ENVIRONMENTAL AND SUSTAINABILITY REPORTING RESEARCH: A BIBLIOMETRIC ASSESSMENT OF TRENDS AND CONCEPTUAL SHIFTS

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Abstract
This study investigates the conceptual and thematic relationship between environmental and sustainability reporting through a descriptive bibliometric analysis. The search phrase used to collect relevant data from Web of Science was designed to encompass two sets of terms: broader sustainability-reporting methodology on one side and environmental or climate-related reporting terminology on the other. The final dataset includes 437 papers, covering the period from 1994 to 2025, analysed with Biblioshiny in R through thematic mapping and thematic evolution across three periods (1994–2013, 2014–2023, 2024–2025; 31, 283 and 123 records) and compared with the broader sustainability literature. Environmental-reporting terms such as environmental reporting and environmental disclosure sit in the same thematic clusters as sustainability-reporting and ESG terms, and author keywords diversify over time, with ESG, ESG disclosure, greenwashing and board gender diversity increasing significantly in 2024–2025 (governance disclosure weakly). Publication growth and thematic diversification coincide in time with the NFRD, the TCFD recommendations, the CSRD and the establishment of the ISSB; these are bibliometric associations, not evidence of regulatory causation. Because every record contains both vocabularies by construction, the findings describe vocabulary change within the intersection corpus and not the full history of either domain. The study contributes a map of how environmental and sustainability-reporting concepts have been combined in this literature.

Keywords
Sustainability reporting; environmental reporting; bibliometric analysis; non-financial reporting; ESG.

JEL Classification
Q56, M14, M41, M48.

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Introduction

Few concepts in corporate reporting have grown as fast as sustainability, and few are as poorly defined (Moore et al., 2017). The same disclosure may be called environmental, non-financial, CSR, ESG or sustainability reporting, depending on the year, the regulator or the journal. What began as a report on emissions and waste has become a regulated, multi-dimensional system, yet it remains unclear whether environmental reporting is a subdomain of sustainability reporting, its precursor, or a parallel stream.

To provide a meaningful framework for investors and stakeholders and ensure transparency and trust, global trends have shifted from voluntary disclosure of non-financial information to mandatory disclosure. Furthermore, the conceptual framework has shifted from broad regulations to comprehensive, complex metrics disclosures, with various milestones guiding research and practical corporate implementation in alignment with advances in literacy infrastructure. As regulation has evolved, certain concepts have expanded into broad umbrellas, while others have developed and gained significance. In the 1990s, sustainability reporting was commonly referred to as environmental and social disclosure; however, post-2014, it began to be recognised as an integrated concept encompassing environmental, social, and governance (ESG) factors.

Despite the evolution of the regulatory framework, we identified a central issue within the emerging literature concerning the study's subject: a conceptual contradiction that elucidates the tension between sustainability reporting as a comprehensive concept and environmental reporting as a specialised subdomain, a relationship that remains ambiguous in the existing literature. Furthermore, terminological confusion remains a key concern, as terms such as ESG, non-financial, sustainability, and CSR are often used interchangeably, despite distinct developments and meanings.

In this paper, we map the overlaps and differences between the two domains, addressing the research problem identified.

Existing reviews trace the growth of sustainability reporting as a whole and describe its shift from voluntary disclosure to regulation-driven, standardised reporting (Hahn & Kühnen, 2013; du Toit, 2024; Rivo-López et al., 2025). Bibliometric studies map its intellectual structure, authors, and themes (Sundarasen et al., 2024; Adamo et al., 2025). However, these studies start from one concept and look outward, and none restricts its corpus to the literature that explicitly connects environmental and sustainability reporting. As a result, how the two domains relate to each other, and how that relationship changes over time, remains unmapped.

This study addresses that gap through a bibliometric analysis of the literature that links the two domains, using thematic mapping to trace changes across periods that coincide with major regulatory developments (GRI, NFRD, TCFD, CSRD, ISSB). We examine whether the literature treats environmental reporting as distinct from sustainability reporting and how that relationship has changed over time. Two research questions guide the analysis:

RQ1: How has the relationship between environmental reporting and sustainability reporting evolved within the literature that addresses both domains, and how does this evolution coincide with major regulatory developments?

RQ2: What emerging research themes are identified, and how do they anticipate the future directions in environmental and sustainability reporting research?

To address the research questions and fill this gap, our study complements prior research by examining how the intersection between sustainability reporting and environmental reporting evolved and what shaped this evolution.

This research paper is structured as follows: the first section provides a short literature review on sustainability and environmental reporting and positions this study relative to existing reviews and bibliometric analyses, followed by a second section containing a detailed description of the research method used in this study, including the Web of Science search string, the construction of the final dataset of 437 papers and the analytical tool used in Biblioshiny. The third section presents the results and discussion in four subsections: the evolution of the field, focusing on the evolution of the scientific production and the most productive authors and sources; trending topics; co-occurrence analysis of keywords; and the thematic evolution of the literature across regulatory periods, ending with a discussion. The paper closes with the main conclusions, followed by theoretical and practical implications, and discusses the study's limitations and directions for future research.

1. Review of the scientific literature

The origins of sustainability reporting can be traced to the late 1980s, emerging in response to environmental catastrophes and growing awareness of ecological concerns. Early reports focused mainly on organisations' environmental impacts, such as emissions, resource consumption, and waste management—effectively serving as environmental reporting (Parkinson and Chew, 2022). The publication of the Brundtland Report in 1987 redirected policymakers' and researchers' attention toward environmental issues (Gray, 2002).

Since the 1990s, corporate reporting has expanded from environmental and climate issues to sustainability reporting. It retains the environmental dimension while integrating the social and corporate governance dimensions. This form of reporting incorporates not only environmental considerations but also social and corporate governance dimensions. Integrating these aspects has strengthened stakeholder accountability and increased transparency in performance (Larrinaga and Bebbington, 2021).

Contemporary sustainability reporting can be traced to the establishment of the Global Reporting Initiative in 1997. This initiative sought to formalize prevailing sustainability reporting practices. After releasing its first set of guidelines in 2000, the GRI consistently underscored the importance of environmental disclosures (https://www.globalreporting.org/about-gri/vision-mission-and-history/).

Initially, environmental reporting was voluntary and lacked standardization. GRI acknowledged this challenge and established a comprehensive set of guidelines, later adopted as standards, to promote standardized non-financial reporting; however, organizations still implement them voluntarily.

Currently, the sustainability reporting landscape is undergoing a major shift from voluntary, non-standardized disclosures to a compulsory, standardized, and integrated component of financial documentation. Mandatory reporting on sustainability factors,

particularly under the European Union's Corporate Sustainability Reporting Directive (CSRD), requires thousands of enterprises to disclose comprehensive, externally verified sustainability information. Alongside the CSRD, the International Financial Reporting Standards (IFRS) S1 and S2 also influence the global reporting framework, promoting enhanced sustainability disclosure, consistency, comparability, and transparency (du Toit, 2024).

Sustainability reporting, especially during the period of voluntary disclosure, was researched in order to understand the reasons behind it. To explain this, researchers proposed some theories to explain why companies choose to report additional information: legitimacy theory, stakeholder theory, institutional theory, signalling theory, etc.

Legitimacy theory expands the perspective by asserting that firms participate in social and environmental disclosure to synchronize their conduct with that of their peers or merely to conform to societal expectations, thereby preserving their social license to operate (Suchman, 1995).

Stakeholder theory posits that corporations have a responsibility extending beyond merely satisfying shareholders' interests (Freeman, 1984). Clarkson (1995) further distinguishes between primary and secondary stakeholder groups, providing useful frameworks for examining corporate responsibilities toward different stakeholders.

Institutional theory complements stakeholder theory by emphasising how organizational behaviour is influenced by regulatory measures, normative expectations, and cognitive pressures originating from the economic environment in which they operate (DiMaggio and Powell, 1983). Therefore, reporting helps companies gain legitimacy and avoid sanctions, which ultimately affects their financial performance (Anand et al., 2023).

The economic foundations of signalling theory are closely connected to information asymmetry. Akerlof (1970) points out that when buyers lack sufficient information about a product, they tend to form general perceptions and evaluate all similar products at the same price, demonstrating how quality uncertainty can impair market functioning. In corporations, managers possess more information regarding internal performance and quality than investors, resulting in information asymmetry. To reduce this disparity, firms can utilise signals to communicate pertinent information to stakeholders, conveying their image, intentions, behaviour, and performance. The signalling model of Michael Spence explains how better-informed actors can communicate otherwise unobservable quality to less-informed market participants. In corporate reporting, voluntary disclosures may therefore function as signals intended to reduce information asymmetry between managers and external stakeholders. Based on Signalling Theory, this perspective emphasizes the importance of transparent corporate communication in alleviating information asymmetry. By signalling their commitment to societal and stakeholder interests, firms may enhance stakeholder trust and improve their market perception (Bae et al., 2019)

These theories are used as interpretive lenses for the thematic structure of the literature identified in the bibliometric analysis. Despite these different perspectives, the theories generally point to the same idea: sustainability-related disclosure is influenced by a combination of organizational, economic, and societal factors. At the same time, the way these disclosures are understood and studied has changed over time, as

environmental and social issues have increasingly been integrated within the broader ESG and sustainability reporting framework. This evolution prompts an intriguing inquiry into the relationship between sustainability reporting and environmental reporting, and whether these two domains have followed similar research trajectories or developed as separate streams of literature. The ongoing modifications to reporting frameworks may also have impacted corporate disclosure practices, as organizations face escalating institutional pressures to align their reporting strategies with emerging expectations and standards.

Several bibliometric studies and systematic reviews have mapped the relevant literature. Hahn and Kühnen (2013) reviewed research on the determinants of sustainability reporting. Benameur et al., 2024, mapped 1053 Scopus articles on sustainability reporting published between 2000 and 2022, and Singhania and Chadha, 2023, analysed 1434 Web of Science articles published between 1992 and 2022, on the environmental side, Bilal et al., 2024, analysed 560 articles on corporate environmental disclosure published between 1982 and 2020, and Rivo-López et al., 2025, analysed 257 articles on environmental sustainability reporting published between 2005 and 2024. These studies examine either sustainability reporting or environmental disclosure. This study focuses on literature that addresses both aspects.

2. Research methodology

Bibliometric analysis is an established research method for identifying emerging areas and interdisciplinary connections. It guides research investments, informs funding decisions, maps collaboration networks, and assesses the international research impact, guiding research allocation (Dagli et al., 2025)

Data collection: This study is based on scrutinizing and analysing the Web of Science database, widely regarded by researchers as one of the broadest sources of peer-reviewed social science articles. It is the oldest and most authoritative database for research publications and citations (Birkle C. et al., 2020). Additionally, Scopus is another platform that covers research papers and is recognized for including relevant research in the field. Merging the two databases is feasible through established procedures (e.g., conversion and de-duplication with bibliometrix's merge functions, or matching by DOI and normalized title). However, such merging introduces metadata inconsistencies, particularly in cited references and keyword fields, that affect co-citation and co-occurrence analyses (Donthu et al., 2021).

The search string used in Web of Science to generate the database involved selecting the "ALL FIELDS" option and searching the relevant keywords. The keyword identification process and the synonyms were iterative and based on a careful examination of the literature review: ALL FIELDS ("sustainability reporting" OR "corporate sustainability reporting" OR "non-financial reporting" OR "ESG reporting" OR "sustainability disclosure*" OR "nonfinancial disclosure*" OR "ESG disclosure*" OR "integrated reporting" OR "triple bottom line reporting") AND ALL FIELDS ("climate reporting" OR "climate disclosure" OR "environmental reporting" OR "environmental disclosure"). We selected terms that are commonly used in academic and professional literature, often as synonyms or related concepts. "Sustainability reporting" and "corporate sustainability reporting" are the two

most widely used main terms. “Non-financial reporting” was the predominant term in the EU Directive 2014/95/EU and in the 2010 discussions, reflecting its complementary nature to financial reporting. “ESG reporting” and “ESG disclosure” gained significant popularity from 2018 to 2020, influenced by the rise of responsible investment and the development of regulatory frameworks (e.g., NFRD in the EU). Their inclusion is based on search relevance to the literature. “Sustainability disclosure” covers the literature with a more specific emphasis on the voluntary disclosure elements. “Integrated reporting” refers to a framework that integrates financial and non-financial information into a unified narrative, often associated with sustainability reporting. In addition, the concept of “Triple Bottom Line reporting” (People, Planet, Profit) is an older idea that underpins many modern approaches. For climate-related disclosures, we selected terms that specifically address the climate and environmental component. “Climate reporting” and “climate disclosure” are direct terms that intensified after the Paris Agreement (2015) and with the founding of the Task Force on Climate-related Financial Disclosures (TCFD). “Environmental reporting” and “Environmental disclosure” are broader terms that also encompass climate issues. They were included to capture studies that treat environmental reporting generally, where climate risk could be a significant problem.

The Boolean structure was aligned with the conceptual objective of the study. The OR operators broadened each terminological set by capturing alternative labels used for sustainability-related reporting and environmental or climate-related reporting. The AND operator was then applied between the two sets to retrieve publications in which the two domains coexist. Accordingly, the search was not designed to map the complete literature on either domain independently. Instead, it was intended to isolate their conceptual intersection and to examine how scholars have related, differentiated, or integrated environmental and climate-related reporting within broader sustainability-reporting frameworks.

This design enables a longitudinal analysis of terminology and thematic relationships within the intersecting literature. It does not, however, establish the complete historical development of environmental reporting or sustainability reporting as separate research streams. References to evolution in this study therefore concern changes observed within the selected intersection corpus. Several search terms (e.g., "ESG reporting", "ESG disclosure", "integrated reporting", "non-financial reporting") have only become common in recent years, making the query structurally more sensitive to recent literature, while previous wordings that were not included in the query (e.g., "social and environmental accounting" or "CSR reporting") may be underrepresented. The "ALL FIELDS" option retrieves records in which the terms appear in fields the authors did not choose, such as database-generated keywords, and Web of Science coverage has expanded over time. The changes observed over time can therefore reflect both the field's conceptual development and the characteristics of this search strategy and the database.

The search, conducted on 23 November 2025, generated 497 documents. Subsequent filters were applied to restrict the papers to specific Web of Science categories and languages. We limited the Web of Science categories to “business finance”, “business”, “management”, “green and sustainable science and technology”, “economics”, and

"environmental studies". We selected English as the language of the research papers we wanted to analyse, given its status as the lingua franca in science and international business (Kamadjeu, 2019). As a result, the new database contained 441 documents. The study aims to analyse reporting as a socio-economic, corporate governance, and regulatory phenomenon. We retained categories such as Business, Economics, Environmental Studies, and Management. Papers from pure technical and natural sciences were excluded as they do not focus on corporate reporting mechanisms.
The data timeframe spans 1994 to 2025, highlighting the evolution of global trends and conceptual shifts.
These filters were applied to improve the relevance and comparability of the final database for the study's research questions.
Data processing: The authors exported the Web of Science database in Excel and plain text formats and reviewed it. The review considered criteria such as abstract relevance, duplicate papers, and keyword relevance, among others, to determine whether to include or exclude papers from the database and was done in Microsoft Excel by Radu Karinne-Alexandra, who was verified by Blidisel Rodica. There were 4 papers excluded because they were duplicates and therefore considered only once in our analysis. No records were excluded based on keyword relevance alone or because the abstract was not in line with our research objective. As a result, the final database contained 437 articles, which were uploaded to RStudio as plain text after the file was updated to exclude the 4 duplicate papers using the bibliometrix package. This package enables complete bibliometric descriptive analyses compared to other primary software tools (Aria & Cuccurullo, 2017).
Data analysis: Biblioshiny, the web interface of bibliometrix, was used for the descriptive analyses (production, authors, sources, trend topics), the thematic map and the thematic evolution. Further analyses (term prevalence, keyword statistics and the robustness check of keyword clusters) were run in R. The thematic map is based on Louvain clustering; the comparison with the Spinglass algorithm is a separate analysis of a keyword network, described below.
The authors' keywords were analysed in this study without combining spelling and synonym variants. The three periods (1994–2013, 2014–2023, 2024–2025) were defined a priori with reference to regulatory milestones. This makes it easier to compare with the chronology of regulations, but it also means the alignment between periods and milestones is partly a design artefact. The last period covers only two years and 123 articles, so its thematic structure is less stable than in previous periods.
Term-prevalence analysis: To examine how the two vocabularies change within the corpus independently of keyword clustering, we computed the prevalence of each query term by period. The 437 records were imported into R with the bibliometrix package (convert2df, WoS plain-text format) and assigned to the three a priori periods (1994–2013, 2014–2023, 2024–2025) using the publication year. For each record, the title, abstract, author keywords and Keywords Plus were concatenated into a single lowercase text field. Each of the thirteen terms in the Web of Science query (nine sustainability-reporting terms, set A, and four environmental or climate-reporting terms, set B) was then searched in this field with case-insensitive string matching using the stringr package, with the hyphen in "non-financial" treated as optional. A record was coded 1

for a term if the term occurred at least once and 0 otherwise. We also coded whether a record contained at least one term from set A and at least one from set B. For each period, we report the percentage of records coded 1 for each term (Table 3). Terms are not mutually exclusive, because one phrase can be contained in another (for example, "sustainability reporting" within "corporate sustainability reporting") and a record can match several terms, so percentages do not sum to 100. Because this check is lexical and uses only title, abstract and keyword fields, whereas the Web of Science query used the ALL FIELDS option, it measures the visible prominence of each label and not the exact retrieval logic. All 437 records contained at least one query term in these fields. Percentages for 1994–2013 rest on 31 records, so differences of a few percentage points in that period correspond to one or two papers and are not interpreted. The analysis is descriptive and shows changes in terminology, not changes in reporting practice.

Interpretation and Data Visualization: The authors interpreted and visualized the results using tables, graphs, and diagrams generated by Biblioshiny. These helped the authors identify trends and synthesize information clearly. To contextualize the bibliometric results, we conducted a targeted qualitative reading of selected papers. The five most-cited papers in the corpus were read in full, together with the papers of three highly locally cited authors represented in the dataset. Selection was therefore citation-based rather than intended as a systematic qualitative review.

Keyword co-occurrence is essential for discovering term connections and revealing data structure and patterns, including clusters of connected terms, across numerous community detection approaches. Traditional detection methods included Louvain, GMO, Leiden, Infomap, SLPA, CNM, Walktrap, SpinGlass, and K-Clique. To assess whether the thematic structure depends on the community-detection method, we applied the Louvain algorithm (Blondel et al., 2008; resolution = 1) and the Spinglass algorithm (Reichardt & Bornholdt, 2006; maximum spins = 25, gamma = 1, initial temperature = 1, final temperature = 0.01, cooling factor = 0.99) to the same keyword co-occurrence network, using the igraph implementations. The network contained all author keywords occurring at least twice (242 of 1,069 distinct keywords; country names and JEL codes excluded), normalised with the association measure and restricted to its largest connected component (239 keywords). Both algorithms were run 50 times with a fixed random seed (set.seed(2026)). For each pair of runs, we computed the Normalised Mutual Information (NMI) and the Adjusted Rand Index (ARI), and report their mean and range, together with the number of clusters found by each algorithm. To estimate the effect of the algorithm's own randomness, Louvain was also compared with itself across 30 pairs of repeated runs. This analysis is separate from the Biblioshiny thematic map (Figure 10), which uses its own settings.

This study is descriptive and bibliometric; therefore, the alignment between publication patterns and reporting developments is interpreted as an association and not as evidence of a causal regulatory effect.

Keyword statistics: Because the number of unique keywords grows with corpus size, we compared the share of records with author keywords, unique author keywords per record, and the type-token ratio (unique keywords divided by keyword occurrences) across periods. For selected keywords, we compared the share of records containing the keyword in 2024–2025 with all earlier records using Fisher's exact test, with the

Benjamini–Hochberg correction across the six keywords tested. Records without author keywords were counted as not containing the keyword. Matching was case-insensitive and lexical, on unmerged keywords, so "ESG" also matches longer keywords that contain it.

3. Results and discussion

3.1 Evolutionary approach

The evolution of scientific production follows the interests of society and the academic community; therefore, research has intensified over the last two years (Figure no 1).

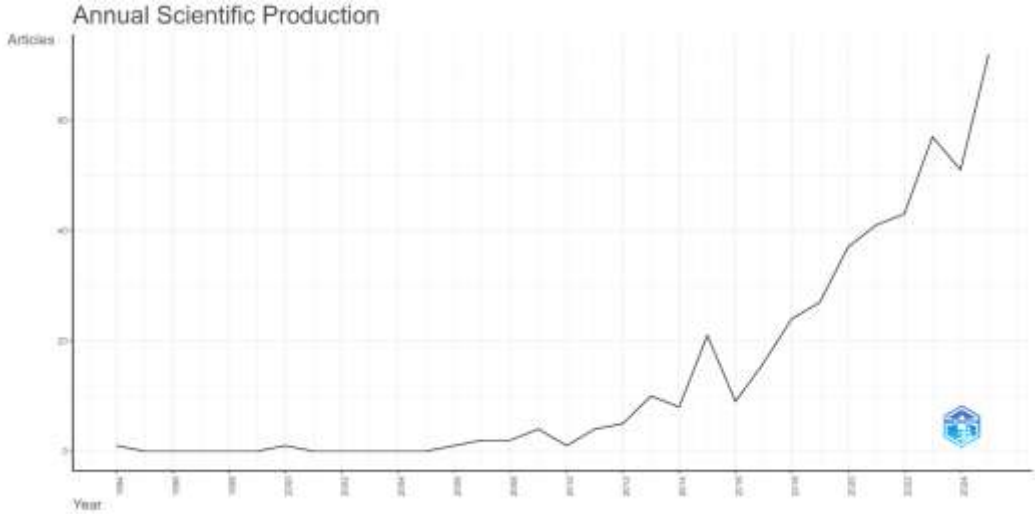


Figure no. 1: Annual Scientific Production.
Source: Author's own computation based on Biblioshiny

An initial analysis of the data, conducted using the Biblioshiny tool, reveals three distinct trends. Initially, writings and publications related to sustainability, sustainability reporting, and the need to apply environmental protection measures began timidly with the appearance of the first article from our database in 1994 by Gray R.H. This resource outlines a separate vision on environmental reporting and sustainability reporting, while confirming the incipient and voluntary use of ecological reporting by the economic and political sectors in that period.

Between 1995 and 1999, and again between 2001 and 2005, interest in this topic was negligible. Since 2006, the number of publications has increased slightly. This first period, 1994 – 2013, is characterized by inferior scientific production, with a total of 31 publications and a share of 7,09% (Figure no. 2). Therefore, the quality and quantity of the research outlined the idea of corporate social responsibility (CSR), voluntary environmental reporting, and the first phases of integrated reporting (IR). Within this period, output peaked in 2013, the year preceding the adoption of the EU Non-Financial Reporting Directive (NFRD).

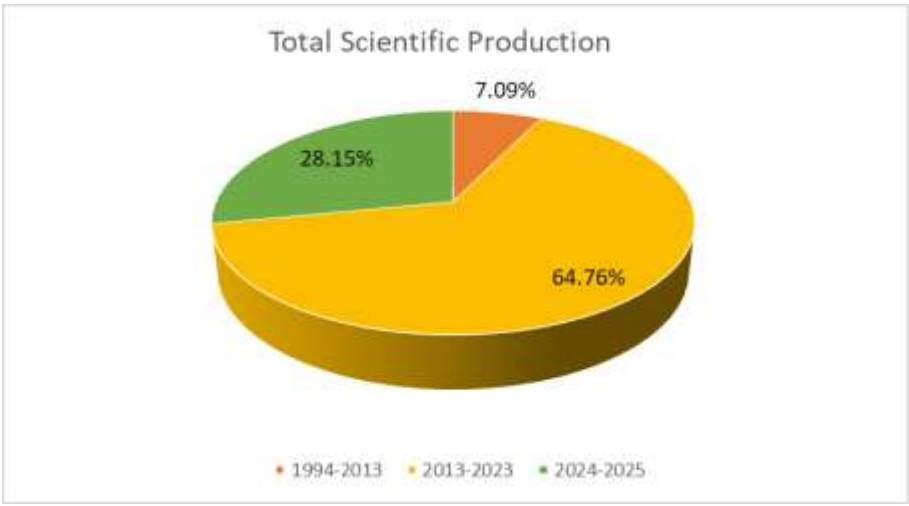


Figure no. 2: Total Scientific Production.
Source: Author's own computation

A significant impact study by Hahn and Kühnen (2013), which outlines objectives similar to our research, involves a quantitative and qualitative research analysis in the Web of Knowledge database for the period 1999 to 2011, identifying articles that synthesize using the main keywords: "GRI", "social report*", "CSR report*", "environment* report*", etc. (Hahn & Kühnen, 2013). The results of this paper emphasize the shift from environmental reports to sustainability reports and toward the Double Bottom Line (integration of social and environmental aspects), or, more recently, the Triple Bottom Line (TBL), which adds financial aspects.

The second period of evolution of academic writings dates from 2014 to 2023, with a total production of 283 articles (64,76%). Although it spans a decade, the average annual production is 28 items, which accounts for approximately one year and a quarter of the entire previous period. This decade begins with slow fluctuations from 2014 to 2017; from 2018 onward, sustainability became a major research focus, and 2023 was the most productive year (57 articles).

This period is marked by major developments in both European and international reporting landscape, including the NFRD and the EU Corporate Sustainability Reporting Directive (CSRD) in 2022 in Europe, and the respective adoption of the TCFD recommendations and the establishment of ISSB.

One significant contribution during this period is the work of Luo and Tang (2023), who highlight the actual impact of ESG reporting and GRI standardization on carbon mitigation.

This study presents a detailed analysis of how the quality of information in sustainability reports relates to carbon mitigation for a sample of listed companies from 53 countries, spanning 2002 to 2019. The results showed no significant association between ESG reporting and carbon mitigation, compared with GRI reporting.

Luo and Tang (2023) provide international evidence that, after controlling for ESG reporting, firms adopting GRI Standards in preparing their ESG reports tend to achieve greater carbon mitigation. Furthermore, the positive effect of GRI adoption on carbon mitigation is particularly evident in weaker institutional and legal environments. Specifically, the authors find a positive and statistically significant effect for countries with French legal origin, whereas the corresponding effects are not statistically significant for countries with English, German, or Scandinavian legal origin (Luo & Tang, 2023).

Another impactful theme is the Circular Economy (CE), highlighted by Esposito et al. (2023). A notable finding is the importance of the circular economy as an alternative economic direction, highlighting the need for companies to implement and approve CE practices, policies, and performance disclosures for stakeholders. This research focuses on the integrated reports of 124 European companies. One key finding is the presence of an internal CSR committee responsible for organizing and reporting on the CE.

In the last two years (2024- 2025), the differentiated period comprises a sample of 123 resources. This publication intensity suggests that sustainability reporting is becoming a top research priority, coinciding with multiple international standards and companies' mandatory ESG reporting.

The authors' study directions during the period shift away from classic sustainability reporting towards its global effects, the harmonization of regulations at the international level, and adaptation to new challenges affecting the capital market and human restructuring, following the segregation and delegation of the sustainable reporting function to respective service providers.

Roy and Mukherjee (2025) explore the link between national organizational culture and its impact on ESG disclosures. The study finds that cultural factors have a greater impact on corporate ESG behaviour and importance across countries than economic factors, as shown by a linear econometric model, supporting previous researchers' ideas (Ortas et al., 2015). Thus, there is no universal good practice for corporate ESG behaviour, but rather an implication of the social culture of every country in question.

Authors Free C., Jones St., and M.-S. Tremblay (Free et al., 2025) addresses greenwashing and how to ensure accounting sustainability, offering a new research direction for the coming period. They prioritise three key aspects of greenwashing research, including new greenwashing regulatory standards, the professional implications of ensuring the quality of sustainable reporting, and the capital market opportunities related to greenwashing.

Additionally, a paper by professors Zhu et al. (2025), covering Chinese companies between 2012 and 2021, also follows this line of thinking. Here, three mechanisms are identified through which institutional investors encourage greenwashing: corporate governance, information transparency, and corporate operations.

Based on the above, studies conducted between 1994 and 2025 show increasing thematic diversity, particularly in the later periods.

To assess whether scientific research in sustainability reporting reflects macro-level trends within the broader discipline, a second, expanded search was conducted. While the initial dataset isolates literature explicitly related to sustainability reporting and

disclosure, the secondary dataset will encompass publications dealing with the fundamental paradigms of „sustainability".

A comparative longitudinal analysis of annual scientific output across both datasets will be conducted, using the same restrictions as in the initial analysis, such as Web of Science categories and language filters. This methodology aims to determine whether the growth trends in sustainability reporting research align with broader disciplinary developments or indicate an independent, specialized evolution. Ultimately, this comparative framework offers a macro-contextual benchmark, thereby enabling a more comprehensive interpretation of the thematic maturity and the growing prominence of sustainability reporting within the scholarly literature.

To make the benchmark comparable with the main search, the benchmark query was re-run on 26 October 2026 with the WoS Index Date restricted to 1900-01-01–2025-11-23, so that it covers only records indexed by the date of the main search. Because WoS records are updated after indexing, this is an approximation of the database state on 23 November 2025. The search used the query: ALL FIELDS (sustainab*) and gave an initial result of 1.771.436 documents. The filtering was done following the same logic as for the initial search: restricting to the Web of Science categories "business finance", "business", "management", "green sustainable science and technology", "economics", and "environmental studies" and restricting the language of documents restricted to English. This approach avoids creating differences between the two searches rather due to filtering than to interest in the field.

Given the substantial volume of articles initially identified, subsequent filtering resulted in a total of 478.694 publications. We used the Results Analysis function in Web of Science to determine the annual number of publications (Figure no. 3).

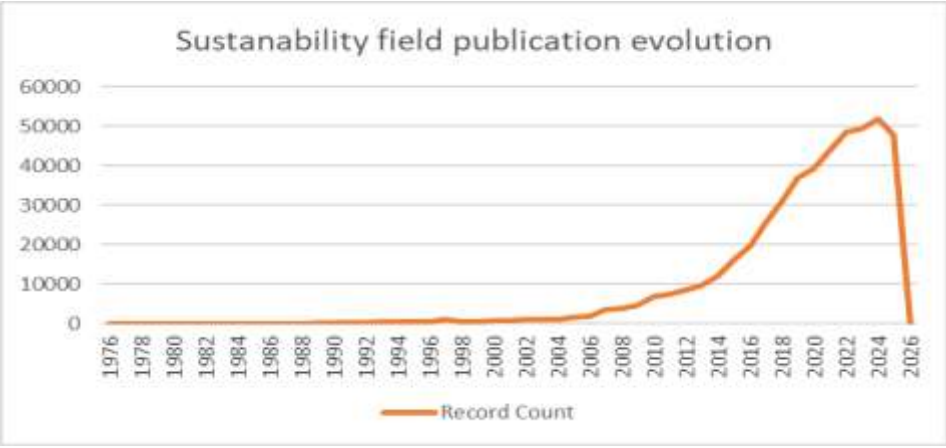


Figure no. 3: Annual scientific production

Source: Author's own computation in Excel, based on Web of Science „Results Analysis" function

The comparison indicates that the sustainability reporting and disclosure research broadly parallels the expansion of the wider sustainability literature. Although

sustainability research has a substantially longer history, with the first study tracing back to 1976, and a much larger publication volume, both domains show a marked acceleration in scientific production from the mid-2010s, followed by particularly strong growth in recent years. Sustainability reporting therefore appears to have developed as a more specialized research stream within the broader sustainability research domain rather than as an independent trajectory.

Nevertheless, the considerably smaller volume and later emergence of sustainability reporting research suggest that its development constitutes a more specific and relatively recent facet of the broader sustainability research agenda.

To visually compare the growth rate and divide the papers into the main clusters identified for sustainability and environmental reporting, from the total database of the broader search, I excluded the papers published before 1994 (1,108 papers) and the ones published after 23.11.2025 (17). The total number of articles included in the following analysis of the growth rate is 477.569. These exclusions allow for a better analysis, understanding how the niche theme evolved compared to the broader one in the same window.

Table no. 1. Comparative analysis between the two databases

Period	Broader set (Sutainability)	Period growth rate of broader dataset (Sutainability)	Sustainability and environmental reporting	Period growth rate of sustainability and environmental reporting	Share of broader field
1994-2013	55,609		31		0.0557%
2014-2023	322,531	480%	283	813%	0.0877%
2024-2025	99,429	-69%	123	-57%	0.1237%
TOTAL	**477,569**		**437**		**0.0915%**

Source: Authors' own computation in Excel

To assess whether sustainability-reporting research constitutes a genuinely specialized research domain rather than merely reflecting the expansion of the broader sustainability literature, we calculated its proportion of total sustainability-related publications across the three periods identified in figure no. 2. This proportion increased from 0.0557% (1994–2013) to 0.0877% (2014–2023) and then to 0.1237% (2024–2025), indicating a modest but consistent rise in the relative significance of reporting-specific scholarship within the wider field. Sustainability and environmental reporting represent a small and young niche of the broader field.

In the first interval, the reporting share was marginal. With only 31 papers in 20 years, it was close to a non-topic. Although the corporate reporting existed in practice (GRI began roughly in 1997), academia attention in the share of whole field was minimal to reporting.

In the second interval, the share rose by 57% (from 0.0557% to 0.0877%). Reporting gained relative importance, and this coincides with the maturation of GRI standards, the adoption of integrated reporting, the NFRD and the TCFD recommendations; however, the bibliometric design does not establish these developments as causal drivers.

The last interval shows the peak of publications per year. This fits the CSRD/ESRS and ISSB era, when the mandatory disclosure became a live research topic. The regulatory

share of total sustainability broader topic lag suggests that the real wave of empirical CSRD papers may come in later periods, so the share could keep rising.
Although the overall sustainability literature reveals a lower annual growth rate during the 2014-2023 period compared to the previous 1994–2013 period, interest in sustainability and environmental reporting appears to vary at a higher rate. This suggests that the flow of research linking sustainability to environmental reporting grew faster than the broader literature on sustainability in the period 2014–2023. It remains within this broader scope, consistent with the parallel trends shown in figure no. 3. The raw growth rates (480%, -69%, 813%, -57%), compare periods of unequal lengths: 20 years, 10 years and 2 years. The negative numbers are not showing decline, annualized figures showing a fairer view, both domains are still growing (Table no. 2).

Table no. 2. Annualized publications

Period	Publications/year-broader set	Publications/year-sustainability and environmental reporting
1994-2013	2,780	1.55
2014-2023	32,253	28.30
2024-2025	49,715	61.50
TOTAL		

Source: Authors' own computation in Excel

3.1.1 Authors

The most pertinent authors were identified based on publication counts, emphasizing researchers who have contributed most significantly to the literature on sustainability and environmental reporting.

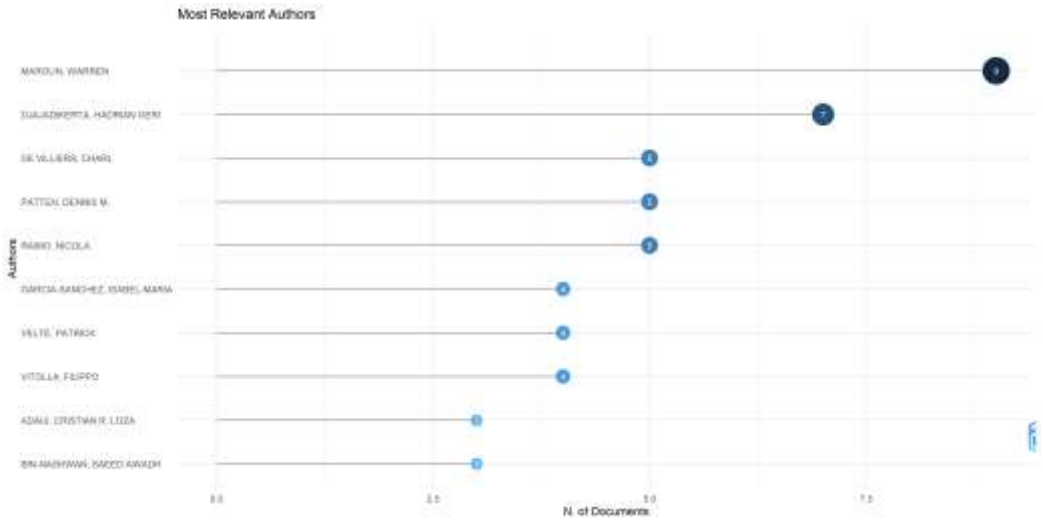


Figure no. 4: Most relevant authors.
Source: Author's own computation based on Biblioshiny

The most influential authors based on the number of citations are displayed in Figure no. 5. These authors are considered relevant because their papers are cited and address subjects of interest to other researchers.

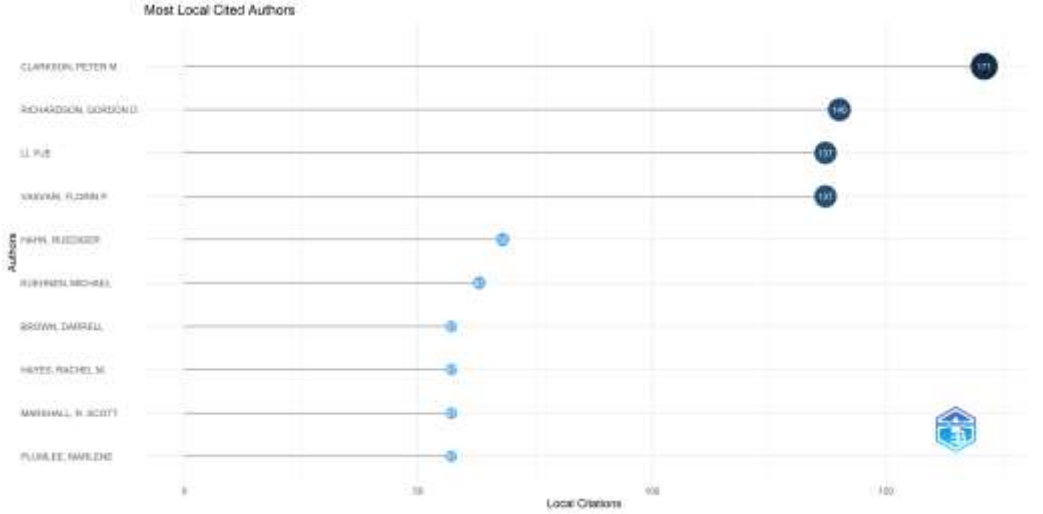


Figure no. 5: Most locally cited authors
Source: Author's own computation based on Biblioshiny

The most locally cited author is Clarkson, with three publications in the dataset, co-authored with the next 3 authors in the ranking (Clarkson et al., 2008, Clarkson et al., 2011, Clarkson et al., 2020). The papers, published in 2008, 2011, and 2020, primarily

focus on environmental reporting and disclosure and their correlations with environmental and corporate performance. The first two papers are relevant not only for their empirical findings but also for their methodological contribution: developing a GRI-based index to assess discretionary environmental disclosure. This methodological contribution provides a basis for subsequent empirical research in the field. The latest publication emphasizes textual analysis of US corporate social responsibility reports; despite being the most recent, it has garnered the highest number of citations. This illustrates the field's evolution toward more sophisticated disclosure analysis, using computational textual analysis to examine whether linguistic characteristics of CSR reports can reveal information about firms' CSR performance.

Within the database, the co-authorship network illustrates the collaboration clusters among researchers. As depicted in Figure no. 6, the network is characterized by small, isolated pairs or trios of co-authors, rather than a large connected component. This suggests the field has low collaboration density, with researchers tending to operate within fixed, closed teams rather than crossing between research groups. Within this intersection corpus, the co-authorship network is fragmented into relatively small collaboration groups. Given the search design, this pattern should not be generalized to the broader sustainability-reporting literature.

Most clusters show two interconnected nodes (e.g., Maroung Warren and Cerbione Dannielle, Bin-Nashwan and Saeed Awadh, etc.), though there are also later clusters, such as the red and orange ones. "Maroun, Warren" has the largest node; however, it appears connected to relatively few other nodes, which could indicate high productivity (a substantial number of solo or primary-author publications) but limited collaborative reach.

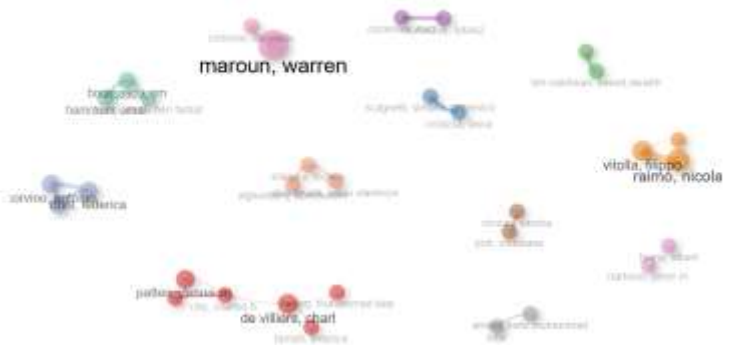


Figure no. 6: Co-authorship network
Source: Author's own computation based on Biblioshiny

3.1.2 Sources

A fundamental aspect of any bibliometric analysis is to determine the publication venues of relevant research, as the distribution of research papers across journals illustrates the structure of a field and the degree of specialization or fragmentation

within the literature. This subchapter examines the journals that have published research on environmental and sustainability reporting within the dataset. It identifies the most influential sources and considers how the publication landscape has evolved in conjunction with the terminological and regulatory shifts discussed previously.

The most significant sources, consisting of the first ten journals ranked by publication volume, account for more than 40% of the entire dataset. These sources indicate that research on environmental and sustainability reporting is disseminated through both generalist sustainability and management journals, as well as specialized accounting outlets. 'Sustainability', with 40 articles, and 'Business Strategy and the Environment', with 30 articles, are the leading publications in this regard.

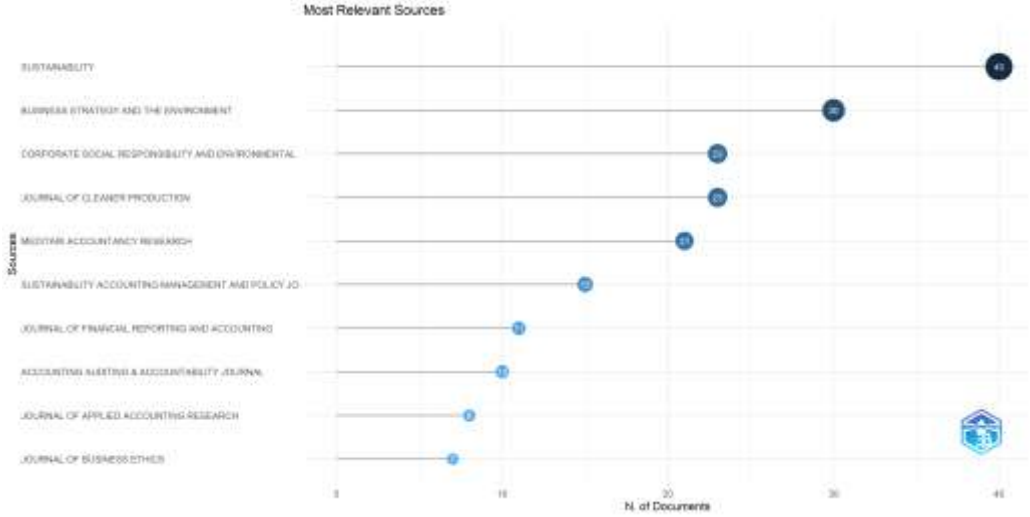


Figure no. 7: Most relevant sources

Source: Author's own computation based on Biblioshiny

While the ranking of the most relevant sources identifies the leading journals in absolute terms, it does not reveal when these journals entered the field or how they contributed over time. In Figure no. 8, this limitation is addressed by illustrating the cumulative production of the top five journals.

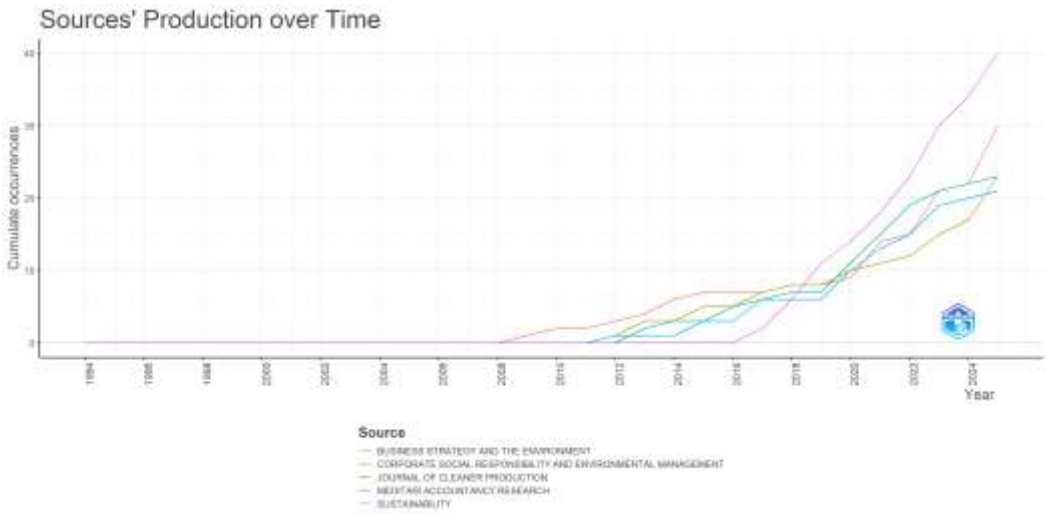


Figure no. 8 Source dynamics

Source: Author's own computation based on Biblioshiny

Interestingly, all five journals remained silent prior to 2008-2011, thereby being consistent with the interpretation that the field only began to garner significant momentum in the late 2000s to early 2010s, coinciding approximately with the adoption of the NFRD.

Business Strategy and the Environment is acknowledged as the pioneering journal, beginning its publication in 2008 and sustaining its leadership for over a decade. This post-2018 increase coincides with major developments in the reporting framework, but the bibliometric design does not establish a causal regulatory effect.

The analysis of the source indicates a field that is both interdisciplinary and rapidly developing: the ranking of Most Relevant Sources indicates a combination of extensive sustainability and management journals along with specialized accounting outlets. Furthermore, the Source Dynamics graph illustrates that this structure has predominantly materialized after 2018, with Sustainability surpassing earlier, more stable contributors such as Business Strategy and the Environment to become the leading publication by 2025. This pattern of delayed yet rapid growth coincides with the period of major CSRD/ISSB-related developments and with an increasing concentration of publications in broad sustainability journals. The bibliometric evidence indicates temporal association rather than a causal regulatory effect.

3.2 Trending topics

We have previously touched on tangential aspects of how topics have evolved.

At the beginning of their research, authors primarily used keywords such as “sustainable development,” “social reporting,” or “CSR.” Although it appeared in the literature in 2012, “corporate sustainability” remains a key author keyword in publications today, one of the few that has retained its usefulness over time.

In Figure no. 9, we can observe the frequency and variety of words used by researchers in scientific production, from their simplicity, voluntary character, and lack of structural regulations in 2011-2016, to regulation, disclosure, mandatory requirements, and integrated reporting in the period 2017-2023, which ultimately oscillates towards corporate responsibility, ESG, and more recently greenwashing, outlining future research directions.

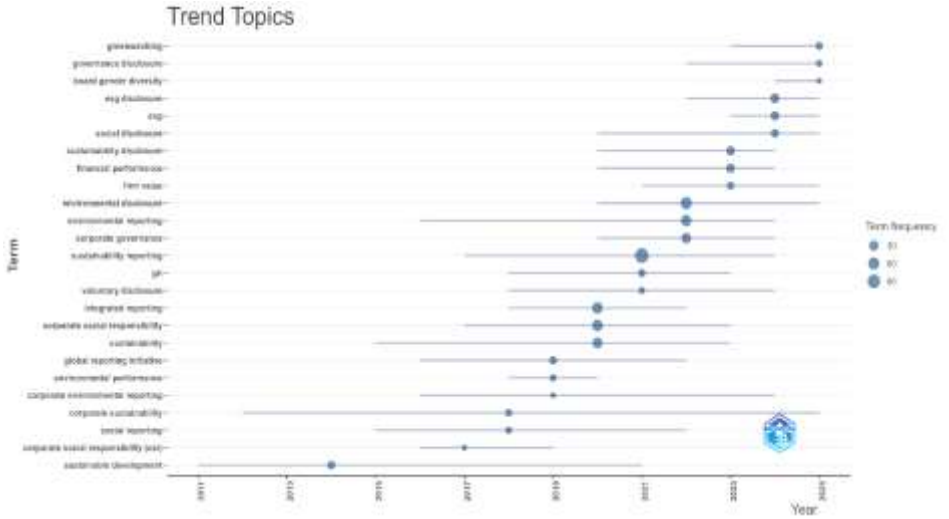


Figure no. 9: Trend topics from 2011 – 2025.

Source: Author's own computation based on Biblioshiny

Between 2014 and 2021, the terms "sustainability," "environmental reporting," and "environmental performance" began to be used tangentially. The trend topics chart shows the central part of each term's distribution over time. This does not mean these terms disappear from the literature, but that their use is concentrated in earlier years than in more recent terms. The author-keyword "sustainability reporting," with the highest frequency of 118 times, shows a decline trend beyond 2024, following the same trend as the words "corporate governance," "voluntary disclosure," "financial performance," and "sustainability disclosure."

The newest research directions in 2024 involve the increasingly frequent use of the keywords "firm value" (11 times), "social disclosure" (16 times), and "ESG" (21 times) or "ESG disclosure" (27 times).

This year's writings include the concepts of "greenwashing," "governance disclosure," and "board gender diversity." We understand that, as internationalization and information standardization increase, we are entering a new era of corporate responsibility and global ecological corporate behaviour.

The most frequently used terms are "sustainable reporting" (118), followed by "environmental disclosure", which appears 62 times, and 51 times "integrated reporting", which is the third word mentioned between 2018 and 2022, while the least used only for 5 times, were "CSR", "corporate environmental reporting", and "board gender diversity."

3.3 Co-occurrence analysis

In this subsection, we highlight the most important themes, clustering them using the Louvain algorithm (Blondel et al., 2008), which groups subjects by the frequency and intensity of correlation between the authors' keywords. Guided by this structure, the representation of the words is centered in four dimensions relative to the center; therefore, the basic themes are positioned in the lower right corner, above them are the motor themes, in the upper left corner are the niche themes, and in the lower left corner are the emerging themes, or those that are about to disappear from usefulness.

Inspired by Handro and Dima (2024) and using the opportunities of the Biblioshiny tool and the Louvain algorithm integrated into it, we identified 1069 authors' keywords. As part of the process, we selected the 250 most frequent terms, with a minimum occurrence of five per thousand documents. Additionally, we excluded country names and JEL terms from the groups because country keywords were considered inappropriate.

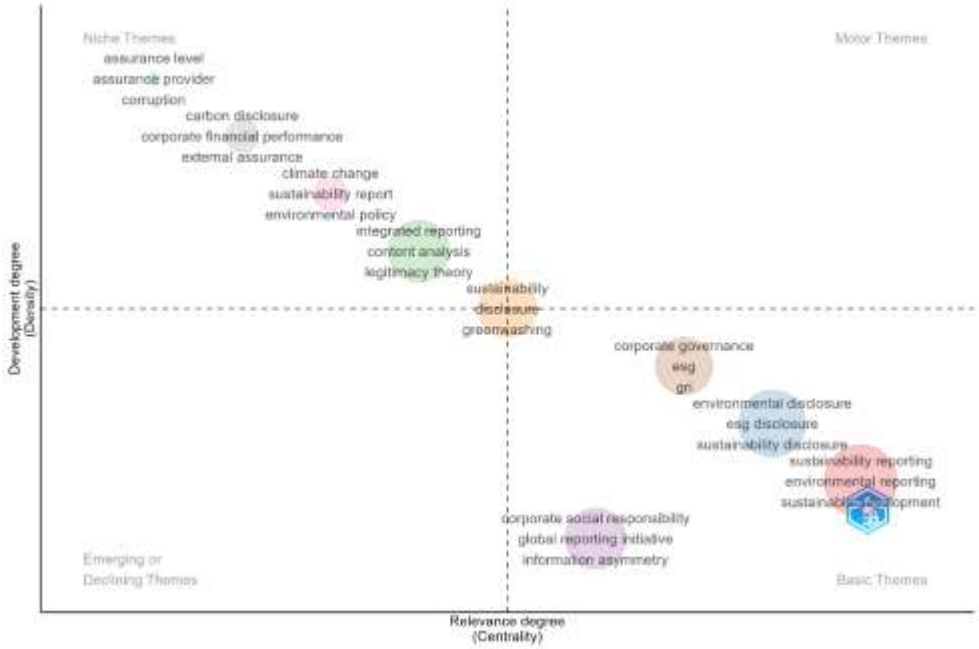


Figure no. 10: Thematic map.

Source: Author's own computation based on Biblioshiny

In our research, we grouped the central themes into four clusters (Figure no. 10). The most representative cluster comprises 48 keywords, including "sustainability reporting", "environmental reporting", and "sustainable development", with a total frequency of 365 (Figure no. 11). Its position on the right side of the plot highlights the theme's current relevance, adequacy, and appropriateness. The next cluster, positioned to the left of "sustainability reporting", includes the author's keywords: "corporate social responsibility", "global reporting initiative", and "information asymmetry", which appears 181 times. The third one is superior to the main cluster with 36 keywords and

includes the terms: „environmental disclosure", "ESG disclosure", and "sustainability disclosure", which appear 260 times (Figure no. 12). Finally, the „corporate governance" cluster contains 25 keywords involving „ESG", „GRI", „corporate sustainability", and „accountability". The composition of the cluster is relevant to the relationship between the two domains. 'Environmental reporting' belongs to the same core cluster as 'sustainability reporting', indicating that the two terms are used together. At the same time, 'environmental disclosure' forms a distinct cluster with 'ESG disclosure' and 'sustainability disclosure'. This result highlights that the vocabulary is structured around both the environment-sustainability distinction and the distinction between 'reporting' and 'disclosure'. This pattern reflects two different research traditions. They relate to studies that measure disclosure through content-based indices and to studies that discuss reporting frameworks.

At the intersection of all quadrants is the „sustainability" cluster, containing 29 terms, such as: „disclosure", „greenwashing", „reporting", „governance", „environmental", and others.

Indeed, these words have been identified in the last two years, including others like "brown washing", "board gender diversity", and "governance disclosure", which emerge as relatively recent themes within the analysed corpus.



Figure no. 11 Sustainability reporting cluster
Source: Author's own computation based on Biblioshiny



Figure no. 12 Environmental disclosure cluster.
Source: Author's own computation based on Biblioshiny

The following four clusters refer to niche topics that cover relatively limited and specific scientific areas. The first one is „integrated reporting" with a frequency of 151 times, demonstrating that the scientific community's interest in subjects or keywords with more limited utility, such as „content analysis", „legitimacy theory", „institutional theory", „circular economy", and „stakeholder theory", is limited.

The next three clusters in this category, „climate change", „carbon disclosure", and „assurance level", are much more specific. The first, with a frequency of 34 times, is „carbon disclosure", represented by 13 words, such as „corporate financial performance", „external assurance", and „cost of equity capital". The second cluster, „climate change," is much smaller and presents the environmental dimension through nine terms: „sustainability reporting", „environmental policy", „carbon risk", and „climate-related risks". Last, the „assurance level" cluster includes „corruption", „nonfinancial reporting", and „financial analysis".

Notably, these selections classified articles into only two categories—basic and niche—without any clusters occupying the emerging and declining themes or the motor themes. This configuration can be interpreted in two ways. On the one hand, it can highlight thematic consolidation. On the other hand, it can reflect the search method. Since the corpus is built around search terms, the positions of the clusters depend on the selected parameters.

To examine how the two vocabularies change within the corpus, independently of the clustering, table no. 3 reports the share of records containing each query term by period. Environmental-reporting vocabulary does not disappear, but its dominant label changes: "environmental reporting" appears in 61.3% of records in 1994–2013 and 22.0% in 2024–2025, while "environmental disclosure" rises from 41.9% to 81.3%. On the sustainability side, ESG and non-financial labels enter after the first period ("ESG disclosure": 0% in 1994–2013, 8.8% in 2014–2023, 27.6% in 2024–2025; "non-financial disclosure": 3.2%, 23.7%, 19.5%), integrated reporting peaks in 2014–2023 (20.8%), and "triple bottom line reporting" almost disappears. "Sustainability reporting" remains prominent throughout. Climate-specific terms are rare in every period (at most

4.1%), so the environmental side of the corpus is represented mainly by environmental reporting and disclosure rather than climate reporting. Because 1994–2013 contains only 31 records, differences of a few percentage points in that period correspond to one or two papers and are not interpreted. These shifts describe changes in how authors label the two domains, not changes in corporate reporting practice.

Table no. 3. Prevalence of query terms in the intersection corpus, by period

Term in title, abstract or keywords (% of records)	1994–2013 (n=31)	2014–2023 (n=283)	2024–2025 (n=123)
Sustainability-reporting set (A)			
Sustainability reporting	74.2	46.3	54.5
Corporate sustainability reporting	3.2	3.5	8.1
Non-financial reporting	0	11.3	8.1
Non-financial disclosure	3.2	23.7	19.5
ESG reporting	6.5	2.8	4.1
ESG disclosure	0	8.8	27.6
Sustainability disclosure	25.8	18.4	27.6
Integrated reporting	9.7	20.8	7.3
Triple bottom line reporting	6.5	0.7	0
Environmental/climate set (B)			
Environmental reporting	61.3	27.2	22
Environmental disclosure	41.9	80.9	81.3
Climate reporting	0	1.1	3.3
Climate disclosure	0	2.5	4.1
Any term from set A	*100*	*97.2*	*99.2*
Any term from set B	*96.8*	*100*	*100*

Source: Author's computation in R (bibliometrix)

Notes: terms are not mutually exclusive, so columns do not sum to 100. Percentages for 1994–2013 are based on 31 records. Matching is case-insensitive in titles, abstracts, author keywords and Keywords Plus.

To assess robustness, the Louvain and Spinglass algorithms were applied to the same network of 239 author keywords (Methods). Across 50 runs, Louvain identified between 12 and 15 clusters (mean 13.4) and Spinglass between 16 and 22 (mean 19.6). Agreement between the two partitions was substantial according to NMI (mean 0.78, range 0.72–0.86) and moderate according to ARI (mean 0.59, range 0.47–0.74). The difference between the two indicators reflects the finer partition produced by Spinglass. Louvain was more consistent with itself (mean NMI between repeated runs = 0.89, range 0.82–0.96) than with Spinglass, which suggests that the lower agreement between algorithms reflects differences between the methods and not only random variation. The core themes are therefore stable across algorithms, whereas the boundaries between neighbouring themes and the number of clusters depend on the algorithm. We therefore interpret cluster-level results as indicative.

3.4 Thematic evolution

The thematic evolution compares the authors' keywords across the three periods.

Continuing, figure no. 13 outlines the top 10 words with a significant impact in the sample of articles. "Sustainability reporting," as we mentioned before, is at the top of the ranking, followed by "environmental disclosure" and "corporate social

responsibility", and third place by 'integrated reporting" and 'environmental reporting"; after that, "corporate governance", "sustainability", and "ESG disclosure".



Figure no. 13: Word Cloud.
Source: Author's own computation based on Biblioshiny

Figure no. 14 shows how the terms used in each period change, against a background of economic, political, and regulatory developments.

Therefore, between 1994 and 2013, only five categories of terms were used in academic writing: "sustainability reporting" as a fundamental and top idea, "sustainability", "social and environmental reporting", "integrated reporting", and "corporate governance". This limited set of terms corresponds to a period in which reporting was largely voluntary and lacked a binding legislative framework.

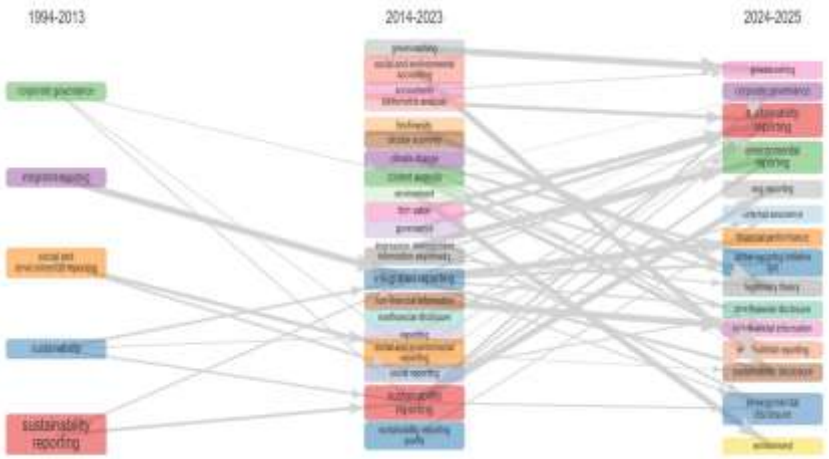


Figure no. 14: Thematic Evolution.
Source: Author's own computation based on Biblioshiny

A significant development in the sustainability reporting area occurred in 2014, with the adoption by the EU Parliament and the Council of the European Union of the EU Non-

Financial Reporting Directive (NFRD), which introduced non-financial disclosure requirements for certain large public-interest companies. In the following years, several voluntary reporting frameworks emerged, including the issuance of the GRI Standards in 2016, the TCFD recommendations published in 2017 or the Sustainability Accounting Standard Board Standards in 2018. In the following year, the European Green Deal established a broader policy framework for the EU's transition towards climate neutrality. This regulatory evolution continued with the adoption of the CSRD in 2022, which expanded the scope and detail of corporate sustainability reporting requirements. The discussion around sustainability and environmental reporting in the context of regulatory frameworks is continuously changing and adapting to crises and defined periods, also adopting simplification packages, such as the OMNIBUS Simplification Package adopted in early 2026, amending core green transition rules, a development that falls outside the period covered by the data.

At the top of the list of motor themes in "firm value" as a key to explain the value of companies are "social and environmental accounting" for the niche of accountancy, and the necessity of disclosure of qualitative information in financial statements, as well as the first signs of "greenwashing" and "circular economy."

In 2024 and 2025, the terms that become more frequent concern ESG, greenwashing and board gender diversity (Figure no. 17).

Author keywords are available for 87.1% of records in 1994–2013, 96.1% in 2014–2023 and 99.2% in 2024–2025. The raw number of unique keywords rises with the size of the corpus, from 100 to 726 and then falls to 427, so we compare normalised measures. Unique keywords per record are 3.70, 2.67 and 3.50 in the three periods, and the type-token ratio is 0.65, 0.51 and 0.61, which indicates that the vocabulary became more concentrated in 2014–2023 and returned to a more varied profile in 2024–2025, and not a steady expansion. Several keywords are more frequent in 2024–2025 than in all earlier records (Table no. 4). Keywords containing "ESG" appear in 34.1% of records in 2024–2025, against 9.9% in 2014–2023 and none in 1994–2013, and "ESG disclosure" rises from 3.9% to 16.3% (Benjamini–Hochberg adjusted $p < 0.001$ for both). "Greenwashing" (1.4% to 6.5%) and "board gender diversity" (0% to 4.1%) also increase significantly (adjusted $p = 0.008$ and 0.003), but they are used by only 8 and 5 records respectively. "Governance disclosure" (1.4% to 4.9%, adjusted $p = 0.040$) shows weaker evidence of an increase, and "firm value" (2.1% to 4.1%) does not differ significantly from earlier periods (adjusted $p = 0.305$). Because the last period covers two years and 123 records, these results are exploratory.

Table no. 4. Number (%) of records whose author keywords contain the term

Author keyword	1994–2013 (n=31)	2014–2023 (n=283)	2024–2025 (n=123)	Adjusted p
ESG	0 (0.0%)	28 (9.9%)	42 (34.1%)	<0.001
ESG disclosure	0 (0.0%)	11 (3.9%)	20 (16.3%)	<0.001
Greenwashing	0 (0.0%)	4 (1.4%)	8 (6.5%)	0.008
Board gender diversity	0 (0.0%)	0 (0.0%)	5 (4.1%)	0.003
Governance disclosure	0 (0.0%)	4 (1.4%)	6 (4.9%)	0.04
Firm value	0 (0.0%)	6 (2.1%)	5 (4.1%)	0.305

Source: Author's computation in R (bibliometrix)

Adjusted p: Fisher's exact test of 2024–2025 vs. all earlier records, Benjamini–Hochberg correction across six keywords. "ESG" also matches longer keywords that contain it.

3.5 Discussion

The results of our paper highlight three patterns: 1. a strong increase in the number of articles after 2014, 2. a change in vocabulary composition associated with environmental and sustainability reporting, and 3. grouping of environmental reporting terms together with sustainability reporting terms. These patterns reflect the field's conceptual development, as reporting has expanded from environmental to social and governance issues. As integrated and ESG concepts have gained traction (Krasteva-Hristova et al., 2025; Kim and Yang, 2025; Mohanasundaram and Mathivanan, 2026), environmental reporting has continued to develop as a distinct line of research (Rivo-López et al., 2025). However, these patterns may also reflect how the corpus was constructed, as the selection and combination of search terms, as well as database coverage, influence the results of bibliometric studies (Hoang, 2025). The design of the intersection ensures that both vocabularies are present in every record. Several search terms have only become common in recent years. The most common keywords align with search terms, and the number of journals and publication volume have increased over time (Mohanasundaram and Mathivanan, 2026). Comparison with the broader literature on sustainability (Table 1, figure no. 3) controls the overall growth of publications, but not of the other factors. Moreover, keyword-based thematic maps are sensitive to keyword selection, time window, and grouping algorithm, and bibliometric techniques capture structural patterns rather than causal links (Mohanasundaram & Mathivanan, 2026). The results should be interpreted as describing the evolution of vocabulary in literature linking the two domains.

The theories presented in the literature review explain why companies disclose sustainability information. The bibliometric results help interpret the questions that the analyzed literature prioritized.

Legitimacy theory (Suchman, 1995) views disclosure as a way to maintain social acceptance. The keyword "legitimacy theory" appears in the integrated reporting cluster, and the most recent period is marked by the emergence of "greenwashing." This

increasing attention to these terms aligns with a legitimacy perspective, in which disclosure may serve symbolic purposes rather than reflect actual performance. The most cited local works in the corpus (Clarkson et al., 2008, 2011) also examine whether environmental disclosure reflects environmental performance, placing this theoretical debate at the center of the literature on intersection.

Signaling theory and the information asymmetry perspective (Akerlof, 1970; Spence, 1973) view disclosure as a way to convey otherwise unobservable quality to investors. "Information asymmetry" appears in the corporate social responsibility/GRI cluster, while "cost of equity capital" and "corporate financial performance" appear in the carbon disclosure cluster. "ESG disclosure" becomes significantly more frequent in 2024–2025, but "firm value" does not (Table no. 4), so the evidence for a growing capital-market focus is limited.

Institutional theory (DiMaggio and Powell, 1983) emphasizes regulatory and normative pressures. The keyword "institutional theory" appears in the integrated reporting cluster, and topics associated with mandatory frameworks, such as "non-financial reporting" in the assurance-level cluster and "governance disclosure" in the most recent period, become more visible after the introduction of mandatory requirements. This is consistent with research increasingly examining disclosure in response to institutional pressures, although bibliometric data do not show that these pressures influenced corporate behavior.

Stakeholder theory (Freeman, 1984) is reflected in the corporate social responsibility/GRI cluster, as the GRI framework addresses a wide range of stakeholders. The coexistence of this cluster with investor-oriented themes such as ESG disclosure and firm value suggests that the literature combines a broad stakeholder perspective with a more investor-focused one.

Overall, theories do not replace each other in the corpus; they are associated with different groups and periods, suggesting that the literature is based on complementary explanations of disclosure, as mentioned in the literature review.

The results are consistent with previous bibliometric studies in several respects. First, the strong growth in publications after the mid-2010s corresponds to the exponential growth in sustainability reporting research reported by Benameur et al. (2024) for 2000–2022. Contrary to their conclusion that the field reached a stage of "saturation" by 2022, our data show that production in the intersection corpus continued to grow in 2024–2025, both in absolute terms and in relation to the broader sustainability literature.

Second, the importance of Business and Environmental Strategy aligns with Bilal et al. (2024), who identify it as the most productive platform in corporate environmental disclosure research.

Third, the thematic structure partially aligns with Rivo-López et al. (2025), whose clusters include sustainability reporting and governance, as well as environmental disclosure. Our map similarly separates a sustainability reporting cluster, an environmental/ESG/sustainability disclosure cluster, and a corporate governance cluster. Bilal et al., 2024, also places institutional legitimacy and theory outside the thematic map's core themes, consistent with our finding that theoretical keywords appear in a niche cluster rather than among the core themes.

In relation to these reviews, this study contributes through its corpus design. Because every record contains both vocabularies, their co-location in the thematic map is a product of construction. The informative results are the change in their relative labels (environmental reporting gives way to environmental disclosure, and ESG and non-financial terms become more prominent on the sustainability side; Table no. 3) and the rising share of this literature within the broader sustainability literature (Table no. 1).

Conclusions

Over decades, epistemic communities have performed a key role in shaping the discussion about the relationship between accounting and social or ecological issues. A long-standing debate on how to account for companies' social and environmental influences occurred well before 1987, when the Brundtland report (UNWCED, 1987) was published (Bebbington, 2021). More than ten years passed between that moment and the publication of the first GRI-based report. Milne and Gray (2013) noted that the term "sustainability" was rarely used in the 1990s in the context of corporate reporting, leading them to conclude that the 1990s were a "lost" decade for sustainability reporting.

This bibliometric review highlights how the literature's vocabulary explicitly linking environmental and sustainability reporting evolved between 1994 and 2025. In the first period (1994–2013), the intersection corpus is small (31 articles, 7.09% of the dataset), and the keywords identified in the literature are concentrated around a limited set of terms, including "sustainability", "sustainability reporting", "social and environmental reporting", "integrated reporting", and "corporate governance". In the second period (2014–2023), the body grows to 283 articles, and the vocabulary changes in composition: "integrated reporting", "environmental disclosure", "ESG disclosure", and "sustainability disclosure" frequently become authors' keywords, alongside "sustainability reporting". In the most recent period (2024–2025), 123 papers introduce or intensify the use of terms such as "ESG", "ESG disclosure", "greenwashing", "governance disclosure", and "board gender diversity". The observed evolution is driven primarily by improvements in the terms used and combined by researchers, not just by a direct measure of changes in corporate reporting practice.

The increase in the volume and diversity of research after 2014 coincides with the introduction of regulatory frameworks, especially in the European Union, and the development of international standards. During this period, the vocabulary of the analyzed literature extends from environmental and social reporting to terms that combine environmental, social, and governance aspects, such as integrated reporting and ESG disclosure. As the study is descriptive, this alignment is interpreted as a temporal correlation. Additionally, the research focuses on sustainability in general (figure no. 3), and the search strategy's characteristics may also contribute to the observed pattern.

More recently, the literature increasingly addresses ESG, ESG disclosure, greenwashing, board gender diversity" and "governance disclosure" (weak). Terms related to environmental and climate reporting do not disappear from this literature. They appear in a broader vocabulary that also covers social and governance issues.

Individual studies in the corpus point to additional factors, such as national culture (Roy & Mukherjee, 2025; Ortas et al., 2015)

Regarding RQ1, within the literature that addresses both domains, environmental and sustainability-reporting terms are not separated into different thematic streams. "Environmental reporting" and "sustainability reporting" fall in the same core cluster of the thematic map, and "environmental disclosure" groups with "ESG disclosure" and "sustainability disclosure". Because the search requires both vocabularies in every record, this co-location is partly a product of the design; the informative result is how the vocabulary around the two changes across periods. In the first period (1994–2013), the author keywords concentrate on a few terms. In 2014–2023, they diversify toward integrated reporting, environmental disclosure and ESG disclosure. In 2024–2025 ESG, ESG disclosure, greenwashing, board gender diversity," and "governance disclosure" (weak) appear or intensify. These changes coincide in time with the NFRD, the TCFD recommendations, the CSRD and the ISSB, and with growth of the broader sustainability literature. The descriptive design, the short final period and the search strategy do not allow us to attribute them to regulation. Table no. 3 shows that the environmental vocabulary persists across all periods while changing label, and the sustainability vocabulary shifts toward ESG and non-financial terms.

For RQ2, the thematic map distinguishes between core and niche themes. The core themes target the sustainability reporting cluster, the environmental/ESG/sustainability disclosure cluster, the corporate social responsibility/GRI cluster, and the corporate governance cluster. The niche themes include integrated reporting, carbon disclosure, climate change, and assurance level. No cluster is in the driving or emerging quadrants of the overall map. The thematic evolution at the period level and trend themes indicate that terms such as 'ESG', 'ESG disclosure', and 'greenwashing' are gaining visibility in 2024–2025. Given the short duration of this period, we interpret these concepts as potential future focal points.

The paper's main contribution is to map how the relationship between environmental reporting terminology and the broader terminology of sustainability reporting has developed in the literature that explicitly links the two fields. The results show that, in this literature, environmental reporting is not replaced by sustainability reporting, but is increasingly discussed alongside it, along with integrated, ESG, and disclosure-related terms. Compared with the broader sustainability literature, the study also shows that this line of research has gained traction over time.

Future research could examine whether environmental reporting has developed differently from sustainability reporting. This analysis could address separate corpora for each vocabulary. The increasing presence of greenwashing and ESG disclosure in recent years suggests that the credibility of sustainability disclosures and the consequences of disclosures for capital markets are relevant areas of research. Benchmarking EU and non-EU frameworks can identify patterns specific to the European regulatory context.

Overall, the literature linking the two fields shows an expanding and diversifying vocabulary. Environmental and climate reporting is increasingly discussed alongside integrated reporting, ESG and broader sustainability terms rather than replaced by them. The domains are better read as overlapping than as successive stages, and the observed

changes describe how researchers label and combine concepts, not a measured change in corporate reporting practice.

- **Theoretical and practical implications**

The results suggest that environmental and sustainability reporting should not be conceptualized as successive stages, but as overlapping domains, whose terminology coexists in the literature. The association of institutional and stakeholder legitimacy, signaling and perspectives with different clusters and periods indicates that these theories provide complementary explanations of the problems studied.

From a practical perspective, the implications mainly concern researchers and those who synthesize the literature. Since the same phenomena are described by several partially overlapping terms (sustainability, non-financial, ESG, integrated, reporting or environmental disclosure), searches and literature reviews that are based on a single term risk missing relevant studies. In this context, search strategies should combine multiple terms and report how terminological choices affect the resulting corpus. More consistent use of keywords by authors and journals would also improve the comparability of bibliometric studies. For standard-setters and policymakers, the terminological heterogeneity observed in the academic literature suggests that clear definitions of terms used in reporting frameworks are essential for the comparability of research on their implementation.

- **Limits**

This study unavoidably has several limitations. The first limitation, acknowledged by the authors, concerns the database used. Although the BiblioShiny developers recommend using Web of Science as the database, and even though the platform is widely recognized as a reliable source of research papers, some relevant papers may have been omitted from this analysis because they were not part of the selected database. Currently, no single database encompasses all articles published on specific topics, so relying on any one database would impose limitations. Relying on a single database may omit relevant studies indexed only in Scopus. Future research could replicate the analysis on a merged WoS–Scopus corpus using established de-duplication procedures.

The keywords used to select relevant articles for the database analyzed in the bibliometric study, although aiming to include all synonyms, may have overlooked relevant keywords used by researchers.

The main search (23 November 2025) and the benchmark search were run at different times. The benchmark was restricted by Index Date to approximate the database state at the time of the main search, but Web of Science records are revised after indexing, so this remains an approximation, and 2025 counts in both datasets may be incomplete because of indexing lag.

The three periods were defined a priori with reference to regulatory milestones, so their alignment with those milestones is partly a design choice, and the final period covers only two years and 123 records, which makes its thematic structure less stable.

Methodologically, a limitation is represented by the search string which limits the results to papers that address in any of the bibliographic fields available for a record,

both environmental and sustainability reporting. This search strategy could exclude articles about either environmental or sustainability reporting because the terminology used by the authors does not include both concepts.

Climate-specific query terms appear in at most 4.1% of records, so the corpus mainly reflects environmental reporting and disclosure; conclusions about climate reporting specifically cannot be drawn from it.

Filtering may also have excluded articles important to a clear and thorough literature review. Limiting articles to English, although helpful to the authors, and the restrictions to the 6 Web of Science categories, could also have excluded relevant information that might have influenced our analysis. Relying on English as the standard language for research, especially for non-native speakers, may lead to misinterpretations in the analysis of research papers and underrepresent the global literature.

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References

[1] Adamo, S., De Matteis, C., Fasiello, R. and Imperiale, F. (2025) 'A literature analysis of sustainability reporting quality', *Corporate Social Responsibility and Environmental Management*, 32(5), pp. 4194–4215. Available at: https://doi.org/10.1002/csr.3177.

[2] Anand, S., Dalmia, N., Patnaik, S. and Singh, A. (2023) 'Diving deep into the dark side: A review and examination of research on organizational misconduct in emerging markets', *Business Ethics, the Environment & Responsibility*, 32(2), pp. 514–547. Available at: https://doi.org/10.1111/beer.12514.

[3] Akerlof, G.A. (1970) 'The market for "lemons": Quality uncertainty and the market mechanism', *The Quarterly Journal of Economics*, 84(3), pp. 488–500. Available at: https://doi.org/10.2307/1879431.

[4] Aria, M. and Cuccurullo, C. (2017) 'bibliometrix: An R-tool for comprehensive science mapping analysis', *Journal of Informetrics*, 11(4), pp. 959–975.

[5] Bae, K.H., El Ghoul, S., Guedhami, O., Kwok, C.C.Y. and Zheng, Y. (2019) 'Does corporate social responsibility reduce the costs of high leverage? Evidence from capital structure and product market interactions', *Journal of Banking & Finance*, 100, pp. 135–150. Available at: https://doi.org/10.1016/j.jbankfin.2018.11.007.

[6] Bebbington, J. (2021) 'Foundations of environmental accounting', in Bebbington, J., Larrinaga, C., O'Dwyer, B. and Thomson, I. (eds.) *Routledge handbook of environmental accounting*. Abingdon: Routledge, pp. 17–28.

[7] Bilal, B., Gerged, A.M., Arslan, H.M., Abbas, A., Chen, S. and Manzoor, S. (2024) 'A bibliometric review of corporate environmental disclosure literature', *Journal of Accounting Literature*, 46(2), pp. 214–237. Available at: https://doi.org/10.1108/JAL-01-2022-0006.
[8] Birkle, C., Pendlebury, D., Schnell, J. and Adams, J. (2020) 'Web of Science as a data source for research on scientific and scholarly activity', *Quantitative Science Studies*, 1, pp. 363–376.
[9] Blondel, V.D., Guillaume, J.L., Lambiotte, R. and Lefebvre, E. (2008) 'Fast unfolding of communities in large networks', *Journal of Statistical Mechanics: Theory and Experiment*, 2008(10), article P10008. Available at: https://doi.org/10.1088/1742-5468/2008/10/P10008.
[10] Clarkson, M.E. (1995) 'A stakeholder framework for analyzing and evaluating corporate social performance', *Academy of Management Review*, 20(1), pp. 92–117. Available at: https://doi.org/10.5465/amr.1995.9503271994.
[11] Clarkson, P.M., Li, Y., Richardson, G.D. and Vasvari, F.P. (2008) 'Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis', *Accounting, Organizations and Society*, 33(4–5), pp. 303–327.
[12] Clarkson, P.M., Overell, M.B. and Chapple, L. (2011) 'Environmental reporting and its relation to corporate environmental performance', *Abacus*, 47(1), pp. 27–60.
[13] Clarkson, P., Ponn, J., Richardson, G., Rudzicz, F., Tsang, A. and Wang, J. (2020) 'A textual analysis of US corporate social responsibility reports', *Abacus*, 56(1), pp. 3–34.
[14] Dagli, N., Haque, M. and Kumar, S. (2025) 'Bibliometric analysis in scientific research: Applications, limitations, and key considerations for authors', *Bangladesh Journal of Medical Science*, 24(1), pp. 7–10.
[15] DiMaggio, P.J. and Powell, W.W. (1983) 'The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields', *American Sociological Review*, 48(2), pp. 147–160. Available at: https://doi.org/10.2307/2095101.
[16] Donthu, N., Kumar, S., Mukherjee, D., Pandey, N. and Lim, W.M. (2021) 'How to conduct a bibliometric analysis: An overview and guidelines', *Journal of Business Research*, 133, pp. 285–296.
[17] Du Toit, E. (2024) 'Thirty years of sustainability reporting: Insights, gaps and an agenda for future research through a systematic literature review', *Sustainability*, 16(23), article 10750.
[18] Esposito, B., Raimo, N., Malandrino, O. and Vitolla, F. (2023) 'Circular economy disclosure and integrated reporting: The role of corporate governance mechanisms', *Business Strategy and the Environment*, 32(8), pp. 5403–5419.
[19] Free, C., Jones, S. and Tremblay, M.-S. (2025) 'Greenwashing and sustainability assurance: A review and call for future research', *Journal of Accounting Literature*, 47(4), pp. 739–764.
[20] Freeman, R.E. (1984) *Strategic management: A stakeholder approach*. Boston: Pitman.
[21] Global Reporting Initiative (n.d.) *Vision, mission and history*. Available at: https://www.globalreporting.org/about-gri/vision-mission-and-history/ (Accessed: 12 September 2026).

[22] Gray, R.H. (1994) 'Corporate reporting for sustainable development: Accounting for sustainability in 2000AD', *Environmental Values*, 3(1), pp. 17–45.
[23] Gray, R. (2002) 'The social accounting project and Accounting, Organizations and Society: Privileging engagement, imaginings, new accountings and pragmatism over critique?', *Accounting, Organizations and Society*, 27(7), pp. 687–708.
[24] Hahn, R. and Kühnen, M. (2013) 'Determinants of sustainability reporting: A review of results, trends, theory, and opportunities in an expanding field of research', *Journal of Cleaner Production*, 59, pp. 5–21.
[25] Han, H., Yu, J. and Kim, W. (2019) 'Environmental corporate social responsibility and the strategy to boost the airline's image and customer loyalty intentions', *Journal of Travel & Tourism Marketing*, 36(3), pp. 371–383.
[26] Handro, P. and Dima, B. (2024) 'Analyzing financial markets efficiency: Insights from a bibliometric and content review', *Journal of Financial Studies*, 16(9), pp. 119–175.
[27] Hoang, A.-D. (2025) 'Evaluating bibliometrics reviews: A practical guide for peer review and critical reading', *Evaluation Review*, 49(6), pp. 1074–1102. Available at: https://doi.org/10.1177/0193841X251336839.
[28] Kamadjeu, R. (2019) 'English: The lingua franca of scientific research', *The Lancet Global Health*, 7(9), p. e1174.
[29] Kim, J. and Yang, W. (2025) 'Environmental, social, and governance (ESG) research: A systematic review of recent trends (2020–2024)', *Sustainable Development*, 34(2), pp. 1872–1900. Available at: https://doi.org/10.1002/sd.70370.
[30] Kiruthika, R. and Sakkarapani, K. (2026) 'Evaluating the detected communities using traditional algorithms on keyword co-occurrence networks', *IAES International Journal of Artificial Intelligence*, 15(1), pp. 919–928. Available at: https://doi.org/10.11591/ijai.v15.i1.pp919-928.
[31] Krasteva-Hristova, R., Papradanova, D. and Vechev, V. (2025) 'Mapping the landscape of sustainability reporting: A bibliometric analysis across ESG, circular economy, and integrated reporting with sectoral perspectives', *Journal of Risk and Financial Management*, 18(8), article 416. Available at: https://doi.org/10.3390/jrfm18080416.
[32] Larrinaga, C. and Bebbington, J. (2021) 'The pre-history of sustainability reporting: A constructivist reading', *Accounting, Auditing & Accountability Journal*, 34(9), pp. 162–181.
[33] Luo, L. and Tang, Q. (2023) 'The real effects of ESG reporting and GRI standards on carbon mitigation: International evidence', *Business Strategy and the Environment*, 32(6), pp. 2985–3000.
[34] Milne, M. and Gray, R. (2013) 'W(h)ither ecology? The triple bottom line, the global reporting initiative, and corporate sustainability reporting', *Journal of Business Ethics*, 118(1), pp. 13–29.
[35] Mohanasundaram, S. and Mathivanan, P. (2026) 'The changing landscape of corporate governance and firm performance research from agency to ESG', *Discover Sustainability*, 7, article 984. Available at: https://doi.org/10.1007/s43621-026-03344-0.

[36] Moore, J.E., Mascarenhas, A., Bain, J. and Straus, S.E. (2017) 'Developing a comprehensive definition of sustainability', *Implementation Science*, 12, article 110. Available at: https://doi.org/10.1186/s13012-017-0637-1.
[37] Ortas, E., Álvarez, I., Jaussaud, J. and Garayar, A. (2015) 'The impact of institutional and social context on corporate environmental, social and governance performance of companies committed to voluntary corporate social responsibility initiatives', *Journal of Cleaner Production*, 108, pp. 673–684.
[38] Parkinson, A. and Chew, L. (2022) 'Towards an environmental sustainability management accounting template', *The Business and Management Review*, 13(1). Available at: https://doi.org/10.24052/BMR/V13NU01/ART-11.
[39] Reichardt, J. and Bornholdt, S. (2006) 'Statistical mechanics of community detection', *Physical Review E*, 74(1), article 016110. Available at: https://doi.org/10.1103/PhysRevE.74.016110.
[40] Rivo-López, E., Villanueva-Villar, M., Pardo-López, C. and Cortés-García, M. (2025) 'Environmental sustainability reporting: A systematic and bibliometric review of two decades of research', *Future Business Journal*, 11, article 165. Available at: https://doi.org/10.1186/s43093-025-00580-0.
[41] Roy, A. and Mukherjee, P. (2025) 'Does national culture influence corporate ESG disclosures? Evidence from cross-country study', *Vision: The Journal of Business Perspective*, 29(4), pp. 438–454.
[42] Singhania, M. and Chadha, G. (2023) 'Thirty years of sustainability reporting research: A scientometric analysis', *Environmental Science and Pollution Research*, 30(46), pp. 102047–102082. Available at: https://doi.org/10.1007/s11356-023-29452-2.
[43] Spence, M. (1973) 'Job market signaling', *The Quarterly Journal of Economics*, 87(3), pp. 355–374. Available at: https://doi.org/10.2307/1882010.
[44] Suchman, M.C. (1995) 'Managing legitimacy: Strategic and institutional approaches', *Academy of Management Review*, 20(3), pp. 571–610. Available at: https://doi.org/10.5465/amr.1995.9508080331.
[45] Sundarasen, S., Rajagopalan, U. and Alsmady, A.A. (2024) 'Environmental accounting and sustainability: A meta-synthesis', *Sustainability*, 16(21), article 9341. Available at: https://doi.org/10.3390/su16219341.
[46] United Nations World Commission on Environment and Development (UNWCED) (1987) *Report of the World Commission on Environment and Development: Our common future*. Oxford: Oxford University Press.
[47] Zhang, J., Fei, J., Song, X. and Feng, J. (2021) 'An improved Louvain algorithm for community detection', *Mathematical Problems in Engineering*, 2021, pp. 1–14.
[48] Zhu, F., Fan, H. and Zheng, Z. (2025) 'The disclosure fog: Institutional investors and corporate greenwashing', *International Journal of Finance & Economics*, 30(4), pp. 3856–3874. Available at: https://doi.org/10.1002/ijfe.3096.