Carbon Disclosure in the Era of Climate Change: A Bibliometric Assessment of Global Research Trends

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Climate change has intensified the demand for greater corporate transparency and accountability, making carbon disclosure an increasingly important research area over the past two decades. As governments, investors, and other stakeholders place greater emphasis on climate-related information, research on carbon disclosure has expanded substantially across various disciplines. Despite this rapid growth, a comprehensive understanding of the intellectual structure, thematic evolution, and emerging research directions of the field remains limited. This study aims to systematically map the global development of carbon disclosure research in the context of climate change through a bibliometric analysis. A total of 290 Scopus-indexed articles published between 2008 and 2026 were analyzed using Bibliometrix (R package) and VOSviewer. The analysis encompasses publication performance, collaboration networks, citation structures, co-citation relationships, keyword co-occurrence, thematic evolution, thematic mapping, and topic trends. The findings reveal a well-established and rapidly evolving research field characterized by expanding international collaboration and increasingly diverse research themes. While climate change remains the dominant theme throughout the study period, the literature has evolved from an initial emphasis on voluntary carbon disclosure toward more specialized topics, including corporate governance, carbon accounting, carbon performance, disclosure quality, and climate-related reporting. Furthermore, emerging themes such as carbon information disclosure, carbon intensity, and developing-country contexts indicate promising opportunities for future research. By providing a comprehensive overview of the intellectual, conceptual, and thematic development of carbon disclosure research, this study enriches the existing literature and offers valuable insights for researchers, policymakers, and practitioners in advancing corporate climate transparency, environmental accountability, and sustainability reporting.

Keywords: carbon disclosure; climate change; bibliometric analysis; scopus

INTRODUCTION

Climate change has become one of the most pressing global challenges, driven primarily by global warming caused by the increasing concentration of greenhouse gases in the atmosphere. Its impacts, including rising temperatures, extreme weather events, sea-level rise, and ecosystem disruption, pose significant threats to environmental sustainability and human well-being. Climate change has led to more frequent and intense extreme weather events, posing significant environmental, economic, and social challenges worldwide (IPCC, 2023).

Global energy-related CO_2 emissions continued to rise, reaching a record 36.8 billion tonnes in 2022, an increase of 0.9% over the previous year (Agency, 2023). This trend reinforces the urgent need to strengthen climate change mitigation efforts through more effective carbon emission reduction strategies.

According to the Global Climate Report by the National Oceanic and Atmospheric Administration (NOAA, 2023)., it is stated that throughout 2023, each month saw global temperatures reach their highest levels, ranging from 1.18°C to 1.48°C above the pre-industrial average over the past decade. Since the start of the industrial era, concentrations of greenhouse gases, including carbon dioxide, in the atmosphere have risen significantly, with carbon dioxide levels increasing by more than 30% (Khatib et al., 2023). At present, carbon dioxide levels in the atmosphere are 50% higher than they were before the Industrial Revolution.

Growing concerns over climate change have intensified demands from governments, investors, regulators, and other stakeholders for greater transparency regarding corporate environmental performance (Kolk et al., 2008). Carbon disclosure has emerged as a key mechanism for addressing these demands by providing information on greenhouse gas emissions, carbon management practices, climate-related risks, and corporate mitigation initiatives (Luo & Tang, 2014). This form of disclosure is widely recognized as an important instrument for enhancing corporate accountability and enabling stakeholders to evaluate a company's commitment to environmental sustainability (Setiawan et al., 2025).

Corporate carbon emissions reporting represents a fundamental component of climate accountability and plays a crucial role in supporting informed decision-making and sustainable business practices. Significant challenges nevertheless persist, particularly with respect to the transparency, completeness, and methodological rigor of current carbon reporting practices (Traub et al., 2025).

The growing importance of carbon disclosure has attracted considerable scholarly attention over the past two decades. Previous studies have examined various dimensions of carbon disclosure, including its determinants, corporate implications, carbon performance, environmental performance, financial performance, corporate governance, stakeholder pressure, and greenwashing practice (Bae Choi et al., 2013;Luo et al., 2012;Qian & Schaltegger, 2017).

Recent research has further highlighted the increasingly close relationship between carbon disclosure and climate change issues, reflecting the broader integration of sustainability considerations into corporate reporting and decision-making processes. Empirical evidence has also explored the relationship between financial performance and carbon disclosure; however, the findings remain inconclusive and often contradictory across different contexts and samples (Nilasakti et al., 2024; Al-Mari & Mardini, 2024; Wardhani et al., 2026)

Despite the growing number of publications on carbon disclosure and climate change, a comprehensive understanding of the field's intellectual structure, thematic development, research trends, and collaboration patterns remains limited. Existing studies have primarily focused on examining the determinants of carbon disclosure, its organizational implications, and its relationship with various corporate outcomes. As a result, the broader knowledge structure underpinning this research domain, including the interactions among influential contributors, collaborative networks, and evolving research themes, has received relatively limited attention. The rapid expansion of the literature has also increased the risk of knowledge fragmentation, making it challenging for researchers to obtain a holistic view of the field's development.

These limitations highlight the need for a bibliometric analysis capable of systematically identifying key contributors, influential publication sources, collaboration networks, and dominant as well as emerging research themes. Such an approach can provide a deeper understanding of the evolution of carbon disclosure and climate change research while revealing areas that warrant further scholarly investigation. Unlike previous studies that have largely concentrated on the substantive aspects of carbon disclosure, this study offers a comprehensive bibliometric assessment of carbon disclosure and climate change literature indexed in Scopus between 2008 and 2026. Using bibliometric techniques, which provide a systematic and objective approach for mapping and evaluating scientific literature through bibliographic data analysis (Zupic & Čater, 2015; Ellegaard & Wallin, 2015), this study examines publication productivity, influential contributors, intellectual structures, collaboration patterns, thematic evolution,

and emerging research trends. The findings are expected to enrich the existing literature by providing a comprehensive overview of the field and offering valuable insights into future research directions. Building upon the need for a comprehensive bibliometric assessment of carbon disclosure and climate change research, this study aims to answer the following research questions:

RQ1: How has carbon disclosure and climate change research developed between 2008 and 2026 in terms of publication performance and scholarly contributions?

RQ2: What collaboration networks have emerged among authors, institutions, and countries in carbon disclosure and climate change research?

RQ3: What intellectual structures, research themes, and emerging trends define the evolution of carbon disclosure and climate change research?

This study aims to provide a comprehensive bibliometric assessment of the carbon disclosure and climate change literature indexed in the Scopus database between 2008 and 2026. Specifically, the study examines the evolution of scientific publications and identifies the most influential authors, journals, institutions, countries, and publications contributing to the field. The study also investigates collaboration networks among authors, institutions, and countries, while mapping the intellectual structure, major research themes, thematic evolution, and emerging trends within the literature. By offering a systematic overview of the field, this study contributes to a deeper understanding of the development of carbon disclosure and climate change research and provides insights into potential avenues for future investigation.

RESEARCH METHODOLOGY

This study applied bibliometric analysis to systematically explore the existing literature on the topic. Bibliometric analysis is a quantitative approach employed to evaluate, monitor, and examine scholarly publications. Initially introduced by Pritchard (1969), this method has become widely adopted for investigating the evolution of research domains (Keathley-Herring et al., 2016; Lawani, 1981). The analysis was based on publications indexed in the Scopus database, which serves as a comprehensive source of bibliographic data for scientific research (Donthu et al., 2021). Scopus was selected because it provides extensive coverage of peer-reviewed journals, conference proceedings, and scholarly books across diverse disciplines, making it a reliable source for bibliometric studies (Donthu et al., 2021; Zupic & Čater, 2015).

The bibliometric analysis was conducted using Biblioshiny, a web-based interface of the Bibliometrix package in R, which facilitates comprehensive bibliometric and science mapping analyses through an interactive environment (Donthu et al., 2021). The analysis examined publication trends, citation structures, collaboration networks, and keyword co-occurrence patterns to identify the intellectual structure and emerging themes within the research field. By focusing exclusively on Scopus-indexed publications, this study ensured a comprehensive, consistent, and internationally recognized dataset for conducting a rigorous bibliometric review. To collect data, we focused on the keyword “carbon disclosure” and “climate change” within article titles, limiting our search to journal articles published between 2008 and 2026.

The data collection process is illustrated in Figure 1. An initial search in the Scopus database using the keywords “carbon disclosure” and “climate change” identified 364 documents. During the screening stage, 64 non-article documents were excluded, resulting in 300 journal articles. Subsequently, the eligibility assessment removed eight trade journal publications and two book series documents. After applying the inclusion criteria, a final sample of 290 journal articles published between 2008 and

2026 was retained for bibliometric analysis. This selection process was conducted to ensure the consistency, relevance, and quality of the dataset, thereby providing a reliable foundation for subsequent bibliometric and science mapping analyses.

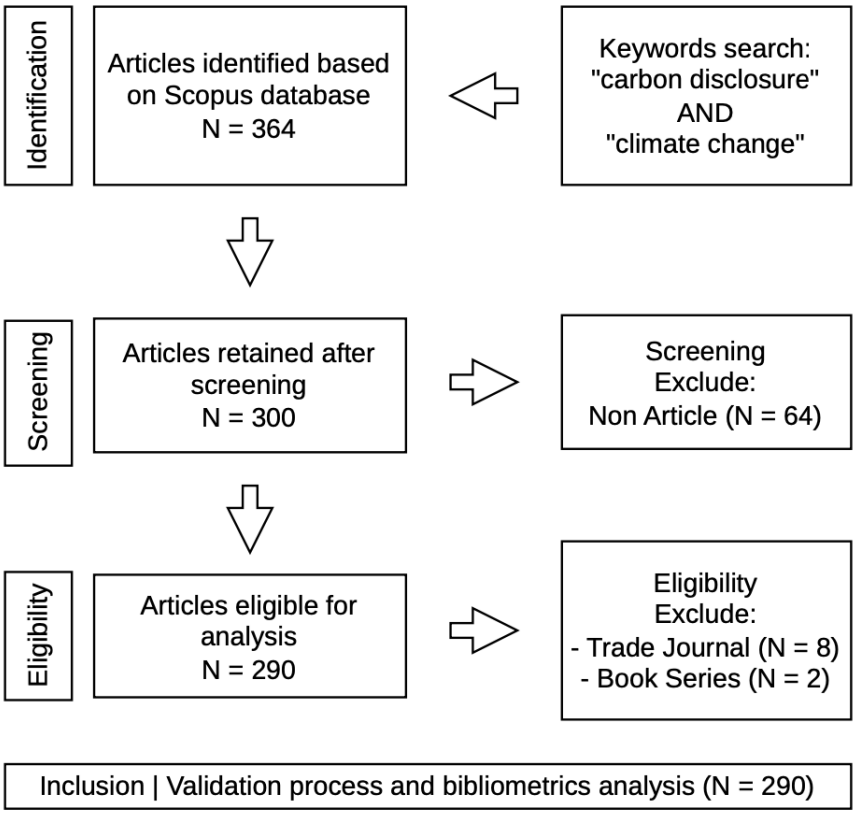


Figure 1. Articles inclusion/exclusion flowchart
Source: Authors compilation, 2026

RESULT AND DISCUSSIONS

1. General characteristics of literature

Table 1 presents the general characteristics of the literature included in the analysis. A total of 290 documents published across 169 academic journals were examined. These publications span the period from 2008 to 2026 and exhibit an average annual growth rate of 10.12%, indicating a sustained increase in scholarly interest in carbon disclosure and climate change research. The dataset contains 688 Keywords Plus and 778 author keywords, reflecting the diversity of topics explored within the field. The 290 articles were authored by 666 researchers, with 29 publications produced by single authors. The rate of international collaboration reached 25.17%, suggesting a relatively high level of cross-country research cooperation. In addition, the average number of authors per document was 2.87, indicating that most studies were conducted collaboratively by multiple researchers.

Figure 2 illustrates the annual publication trends in carbon disclosure and climate change research. The results indicate that 2008 marked the beginning of scholarly publications on this topic within the dataset. Since then, research activity has been sustained, with at least one publication appearing each year throughout the 2008-2026 period. A notable increase in publication output emerged after 2011, signaling growing academic interest in the field. This trend coincides with developments reported by the Carbon Disclosure Project (CDP), which

revealed that, for the first time, a majority of companies included in the S&P 500 Index had integrated climate change considerations into their business strategies.

Table 1. Summary of the key characteristic of the 290 articles analyzed

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2008:2026
Sources (Journals, Books, etc)	169
Documents	290
Annual Growth Rate %	10.12
Document Average Age	5.43
Average citations per doc	61.54
References	0
DOCUMENT CONTENTS	
Keywords Plus (ID)	688
Author's Keywords (DE)	778
AUTHORS	
Authors	666
Authors of single-authored docs	29
AUTHORS COLLABORATION	
Single-authored docs	33
Co-Authors per Doc	2.87
International co-authorships %	25.17
DOCUMENT TYPES	
article	290

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

In the same year, CDP represented 551 institutional investors managing approximately USD 71 trillion in assets, while board-level or senior management oversight of climate change programs increased from 68% to 87%. These developments highlight the growing importance of climate-related transparency and may have contributed to the increasing volume of research on carbon disclosure and climate change.

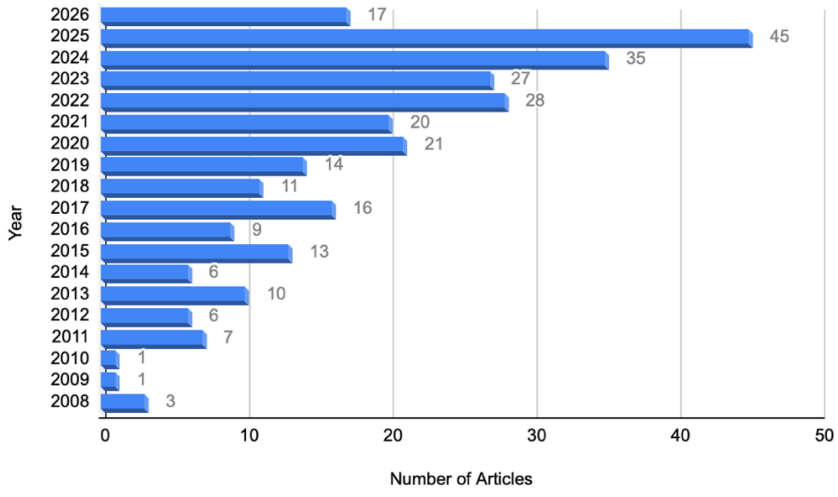


Figure 2. Document by year of publication
Source: Authors compilation, 2026

The growth of research on carbon disclosure and climate change has also been influenced by the continuous development of global sustainability reporting standards and frameworks, particularly those introduced by the Global Reporting Initiative (GRI). These

reporting guidelines have encouraged organizations to enhance transparency regarding their environmental impacts and carbon emissions, thereby increasing the relevance of sustainability reporting within both academic and professional communities. Consequently, carbon disclosure has become an increasingly important area of inquiry, attracting growing attention from researchers seeking to understand its determinants, implications, and role in addressing climate-related challenges.

1.1 General characteristic of sources

Table 2 presents the most productive journals publishing research on carbon disclosure and climate change indexed in the Scopus database. The results indicate that Business Strategy and the Environment is the leading publication outlet, contributing 19 articles, followed by Journal of Cleaner Production with 14 articles and Sustainability with 10 articles. The prominence of these journals suggests that carbon disclosure and climate change research has primarily evolved within the domains of sustainability, environmental management, and business strategy.

Corporate Social Responsibility and Environmental Management contributed 9 articles, while Journal of Business Ethics and Social Responsibility Journal each published 5 articles. These findings indicate that carbon disclosure is not solely examined from an environmental perspective but is also increasingly associated with corporate social responsibility and business ethics. This reflects the growing recognition of carbon disclosure as an integral component of sustainable corporate governance and organizational accountability.

Table 2. Most relevant journals

Journals	Articles	TC
Business Strategy and the Environment	19	1860
Journal Of Cleaner Production	14	1048
Sustainability (Switzerland)	10	246
Corporate Social Responsibility and Environmental Management	9	818
Journal Of Business Ethics	5	2043
Social Responsibility Journal	5	214
Meditari Accountancy Research	4	40
Sustainability Accounting, Management and Policy Journal	4	233
Accounting And Finance	3	424
Accounting Research Journal	3	377
Accounting, Auditing and Accountability Journal	3	727
British Accounting Review	3	1737
Business And Society	3	355
Climate Policy	3	27
Energy Policy	3	172
Journal Of Applied Accounting Research	3	74
Journal Of Business Research	3	287
Journal Of Environmental Management	3	318
Journal Of Industrial Ecology	3	25
Journal Of International Accounting Research	3	243

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

The results further reveal the contribution of several accounting-oriented journals, including Meditari Accountancy Research, Sustainability Accounting, Management and Policy Journal, Accounting and Finance, Accounting Research Journal, Accounting, Auditing and Accountability Journal, The British Accounting Review, and Journal of International Accounting Research. The presence of these journals highlights the increasing importance of carbon disclosure within the accounting discipline, particularly in relation to sustainability

reporting, information transparency, corporate accountability, and climate-related reporting practices.

Overall, the findings demonstrate the multidisciplinary nature of carbon disclosure and climate change research, with substantial contributions from the fields of sustainability, environmental management, corporate social responsibility, and accounting. The dominance of sustainability-focused journals suggests that carbon disclosure has become an important mechanism for supporting climate change mitigation efforts and promoting more sustainable business practices. Furthermore, these results confirm that carbon disclosure and climate change research has expanded beyond the boundaries of environmental studies and evolved into a cross-disciplinary research area encompassing management, accounting, finance, and corporate governance.

Table 3. Most productive countries.

Country	Publlications	TC
Australia	86	4252
Canada	24	1663
United Kingdom	63	1550
China	66	1376
USA	42	1250
Germany	30	869
France	19	738
Italy	21	495
Sweden	2	406
Kuwait	3	354

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

1.2 General characteristics of authors - most active countries

Table 3 presents the most productive countries in carbon disclosure research. Australia ranks first in terms of publication output, contributing 86 articles and accumulating 4,252 citations. China follows with 66 publications, while the United Kingdom ranks third with 63 publications. Although China has produced a substantial number of publications, Australia demonstrates a stronger scholarly influence, as reflected by its considerably higher citation count. Canada and the United States also emerge as important contributors to the development of the carbon disclosure literature, exhibiting both high research productivity and significant academic impact.

Australia's leading position may be attributed to its early adoption of climate-related regulatory frameworks, particularly the National Greenhouse and Energy Reporting (NGER) Act 2007 and the Clean Energy Act 2011. These regulations require companies to measure, report, and disclose greenhouse gas emissions, thereby increasing the demand for research on carbon disclosure practices and climate-related accountability. The implementation of such regulatory initiatives has likely stimulated scholarly interest by providing a rich institutional context for examining corporate environmental transparency, disclosure quality, and stakeholder responses to climate-related reporting. Consequently, Australia has established itself as one of the most influential contributors to the advancement of carbon disclosure research.

Figure 3 illustrates the international collaboration network in carbon disclosure research. The results indicate that Australia, China, the United Kingdom, and the United States serve as the principal actors within the global research network. Australia

occupies the most central position, exhibiting extensive collaborative links with numerous countries, while China also demonstrates a strong international collaboration network. These findings suggest that a country's research productivity is influenced not only by its academic capacity but also by the extent of its international collaborations. Such collaborative relationships facilitate the exchange of knowledge, expertise, data, and research resources, thereby enhancing research quality and accelerating the development of the carbon disclosure literature. The prominence of these countries within the collaboration network further highlights the importance of cross-border partnerships in advancing scholarly understanding of carbon disclosure and climate-related issues on a global scale.

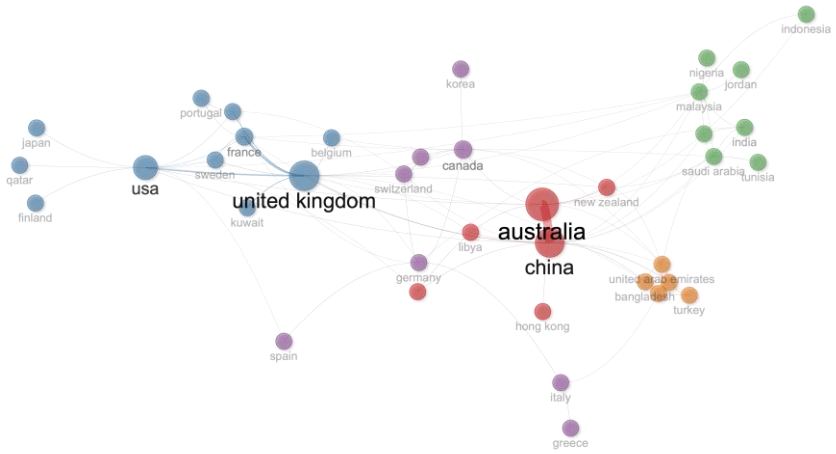


Figure 3. Country collaboration networks.
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

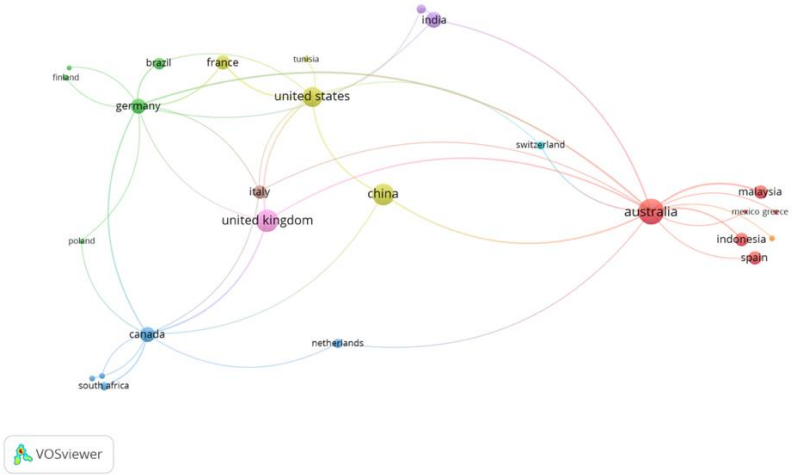


Figure 4. Citation network by country.
Source: Processed using VOSviewer, 2026

Figure 4 presents the country citation network in carbon disclosure research. The visualization reveals that Australia exerts the strongest scholarly influence within the field, as indicated by the largest node size and its extensive

citation connections with other countries. In addition to Australia, the United States, China, the United Kingdom, and Germany also demonstrate substantial citation impacts, suggesting that publications originating from these countries are frequently referenced in subsequent studies. Strong citation linkages between Australia and countries such as China, the United States, the United Kingdom, Malaysia, and Indonesia further reflect the broad dissemination and influence of Australian research within the global academic community. These findings indicate that scholarly influence is determined not only by publication productivity but also by the quality, visibility, and impact of research outputs. Consequently, highly cited countries play a crucial role in shaping the intellectual development and future direction of carbon disclosure research worldwide.

Table 4. Top productive universities

University	Articles
Western Sydney University	17
Macquarie University	13
University Of Newcastle	8
Universidad De Sevilla	6
University Of Western Sydney	6
Universität Hamburg	6
Federal University of Bahia (UFBA)	5
Swinburne University of Technology	5
University Of Ottawa	5
Yildiz Technical University	5

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

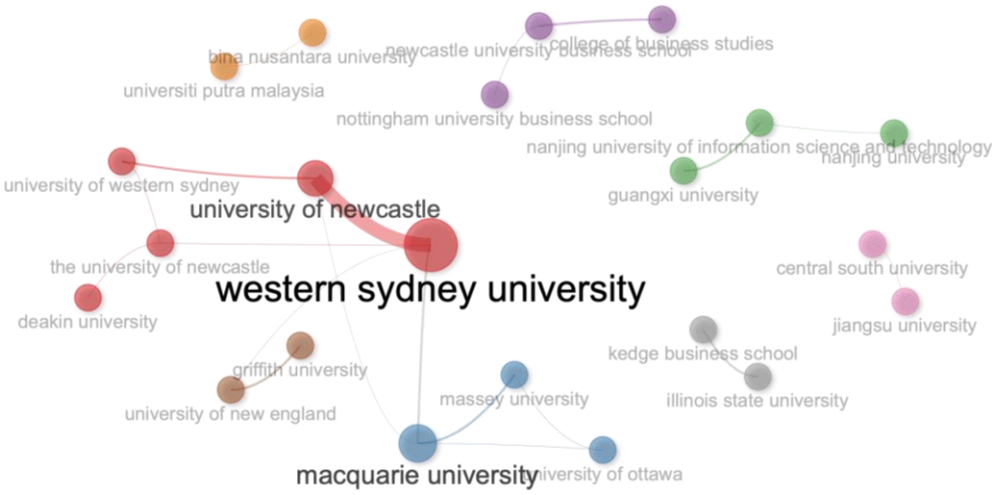


Figure 5. Universities collaboration networks
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

1.3 General characteristics of authors – most active univeristies

Table 4 presents the most productive universities in carbon disclosure and climate change research. Western Sydney University (Australia) ranks first with 17 publications, followed by Macquarie University (Australia) with 13 publications and the University of Newcastle (Australia) with 8 publications. These findings further reinforce Australia's prominent position as a leading contributor to the carbon disclosure and climate change literature. The results also reveal that ten universities

have published at least five articles in this field, while more than 400 other institutions have contributed at least one publication, indicating broad academic engagement with the topic across the global research community.

Figure 5 illustrates the collaboration network among universities. The visualization demonstrates that numerous institutions have established collaborative relationships to enhance research quality and advance knowledge related to carbon disclosure and climate change. Such collaborations facilitate the exchange of expertise, resources, and research perspectives, thereby strengthening the overall development of the field. The widespread participation of universities further reflects the growing recognition of carbon disclosure as an important research area in addressing climate change challenges and supporting global sustainability efforts. The dominance of Western Sydney University and Macquarie University highlights the strong commitment of Australian higher education institutions to sustainability and climate change mitigation.

Western Sydney University joined the United Nations Race to Zero for Universities and Colleges initiative in 2021 and established ambitious targets, including achieving carbon neutrality and becoming a climate-positive institution. These commitments are reflected in its extensive research activities and sustainability initiatives related to carbon emissions reduction. Similarly, Macquarie University has demonstrated a strong commitment to environmental sustainability through its Campus Masterplan, implemented since 2014, which includes targets for reducing energy consumption, carbon emissions, water usage, and waste generation. The active involvement of these institutions in sustainability initiatives may help explain their significant contributions to the advancement of carbon disclosure and climate change research.

1.4 General characteristics of authors – most active authors

Table 5 presents the most productive authors in carbon disclosure and climate change research. Tang Q ranks first with the highest number of publications (18 articles) and the greatest citation impact (3.374 citations). Luo L follows in second place with 12 publications and 2.680 citations. Together, Tang Q and Luo L account for 71.82% of the total citations received by the authors listed in Table 5, highlighting their dominant influence on the development of the carbon disclosure literature.

Table 5. Most relevant authors

Authors	Articles	TC	H-index
Tang Q	18	3374	17
Luo L	12	2680	11
González-González Jm	6	225	5
Zamora-Ramírez C	6	225	5
Mateo-Márquez Aj	5	218	4
Ziane Y	5	291	5
Bui B	4	387	4
Caby J	4	255	4
Datt R	4	283	3
Houqe Mn	4	349	4
Hsueh L	4	142	4

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

Figure 6 illustrates the author citation network, which exhibits a relatively centralized structure with limited connectivity. Tang Q occupies the most prominent and central position, indicating the strongest citation influence within the

network. In bibliometric networks, larger nodes represent authors with greater citation impact, while links between nodes indicate citation relationships among authors(van Eck & Waltman, 2014). Tang Q is directly connected to several influential authors, including Alsaifi K, Zamora-Ramírez C, Ziane Y, and Caby J, suggesting that these authors constitute the core intellectual foundation of carbon disclosure research. By contrast, authors such as Bimha A and Rohani A are located at the periphery of the network, reflecting relatively weaker citation connections within the field. Overall, the network suggests that the intellectual structure of carbon disclosure research remains concentrated around a limited number of highly influential scholars, a pattern commonly observed in research fields that are still consolidating their knowledge base (Donthu et al., 2021).

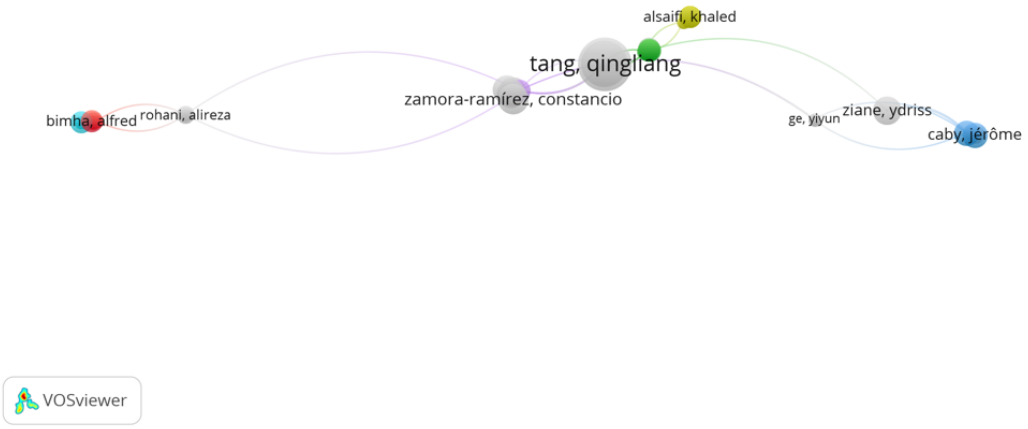


Figure 6. Citation network by authors
Source: Processed using VOSviewer, 2026

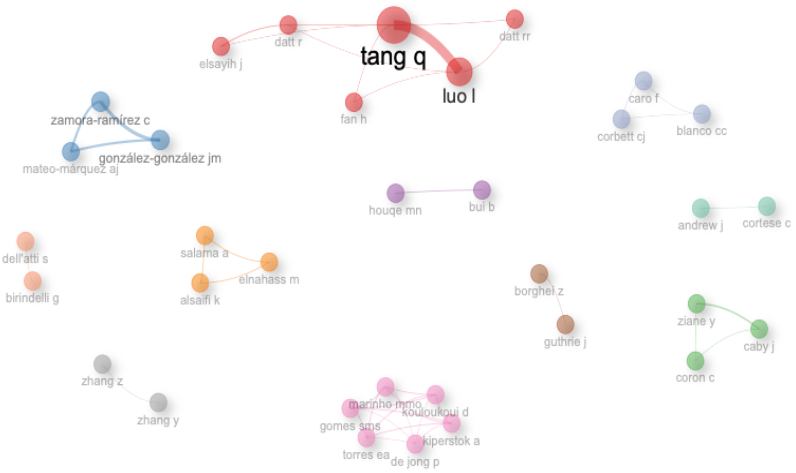


Figure 7. Authors collaboration networks.
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

The collaboration pattern observed in this study underscores the central role of Tang Q and Luo L in the development of carbon disclosure research. Despite the strong contribution of Australian scholars, the network remains concentrated among a

limited number of established research groups, indicating considerable scope for broader international collaboration. Expanding participation from Southeast Asia, including Indonesia, could enrich the literature by providing evidence from diverse institutional, regulatory, and socioeconomic contexts.

Table 6. Overview of top-cited articles by citations per year

No	Author	Title	Year	Citation	Source
1	Liao L., Luo L., Tang Q.	Gender diversity, board independence, environmental committee and greenhouse gas disclosure	2015	1,406	British Accounting Review, 47(4)
2	Ben-Amar W., Chang M., McIlkenny P.	Board Gender Diversity and Corporate Response to Sustainability Initiatives: Evidence from the Carbon Disclosure Project	2017	941	Journal of Business Ethics, 142(2)
3	Li D., Huang M., Ren S., Chen X., Ning L.	Environmental Legitimacy, Green Innovation, and Corporate Carbon Disclosure: Evidence from CDP China 100	2018	694	Journal of Business Ethics, 150(4)
4	Kolk A., Levy D., Pinkse J.	Corporate responses in an emerging climate regime: The institutionalization and commensuration of carbon disclosure	2008	616	European Accounting Review , 17(4)
5	Luo L., Lan Y.-C., Tang Q.	Corporate Incentives to Disclose Carbon Information: Evidence from the CDP Global 500 Report	2012	411	Journal of International Financial Management and Accounting , 23(2)
6	Stanny E., Ely K.	Corporate environmental disclosures about the effects of climate change	2008	406	Corporate Social Responsibility and Environmental Management, 15(6)
7	Hahn R., Reimsbach D., Schiemann F.	Organizations, Climate Change, and Transparency: Reviewing the Literature on Carbon Disclosure	2015	320	Organization and Environment , 28(1)
8	Ben-Amar W., McIlkenny P.	Board Effectiveness and the Voluntary Disclosure of Climate Change Information	2015	288	Business Strategy and the Environment , 24(8)
9	Rankin M., Windsor C., Wahyuni D.	An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system: Australian evidence	2011	281	Accounting Auditing and Accountability Journal , 24(8)
10	Weinhofer G., Hoffmann V.H.	Mitigating climate change - How do corporate strategies differ?	2010	281	Business Strategy and the Environment , 19(2)

Source: Authors compilation, 2026

2. The influential studies and themes of research

Figure 7 illustrates the author collaboration network in carbon disclosure research. The visualization reveals 11 clusters, each representing a research community formed through collaborative publication activities. In this network, node size reflects an author's publication productivity or frequency of occurrence, whereas the edges indicate collaborative relationships between authors (Donthu et al., 2021). Larger nodes and thicker edges

represent stronger collaboration intensity and greater research productivity.

The cluster centered on Tang Q, which also includes Luo L, is the most prominent, as indicated by its larger nodes and denser collaborative links compared with the other clusters. This finding suggests that high scientific productivity and influence are closely associated with sustained research collaboration. By contrast, several smaller clusters remain relatively isolated, indicating that collaboration in carbon disclosure research is still fragmented. This collaboration pattern highlights opportunities to strengthen international research partnerships and promote broader knowledge exchange across institutions and countries.

Table 6 presents the most influential articles in carbon disclosure and climate change research based on total citation counts. The most highly cited article is Gender Diversity, Board Independence, Environmental Committee and Greenhouse Gas Disclosure by Liao, Luo, and Tang (2015), with 1,406 citations, highlighting its role as a seminal study in explaining the influence of corporate governance mechanisms on greenhouse gas disclosure. The second most cited article is Board Gender Diversity and Corporate Social Responsibility: Evidence from the Carbon Disclosure Project by Ben-Amar and Chang (2017), which has received 941 citations, underscoring the importance of board gender diversity in promoting corporate environmental transparency. Other highly cited studies primarily examine environmental legitimacy, corporate responses to climate change, voluntary carbon disclosure, and corporate strategies for addressing climate-related challenges. Overall, these findings indicate that the intellectual foundation of carbon disclosure research is largely built upon studies of corporate governance, legitimacy, stakeholder pressure, and corporate responses to climate change, which continue to serve as key references for subsequent research.

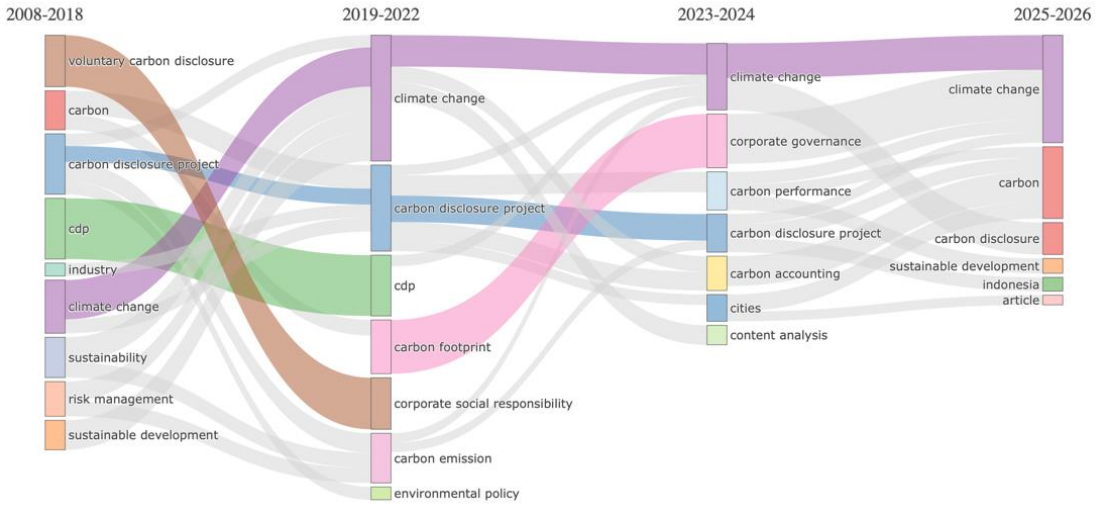


Figure 8. Thematic evolution.
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

As presented in Figure 8, during the 2008–2018 period, the literature was dominated by foundational themes such as carbon, Carbon Disclosure Project (CDP), climate change, voluntary carbon disclosure, sustainability, risk management, and sustainable development. Early research primarily examined corporate

carbon disclosure practices, voluntary environmental reporting, and the role of climate change in advancing corporate sustainability. A study using Carbon Disclosure Project (CDP) data found that companies disclosed, on average, only about 22% of their total Scope 3 emissions, indicating that supply chain carbon disclosure remained far from comprehensive (Blanco et al., 2016). The prominence of the Carbon Disclosure Project (CDP) also highlights its role as one of the earliest global frameworks for reporting greenhouse gas emissions and climate-related information.

The 2019–2022 period marked a shift in research focus toward more specific topics. Although climate change and the Carbon Disclosure Project (CDP) remained the dominant themes, new topics such as carbon footprint, carbon emissions, corporate social responsibility, and environmental policy began to emerge. A previous study using data from the Carbon Disclosure Project (CDP) to evaluate corporate carbon footprints found that reductions in carbon emissions did not automatically translate into improved financial performance (Mahapatra et al., 2021). This shift reflects a broadening of research attention beyond voluntary carbon disclosure practices toward evaluating environmental impacts, corporate social responsibility, and the role of environmental policies in promoting greater carbon transparency.

The 2023–2024 period witnessed a further diversification of research themes. Climate change remained the central topic, while new themes such as corporate governance, carbon performance, carbon accounting, content analysis, and the Carbon Disclosure Project (CDP) gained increasing attention. These developments indicate a shift from examining whether companies disclose carbon-related information toward evaluating disclosure quality, corporate governance mechanisms, carbon accounting practices, and the implications of carbon disclosure for corporate performance. The emergence of content analysis as a prominent research theme also reflects the growing adoption of methodological approaches for assessing the quality and characteristics of carbon disclosure. For example, a recent study employing content analysis of corporate reports identified substantial gaps in disclosure transparency, including carbon emissions monitoring, the establishment of net-zero targets, carbon footprint reduction practices, and carbon offsetting mechanisms, thereby raising concerns about the credibility of carbon-related information disclosed by companies (Boiral et al., 2024).

The 2025–2026 period was characterized by the continuation of most previously established research themes, alongside the emergence of several new developments. Climate change remained the most dominant theme, followed by carbon, carbon disclosure, and sustainable development. The appearance of Indonesia as a new research theme reflects the growing academic interest in empirical evidence from developing countries, particularly those in Southeast Asia. This development suggests that future research is likely to expand its geographical scope by incorporating diverse institutional, regulatory, and developmental contexts across countries.

The evolution of research themes demonstrates a clear transition from studies primarily focused on corporate carbon disclosure practices toward a broader and more integrated research agenda encompassing corporate governance, carbon accounting, carbon performance, sustainable development, and country-specific contexts. This progression highlights the increasing maturity of the carbon disclosure literature, driven by growing global demands for transparency,

accountability, and effective climate change mitigation.

3. The intellectual structure and the recent research trends in carbon disclosure research

Co-citation is defined as the frequency with which two documents are cited together by subsequent publications. The more frequently two references are co-cited, the stronger their co-citation relationship, indicating a higher degree of subject similarity and semantic relatedness between the publications (Small, 1973). As shown in Figure 9, the reference co-citation analysis reveals two major clusters that represent the intellectual foundation of research on carbon disclosure and climate change. Co-citation analysis identifies references that are frequently cited together, thereby capturing the conceptual proximity among studies and revealing the underlying knowledge structure of a research field (Zupic & Čater, 2015). The visualization shows that these two clusters are closely interconnected, suggesting that the intellectual foundation of carbon disclosure research has evolved through two complementary streams of inquiry with strong conceptual linkages.

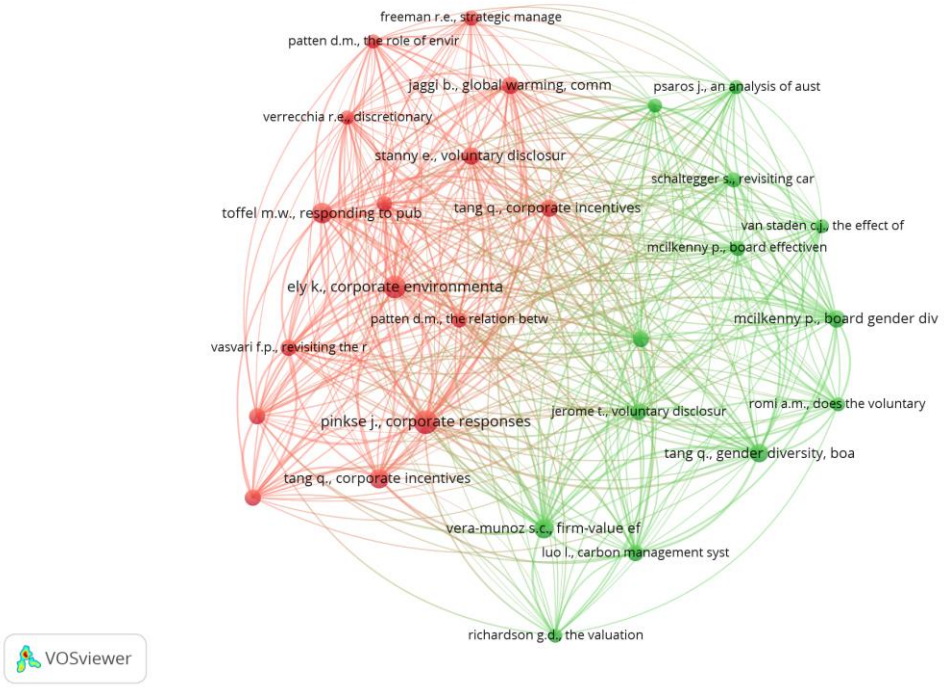


Figure 9. Co-citation network by references.
Source: Processed using VOSviewer, 2026

The first cluster (red) primarily focuses on studies examining voluntary carbon disclosure practices, corporate responses to climate change, stakeholder pressures, and the factors influencing firms' decisions to disclose environmental information. The second cluster (green) emphasizes the relationship between corporate governance, carbon management systems, firm value, and the quality of carbon disclosure. The extensive connections between these two clusters suggest that carbon disclosure research has evolved through the integration of corporate governance, organizational strategy, and sustainability reporting perspectives rather than as separate streams of inquiry. The dense network structure further indicates that the field has established a robust intellectual foundation, with interconnected

studies collectively advancing the understanding of the determinants, quality, and implications of carbon disclosure.

Figure 10 presents the journal co-citation network in carbon disclosure and climate change research, illustrating the intellectual relationships among journals that are frequently cited together. In this network, node size represents citation frequency, while edges indicate co-citation relationships between journals (van Eck & Waltman, 2010). Business Strategy and the Environment occupies the most central position with the largest node, highlighting its role as the most influential journal in the development of the carbon disclosure literature. Other highly connected journals, including Strategic Management Journal, Corporate Social Responsibility and Environmental Management, Accounting, Organizations and Society, and The British Accounting Review, also play significant roles, reflecting the integration of strategic management, sustainability, and accounting perspectives within this research field.

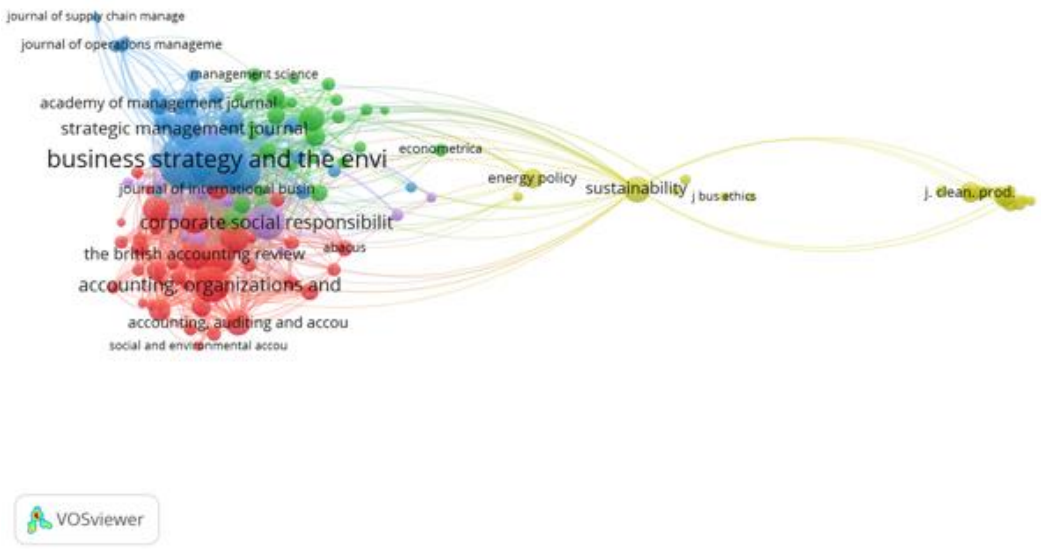


Figure 10. Co-citation network by journals. Source: Processed using VOSviewer, 2026

Another prominent cluster, led by Sustainability, Energy Policy, and Journal of Cleaner Production, underscores the close connection between carbon disclosure research and issues related to environmental policy, sustainable development, and carbon management. The overall network structure indicates that carbon disclosure research has evolved into a multidisciplinary field, drawing on diverse intellectual foundations from strategic management, accounting, corporate governance, and environmental sustainability.

4. Keyword analysis and future directions

The Scopus database provides a comprehensive collection of bibliographic records from published scientific literature across a wide range of disciplines. In this study, the bibliographic data were analyzed and visualized using Biblioshiny, a web-based interface of the Bibliometrix package in R, to systematically map the intellectual landscape of carbon disclosure and climate change research. Furthermore, co-occurrence analysis was employed to identify and visualize the relationships among keywords based on the frequency with which they appeared together in the retrieved publications. The resulting

clusters provide valuable insights into the conceptual structure of the research field by revealing the degree of association among research topics and highlighting the dominant and emerging themes within the literature.

Based on Figure 11, the keyword co-occurrence analysis reveals the formation of four major clusters representing distinct research themes within the carbon disclosure and climate change literature. Co-occurrence analysis is a bibliometric technique used to explore the relationships among keywords in scientific publications, where nodes represent keywords and links (edges) indicate their co-occurrence within the analyzed documents (van Eck & Waltman, 2010). The red cluster is the most prominent, characterized by the largest nodes and the highest level of connectivity, suggesting that the topics within this cluster constitute the primary focus of the literature. Node size reflects the frequency of keyword occurrence, whereas thicker links indicate stronger relationships between keywords and a higher degree of thematic association (Donthu et al., 2021). The green and blue clusters also contain numerous interconnected nodes, indicating well-developed and closely related research subthemes.

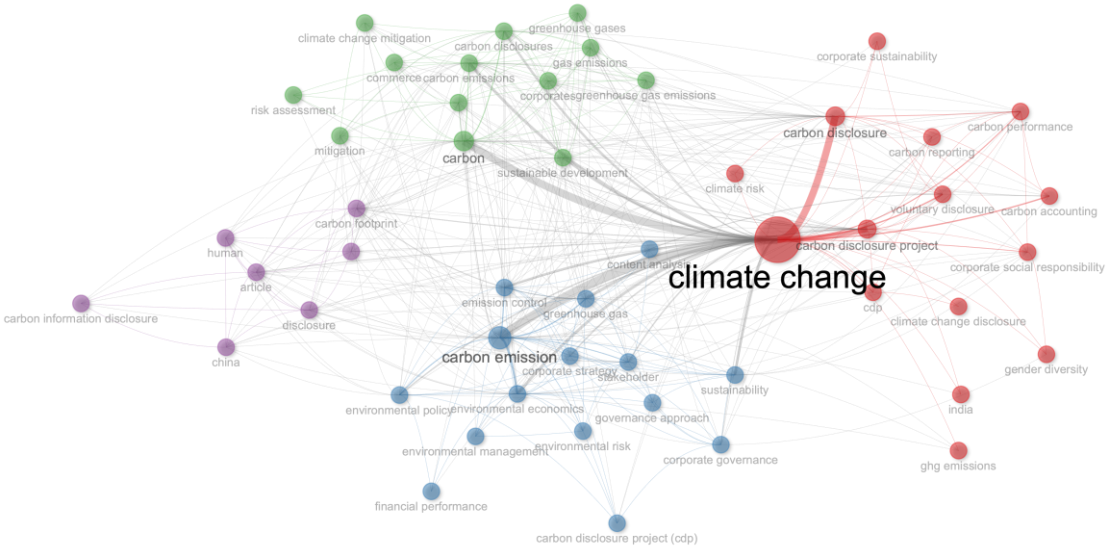


Figure 11. Visualization of co-occurance network
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

The spatial distance between keywords reflects their conceptual relatedness, with shorter distances indicating stronger associations and the formation of thematic clusters representing core research topics (Aria & Cuccurullo, 2017; Zupic & Čater, 2015). In contrast, the purple cluster contains fewer nodes and is positioned relatively distant from the other clusters, suggesting a more specialized or emerging research area. The emergence of newly connected nodes in the network suggests the development of new research themes and evolving research interests over time. (Du et al., 2024) .Nevertheless, the extensive interconnections among clusters demonstrate that the various research themes remain conceptually intertwined, forming an integrated knowledge network. Network analysis provides insights into the relationships among research themes and

facilitates the identification of the intellectual structure and thematic evolution of a research field (Yazdanjue et al., 2025).

Table 7. Keyword selected for network parameters

Node	Cluster	Betweenness	Closeness	PageRank
Climate Change	1	585,4078	0,0204	0,1455
Carbon Disclosure	1	17,1825	0,0149	0,0384
Carbon Disclosure Project	1	19,3107	0,0147	0,0389
Carbon Accounting	1	0,0602	0,0114	0,0121
Carbon Performance	1	1,2277	0,0123	0,0169
Voluntary Disclosure	1	0,7124	0,0116	0,0120
CDP	1	0,4349	0,0111	0,0095
Corporate Social Responsibility	1	0,3638	0,0116	0,0130
Climate Change Disclosure	1	0,0000	0,0104	0,0042
Corporate Sustainability	1	0,0000	0,0106	0,0053
GHG Emissions	1	0,0000	0,0106	0,0056
Carbon Reporting	1	0,0251	0,0111	0,0072
Climate Risk	1	0,0000	0,0105	0,0047
Gender Diversity	1	0,0255	0,0106	0,0059
India	1	0,0080	0,0105	0,0043
Carbon Emission	2	67,5633	0,0179	0,0651
Environmental Economics	2	14,8703	0,0149	0,0349
Sustainability	2	2,0799	0,0125	0,0226
Greenhouse Gas	2	8,5346	0,0145	0,0302
Emission Control	2	5,6452	0,0143	0,0285
Corporate Governance	2	2,2310	0,0122	0,0160
Environmental Policy	2	2,4088	0,0127	0,0199
Stakeholder	2	5,2513	0,0133	0,0240
Corporate Strategy	2	0,7938	0,0120	0,0175
Carbon Disclosure Project (CDP)	2	0,0233	0,0111	0,0079
Content Analysis	2	0,0600	0,0112	0,0078
Financial Performance	2	0,0000	0,0108	0,0058
Environmental Management	2	0,0120	0,0110	0,0078
Environmental Risk	2	0,0982	0,0111	0,0079
Governance Approach	2	0,0078	0,0111	0,0090
Carbon	3	37,2403	0,0164	0,0521
Carbon Emissions	3	14,0197	0,0154	0,0348
Carbon Disclosures	3	5,1833	0,0137	0,0289
Sustainable Development	3	8,0034	0,0141	0,0263
Corporates	3	0,3199	0,0122	0,0170
Greenhouse Gas Emissions	3	0,6428	0,0123	0,0180
Greenhouse Gases	3	0,0747	0,0120	0,0184
Gas Emissions	3	0,3773	0,0122	0,0181
Investments	3	3,1312	0,0133	0,0206
Risk Assessment	3	0,0000	0,0109	0,0080
Climate Change Mitigation	3	0,1123	0,0114	0,0078
Mitigation	3	0,4290	0,0116	0,0098
Commerce	3	0,1329	0,0114	0,0104
Carbon Footprint	4	3,9230	0,0135	0,0226
Disclosure	4	3,4153	0,0123	0,0154
Article	4	2,6511	0,0128	0,0200
China	4	0,2687	0,0116	0,0113
Investment	4	1,5222	0,0120	0,0129
Carbon Information Disclosure	4	0,0129	0,0110	0,0068
Human	4	0,2019	0,0118	0,0123

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

The red cluster is the most dominant cluster, exhibiting the highest level of connectivity, indicating that the topics within this cluster represent the primary focus of the research field. As shown in Table 7, the keyword climate change has the

highest betweenness centrality value (585.4078), highlighting its role as the principal bridge connecting the research network (Freeman, 1977). Other keywords in this cluster, including carbon disclosure (17.18), carbon disclosure project (19.31), carbon accounting, voluntary disclosure, corporate social responsibility, and carbon reporting, represent the fundamental themes of carbon disclosure research. The presence of the Carbon Disclosure Project (CDP) further highlights its role as one of the most influential reporting frameworks and data sources for corporate carbon disclosure (Setiawan et al., 2025).

The blue cluster is centered on the keyword carbon emission, which has a betweenness centrality of 67.56 and a PageRank score of 0.0651, indicating its strong influence within the research network. This cluster also includes keywords such as environmental economics, greenhouse gas, emission control, corporate governance, environmental policy, stakeholder, and corporate strategy, reflecting the research focus on corporate governance, environmental policy, and strategic approaches to carbon emission management.

The green cluster is dominated by the keyword carbon (betweenness = 37.24; PageRank = 0.0521), followed by carbon emissions, sustainable development, and carbon disclosures. This cluster represents studies related to greenhouse gas measurement and reporting, as well as climate change mitigation within the broader context of sustainable development (Aria & Cuccurullo, 2017; Zupic & Čater, 2015).

The purple cluster is the smallest cluster, comprising keywords such as carbon footprint, disclosure, investment, China, and carbon information disclosure. Its relatively low closeness centrality values (0.0110–0.0135) indicate that these topics remain relatively peripheral within the research network and may represent promising directions for future research (Boeing, 2017).

The numerous links connecting the clusters indicate strong conceptual relationships among the various research themes, forming an integrated knowledge network. The keywords climate change and carbon disclosure exhibit strong connections with other prominent terms, including carbon emissions and carbon disclosure project, suggesting that these topics constitute the core focus of the existing literature. The frequent co-occurrence of the keyword climate change, disclosure, performance, and emission further highlights their central role in carbon disclosure research, reflecting the close interrelationship between climate change issues and corporate disclosure practices.

Several research themes remain promising avenues for future investigation. Research on stakeholder pressure, for example, has extensively examined the influence of ownership structures, including institutional, government, managerial, and ownership concentration, on corporate carbon disclosure practices (Calza et al., 2016); (Luo et al., 2012b). Empirical evidence further suggests that institutional ownership and foreign ownership positively influence carbon emissions disclosure, whereas concentrated ownership (block-holder ownership) is negatively associated with disclosure practices (Bedi & Singh, 2025).

The relationship between financial performance and carbon disclosure also remains an evolving research area, with empirical findings that are still inconclusive. Several studies have reported that carbon disclosure enhances corporate financial performance by reducing the cost of debt and increasing institutional investor ownership, as explained by signaling theory, rent-seeking theory, and sustainable development theory (Xu et al., 2025). In

contrast, other studies have found that carbon disclosure negatively affects financial performance in the short term but generates positive long-term effects while simultaneously improving carbon performance (Siddique et al., 2021).

Disclosure policy represents another promising research theme. Companies face increasing pressure from both government regulations and market demands to enhance the transparency of carbon-related information. Existing evidence indicates that coercive pressure from regulators exerts a stronger influence on climate-related disclosure than normative pressure from the media and civil society (Mateo-Márquez et al., 2021). Increasingly stringent environmental regulations, together with the influence of Confucian culture, have also intensified oversight of corporate carbon disclosure practices (Tang et al., 2022). Advancing research in these areas is expected to deepen the understanding of the determinants, mechanisms, and implications of carbon disclosure while contributing to the further development of sustainability reporting theory and practice.

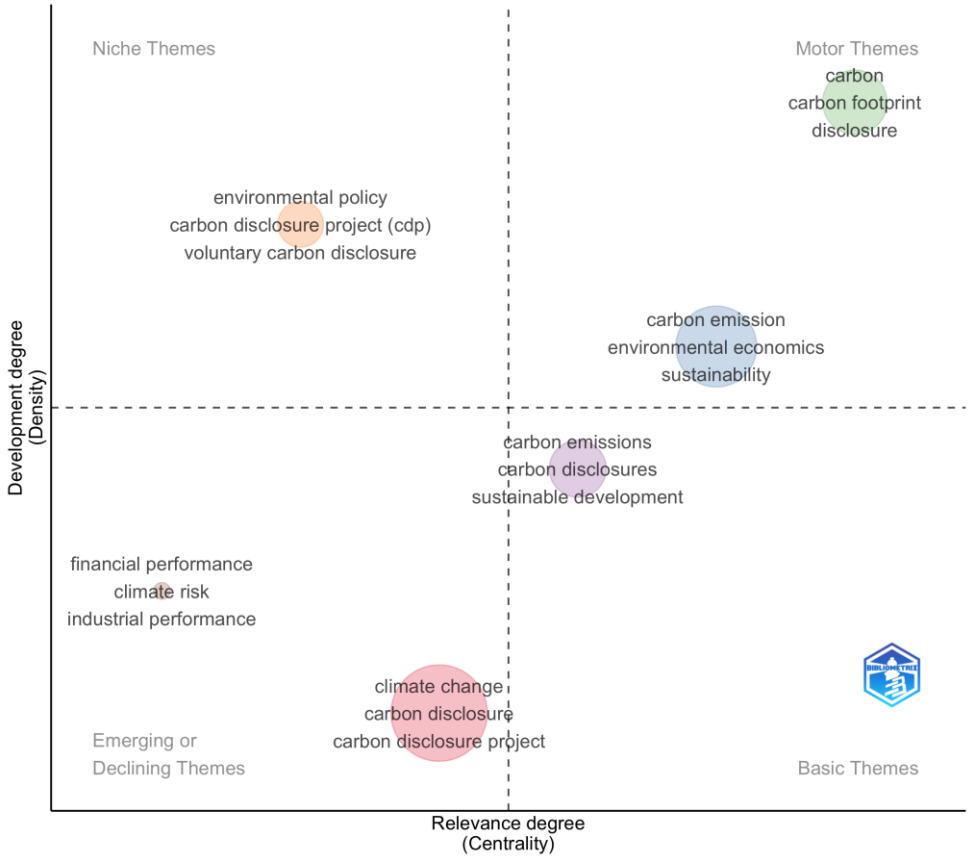


Figure 12. Thematic map by keywords.
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

Thematic Maps

This study identified several major themes to provide a more comprehensive understanding of the development of carbon disclosure research. Figure 12 presents the thematic map, which classifies research themes according to two dimensions: centrality (X-axis), representing the relevance of a theme to the overall research field, and density (Y-axis), indicating the degree of internal development and maturity of each theme (Li et al., 2023).

The Basic Themes quadrant comprises themes such as carbon emissions, carbon disclosures, and sustainable development. Despite their relatively low internal development, these themes are highly connected to the overall research field and therefore serve as the conceptual foundation of the carbon disclosure literature. This finding is supported by (Luo & Tang, 2014), who found that higher-quality carbon disclosure is positively associated with better carbon performance, highlighting its role in supporting sustainable development through more effective emissions management.

In addition to the Basic Themes, the Niche Themes quadrant (upper-left) comprises well-developed themes with relatively low relevance to the overall research field. In this study, these themes include environmental policy, the Carbon Disclosure Project (CDP), and voluntary carbon disclosure. Their position indicates that research on environmental regulations, CDP-based carbon reporting, and voluntary carbon disclosure has matured, although it remains concentrated within specific research communities. This finding is consistent with previous studies highlighting the important role of regulatory pressure and voluntary reporting frameworks in enhancing corporate carbon disclosure and climate-related transparency (Kolk et al., 2008); Mateo-Márquez et al., 2021).

Meanwhile, the Motor Themes quadrant occupies the upper-right section of the thematic map, indicating high density and centrality. This finding is consistent with previous studies demonstrating that carbon, carbon footprint, and disclosure constitute the foundational pillars of carbon disclosure research, with CDP serving as a key mechanism through which companies report their carbon footprint data across Scope 1, 2, and 3 emissions (Mahapatra et al., 2021).

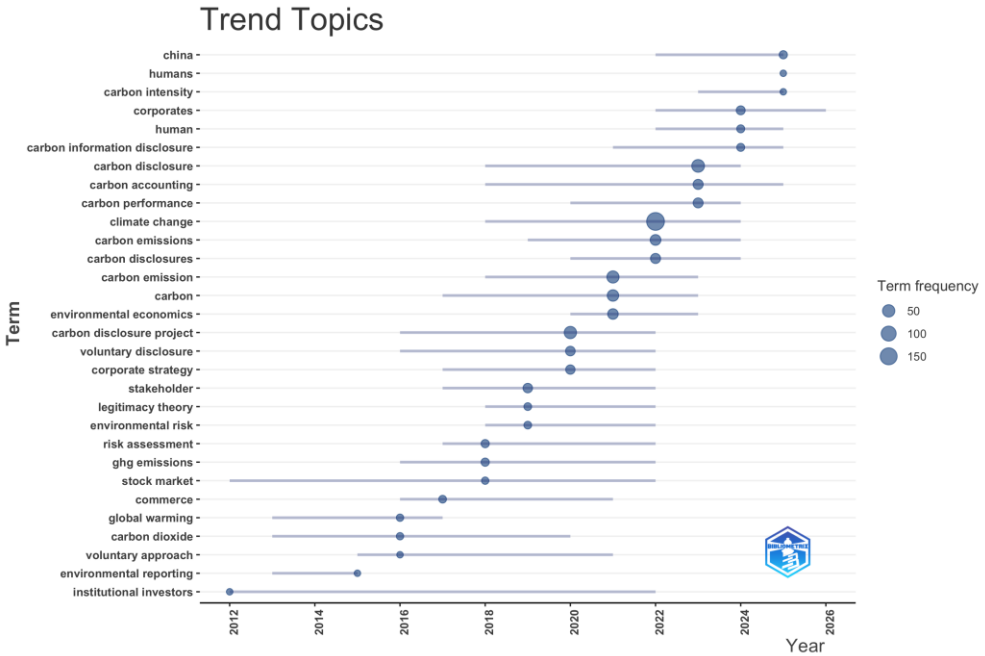


Figure 13. The topic of trends.
Source: Processed using bibliometrix R-packages (Biblioshiny), 2026

Figure 13 illustrates the thematic evolution of carbon disclosure research, revealing a clear shift from broad environmental issues toward more strategic

and corporate governance-oriented topics. During the initial period (2012–2016), research was dominated by themes such as institutional investors, environmental reporting, carbon dioxide, and global warming, reflecting a primary focus on climate change awareness and the role of environmental reporting in responding to stakeholder pressures. As corporate demands for transparency and accountability increased, the research focus shifted toward voluntary disclosure, corporate strategy, stakeholders, and the Carbon Disclosure Project (CDP) during the 2017–2020 period. This transition suggests that carbon disclosure has evolved beyond a mere environmental reporting practice to become a strategic instrument associated with organizational legitimacy and stakeholder management.

The 2021–2025 period was characterized by the increasing prominence of themes such as climate change, carbon emissions, carbon disclosure, carbon accounting, and carbon performance, as reflected by their relatively larger node sizes. These findings indicate that the literature has moved beyond examining disclosure practices toward evaluating the quality, credibility, and organizational implications of carbon disclosure. The emergence of new themes, including carbon intensity and carbon information disclosure, further highlights the growing emphasis on the measurement, standardization, and effectiveness of corporate carbon information. This evolution reflects a more critical perspective in which research increasingly assesses not only whether companies disclose carbon-related information but also the extent to which such disclosures accurately represent their environmental performance. The observed trend therefore indicates a paradigm shift from emphasizing disclosure quantity toward disclosure quality, which is likely to become a key research agenda in the future development of the carbon disclosure literature.

CONCLUSION

This bibliometric assessment provides a comprehensive overview of the global development of carbon disclosure research in the context of climate change based on 290 Scopus-indexed publications published between 2008 and 2026. The findings demonstrate that the field has expanded substantially over the past two decades, supported by increasingly extensive international collaboration and well-established intellectual foundations. Australia, the United Kingdom, China, and the United States emerged as the leading contributors to this research domain, while Business Strategy and the Environment has remained one of the most influential journals shaping scholarly discourse on carbon disclosure.

The thematic analyses reveal a clear evolution from an initial emphasis on voluntary carbon disclosure and environmental reporting toward more specialized research areas, including corporate governance, carbon accounting, carbon performance, disclosure quality, and climate-related reporting. Throughout the study period, climate change has consistently remained the central theme linking diverse streams of carbon disclosure research. Meanwhile, the emergence of topics such as carbon information disclosure, carbon intensity, and developing-country contexts indicates that the field continues to evolve in response to increasing demands for corporate transparency, environmental accountability, and sustainability reporting.

By synthesizing the intellectual structure, collaboration patterns, conceptual development, and thematic evolution of the literature, this research enriches the current understanding of carbon disclosure and provides a comprehensive knowledge base for future investigations. The findings offer

valuable insights for researchers in identifying emerging research opportunities and for policymakers and practitioners in strengthening corporate climate governance and sustainability reporting practices. Future bibliometric research could be enhanced by incorporating multiple bibliographic databases, applying more advanced science-mapping techniques, and exploring emerging themes across diverse institutional, industrial, and regional contexts to provide a broader understanding of this rapidly evolving field.

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