. The thematic map is a widely used bibliometric tool that positions research themes across two dimensions: the horizontal axis represents the relevance degree (centrality), which measures the extent to which a theme is connected to other themes in the field, while the vertical axis represents the development degree (density), which reflects the internal cohesion and maturity of a theme (Cobo et al., 2011). Based on the combination of these two dimensions, research themes are classified into four quadrants: motor themes (high centrality, high density), niche themes (low centrality, high density), emerging or declining themes (low centrality, low density), and basic themes (high centrality, low density) (Aria and Cuccurullo, 2017).

The basic themes quadrant contains sustainability, climate change, and carbon disclosure. Although these themes exhibit relatively lower density, they have high centrality, suggesting that they constitute the conceptual foundation of the field and are strongly connected with other research topics. In contrast, the niche themes quadrant includes environmental sustainability, disclosure, and human, indicating specialized topics with well-developed internal relationships but limited influence on the broader research landscape. Meanwhile, the emerging or declining themes quadrant consists of sustainability reporting,

environmental management, corporate sustainability, risk assessment, climate change mitigation, and financial markets. These themes may represent either newly emerging research opportunities or topics receiving declining scholarly attention. Considering the increasing global emphasis on ESG practices, mandatory sustainability reporting, and climate-related financial disclosure, these themes are more likely to represent promising directions for future research rather than declining areas (Donthu et al., 2021; Aria & Cuccurullo, 2017).

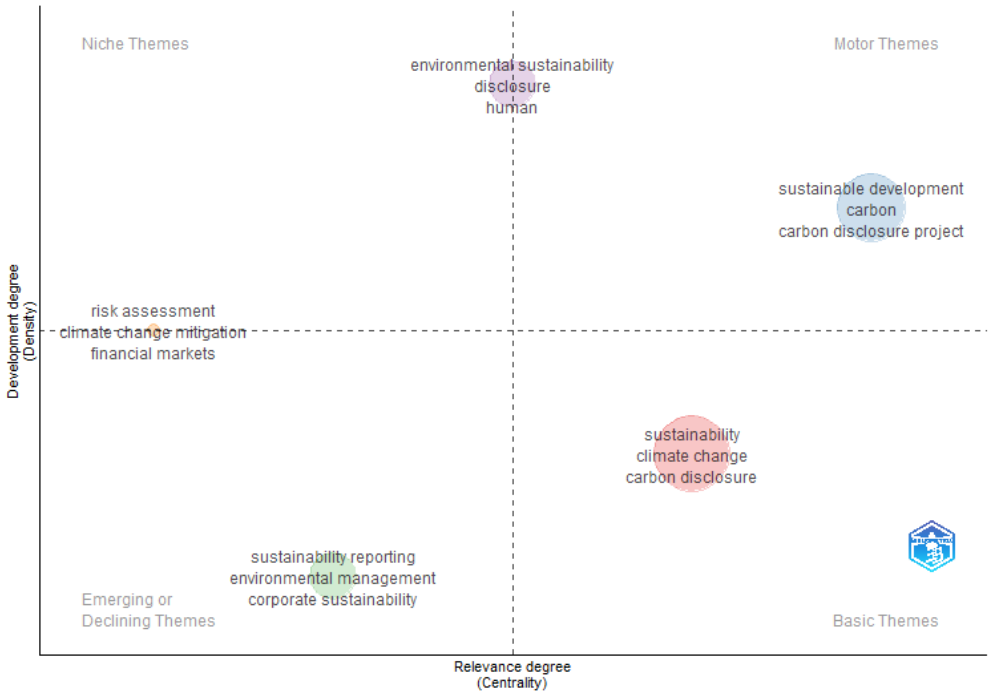


Figure 11. Thematic map by keywords.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

3.4.2 Topic Trends

Figure 12 presents the trend topic analysis of carbon disclosure and sustainability research over the period 2014 to 2026, illustrating the temporal evolution of research themes and identifying topics that have gained, maintained, or lost scholarly momentum over time. The size of each bubble corresponds to the frequency of the associated term within the dataset, while the horizontal positioning indicates the period during which each topic was most actively discussed (Donthu et al., 2021).

Several core topics, including sustainability, climate change, carbon disclosure, and sustainable development, demonstrate consistent and sustained scholarly activity throughout the entire observation period, confirming their enduring centrality as the foundational themes of the research field (Velte et al., 2020; Borghei, 2021). From 2020 onward, topics such as corporate governance, carbon economy, carbon performance, investments, and supply chain management show notably increasing activity, reflecting the growing scholarly attention to governance mechanisms, financial implications, and value chain dimensions of carbon disclosure following major regulatory developments including the TCFD recommendations and the establishment of the ISSB (Bui et al., 2020; IFRS Foundation, 2023). Most notably, scope 3 emissions emerges as the most rapidly

growing recent topic, appearing prominently in the 2024–2026 period in response to evolving mandatory reporting requirements (IFRS Foundation, 2023). Conversely, topics such as gas industry, financial markets, environmental reporting, and global reporting initiative show declining prominence, concentrated primarily in the 2014–2018 period, reflecting the gradual transition from GRI-based voluntary disclosures toward more standardized mandatory reporting frameworks (Christensen et al., 2021; TCFD, 2017).

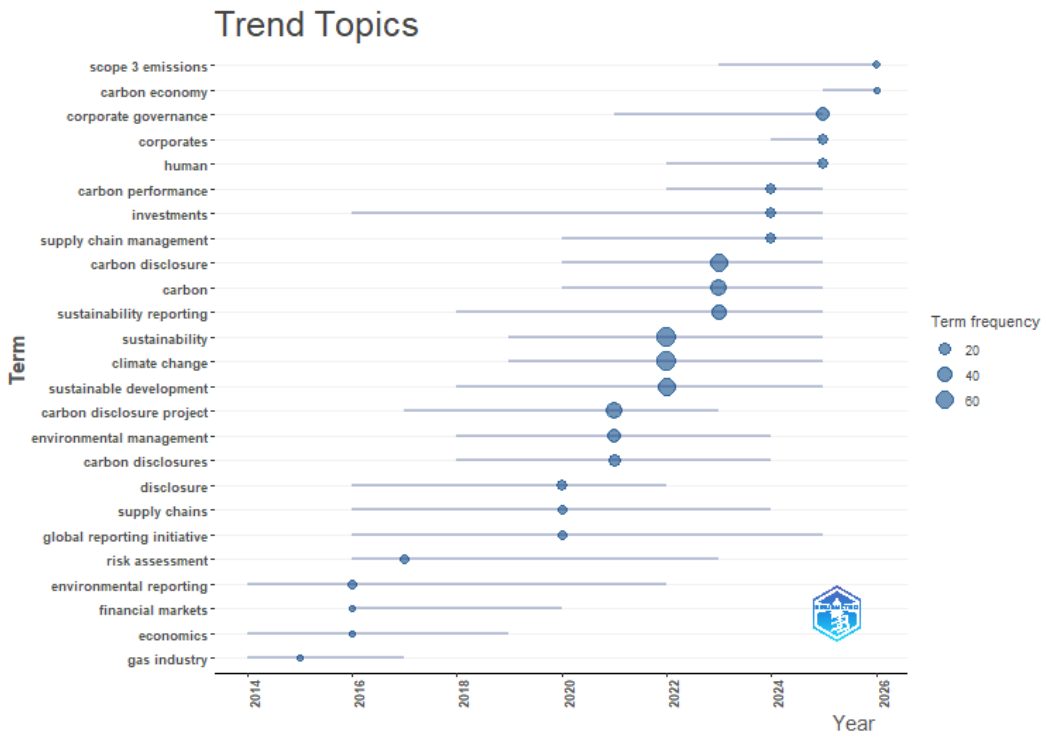


Figure 12. The topic trends.
Source: Processed using bibliometrix R-package (Biblioshiny), 2026.

The trend topic analysis reveals several important directions for future research in carbon disclosure and sustainability. The rapid emergence of scope 3 emissions as a prominent recent topic suggests that future studies should prioritize the determinants, quality, and consequences of value chain emission disclosures, particularly in the context of evolving mandatory reporting standards. The growing prominence of corporate governance and carbon performance in recent years highlights the continued importance of governance research, with future studies potentially examining how specific board characteristics and governance structures influence not only the quantity but also the accuracy and verifiability of carbon disclosures (Bui et al., 2020; Ben-Amar et al., 2017).

The sustained presence of sustainable development and carbon disclosure project as active topics throughout the observation period suggests that CDP-based research and SDG-oriented investigations will continue to represent productive avenues for future scholarship (Ma et al., 2023). Finally, the early-stage emergence of topics related to carbon economy and digital technologies, including artificial intelligence as identified in the co-occurrence network analysis, points to an exciting frontier of research exploring the intersection of technological innovation and

corporate carbon disclosure practices (Bazhair et al., 2022; Donthu et al., 2021).

CONCLUSION

This study provides a comprehensive bibliometric review of carbon disclosure and sustainability research by analyzing 282 publications indexed in the Scopus database between 2008 and 2026. The findings indicate that this research area has experienced substantial growth, particularly after 2020, reflecting increasing global attention to climate change, sustainability reporting, and corporate environmental accountability. The analysis identified the most influential journals, countries, universities, authors, and highly cited publications, while also revealing the intellectual structure and thematic development of the field through collaboration networks, keyword co-occurrence, thematic evolution, thematic maps, and topic trend analyses. Overall, the literature has evolved from general discussions of climate change and corporate social responsibility toward more specific themes, including carbon disclosure, sustainability reporting, carbon accounting, environmental management, ESG, and corporate governance.

The results demonstrate that Business Strategy and the Environment, Journal of Cleaner Production, and Journal of Business Ethics have made significant contributions to the development of this research field. The United States, Australia, and the United Kingdom emerged as the most productive countries, while Australian universities, particularly Western Sydney University and Macquarie University, played a prominent role in advancing scientific output. Keyword analysis further indicates that sustainability, climate change, carbon disclosure, and sustainable development remain the dominant research themes, whereas emerging topics such as environmental sustainability, carbon footprint, artificial intelligence, carbon performance, and supply chain management offer promising directions for future studies. These findings suggest that carbon disclosure research has become increasingly interdisciplinary and internationally collaborative, supporting the development of more transparent corporate sustainability practices.

Despite these contributions, this study has several limitations. First, the findings are based exclusively on publications indexed in the Scopus database, which may not fully represent the entire body of carbon disclosure and sustainability research. Second, the results are influenced by the search strategy and keyword selection used to retrieve the dataset, which may have excluded relevant studies employing different terminology. Finally, bibliometric analysis identifies publication patterns and intellectual structures but does not critically evaluate the theoretical arguments, research methods, or empirical findings of individual studies. Future research is therefore encouraged to combine bibliometric analysis with systematic literature reviews or meta-analyses and to incorporate multiple databases for broader coverage.

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