

## REVIEW ARTICLE

# Extending the boundaries of financial reporting in the extractive industries: Insights from bibliometric analysis

Giovanna Centorrino | Valeria Naciti | Daniela Rupo

Business Administration and Accounting,  
University of Messina, Messina, Italy

## Correspondence

Valeria Naciti, Business Administration and  
Accounting, University of Messina, Messina,  
Italy.

Email: [valeria.naciti@unime.it](mailto:valeria.naciti@unime.it)

## Abstract

Financial reporting in extractive industries (EIs) is a crucial function that warrants further attention in the literature. Previous studies have identified several issues related to financial reporting quality, its impact on stock prices, and the relationship between financial reporting and corporate governance. However, significant gaps remain in understanding the impact of the extractive industry's unique characteristics and the role of regulators in enhancing financial reporting practices. This study aims to illuminate the research trajectory affecting extractive firms by describing the state-of-the-art regarding related accounting standards through a mapping of currently accessible studies. To achieve this, we applied a bibliometric analysis methodology. Bibliometric techniques provide a quantitative approach for objectively assessing literature, offering a comprehensive overview of influential authors, journals, themes, and countries within a specific research field. This approach also facilitates the identification of research trends and the prediction of future developments. The study highlights the growing demand for sustainability reports as the primary formalized means for companies to disclose their sustainable development efforts. Research on sustainability reporting in the mining sector underscores the importance of integrated sustainability reporting, with a focus on understanding the evolution and advancement of reporting methodologies across all dimensions of corporate social responsibility.

## KEYWORDS

accounting standards, bibliometric analysis, corporate social responsibility, extractive industry, financial reporting, IFRS 6

## 1 | INTRODUCTION

The oil, gas, and mining industries are categorized as extractive industries (EIs), which are engaged in the exploration and removal of natural resources from the earth's surface or subsurface. The initial phase of this process involves determining the presence of a resource and assessing whether its extraction is economically viable (Marcos-Martinez et al., 2019). These phases are fraught with substantial risk due to the low probability of discovering commercially exploitable

sites. EIs require substantial financial investment to support upstream activities. Consequently, the issuance of shares or bonds on financial markets becomes crucial for attracting investor interest. In this context, financial statements serve as an essential instrument, providing stakeholders with a comprehensive overview of the company's management, thereby aiding in decision-making and ensuring the continued alignment of their interests.

The accounting and disclosure methods employed by businesses in EIs today differ markedly from those utilized in other sectors across

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2024 The Author(s). *Corporate Social Responsibility and Environmental Management* published by ERP Environment and John Wiley & Sons Ltd.



various countries. This discrepancy poses challenges for users attempting to compare financial statements of mining and petroleum companies across different nations or with other companies within the same nation (International Accounting Standard Committee, 2021). Due to the unique nature of extractive production, it has become imperative to address these issues, prompting central international accounting bodies to establish specific accounting standards. These issues significantly influence the decision-making processes of markets, governments, investors, and other stakeholders (Baudot & Cooper, 2022). The prominent role of the extractive sector in the global economic system (Cortese et al., 2022) and its distinct business characteristics have made it a focal point of extensive research. The academic debate on disclosure and accountability implications remains active on an international scale. Global discussions, the unique and strategic significance of extractive sector companies, recent developments regarding the reduction of gas and oil supply sources, and the prominent role of international financial reporting standard (IFRS) No. 6 on exploration for and evaluation of mineral resources collectively indicate that this research field is sufficiently mature to warrant further study (Mukherjee et al., 2022).

The quality of financial reporting in EIs has been extensively discussed in the literature (Gray et al., 2019; Smith and Venter, 2020; Mcchlery and Hussainey, 2021). Constantatos et al. (2020) identified that extractive companies tend to provide low-quality financial information due to their complex operations, volatile markets, and exposure to geopolitical risks.

Hassan (2004) reported that high-quality financial reporting positively influences the stock prices of extractive companies.

The relationship between financial reporting and corporate governance in EIs has also been investigated. Afriyie et al. (2016) discovered that superior corporate governance is positively correlated with the quality of financial reporting in EIs. Additionally, Gstraunthaler and Ulyanova (2010) found that extractive companies with robust corporate governance are more likely to disclose environmental and social information in their financial reports.

Many contributions have focused on specific aspects of asset valuation and reporting without considering the complex and multifaceted implications of accounting for exploration and evaluation costs for external users within the mining industries. Although other studies, such as Gray et al. (2019), have reviewed the existing literature on financial reporting in the extractive sector, a bibliometric analysis has yet to be conducted. Given the significance of the EIs and the growing interest in their economic impact, it is worthwhile to map and conceptualize the fragmented existing literature. Accordingly, the primary aim of this research is to conduct a comprehensive bibliometric analysis of financial reporting in EIs to envisage emerging trends in corporate disclosure in this specific industry. This analysis maps the state-of-the-art in related accounting standards and practices, identifying influential authors, journals, themes, and countries within the field, and highlights the focus of current evolution of corporate mandatory reporting and future research directions.

This research adopts a novel perspective of investigation on corporate reporting in the mining industry, enhancing understanding on

how these companies are called to disclose the value creation to stakeholders under the accounting and reporting regulatory framework and the need for the adoption of further reporting tools to cope with their information needs. In this vein, the study addresses the following questions:

1. RQ1: How has research on EI and accounting evolved?
2. RQ2: What topics have linked EI and financial accounting, attracting scholarly attention over time?
3. RQ3: What are the research trends and thematic areas in EI and accounting and reporting?

This study makes a significant contribution by highlighting several gaps that researchers still need to address. Firstly, it underscores the increasing need for sustainability reports, which provide a structured platform for businesses to disclose their sustainable development initiatives. In the mining sector, scholarly inquiry emphasizes the evolution toward sustainability reporting to cover all dimensions of corporate social responsibility (CSR). Secondly, further research is required to examine the role of regulators in improving financial reporting in EIs in the evolving scenario toward a comprehensive disclosure. Thirdly, more studies are needed to investigate the usefulness of financial reporting to the assessment of environmental, social, and governance (ESG) performance of EIs.

The remainder of this paper is organized as follows. Section 2 presents the theoretical background. Section 3 discusses the research methodology and techniques. Section 4 presents the analysis, conclusions, and findings based on the research objectives and questions. Section 5 identifies our research stream. Section 6 discusses the study's conclusions, policy implications, and future directions.

## 2 | THEORETICAL BACKGROUND

Mineral, oil, and gas companies, including some of the world's largest corporations and numerous smaller exploration firms, represent substantial values on international stock exchanges. Their activities—exploring, discovering, developing, and extracting deposits of minerals, oil, and natural gas—are collectively known as extractive activities. These processes involve multiple stages, from identifying and assessing resources to their eventual extraction. Following the upstream extraction of metals and the production of crude oil and gas, the industry moves into downstream activities, which include refining and developing value-added products (Cortese et al., 2009).

Profits from EIs are particularly risky due to the high proportion of fixed costs and the unpredictability and volatility of selling prices. Several factors contribute to this uncertainty, including land access, environmental approval procedures, the discovery of profitable mineral reserves, the viability of extraction technology, taxation, and other government policies (Luther, 1996). Development and production risks, evolving technology, varying time horizons, market risks, and shifting legal and political environments necessitate alternative economic outcomes for successful projects (Wise & Spear, 2000).

For several decades, the reporting practices of extractive activities have been the focus of contentious discussion, posing challenges for regulators and standard setters (Gray et al., 2019). Extractive companies often prefer flexible accounting methods for pre-production activities, enabling them to present their operations in the most favorable light. These pre-production costs are typically accounted for using historical cost conventions. The full cost method is adopted to capitalize all costs associated with property exploration within the appropriate geographic cost center, usually a country. In contrast, the successful efforts method capitalizes the costs of drilling exploratory and stratigraphic test wells to determine if the well can produce proven reserves (KPMG, 2017). If it is later determined that the well cannot produce proven reserves, the capitalized costs are expensed.

Numerous attempts have been made to develop financial reporting standards aimed at limiting the variety of accounting methods available and guiding expert judgment. Since 1998, the International Accounting Standards Committee (IASC) has recognized the uncertainties and challenges faced by mining companies and their substantial impact on the global economy. As a result, a specific draft standard was issued to address some of these critical issues. Despite the issuance of IFRS 6 in 2004 and its subsequent updates, the choice of the evaluation method remains discretionary, aligning with the operational strategies and financial reporting objectives of the firm (Gray et al., 2019). Consequently, IFRS accounting practices often reflect pre-IFRS national requirements (Stadler & Nobes, 2022).

The economic power of the extractive companies, coupled with their lobbying influence, have sustained the use of both the full cost and successful efforts methods of accounting for exploration and evaluation costs, a situation likely to persist in the future.

Moreover, the extractive sector faces intense scrutiny and pressure regarding sustainability issues. The sector's operations inherently impact the environment, making sustainability a critical concern. The international debate on sustainability, as highlighted by Sharma and Bhatnagar (2015), permeates every facet of extractive industry operations. These industries are deemed "sensitive" due to their potential environmental and social impacts, necessitating stringent regulatory frameworks and heightened corporate responsibility standards (Rathobei et al., 2024).

### 3 | RESEARCH METHODOLOGY

To answer the research questions, we applied a bibliometric analysis methodology that is acknowledged to play a crucial role in the quantitative research field (Bortoletto et al., 2023; Centorrino et al., 2022; Mukherjee et al., 2022; Srivastava et al., 2021; Zupic & Cater, 2015), as it provides different visual outcomes to present relationships between the key features of research (Kumar et al., 2022). This methodology has been used in the field of accounting and management (Carmona et al., 1999); Performance analysis and science mapping are the two primary applications of bibliometric methods (Cobo et al., 2011). A performance analysis examines how well people and organizations perform regarding research and publication. Science

mapping aims to make the dynamics and organization of scientific fields observable. Researchers can review a specific research line using this structure and development information. Bibliometric techniques provide a subjective assessment of literature as a quantitative approach. In a review article, they offer proof of the theoretically derived categories (Galletta et al., 2022). By combining the views of several authors, these techniques bring objectivity to the assessment of scientific literature and have the potential to strengthen rigor and reduce researcher bias in scientific literature reviews (Zupic & Cater, 2015). Moreover, by visualizing networking mapping, bibliometric analysis helps investigate the relationship between articles, citations, authors' productivity, and emerging keyword trends. This will help identify research gaps in the field (Donthu et al., 2021; Mukherjee et al., 2022).

Accordingly, the analysis carried out in this research offers a progressive perspective to evaluate literature development from conceptual uncertainty to theory evaluation and to clarify the critical dimensions and their relationships. Furthermore, bibliometric analysis provides a comprehensive overview of the most influential authors, journals, keywords, and countries in a specific research field (Mukherjee et al., 2022). Through this analysis of the evolution of literature, it is possible to consider and highlight the number of academic partnerships in the research community to develop and share knowledge with (Koseoglu, 2016), identify research trends, and predict future outcomes.

#### 3.1 | Data collection

To examine the current stream of literature, we carried out a bibliometric analysis integrated with content analysis (Gaur & Kumar, 2018; Gerged et al., 2023). Bibliometric analysis addresses certain limitations inherent in the literature review methodology by quantifying the existing body of literature. Unlike literature reviews, which aim to transform literature content into objective and systematic forms for content identification, specification, mapping, and evaluation, bibliometric analysis offers a more comprehensive approach. Literature reviews often fail to identify related intellectual domains (Tranfield et al., 2003).

This methodology provides a foundation for analyzing extensive bibliometric data, enabling the classification and visualization of information. It allows the identification of key topics, expressed as keywords, that frequently appear in literature. Essentially, the occurrence of a topic in literature and its co-occurrence structures signify the prominence of the topic and the strength of connections between them, respectively. The circle size indicates the frequency of a keyword or author occurrence, while colors indicate the cluster to which the keywords belong. Additionally, the frequency of publications (referred to as 'items') reflects the prominence of a keyword. The strength of connections between two keywords, such as  $i$  and  $j$ , is determined by the number of items containing both keywords in the title, abstract, or author keywords (Naciti et al., 2021).

**TABLE 1** Terminology used by VOSviewer software (Van Eck & Waltman, 2014).

Term	Description
Items	Objects of interest (e.g., publications, researchers, keywords, authors)
Link	Connection or relation between two items (e.g., co-occurrence of keywords)
Link strength	Attribute of each link, expressed by a positive numerical value. In the case of co-authorship links, the higher the value, the higher the number of publications the two researchers have co-authored
Network	Set of items connected by their links
Cluster	Cluster sets of items included in a map. One item can belong only to one cluster
Weight attribute: Number of links	The number of links of an item with other items
Weight attribute: Total link strength	The cumulative strength of the links of an item with other items

Moreover, to assess changes in keyword frequency over time, we conducted a chronological analysis using a weighted average of the years. The average year of occurrence provides insights into temporal trends. The definitions clarify key elements such as items, objects of interest, links, link strength, clusters, and various weight attributes, offering a comprehensive understanding of the bibliometric analysis approach.

The average year of occurrence of a keyword  $i$  is calculated by:

$$y_i = \frac{\sum_t (n_{it}t)}{\sum_t n_{it}}$$

where  $n_{it}$  represents the number of items where keyword  $i$  occurs in year  $t$  ( $t = 1985, 2009, \dots, 2023$ ).

Table 1 shows some technical terms we use to describe the clusters created by the software.

Among the different approaches we used:

1. Citation analysis to observe the most influential paper in a research field.
2. Bibliographic coupling, a technique for scientific mapping that allows us to observe the present trajectory of research.
3. Co-word analysis, a technique for scientific mapping that allows us to observe the present and future direction of topics.
4. Countries analysis to observe the most influential countries.

### 3.2 | Data analysis

This study used the preferred reporting items for systematic reviews and meta-analyses (PRISMA) approach (Page et al., 2021) for the selection of papers. Following recent research on the field of

**TABLE 2** The preferred reporting items for systematic reviews and meta-analyses model for literature reviews.

Study design	The study applies a literature review to summarize existing literature evidence based on a rigorous, explicit, and transparent stepwise iterative process
Review protocol	To minimize the likelihood of biased post hoc decisions in review methods, reviewers have previously set the search criteria and related keywords
Eligibility criteria	We considered only articles published in peer-reviewed journals as eligible; we identified studies by searching the Web of Science (WoS) electronic database applying the codes defined by the authors; we mapped and clustered bibliometric data
Publication type included	Peer-reviewed articles from WoS electronic database
Publication time frame	1985–2023
Language	English
Search strategy	We selected the following codes to search in the source database: Account*, accounting standard* financial report*, IFRS 6, mining industry*/company*, extractive industry*/company*, oil and gas industry*/company*. Categories: Business; management; economics; public administration; We assessed full-text articles for the subsequent eligibility and inclusion decision. Main topics were identified through a cluster network analysis

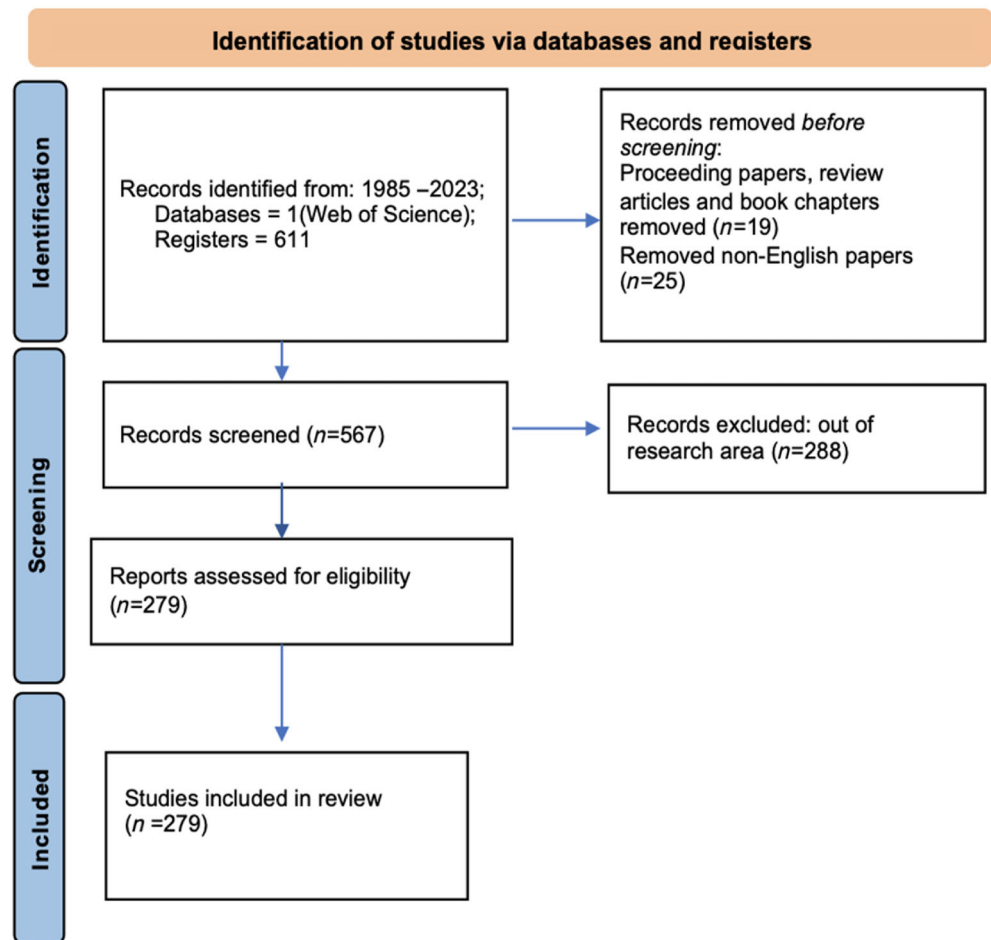
accounting and management (Galletta et al., 2024; Öztürk et al., 2024) we applied the steps described in Table 2 and Figure 1 for the selection of articles to be included in our sample.

Search expressions derived from the selected keywords were used to collect materials from the chosen search databases. We used the Web of Science (WoS) database to collect publications on the topic. This broad, interdisciplinary bibliographic database offers thorough publishing statistics and high-quality articles on numerous scientific fields, globally. The analysis considered publications between 1985 (since the establishment of the WoS database that year), and 2023. To extract publications, we used the following search terms: account\*, accounting standard\* financial report\*, IFRS 6, mining industry\*/company\*, extractive industry\*/company\*, oil and gas industry\*/company\*.

In the selection of the keywords for our analysis, we decided to exclude all the terms specifically referred to CSR and sustainability reporting, to observe the evolution of corporate reporting under the lens of financial reporting. Our research strategy revealed, as we might expect, that nonfinancial aspects are becoming prominent also within mandatory reporting, already much earlier than the evolution of the regulatory framework for financial reporting.

In this sense, we have considered that, living aside more detailed implications concerning the subjectivity of many estimates of values within the financial statements, the topic deserves to be developed

**FIGURE 1** Preferred reporting items for systematic reviews and meta-analyses flow diagram for systematic literature reviews.



considering the interrelationships between financial and nonfinancial information.

Data from the WoS were imported to VOSviewer v.1.6.16 software (Centre for Science and Technology Studies, Leiden University, Leiden, The Netherlands), which is often used to analyze and display relationships among authors, nations, co-citations, and the keywords used in articles. Publications were organized and methodically evaluated according to publication year, study field, journal title, nations, organizational connections and authors. Publications were organized and methodically evaluated according to publication year, study field journal title, nations, organizational connections, and authors. Network analysis also considered frequency of the keywords taken from the articles. The program uses citation data to locate networks and clusters of varied sizes and hues. These clusters are based on a link analysis that considers the degree to which the sample articles are connected (Van Eck & Waltman, 2014).

A customized thesaurus was used before the data were analyzed using VOSviewer to prevent repetition and synonyms. Some acronym-containing words, such as CSR and corporate social responsibility, have been combined into one term. Data that had been cleaned and arranged were then loaded into VOSviewer.

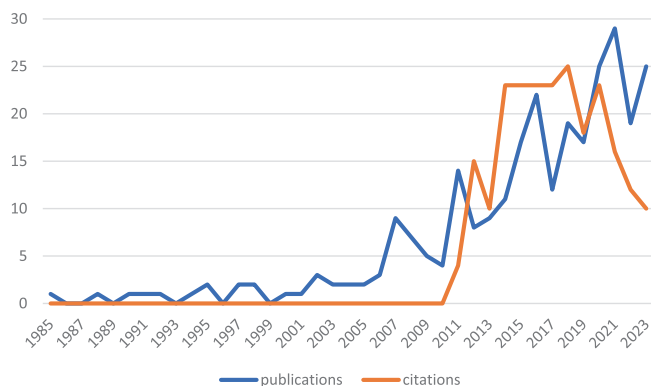
## 4 | RESULTS AND DISCUSSIONS

### 4.1 | Descriptive analysis

This section represents the bibliometric results of articles dating between 1985 and 2023. Figure 2 shows the 279 analyzed documents and 4078 citations extracted from sources. Between 1992 and 2007, the number of papers were not relevant. Starting from 2006, it is evident that the scientific community had intensified its interest in the issues of mineral resources, considerably increasing the number of publications on the subject. This trend might have been influenced by the first adoption of IFRS 6 at an international level. In subsequent years, the trend “goes up the stairs and down with the elevator” as it is a bullish topic that slowly rises over time. It can be noted that the peak of studies in this field was reached in 2020 (29 papers) and 2021 (25 papers), suggesting a growth in research interest starting from 2019. During 2022 (19 papers), there was a decrease, probably due to the COVID-19 pandemic period, which was followed by an increase in 2023 (25 papers). The annual citation count shows a similar pattern.

Table 3 shows the top journals with more than three publications. It is worth noting that the journals have the same number of records in several positions on the list. The papers published by the top





**FIGURE 2** Number of publications and citations from 1985 to 2023.

**TABLE 3** Top journals with more than three publications.

Ranking	Journal	Record count	% of 279
1	<i>Energy Policy</i>	12	4.301
2	<i>Mineral Economics</i>	10	3.584
3	<i>International Journal of Energy Sector Management</i>	8	2.867
4	<i>Meditari Accountancy Research</i> <i>World Development</i>	7	2.509
5	<i>European Journal of Operational Research</i> <i>Journal of World Energy Law Business</i>	6	2.151
6	<i>Accounting Auditing Accountability Journal</i> <i>Accounting Forum</i> <i>Ecological Economics</i>	5	1.792
7	<i>Accounting and Finance</i> <i>Applied Economics</i> <i>Australasian Accounting Business and Finance Journal</i> <i>Australian Accounting Review</i> <i>Journal of Emerging Technologies in Accounting</i> <i>Review of Income and Wealth</i>	4	1.434
8	<i>Accounting History</i> <i>Accounting Research Journal</i> <i>Accounting Review</i> <i>Business History</i> <i>Business Strategy and The Environment</i> <i>Corporate Governance the International Journal of Business in Society</i> <i>Corporate Social Responsibility and Environmental Management</i> <i>Critical Perspectives on Accounting</i>	3	1.075

journals (119) account for 42.63% of the total journal articles (279). In *Energy Policy*, the first of the top journals, twelve papers were published with a score of 4.301%. The first paper was published in 1998

(Rutledge and Wright (1998)) and regards the issue of profitability and taxation in the UK Continental Shelf oil and gas industry; the last one was published in 2019 (Kraal (2019)). It compares different countries concerning their petroleum industry tax incentives and energy policy.

## 4.2 | Citations

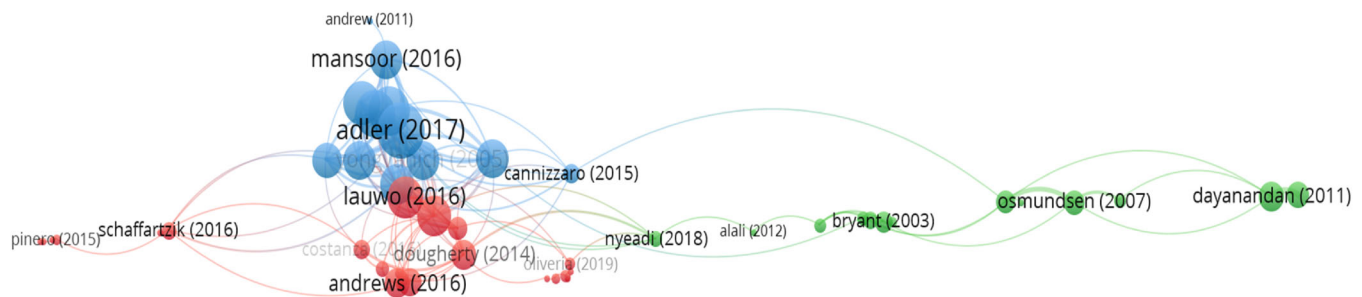
Citations are still considered a crucial indicator of scientific impact (Larsen & Von Ins, 2010). Nevertheless, in the case of bibliometric analysis, they should be used with some caution given that new articles are less likely to be more frequently cited than older articles, especially in study fields like the present one, that, in recent times, have seen considerable growth (Mukherjee et al., 2022). Table 4 displays the top-cited paper of our sample. It is essential to highlight the variety of the topics and approaches of the papers, which is also evident in the top journals: this may indicate that many areas are interested in this subject, which can be approached from diverse perspectives.

In first position, there is the paper by Epstein et al., (2011), which has 225 citations and an average per year of 16.07. It considers the different stages in the life cycle of coal as generating a waste stream carrying multiple hazards for health and the environment. An impactful article by Cho (2009), second position (167 citations), presents a case study examining the environmental disclosure decisions and practices of Total SA, one of the world's largest integrated oil and gas companies. The paper by Corts and Singh (2004) is in third position (116 citations). It regards the offshore drilling industry. Cross's (1995) paper, in fourth position (108 citations), reports the results of a study of three successive IT outsourcing contracts at British Petroleum (BP).

An impactful paper by Hochbaum and Chen (2000), in fifth position (101 citations), addresses more technical arguments regarding the open-pit mining problem. The following paper by Sukcharoen et al. (2014), sixth position (99 citations), considers the relationship between oil prices and stock market index of various countries between 1982 and 2007. Sovacool et al. (2016) are in seventh position (94 citations). Their paper regards the critical topic of the extractive industries transparency initiative (EITI), the worldwide non-governmental organization (NGO) that maintains a voluntary standard for revenue transparency in the extractive sector. The eighth paper (Clark & Jacks, 2007), with 81 citations, addresses the historical issue of coal output during the Industrial Revolution. In ninth position (72 citations), there is the paper by Cooke (2003). The author discusses a critical analysis of the system dynamics of the 1992 Westray mine disaster in Nova Scotia, Canada. The last paper (62 citations) in our top ten, by Lauwo et al. (2016), regards the ongoing debate on governance, accountability, transparency, and CSR in the mining sector in the context of a developing country. It can be noted that among the most cited works, no example appears of a study on any accounting aspects of the topic. This peculiarity highlights that the field of studies which this analysis is aimed at is represented by multiple interests including the need for more cost evaluation issues specific to IFRS 6 or other international accounting standards.

**TABLE 4** Top-cited articles.

Ranking	Title	Authors	Source title	Year	Citations
1	Full cost accounting for the life cycle of coal	Epstein, P. R. et al.	<i>Ecological Economics Reviews</i>	2011	225
2	Legitimation strategies used in response to environmental disaster: A French case study of total SA's Erika and AZF incidents	Cho, C. H.	<i>European Accounting Review</i>	2009	167
3	The effect of repeated interaction on contract choice: Evidence from offshore drilling	Corts, K. S.; Singh, J.	<i>Journal of Law Economics &amp; Organization</i>	2004	116
4	IT outsourcing—British Petroleum's competitive approach	Cross, J.	<i>Harvard Business Review</i>	1995	108
5	Performance analysis and best implementations of old and new algorithms for the open-pit mining problem	Hochbaum, DS; Chen, A.	<i>Operations Research</i>	2000	101
6	Interdependence of oil prices and stock market indices: A copula approach	Sukcharoen, K. et al.	<i>Energy Economics</i>	2014	99
7	Energy governance, transnational rules, and the resource curse: Exploring the effectiveness of the extractive industries transparency initiative (EITI)	Sovacool, B. K. et al.	<i>World Development</i>	2016	94
8	Coal and the industrial revolution, 1700–1869	Clark, G.; Jacks, D.	<i>European Review of Economic History</i>	2007	81
9	A system dynamics analysis of the Westray mine disaster	Cooke, D. L.	<i>System Dynamics Review</i>	2003	72
10	Corporate social responsibility reporting in the mining sector of Tanzania: (Lack of) government regulatory controls and NGO activism	Lauwo, S. G. et al.	<i>Accounting Auditing &amp; Accountability Journal</i>	2016	62

**FIGURE 3** Bibliographic coupling clusters.

### 4.3 | Bibliographic coupling

Two articles are said to be bibliographically related if they both list the same one or more sources in their bibliographies (Kessler, 1963). As a result, if two publications mention a third publication, they are said to be bibliographically related (coupled).

The bibliographic coupling of articles and the graphical visualization of the clusters are shown in Figure 3. The color of each node represents the various approaches developed in the field of EI literature, and the sizes indicate the total number of citations for each article. Furthermore, the distance from one node to another is noteworthy. The shorter the distance between two nodes, the more they share many references. Three clusters attributable to different colors emerge from the analysis. Overall, the blue cluster contains papers

with environmental reporting issues as a common theme. The red is related to the ongoing debate on governance, accountability, transparency, and CSR in extractive companies, and the green looks at the accounting methods for exploration and development (E&D) expenditures for extractive firms.

Table 5 shows the top ten articles based on the total connection strength of the examination of bibliographic coupling. The VOSviewer manual states that each link has a strength, represented by a positive numeric value. The higher the value the stronger the relationship. Adler et al., 2017 study in the blue cluster (Figure 2) has the highest link strength of 87. The paper, using content analysis and interviews, explores the biodiversity reporting practices and trends of the top 50 Australian mining companies before and after the United Nations (UN) declared 2011–2020 as the “Decade on Biodiversity,” which

**TABLE 5** Top articles bibliographically coupled by total link strength.

Rank	Document	Citations	Total link strength	Cluster color
1	Adler et al. (2017). United Nations Decade on Biodiversity: A study of the reporting practices of the Australian mining industry	43	87	Blue
2	Cho (2009). Legitimation strategies used in response to environmental disaster: A French case study of Total SA's Erika and AZF incidents	167	68	Blue
3	Islam and Islam (2011). Environmental incidents in a developing country and corporate environmental disclosures A study of a multinational gas company	23	63	Blue
4	Coetzee and Van Staden (2011). Disclosure responses to mining accidents: South African evidence	48	53	Blue
5	Lauwo et al. (2016). Corporate social responsibility reporting in the mining sector of Tanzania: (Lack of) government regulatory controls and NGO activism	62	48	Red
6	Phiri et al., (2019) Stakeholder interactions and corporate social responsibility (CSR) practices Evidence from the Zambian copper mining sector	30	47	Red
7	Amoako et al., (2017) Sustainability reporting insights from the websites of five plants operated by Newmont Mining Corporation	28	46	Blue
8	Mansoor and Maroun (2016) An initial review of biodiversity reporting by South African corporates: The case of the food and mining sectors	21	43	Blue
9	Yongvanich and Guthrie (2005) Extended performance reporting: an examination of the Australian mining industry	44	43	Blue
10	Abdalla and Siti Nabiah (2015) Pressures for sustainability practices in an oil and gas company: evidence from Sudan	24	42	Blue

aimed to contribute to reducing the continuing loss of species diversity significantly. The results show that the extent of biodiversity reporting is quite variable, with some companies showing substantial increases in their biodiversity reporting and others showing modest or no increases.

Cho, 2009, is in second position, with a total link strength of 68, in the blue cluster, which is also present in the second position of the top-cited articles. It presents a case study examining the environmental disclosure decisions and practices of Total SA, one of the world's biggest integrated oil and gas companies. Its management is constantly exposed to ethical and social issues as it operates in environmentally sensitive industries and has a significant global presence. Overall, the results show that Total employed communication tactics to justify their behavior and bolster the claim that social and environmental disclosures are still an effective tool for establishing legitimacy rather than an attempt to increase accountability.

With a total of 63 link strengths, the paper of Islam and Islam (2011) (blue cluster) examines the Niko Resources environmental disclosure programs after two significant environmental blowouts at a gas field in Bangladesh in 2005. Niko Resources is a multinational oil and gas company with headquarters in Canada. Analysis of the Niko disclosure approach aims to understand if it was connected to public anxiety about the blowouts. The results demonstrate that Niko failed to fulfill its obligation to the local community impacted by the blowouts by including nonfinancial environmental information in its annual reports and press releases. Coetzee and Van Staden (2011) (blue cluster) has a total link strength of 53. His paper looks at the safety disclosures made by South African mining companies in their annual reports, sustainability reports, and reactive corporate press releases in the wake of two significant mining accidents that happened at their

Gold Fields and Harmony Gold mines. The findings indicate that organizations increase their safety disclosures in response to perceived threats to their legitimacy.

Another stream of literature was pursued by Lauwo et al. (2016), red cluster (Figure 3), 48 total link strength. To highlight the importance of local government laws and nationally organized NGO advocacy and campaigning concerning promoting corporate social reporting practices, the paper looks at the reporting policies of Tanzania's two biggest multinational gold mining companies. Phiri et al., (2019) are in sixth position, with a paper in the red cluster. This paper critically examines how key players interact and affect CSR in Zambia's copper mining industry. The authors specifically look at the power dynamics in stakeholder interactions. The study reveals glaring power imbalances between the government, civil society, and mining corporations. Various factors make these imbalances worse, including conflicts among these critical stakeholders.

In the last four positions, all papers are in the blue cluster. The seventh is the paper by Amoako et al., (2017). It aims to identify and account for the contents of sustainability reporting communicated through the websites of the plants of the same multinational mining corporation on five continents. It was found that most of the reporting on sustainability matters comprises narratives; there were also a few physical measures but very little financial information. In eighth position, Mansoor and Maroun's (2016) paper examines to what extent South African companies listed on the local stock exchange in the mining and food producer and retail sectors include biodiversity-related issues in their integrated and sustainability reports. Even though South Africa has a well-established corporate governance code and a long history of including nonfinancial information in corporate reports, the research findings reveal few examples of detailed



**TABLE 6** Top-cited keyword.

Keyword	Occurrences	Cluster
Extractive industry	52	Green
Corporate social responsibility	25	Green
Disclosure	23	Red
Governance	18	Green
Oil	18	Blue
Accountability	14	Green
International financial reporting standard	14	Red
Environmental disclosure	13	Green
Performance	12	Green
Value relevance	10	Red

reporting on biodiversity issues. In ninth position, Yongvanich and Guthrie's (2005) paper argues the importance of reporting intellectual capital (IC) information and noneconomic performance.

A content analysis was carried out utilizing an Extended Performance Reporting Framework to investigate the voluntary reporting practices found in the annual reports of Australian mining companies. According to the results, the sample companies prioritized information on internal control over information on noneconomic performance. The study offers an opportunity to examine the reasons behind the decisions to report or not report different reporting elements. In tenth position, Abdalla and Siti-Nabiha, (2015) aimed to investigate the pressures to adhere to sustainability practices in an oil company in Sudan and its response to them. Results show that external and internal pressures were exerted on the company to adopt sustainability practices. However, the coercive pressures did not necessarily bring about a fundamental change in the organization.

#### 4.4 | Co-word analysis

Keyword analysis looks at the publication's actual content and makes the same assumption as co-citation analysis, that is, that words that commonly occur together have a thematic connection. It can be used as a complement to deepen comprehension of thematic clusters obtained via co-citation analysis or bibliographic coupling as topics created through commonality in publications tend to be quite generic. This kind of analysis may also be used to foresee future research on the subject, provided that pertinent "words" with implications for future publication and research goals are included in the study.

This method is crucial since it helps authors understand the development and organization of the research area. It allows us to clarify two issues: to detect the hierarchies among the areas of a research problem and to detect the minor but potentially growing areas. Accordingly, conceptual mapping of scientific material is made more accessible. The article's title, abstract, and author keywords all serve as sources for the keywords.

Table 6 shows the most frequently used words in our sample of articles.

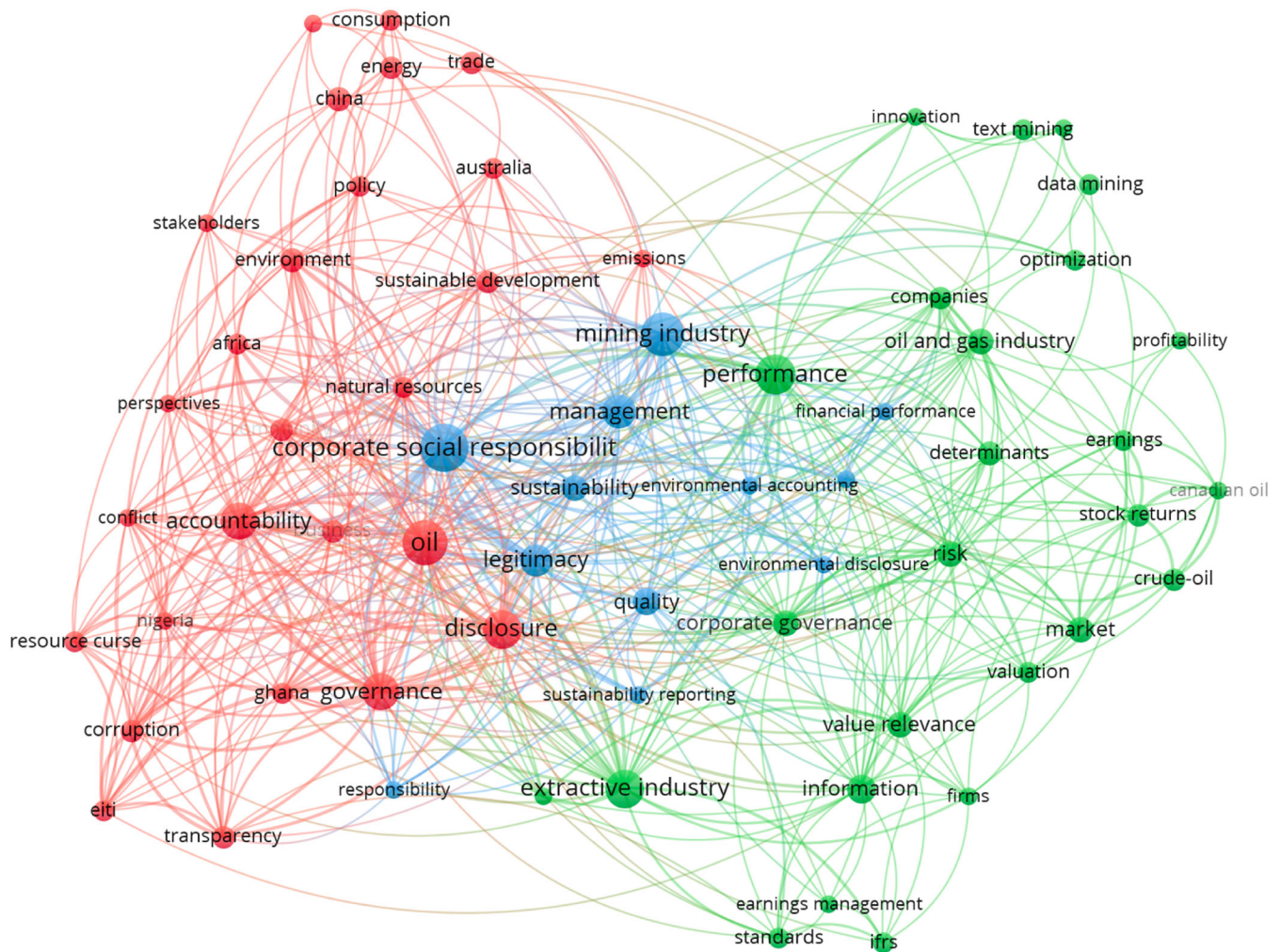
The keyword analysis map is shown in Figure 4. It represents the keywords connected through the colored lines that show how many publications these keywords occurred in, simultaneously, in the data set. The terms that are used the most frequently show that these words have seen more significant research.

Three clusters are represented by different colors (green, red, and blue) on the keyword co-occurrence network map (Figure 4). Although these clusters are closely related and have common themes, three study strands may be distinguished that pertain to performance and accounting (green cluster), CSR (blue cluster) and accountability (red cluster).

The green cluster highlights the intricate relationships among key concepts such as performance, EIs, IFRS, risk, value relevance, and innovation. The extractive industry, encompassing sectors like mining and oil, requires specialized accounting and disclosure practices due to its unique operational and assets characteristics. Performance in this industry is assessed through financial and operational metrics, while risk management is crucial due to market volatility and regulatory changes. IFRS plays a vital role in establishing global standards, particularly concerning the costs for exploration and evaluation of mineral reserves, ensuring consistency and transparency in financial reporting (Gray et al., 2019; Nobes & Stadler, 2021; Rizzato, 2012). This standardized approach enhances the value relevance of financial information, making it more useful for investors and stakeholders. Additionally, innovation in the extractive industry, through new technologies and practices, demands precise accounting to reflect its impact on financial performance and resource management (Cortese et al., 2010; Cortese et al., 2022). Thus, the green cluster underscores how performance, risk, and value relevance in the EI sector are deeply influenced by specialized accounting standards and the adoption of innovative practices.

The blue cluster emphasizes the centrality of CSR issues in the EI and their connections to accountability, environmental concerns (Henckens, 2021), and management practices (Sharma & Bhatnagar, 2015) in relation to firm performance. Key terms with the highest occurrences in this cluster are CSR, mining industry, management, and legitimacy. CSR, the most prominent keyword, indicates to what extent the industry is influenced by the evolution trend to encompass a company's commitment to ethical behavior, social and environmental sustainability, and stakeholder engagement. The cluster also highlights the importance of legitimacy, which refers to a company's perceived right or authority to operate. CSR initiatives are crucial for building and maintaining this legitimacy by meeting societal expectations and demonstrating responsible business practices (Dashwood, 2012; Lauwo et al., 2016). Thus, the blue cluster underscores how CSR, environmental accountability, and effective management are intertwined with financial reporting in enhancing firm performance and securing the legitimacy of companies in the mining industry.

The red cluster focuses on themes such as oil, disclosure, governance, resources, and corruption (Njowa & Musingwini, 2018). Disclosure in this context refers to the transparency and openness of organizations in sharing information, particularly regarding environmental impact, social responsibility, and other pertinent factors. In the



**FIGURE 4** Co-words network cartography analysis.

oil industry, such voluntary disclosure is crucial for fostering trust and accountability. Governance is emphasized as essential for ensuring responsible and ethical practices, regulatory compliance, and effective resource management. Effective governance and resource management are pivotal for sustainable development, environmental conservation, and long-term profitability. The word corruption is notably relevant in this cluster, signifying the centrality of this theme in EI firms, which often face substantial investments, stringent regulations, and operations in countries with high-risk of bribery and fraud (Wise & Spear, 2000). Furthermore, mining firms, in particular, have shown fewer anti-corruption efforts compared to firms in other industries (Gray et al., 2019). Thus, the red cluster underscores the importance of transparency, ethical governance, and anti-corruption measures in maintaining sustainability and integrity within the EIs.

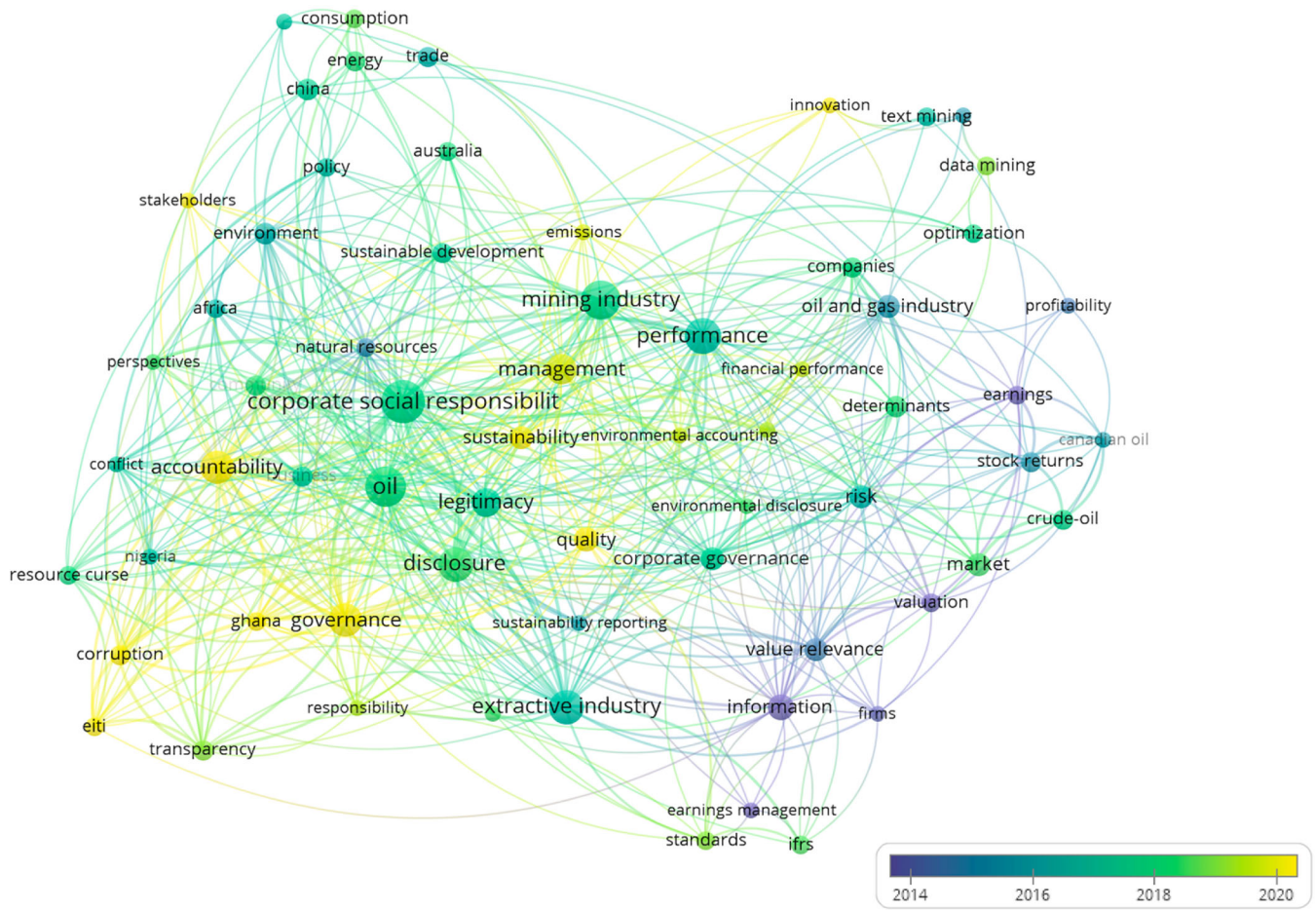
#### 4.5 | Co-word overlay

Co-word analysis helps identify the research front of a particular field. The visual depiction (Figure 5) of the temporal keyword

co-occurrence map demonstrates the classification of topics and their commonalities. We observe that the timeline goes from purple (2014) to green (2016) to yellow (2020). The cluster color represents the relative popularity of a keyword in a specific year. Figure 5 shows a temporal overlay on a keyword co-occurrence map. The transformation within this timeframe also reflects the development of the investigated field of study. The purple cluster demonstrates the main keywords pertinent to literature from 2014 to 2016. The main interests regard information, value relevance, and valuation. It is worth noting that the period from 2016 to now is characterized by a rapid growth of pro-environmental behavior subjects, during which great attention was paid to the relationship between humans and the ecological environment.

Several themes can be regarded as pioneering in their approach to subsequent developments, as evidenced by the green cluster from 2015 to 2018. During this period, the emphasis was primarily on EIs and its relationship with CSR issues, including sustainability, governance, and corporate performance, particularly within the oil sector. A significant aspect of EI research interests is the debate over whether natural resources should be considered community





**FIGURE 5** Co-word overlay.

**TABLE 7** Top ten country geographic trends, citations, and academic collaborations.

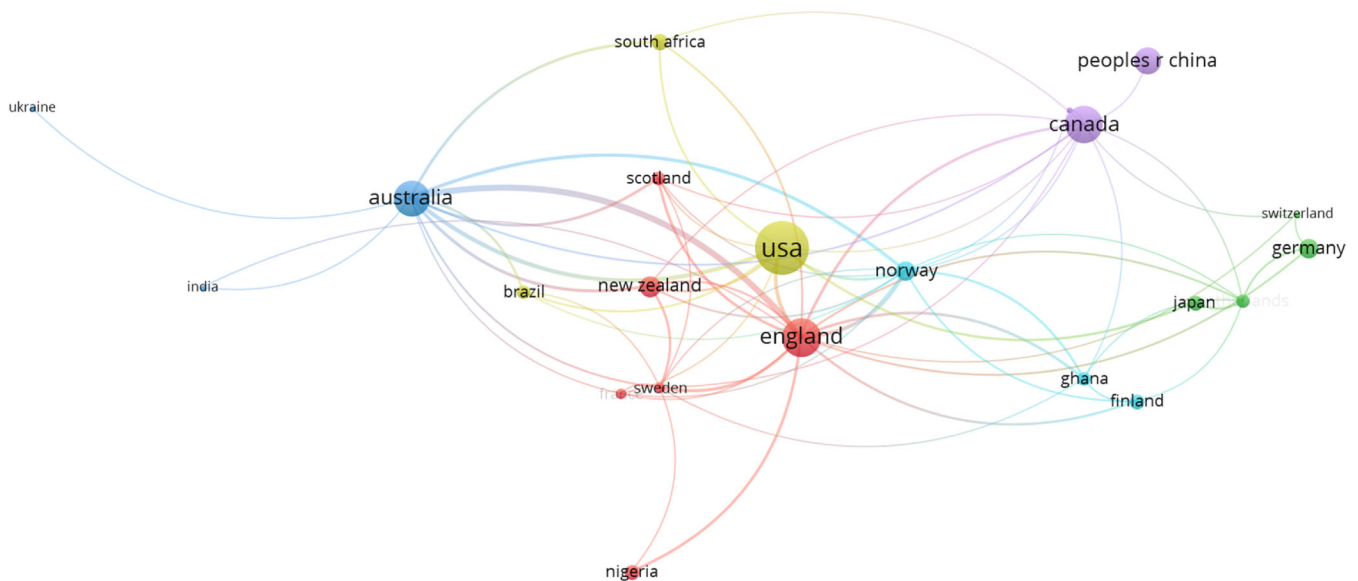
Countries	Record count	% of 279	Citations
US	44	15.771	1167
England	39	13.978	641
Australia	35	12.545	541
Canada	21	7.527	562
People's Republic of China	17	6.093	297
South Africa	12	4.301	126
Brazil	11	3.943	86
Ghana	11	3.943	84
Norway	11	3.943	156
The Netherlands	9	3.226	86

assets or privately held proprietary rights. Since 2018, the yellow cluster has shown a more explicit focus on accountability, stakeholders, corruption, and innovation within EI research. These themes are also evident in the analysis of the top ten bibliographically coupled articles.

#### 4.6 | Geographic trends and academic collaborations

Table 7 shows the top ten countries by record count. The US is the most effective and productive country, with the most publications, 44 papers, and an estimated 15.771% of the selected articles. Moreover, it has 1167 citations. Indeed, the debate concerning the accounting issue of petroleum activities emerged in the US during the late 1960s (Cortese et al., 2009). Later, the argument resurfaced internationally, and, in 1998 IASC in England added it to its agenda project. Today, England accounts for 39 papers, representing 13.978% of the considered documents, and 641 citations. It is interesting to note that Australia has 35 publications, 12.545%, and 541 citations; this could be linked to the fact that it has its Australian national standard AAS 7 Accounting for the EIs, issued in 1989, and subsequently in the current standard AASB 6, published in 2005.

Figure 6 shows the citation network by country, where the relatedness of the country is determined based on the number of times they cite each other. From the analysis, we can observe that there are several clusters represented by different colors: US (yellow), which is the nation with the highest citation, is related to Brazil and



**FIGURE 6** Countries citations network.

South Africa; Australia (blue) is associated with India and Ukraine; England (red) is related with Scotland, New Zealand, Sweden, and Nigeria; Canada (purple) is related with China.

## 5 | THE MAIN RESEARCH AREAS: A BRIEF ANALYSIS

According to Callon, co-word analysis permits us to identify and visualize complex networks and their evolution (Callon et al., 1983, p. 194). This type of analysis, together with the others described in the above sections, shows three main areas of research that can be distinguished as related to the study lines in extractive activities: (i) EI and financial reporting; (ii) EI and CSR; (iii) EI and natural resources. The stages of the evolution of the topics will be challenged in the next section.

### 5.1 | Extractive industry and financial reporting

Extractive companies engage in activities characterized by significant uncertainty, primarily manifested as the risk that the financial investments required for the upstream phases—research could not be compensated by the exploitation of the industrial site. Indeed, the assessment of the economic feasibility of new sites is based on the projection of future economic benefits over time. On the other hand, given the significant impact potentially associated with extractive companies, the assessment of relapses on the environment and of the general consequences on society represent a key issue for this type of firms, calling from additional information to meet the various stakeholders claims. This highlights the critical role of financial reporting as a tool for providing stakeholders with a comprehensive summary of company management, aiding their decision-making, and

ensuring the achievement of their interests (Abdo, 2016). However, EI financial reporting has been consistently criticized for its poor quality and lack of comparability across firms (Gray et al., 2019; Luther, 1996).

Although some critical accounting matters relating to EI enterprises have been already addressed by the IFRS framework, numerous attempts have been made to create a specific financial reporting standard to constrain the options available for accounting techniques and direct the use of expert judgment. The opportunity to choose among different competing accounting methods for exploration activities (Abdo, 2016; Misund, 2017) remains one of the most contentious aspects and is frequently discussed in international literature (Cortese, 2013; Luther, 1996), calling for a specific standard to issue new accounting and reporting rules for this case. Consequently, in 2004, the International Accounting Standards Board (IASB) created and released the IFRS 6, an accounting standard specifically for the extractive sectors, to improve the comparability of financial statements, increase the uniformity of accounting processes, and meet stakeholders' demands for decision-making utility. Currently, the IASB is investigating whether to develop additional guidelines or regulations to enhance the disclosure of an entity's exploration and evaluation costs and operations.

### 5.2 | Extractive industry, CSR, and accountability

The relevance of sustainability disclosure in the mining sector is an emerging trait also within the content of the annual reports, mainly to help understand the impact of the firms on the three sustainability pillars (social, environmental, and economic) together with financial information. Yongvanich and Guthrie (2005) emphasized the need to disclose financial and nonfinancial performance in the context investigated. Based on 73 information items (IC elements and noneconomic

performance) voluntarily disclosed in the annual report, within a sample of 17 Australian mining corporations for the fiscal year 2002, the study shows that the mining industry demonstrates, more than other sectors, an active role toward sustainability issues, even if the level of information on this aspect results not to be particularly extensive. Moreover, it emerges the need to establish adequate monitoring systems and an appropriate set of indicators in the industry.

A temporal examination of the reporting of 10 mining corporations between 1999 and 2003 was carried out by Jenkins and Yakovleva (2006). The reporting techniques across these businesses varied significantly. However, researchers discovered growing trends in social and environmental reporting and the inclusion of economic disclosures in the stand-alone Social and Environmental Reports. Furthermore, Lee (2017) looked at the link between the quality and quantity of environmental disclosures, based on Australian mining company reports.

More recently, Radhouane et al. (2020) focused on annual reports and sustainability-sensitive industries, demonstrating that environmentally sensitive industries that give a higher degree of assurance are financially rewarded by market participants for a higher level of environmental disclosure. Another crucial focus of the research is reporting on anti-corruption policies. Although EITI was created in 2002 to improve global transparency for the oil, gas, and mining sectors that are notorious for their opacity, given its voluntary application, it has not yet been as successful as its supporters may want us to believe (Keune et al., 2017; Sovacool et al., 2016).

In the extractive industry, sustainability reporting goes beyond mere regulatory compliance; it is a strategic tool that helps companies build trust and credibility. By transparently disclosing information on their ESG performance, extractive firms can demonstrate their commitment to responsible business practices. This includes detailing efforts in reducing carbon emissions, managing waste, ensuring safe working conditions, and contributing to community development. The global reporting initiative (GRI) and the Sustainability Accounting Standards Board (SASB) provide frameworks that many companies use to structure their sustainability reports, ensuring they cover material issues relevant to their stakeholders.

Moreover, robust sustainability reporting in the extractive sector can lead to competitive advantages. Companies that are perceived as socially and environmentally responsible are more likely to attract investment, secure licenses and permits, and maintain good relations with local communities and governments. It also helps in risk management by identifying potential ESG-related risks early and addressing them proactively.

### 5.3 | Extractive industry and natural resources

The expansion of the global socioeconomic system, driven by increasing raw material consumption (Krausmann et al., 2009), poses significant threats to terrestrial ecosystems (Pothen & Welsch, 2019). Despite extensive studies on natural resources (Hart & Dowell, 2011), the literature often overlooks the impacts on human development and

institutional degradation, focusing primarily on resource abundance. The mining industry's role in the sustainability debate is particularly critical due to its reliance on nonrenewable and time-limited resources, which are essential to meeting growing demands and ensuring intergenerational justice.

Oil and gas companies manage and account for proven reserves of hydrocarbons, with reserve estimation being a key activity. This involves assessing the amount of economically recoverable oil and gas in a given field, which is crucial for financial reporting, investment decisions, and determining overall company value.

Environmental concerns in the industry include the use of unsuitable extraction techniques that undermine conservation efforts, while quarrying activities can significantly alter landscapes and often involve the use of hazardous chemicals. The primary challenge for the industry is to balance the extraction of necessary resources with the implementation of responsible environmental stewardship practices.

Thanks to support from the mining sector, the concept of sustainable mining has been increasingly incorporated into numerous international processes in recent years (Whitmore, 2006). Literature on EIs and natural resources underscores the significance of institutions and governance, examining how the interactions among politics, natural resources, and institutional forms evolve over time and across countries. However, there has been less focus on the political conditions under which institutional change occurs. Another important theme is the nature of social mobilization and its impact on the relationship between mining expansion and rural development (Bebbington et al., 2018).

The debate within the EI and natural resource literature also addresses the mining industry's engagement with human rights discourses. Human rights violations are more prevalent in developing countries, often linked to global extractive firms, where disputes and conflicts frequently arise. This highlights the need for a deeper understanding of the political, social, and institutional contexts that influence the dynamics of the EIs.

## 6 | CONCLUSION AND POLICY IMPLICATIONS

The last few years have seen a significant increase in literature on the extractive sectors, with focus on financial reporting, which still presents many criticalities and increasingly affect by the need to cover CSR issues. In this paper, several bibliometric techniques on WoS database-indexed publications are applied through the VOSviewer program to outline the development of literature on accounting and reporting in the extractive industry. The primary goal of this analysis is to aid researchers and academics in understanding EI firms' information features, providing up-to-date knowledge regarding accounting related issues by mapping extant research.

The current study shows several effects that need to be highlighted. Firstly, this study contributes to broadening knowledge of accounting approaches in the extractive sector. Although the



**TABLE 8** Potential future directions for research.

### 1. Extractive industry and financial reporting

How comparable are financial reports from a user perspective?  
To what extent do financial statements consider climate-related risks?  
Is the risk of climate disaster a relevant issue in provisions for risks?

### 2. Extractive industry, CSR and accountability

Is the level of standardization regarding information and key performance indicators related to the environment? What role do regulatory frameworks play in shaping CSR and accountability practices in the extractive industry?  
Are the ESG disclosures handled for private benefits? Are institutional factors, stakeholders' pressures, and regulatory intervention limiting such behavior?

### 3. Extractive industry and natural resource

What measures have been taken to prevent climate change by focusing on the close ties between ecosystem health, the benefits of nature to humans, and natural resources-based solutions in the field of extractive industry?  
Given that the dimension of "power" resulted as a relevant feature within the extractive industry, will revising the IFRS 6 be postponed until new regulations and/or lobbies' claims ask for new rules?

accounting treatment of costs incurred during the extraction process in the perspective of the IAS/IFRS international accounting standards constitutes an independent aspect, references that international standard IFRS 6 makes to the standard on intangible assets (IAS 38) are explicit. Indeed, over the years, intangible assets have assumed ever greater importance for companies, deserving particular attention from business economics scholars. In this scenario, investments in intangible resources have commonly been considered the most critical factor of innovation, the so-called value relevance (de Souza et al., 2024).

Secondly, although keywords like "accounting," "financial report," and "IFRS 6" have received attention as they are fundamental to the domain, other keywords such as "sustainability report," "CSR," and "environmental disclosure," have garnered even greater attention since they co-occur. In most accounting studies, they are critical areas that will always impact how firms manage their core business. Indeed, as discussed before, companies operating in the extractive sector have high environmental risks, given the nature of their business (Mitchell, 2021). However, historically, management could have communicated their nonfinancial activities and successes more effectively to the public. This reality is rapidly changing; environmental and social issues are treated like management or financial issues in reports, meetings, and conferences with investors. Transparency, competitiveness, governmental legitimacy, conflicts, and incentives all impact how much and how well these corporations disclose environmental issues. Both locally and worldwide, these factors have substantially impacted EI.

Thirdly, another relevant theme that emerged from the co-word is governance. EI have all too often been considered a curse because they are associated with corruption, lobbying, exploitation, environmental degradation, a contributing cause of climate change, biodiversity loss, armed conflicts, gender-based violence, and human

rights violations. In this sense, it is necessary to manage the extractive sector, particularly concerning the new minerals and metals which the technological revolution depends on, in a sustainable, inclusive, and fair way. Therefore, to reverse the trend, some fundamental points cannot be ignored which indicate essential further research efforts, starting with good governance of extractive resources, including independent monitoring and the fight against corruption and illicit financial flows, along with mismanagement of revenues.

In conclusion, the analysis of this bibliometric study of the development of academic discourse reveals potential future directions for research (Table 8) in accounting and management, from a transdisciplinary perspective. As a result, several concerns exist regarding the future studies we have highlighted.

The need for EIs to adjust and invest in their business models while upholding discipline and profits presents an increasingly pressing challenge (Mitchell, 2023).

According to Rathobei et al., (2024), given the current green and digital transformation, it is crucial to reconsider the mining business. Changing carbon-based economies, fostering innovation and efficiency, and promoting challenges against the effects of climate change and environmental degradation can create a sustainable future for the planet. Mining companies in the world's shift toward digital technologies and digital transformation must shape their business to new environmental regulations. Accordingly, mining businesses must improve sustainable practices to achieve advanced technologies that reduce carbon footprints and increase resource efficiency.

Companies in the extractive industry are thus adopting frameworks such as the GRI and the SASB to disclose their sustainability efforts comprehensively (Rathobei et al., 2024). The topic is so important that the GRI has developed a new standard specifically for the extractive industry (GRI 14: Mining Sector 2024). To address broad stakeholder demand for transparency regarding the mining sector's impact and contributions to sustainable development. Such disclosure is increasingly becoming part of financial reports, as stakeholders demand more comprehensive information beyond traditional financial metrics (Kaupke & zu Knyphausen-Aufseß, 2023).

These frameworks help in aligning business strategies with broader societal goals, ensuring long-term value creation and compliance with regulatory requirements.

In enhancing sustainable practices, users of financial reports, particularly those scrutinizing the financial statements, require improved qualitative and quantitative insights into the ramifications of climate-related risks on the valuation of assets and liabilities and the criteria followed to expense the costs in the income statement. Accounting policies must explicitly address climate-related risks, often perceived as remote and inadequately factored into financial statements' preparation.

While the IFRS lacks specific provisions addressing climate-related issues, it is imperative for businesses to conscientiously integrate these considerations. This becomes especially paramount when implementing standards where the implications of climate-related risks are profound and far-reaching. Indeed, financial reporting in EIs traditionally focuses on financial performance,

including revenue, expenses, and profitability. However, stakeholders increasingly demand transparency and CSR: sustainability disclosure provides a framework for companies to communicate their ESG practices and performance to stakeholders, including investors, regulators, and communities affected by their operations (Kandpal et al., 2024). Thus, it is crucial to investigate whether extractive companies adhere to IFRS 6 criteria and whether IFRS has successfully harmonized accounting methods in the EIs: information concerning climate-related hazards should be adequately communicated in the financial statement.

Finally, although the study aims to investigate the topic of financial reporting of EI, which is conceived as a driver for creating value for stakeholders, future research should place the economic and social dimensions on the same level. In this evolving “construction site,” there remains ample opportunity to bridge the gap between financial and nonfinancial information, viewed through the lens of market dynamics, company performance, and the legitimization of accountability to meet stakeholder information needs. This highlights the necessity for robust CSR and sustainability frameworks within financial reporting to enhance transparency and accountability, ensuring that stakeholders are fully informed about both financial performance and environmental impact (Attah & Amoah, 2023).

CSR and sustainability have become increasingly significant in the EI, encompassing sectors such as mining, oil, and gas. These industries, often criticized for their environmental and social impacts, are under growing pressure to demonstrate responsible practices through transparent financial reporting. Effective CSR and sustainability initiatives can lead to enhanced reputations, improved risk management, and better stakeholder relations (Cheda, 2024). The integration of these initiatives into financial reporting provides a holistic view of a company's operations, ensuring that economic, environmental, and social performance are equally prioritized.

Crucially, the Corporate Sustainability Disclosure Directive (CSRD) and EU Taxonomy will play pivotal roles in shaping the regulatory landscape for this sector, driving convergence between various forms of information, both accounting and nonaccounting based.

## ACKNOWLEDGMENT

Open access publishing facilitated by Università degli Studi di Messina, as part of the Wiley - CRUI-CARE agreement.

## REFERENCES

- Abdalla, Y. A., & Siti-Nabiha, A. K. (2015). Pressures for sustainability practices in an oil and gas company: Evidence from Sudan. *Qualitative Research in Accounting & Management*, 12(3), 256–286.
- Abdo, H. (2016). Accounting for extractive industries: Has IFRS 6 harmonised accounting practices by extractive industries? *Australian Accounting Review*, 26(4), 346–359.
- Adler, R., Mansi, M., Pandey, R., & Stringer, C. (2017). United Nations Decade on Biodiversity: A study of the reporting practices of the Australian mining industry. *Accounting, Auditing & Accountability Journal*, 30(8), 1711–1745. <https://doi.org/10.1108/AAAJ-04-2015-2028>
- Afriyie, K., Ganle, J. K., & Adomako, J. A. A. (2016). The good in evil: A discourse analysis of the galamsey industry in Ghana. *Oxford Development Studies*, 44(4), 493–508.
- Amoako, K. O., Lord, B. R., & Dixon, K. (2017). Sustainability reporting: Insights from the websites of five plants operated by Newmont Mining Corporation. *Meditari Accountancy Research*, 25(2), 186–215.
- Attah, A., & Amoah, P. (2023). The extractive industry and expectations of resource benefits: Does CSR promote community well-being? *Corporate Governance: The International Journal of Business in Society*, 23(6), 1437–1453.
- Baudot, L., & Cooper, D. J. (2022). Regulatory mandates and responses to uncomfortable knowledge: The case of country-by-country reporting in the extractive sector. *Accounting, Organizations and Society*, 99, 101308.
- Bebbington, A., Abdul-Gafaru, A., Humphreys Bebbington, D., Hinfelaar, M., Sanborn, C., Achberger, J., Huber, C. G., Hurtado, V., Ramirez, T., & Odell, S. D. (2018). *Governing extractive industries: Politics, histories, ideas* (1st ed.). Oxford University Press.
- Bortoletto, W. W., Junior, A. C. P., & Cabello, O. G. (2023). Exploring the scientific literature on clean development mechanisms: A bibliometric analysis. *Energy Policy*, 183, 113806.
- Callon, M., Courtial, J. P., Turner, W. A., & Bauin, S. (1983). From translations to problematic networks: An introduction to co-word analysis. *Social Science Information*, 22(2), 191–235.
- Carmona, S., Gutiérrez, I., & Cámara, M. (1999). A profile of European accounting research: Evidence from leading research journals. *The European Accounting Review*, 8(3), 463–480.
- Centorrino, G., Naciti, V., & Rupo, D. (2022). From double-entry bookkeeping and ledger to blockchain technology: New frontiers for accounting information systems. *Management Control: special issue*, 2, 15–41.
- Cheda, T. (2024). The implication of extractive industries' operation on human and environmental rights of vulnerable groups in pursuit of environmental sustainability in Africa. In *Human rights and the environment in Africa* (pp. 353–371). Routledge.
- Cho, C. H. (2009). Legitimation strategies used in response to environmental disaster: A French case study of total SA's Erika and AZF incidents. *The European Accounting Review*, 18(1), 33–62.
- Clark, G., & Jacks, D. (2007). Coal and the industrial revolution, 1700–1869. In *European Review of Economic History* (Vol. 11, pp. 39–72). Cambridge University Press.
- Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Science mapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for Information Science and Technology*, 62(7), 1382–1402.
- Coetzee, C. M., & Van Staden, C. J. (2011). Disclosure responses to mining accidents: South African evidence. *Accounting Forum*, 35(4), 232–246.
- Constantatos, A.-F., D. Dionysiou, R. Slack, I. Tsalavoutas, and F. Tsoligkas, 2020. The capitalisation of intangibles debate: Accounting for exploration and evaluation expenditure in extractive activities. <https://www.accaglobal.com/hk/en/professional-insights/global-profession/capitalisation-intangibles-debate.html>
- Cooke, D. L. (2003). A system dynamics analysis of the Westray mine disaster. *System Dynamics Review: The Journal of the System Dynamics Society*, 19(2), 139–166.
- Cortese, C., Moerman, L., & Chang, M. (2022). Is the extractive industries standard still fit for purpose? *Accounting and Finance*, 62, 2807–2838.
- Cortese, C. L. (2013). Politicisation of the international accounting standard setting process: Evidence from the extractive industries. *Journal of New Business Ideas and Trends*, 11(2), 48–57.
- Cortese, C. L., Irvine, H. J., & Kaidonis, M. A. (2009). Extractive industries accounting and economic consequences: Past, present and future. *Accounting Forum*, 33(1), 27–37.
- Cortese, L. C., Irvine, L. H., & Kaidonis, A. M. (2010). Powerful players: How constituents captured the setting of IFRS6, an accounting standard for the extractive industries. *Accounting Forum*, 34, 76–88.
- Corts, K. S., & Singh, J. (2004). The effect of repeated interaction on contract choice: Evidence from offshore drilling. *Journal of Law, Economics, and Organization*, 20(1), 230–260.



- Cross, J. (1995). IT outsourcing: British petroleum's competitive approach. *Long Range Planning*, 28(4), 128.
- Dashwood, H. S. (2012). CSR norms and organizational learning in the mining sector. *Corporate Governance: The international journal of business in society*, 12(1), 118–138.
- de Souza, P. V. S., Machado Ribeiro, J. P., & Paulo, E. (2024). Organizational complexity and value relevance under the regulatory and financial standards of Brazilian electric power companies. *Energy Policy*, 186, 114000. <https://doi.org/10.1016/j.enpol.2024.114000>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of business research*, 133, 285–296.
- Epstein, P. R., Buonocore, J. J., Eckerle, K., Hendryx, M., Stout lii, B. M., Heinberg, R., ... Glustrom, L. (2011). Full cost accounting for the life cycle of coal. *Annals of the new York Academy of Sciences*, 1219(1), 73–98.
- Galletta, S., Mazzù, S., & Naciti, V. (2022). A bibliometric analysis of ESG performance in the banking industry: From the current status to future directions. *Research in International Business and Finance*, 62, 101684.
- Galletta, S., Mazzù, S., Naciti, V., & Paltrinieri, A. (2024). A PRISMA systematic review of greenwashing in the banking industry: A call for action. *Research in International Business and Finance*, 102262.
- Gaur, A., & Kumar, M. (2018). A systematic approach to conducting review studies: An assessment of content analysis in 25 years of IB research. *Journal of World Business*, 53(2), 280–289. <https://doi.org/10.1016/j.jwb.2017.11.003>
- Gerged, A. M., Arslan, H. M., Abbas, A., Chen, S., & Manzoor, S. (2023). A bibliometric review of corporate environmental disclosure literature. *Journal of Accounting Literature*, 46(2), 214–237.
- Gray, S. J., Hellman, N., & Ivanova, M. N. (2019). Extractive industries reporting: A review of accounting challenges and the research literature. *Abacus*, 55, 42–91.
- Gstraunthaler, T., & Ulyanova, M. (2010). Corporate Governance in the Extractive Industry—Comparing Russian Oil and Gas companies and South African Gold Producers. *Corporate Ownership and Control*, 7(4), 62–73.
- Hart, S., & Dowell, G. (2011). A natural-resource-based view of the firm: Fifteen years after. *Journal of Management*, 37, 1464–1479.
- Hassan, M. S. (2004). *The information quality of derivative disclosure in corporate annual reports of Australian firms in the extractive industries* (Doctoral dissertation. Queensland University of Technology).
- Henckens, T. (2021). Scarce mineral resources: Extraction, consumption and limits of sustainability. *Resources, Conservation and Recycling*, 169, 105511.
- Hochbaum, D. S., & Chen, A. (2000). Performance analysis and best implementations of old and new algorithms for the open-pit mining problem. *Operations Research*, 48(6), 894–914.
- International Accounting Standard Committee. (2021). *Summary of issues: Extractive industries*. Issued for comment by the IASC Steering Committee on Extractive Industries.
- Islam, M. A., & Islam, M. A. (2011). Environmental incidents in a developing country and corporate environmental disclosures: A study of a multinational gas company. *Society and Business Review*, 6(3), 229–248.
- Jenkins, H., & Yakovleva, N. (2006). Corporate social responsibility in the mining industry: Exploring trends in social and environmental disclosure. *Journal of Cleaner Production*, 14(3–4), 271–284.
- Kandpal, V., Jaswal, A., Santibanez Gonzalez, E. D. R., & Agarwal, N. (2024). Corporate social responsibility (C.S.R.) and E.S.G. Reporting: Redefining business in the twenty-first century. In *Sustainable energy transition. Circular economy and sustainability*. Springer. [https://doi.org/10.1007/978-3-031-52943-6\\_8](https://doi.org/10.1007/978-3-031-52943-6_8)
- Kaupke, K., & zu Knyphausen-Aufseß, D. (2023). Sustainability and firm value in the oil and gas industry—A vicious circle? *Corporate Social Responsibility and Environmental Management*, 30(3), 1129–1144.
- Kessler, M. M. (1963). Bibliographic coupling between scientific papers. *American documentation*, 14(1), 10–25.
- Keune, M. B., Keune, T. M., & Quick, L. A. (2017). Voluntary changes in accounting principle: Literature review, descriptive data, and opportunities for future research. *Journal of Accounting Literature*, 39(1), 52–81.
- Koseoglu, M. A. (2016). Mapping the institutional collaboration network of strategic management research: 1980–2014. *Scientometrics*, 109(1), 203–226.
- KPMG. (2017). *Handbook: IFRS compared to US GAAP*. KPMG Int.
- Kraal, D. (2019). Petroleum industry tax incentives and energy policy implications: A comparison between Australia, Malaysia, Indonesia and Papua New Guinea. *Energy Policy*, 126, 212–222.
- Krausmann, F., Gingrich, S., Eisenmenger, N., & Erb, K. H. (2009). Growth in global materials use, GDP and population during the 20th century. *Ecological Economics*, 68(10), 2696–2705.
- Kumar, A., Sharma, S., Vashistha, R., Srivastava, V., Tabash, M. I., Munim, Z. H., & Paltrinieri, A. (2022). International journal of emerging markets: A bibliometric review 2006–2020. *International Journal of Emerging Markets*, 19(4), 1051–1089.
- Larsen, P., & Von Ins, M. (2010). The rate of growth in scientific publication and the decline in coverage provided by science citation index. *Scientometrics*, 84(3), 575–603.
- Lauwo, S. G., Otusanya, O. J., & Bakre, O. (2016). Corporate social responsibility reporting in the mining sector of Tanzania: (Lack of) Government regulatory controls and NGO activism. *Accounting, Auditing & Accountability Journal*, 29(6), 1038–1074.
- Lee, K. H. (2017). Does size matter? Evaluating corporate environmental disclosure in the Australian mining and metal industry: A combined approach of quantity and quality measurement. *Business Strategy and the Environment*, 26(2), 209–223.
- Luther, R. (1996). The development of accounting regulation in the extractive industries. *The International Journal of Accounting*, 31(1), 67–93.
- Mansoor, H., & Maroun, W. (2016). An initial review of biodiversity reporting by South African corporates: The case of the food and mining sectors. *South African Journal of Economic and Management Sciences*, 19(4), 592–614.
- Marcos-Martinez, R., Measham, T. G., & Fleming-Muñoz, D. A. (2019). Economic impacts of early unconventional gas mining: Lessons from the coal seam gas industry in New South Wales, Australia. *Energy Policy*, 125, 338–346.
- Mcchery, S., & Hussainey, K. (2021). Risk disclosure behaviour: Evidence from the UK extractive industry. *Journal of Applied Accounting Research*, 22(3), 484–506.
- Misund, B. (2017). Accounting method choice and market valuation in the extractive industries. *Cogent Economics & Finance*, 5(1), 1408944.
- Mitchell, P. (2021). *Top 10 business risks and opportunities for mining and metals in 2022*. EY.
- Mitchell, P. (2023). *Top 10 business risks and opportunities for mining and metals in 2024*. EY.
- Mukherjee, D., Lim, W. M., Kumar, S., & Donthu, N. (2022). Guidelines for advancing theory and practice through bibliometric research. *Journal of Business Research*, 148, 101–115.
- Naciti, V., Rupo, D., & Pulejo, L. (2021). Gender diversity and performance in family small-to-medium business: Mapping and clustering bibliometric networks. *Piccola Impresa/Small Business*, 3, 23–48.
- Njowa, G., & Musingwini, C. (2018). A framework for interfacing mineral asset valuation and financial reporting. *Resources Policy*, 56, 3–15.
- Nobes, C., & Stadler, C. (2021). Towards a solution to the variety in accounting practices of extractive firms under IFRS. *Australian Accounting Review*, 31, 273–285.
- Öztürk, O., Kocaman, R., & Kanbach, D. K. (2024). How to design bibliometric research: An overview and a framework proposal. *Review of Managerial Science*, 1–29. <https://doi.org/10.1007/s11846-024-00738-0>

- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *bmj*, 372.
- Phiri, O., Mantzari, E., & Gleadle, P. (2019). Stakeholder interactions and corporate social responsibility (CSR) practices: Evidence from the Zambian copper mining sector. *Accounting, Auditing & Accountability Journal*, 32(1), 26–54.
- Pothen, F., & Welsch, H. (2019). Economic development and material use. Evidence from international panel data. *World Development*, 115, 107–119.
- Radhouane, I., Nekhili, M., Nagati, H., & Paché, G. (2020). Is voluntary external assurance relevant for the valuation of environmental reporting by firms in environmentally sensitive industries? *Sustainability Accounting, Management and Policy Journal*, 11(1), 65–98.
- Rathobei, K. E., Ranängen, H., & Lindman, Å. (2024). Exploring broad value creation in mining-corporate social responsibility and stakeholder management in practice. *The Extractive Industries and Society*, 17, 101412.
- Rizzato, F. (2012). Analisi empirica e proposta di disclosure. In *Settore estrattivo e IFRS*. Giuffrè.
- Rutledge, I., & Wright, P. (1998). Profitability and taxation in the UKCS oil and gas industry: Analysing the distribution of rewards between company and country. *Energy Policy*, 26(10), 795–812.
- Sharma, D., & Bhatnagar, P. (2015). Corporate social responsibility of mining industries. *International Journal of Law and Management*, 57(5), 367–372.
- Smith, C., & Venter, E. R. (2020). Financial statement comparability in the extractive industry. *Accounting Research Journal*, 33(3), 523–541.
- Sovacool, B. K., Walter, G., Van de Graaf, T., & Andrews, N. (2016). Energy governance, transnational rules, and the resource curse: Exploring the effectiveness of the extractive industries transparency initiative (EITI). *World Development*, 83, 179–192.
- Srivastava, P. R., Sharma, D. P., Kaur, I., Wamba, S. F., & Wang, W. Y. C. (2021). Intellectual structure and publication pattern in journal of global information management: A bibliometric analysis during 2002–2020. *Journal of Global Information Management (JGIM)*, 29(4), 1–31.
- Stadler, C., & Nobes, C. W. (2022). *Varied international practice in accounting for extractive activities*. SSRN.
- Sukcharoen, K., Zohrabyan, T., Leatham, D., & Wu, X. (2014). Interdependence of oil prices and stock market indices: A copula approach. *Energy Economics*, 44, 331–339.
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222.
- Van Eck, N. J., & Waltman, L. (2014). Visualizing bibliometric networks. In *Measuring scholarly impact: Methods and practice* (pp. 285–320). Cham: Springer International Publishing.
- Whitmore, A. (2006). The emperor's new clothes: Sustainable mining? *Journal of Cleaner Production*, 14, 309–314.
- Wise, T., & Spear, N. (2000). Accounting for extractive industries: An Australian perspective. *Petroleum Accounting and Financial Management Journal*, 19(1), 30–53.
- Yongvanich, K., & Guthrie, J. (2005). Extended performance reporting: An examination of the Australian mining industry. *Accounting Forum*, 29(1), 103–119.
- Zupic, I., & Cater, T. (2015). Bibliometric methods in management and organisation. *Organizational Research Methods*, 18(3), 429–472.

**How to cite this article:** Centorrino, G., Naciti, V., & Rupo, D. (2024). Extending the boundaries of financial reporting in the extractive industries: Insights from bibliometric analysis. *Corporate Social Responsibility and Environmental Management*, 1–17. <https://doi.org/10.1002/csr.2967>