

**Research Article****Assessing Sustainability Disclosure Trends in State-Owned Enterprises: A Comprehensive Review**¹Khouloua Naseer | ^{2*}Saira Arshad | ³Amna Arshad | ⁴Muhammad Rehan**Authors Information**

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The authors declare no competing financial or personal interests that could have influenced this work.

Abstract

Sustainability disclosure is increasingly important as stakeholders demand transparency in organizations' environmental, social, and governance (ESG) practices. State-owned enterprises (SOEs), particularly in developing countries, face distinct challenges in sustainability reporting due to governance structures and political influences. Despite their significant role in many economies, the quality and extent of SOE disclosures remain underexplored. This study reviews 138 journal articles from 1991 to 2021, examining sustainability disclosures in SOEs using bibliometric analysis via the biblioshiny interface. Key sources, authors, countries, and research themes were identified, with core publications categorized through Bradford's Law. The findings show a growing emphasis on ESG metrics, corporate governance, and environmental responsibility. The Journal of Cleaner Production and Meditari Accountancy Research were identified as the most impactful journals. The USA leads in publication output, while Spain has the highest citation impact. The study also reveals research gaps, such as the need for sector-specific studies and further exploration into the alignment between reported sustainability efforts and actual practices. This research provides valuable insights for policymakers and researchers, offering a roadmap for future studies on SOE sustainability disclosures.

Keywords: Sustainability Disclosure, State-Owned Enterprises (SOEs), ESG Practices, Bibliometric Analysis, Corporate Governance.

How to Cite this Work:

Naseer, K., Arshad, S., Arshad, A. & Rehan, M. (2024), "Assessing Sustainability Disclosure Trends in State-Owned Enterprises: A Comprehensive Review", *Sustainable Trends and Business Research*, Vol. 02 No 01, pp. 56-75.

1 INTRODUCTION

Sustainability disclosure has become more and more important in recent years due to stakeholder demands for increased transparency from organizations on their environmental, social, and governance (ESG) policies (Ali et al., 2024). State-owned enterprises (SOEs) have significant importance in several economies, especially in emerging nations, because of their ability to impact public policy and major infrastructure projects (H. M. Arslan, Chengang, Bilal, Siddique, & Yahya, 2022). Despite their important significance, the scope and quality of sustainability disclosures made by SOEs are still little understood. These disclosures are essential for evaluating these businesses' effects on the environment and society, as well as for enhancing accountability and promoting sustainable development (H. Arslan & Bashir, 2021). Previous studies have highlighted the growing trend of sustainability reporting; however, the motivations and influential factors behind these disclosures in SOEs require further a The increasing trend of sustainability reporting has been noted in earlier research; nevertheless, further investigation is needed into the reasons and determining elements of these disclosures in SOEs (H. M. Arslan, Chengang, Komal, & Chen, 2023).

SOEs take a different tack when it comes to sustainability disclosure than privately held companies because of their distinct governance and organizational structure. Government regulations, political pressures, and larger societal commitments frequently affect SOEs and have an impact on their reporting procedures (H. M. Arslan, Khan, Latif, Komal, & Chen, 2022). The goals of this bibliometric analysis are to review the significant facets of sustainability disclosures in SOEs and present a conceptual framework for comprehending these practices. By examining the existing literature, this study seeks to identify key trends, gaps, and challenges in the field, offering valuable insights for policymakers, regulators, and researchers interested in enhancing transparency and sustainability in state-owned enterprises.

The public is now more aware of the need of obtaining social and environmental protection in addition to commercial added value as a result of organizations' growing impact on society (H. M. Arslan, Khan, et al., 2022; Gerged, Arslan, Abbas, Chen, & Manzoor, 2023). Sustainability disclosure lets the organization inspect the comprehensive issues society faces, which prepares them to be more conscious of the risks and opportunities. Sustainability is the platform where organizations can impress the public by disseminating the positive impacts of their business (H. Li, Arslan, Mousa, & Abbas, 2023). State Owned Enterprises (SOEs) are the bodies created by the governments, allowing them to work for commercial activities in the country(Mahmood et al., 2023). Since they are in charge of carrying out social and environmental programs in their communities, local government officials play a vital role in the community. Most SOEs disseminate sustainability in their annual reports and notify stakeholders about the organization's activities(Mubeen et al., 2024).

Reporting on sustainability is crucial for the enterprise's reputation as well as for stakeholders at all levels. Environmental data is being increasingly sought after as a result of the stakeholder demands for more consistent organizational effects on the natural environment and sustainability problems (Argento, Grossi, Persson, & Vingren, 2019). These aspirations are aided in part by increased environmental consciousness, such as climate change, global warming, habitat loss, and GHG pollution, which is a function of organizational practices (Solovida & Latan, 2017). The public wants government to handle scarce capital in a balanced way(Lynch, 2010), giving them much greater responsibility and transparency for long-term growth than the private sector (Ball, Grubnic, & Birchall, 2014). High-quality CSR reports will help businesses escape a downturn by improving social trust (Lins, Servaes, & Tamayo, 2017). CSR operations will serve as a hedge and offset the detrimental consequences of negative incidents such as reduced sales, downward analyst changes, negative news coverage, and lawsuits (Ramos-Meza et al., 2021). We describe this kind of impact as a "insurance effect."

China's mandatory CSR disclosure offers a perfect environment for examining the complex interactions between many influences driving economic activity. For all state-owned enterprises (SOEs) under the jurisdiction of the Central Government in 2008, CSR disclosure was required; for other businesses, such as private-owned enterprises (POE) and SOEs under the authority of Local Governments, CSR disclosure was optional. We are able to determine government engagement in relation to the publication of non-financial information because of that particular scenario. In order to determine if the impact of government intervention differs from that of market forces, we look at the effects of various

negative shocks on businesses. The entanglement of government to examine the sustainability disclosure in China, 2008 conclude the negative shocks by applied mixed compulsory dissemination of SOEs controlled by Central government and discretionary dissemination of SOEs and private-owned enterprises controlled by Local government.

According to a recent survey, local governments have a lot of difficulties when it comes to planning and disclosing environmental information. One of the most likely factors for low environmental disclosure, aside from budgetary limitations, is a deficiency of qualified personnel to manage environmental disclosure (Kassim, Ahmad, Nasir, Nori, & Arifin, 2019). In contrast to the commercial sector, reporting EDs is still voluntary in the public sector in several nations, including Malaysia (Greiling & Grüb, 2014). Differences in the scope, nature, and mode of ED reporting are noted since it is voluntary. According to recent surveys, there is an increase in the number of disclosures (Greiling & Grüb, 2014). It also indicates that local governments are generally becoming less interested in producing independent social and environmental studies and that they are solely generated to gain credibility. The quality of disclosures appears to be impacted by the LGs' selective sharing of social and environmental information because the practice is still voluntary (Greiling & Grüb, 2014).

There are several issues with the current global environment that need to be resolved. For this study, we want to know the answers to the following questions, which will help us understand the complexities of voluntary disclosure and offer a holistic framework for prospective studies in the area where political and environmental sciences collide.

1. What are the influential aspects of sustainability disclosure in state owned enterprises?
2. What are the primary themes and trends in the study of sustainability disclosure?
3. What comprehensive lessons can we draw from the literature of the past to prepare for the future, and what kind of agendas can we set?

We conducted a detailed bibliometric analysis to address the first research question. This analysis identified key sources, authors, countries, and affiliations. Using metrics like total citations (TC) and net publications (NP) per year, we pinpointed the most influential sources and core authors. By applying Bradford's Law, we categorized the sources into three zones: Zone 1, the highly productive "nuclear zone," Zone 2, the moderately productive zone, and Zone 3, with low productivity (Viju and Ganesh, 2013). This classification helped us determine the core publications driving research in sustainability disclosure. For the second research question, we analyzed keywords and citations to identify major trends such as the increasing importance of ESG metrics, voluntary versus mandatory disclosures, and the role of technological advancements. Themes like corporate governance and environmental responsibility emerged as critical focal points. To answer the third question, we highlighted research gaps and proposed future agendas, including the need for more studies exploring the intersection of political, environmental, and socio-economic factors in SOE disclosures. This provides a roadmap for future research while offering a comprehensive understanding of the complexities of sustainability disclosure in SOEs. Based on overall citations and frequency of publications, we recommend top countries and affiliations.

2 MATERIAL AND METHODS

Our bibliometric analysis data is divided into two parts. In the first part, we choose the source from which to collect and review papers. For this, we have some databases like Scopus, Sci-Hub. In second segment, we created a search query to gather comprehensive data. For that matter, we have chosen the area of environmental sciences for selection, and to adapt our search question to our goal and the desired results, we have used a variety of filters. The final query is (TITLE-ABS-KEY ("corporate social responsibility" OR csr OR sustainability OR carbon OR "Carbon emission*" OR "climate change" OR ghg OR "greenhouse gas*" OR environment*) AND TITLE ("state*" OR "government*") AND TITLE-ABS-KEY (disclosure*)) AND (LIMIT-TO (LANGUAGE,"English")). . The final search query has able to find 43 articles from environmental science, 63 articles from social sciences, 30 articles are from economics, econometrics, and finance, and 82 articles are from the field of business, management, and accounting. We limit the results of our search to English-language journal articles and papers. One advantage of conducting efficient bibliometric

research using a single comprehensive language is that it offers a range of tools for comparing affiliations, article sources, and keywords. Additionally, after doing a thorough analysis of the papers, we eliminated 80 articles that did not align with the study's goals. As a result, our final sample comprised 138 articles.

The paper follows a five-step process that [Zupic and Čater \(2015\)](#) propose as a bibliometric workflow.

The five stages needed to finish the bibliometric study of the literature on coronaviruses are shown in Figure 2.

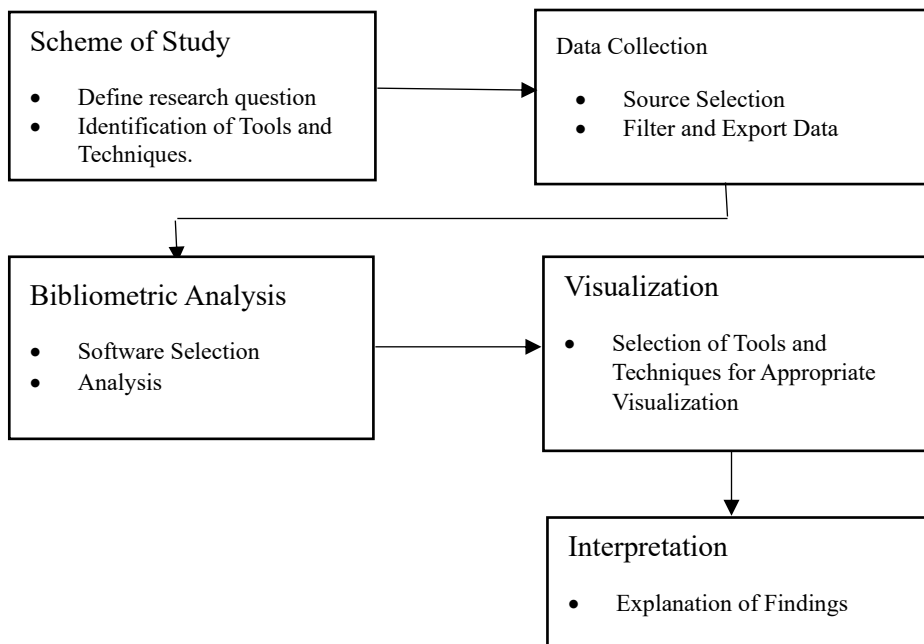


Figure 1. The procedure of bibliometric analysis

3 FINDINGS

Bibliometric analysis is the statistical and mathematical methodologies used to books and media communication. One tool in the package, Biblioshiny, provides complete scientometric and bibliometric analysis with a range of choices, including sources, documents, authors, conceptual structure, social structure, and intellectual structure, for people who are not programmers.

Before proceeding, it is crucial to comprehend the descriptive features of sustainability disclosure, which are listed in Table 1. I finished 138 articles, all of which were journal articles. Along with 373 author keywords, each of these journals uses 517 keywords. This literature covers the years 1991 through 2021.

These papers were written by 337 writers, of which only 28 articles have a single author, and 309 have multiple authors. The collaboration index demonstrates the substantial cooperation seen in transparency publications. With a document to author ratio of 0.409, there are, on average, nearly two writers per document.

Table 1: Descriptive characteristics of sustainability disclosure.

| DESCRIPTION | RESULTS |
|---------------------------------|-----------|
| MAIN INFORMATION ABOUT DATA | |
| Timespan | 1991:2021 |
| Sources (Journals, Books, etc) | 98 |
| Documents | 138 |
| Average years from publication | 6.96 |
| Average citations per documents | 22.54 |

| | |
|--------------------------------------|-------|
| Average citations per year per doc | 2.633 |
| References | 8333 |
| DOCUMENT TYPES | |
| article | 125 |
| book chapter | 2 |
| conference paper | 7 |
| review | 4 |
| DOCUMENT CONTENTS | |
| Keywords Plus (ID) | 517 |
| Author's Keywords (DE) | 373 |
| AUTHORS | |
| Authors | 337 |
| Author Appearances | 376 |
| Authors of single-authored documents | 28 |
| Authors of multi-authored documents | 309 |
| AUTHORS COLLABORATION | |
| Single-authored documents | 28 |
| Documents per Author | 0.409 |
| Authors per Document | 2.44 |
| Co-Authors per Documents | 2.72 |
| Collaboration Index | 2.81 |

Figure 2 shows the annual production. Literature is produced in little amounts at first, but over time, it increases. In 2014, there was an increasing trend then there was peak production of publications in 2020.

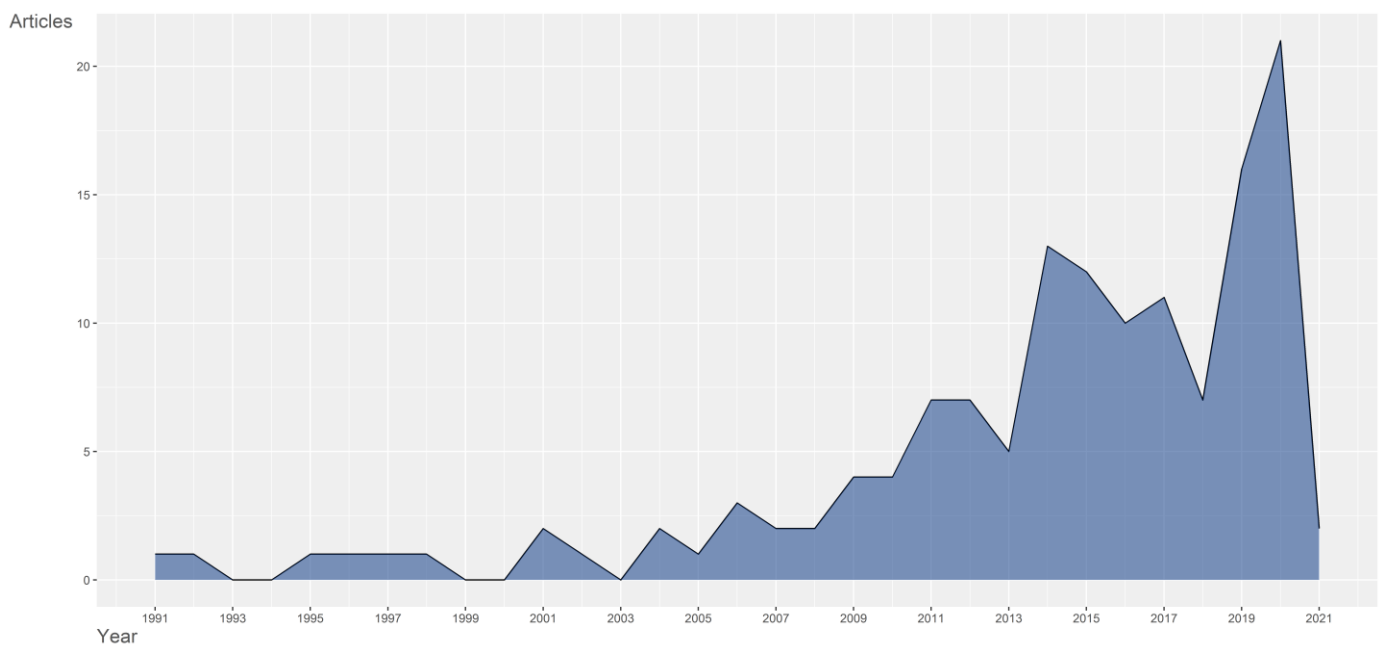


Figure 2. Annual Scientific Production

Figure 3 shows a three-field analysis that connects keywords (on the left) with countries (in the middle) and university affiliations (on the right). The lines illustrate the relationships between these elements. The keywords on the left represent various research themes, such as "e-government," "transparency," "sustainability," "local government," "corporate social responsibility," "disclosure," and "environmental disclosure." In the middle, we see the countries most

involved in publishing research on these topics. Notable countries include Spain, Italy, Malaysia, China, and the United States. On the right are the universities and institutions affiliated with these publications. Some prominent universities include the University of Granada, University of Salerno, Curtin University, Universidad de Burgos, and City University of Hong Kong. Each university is connected to specific keywords and countries, demonstrating their contributions to particular areas of research. The figure 4 shows which universities are most active in specific fields and how countries are leading in different research topics related to sustainability, transparency, and corporate social responsibility. For example, the University of São Paulo in Brazil is linked with themes like "sustainability" and "local government," while Nankai University in China is associated with "corporate social responsibility" and "environmental disclosure." The dense network of lines highlights the strong global connections between academic institutions and the research areas.

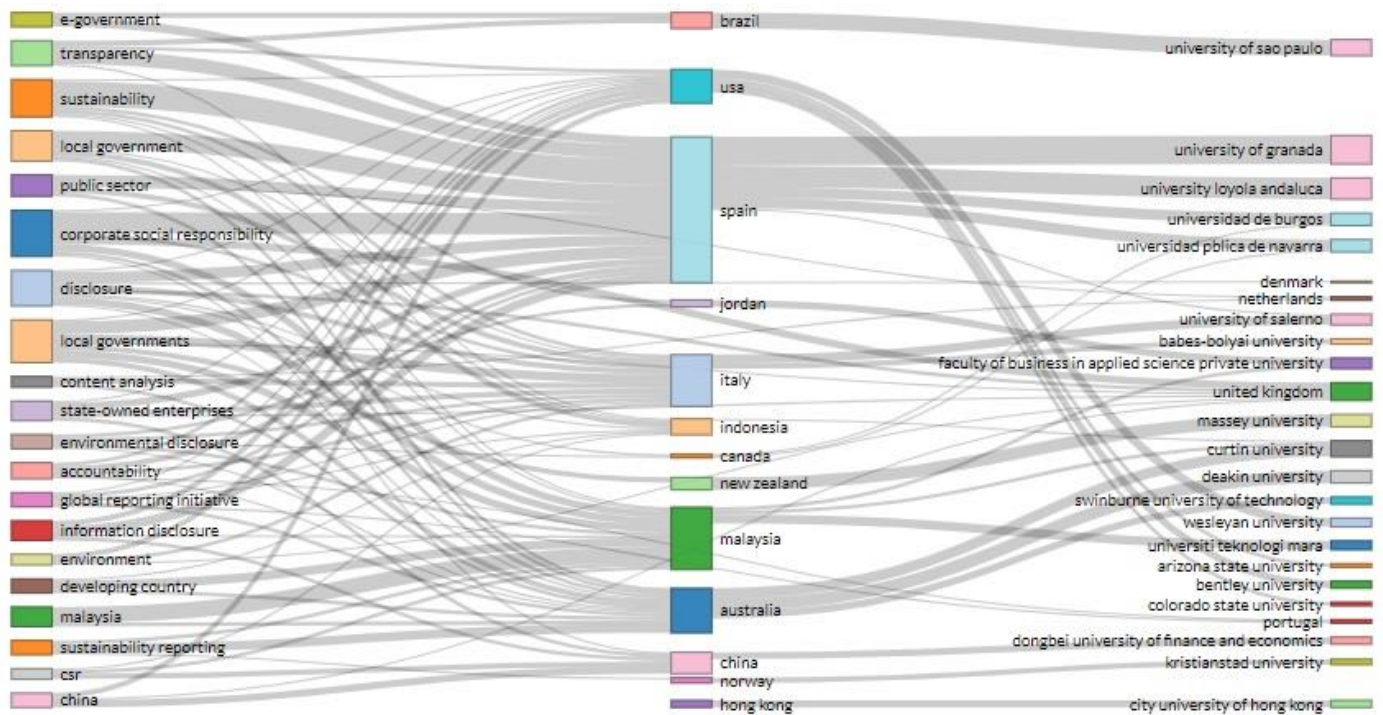


Figure 3. Three-fold analysis of voluntary disclosure

3.1. Influential Aspects of Coronavirus Literature

3.1.1. Core Journals

We utilize source impact and Bradford Law to identify the main publications that publish sustainability disclosure in the environmental sciences. The papers are ranked according to h, m, g-index, net production (NP), total citations (TC), and publication beginning year (PY_start) in Table 2. 'Cleaner Production' is a concept that aims to reduce waste while increasing efficiencies in the use of energy, water, resources, and human capital. Published in JOCP, Zeng, Meng, Yin, Tam, and Sun (2010) reported that the Structure Equation Model (SEM) was used to analyze the relationship between cleaner production and business performance. The results showed that cleaner production has a net positive effect on firm results and that the activities related to cleaner production in the high-cost scheme contribute more to non-financial performance than financial performance, while the activities related to cleaner production in the low-cost scheme contribute more to financial performance. Meditari Accountancy Research encourages a greater understanding of accounting issues through studies on the social effects of accounting, sustainability accounting, CSR, and integrated reporting. According to de Klerk and de Villiers (2012), it was published in MAR and shows the positive correlation between value relevance and corporate responsibility reporting CRR since firms with greater levels of CRR will probably have higher share prices. Social responsibility is an organization's responsibility for the effects of its actions and practices on society and the community, as shown by open and ethical action. As reported by Orlitzky, Siegel, and

Waldman (2011), it is discovered that voluntary CSR actions enhance a firm's competitiveness and reputation and such activities should be an improvement in financial and economic performance.

Table 2. Top Ten Journals according to the source impact

| Top ten Journals | h_index | g_index | m_index | TC | NP | PY_start |
|--|---------|---------|-------------|-----|----|----------|
| JOURNAL OF CLEANER PRODUCTION | 7 | 9 | 0.777777778 | 317 | 9 | 2013 |
| MEDITARI ACCOUNTANCY RESEARCH | 4 | 5 | 1.333333333 | 28 | 7 | 2019 |
| JOURNAL OF ACCOUNTING AND PUBLIC POLICY | 4 | 5 | 0.133333333 | 240 | 5 | 1992 |
| SOCIAL RESPONSIBILITY JOURNAL | 4 | 4 | 0.266666667 | 134 | 4 | 2007 |
| SUSTAINABILITY ACCOUNTING, MANAGEMENT AND POLICY JOURNAL | 4 | 4 | 0.363636364 | 86 | 4 | 2011 |
| SUSTAINABILITY (SWITZERLAND) | 3 | 4 | 1 | 17 | 5 | 2019 |
| ACCOUNTING, AUDITING AND ACCOUNTABILITY JOURNAL | 3 | 3 | 0.2 | 393 | 3 | 2007 |
| MANAGERIAL AUDITING JOURNAL | 2 | 3 | 0.333333333 | 41 | 3 | 2016 |
| CORPORATE SOCIAL RESPONSIBILITY AND ENVIRONMENTAL MANAGEMENT | 2 | 2 | 1 | 4 | 2 | 2020 |
| LOCAL GOVERNMENT STUDIES | 2 | 2 | 0.5 | 6 | 2 | 2018 |

We apply source impact and Bradford Law to identify the major journals that publish literature on sustainability disclosure in state-owned enterprises. Bradford's Law, as shown in Table 3, categorizes the journals into three zones. Zone 1 represents the most influential or "nuclear" journals, providing the highest volume of valuable research. Zone 2 includes journals that are moderately productive compared to Zone 1, and Zone 3 consists of journals that contribute less frequently than those in the first two zones. Our analysis found that ten journals, such as the "Journal of Cleaner Production" and "Meditari Accountancy Research," are classified in Zone 1. These journals are the most active in publishing research on sustainability disclosures in state-owned enterprises. The rest of the journals, which have comparatively fewer articles, are classified as Zones 2 and 3. The "Journal of Cleaner Production," which ranks highest in Zone 1, has published nine articles on this topic, reflecting its prominence in the field.

Table 3: Journal rankings.

| Sources | Rank | Freq | cumFreq | Zone |
|--|------|------|---------|--------|
| JOURNAL OF CLEANER PRODUCTION | 1 | 9 | 9 | Zone 1 |
| MEDITARI ACCOUNTANCY RESEARCH | 2 | 7 | 16 | Zone 1 |
| JOURNAL OF ACCOUNTING AND PUBLIC POLICY | 3 | 5 | 21 | Zone 1 |
| SUSTAINABILITY (SWITZERLAND) | 4 | 5 | 26 | Zone 1 |
| SOCIAL RESPONSIBILITY JOURNAL | 5 | 4 | 30 | Zone 1 |
| SUSTAINABILITY ACCOUNTING, MANAGEMENT AND POLICY JOURNAL | 6 | 4 | 34 | Zone 1 |
| ACCOUNTING, AUDITING AND ACCOUNTABILITY JOURNAL | 7 | 3 | 37 | Zone 1 |
| MANAGERIAL AUDITING JOURNAL | 8 | 3 | 40 | Zone 1 |
| ADVANCES IN ENVIRONMENTAL ACCOUNTING AND MANAGEMENT | 9 | 2 | 42 | Zone 1 |
| CORPORATE SOCIAL RESPONSIBILITY AND ENVIRONMENTAL MANAGEMENT | 10 | 2 | 44 | Zone 1 |

Figure 4 illustrates the publication growth of key journals over time. We use the loess smoothing method, which applies locally weighted regression, to analyze the trends in journal publications from 1991 to 2021. The graph shows how the number of publications related to sustainability disclosure in state-owned enterprises has evolved. The figure highlights that between 2010 and 2015, there was minimal growth in publication activity. However, since 2016, there has been a noticeable rise in the number of publications, particularly in journals such as "Meditari Accountancy Research," "Sustainability (Switzerland)," and "Journal of Cleaner Production." These journals exhibit a sharp upward trend, indicating increased research interest in sustainability disclosures. Conversely, the "Journal of Accounting and Public Policy" shows a more stable and lower publication rate than other journals. This figure suggests that sustainability disclosure has become an increasingly significant study area, particularly in recent years.

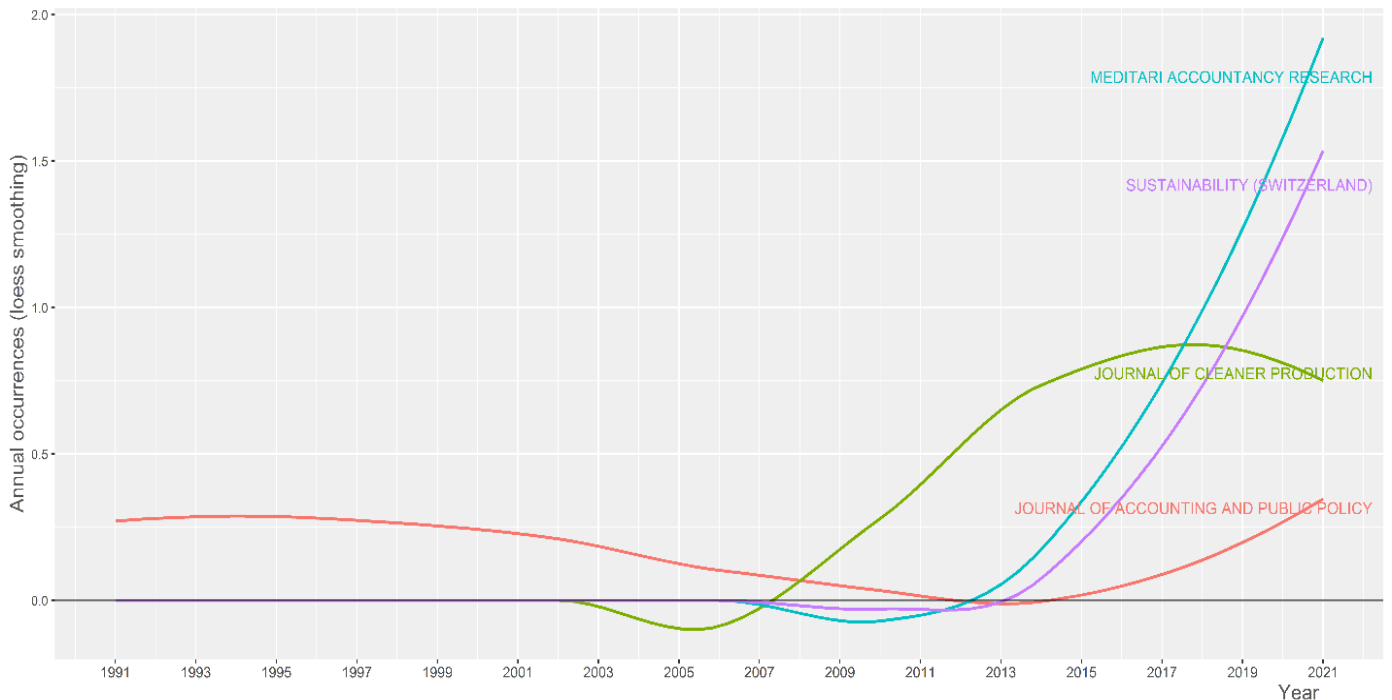


Figure 4. Source growth

3.1.2. Core Journal Articles

The top articles in environmental sciences disclosure publications are highlighted in this section. Table 4 contains a list of the top 10 articles that have been cited worldwide.

On the top of the list, Sauerbrei, Meier-Hirmer, Benner, and Royston (2006) conclude the study of corporate social reporting (CSR) practice by analyzing corporate managers' perspectives on the current state of, and potential prospects for, social reporting in Bangladesh. Laswad, Fisher, and Oyelere (2005) reported local authorities' voluntary Internet financial reporting practices. The study from Archel, Husillos, Larrinaga, and Spence (2009) is the 3rd on the list to conclude the survey regarding the scope of legitimacy theory (LT) through a systematic examination of the relationships between firm legitimizing strategies and the characteristics of the political climate in which they are formed. Davis (2014) provides an analysis of public attitudes toward fracking use and policies with an eye toward factors that help us account for differing levels of support. Criado-Jiménez, Fernández-Chulián, Larrinaga-González, and Husillos-Carqués (2008) conclude the study of 78 of the largest Spanish companies' reporting patterns between 2001 and 2003 investigates the degree to which they complied with the ICAC-2002 norm required them to make disclosures about the world in their financial statements. The study by Criado-Jiménez et al. (2008) adds to earlier country-level studies of non-financial reporting of the public sector by researching public transparency concerning sustainability and evaluating the determinants of sustainability disclosure practices in Spanish municipalities 'compare environmental disclosure provided by Canadian and US companies to investigate the role of cultural and institutional factors in motivating the development of mandatory and voluntary disclosure. A growing body of literature suggests that complex financial

statements have a negative impact on the knowledge environment. So, the study of Guay, Samuels, and Taylor (2016) investigates whether managers use voluntary transparency to minimize these adverse effects in this paper. Esa and Ghazali (2012) reported to examine if there has been a shift in the degree of corporate social responsibility (CSR) disclosure and to see if corporate governance qualities affect CSR disclosure in Malaysian government-linked corporations' annual reports Karkkainen (2002) reported the National Environmental Policy Act (NEPA) aims to enhance environmental outcomes by requiring complete disclosure of the expected results of agency acts.

Table 4. Most globally cited article.

| Paper | Total Citations | TC per Year |
|--|-----------------|-------------|
| The views of corporate managers on the current state of, and future prospect for, social reporting in Bangladesh | 227 | 15.133 |
| Determinants of voluntary Internet financial reporting by local government authorities | 168 | 9.882 |
| Social disclosure, legitimacy theory and the role of the state | 129 | 9.923 |
| Energy Abundance or Environmental Worries? Analyzing Public Support for Fracking in the United States | 115 | 14.375 |
| Compliance with Mandatory Environmental Reporting in Financial Statements: The Case of Spain (2001–2003) | 109 | 7.786 |
| Journal of Cleaner Production | 100 | 11.111 |
| Culture, institutional factors and differences in environmental disclosure between Canada and the united states | 99 | 4.714 |
| Guiding through the Fog: Financial statement complexity and voluntary disclosure. | 97 | 16.167 |
| Corporate social responsibility and corporate governance in Malaysian government-linked companies. | 92 | 9.2 |
| Toward a smarter Nepa: monitoring and managing government's environmental performance | 91 | 4.55 |

3.1.3. Core Words

The terms that appear most frequently in environmental sciences disclosure literature are included in Table 5. The table is broken down into four sections: the title, abstract, authors' keywords, and keywords plus. The most used words throughout are "environment" and "disclosure." Environmental science with relation to CSR and societal advantages. These key words are related to disclosure, sustainability, government, public. Minimal author keywords are employed in this literature. Keyword plus cover the main topic where there is sustainability, accountability, transparency. Moreover, keywords related to socio and disclosure indicate the relation between society and enterprises. These are the topics related to sustainability disclosure in state-owned enterprises. The abstract's most frequently used word is disclosure, and the title's most frequently used word is United States. The abstract and title employ more generic terms, with a reduced chance of creating a theme or research stream.

Table 5. Most frequent Words

| Keyword Plus | | Author Keyword | |
|------------------------|-------------|-----------------------|-------------|
| Words | Occurrences | Words | Occurrences |
| corporate | social | | |
| responsibility | 18 | disclosure | 46 |
| disclosure | 14 | environmental | 38 |
| sustainability | 12 | government | 36 |
| local governments | 11 | local | 35 |
| local government | 9 | reporting | 29 |
| malaysia | 8 | governments | 27 |
| transparency | 8 | social | 27 |
| information disclosure | 7 | corporate | 24 |
| accountability | 6 | State | 24 |
| public sector | 6 | sustainability | 22 |

| Abstract | | Title | |
|-----------------|------------|--------------------------|------------|
| Words | Occurrence | Words | Occurrence |
| disclosure | 365 | united states | 16 |
| environmental | 260 | local government | 13 |
| reporting | 167 | china | 10 |
| government | 148 | information disclosure | 10 |
| local | 143 | government regulation | 9 |
| study | 138 | sustainable development | 9 |
| public | 129 | article | 7 |
| social | 124 | environmental monitoring | 7 |
| csr | 123 | governance approach | 6 |
| sustainability | 120 | government | 6 |

The word cloud in figure 5 presents the most common terms in the literature related to sustainability disclosure in state-owned enterprises. The larger the word appears, the more frequently it is used in the publications. The terms "disclosure," "government," "environmental," and "social" are among the most prominent, indicating their central importance in this field. Other frequently occurring terms include "reporting," "state," "corporate," and "enterprises," which are also significant in the context of sustainability and corporate social responsibility. Additionally, words like "financial," "transparency," "analysis," and "regulation" suggest a focus on the regulatory and analytical aspects of sustainability disclosure. This word cloud visually highlights the key themes and topics in the literature, showing the emphasis on environmental and corporate reporting within government and state-owned enterprises.



Figure 5. Word Cloud

Figure 6 shows us how the number of words in literature has grown throughout time alongside to the cloud. As the figure illustrates, the reporting keyword started to increase in the early 90s, which shows that reporting is the main keyword to enhance the relationship between the public and corporations. The increase in term usage over time is analyzed in Figure 6 using the loess smoothing approach. The use of government keywords rapidly increased in 2005, whereas the use of State keywords decreased in 2011. There has been an increase in keywords like Local, social, and corporate.

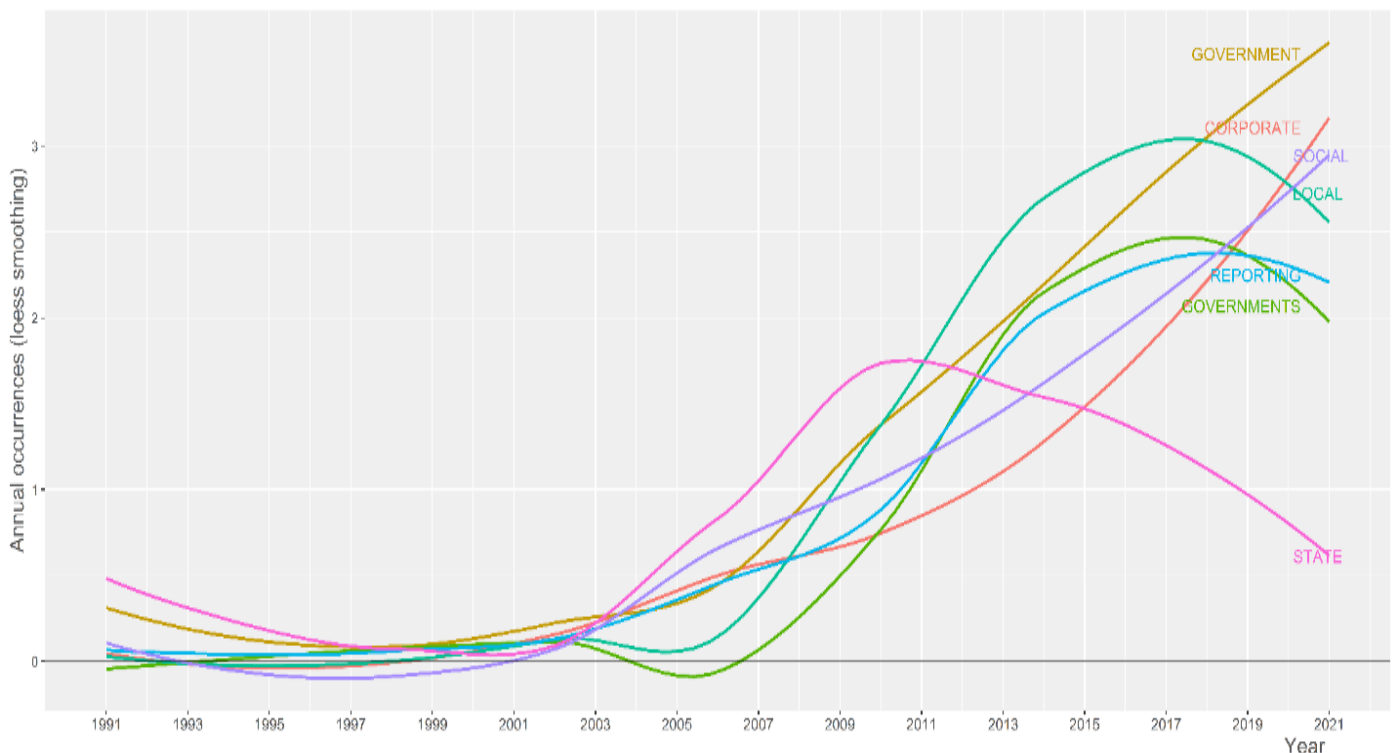


Figure 6. Word Growth Overtime

Table 6 provides data on the top countries in terms of publications and citations in the area of sustainability disclosure. Spain ranks first with a total of 563 citations and a frequency of 37 publications, followed by the USA with 372 citations and 42 publications, making it the most frequent contributor. The United Kingdom ranks third with 265 citations and 9

publications. Canada, Malaysia, New Zealand, and Italy also appear in the list, indicating their contributions in publications and citations. China ranks eighth with 127 citations and 28 publications, emphasizing its growing influence in the field. Australia and Denmark round out the top 10 countries, reflecting their roles in the academic discussion on sustainability disclosure. This table highlights the geographical distribution of research efforts. It shows how certain countries, particularly Spain, the USA, and the UK, have made significant contributions in terms of the number of publications and their academic impact.

Table 6. Top countries in terms of publications and citations.

| Country | Total Citations | Region | Freq |
|----------------|-----------------|-------------|------|
| SPAIN | 563 | USA | 42 |
| USA | 372 | SPAIN | 37 |
| UNITED KINGDOM | 265 | CHINA | 28 |
| CANADA | 220 | AUSTRALIA | 18 |
| MALAYSIA | 182 | ITALY | 16 |
| NEW ZEALAND | 168 | MALAYSIA | 16 |
| ITALY | 131 | CANADA | 10 |
| CHINA | 127 | INDONESIA | 10 |
| AUSTRALIA | 113 | UK | 9 |
| DENMARK | 57 | NEW ZEALAND | 5 |

3.1.4. MAIN AUTHORS, AFFILIATION, INSTITUTIONS AND COUNTRIES

This section contains details about the main contributors, their affiliations, institutions, and countries with a high level of transparency literacy in environmental sciences. Table 7 lists the ten writers who seem to have the most significant effect on the literature on sustainability transparency. The h-index is used to determine ranking.

FISK JM (ranked 1) reported the research on fracking disclosure of state politics (Fisk, 2013). JOSEPH C (ranked) investigates the determinants of sustainability news on Malaysian city council websites using a transparency index and an institutional theory structure (Joseph, Pilcher, & Taplin, 2014). TAPLIN R (ranked 3) investigates sustainability reporting on Malaysian local government websites, which is used to demonstrate how two measurement approaches (abundance & occurrence) result in distinct interpretations of disclosure extent (Joseph et al., 2014). AHMAD S (ranked 4) analyzes to see if legitimacy theory describes the extent and nature of environmental disclosures and the reasons for the disclosure in the sense of Malaysian industrial goods and construction firms (Ahmad & Sulaiman, 2004). CHE KU KASSIM CKH (ranked 5) reported the magnitude of environmental disclosure (ED) made by Malaysian government on websites and the method of disclosure for enhance underlying motives behind the Eds (Kassim, Ahmad, Nasir, Arifin, & Nori, 2020). NAVARRO-GALERA A (ranked 6) explores determinant factors that can assist website developers and administrators improve the online sustainability accountability offered by regional governments (Navarro-Galera, Rodríguez-Bolívar, Alcaide-Muñoz, & López-Subires, 2016). Alcaraz-quiles fj (ranked 7) used an empirical research of 62 LGs in the United Kingdom, Ireland, and Southern Europe to identify factors that support online accountability regarding the sustainability of public policy (Ortiz-Rodríguez, Navarro-Galera, & Alcaraz-Quiles, 2018). Chen x (ranked 8) examine the impact of environmental legitimacy (an external informal mechanism) on corporate carbon transparency, as well as the role of green innovation (an internal formal mechanism) as a mediator (D. Li, Huang, Ren, Chen, & Ning, 2018). De los rosberjillos a (ranked 9) examines the activities of European local governments in disclosing sustainability knowledge, with a focus on the websites of major European cities classified as Anglo-Saxon (English speaking) or Nordic, depending on administrative culture (Galera, de los Ríos Berjillos, Lozano, & Valencia, 2014). FARNETI F (ranked 10) addressed the application of the Global Reporting Initiatives (GRI) and sustainability reporting (SR) guidelines to public and third-sector organizations (Durnay & Gutherie).

Table 7. Top 10 Authors' Impact in corona Pandemic Literature

| Author | h_index | g_index | m_index | TC | NP | PY_start |
|------------------------|---------|---------|---------|-----|----|----------|
| FISK JM | 3 | 3 | 0.333 | 159 | 3 | 2013 |
| JOSEPH C | 3 | 3 | 0.2 | 64 | 3 | 2007 |
| TAPLIN R | 3 | 3 | 0.3 | 39 | 3 | 2012 |
| AHMAD S | 2 | 2 | 0.333 | 7 | 3 | 2016 |
| CHE KU KASSIM CKH | 2 | 2 | 0.333 | 7 | 3 | 2016 |
| NAVARRO-GALERA A | 2 | 3 | 0.25 | 85 | 3 | 2014 |
| ALCARAZ-QUILES FJ | 2 | 2 | 0.25 | 83 | 2 | 2014 |
| CHEN X | 2 | 2 | 0.4 | 67 | 2 | 2017 |
| DE LOS ROS BERJILLOS A | 2 | 2 | 0.25 | 61 | 2 | 2014 |
| FARNETI F | 2 | 2 | 0.182 | 43 | 2 | 2011 |

Table 7 displays the majority of pertinent associations. First up is the University of Granada. Strong research foundations on media demand for transparency by local governments have been made available by the university (Cuadrado-Ballesteros, Frías-Aceituno, & Martínez-Ferrero, 2014). Curtin University is ranked 2; Curtin University students were more likely to not disclose their disability as part of their studies (Kent, Ellis, Deakin is a dual-mode university, with more than half of its students completing at least part of their studies online and an entrepreneurial arm that offers distance education opportunities to an ever more significant number of students (Calvert, 2001). University Loyola Andalucacomes, 4th on affiliations, recognizes developments and patterns in awareness creation in the field of sustainability reporting in the public sector to analyze its structure and draw inferences and insights. The remaining Universities published 3 articles.

Table 8. Most Relevant Affiliations.

| Affiliations | Articles |
|------------------------------------|----------|
| UNIVERSITY OF GRANADA | 8 |
| CURTIN UNIVERSITY | 4 |
| DEAKIN UNIVERSITY | 4 |
| UNIVERSITY LOYOLA ANDALUCA | 4 |
| KRISTIANSTAD UNIVERSITY | 3 |
| MASSEY UNIVERSITY | 3 |
| SWINBURNE UNIVERSITY OF TECHNOLOGY | 3 |
| UNIVERSIDAD DE BURGOS | 3 |
| UNIVERSIDAD PBLICA DE NAVARRA | 3 |
| UNIVERSITI TEKNOLOGI MARA | 3 |

Table 9 presents data on the top 10 corresponding author countries. The USA ranks first with 18 articles, 15 single-country publications (SCP), and three multiple-country publications (MCP). China follows in second place with 16 articles, comprising 15 SCP and 1 MCP. Spain ranks third with 14 publications, 13 of which are SCP and 1 MCP. Australia is in fourth place, with 9 articles, including 8 SCP and 1 MCP. Italy rounds out the top five with 8 articles, consisting of 6 SCP and 2 MCP. The table provides insights into the level of international collaboration by highlighting the MCP ratio, where countries like Jordan show a relatively high MCP ratio of 0.5, indicating more frequent collaboration compared to other countries, such as the USA, with a ratio of 0.1667. This table helps illustrate the geographic distribution of research output in sustainability disclosure and the extent of collaboration across countries.

Table 9. Corresponding author's country.

| Country | Articles | Freq | SCP | MCP | MCP_Ratio |
|----------------|----------|---------|-----|-----|-----------|
| USA | 18 | 0.17308 | 15 | 3 | 0.1667 |
| CHINA | 16 | 0.15385 | 15 | 1 | 0.0625 |
| SPAIN | 14 | 0.13462 | 13 | 1 | 0.0714 |
| AUSTRALIA | 9 | 0.08654 | 8 | 1 | 0.1111 |
| ITALY | 8 | 0.07692 | 6 | 2 | 0.25 |
| MALAYSIA | 8 | 0.07692 | 7 | 1 | 0.125 |
| CANADA | 5 | 0.04808 | 2 | 3 | 0.6 |
| INDONESIA | 3 | 0.02885 | 3 | 0 | 0 |
| UNITED KINGDOM | 3 | 0.02885 | 2 | 1 | 0.3333 |
| JORDAN | 2 | 0.01923 | 1 | 1 | 0.5 |

The issue of reporting is related to the environment, so for the welfare of humanity, major collaboration is required among countries. Table 10 attempted to address this problem; regrettably, there hasn't been much international cooperation. In 3 publications, the USA and Canada cooperated in 2 publications, while Australia and Malaysia cooperated. Only articles 2 and 1 showed cooperation from the remaining nations in the table.

Table 10. Collaboration network.

| From | To | Frequency |
|-----------|-------------|-----------|
| USA | CANADA | 3 |
| AUSTRALIA | MALAYSIA | 2 |
| ITALY | ROMANIA | 2 |
| USA | KOREA | 2 |
| AUSTRALIA | INDONESIA | 1 |
| AUSTRALIA | ITALY | 1 |
| AUSTRALIA | NETHERLANDS | 1 |
| CANADA | FRANCE | 1 |
| CANADA | KOREA | 1 |
| CANADA | NORWAY | 1 |

4. Conceptual Framework

By utilizing the connection between words (keyword plus), this part helps us comprehend the different themes. Initially, the research implies a co-occurrence network, which allows one to compare various sustainability disclosure issues in environmental sciences over time. Then, we can arrange these word networks on a bi-dimensional matrix called a 'Thematic Map' to examine the network's centrality and density.

4.1. Co-Occurrence Network

The co-occurrence network of keyword plus is displayed in Figure 7. The graphic was taken from the R package "bibliometrix" (also known as "biblioshiny"). Four streams of sustainability disclosure in environmental sciences may be identified by looking at the co-occurrence network of terms. The blue and green clusters are related to each other in terms of themes, whereas the red cluster is the core cluster with the highest centrality. The highest centrality is CSR. The sustainability disclosure is split up into several study streams by each group.

The red cluster represents the central cluster, discussing multiple characteristics of CSR, disclosure, Malaysia, state-owned enterprises, sustainability reporting, information disclosure, and CSR disclosure. The blue research stream is the 2nd significant stream in which studies are related to the local governments, public sector, voluntary disclosure, accountability, content analysis, and developing countries. The green research stream is related to sustainability,

environmental disclosure, transparency, local government, and e-government. Purple is the last rank stream associated with China, CSR, CSR reporting, environment, and government regulation.

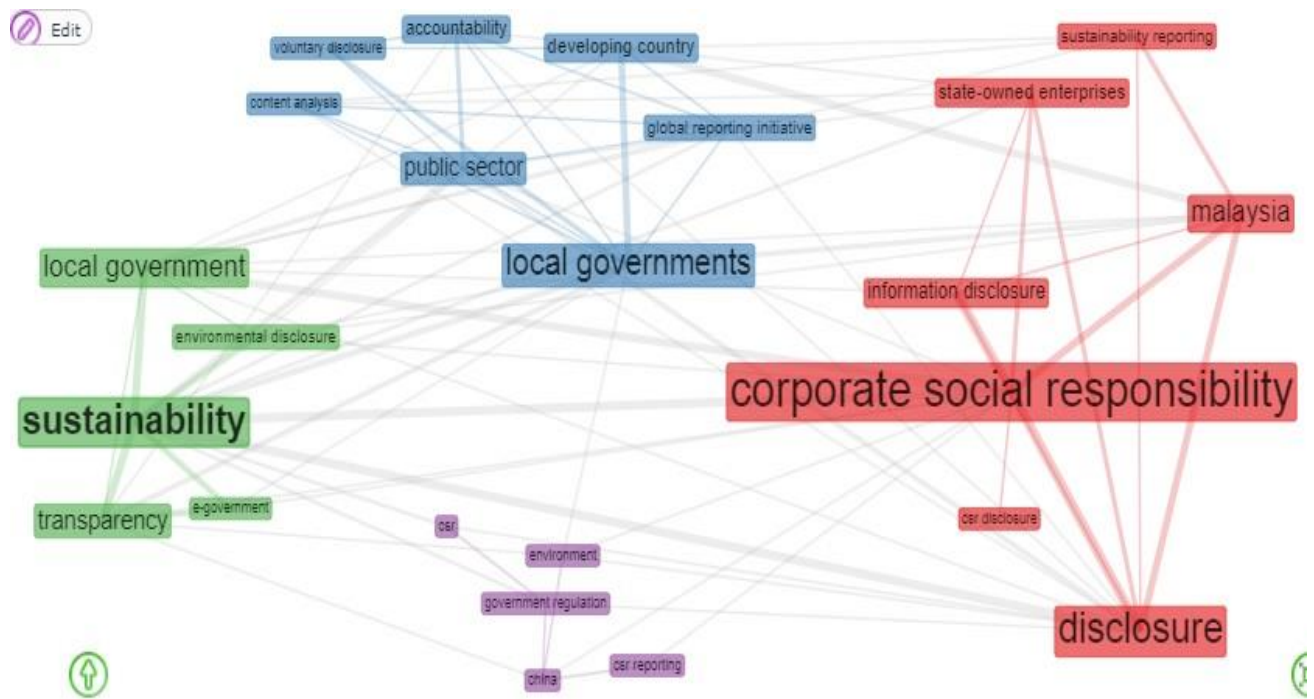


Figure 7. Co-occurrence network.

4.2. Thematic Map

We have determined a few research topics to help you better comprehend the results. We can arrange the established themes into a strategic diagram in order to assess the importance and development of the research subject. The picture above displays the thematic map in Figure 8, which is based on density (y-axis) and centrality (x-axis) (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011). The centrality value of the chosen theme reflects its importance in the research field, while the density represents the development or growth of that theme. The graph is divided into four quadrants: Motor themes (upper right corner) are highly developed and drive the research field forward. In this figure, themes like "environment," "accountability," "local governments," and "public participation" are in the motor themes quadrant, indicating their importance and ongoing development in sustainability and CSR disclosure research. Niche themes (upper left corner) are well-developed but not central to the broader field. Here, "China" and "CSR reporting" are classified as niche issues, indicating that they are specific subjects with little general significance. The transversal or basic themes (lower right corner) are less developed but very important to the field because of their low density and high centrality. Under this heading, the terms "corporate social responsibility" (CSR), "transparency," and "sustainability reporting" are highlighted, underscoring their fundamental importance in the literature while also pointing to the need for more research and development. The lower left corner indicates emerging or decreasing topics, which are less established and less essential to the discipline. "Integrated reporting" and "CSR disclosure" are shown in this figure's lower quadrant, indicating that they are either newer concepts or may eventually lose significance (Nasir et al., 2020). This thematic map highlights the most significant and emerging research fields and offers insights into the organization of research themes within the literature on sustainability disclosure.

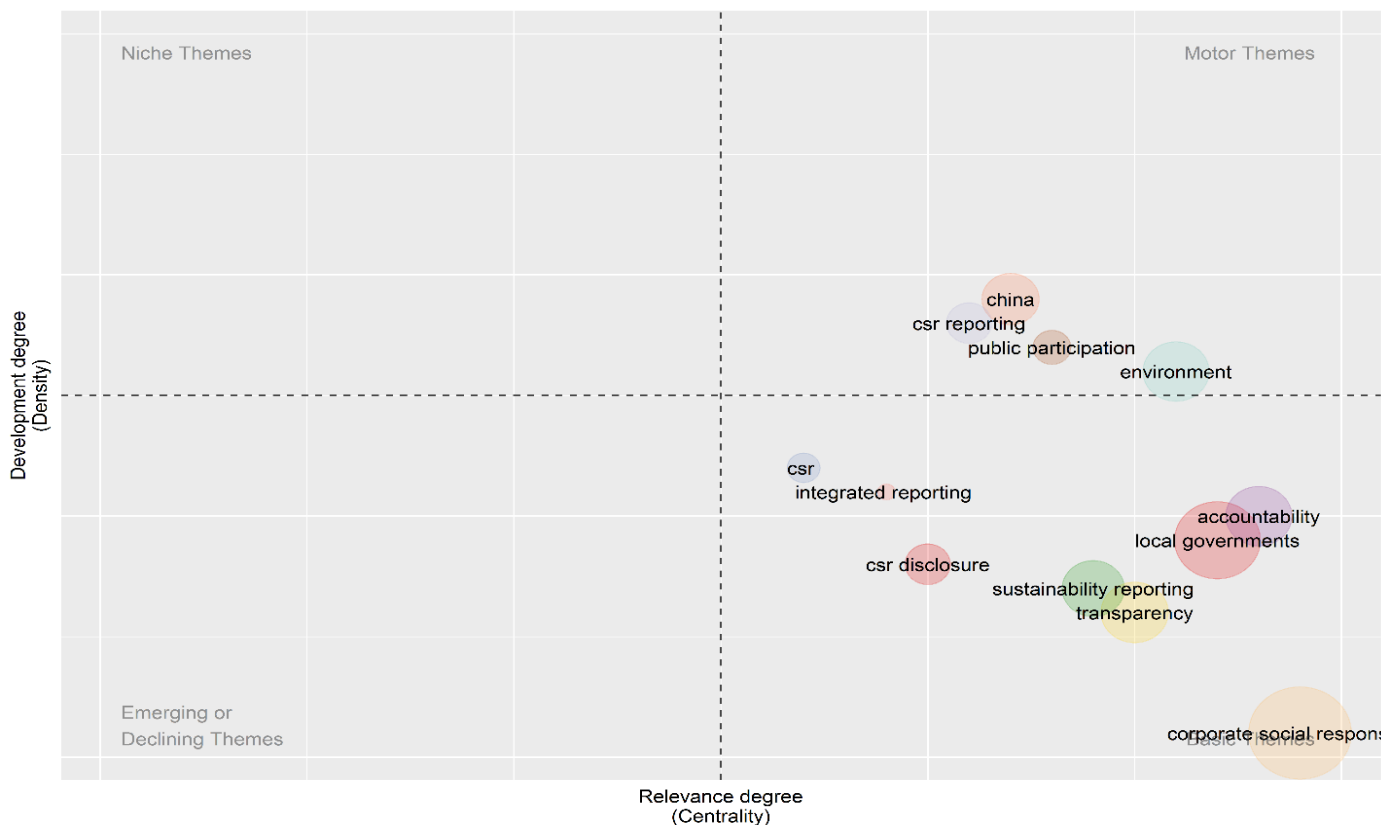


Figure 8. Thematic Map.

4.3. Thematic Evolution

The growth of literature over time is illustrated in Figure 9, which also includes theme evolution alongside the thematic diagram. Keywords are used to highlight the themes' development throughout time. The evolution is divided across many time segments and 'biblioshiny' produces thematic development. The first segment covers the years 1991–2012, with the terms "environmental," "government," "social," and "state" emerging as significant issues. The basis for the current emphasis on sustainability and disclosure was laid by these early topics. The majority of the literature produced during this time period concentrated on the political and environmental facets of sustainability. The themes changed to "environmental," "reporting," and "state-owned" in the subsequent time segment from 2013 to 2015. This development indicates a growing emphasis on reporting procedures and the position of state-owned companies in environmental discussions. The topics underwent additional development between 2016 and 2019, with a focus on "disclosures," "environmental," "companies," and "government." Around this time, research on corporate disclosures and the responsibilities of governments in environmental management started to become more thorough. Lastly, the trend towards themes like "disclosure," "evidence," "local," "state," "corporate," and "sustainability" is seen in the 2020–2021 segment. This suggests that the body of current research is growing in areas such as corporate practices, local governance, and sustainability initiatives, especially regarding state-owned businesses and more general corporate social responsibility. The evolution and shift in the focus of sustainability and disclosure research are graphically depicted in Figure 9.

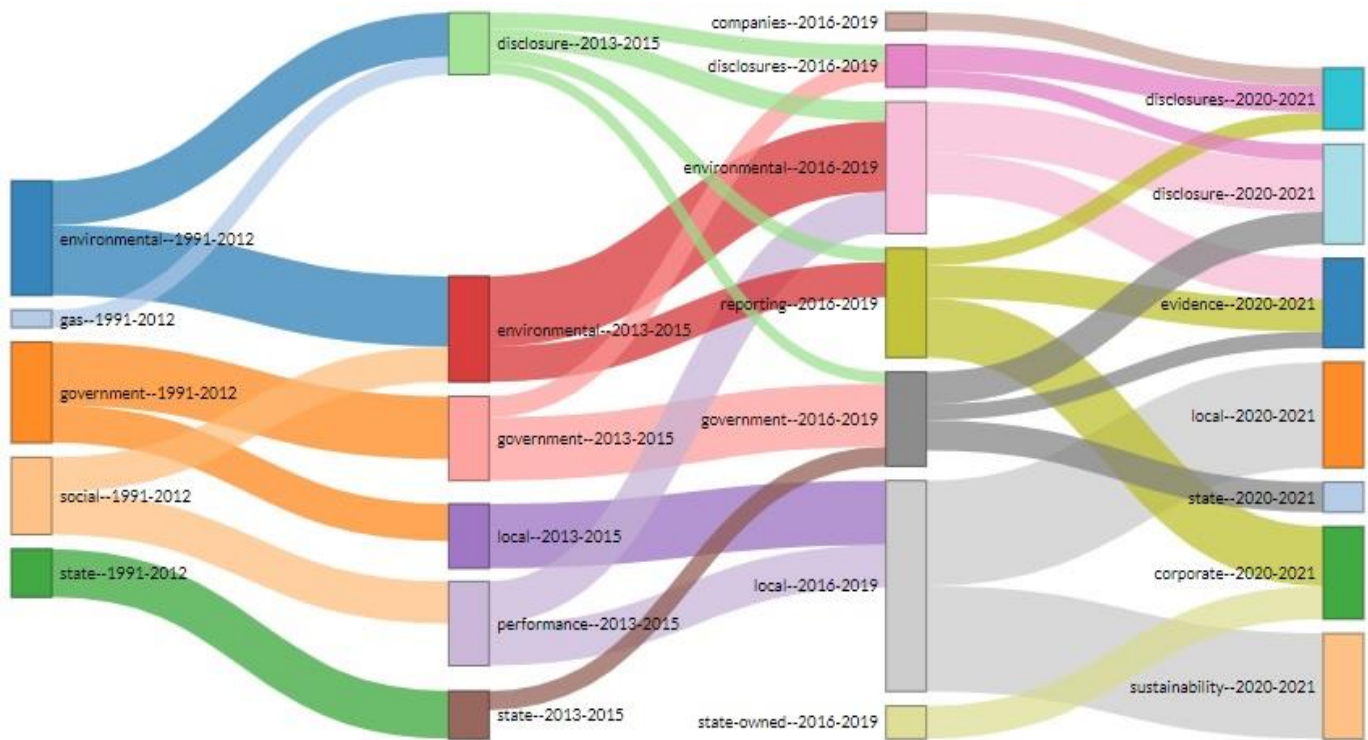


Figure 9: Thematic Evolution

4 CONCLUSION

Finally, this research highlights the increasing significance of environmental, social, and governance (ESG) policies in recent years by offering a thorough bibliometric analysis of sustainability disclosure in state-owned companies (SOEs). Bradford's Law served as our guidance for our investigation, which focused on the crucial factors influencing sustainability disclosures in SOEs and identified important journals, authors, and nations that contribute to this subject. According to the analysis, the top three publications having the most significant influence in this field are the Journal of Cleaner Production, Meditari Accountancy Research, and Journal of Accounting and Public Policy. The most often referenced article from the core 23 journals is BELAL AR (2007), published in Account Audit Account J. It offers essential insights into corporate social responsibility (CSR) procedures from the viewpoint of company managers in Bangladesh. Additionally, FISK JM is identified as one of the most impactful authors, and the University of Granada emerges as the most relevant affiliation for publishing sustainability literature. In terms of geographical contributions, the USA has the most publications, but articles from Spain receive the highest number of citations. China and Spain follow the USA in terms of corresponding authorship. Collaboration patterns reveal that the USA and Canada are prominent partners in sustainability research, with Canada also collaborating with other nations such as France, Korea, and Norway. Through the thematic evolution analysis, we observed the increasing significance of corporate governance, transparency, and environmental responsibility as core themes in sustainability reporting. The conceptual structure, derived from the 'biblioshiny' R-package, identified four key research streams, highlighting the development of CSR, integrated reporting, local governance, and sustainability reporting as transversal themes, while motor themes such as environmental accountability continue to drive the literature forward. The study also explored the evolution of sustainability themes over four distinct time segments (1991-2012, 2013-2015, 2016-2019, and 2020-2021), showcasing how the field has developed from early environmental and governmental discussions to more nuanced studies of CSR disclosure and integrated reporting. The thematic evolution underscores the dynamic nature of sustainability literature, reflecting the growing complexity of SOEs' roles in achieving global sustainability goals. In conclusion, this study presents important implications for future research in addition to identifying important relevant variables in sustainability disclosure. This paper establishes the framework for future research on sustainability disclosures by analyzing previous patterns and present practices. It emphasizes the need for more in-depth investigation into the political, environmental, and socioeconomic issues that influence SOEs' disclosure policies. This offers a road map for

academics, regulators, and politicians to improve accountability and transparency in state-owned businesses, promoting sustainable development globally.

4.1. Future Agenda

The study's conclusions open up a number of new research directions that might improve our knowledge of sustainability disclosure in state-owned enterprises (SOEs). Subsequent investigations have to go more into the distinctions in sustainability disclosure methodologies between state-owned enterprises and privately held companies. Comparative studies may be used to determine the different incentives and obstacles that each kind of organization experiences when reporting their ESG practices, given the various governance structures, political constraints, and social duties of state-owned enterprises (SOEs). Future research might look more closely at the particular political pressures and how they affect sustainability practices, even while this study emphasized the impact of political influence and government legislation on SOE disclosures. The influence of government engagement on the breadth and quality of disclosures might be studied through case studies in various nations with diverse political systems. Given the prominence of the USA, Spain, and China in this subject, it would be worthwhile for future research to concentrate on cross-border partnerships in sustainability disclosures. Examining the impact of cross-national collaborations on sustainability reports' uniformity, comparability, and openness may yield important information about international initiatives aimed at harmonizing sustainability standards among different geographical areas. Examining sector-specific sustainability disclosure methods within SOEs might be beneficial for future studies. For instance, due to the nature of their business and legal constraints, some industries, including the energy, transportation, or public utility sectors, may have distinct goals and strategies for sustainability. A more thorough sector-based examination could identify particular difficulties and industry best practices. Future research may promote the progress of accountability, transparency, and sustainable development in the public sector by filling up these research gaps and advancing a more nuanced knowledge of sustainability disclosure in SOEs.

4.2. Study Limitations

There are many limitations to the study. First, the findings' generalizability may be limited by the sample size, time frame, and concentration on German-speaking nations. Furthermore, alternative sustainability reporting (SR) frameworks are not included in evaluating GRI compliance due to their exclusive use within the Global Reporting Initiative (GRI) framework. The possible discrepancy between high SR compliance and actual sustainability performance is a significant drawback. Publicly available metrics may not accurately represent how sustainable initiatives are being implemented. Future studies could investigate other SR frameworks and evaluate how well-reported efforts match actual procedures.

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