



## Review

# Trajectories and connections in socio-environmental disclosure research: A bibliometric mapping

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## ABSTRACT

The objective of this research is to conduct a systematic review of scientific literature regarding socio-environmental disclosure. For this purpose, the Scopus and Web of Science journal databases were used to collect primary studies. Subsequently, the content of the abstracts was extracted using the content analysis technique. The analysis period of the corpus spans from 2009 to 2024, encompassing a total of 113 primary studies. The research protocol developed by Tranfield et al. (2003) was used, considering its stages: (i) review planning, (ii) review conduction, and (iii) report writing and dissemination of results. Additionally, the data from the final corpus were processed using the bibliometric software VOSviewer and Bibliometrix for comprehensive scientific mapping analysis. The analyzed results of the corpus indicate that the theme still has room for exploration in future studies. A co-citation analysis of the documents was also conducted, revealing three clusters of complementary strands: environmental disclosure practices, sustainability assurance, and organizational legitimacy. The corpus words were evaluated, revealing a measured association between construct performance (disclosure and corporate social responsibility - CSR) and other keywords. Among the pairs of words with statistically significant associations are "performance" and "organizations," as well as "legitimacy." These associations demonstrate a statistically significant relationship between the various measurement indicators related to Socio-environmental Disclosure. Finally, a list of future research proposals was provided so that those interested in the explored theme can further deepen their analysis of the knowledge on the subject in question.

## 1. Introduction

According to Batista et al. (2016) and Salvador et al. (2021), the daily operations of both public and private sector entities must be guided by the assertive and sustainable use of environmental resources. In this regard, Forechi et al. (2020) show that the growing importance attributed to environmental concern reflects the urgency of its preservation and the pressing need to mitigate the adverse impacts resulting from human activities, as seen in the work of Gomes and Tortato (2011). The transition to sustainability, for instance, is a process that goes beyond technological change, involving social and political issues within an evolving system susceptible to forces such as individual and social learning shaping the way of thinking about solutions, producing

more efficient ways of ensuring the necessary change (Safarzyńska et al., 2012).

According to Pereira et al. (2023), socio-environmental disclosure emerges as a tool for companies to demonstrate more sustainable performance, given the social recognition of their significant responsibility for environmental issues. In this context, such developments have been associated with a growing trend of companies disclosing a wide range of environmental information in specific corporate reports, such as ecological or sustainability reports (Braam et al., 2016).

Thus, sustainability reports serve as the primary vehicles for disseminating these practices, as Burgwal and Vieira (2014) noted. As highlighted by Tinoco and Robles (2006), these reports elucidate organizations' financial and non-financial (environmental and social)

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information. Additionally, the authors Maciel et al. (2021) emphasize that the disclosure of reports plays a fundamental role in understanding the sustainable performance of companies, providing their stakeholders with the opportunity to acquire relevant knowledge about the initiatives of the organizational entity (Sinclair-Desgagné and Gozlan, 2003).

However, the potential impact of report disclosures on corporate environmental performance has not yet been determined in the current academic community to consolidate the concept of Corporate Social Responsibility (CSR) and strengthen the commitment to sustainability, as well as maintain public trust and support in the organizations that disclose them (Waluyo Jati et al., 2023).

According to Souza et al. (2016) and Saleh Altarawneh (2023), this focus on CSR becomes pertinent due to understanding the adverse effects of pollution, emissions, and waste on the environment and ecosystems, particularly considering the growing aspect of climate change.

Similarly, corporate reports integrate financial and non-financial information into a single document, covering environmental and social aspects (Benjamin et al., 2024). According to Xu et al. (2024), environmental information disclosure is a communication channel to ensure companies gain public and governmental recognition, being transparent in their environmental and operational management statutes. As Younis (2023) pointed out, this practice is intrinsically related to the disclosure of sustainable reports and the added value to the company by such practices. In the banking sector, Dai et al. (2022) demonstrate that financial institutions where green innovation occurs tend to focus more on corporate social responsibility (CSR), thereby seeking positive environmental impacts. The authors define CSR and green finance as having a positive impact on environmental performance, with green innovation serving as a mediating factor.

Considering stakeholder pressures on organizational environmental performance, Shahzad et al. (2024) noted that digital CSR campaigns emphasize elements such as transparency, accounting, and the timely updating of environmental performance measures to help maintain stakeholder trust, thereby demonstrating a commitment to sustainability. In this sense, managers must recognize that stakeholder pressure prompts companies to adopt sustainable practices, thereby enhancing their environmental performance. With this, companies can foster stronger relationships, meet environmental requirements, and achieve their objectives. The authors further note that this approach enables companies to manage stakeholder pressure, enhance environmental performance, and establish a positive reputation for sustainability, ultimately contributing to long-term value and resilience in a competitive market.

In the Brazilian context, the Securities and Exchange Commission (CVM) approved Resolution CVM 193, which authorizes the preparation and disclosure, starting in 2024, of sustainability-related financial information reports based on the global IFRS S1 standard of the ISSB (Brasil, 2023). In this scenario, both forms of disclosure are of extreme importance for business management, with the primary purpose of sharing information with stakeholders about an organization's socio-environmental performance.

This article employs the systematic literature review technique to mitigate bias and foster a more impartial analysis of the results, thereby facilitating a conclusive synthesis of a specific intervention (Galvão and Pereira, 2015). In this context, the systematic review emerges as a significantly comprehensive procedure, extending beyond the mere exposition of the obtained results, as it requires a reflective analysis of the data, regardless of its quantitative or qualitative nature (Costa et al., 2015). Furthermore, Systematic Reviews (SRs) are significant tools for supporting policy decisions, as they provide information with a more rigorous assessment of publication bias, although not entirely free from flaws (Galvão and Pereira, 2022).

Based on the abovementioned conjectures, the research question to be answered in this SR can be defined as follows: *What is the panorama of scientific research on socio-environmental disclosure in the Scopus and Web of Science journal databases?*

The main justification for conducting this study is the lack of quality assessment of systematic review works on socio-environmental disclosure. Considering that the disclosure of environmental performance reports plays a crucial role in stakeholders' decision-making, in collaboration with environmental activists and governments, for the sake of sustainability, and to promote guarantees of satisfactory profitability, this article aims to contribute to both business entities and scientific literature.

Thus, this systematic review aims to map scientific production regarding socio-environmental disclosure in the scientific literature. The SRL technique highlights theoretical findings from established literature and provides readers with proposals for future research.

The study contributes to the understanding of the dynamics of socio-environmental disclosure and its implications for transparency and corporate sustainability, using the Scopus and Web of Science journal databases to collect literature covering the recent period. The novelty of this research lies in its extensive analysis of materials retrieved from databases, revealing significant associations between key constructs such as performance, organizations, and legitimacy.

The use of the research protocol developed by Tranfield et al. (2003) enabled adequate and systematic planning and conduct, allowing for the preparation of a detailed report on the review's findings. In conjunction with the methodology, advanced bibliometric tools were utilized to facilitate a comprehensive analysis, resulting in a scientific mapping. The results highlight three groups of socio-environmental disclosure practices, sustainability assurance, and organizational legitimacy, providing a solid basis for future research.

This work is structured into five sections that can be summarized as follows: the first deals with the introductory part; the second refers to the theoretical foundation; the third concerns the methodological procedures of the research; the fourth deals with the presentation and analysis of the research corpus, discussing the results, commenting on the research implications, giving directions for future research and presenting the contributions and originality of the research; and the fifth section contains the conclusive remarks about the study.

## 2. Theoretical framework

It is known that corporate socio-environmental disclosure practices aim to provide information about a company's social and environmental procedures, usually based on its annual report. However, as Asrori et al. (2019) highlighted, the amount of relevant information is still predominantly disclosed voluntarily. Disclosing these practices can benefit investors and the organization by enhancing the corporate image and driving favorable financial results. While such disclosures may increase the cost of equity (COE), they also positively impact the company's value and profitability (Atasel et al., 2020).

Among the fundamental theories of socio-environmental disclosure, the following can be highlighted: (i) stakeholder theory, (ii) legitimacy theory, and (iii) institutional theory. Torelli et al. (2020) emphasize that the relevance and effect of stakeholder participation directly condition decisions related to the principle of materiality, which, in turn, affects corporate reports. However, despite the widespread adoption of stakeholder theory in environmental disclosure research, empirical evidence investigating the impact of these actors on corporate disclosure remains substantially restricted (Guenther et al., 2016).

The legitimacy theory proposes that a firm's voluntary disclosure, often through social reports, seeks to reconcile diverse interests resulting from a compromise between its social and economic impacts, thereby legitimizing its activities (Guthrie and Parker, 1990). According to Farneti et al. (2019), voluntary disclosure can be seen as a strategy used by companies to influence their relationship with investors positively.

As for institutional theory, it emphasizes that organizations operating within the same institutional environment tend to adopt similar practices, as the attitudes of interest groups towards environmental reports are influenced by these standard practices, as evidenced in the

work of (Pucheta-Martínez and Gallego-Álvarez, 2018). Additionally, there is evidence that national-level factors play a crucial role, as underscored by institutional theory, due to an understanding of social pressures (Gerged et al., 2023).

According to Bhattacharyya and Verma (2020), the concept of corporate social responsibility (CSR) has led companies to prioritize both economic objectives and socio-environmental responsibilities simultaneously. In this context, the study by Zhang and Yang (2023) states that disclosing environmental information can reduce pricing companies' share delays, improving information transparency.

However, the authors Vourvachis et al. (2016) highlighted obstacles to achieving this task, as specific organizations adopt disclosure strategies intending to mitigate potential social and political repercussions, rather than to ensure transparency in the accountability of social and environmental performance, as to enhance their reputation.

From the perspective of Amorim and Souza (2022), companies operating in high environmental impact sectors are subject to greater scrutiny and face stricter regulations, which has led them to increase the disclosure of environmental information, generally of lower quality, characterized by being more extensive and less specific as they tend to select which environmental information to disclose, usually after ecological incidents.

In this context, Monteiro et al. (2023) stated that environmental accounting is crucial for recording and disclosing business actions that affect the environment, thereby providing accurate information about the social costs of production externalities. However, it may face challenges such as the complexity of ISO standards, legal requirements, lack of incentives, absence of management commitment, and high implementation costs. Additionally, De Villiers et al. (2023) suggested that, although previous studies indicate that shareholders generally prefer financial information, this preference may not be universal, mainly due to the growing social pressure on environmental issues from international bodies.

Moreover, there are various widely accepted reporting frameworks, such as the Global Reporting Initiative (GRI) sustainability reporting guidelines (G3), which aim to benefit both the organizations that prepare the reports and their users, promoting a standardized approach, as evidenced by Huang et al. (2014).

With the adoption of the Sustainable Development Goals by the United Nations (UN, 2030), a substantial debate has emerged in Europe about improving these sustainability reports, led by the European Commission and the IFRS Foundation in developing non-financial reporting (NFR) standards, when the latter warned that the use of multiple standards and metrics increases the complexity and costs associated with NFR, hindering the participation of capital markets in the transition to a low-carbon economy (Papa et al., 2022).

According to Faisal and Achmad (2014), companies' voluntary disclosure of information can alleviate agency problems and information asymmetry, reduce opportunistic behavior by managers, and force them to provide data that builds trust and credibility among stakeholders. The previous study also highlighted that various corporate governance mechanisms, such as the appointment of non-executive or independent directors, the creation of audit committees, and the strengthening of internal controls, often play a crucial role in monitoring managers' behavior and decision-making, encouraging them to adopt a more cautious stance, as emphasized in the work of Adinehzadeh et al. (2018).

### 3. Methodological procedures

This section describes the methodological procedures adopted in this systematic literature review based on the research protocol developed by Tranfield et al. (2003). In this context, such a protocol defines that the process of creating this type of study requires the implementation of a protocol encompassing three stages: (i) review planning, (ii) review conduction, and (iii) report writing and dissemination of results.

#### 3.1. First phase: planning the systematic literature review

This phase begins with mapping the presence of systematic literature reviews by specialists to develop a new systematic review on the explored theme, using inclusion and exclusion criteria. Thus, the research protocol proposed by Tranfield et al. (2003) is based on the steps to be carried out at the following stages: sample selection, search strategies, and the inclusion and exclusion criteria of the studies, thereby ensuring the objectivity of the SRL to avoid researcher bias.

In this planning stage, a search was conducted in the Scopus and Web of Science journal databases. It generated strings with the theme "socio-environmental disclosure" to verify the need to perform an SRL and ensure its novelty. The results obtained from the database searches, as mentioned earlier, revealed four systematic literature reviews; however, upon thoroughly reading each of them, it was found that they all explored the theme in a relational manner, which differs from this review, as the theme is explored more comprehensively.

Thus, there is a need for a systematic review to map scientific production on socio-environmental disclosure comprehensively. With the research question defined regarding the panorama of scientific research on socio-environmental disclosure, the next step was to detail the review protocol, specifying the search strategies, inclusion and exclusion criteria, and analysis methods.

In this context, developing this SRL will enable the identification, mapping, and analysis of relevant research on environmental disclosure topics, demonstrating originality and being the first to address the same.

#### 3.2. Second phase: conducting the systematic review

The second phase aims to identify the terms and keywords identified in the first stage and detail them based on research discussions to ensure their reproducibility. For this review, the following keywords were defined as the search strategy: "Environmental Disclosure," "Socio-Environmental Disclosure," "Disclosure of Sustainability Reports," "Disclosure of Socio-Environmental Information," and "Socio-Environmental Responsibility," as they encompass the formulation of the research problem for this systematic review. The choice of these terms aims to capture the breadth of the concept of socio-environmental disclosure, according to the theoretical framework presented, ensuring the scope and adherence of searches to the central theme.

The choice of the two journal databases can be justified due to their extensive collection of qualified journals and other indexed databases. The Scopus database offers a comprehensive overview of scientific publications worldwide, encompassing areas such as the social sciences, biological sciences, health, and physical sciences, and indexing a wide range of academic titles, conferences, and books. The Web of Science database belongs to the Institute for Scientific Information (ISI). It is considered interdisciplinary, providing access to abstracts and references across all areas of knowledge, encompassing approximately 12,000 journals. The execution of searches in both databases aims to increase the coverage of relevant literature, minimizing the risk of omitting important studies, in addition to ensuring that quality channels are reached since both databases are reference indexes for the scientific community in general.

Based on the previously reported keywords, a search string was created using the Boolean operators "OR" and "AND" to use the synonymous terms mentioned in the construct "socio-environmental disclosure." The search string was structured for both databases, and the number of works was identified after applying the filters established from the menus available in the previously reported databases as the criteria for selecting the corpus. As shown in Table 1, the initial search of the string in the journal databases yielded 2836 scientific works, with 1285 documents originating from the Scopus database and 1551 works from the Web of Science database. Notably, these searches were conducted in May 2024 and involved the support of five researchers to evaluate the selected corpus thoroughly.

**Table 1**

Search Strings are used on Scopus and Web of Science bases.

Databases	Search String	Number
Scopus	TITLE-ABS-KEY(("environmental disclosure*" OR "socio-environmental disclosure*" OR "disclosure of sustainability reports*" OR "disclosure of socio-environmental information*" OR "socio-environmental responsibility*") AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ECON")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re")) AND (LIMIT-TO (PUBSTAGE, "final")))	240
Web of Science	ALL=(((("environmental disclosure*" OR "socio-environmental disclosure*" OR "disclosure of sustainability reports*" OR "disclosure of socio-environmental information*" OR "socio-environmental responsibility*")))) and Open Access and Business Finance or Management or Business or Economics or Public Administration (Web of Science Categories) and English (Languages) and Early Access or Conference Paper or Correction or Editorial Material (Delete – Document Types)	331

The initial criterion adopted from the database menus, following the first execution, was to consider only open-access documents, resulting in a total of 995 works of various natures, with 410 extracted from Scopus and 585 from Web of Science. This first criterion prioritizes open access, considering that it facilitates the dissemination and access to studies by a wider audience, although recognizing that it may exclude some relevant works.

The subsequent criterion was to consider only those documents related to economics and management, the focus of this scientific work, totaling 654 works, with 264 documents originating from Scopus and 390 from Web of Science. This criterion aims to align the selection with the research's disciplinary focus, as defined in the planning stage.

Another criterion adopted was to consider only documents written in English, totaling 625 works, with 256 of them from Scopus and 369 from Web of Science. Since English is the predominant language in international scientific communication, its choice facilitates the analysis and comparability of studies.

The final criterion adopted was to consider both articles and literature review articles, excluding early access articles and those from scientific events. This filter focuses on publications that have undergone a more rigorous peer review process and represent consolidated scientific contributions. This resulted in 571 articles, with 240 from Scopus and 331 from Web of Science, as shown in **Table 1**.

The inclusion and exclusion process mentioned earlier used specific menus in the reported journal databases. The subsequent step was to compile the metadata into a spreadsheet and evaluate the presence or absence of duplicate articles. In this regard, 126 duplicate articles were identified and excluded, resulting in 444 articles, with 137 from Scopus and 307 from Web of Science. Removing duplicates is essential to ensure that each study is counted only once, thereby avoiding distortions in the analysis that the excessive counting of duplicate publications could cause.

Next, the articles in the corpus were selected based on those belonging to the top three citation quartiles (Q1, Q2, and Q3) of the Scimago Journal Ranking (SJR, 2023), resulting in a total of 380 articles, comprising 109 from Scopus and 271 from Web of Science. This quality criterion aims to focus the analysis on studies published in journals with more significant impact and scientific reputation, increasing the reliability of the review findings.

Finally, we used the inclusion criterion of adherence to the explored content. Thus, after thoroughly reading their abstracts, only articles relevant to the explored theme were included in the corpus. This procedure yielded 113 articles that constitute the research corpus, comprising 16 articles obtained from Scopus and 97 from Web of

Science, as illustrated in **Fig. 1**. This refinement step is crucial to ensure that the final corpus consists exclusively of studies that directly address the research question, rather than relying on simple keyword matching.

The selected corpus, comprising 113 studies from the databases, will be analyzed based on various citation statistics and the impact of prominent authors reported in the scientific literature. The bibliometric packages used in the corpus analyses will be VOSviewer (van Eck and Waltman, 2014), Bibliometrix (Aria and Cuccurullo, 2017), and T-Lab Plus version 2022 (Lancia, 2022). The selected corpus is available in [Appendix A](#) of this article.

Detailed elements of the collection, such as title, abstract, keywords, authors, author affiliations, year of publication, journal, volume, number, pages, and cited references, were organized and standardized in formats compatible with bibliometric software. Detailed extraction and standardization of metadata are fundamental steps to ensure the accuracy and quality of subsequent bibliometric analyses.

### 3.3. Third phase: dissemination of systematic review results

This phase refers to the synthesis and dissemination of the SRL results, which are supported by the protocol of Tranfield et al. (2003), aiming to form a cluster of results that generate knowledge. At this point, the characteristics of the textual corpus are detailed, and clusters are formulated, which are used to analyze potential variables that can be utilized in future research on the investigated theme.

This phase is responsible for reporting the in-depth analysis of the final corpus, focusing on the synthesis and dissemination of the systematic review's results to generate knowledge and identify directions for future research. Below is a summary of what each tool provided in terms of results.

- The Bibliometrix software was used to calculate general indicators of the scientific production of the corpus, including annual growth rate, number of authors, international co-authorships, and average number of co-authors per document. This analysis provides a quantitative overview of the field of study, its characteristics, and temporal evolution.
- The VOSviewer software was used to map co-citation networks between authors, with the following parameters defined: unit of analysis "cited author", type of analysis "co-citation", counting method "full counting", and a cut-off criterion of at least one citation per author, ensuring the generation of cluster visualizations. Author co-citation analysis reveals the intellectual structure of the field by identifying the most influential authors and complementary schools of thought or lines of research. The parameters were chosen to strike a balance between the clarity of visualization and the inclusion of significant authors.
- The abstracts of the articles in the corpus were processed by T-Lab Plus software to generate a word cloud with the most frequent terms based on a minimum number of citations. The word cloud provides a quick view of the most prominent terms in the corpus, indicating central thematic focuses.
- The VOSviewer software was also used to build a keyword co-occurrence network, with the following parameters: analysis type "co-occurrence", study unit "all keywords", counting method "full counting", and defining a minimum frequency of occurrences. This analysis maps the relationships between the main concepts and themes addressed in the literature, identifying emerging thematic clusters. The parameters seek to identify the most relevant keywords and their interconnections.

The clusters identified in the co-citation and co-occurrence analyses were named and described based on the content of the articles and prominent authors in each. Theoretical and practical implications were discussed, and proposals for future research were developed based on the identified gaps and trends. The transformation of raw data into

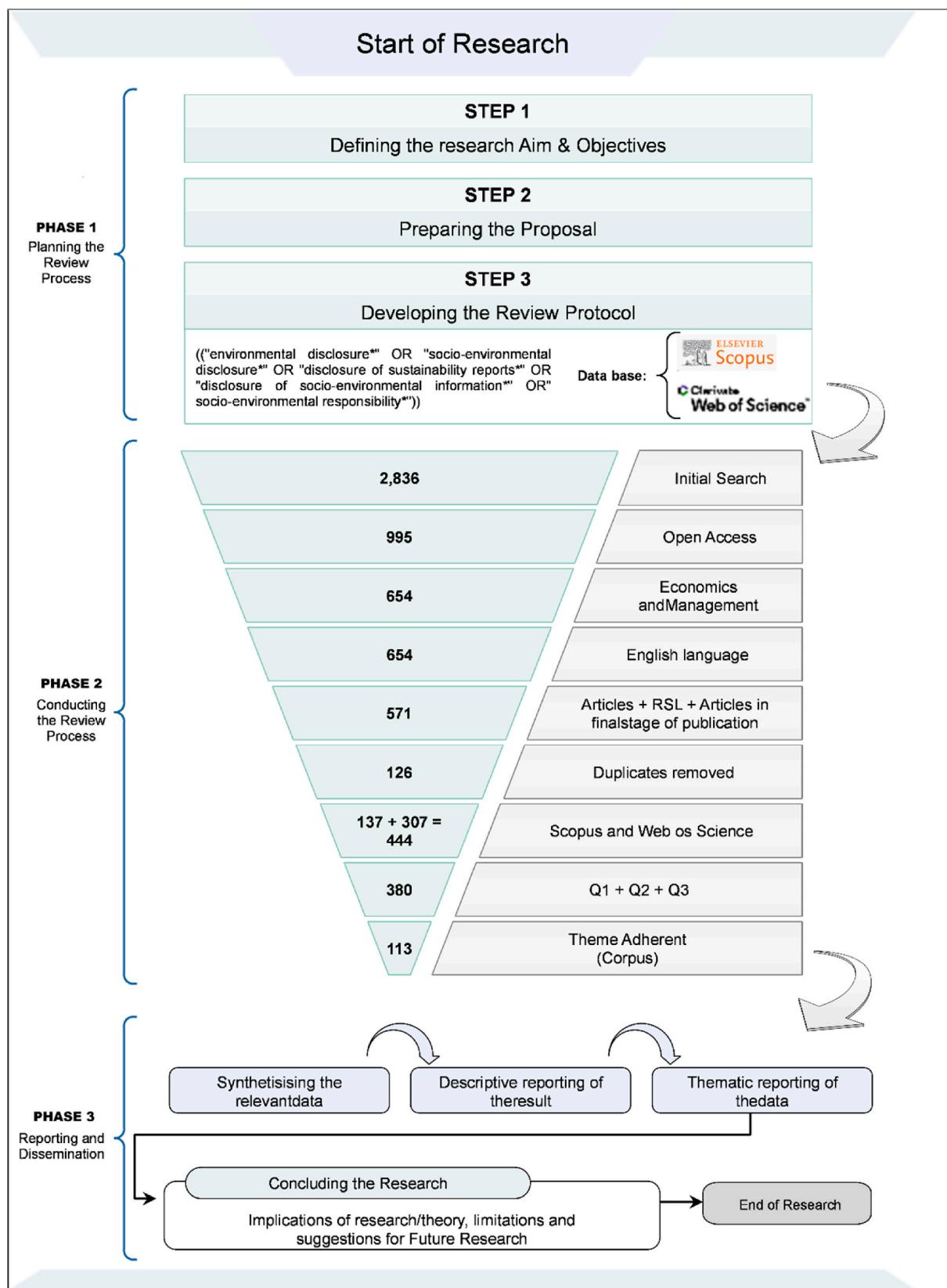


Fig. 1. Flowchart of the research protocol from Tranfield et al. (2003).

visualizations and interpretations provides evidence that answers the research question and contributes to the advancement of the field. Triangulating the findings of different bibliometric techniques with the literature in the corpus strengthens the validity of the conclusions.

This phase, therefore, ensures the dissemination of results in a clear, structured, and detailed manner and is essential for the scientific community to evaluate, utilize, and build upon the findings of the review. Section 4 below provides details of the analytical process employed.

#### 4. Presentation and analysis of the corpus

This section presents the results obtained from the selected corpus based on the Scopus and Web of Science journal databases, estimated using the bibliometric packages VOSviewer, Bibliometrix, and T-Lab Plus, to answer the research question described in the introductory part of this work.

##### 4.1. Analysis of scientific production indicators of the corpus

From the analysis of the scientific production indicators extracted from the 113 articles in the corpus, it is possible to evaluate that the information related to the explored theme regarding the data on the characteristics of the articles includes a total of 44 journals where the articles were published, as shown in Fig. 2.

As shown in Fig. 2, the scientific production indicators of the corpus span the years 2009–2024, covering a period of 16 years. It has an annual growth rate of scientific production of around 14.87 %. This sample comprises 304 authors and co-authors, with only five authors publishing their work as single authors. Additionally, 39.82 % have international co-authorship, with an average of 3 co-authors per document.

It was also found that the authors of the works defined 368 keywords, and the corpus comprises a total of 6599 references, resulting in an average of approximately 18.01 references per work. Notably, the average age per document is 4.37 years, while the average number of citations per document is 57.11.

##### 4.2. Temporal analysis of the scientific production of the corpus

This subsection aims to highlight the behavior of the scientific production of the primary articles in the corpus, emphasizing the most prominent articles on the explored theme. As shown in Fig. 3, the temporal behavior of the scientific production in the corpus is analyzed annually, and its division into 4-year sub-periods is explored on the theme. It is worth noting that although the corpus publications contain various authors, only the first author of the work will be reported in the subsequent analyses.

As shown in Fig. 3, when evaluating the behavior of scientific production over the corpus extraction period, it was observed that a total of 6 articles were published between 2009 and 2012. The most cited work during this period was by Reverte (2009), titled “Determinants of Corporate Social Responsibility Disclosure Ratings by Spanish Listed Firms,” which aimed to analyze whether a series of company and industry characteristics, as well as media exposure, are potential determinants of corporate social responsibility (CSR) disclosure practices by Spanish listed companies.

Between 2013 and 2016, the growth rate of scientific production averaged around 9.7 %, with 2014 being a notable exception. The most cited author in terms of citations was Cheng et al. (2014), who received 184 citations. His work, titled “The International Integrated Reporting Framework: Key Issues and Future Research Opportunities,” aimed to introduce the concept of integrated reporting (IR) as described by the International Integrated Reporting Council (IIRC).

Between 2017 and 2020, the growth rate of scientific production on the explored theme accelerated, reaching around 39.8 %, with 45 articles published during this time. The standout author was Diouf and Boiral (2017), with his work titled “The Quality of Sustainability Reports and Impression Management: A Stakeholder Perspective,” which aimed to analyze the perceptions of stakeholders—specifically, socially responsible investment (SRI) professionals—on the quality of sustainability reports using the Global Reporting Initiative (GRI) framework.

Finally, between 2021 and 2024, the growth rate of the explored theme was around 45.1 %. The most cited work during this period was by Singhania and Saini (2021), who published the article titled “Demystifying Pollution Haven Hypothesis: Role of FDI,” which aimed to explore the interrelationship between foreign direct investment (FDI), institutional factors, financial development, and sustainability.

##### 4.3. Co-citation analysis of authors

This subsection aims to map which authors are most frequently cited together based on the primary articles selected in the corpus. Such an evaluation will enable the identification of authors who work on similar or complementary topics, thereby highlighting connections between different fields of economic and management knowledge.

The co-citation analysis, whether of documents, authors, or journals establishes a fundamental premise that if two or more documents, authors, or journals are cited together in subsequent work, there will be, at least from the perspective of the citing author, a similarity between the cited ones (Miguel et al., 2008). This leads to the deduction that the higher the co-citation frequency, the closer the relationship between them.

Similarly to what was described earlier, two authors or documents will be considered co-cited if a third author or document cites them



Fig. 2. Panel of scientific production indicators of the corpus.

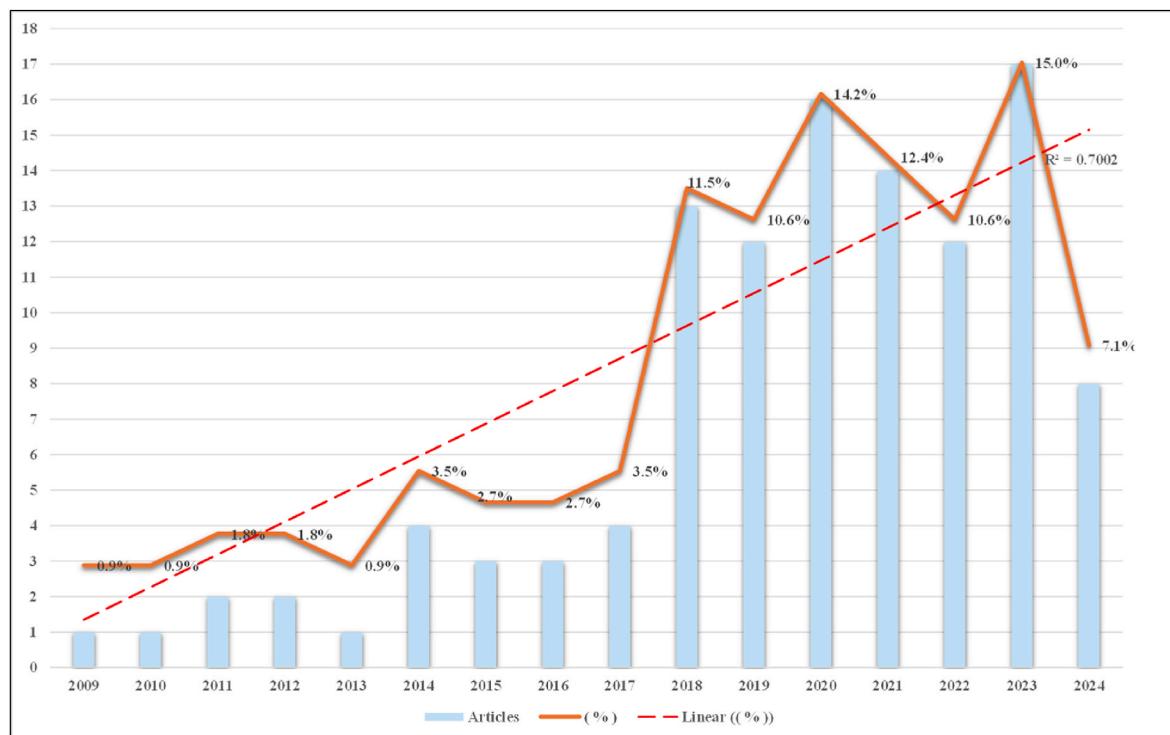


Fig. 3. The behavior of scientific production of the corpus.

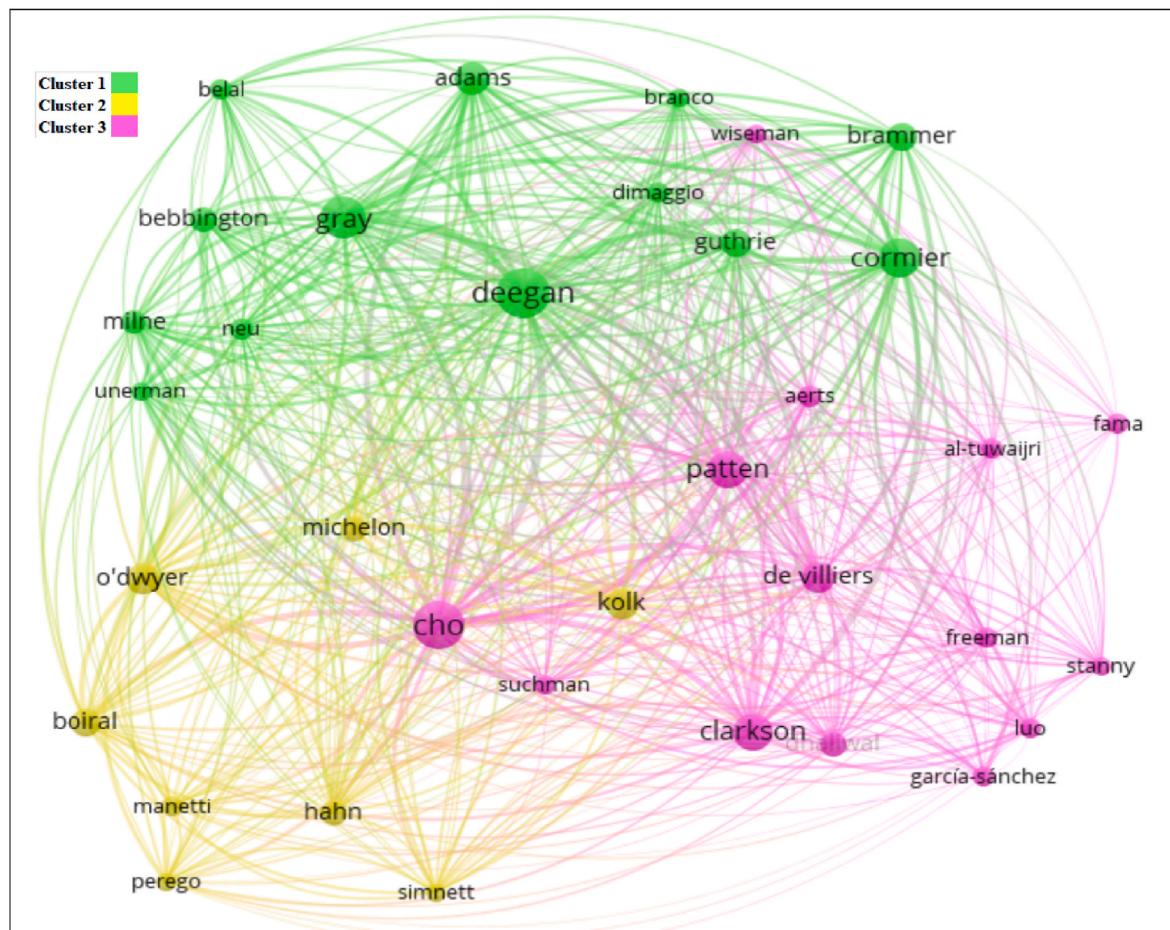


Fig. 4. Co-citation network.

together. The higher the number of documents in which these two authors or documents are co-cited, the stronger the co-citation relationship between them (van Eck and Waltman, 2014).

To estimate the co-citation network of authors in this systematic review's corpus, the bibliometric package VOSviewer was used, considering the following input parameters: "cited author" was selected as the unit of analysis, the type of analysis was "co-citation," and the counting method was defined as "full counting."

Additionally, a cut-off criterion was defined, with a minimum of 17 citations by an author from the 113 analyzed articles, resulting in a total of 35 authors or "nodes" and 567 connections or "edges." Finally, "linlog modularity" was used as the normalization analysis method, as this configuration presented a better distribution and visualization of the network.

As shown in Fig. 4, the co-citation relationship network comprises 35 nodes (authors) and three clusters, represented by the colors green, yellow, and pink. The size of the nodes is proportional to the frequency of citations received by the authors/co-authors' published works, while the thickness of the line segments refers to the strength of the relational ties between these "nodes."

Generally, the studies evaluated in their clusters present a very close theoretical relationship, indicating convergence in the citation of classic authors on the studied theme, evidenced by the relationships between them. By analyzing the number of relational ties and citations among the most co-cited authors, it is noted that in each of the formulated clusters, the most prominent authors were:

**Cluster 1 – Green (Environmental Disclosure Practices):** This cluster pertains to the actions and strategies adopted by an organization regarding the communication of its environmental practices and performance, both to the public and other stakeholders, as evidenced in the works of Brooks and Schopohl (2021) and Gunarathne and Lee (2021). This cluster contains 13 authors, with Deegan and Gordon (1996) being the most prominent. His work, "A Study of the Environmental Disclosure Practices of Australian Corporations," received 107 citations and 1497 relational ties in the first cluster. His work, published in the journal Accounting Business Research, aimed to analyze the environmental disclosure practices of Australian corporations. The study concluded that Australian companies tend to disclose positive environmental information more frequently than negative information. Such practices help to increase the transparency and accountability necessary for achieving the Sustainable Development Goals (SDGs), such as SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action), as these environmental and organizational practices encourage sustainable behavior and contribute to environmental awareness and education, which relates to SDG 4.

**Cluster 2 – Yellow (Sustainability Assurance):** This cluster focuses on implementing policies, practices, and processes that ensure a balance between economic growth, environmental protection, and social well-being over time, as described in Martine et al. (2012). The second cluster includes eight authors, with O'Dwyer (2011) being the most prominent. His work, titled "The Case of Sustainability Assurance: Constructing a New Assurance Service," received 43 citations and 773 relational ties in the second cluster. His work was published in Contemporary Accounting Research and aimed to develop an understanding of how auditors attempted to construct the practice of sustainability auditing and understand how and to what extent these efforts made sustainability reporting auditible, concluding that the attempts to make the domain of sustainability reporting auditible were fragile and highlighted the trial-and-error nature of the processes by which accountants can develop their presence in new markets for their expertise. It is worth noting that sustainability assurance is essential for achieving the Sustainable Development Goals in general, especially concerning SDG 11 (Sustainable Cities and Communities), SDG 7 (Affordable and Clean Energy), and SDG 15 (Life on Land), aiming to ensure sustainability by adopting practices that preserve natural resources, reduce the carbon footprint, and promote social equity.

**Cluster 3 – Pink (Organizational Legitimacy):** This cluster refers to the recognition and acceptance by society regarding the actions and operations of a given organization, which are characterized as appropriate, fair, and responsible, as reported in the works of Bansal (2005) and Starik and Kanashiro (2013). The third cluster includes a total of 14 authors, with a highlight on the work developed by Cho and Patten (2007), titled "The role of environmental disclosures as tools of legitimacy: A research note," where the research received a total of 106 citations and 1499 relational ties in this cluster. The central objective of his work was to investigate how environmental disclosures are used by companies to gain legitimacy, resulting in findings that indicate the use of monetary and non-monetary components of non-litigation-related environmental disclosure varies among groups. The findings support the argument that companies use disclosure as a legitimization tool. In this context, organizational legitimacy assumes high importance for achieving the Sustainable Development Goals (SDGs), as such organizations receive more significant support and collaboration from stakeholders, in addition to facilitating the implementation of initiatives that contribute to SDG 16 (Peace, Justice, and Strong Institutions) and SDG 17 (Partnerships for the Goals). Notably, it is assumed that an organization characterized as legitimate can lead by example, encouraging other companies to follow its sustainable practices.

Finally, organizational environmental disclosure, sustainability assurance, and the pursuit of legitimacy are interconnected elements that motivate organizations to effectively contribute to operationalizing sustainability goals. Organizations can play an essential role in achieving sustainable development goals by increasing transparency, implementing sustainable practices, and seeking public recognition.

#### 4.4. Analysis of corpus terms

The objective of this subsection is to evaluate the terms or keywords from the corpus articles, aiming to visually identify which terms are most frequent in this set of articles, highlighting at the same time the most central and recurring terms in scientific literature, as well as evidencing the connections between different concepts, to understand more deeply the field of economics and management. In this sense, a word cloud and its frequency of occurrence were formulated based on the abstracts extracted from the primary corpus articles. The 20 most evoked words from the corpus and a minimum of 6 citations were considered, as evidenced in Fig. 5.

Based on Fig. 5, note that the most highlighted keyword or term in the corpus is "disclosures" with a total of 80 occurrences, corresponding to 18.8 % of the 425 occurrences, followed by the terms: "corporate social responsibility – CSR" with a total of 58 occurrences, representing 13.6 % of the total occurrences, "performance" with 43 occurrences, representing 10.1 % of the total, "organizations" with 38 occurrences, representing 8.9 % of the total occurrences, and "legitimacy" which obtained a total of 32 occurrences, corresponding to 7.5 % of the 20 main words selected from the corpus.

Notably, the top 5 keywords in the corpus account for approximately 60 % of the total words evaluated. It is also highlighted that the more centralized the analyzed words are, the larger their size, reflecting their higher evocation. Conversely, the smaller and more distant from their center, the lower their evocation.

Regarding the relationship between the corpus words, van Eck and Waltman (2014) show that the relationship between two keywords is determined by the number of articles in the same journal database in which both occur together, whether in the title of the work, its abstract, or even in the list of keywords.

This type of analysis aims to map possible research themes related to the central topic: "environmental disclosure." It is emphasized that the size of the "node" to be estimated is proportional to the frequency of occurrence of a given keyword. In contrast, the strength of the relationship between the "nodes" can be evaluated by their proximity.

In this sense, clustering allows for evaluating the relationship

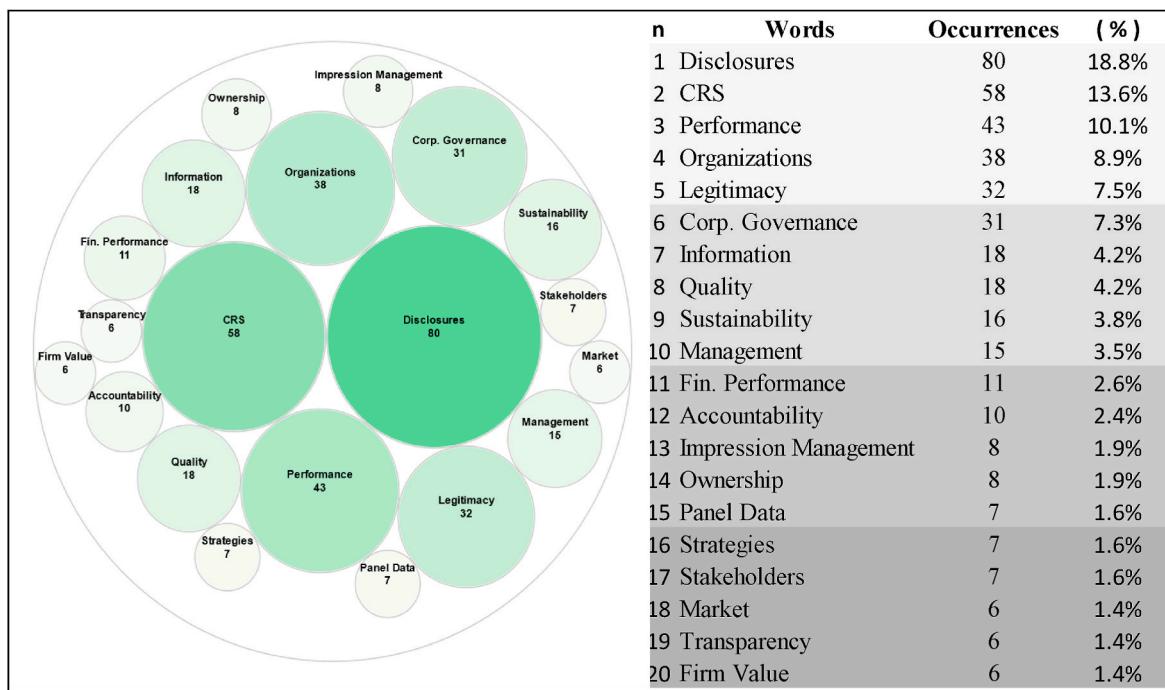


Fig. 5. Word cloud of the selected corpus.

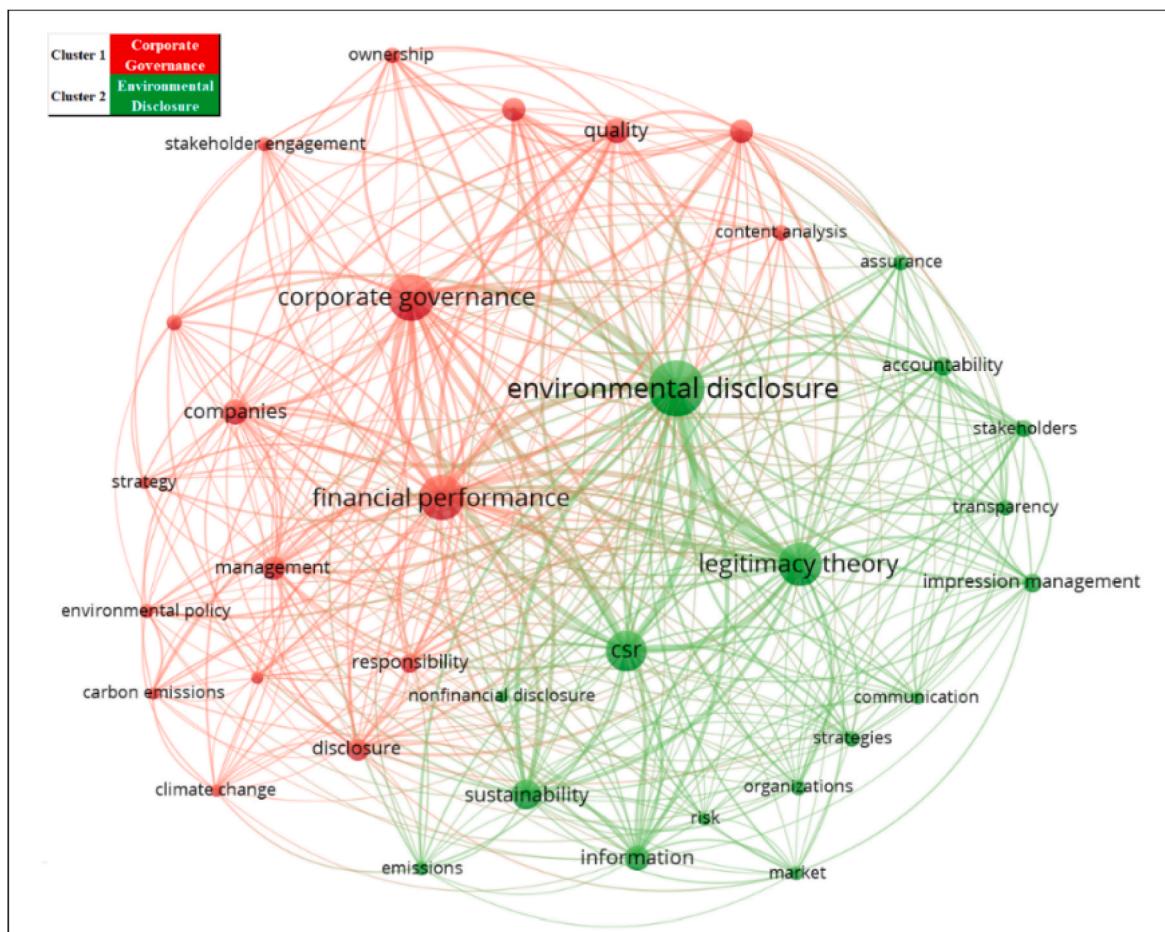


Fig. 6. Relationship network between corpus keywords.

between keywords, where the parameters defined in the bibliometric package VOSviewer were: "co-occurrence" for the type of analysis, "all keywords" for the unit of study, and "full counting" for the counting method, assigning the same weight to each link between the words.

The co-occurrence network identifies pairs of keywords that occur most frequently in the textual corpus (Nepomuceno et al., 2022). Fig. 6 shows the formulation of the corpus keyword network, which was restricted to a minimum frequency of 6 occurrences, resulting in 35 "nodes" distributed in 2 clusters.

Fig. 6 shows two clusters: the first, in red, was named "corporate governance" because it was the most evoked word in the corpus, while the second cluster, in green, was called "environmental disclosure" because it was the most highlighted word in the corpus.

By evaluating the content of each of the two clusters in detail based on the scientific literature consulted from the corpus, it is noted that:

**Cluster 1 – Red:** This cluster contains a total of 18 words or "nodes," focusing on the central theme of "corporate governance," which can be evidenced in the work developed by Adu (2022), titled "Sustainable banking initiatives, environmental disclosure and financial performance: The moderating impact of corporate governance mechanisms." This term is recurrently evoked and aims to contribute to sustainable development in business literature by examining the impact of a broad corporate governance disclosure index on sustainable banking initiatives and subsequently determining to what extent corporate governance mechanisms moderate the sustainability sensitivity metric's impact on performance. This is based on data collected from 220 banks in 16 Sub-Saharan African countries during the period 2007–2018 (i.e., making observations over the banking year of 2027), concluding that corporate governance mechanisms have a positive impact on sustainable decisions, as captured by environmental disclosures and sustainable banking initiatives. It also shows that these same initiatives improve the financial performance of banks in Sub-Saharan African countries. Finally, the study finds that the relationship between sustainable banking initiatives and economic performance is significantly moderated by corporate governance mechanisms, indicating that the sustainability sensitivity measure to performance is predominantly positive and improves in banks with high-quality corporate governance mechanisms.

In this same cluster, the term "financial performance" is also highlighted, where its relationship with corporate governance practices can be perfectly justified due to the interdependence of governance processes and performance, given that the practices, rules, and processes by which the company is directed and controlled involve the management of stakeholders such as shareholders, the board of directors, or even executives.

**Cluster 2 – Green:** This cluster is composed of a total of 17 words or "nodes," focusing on the central theme of "environmental disclosure," which is prominently highlighted in the work described by Wahyuningrum et al. (2020), titled "Do environmental and financial performances affect environmental disclosures? Evidence from listed companies in Indonesia." This keyword is recurrently evoked and aims to examine the effect of environmental performance, company financial performance, and company characteristics on environmental disclosure. The population used in this research comprised all non-financial companies listed on the Indonesia Stock Exchange from 2014 to 2016. The sample was selected using a purposive sampling method to obtain 36 sample companies, and the data were analyzed through multiple regression analysis. The conclusion is that both the environmental performance variable, as described by PROPER ratings and ecological management systems, and the company size variable affect the extent of environmental disclosures. However, the financial performance variable, characterized by the profitability and leverage of companies, and the number of board members variable, do not significantly affect the extent of environmental disclosures.

It is worth noting that in this same cluster, another highlighted keyword is the "legitimacy theory," which is based on the premise that companies disclose environmental information to maintain or even gain

legitimacy in the eyes of society and their stakeholders. In this sense, this theory suggests that organizations operate within a system of social values, norms, and beliefs that must be perceived as legitimate to ensure their survival and success.

#### 4.5. A classification for the academic debate of socio-environmental dissemination research

The analysis presented not only maps the research landscape in socio-environmental disclosure but also allows for an in-depth interpretation and the proposal of a new classification that captures the evolution and central dynamics of this field of study. The co-citation analysis of authors revealed three intellectual clusters (see Fig. 4) that can be interpreted as the thematic pillars underpinning research in socio-environmental disclosure.

- Pillar 1 of Environmental Disclosure Practices, focuses on what, how, and why companies disclose environmental information, investigating the determinants and nature of these practices (Deegan and Gordon, 1996; Reverte, 2009). It represents the descriptive and exploratory foundation of the field.
- Pillar 2 of Sustainability Assurance, addresses the credibility and verification of disclosed information, concentrating on assurance processes and the ethics and quality of sustainability reports (Boiral et al., 2019; O'Dwyer, 2011). It reflects a concern for the reliability and accountability of disclosure.
- Pillar 3 of Organizational Legitimacy, examines the strategic motivations behind disclosure, particularly the use of disclosure as a means to build, maintain, or restore organizational legitimacy in the eyes of society and stakeholders (Cho and Patten, 2007; Patten and Shin, 2019).

These pillars are interconnected with two main arenas of debate where their manifestation and interaction occur.

- Arena 1, Corporate Governance and Financial Performance, demonstrates how disclosure practices (Pillar 1) and the pursuit of legitimacy (Pillar 3) are intrinsically linked to governance structures and their economic implications for organizations seeking sustainability assurance (Pillar 2).
- Arena 2, Environmental Disclosure and Legitimacy Theory, highlights the centrality of Pillar 3 as one of the main theoretical drivers for understanding disclosure practices (Pillar 1).

The interaction between the research pillars and the arenas of debate suggests a research ecosystem where disclosure practices are examined from the perspective of their credibility and legitimization motivations, with direct implications for corporate governance and performance.

Based on the temporal analysis (see Fig. 3) and the prominence of the identified themes and authors, we propose an evolutionary classification of the literature on socio-environmental disclosure, characterized by three distinct periods that reflect the maturation of the field.

In Period 1 (approximately 2009–2016) of Emergence and Justification, a more gradual growth in scientific production is observed, marked by the need to establish the field, describe initial disclosure practices, and justify their relevance. The focus is on the determinants of disclosure and the first attempts to connect these practices to corporate social responsibility and legitimacy theory. Works such as (Reverte, 2009), which analyzes the determinants of disclosure, and (Cheng et al., 2014), which introduce the integrated reporting framework, are emblematic of this phase, where Pillar 1 (Disclosure Practices) and Pillar 3 (Legitimacy) began to be delineated. Research aimed to understand the initial "why" and "how" of disclosure, often in response to emerging social and environmental pressures, with an emphasis on voluntarism and the pursuit of acceptance.

In Period 2 (approximately 2017–2020), a significant acceleration in

scientific production is observed, marked by Scrutiny, Quality, and Scope Expansion. This phase is characterized by greater scrutiny of the quality and veracity of disclosed information. Attention turns to impression management and the importance of assurance for sustainability reports, reflecting the strengthening of Pillar 2 (Sustainability Assurance). The work of (Diouf and Boiral, 2017) on the quality of reports and impression management is a prominent example. Discussions also delve deeper into stakeholder engagement and the impact of different governance mechanisms. The field matures, moving from simple description to a critical analysis of the substance and credibility of disclosure. The "appearance" of sustainability begins to be confronted with the "reality" of practices, driving the need for verification mechanisms.

In Period 3 (approximately 2021–2024) of Strategic Integration, Impact, and Response to Global Imperatives, the most significant growth in scientific production is noted, indicating an intensification of interest and complexity in research. There is a deeper integration of socio-environmental disclosure with global corporate performance (both financial and non-financial), business strategies, and responses to global imperatives, such as climate change and the Sustainable Development Goals (SDGs). The work of (Singhania and Saini, 2021), exploring the interrelationship between foreign direct investment and sustainability, illustrates the expansion into macro themes.

The influence of new regulations (such as CVM 193 in Brazil) and the demand for transparency throughout the value chain becomes more evident. Arena A (Governance and Performance) and Arena B (Disclosure and Legitimacy) are in full interaction. During this period, socio-environmental disclosure transcends its function as mere communication or an isolated legitimization tool, consolidating itself as a critical component of corporate strategy, risk management, and long-term value creation. There is a growing recognition of its interdependence with economic, social, environmental, and governance factors in a globalized and interconnected context.

#### 4.6. Research implications

This research brings some theoretical and empirical implications, contributing with insights into socio-environmental disclosure by explaining the involved dynamics through the integration of stakeholder, legitimacy, and institutional theories, seeking a basis in the academic discourse itself through the works found, in addition to bringing an integrative view of these works, through the cluster analyses carried out. From a practical perspective, the findings underscore the importance of transparent reporting for corporate responsibility and sustainability, providing policymakers with guidelines for effective regulations and offering corporate managers a roadmap to build trust and promote ethical responsibility, ultimately driving positive changes in organizational socio-environmental practices. Next, a more in-depth view of the theoretical and empirical implications of the research will be presented.

##### 4.6.1. Theoretical implications

The theoretical implications follow the three main theories previously discussed, providing a framework for understanding the dynamics of socio-environmental disclosure practices. The research highlights the interplay between stakeholder pressures, the quest for legitimacy, and institutional influences. Based on the literature findings, some insights are outlined below.

The literature underscores the importance of stakeholder engagement in shaping corporate disclosure practices, suggesting that companies are more likely to disclose socio-environmental information when there is significant pressure from stakeholders, including investors, customers, and regulatory bodies (Pucheta-Martínez et al., 2020). This aligns with the premise that stakeholder participation directly influences corporate decisions related to materiality, affecting the content and quality of disclosures (Torelli et al., 2020).

Hummel (2016) notes that companies with strong sustainability

records utilize high-quality disclosure to showcase their performance; conversely, those with poor performance tend to use low-quality disclosure to mask their issues and maintain a positive image, thereby bridging the gap between stakeholder theory and legitimacy theory. Companies that disclose social and environmental information are committed to demonstrating their sustainable practices. It is strategic to support these companies in maintaining public trust and support, which is crucial to their long-term success and helps keep them increasingly transparent over time (de Moraes et al., 2023).

In this line of reasoning, voluntary socio-environmental disclosure as an organizational transparency strategy often serves as a mechanism for organizations to cultivate legitimacy among their various stakeholders – see, for instance, Dhandhania and O'Higgins (2022) for a study with tobacco and gambling companies in United Kingdom, and Rocca et al. (2021) for a study involving public sector organizations-, thus establishing a clear link between stakeholder and legitimacy theories. If companies strategically communicate their socio-environmental efforts, they do so to signal that they are engaged in practices that seek to harmonize their environmental, social, and economic footprints with current norms and expectations, seeking legitimacy (Cho and Patten, 2007).

This proactive and participatory disclosure fosters interaction between stakeholders, enabling organizations to cultivate and maintain the trust and endorsement of these actors, ultimately promoting organizational viability and prosperity with a socio-environmental focus (Benjamin et al., 2024). The fact is that companies necessarily navigate the complex landscape of social demands and regulatory pressures, seeking responses to these demands (Tang and Demeritt, 2018).

Incorporating institutional theory, there is a perspective on institutional pressures shaping disclosure practices (Traxler et al., 2023). Among their findings, Deegan and Gordon (1996) presented evidence that companies operating in environmentally sensitive industries are more likely to adopt disclosure practices, with environmental disclosures being used to legitimize the firms' operations.

Organizations gain a crucial perspective on the public pressures that shape disclosure practices. According to Deconinck et al. (2023), companies are under growing pressure to report emissions beyond their direct operations and energy use, now including those from their entire supply chain, from sourcing to distribution. In this sense, institutional theory underpins why voluntary disclosures, initially employed to gain legitimacy, become widespread as they are institutionalized through standards or regulatory mandates (Baalouch et al., 2019). The adoption of standardized reporting frameworks and the impact of national-level factors on disclosure practices are prime examples of how these institutional forces shape corporate behavior in response to stakeholder expectations and the quest for legitimacy (Yu et al., 2021).

##### 4.6.2. Empirical implications

This research provides an understanding of current trends in socio-environmental disclosure practices, drawing on the existing literature. The related empirical implications underscore the importance of transparent reporting for corporate responsibility and sustainability, offering a roadmap for future research and policy development.

Based on Baloria et al. (2019) who emphasize shareholder proposals as an effective way for investors to communicate their preferences regarding corporate disclosure policies, and considering activists' continued focus on environmental and social disclosure, the notion that shareholder proposals serve as an effective mechanism to influence corporate disclosure is reinforced. Consequently, the findings of this study are likely to extend to a broader spectrum of disclosures across environmental, social, and governance issues, reflecting the broader importance of shareholder engagement in shaping corporate transparency. Such transparency also helps companies better manage stakeholder expectations and enhance their overall corporate image, ensuring better internal reporting to enable internal engagement in the drive for transparency (Zhang and Yang, 2023).

As discussed in the theoretical implications, stakeholder participation also has great power to drive socio-environmental disclosure. Here, a strong connection exists between the practical aspects of promoting disclosure, as companies are more likely to disclose socio-environmental information when faced with pressure from stakeholders, including investors, customers, and regulatory bodies (Benjamin et al., 2024; Guenther et al., 2016; Shahzad et al., 2024). There is, therefore, an impact on organizational decisions related to materiality, which in turn affects the content and quality of disclosures.

Diebel et al. (2024) suggest that policymakers should consider incorporating an educational component into existing regulations to raise awareness about the positive impacts of collecting and disclosing data. It can help promote transparency and accountability, fostering a culture of sustainability within the corporate sector.

According to Fortanier et al. (2011), the proliferation of standards and guidelines is associated with both an increase in the aggregate level of CSR reporting and the harmonization of firms' activities across different countries. These policies aim to reduce the role of domestic institutions, such as legislation and social concerns, and shape CSR practices. Defining these policies ultimately generates strategic interventions that can effectively promote a paradigm shift towards greater transparency and accountability within the corporate sector, ensuring the development of benchmarking (Papa et al., 2022).

By establishing clear expectations and requirements, policymakers can also foster reforms in companies' sustainable governance practices, thereby improving related initiatives and supporting managers in managing them strategically (Adu, 2022). Disclosure ensures an adequate level of information availability, meeting the requirements of regulation and social interests in terms of accountability.

In addition, based on their literature search, Patten and Shin (2019) comment that several studies indicate that companies using disclosure merely to legitimize their actions do not subsequently outperform their peers, which would significantly bolster arguments for stricter regulation of sustainability reporting. Similarly, the positive effects of enhanced regulation and oversight on the quality of sustainability reports across both the private and public sectors would also provide compelling support for increased regulatory intervention.

Ultimately, as commented by De Villiers et al. (2023), the regulatory measures and national legal systems directly influence the creation and dissemination of financial and non-financial information. This highlights the necessary role of governments in promoting transparency and accountability through legislative and regulatory action.

#### 4.7. Proposal for future research

The importance of proposing new research lies in its relevance to emerging scientific discoveries, as systematic reviews highlight the need for studies with practical applications that contribute to solving real-world problems and creating innovative solutions. Thus, it is necessary to present the proposal for future studies in a manner that allows discoveries to be validated and generalized across different contexts, populations, and time periods, thereby ensuring the robustness of the results.

Considering the qualification of the sample using only highly reputable articles, this work suggests encouraging the investigation of the relationships between socio-environmental disclosure and the impact of emerging technologies, such as blockchain, artificial intelligence (AI), and Big Data, highlighting their potential as a promising area of innovation in new research, also promoting green innovation in companies' products and processes. It also proposes deepening investigations into institutional factors, such as opinions on social networks, and how these affect the prioritization of socio-environmental report disclosures, influencing corporate social responsibility.

a) **Blockchain** can provide an immutable, transparent, and decentralized record of transactions (Ezzeddini et al., 2022), transforming

how companies report their socio-environmental practices and ensuring the authenticity and integrity of disclosed data, making it difficult to manipulate or hide information.

- b) **AI** can process large volumes of data (in Big Data context), identify patterns, and predict future impacts precisely (Tao, 2024). At the same time, machine learning tools can analyze data on energy consumption, carbon emissions, and natural resource use, providing insights that support strategic decision-making (Behera et al., 2024).
- c) **Big Data**, by integrating various sources of information, enables a more comprehensive and detailed analysis of companies' socio-environmental practices, allowing them to monitor their performance in real-time, identify areas for improvement, and implement more sustainable practices proactively, while also supporting the progress of AI (Adnan et al., 2024).
- d) **Social Networks** are powerful communication tools for understanding public perceptions, opinions, and expectations (Mouronte-López et al., 2024), and this is no different when it comes to companies' socio-environmental practices. Analyzing these opinions can reveal trends and social pressures that encourage organizations to adopt greater transparency and commitment to sustainability. Additionally, social networks amplify the impact of corporate reputation, making it essential for companies to monitor and respond to the demands imposed by their stakeholders.
- e) **Green Innovation**, valuing regional and cultural characteristics that lead to a low-cost process with specific values and practices, considering elements of frugal production (Moreira et al., 2024; Subramanian et al., 2017), but also observing premises for developing new products with sustainable characteristics to reduce the impacts of their production and use on the environment (Wu et al., 2021), ensuring the maintenance of the competitive power of the companies involved.
- f) **Green Finance** incorporates sustainability as a premise for the financial system to contribute to long-term stability and prosperity (Taneja et al., 2023). This can be combined with high-tech innovation to support sustainable development (Zhang et al., 2024), considering other elements such as blockchain, AI, Big Data, and social networks, to promote green innovation in the financial market.

Ultimately, combining these concepts can elevate the standards of socio-environmental disclosure reports, making them more effective and promoting safer and more transparent management of natural resources, thereby contributing to global sustainability.

#### 4.8. Research contributions and originality

This study presents a methodological application based on an established protocol, which ensures analytical depth using a set of bibliometric tools for a comprehensive scientific mapping of the field of socio-environmental disclosure.

The application of this protocol, as defined by Tranfield et al. (2003), enabled transparent execution based on inclusion and exclusion criteria, resulting in a final corpus of 113 studies that ensured replicability and minimized biases. The protocol ensured a multifaceted and comprehensive scientific mapping based on the corpus, applying a toolkit that integrated VOSviewer, Bibliometrix, and T-Lab Plus software.

This triad of tools allowed a bibliometric analysis that transcends the mere counting of publications by offering:

- a) A co-citation analysis revealing the intellectual linkage structure among the main authors inherent to the field and the theoretical pillars that sustain it. This analysis enabled the identification of three clusters (Fig. 4), highlighting sets of authors working on related themes, as described in Section 4.3.
- b) Application of a frequency-based approach for the formulation of a word cloud, highlighting the most prevalent terms visually and quantitatively. This combined approach provides a panoramic and,

at the same time, detailed view of the trajectories and connections in research on socio-environmental disclosure. Fig. 5 in Section 4.4 presents the corpus analysis, ensuring a visualization of the most prominent words associated with the theme.

- c) A co-occurrence analysis of keywords allowing the identification of central constructs and their relationships, which can be visualized through Fig. 6, also in Section 4.4, containing 2 clusters associating these constructs.

Thus, this study presented pioneering and comprehensive bibliometric mapping, being the first to apply this depth of bibliometric mapping comprehensively to the theme of socio-environmental disclosure. The results generated by this methodology offer substantive and original contributions to the literature on the target topic. The following are the contributions based on the results.

The study presented the identification and characterization of clusters with central themes based on co-citation analysis, which revealed three main and complementary clusters: "Environmental Disclosure Practices," "Sustainability Assurance," and "Organizational Legitimacy." The identification of these clusters highlights the research strands that shape current understanding, offering a clear conceptual map of theoretical interdependencies.

The keyword analysis of the corpus, in turn, identified two prominent clusters: "Corporate Governance" and "Environmental Disclosure". This empirically demonstrates the areas of greatest thematic concentration and conceptual synergies in primary studies.

The study's findings provide an analytical validation of key constructs and their relationships by demonstrating the prominence of terms such as "disclosure," "corporate social responsibility (CSR)," "performance," "organizations," and "legitimacy." More importantly, statistically significant associations were revealed between pairs of words such as "performance" and "organizations," as well as "performance" and "legitimacy," providing an empirical basis for the interrelation of these indicators in the context of socio-environmental disclosure.

A detailed panorama of scientific production and temporal trends is also delivered, as the study offers scientific production indicators (e.g., an annual growth rate of 14.87 %, 304 authors, an average of 3 co-authors per document, 39.82 % international co-authorship) and a temporal analysis that shows a sharp increase in interest in the topic, especially in the period 2021–2024 (growth of 45.1 %). This temporal analysis, along with the identification of the most cited works per period, provides a historical and evolutionary context for the research.

A future research agenda is delineated, where the list of proposals for future research constitutes a direct and original contribution, as it is derived from the systematic analysis of identified gaps and trends. The suggestion to investigate the impact of emerging technologies (Blockchain, AI, Big Data), social networks, green innovation, and green finance on socio-environmental disclosure is timely and based on evidence from the corpus.

Finally, it can be inferred that the study offers an integration between theoretical and practical implications, enriching the way the results of the bibliometric mapping align with and inform stakeholder legitimacy and institutional theories. The implications presented generate indications for policymakers and managers, being strengthened by the systematic nature of the research developed.

## 5. Final considerations

Socio-environmental disclosure emerges as a means for companies to demonstrate their commitment to sustainability in response to social recognition of their responsibility for environmental issues. This phenomenon has led to an increase in companies sharing a wide range of information on environmental issues in specific reports, such as sustainability reports.

This study stands out for its comprehensiveness and depth of analysis, made possible by the application of an appropriate research

protocol, which allowed us to identify and map the scientific production on socio-environmental disclosure in a systematic and detailed manner. In addition, the analysis aimed to identify significant relationships or associations between the main constructs, including performance, organizations, and legitimacy, thereby providing a solid foundation for future research on these topics within the context addressed.

Regarding the research question on the state of scientific research on socio-environmental disclosure in the Scopus and Web of Science journal databases, 113 scientific articles published over a 16-year period were analyzed. This analysis aimed to assess the performance of authors and co-authors focused on the topic while identifying trends and addressing gaps that remain unexplored in the current literature.

Our analysis revealed that 113 articles were extracted from 44 journals, with a substantial number of 304 authors and co-authors. Five articles contained a single author, a relatively small number compared to the total number of authors and co-authors in the corpus. The international participation rate of the corpus was about 39.82 %, with an average of 3 co-authors per article.

Regarding the temporal analysis, among the 16 years studied, the periods between 2021 and 2024 stand out with a strong increase in the publication of articles on the topic, growing around 45.1 %, as well as the years 2017 and 2020 with a rate of 39.8 % and a total of 45 articles published, demonstrating that in recent years there has been greater interest in the topic.

Regarding the co-citation network, a reference of 17 minimum citations was used to form the networks, and it was found that there were 3 clusters with 35 "nodes" and 567 connections. The first cluster, formed by 13 authors, references the work of Deegan and Gordon (1996), titled "A Study of the Environmental Disclosure Practices of Australian Corporations," which received 107 citations and 1497 relational ties in the first cluster. In the second cluster, the highlight was the work of O'Dwyer (2011), titled "The Case of Sustainability Assurance: Constructing a New Assurance Service," which received 43 citations and 773 relational ties. Additionally, in the third cluster, the reference was the study by Cho and Patten (2007), titled "The role of environmental disclosures as tools of legitimacy: A research note," where the research received 106 citations and 1499 relational ties in this cluster.

Regarding the keywords, the most highlighted terms in the corpus are "disclosure," with a total of 80 occurrences, corresponding to 18.8 % of the 425 occurrences, followed by the terms: "corporate social responsibility – CSR," with a total of 58 occurrences, representing 13.6 % of the total occurrences, "performance" with 43 occurrences, representing 10.1 % of the total, "organizations" with 38 occurrences, representing 8.9 % of the total occurrences, and "legitimacy" which obtained a total of 32 occurrences, corresponding to 7.5 % of the 20 main words selected from the corpus.

When analyzing the keyword network with a minimum parameter of 6 occurrences, a total of 35 "nodes" were distributed in a total of 2 clusters. In the first red cluster, the terms with the most occurrences were "corporate governance and financial performance," containing 18 words. Meanwhile, the second cluster has 17 words; the most highlighted term was "environmental disclosure."

Based on the implications of this research, policymakers are advised to prioritize the development and implementation of standardized and comprehensive regulations that mandate environmental and social disclosure. Such policies should not only define the scope and content of reports but also establish clear mechanisms for verification, disclosure, and accountability, ensuring the reliability and comparability of the information disclosed. In addition, incentives and support programs can be introduced to encourage companies, especially small and medium-sized enterprises (SMEs), to adopt sustainable practices and enhance their disclosures beyond the mandatory requirements. Collaboration among entities and harmonizing reporting frameworks are also crucial for facilitating global comparability, providing an enabling environment for benchmarking, and effectively addressing transnational environmental and social challenges.

For organizations' managers, this research highlights the strategic need to adopt robust social and environmental disclosure to build trust, strengthen legitimacy, and foster stronger relationships with stakeholders. Companies should move beyond a purely compliance-oriented approach and seek to integrate sustainability considerations to reshape their business strategies and operational processes. Engaging human resources, using their expertise, and investing in modern systems to support the generation of reliable and transparent social and environmental data-based reports should be considered objectives in the organizational development strategy. Engaging stakeholders to understand their expectations and incorporating their feedback into disclosure practices can further enhance the credibility and relevance of corporate reporting, ultimately contributing to long-term value creation and resilience.

## Generative AI and AI-assisted technology declaration

While preparing this work, the authors used Microsoft Copilot, Google Gemini and Grammarly to translate and edit the text. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

## CRediT authorship contribution statement

**Wesley Vieira da Silva:** Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Hyandra Kalina Silva de Carvalho Gama:** Writing – original draft, Investigation, Formal analysis, Data curation. **Maria Cádina Marques da Silva:** Writing – original draft, Investigation, Data curation. **Vinicius José Silva Oliveira:** Writing – original draft, Investigation, Data curation. **Luciano Luiz Dalazen:** Writing – original draft, Validation. **Victor Diogho Heuer de Carvalho:** Writing – review & editing, Writing – original draft.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A

## Data availability

All relevant research data are presented in the text of the article.

## References

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