Review

Non-financial disclosures and sustainable development: A scientometric analysis

Neha Saini [a,1], Monica Singhania [b], Morshadul Hasan [c,1], Miklesh Prasad Yadav [d], Mohammad Zoynul Abedin [e,*]

[a] *Department of Management, Netaji Subhas University of Technology, Delhi, India*
[b] *Department of Management, Faculty of Management Studies, University of Delhi, India*
[c] *Murdoch Business School, Murdoch University, Perth, 6150, Australia*
[d] *Indian Institute of Foreign Trade, Kakinada, India*
[e] *Department of Finance, Performance & Marketing, Teesside University International Business School, Teesside University, Middlesbrough, TS1 3BX Tees Valley, United Kingdom*

A B S T R A C T

Pressure on companies to report on non-financial dimensions has amplified the interest in sustainability due to increased awareness among stakeholders. While connecting value-related success to financial performance is a niche field among academicians and researchers, the debate is still on "*Does it matter the going value of non-financial disclosures (NFD) relevant?*" To clarify ambiguous perceptions in existing literature, we examine how NFD connects to sustainable development by conducting an in-depth scientometric analysis to gain insights into evolution, trends, and other multi-dimensional aspects to map centralities and bursts in non-financial sustainability indicators. We used bibliometric data from a pool of 1568 studies from Web of Science published in Social Science Citation Index (SSCI) and Science Citation Index Expanded (SCIE) journals between 1991 and 2021 to identify the prominent research areas in this stream and the pattern of the interrelationship among various disciplines. The current investigation reveals several novel features of ESG disclosures, such as corporate sustainable performance, environmental performance, environmental disclosures, sustainable supply chains, sustainability indicators, and integrated reporting. This study highlights bottlenecks and suggests the scope of future research on Environmental, Social and Governance (ESG) to meet sustainable business goals. The findings of this study include 13 major clusters refining ESG for sustainability, concluding with a new theory encapsulating sustainable development through non-financial disclosure in business processes. This study has significant practical implications on the ESG dimension in the corporate world of emerging countries are under the development stage.

1. Introduction

The genuine and authentic Corporate Social Responsibility (CSR) practices strengthen consumer and public relationships by instilling high expectations in their favourite brands that need to engage with CSR strategies and environmental concerns. This has also forced governments everywhere to establish an economic aid package to support sustainability by adopting ESG outcomes as non-financial disclosures (NFD). In the recent literature, investors have increasingly used NFD, more particularly ESG criteria to make investment decisions (Alda,

2021; Escrig-Olmedo et al., 2017; Ahmed et al., 2022; Chai et al., 2022a; Gangi et al., 2022), and it has also been observed that companies with ESG practices make a superior profit compared to the companies that do not follow ESG practices (Garcia et al., 2017). More has been committed to sustainability in such a backdrop, emphasizing non-financial disclosures (NFD) covering ESG factors. The concept of ESG is not new, but it has attained massive importance during the ongoing pandemic. Environmental reporting is a corporate response to public demand to reduce pollution levels and accomplish the 2030 Agenda for Sustainable Development's sustainable development goals (Turzo et al., 2022). NFD

also significantly linked to sustainable development. For example (Cosma et al., 2020), reveals that NFD differentiate banks in term of contribution to sustainable development. More particularly, disclosure on environmental information (Dobija et al., 2022). Even, the ESG information has acquired significant importance to meet up multiple stakeholders' expectations regarding corporate sustainability (Nicolò et al., 2022). That is why NFD disclosures are gaining enormous significance in the present times. Many studies suggest ESG disclosures are likely to give significant advantages in the future and have an encouraging impact on corporate financial performance (CFP). Particularly Chen and Xie (2022), Wagner (2010), and Xie et al. (2019) found positive and significant impact of ESG on financial performance.

Despite a large body of study on this topic, there is no compelling evidence of a link between environmental, social and governance policy and a company's profitability. To the best of our knowledge, there are no other systematic reviews addressing ESG issues except for Erkens et al. (2015), who reviewed studies focusing on top journals, topics, methodology, countries, and authors. There was another study by Gao et al. (2021) that focused only on ESG disclosure. However, there is no other study that focuses on ESG disclosure, sustainability, and corporate financial performance in a scientometric study. Thereby the absence of a study focusing on ESG disclosure, sustainability, and corporate financial performance through conducting a scientometric study is considered the study gap.

Aligning with the research gaps, we specify the key objective of this study to examine in what aspect NFD, particularly ESG connects to sustainable development. Considering the key aim of the study, this study tries to review existing literature to answer the research following questions (RQs) stated below in this paper. *RQ1: What are the current publication trends in ESG disclosures? RQ2: Who are the most well-known experts and collaborations within this topic's publishing lists? RQ3: Which key themes involve ESG disclosures and sustainability? RQ4: Which are the most influential articles in the ESG and sustainability disclosures? RQ5: What is the intellectual structure of current research? RQ6: What areas require massive attention in ESG disclosure practices?* The reason and logic behind working on such research questions and problems have been explained in Appendix B. The current study used data from 1568 articles to answer the research questions and conducted an in-depth review utilizing scientometric analysis through Citespace.

The existing scope of the knowledge is limited to ESG policy, sustainability, and a company's profitability, which is elaborately examined in this study with empirical justification with bibliometric data. This is the novelty of this study. The contribution of this study is that the present study is not limited to scientometric analysis, but this study is the first study to conduct a detailed scientometric analysis exploring various intellectual turning points and most active research areas with transformative discoveries. This study is more detailed and consistent than previous research considering the recent time frame, a detailed key string employed, technique, and data sources. As a result, this article serves as a one-stop resource for a comprehensive overview of ESG and sustainability research. This article's review of ESG and sustainability provides two significant contributions. The first contribution of this article is a state-of-the-art overview of the performance (i.e., publication trends, top authors, countries, institutions, and journals) and intellectual structure (i.e., prominent research themes) of ESG and sustainability research. Thus, this article fills the knowledge availability and awareness gap that currently exists. This suggests that the readers of the journal—for example, early and established researchers, policy makers, and practitioners—will be able to gain entry and updated insights without having to engage in duplicative efforts to review the field in its entirety.

The review is organized as follows: Section 1 presents the introduction, and section 2 of the paper defines the methodology (including data sources and data collection methods), key strings, details of software parameters, techniques, and tools for identifying and analyzing transformative narratives of the study. Section 3 covers the results with different themes, including author citation, journal citation, and document citation with cluster analysis of keywords and reference citations. Section 4 describes the thematic discussions; section 5 highlights the conclusion with the main findings outlining the current study's limitations, and section 6 focuses on future research areas in this stream.

2. Data sources and analysis method

2.1. Data sources and time frame

To understand the trend, insights, intellectual structure, and transforming discoveries in the field of "*ESG and sustainability,*" we use bibliometric analysis. Following the methodology of (Korom, 2019), the Web of Science (WoS) database was selected for data collection, and we conducted a "topic" search (combination of title, abstract, keywords, and author keywords) with a "search string." WoS was chosen as it had a diverse selection of excellent publications in all academic fields and was one of the largest repositories of research articles dating back to the 1900s. Search string has been developed scientifically by reviewing 53 articles based on ESG disclosures. Using the structure of the scientific field proposed by Ronda-Pupo (2017), the critical string activity was carried out. Ronda-Pupo (2017) suggested inclusion criteria to select the journal, time frame, language, indexing and key strings. The process of designing the key string has been followed using a scientific approach. The key string used in the present study can be found in appendices (A).

The string yielded 5919 research papers, which was quite large. We must restrict our research to some additional foundation to get absolute and concrete results. Based on a minimum number of documents selected for analysis, we used Cochran's Sample size formula using equation (1) (Cochran, 1991).

$$n = \frac{NZ^2(p(1-p))}{(N-1)e^2 + Z^2p(1-p)} \tag{1}$$

where *n* was a number of documents randomly selected for validation, *N* represented the total number of publications received from WoS using the search string, and *Z* was the deviation from the mean value accepted as the level of confidence (for 95% level of confidence, *Z* value is 1.96), *e* was error margin, and p was the proportion of results that were expected to be invalid (randomly selected and expected to be very low).

With $N = 5919$, $Z = 1.96$ (level of confidence); $e = 0.05$, $p = 0.10$, n was found to be 136 as minimum recommended size. Rather than going random selection of articles, we chose for "title" selection criteria and refined them to "articles" and "English" language, and 1568 research articles were extracted from January 1991 till May 2021. SSCI and SCI databases were chosen for data extraction as sustainability, ESG, and NFD were pertaining to social sciences and science areas.

2.2. Method of analysis

We analyzed the data extracted from WoS and used the Citespace version, 5.7.R5 (64 bit), developed by Chaomei Chen of Drexel University for analyzing and visualizing drifts and patterns in the technical literature Chen, Ibekwe-SanJuan and Hou (2010) for bibliometric analysis. The authors considered that Citespace provided various visual analytic functions and scientific clustering methods, like betweenness centrality, burst detection, modularity score, silhouette, and density.

The methodology adopted for visualization included 1991 to 2021, with one year per slice. Visualization of a different category was executed for different nodes like Author, References, Keywords, Journal Co-citation, Author Co-Citation, Countries, and Institutes, incorporating research in this area. The top 20–50 levels of most cited or occurred items from each slice were selected in the selection criteria. The pruning algorithm selects a path finder and prunes with a merged network for further dataset processing (Table 1). Pathfinder was believed to be a wiser choice (Chen and Leydesdorff, 2014), as it reduced the link

Table 1
List of Parameter used for analysis.

S. No.	Parameter	Description	Choice
1	Time Slice	Time span of the analysis	From 1991 to 2021 (Time Slicing- 1 Year)
2	Term Source	The bibliographic record provides four types of textual data, which is unstructured form and used for analyzing and processing part of visual analysis	Title, abstract, author, keyword, and other information (Citations)
3	Node type	Indicating node for analysis: Reference, Cited Author, Cited Journal, Author, Keyword, Category, Country, Institution, Grant, Terms	Reference, Cited Author, Cited Journal, Author, Keyword, Category, Country, and Institution
4	Pruning	Technique to reduce unnecessary links (significantly less impactful) systematically; this process enhances visualization of network	Pathfinder algorithm is used to merge network
5	Selection Criteria	Method of selection of records for visualization for the final network	Top 20 to 50 sources selected based on requirement and accessibility of software

Source: Authors' explanation

crossing in each network, enabling clear visibility of the most prominent nodes and collaborations. Node size indicated a number of publications, and the bond's thickness indicated the intensity of their collaboration (Zhao, 2017). The software results in technical terminologies in Modularity (Q), Mean Silhouette (S), Betweenness Centrality, Burstiness, and Sigma. Modularity refers to the extent it can be broken down into several components or modules. The high modularity index indicated the loosely assembled clusters (Chen et al., 2010). Silhouette score (S) measured the quality of clustering configuration. The highest value (*i.e.*, 1) represented a perfect solution and an utterly homogeneous cluster (Chen et al., 2010). Betweenness centrality was defined as the degree to which a node in a network is part of paths that connect an arbitrary pair of nodes in the network and was represented by purple trims outside the node. The thickness of trims indicated high centrality between clusters for this specific node. Kleinberg (2002) defined burstiness as an abrupt surge in the frequency of citations of a particular article, maybe author, document, or keyword, depending upon analysis node type. The dark red trim in the centre represented burstiness, and thickness integrated the burstiness significance. Because of the ability to generate high-quality clusters with high intra-class variability, low inter-class similarity, and similarity between classes, the log-likelihood ratio (LLR) was used to cluster the results. The period used was based on a few colour codes; the topmost colour code graph represented the period from earlier to the latest. The red colour represented the most recent connections, and the grey represented the oldest collaborations in the cluster. Citespace visualization was equipped with all these parameters for analyzing clusters and deploying important information out of visualization (Chen et al., 2010). No other software analyzed these parameters to the best of our knowledge.

2.3. Methodological framework

Algorithm-based scientometric mapping, which enables comprehensive visualization of a specific study topic, is a result of technological advancements. Goldenberg (2017) states *"Scientometrics is the study of measuring scientific and technological progress through quantitative analysis, comparisons of activity, productivity, and scientific innovation"*. Compared to scientometric mapping research, traditional evaluations might present and interpret data in a subjective manner, however, scientometric mapping approach is based on sophisticated algorithms giving a fair

quantitative assessment of the study topic (Klarin and Suseno, 2022). Also, a scientometric review supports searching through all academic articles on a chosen topic, enabling thorough comprehension mapping of the study field based on quantitative measurement. In this case, the fundamental difference between the scientometric review and other review is the measuring the research finding with quantitative justification. Scientometric reviews provide empirical evidence of research findings through analytical method mapping or visualization, while general synthesis literature provides only a qualitative assessment of the existing literature without any empirical findings. Also, the scientometric analysis provides visual representations that make it simpler to identify significant shifts in academic disciplines across time. On the other hand, other review methods, such as comprehensive literature review or general literature review do not provide significant visualize mapping in any specific academic disciplines across the time (Chen and Song, 2019). The method helps researchers in providing content analysis of the subject, including, for example, the identification of themes with the greatest impact and trends, as well as publications. It also enables researchers to evaluate studies' potential for the systematic organization in an impartial manner.

We meticulously reviewed and organized the literature using the clustering application CiteSpace to identify words with a high degree of similarity and their positions on a map. The algorithm clusters by distributing nodes in a network based on connections between words and articles that were assigned to the same clusters were presumably connected thematically. Due to the above reasoning, we prefer to have scientometric analysis as compared to any other literature review approach.

Following the methodology adopted in section 2.1, the present study has followed a structured document search and selection procedure. The document search and selection procedure is illustrated in Fig. 1, segregated into four different stages. *Stage 1* identifies records in a specific area (from 1991 to 2021) using the key string specified in section 2.1. We found 5919 high-quality papers. In the next step, we try to screen the records based on some criteria like language, type of articles and many others. For the purpose of cleaning up the data, keywords and abstracts were carefully examined, and those that did not correspond to ESG and sustainability research or other areas of study were removed. *Stage 2* considers the screened records based on language (English) and article type (full journal articles). Articles are further refined by considering only high impact in science and social science streams (SCI and SSCI) listed journals as eligibility criteria. After *Stage 2*, we are left with 1568 articles on which scientometric study has been undertaken for analysis and visualization purposes. Finally, the records were processed for visualization using CiteSpace, and a scientometric analysis was conducted. Because of its remarkable ability to produce network visualisations and clusters to address the study topics listed in Table 1, CiteSpace5.7.R5 (64-bit) was chosen based on different methodology structures (Appendix B).

We also outline a proliferation of nomenclatures to reduce the high risk of misinterpretation between scholars and practitioners. In the following Fig. 2, this study summarises the main types of non-financial reports commonly used in business practices before starting our scientometric study. The concept of nomenclatures in scientometric analysis has been taken from Turzo et al. (2022).

3. Analysis and findings

3.1. Developmental trend analysis

Under the domain of sustainable development and NFD, Fig. 3 represents the timeline of published studies in the area of ESG, sustainability disclosure, and non-financial disclosures. The first article was published in 1991, and after 2008, ESG gained massive importance. The rising trend indicates how debatable the topic is in the eyes of econometricians, policymakers, environmentalists, and academic fields like
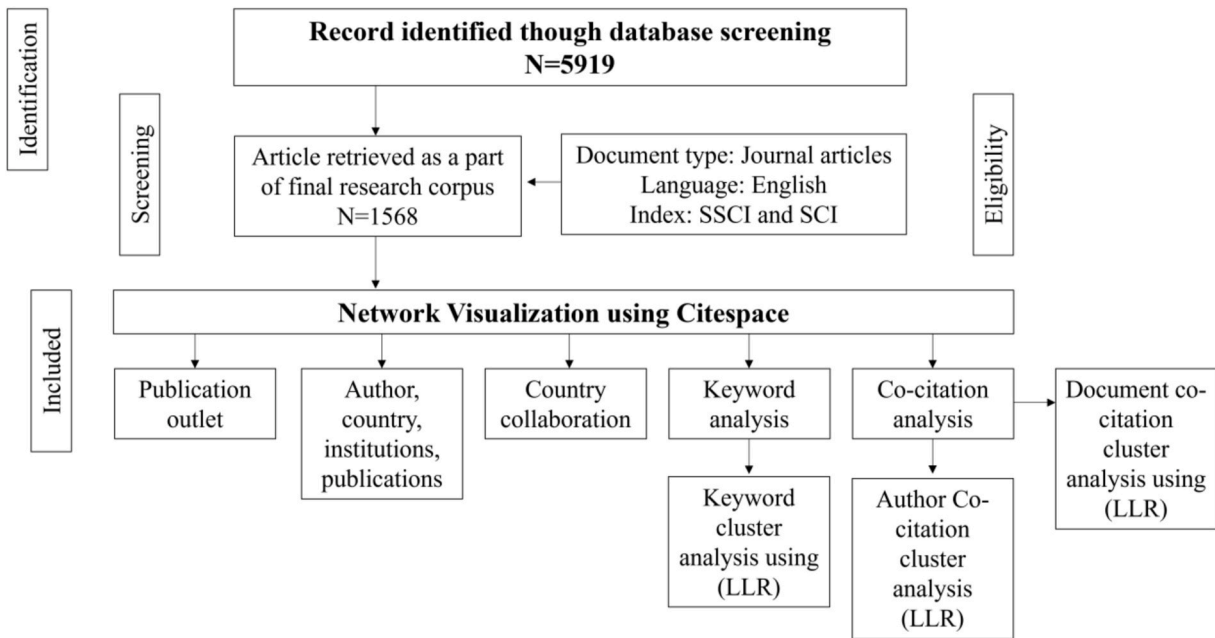
Fig. 1. Data screening and Visualization process.
Source: Authors' explanation
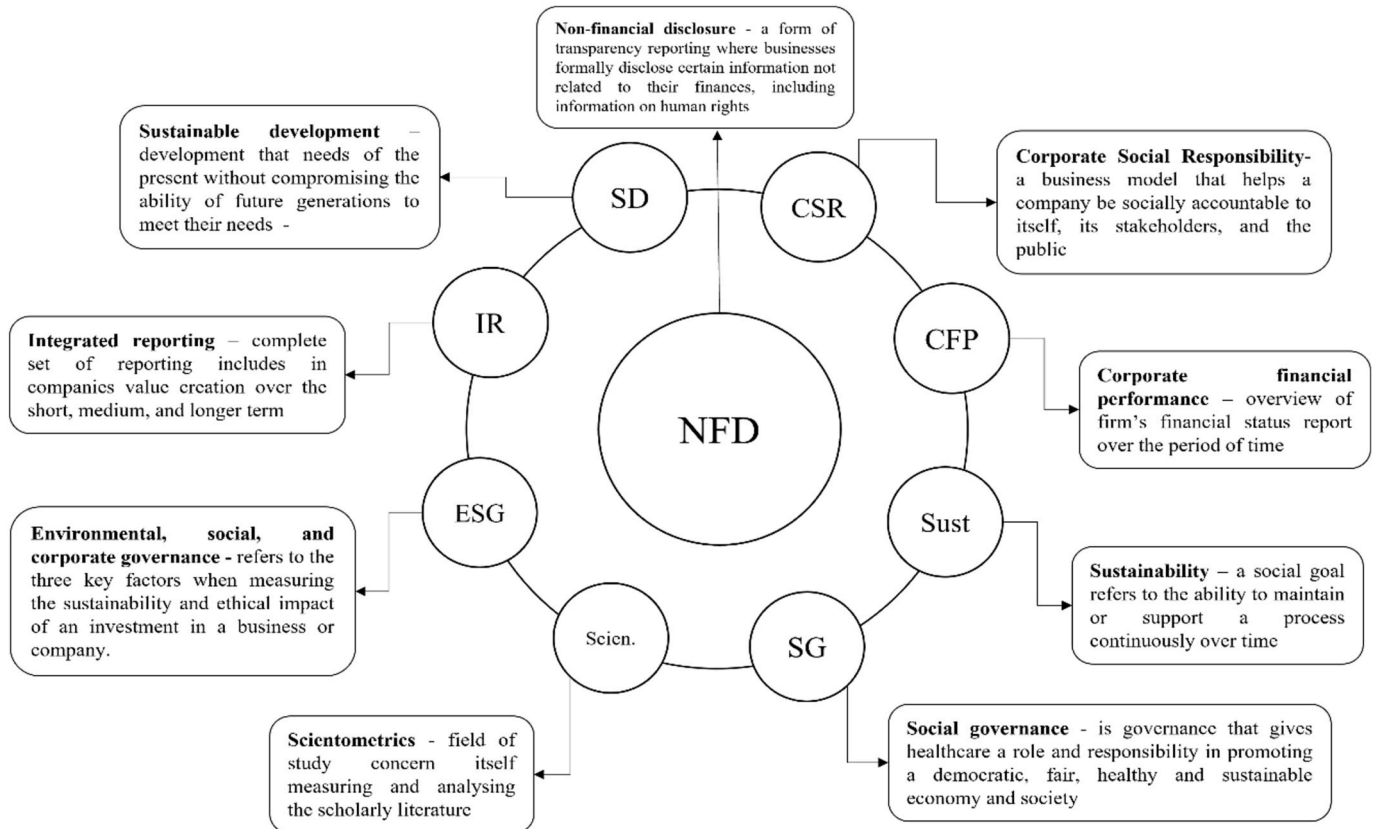
Fig. 2. Nomenclature of key concepts of the study.
Source: Authors' illustration

accounting and management. Around 77 per cent of articles (1207 out of 1568) were published during 2010–2021, with 70 per cent (1102 out of 1568) published during 2016–2021. We extensively look at trend analysis to answer RQ1 (current publication trend in ESG disclosures) (Fig. 3). We divide the data set into two equal parts (1991–2010) and

(2011–2021); the mean publications from the first decades are five on average, and for the second decade, it is 127 average publications yearly. There is a significant mean difference (with *t-statistics* 4.217, degree of freedom ($df = 28$) between the two decades with high variability ($F\text{-}statistics = 19.28$). The justification seems to be that citizens
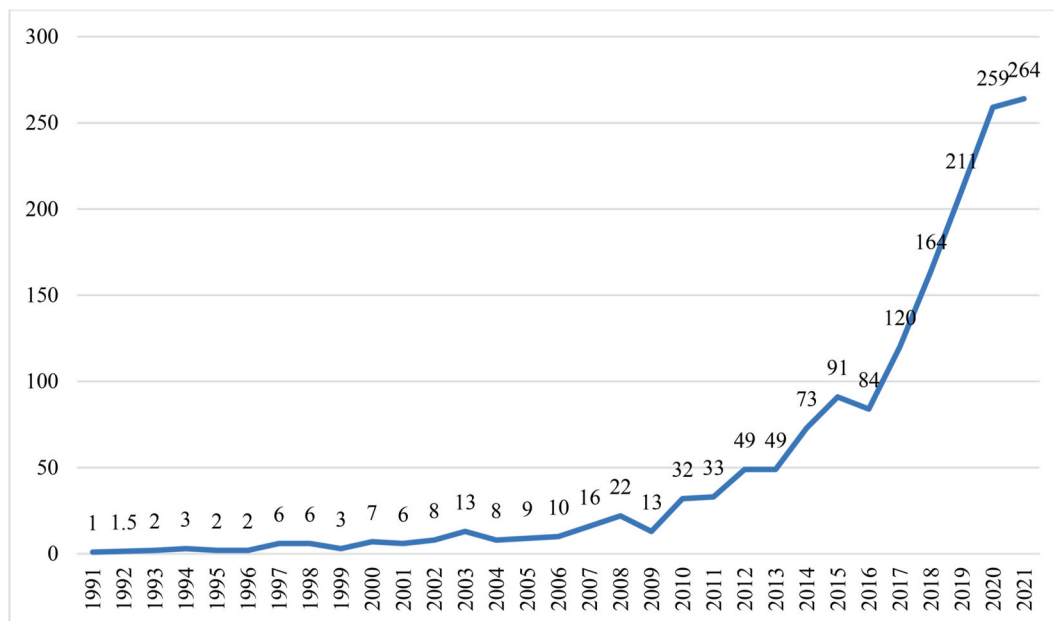
Fig. 3. Number of publications over the years.
Source: Authors' explanation

are becoming more aware of ESG disclosures, CSR practices, and sustainable and green practices to minimize corporate scams and environmental degradation and maximize stakeholders' wealth. Also, companies also recognized that inclusion of ESG practices and unveiling voluntary/mandatory NFD directly had a positive impact on their financial metrics, such as abnormal return (Gupta and Goldar, 2005), investments, costs and contingencies (Moneva and Cuellar, 2009), quality financial decisions (Brammer and Pavelin, 2006), stockholders financial interests (Berthelot et al., 2003), and removed information asymmetry (Siew et al., 2016). Due to the importance of voluntary disclosures in the valuation process and stakeholders' expectations, academicians and policymakers explored this area more. Furthermore, Covid-19 made us realize how critical it is to apply the environmental, social, and regulatory framework to achieve long-term development.

3.2. Network of author and co-authorship

To answer *RQ2 (Who are the most well-known experts and collaborations within this topic's publishing lists),* the visualization from Citespace software of the corporation network between various authors was executed in this section. This visualization represented a collaboration network among authors by describing collaboration characteristics with the subject area and the strength of their association. The author network was identified with 135 nodes and 106 links, meaning that among 135 authors with the top published papers, only 106 authors found some association. The network presented in Fig. 4 had a density of 0.0117, representing a loosely connected network, *i.e.*, most research works were undertaken within a closed-knitted network with significantly less or no long-term, low-intensity cooperation between them. The colour of links, *i.e.*, Red, Orange, Green, Yellow, purple, and Grey, only represent different periods, implying that links having red colour were the latest collaborations while grey was the oldest one. The co-author network had very high modularity (Q = 0.9726), indicating the structure of the cluster was loosely assembled. A high Silhouette score (S = 1) represented the perfect solution as homogeneous clusters. Citation Bursts and Betweenness Centrality were evaluated as part of the authors' collaboration. Citation burst measures the rapid increase in citations using the Kleinberg algorithm (Kleinberg, 2002). Thomas P Lyon (Burstiness = 2.19) and Liyin Shen (Burstiness = 2.07) received the

highest burstiness (for the current sample) in the year 2011. Thomas P Lyon provided transformative discoveries in the field of NFD by exploring ways companies are considering ESG disclosures as greenwashing, while Liyin Shen has provided the basis of urban planning to achieve sustainable practices by developing sound infrastructure. Table 2 further elaborates the list of authors and their areas of expertise in contrast to the current theme of ESG disclosure and sustainability, along with citation bursts and h-index wherein research papers were arranged based on burstiness calculated.

Fig. 4 explains the authors' collaboration network analysis. Starting with Elizabeth Demers, Jurian Hendriksen, Philip Joos, Baruch Lev (frequency = 2, citation = 31) as one of the recent collaborations (indicated with red links) highlighted the relationship between ESG disclosure and stock performance during the Covid-19 crisis.

Payman Ahi, Mohamad Y. Jaber, Cory Searcy (Frequency = 4, Highest citation = 46) worked in sustainable and green supply chain management. This group has papers from the year (2013–2018), and primarily paper was written by Cory Searcy and Payman Ahi (Frequency = 10, Highest citation = 1226) in collaboration. They have devised several models for assessing the practices of sustainable performance and matrices for social and environmental focus used to measure economic performance in green and sustainable supply chain management. Mohamad, Y. Jaber, and Cory Searcy (Frequency = 10, Highest citation = 72) are working on sustainable strategies based on eco-innovation drives on supply chains. John Dumay has worked with Subhash Abhayawansa (Frequency = 3, Highest citation = 22) and Federica Farneti (Frequency = 5, Highest citation = 336), respectively, in a different group on the integrated reporting system (Dumay et al., 2010). proposed the GRI sustainability reporting guidelines for the public sector organization. Both authors, in collaboration, have provided path-breaking research from sustainable to integrating reporting systems of financial institutions in developed countries. Dumay et al. (2020) worked on a structural way of implementing the international integrated reporting council (IIRC) through a rhetorical process. Xiaoling Zhanga, Yuzhe Wu, and Liyin Shen (Frequency = 3, Highest citation = 110) have worked in the area of Urban area sustainable development. The authors suggest recommendations with different policies to achieve sustainable urban land use and planning development (Vitolla et al., 2019). (Frequency = 7: Highest citation = 29) is the upcoming cluster

Fig. 4. Author collaboration network analysis.
Source: Authors' explanation

working in integrated reporting, besides analyzing the impact of integrated reporting on the economic and social performance of the companies. Charbel Jabbour and Sousa Jabbour (Frequency = 10, Highest citation = 241) have contributed significant research on green supply chain management and different aspects of organizational linkages, including human resource management, organizational capabilities, quality management, etc. many more. And Jabbour, Charbel, and Luthra, Sunil (Frequency = 1, Highest citation = 15) have used modelling analytics to ascertain the relationship between supply chain management and integrated approach. Apart from the listed authors, many other recent collaborations focus on environmental disclosures, sustainable ratings, sustainable reporting, and CSR developments.

3.3. Country and institution analysis

This section (Fig. 5) covers the list of countries and institutions globally working on ESG disclosures and quantifications. The analysis has been segregated into two parts, one is related to the country, and the other covers the top institutions embarking on research on this subject content. The country analysis network has 91 nodes and 308

(Modularity Q = 0.6893, silhouette S = 0.8897) networks representing close and homogeneous country clusters, while institutional analysis has 181 nodes and 106 networks (Modularity Q = 0.9166, silhouette S = 0.9639), representing a loose and homogenous cluster. The top 10 countries of publication in this field are USA (Frequency = 199, Burst = 4.11, Centrality = 0.41), China (Frequency = 138, Burst = 2.78, Centrality = 0.28), Italy (Frequency = 128, Burst = 3.36, Centrality = 0.08), England (Frequency = 125, Burst = 3.21, Centrality = 0.46), Australia (Frequency = 121, Burst = 2.6, Centrality = 0.09), Spain (Frequency = 71, Centrality = 0.08), Canada (Frequency = 71, Burst = 5.4, Centrality = 0.30), Netherlands (Frequency = 64, Centrality = 0.57), France (Frequency = 61, Centrality = 0.29), Brazil (Frequency = 57, Burst = 3.45, Centrality = 0.06). Out of the top 10, eight are developed countries, and two are developing countries. To further understand the network, the collaboration pattern can be understood by the colour of nodes, as shown in the time bar at the top from Grey to red shows the timeline from older to recent.

Countries with high centrality (top 5 - Netherland, England, USA, Norway, Belgium) are acting as joining nodes in the network with a significant contribution, and burstiness with red trim in between the

Table 2
Author Details with paper frequency and burstiness.

Freq	Author	Area of Expertise	Institution	h-Index[a]	Bursts and Year
4	THOMAS P LYON	Corporate environmental disclosure, green washing	University of Michigan	38	2.19; 2011
5	LIYIN SHEN	Urban Sustainable development	Chongqing University	72	2.07; 2011
3	SJORS WITJES	Circular Economy, Corporate sustainability reporting	Radboud University	9	1.89; 2017
5	CHARL de VILLIERS	CSR reporting, Environmental disclosure, and Integrated reporting	The University of Auckland	40	1.89; 2018
7	CORY SEARCY	Green and Sustainable Supply Chain Management	Ryerson University	44	1.86; 2012
6	JOHN DUMAY	Sustainability and Integrated Reporting	Macquarie University	46	1.84; 2017

[a] h-index are sourced from the author profile available at google scholar based on Scopus calculations, accessed on May 06, 2021.
Source: Authors' explanation

node (top 5 - Canada, USA, Taiwan, Brazil, Italy) shows the constant surge in the articles over a while. The thickness of nodes elaborates on the type of association among the countries. Of all, Canada, Denmark, and Greece have the strongest association, while Romania, Spain, Mexico, and Austria have a weak association with other countries.

Fig. 6 represents the association among the different institutions, with a low density (0.0065), showing strong cooperation among the group of institutions in a cluster. Among all, the highest contribution in this research area has been sponsored by Hong Kong Polytechnic University, Hong Kong (Frequency = 18, Burst = 2.47, Centrality = 0.03), Macquarie University, Sydney (Frequency = 12, Burst = 2.10, Centrality = 0.02), Monash University, Clayton (Frequency = 11, Centrality = 0.01), University of Pretoria, Pretoria, (Frequency = 9, Centrality = 0.01), Auckland University, Auckland (Frequency = 8, Centrality = 0.01) respectively. Out of the top five institutions, three are from developed countries, while two are from developing countries.

3.4. Keyword network analysis

The purpose of the critical work analysis is to demonstrate that the author's keyword adequately represents the content of an article. When two key strings appear in the same article, keyword co-occurrence highlights the relationship between the two notions (Comerio and Strozzi, 2019). Keywords in the article define the topic, sub-fields, subject, research stream, and many more. They serve as a starting point for comprehending and recognizing research concepts (Zhao, 2017). The two main highly convenient inclusion criteria based on keyword searching are keywords in the title itself and keywords in the full text of the articles (Paul and Criado, 2020). We choose the title method as a suitable sample size to obtain a deluxe sample. *RQ3 (Which key themes involve ESG disclosures and sustainability?)* focuses on identifying the popular themes among the scholars working on ESG and sustainability disclosures. As shown in Fig. 7, with 100 nodes and 307 connections, the network has a mean Silhouette of S = 0.9274 and a Modularity of Q = 0.7362, Density = 0.0259. The size of each keyword's node corresponds to the frequency of that keyword. Keywords are

further demonstrated in different clusters and have homogenous effects; low density implies not a very close connection between these keywords. The list of the top 25[2] keywords in the network is listed in Table 3.

Betweenness centrality and burstiness range from 0.55 to 0.10 and 9.98 to 3.65, respectively, for the top 25 key works. For instance, "Disclosure" (Frequency = 73, Centrality = 0.19, Burstness = 8.48) is linking various nodes and having a huge surge during 2019, which means after 2019, it has attained huge citations in a related topic (Connected with Red network). "Indicators" (Frequency = 117, Centrality = 0.25, Burstness = 6.59) connected with the dark grey network reveal that citation has surged during the middle period from 2007 to 2012. Environmental Management (Frequency = 11, Centrality = 0.23, Burstness = 6.49) citation surge started in the year 2014 and connected with blue nodes.

Looking at the trending keywords in the area of ESG sustainability, observing the burstiness Table 4, over the period, the journey started with *sustainability indicators (2003)* to achieve *sustainable development (2009),* including *corporate sustainability (2010), green (2014)* practices are focusing on *environmental management (2013), environmental disclosure (2016) in business (2015) and firm (2015)* by providing *quality (2018)* products with high *information (2019)* disclosure in the books of accounts.

3.4.1. Keyword clustering

Considering Table 4 as a base for keyword hot spot analysis, Citespace provides an additional feature of keyword clustering for further interpretations. We have used LLR (*Log-Likelihood Ratio*) clustering algorithm. Eight clusters are formulated (Fig. 8), and Table 5 shows the representation of clusters along with Silhouette S ranging from 0.824 to 0.966, stating that the clustering outcome is sufficient for further analysis and the top terms within the cluster are well-matched, and the findings are consistent. We have selected the timeline view of clustering where keywords are sourced from different periods, the most occurred keywords can be found along the timeline, and the red trims in the middle show keywords' burstiness. Colours of the link between keywords have shown the time slice of first co-occurrence Cluster #0 is related to sustainability indicator as to the central theme and covering articles related to sustainability, environmental disclosure, and urban sustainability.

Organizational motivation is one of the essential aspects of achieving sustainability, in which board members play a critical role (Galbreath, 2015). advises that having a combined eco-social and environmental score indicates access to sustainable performance (Petit et al., 2018). Cluster #1 considers the international perspective of sustainability frameworks by looking at voluntary cross-country disclosure and economic performance (Clarkson et al., 2008), covering the large international firm-level study (Monteiro and Aibar-Guzmán, 2010). Cluster #2 Defining measures of sustainability performance by looking at global and local resources (Gualandris et al., 2014) and building inter-organizational relationships through knowledge-sharing processes to achieve this (Cheng, 2011). Cluster #3 is stressing on sustainable corporate disclosures, including environmental disclosure, social disclosures, and governance disclosures (Nekmahmud et al., 2022a, 2022b; Radu and Francoeur, 2017; Stolowy and Paugam, 2018). Cluster #4 is related to corporate sustainability performance in emerging countries (Lourenço and Branco, 2013); by adopting the methodology of firm-level analysis (Wagner, 2010), the main focus is on understanding the relationship between ESG disclosures and analysis with the economic performance of the company (Arayssi et al., 2020). Cluster #5 Triple Bottom Line Approach, the cluster is devising a strategy for social, environmental, and financial sustainability considering green supply

---

[2] Corporate Social Responsibility (153) and CSR (46) has been merged with Corporate Social Responsibility.
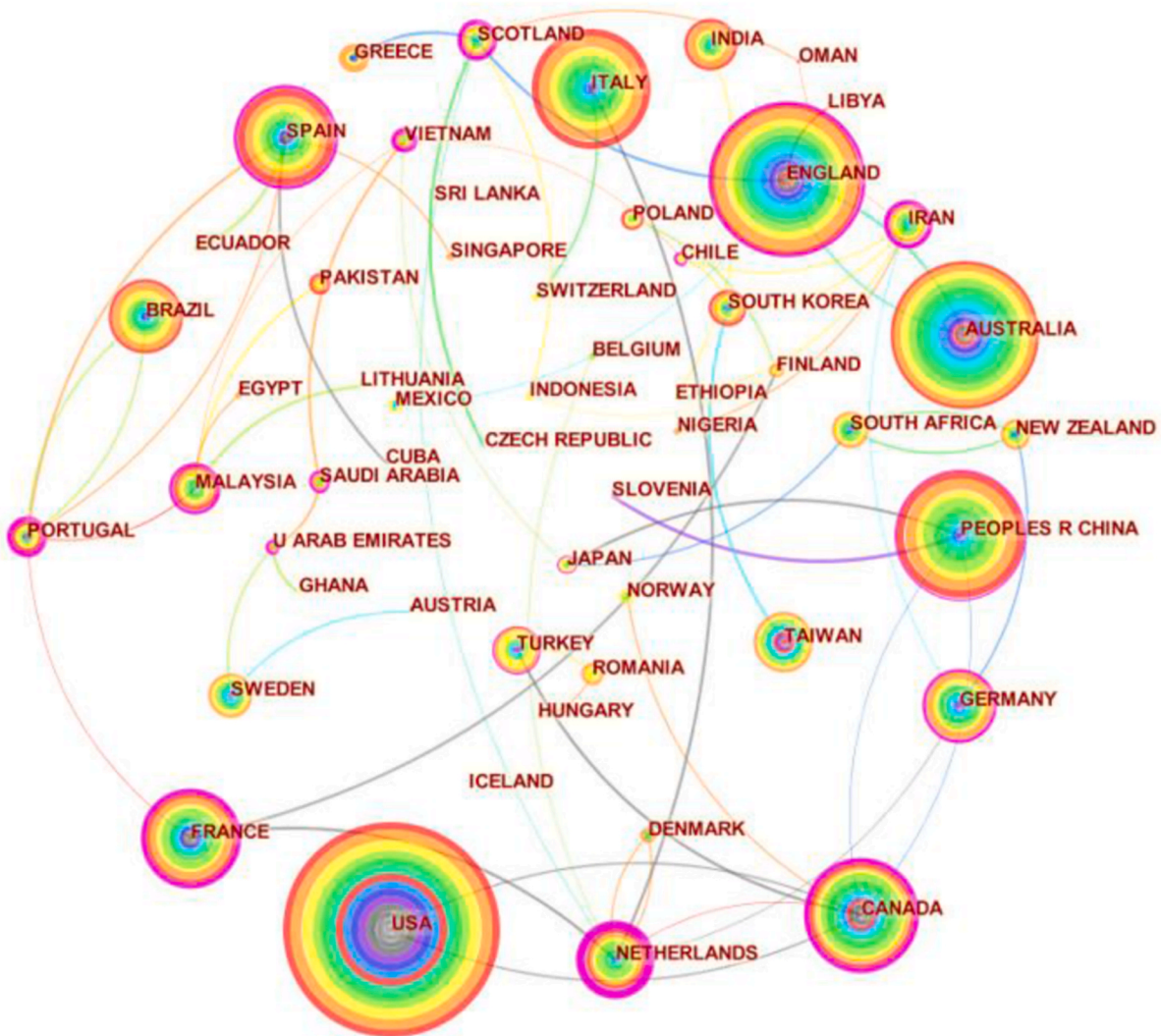
Fig. 5. Country network analysis.
Source: Authors' explanation

chain management with multi-dimensional indicators (Gualandris et al., 2014; Hasan et al., 2019).

Cluster #6 demonstrates how Green Innovation Practices are used for attaining sustainable development. Wang et al. (2021) studied green innovation practices with firm-level performance, and Hendiani et al. (2021) tried to identify the social failures in sustainable manufacturing and propose a model to fix this issue.

Cluster #7 associates with Sustainability Indicator and highlights the measures that lead to sustainable factors reporting. Indicators associated with sustainability must be directly linked with social and environmental performance and quantifiable (Kuo and Yu, 2017; Chai et al., 2022b; Dhifaoui et al., 2022; Khalfaoui, 2022; Vitolla et al., 2019). Cluster #8 belongs to Integrated Reporting (I.R.), where a paradigm shift is observed from sustainability reporting and disclosure to an integrated reporting system. I.R. is a valuable communication from the company about strategy, performance, and various measures taken while creating a value over the period, which further requires the creation of value relevant to organizational capital (Tlili et al., 2019). In addition, Loprevite et al. (2018) found that the voluntary integrated report led to higher sustainable reporting and mandatory integrated reporting led to higher economic performance. Soriya and Rastogi (2021) also mention that I.R. enlightens practitioners about the difficulties facing internal organizations and economies. Focusing on the I.R. developments in various nations might be beneficial for academics and researchers. Additionally, it might assist regulators in creating various frameworks, models, and regulations for its upcoming deployment.

3.5. Journal Co-citation network

This section covers the co-citation network of node "*Journal.*" While doing a literature review, it becomes pretty important to see the journals of the researcher's interest area in a particular field. JCR-indexed articles with an Impact Factor above a certain level (i.e., 1.0 plus) can be relied upon when hundreds of papers on a familiar subject have already been published and need to be reviewed (Paul and Rosado-Serrano, 2019). Paul and Criado (2020) advised including the articles from the top 10–20 journals with ABDC ranked A*/A and ABS ranked 3 or above in the interest area of a researcher to reduce the biased journal selection criteria. As a result, this section is critical for analyzing and tracking the dissemination of publications from various journals. With 139 nodes and 520 networks, Fig. 9 and Table 6 represent the co-citation network of journals in the current area of research. The node size is in proportion to Journal Citation. Mean Silhouette score = 0.9355, Modularity = 0.7376, Density = 0.0307; implying that the clusters have a spread in terms of publications and are homogenous. Also, there is strong journal citation among them. ESG sustainability is being more popular in *Sustainability* specific journals like Sustainability (Frequency = 291, Burst = 28.3, Centrality = 0.00), Sustainable Development (Frequency = 35, Burst =
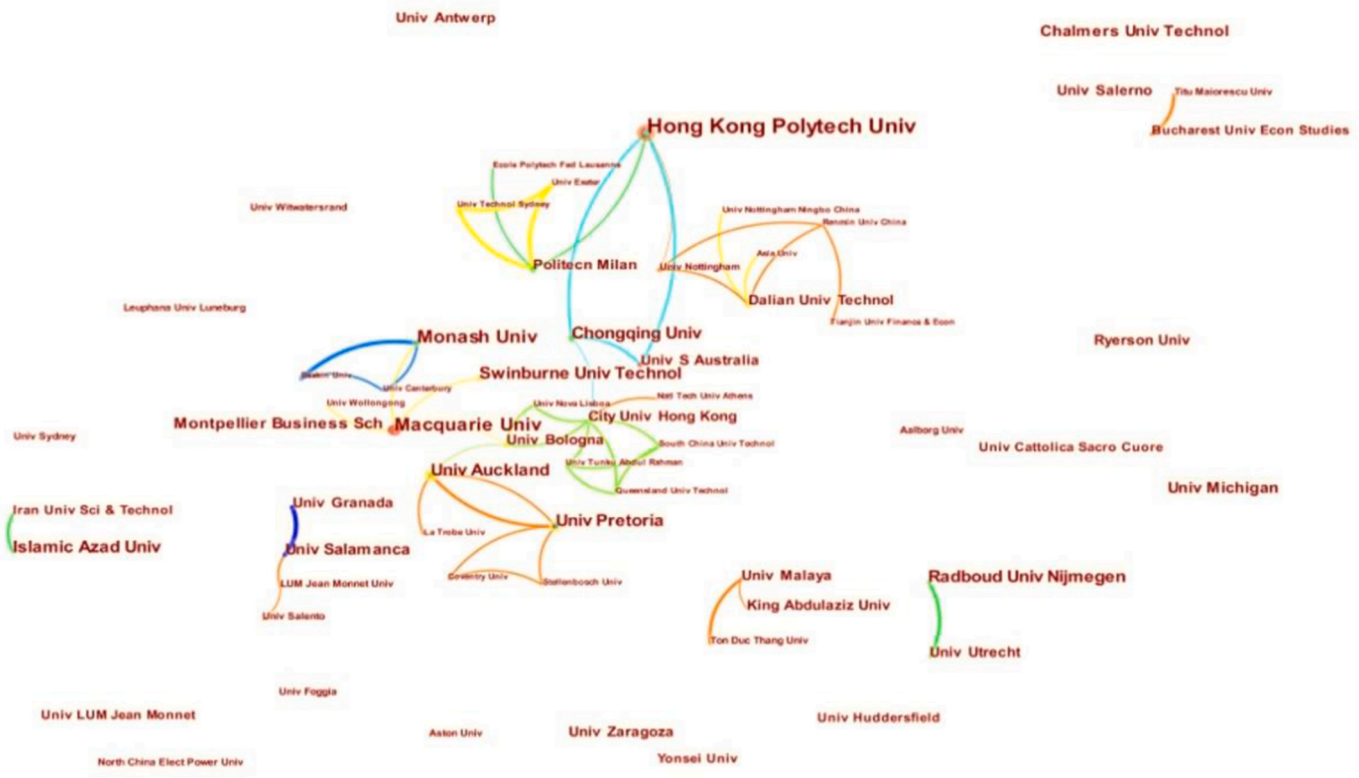
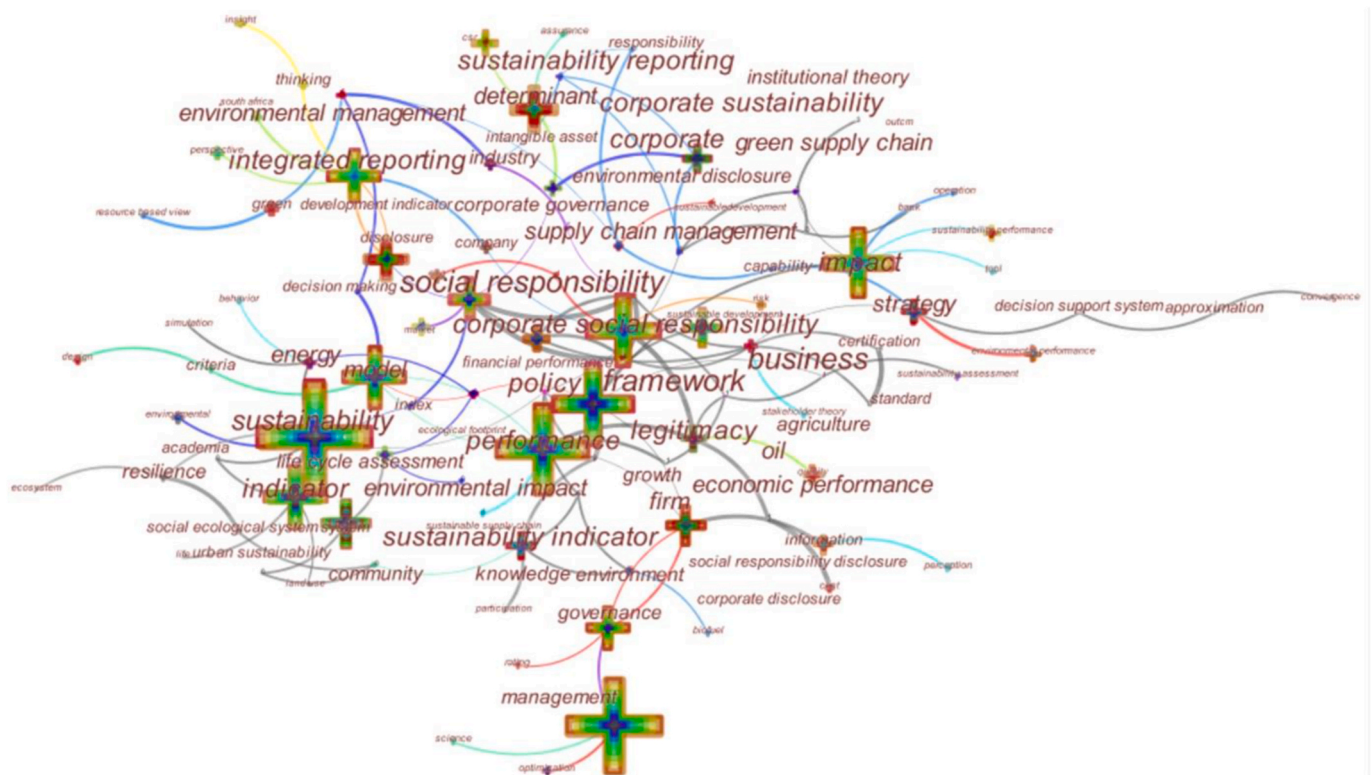**Fig. 6.** Research institution network analysis.
Source: Authors' explanation

Fig. 7. Network of keywords.
Source: Authors' explanation

Table 3

List of highly cited keywords with frequency and $\sum$ Score.

Keywords	Frequency	$\sum$ Score[a]	Keywords	Frequency	$\sum$ Score
Sustainability	280	1	Model	102	1
Management	246	1	System	73	1.21
Performance	197	1	Social Responsibility	65	1
Framework	157	1	Sustainable Development	62	1
Corporate Social Responsibility	199	1	Firm	59	4.38
Impact	151	1	Sustainability Indicator	50	1.98
Indicator	117	4.4	Information	45	1.48
Integrated Reporting	112	1	Environmental Disclosure	41	2.91
Model	102	1	Financial Performance	39	1
Governance	87	1	Legitimacy	38	3.56
Determinant	82	1.35	Quality	32	1
Disclosure	73	4.49	Strategy	32	3.28
System	73	1.21	ESG	26	1
Social Responsibility	65	1	Sustainability Performance	23	1
Sustainable Development	62	1	Environmental Performance	23	1

[a] "The combined strength of structural and temporal properties of a node, namely, its betweenness centrality and citation burst (C. Chen et al., 2009)".

Source: Authors' explanation

Table 4

Keywords citation bursts.

Keywords	Year	Strength	Begin	End	1991–2021
sustainability indicator	1991	22.52	1997	2009	
sustainable development	1991	3.93	1998	2003	
case study	1991	3.94	2003	2015	
corporate environmental disclosure	1991	4.1	2004	2011	
environmental disclosure	1991	3.59	2004	2006	
indicator	1991	4.92	2007	2012	
sustainability index	1991	3.87	2007	2012	
legitimacy	1991	6.29	2008	2014	
environmental impact	1991	8.85	2010	2017	
environmental information	1991	5.67	2010	2011	
energy	1991	5.77	2011	2015	
green supply chain	1991	5.34	2011	2016	
developing country	1991	3.62	2011	2013	
environment	1991	3.55	2011	2014	
environmental management	1991	7.58	2012	2014	
strategy	1991	6.8	2012	2017	
life cycle assessment	1991	5.75	2012	2015	
environmental sustainability	1991	5.74	2012	2014	
sustainability assessment	1991	4.84	2012	2018	
industry	1991	4.82	2012	2013	
design	1991	3.72	2012	2016	
decision making	1991	3.61	2012	2013	
system	1991	9.34	2014	2016	
sustainable supply chain	1991	6.76	2014	2015	
green	1991	5.79	2014	2017	
practical implication	1991	4.94	2014	2015	
international integrated reporting council	1991	8.54	2015	2016	
annual report	1991	6.8	2016	2017	
governance	1991	5.96	2017	2021	
corporate governance	1991	7.92	2018	2021	
determinant	1991	7.74	2018	2021	
information	1991	11.23	2019	2021	
disclosure	1991	10.79	2019	2021	
social responsibility	1991	10.03	2019	2021	
firm	1991	8.93	2019	2021	

Source: Authors' explanation

16.69, Centrality = 0.05), International Journal Of Sustainable Development and World Ecology (Frequency = 18, Burst = 9.62), Sustainability Accounting Management and Policy Journal (Frequency = 38) *ESG as a Business Strategy* like Business Strategy and the Environment (Frequency = 447, Burst = 13.69, Centrality = 0.73), *ESG is Environmental Protection and Energy management* measure includes Journal of Environmental Management (Frequency = 206, Burst = 4.13, Centrality = 0.15), Ecological Indicators (Frequency = 198, Burst = 7.5), Journal of Industrial Ecology (Frequency = 15, Burst = 9.39, Centrality = 0.57), Ecological Economics (Frequency = 359, Centrality = 0.54), Energy Policy (Frequency = 28, Burst = 13.89, Centrality = 0.05), *ESG reporting* *as accounting* specific journals includes Accounting Auditing & Accountability Journal (Frequency = 267, Centrality = 0.09), Accounting Organizations & Society (Frequency = 309, Centrality = 0.56) *ESG as a component of Supply Chain Management* cover Supply Chain Management (Frequency = 19, Burst = 10.93, Centrality = 0.03), Journal Of Supply Chain Management (Frequency = 12), International Journal Of Production Economics (Frequency = 196, Centrality = 0.012), *ESG as a part of Business Ethics* category involves journals like Corporate Social Responsibility And Environmental Management (Frequency = 263), Journal of Business Ethics (Frequency = 539, Centrality = 0.06).
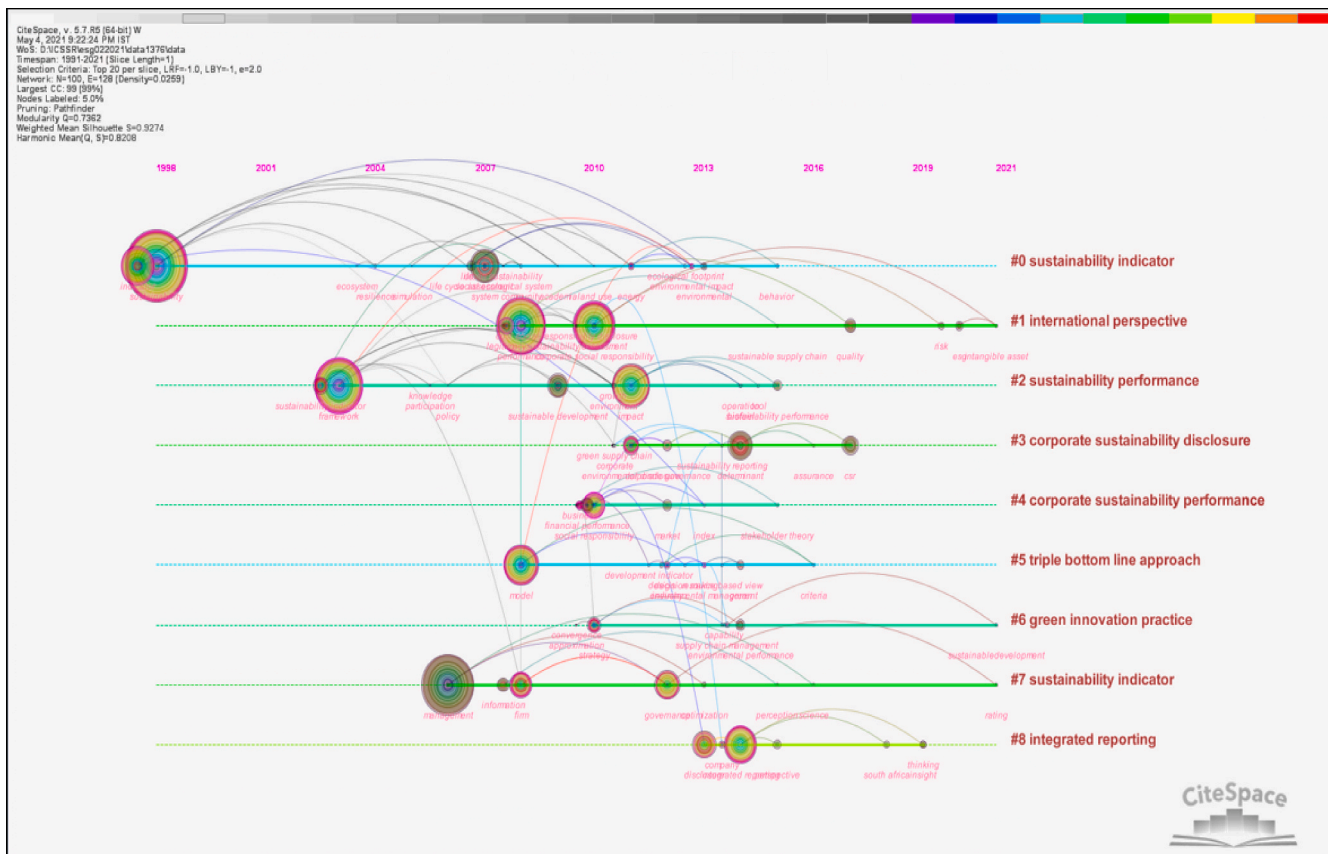
Fig. 8. Clusters of keywords- timeline view.
Source: Authors' explanation

Compared to a global map of scientific literature, Chen and Leydesdorff (2014) developed dual map overlays to show trends in a scientific portfolio. The global base map depicts the interconnections of over 1568 scientific journals. These journals are organized into regions based on disciplinary publication and citation patterns. A "dual map" refers to the element of citing and being cited. The left side of the map shows the Citing Journals, and the right side shows Cited journals. The dark lines represent the significant citations from one journal to another based on Z-score (Fig. 10). The colour code represents the subject area. As clearly visible from the graph, the 'Veterinary, Animal, Parasitology' and '*Environment*, Toxicology and Nutrition' journals are cited by '*Ecological, Earth* and Marine' Journals (represented in yellow highlight). The other set of journals like 'Psychology, Education and Social' and 'Economic, Economics and Political' journals are significantly cited by 'Economic, Economics, and Political' and 'Psychology, Education and Health' headed journals. ESG is quite popular in environmental, health, ecological, and sustainability-related areas and has an interdisciplinary area of research.

3.6. Document Co-citation network

The next category is the author co-citation network which is used to identify the relationship pattern among the various authors who published and cited their work in a current area of research. The document co-citation network node is selected to answer RQ4 (The most influential articles in the ESG and sustainability disclosures). With 302 nodes and 1288 networks, visualization is presented in Fig. 11. The network (Fig. 11) is reasonably alienated into loosely coupled clusters (Modularity of Q = 0.761), with good homogeneity among the clusters (Mean Silhouette S = 0.9356), and a moderate collaboration is being observed among the authors (Density = 0.0202). Fig. 11 represents the reference

node citations with high cited articles in the current theme of NFD and sustainability. A few articles from various clusters were picked based on burst score and centrality to better grasp the structure and approach for deploying ESG as a tool for achieving sustainable development. Table 7 represents the top 40 articles having the highest citations.

Seuring and Müller (2008) the highest centrality = 0.70, with frequency as 59, and connecting clusters #1, #2, #5 and #6 and burstness 5.10. The study is based on a conceptual review of sustainable supply chain management, suggesting two key strategies, risk and performance, from the supplier's perspective and supply chain management methods for sustainable products. Environmental issues take precedence in the research, followed by social concerns.

Ramos and Caeiro (2010) have second highest centrality = 0.63, connecting clusters #6 (Corporate sustainability performance) and #9 (sustainability indicators). The study projected and evaluated the efficacy of sustainability indicators. Experts are attempting to link sustainability indicators and performance measurement activities. The author has attempted to construct a meta-framework to determine the major objectives, aims, performance, and evaluation by evaluating the sustainable development indicators. The SDIs were identified and scored using a qualitative assessment based on expert knowledge in the study. The author has also established a methodology for assessing the performance of SDIs, which will provide the SDI set with a high level of credibility and accuracy.

Freebairn and King (2003), with the centrality, 0.59, link cluster #9 (of sustainability indicator) and cluster #6 (corporate sustainability performance). The papers discussed the sustainability indicators and how they should be managed efficiently by communicating them to each operational level. Rather than being limited to top/executive level management, the sustainable indicator must be understood by implementing it. If the indicator's flexibility is visible from the top

Table 5
Clusters of keywords - timeline view.

Cluster id	Number of Members	Silhouette Score	Mean Year	LLR Cluster Label	Main Theme
#0	18	0.944	2007	Sustainability, Environmental Disclosure, Urban Sustainability Indicator	Sustainability Indicator
#1	14	0.951	2012	Organizational Legitimacy, Firm Value, Stakeholder Engagement, Cross-Country Investigation	International Perspective
#2	13	0.963	2009	Sustainable Development, Ecological Economics, Integrating Sustainability Performance Measurement	Sustainable Performance
#3	11	0.958	2012	Environmental Disclosure, Environmental Regulation, Triple Bottom Line Performance	Corporate Sustainable Disclosure
#4	10	0.925	2011	Corporate Sustainability, Firm-Level Analysis, Measuring Corporate Environmental Performance	Corporate Sustainable Performance
#5	9	0.866	2012	Energy Consumption, Green Supply Chains, Manufacturing Processes, Benchmarking	Triple Bottom Line Approach
#6	9	0.878	2013	Sustainable Development, Stakeholder Pressure, Environmental Scanning Practice, Supply Chains Review	Green Innovation Practices
#7	8	0.966	2012	Environmental Indicator; Sustainable, ESG Disclosure, Environmental Rating	Sustainability Indicator
#8	7	0.824	2016	Reporting, Integrated Reporting Practice, International Integrated Reporting Framework	Integrated Reporting

Source: Authors' explanation

management level down to the executable level, it will work effectively and efficiently. The success of the sustainability indicator depends on how it assists in the interactive forum.

Clarkson (1995) with centrality score, 0.53, frequency- 6, connecting cluster #1, #5, #2, #6. The article presents the conclusion from 10 years of the research program to develop a framework and methodology for understanding corporate behaviours. Three main principles, like summary approaches, models, and methodologies, are used to study the data of 70 sample papers, and thirdly, discuss the policy related to CSR policies in appendices. The paper served as a base for many CSR performances and policy streams. Reed et al. (2006) with the centrality of 0.53, burstness of 4.46, and frequency of 10 make this article critical in cluster Sustainability indicators; the paper is targeting the best way to avoid confusion and ambiguity to collect the data on S.I.s through best practices using the literature review of many articles using a top-down and bottom-up approach. The paper has used the adaptive learning process for sustainable indicators, which has been explained very effectively.

Dumay et al. (2016) (Burstness- 17.03 and Centrality 0.06, frequency-49) have the highest burstiness in an article and are related to cluster 4 of "Integrating reporting." The study is considering SLR on integrative reporting suggesting a framework of triple bottom line reporting is expected to have a solution to a traditional financial reporting system as the TBL framework provides more excellent business value. The paper also highlighted the importance of accounting for sustainability, global reporting initiative, and integrated sustainability reporting.

de Villiers et al. (2014) (Burstness- 15.90 and Centrality 0.02, frequency-52) a study of the evolution of integrated reporting policies and procedures in a group of developed and developing countries. South Africa has been a pioneer in designing and enforcing integrated reporting requirements. Companies listed on the Johannesburg Stock Exchange are expected to use the South African integrated reporting system for integrated reporting. Furthermore, the companies are answerable for why the delay or default has been apprehended in reporting. This paper also discusses other countries with pioneer practices used as benchmark practices.

Flower (2015) (Burstness- 15.27 and Centrality 0.11, frequency-50) traces the history of the International Integrated Reporting Council (IIRC) for four years since its implementation. IIRC has little impact on corporate sustainability reporting practices due to the ineffectiveness of lack of force to implement and concluded that IIRC had been the victim of regulatory capture.

Higgins et al. (2014) (Burstness- 12.63 and Centrality 0.24, frequency-38) investigated the internal devices employed by the early adopters of integrated reporting in Australia to manage the reporting process. The study is among a few empirical studies that have used the interview method across different organizations in Australia.

To understand the intellectual structures of ESG and sustainability, Cluster analysis of co-citation analysis is being done *RQ5 (What is the intellectual structure of current research?).* The term intellectual structure is used here to refer to the research themes of the specified study. In other words, the Intellectual structure refers to the thematic clustering of the study. Table 8 and Fig. 12 represent the significant research areas on environmental, social and governance. The whole network is divided into 13 clusters (#0 to #12). The effect of subsequent research citing the works together is revealed by clustering results. Cluster-ID #0 has a maximum number of members of 47 based on environmental performance studies, and cluster ID #1 has 41 members with supply chain management. All clusters have a silhouette score above 0.9, which "measures how effectively similar an object is to its cluster (cohesion) compared to other clusters (separation)." The current network has a loosely coupled network (Modularity of Q = 0.761) and good homogeneity between the clusters (having silhouette S = 0.9356), suggesting the network has a well-fit and high-quality cluster analysis. The objective of document citation is to identify the core theme on which various authors are progressing the work. To grasp the substance of each cluster in a nutshell, we must investigate the common ties between the different clusters (*i.e.*, study the referenced articles in clusters).

Cluster id #0 has 47 members with the name environmental performance (EP), showing the relationship among various categories of analysis like the impact of EP on the level of environmental disclosure has a positive association (Clarkson et al., 2008). The importance of E.P. on sustainable development is being analyzed in this cluster. The measures of EP leading to sustainability in the production process are analyzed. In contrast, the role and functioning of environmental disclosures and various concerns and pressures for disclosing the E.P. in books of accounts and found that E.P. is the source of legitimate tool to disclose the firm and attain competitive advantage in the eyes of stakeholders (Cho and Patten, 2007). The performance of the environment and sustainability is giving rise to a dialogical instrument between the firm and its stakeholders for sustainable linked contracts (Roberts, 1992). Stakeholder theory states that the release of sustainable information towards sustainable disclosures and other related parties may have taken the benefits of the same.

Cluster id #1, with 41 members highlighting the role of ESG in

Fig. 9. Journal Co-citation network.
Source: Authors' explanation

supply chain management, is very important. In the production process, the input conversion leads to the emission of hazardous gases. Through ESG practices, such types of emissions can be controlled and minimized. The cluster has invoked the relationship between ESG and supply chain leading to sustainable supply chain management (SCM) and discusses that the production process has to be converted as green and SCM management and demonstrates the relationship between environmental, social, and economic agendas (Carter and Rogers, 2008) by the adoption and diffusion of innovative green practices on supply chain management (Sarkis et al., 2011), with a linear multi-objective programming model for formulated to increase the economic performance by optimizing the operations of integrated logistics and product reverse logistics in SSCM (Sheu et al., 2005). Any organization is taking most of its resources from society and abides by a social contract to undertake the socially acceptable behaviour in exchange for such resources, which guarantees them to provide the licence to operate (Deegan et al., 2002). The legitimacy approach makes it compulsory to invest in sustainable disclosures if it is prevailing in the current scenario of society. The inclusion of supply chain mechanisms is one of the major aspects of the legitimacy approach in business and society.

Cluster id #2 is identified as an environmental disclosure with 32 members. The cluster is considering the importance of environmental disclosures and sustainability reporting in different sets of areas and MNCs. It covers the set of studies providing a theoretical foundation towards the importance of voluntary disclosure, i.e., social and environmental in creating organizational legitimacy (Deegan, 2002), model-based deference of environmental disclosure on profitability the area of enormous importance and significantly affected by the size and industry classifications (Patten, 1991), whereas (Jensen and Berg, 2012)

providing the concept of integrated reporting system with differences, similarities, and advantages with respect to sustainable environmental disclosures.

Cluster id # 3, #7, and #9 cover the sustainability indicator's theme. The cluster is highlighting the sustainability indicators. There are different frameworks available for evaluating the environmental and sustainable performance at the organizational level, industry level or country level. To measure sustainable development, indicators are considered as the method and approaches mostly used. Raucci and Tarquinio (2020) mention NFD as sustainability performance indicator that can add value significantly to non-financial corporate communication which ultimately support internal decision making. Not only for the decision making, also, In the area of environmental and technological improvements, sustainability metrics have grown in importance as a tool for policymaking and corporate success (Singh et al., 2009) and proposing various environmental and social indicators (Freebairn and King, 2003; Hezri and Dovers, 2006). Also, and providing the methodology by selecting, identifying and measuring the sustainable indicators (Reed et al., 2006).

Cluster id #4 belongs to integrated reporting (IR). The apex body, The International Integrated Reporting Committee (IIRC) in 2011, met with several corporate bodies, investors, and regulatory bodies to develop a new approach to reporting by combining the different aspects of financial, social, and sustainability areas and named it as Integrated reporting and provide a proposal towards materializing the IR framework. IR stresses sustainability reporting, which exhibits the more established process for stakeholder engagement. Firms reporting sustainability indicators are likely to outperform their counterparts in the long run (Eccles et al., 2014). Due to the fact, IR is attaining immense

Table 6
List of top 20 Journals Publishing in Current Area.

S. No.	Author	Impact Factor[a]	Freq	% of Total	Publisher
1	Journal of Cleaner Production	9.297	660	9.32	Elsevier B.V.
2	Journal of Business Ethics	4.141	539	7.61	Springer
3	Business Strategy & The Environment	10.302	447	6.31	John Wiley & Sons Inc.
4	Ecological Economics	5.389	359	5.07	Elsevier B.V.
5	Academy of Management Review	12.638	336	4.75	Academy of Management
6	Accounting Organizations & Society	4.00	309	4.37	Elsevier B.V.
7	Sustainability	3.251	291	4.11	MDPI
8	Strategic Management Journal	8.641	281	3.97	Wiley Online Library
9	Accounting Auditing & Accountability Journal	4.117	391	5.52	Emerald
10	Corporate Social Responsibility & Environmental Management	8.741	263	3.72	Wiley Online Library
11	Academy of Management Journal	10.194	253	3.57	Academy of Management
12	Journal of Environmental Management	6.789	206	2.91	Elsevier B.V.
13	Ecological Indicators	4.958	198	2.8	Elsevier B.V.
14	International Journal of Production Economics	7.885	196	2.77	Elsevier B.V.
15	Accounting Forum	2.875	174	2.46	Taylor And Francis
16	Journal of Accounting & Public Policy	2.815	160	2.26	Elsevier B.V.
17	British Accounting Review	5.577	141	1.99	Elsevier B.V.
18	Accounting Review	4.301	124	1.75	American Accounting Association
19	Journal of Financial Economics	6.988	117	1.65	Elsevier B.V.
20	European Journal of Operational Research	5.334	101	1.43	Elsevier B.V.

[a] Extracted from JCR list of Journals, June 2021 (https://jcr.clarivate.com/).
Source: Authors' explanation

importance as studies are being conducted in providing the structural base literature review in this area to develop the insights on developing a theoretical framework, critical reviews on existing policies and outline for future research opportunities have been provided by (Dumay et al., 2016) and finally adopting the institutionalization of IR (Higgins et al., 2014). The IR adds value to companies' performance through providing access to both financial and non-financial information (Hoque, 2017). Veltri and Silvestri (2020) mention the adoption of IR has not only informational, but also managerial and financial impacts.

Cluster id #5 is related to corporate sustainability rating. The creation and implementation of sustainable indicators alone do not qualify a company for corporate sustainability, but a frequent evaluation of the indicators' effectiveness is always needed (Ramos and Caeiro, 2010). Sustainable indicators are used to assess and improve corporate performance (Azapagic, 2004). Singh et al. (2009) compiled the information related to formulating the strategy and devising the appropriate methodology for valuing sustainable indicators. The corporate sustainability rating of different companies depends upon their sustainability screening methodology, like toxins release and regulatory compliance with environmental policy (Delmas and Blass, 2010).

Cluster id #6 considers the corporate sustainability indicators with the corporate financial performance (CFP). In this aspect, Brammer and Pavelin (2006) reveals that larger firms are likely to make voluntary environmental disclosure and positively impact their financial

performance. Also, it was found that firms disclosing high ESG scores are likely to have high CFP (Chen and Xie, 2022; Friede et al., 2015; Orsato, 2006; Xie et al., 2019). Environmental performance impacts the cost of equity and has a reverse causality relationship among them (Dhaliwal et al., 2011). Further, the relation between responsibility disclosure and CFP is high when the country/company has a stakeholder-oriented approach (Dhaliwal et al., 2012)

Cluster id #8 defines moderating effects of NFD, which scores act as a moderator and significantly affect the firm's performance. Also, such disclosures minimize the information asymmetry between the agents and stakeholders and act as a base to meet investors' and stakeholders' requirements. Mandatory of NFD in public interest and large companies has positive moderating impact on the connection between both financial and non-financial performance, as well as reduce the direct costs associated by pursuing non-financial performance (Cupertino et al., 2022). Also, another study of moderating effects of ESG on financial performance (Liu et al., 2022) reveal that ESG activity positively impact on companies' financial performance, as well as the effects of ESG activities on financial performance is mediated by companies' non-financial performance. However, the mediation effects differ the degree of institutional pressure from clients, competitors, and finally the government.

Cluster id #11 analyses the chemical process and sustainability. Industries are also required to manage their waste and toxin materials in their sustainability reporting, especially the chemical industries. Global reporting initiatives (GRI) also encourage chemical industries to report sustainable measures (Dumay et al., 2010). Based on the resource-based theory, organizations are not self-contained and depend on their external environment for resources for their existence and growth (Pfeffer and Salancik, 2003). It becomes the liability of organizations to not pollute the physical environment of nature. Hence chemical industries are needed to follow the sustainable disposal of their waste materials.

Cluster id #12, Urban sustainability principles have driven growth in urban and metropolitan areas to achieve higher social, economic, and environmental sustainability levels. The goal of urban sustainability is to lower the GHG emissions usage of renewable energy and build a design to support minimum energy consumption or green production process, especially the environmental reporting (Frost, 2007; Haddock-Fraser and Fraser, 2008).

The clusters of this section basically originated from the inherent theoretical underpinning. From the investor's point of view, legitimacy theory expects to invest in sustainability disclosures as per the prevailing norms in the environment. If there exists mandatory disclosure of such practices, then firms abide by the rule of mandatory disclosure (Einhorn, 2005; Noh et al., 2019). In comparison, stakeholder theory addresses the beliefs about the stakeholders' liability in the system. Corporations are running through the funds of stakeholders, and they are expected to give something better in return to their stakeholders, as stated by (Freeman et al., 2010) in stakeholders theory. To reduce the information asymmetry among the agents and principals, managers are required to disclose the relevant information related to sustainability and consider the higher voluntary disclosures to mitigate the agency-related costs (Jensen and Meckling, 1976).

4. Thematic discussion

4.1. Timeline of evaluation and current situation

There has been a growing public concern since the late 1980s regarding the effect of industrial activities on nature. Accordingly, the term "Socially Responsible Investing" was noted during the 1980s and 1990s. Earlier models used value judgments and negative screening for investment decisions in companies, using exclusionary filters to keep companies out of portfolios that did not meet specific criteria. The first international push for cooperation on global warming came in 1997
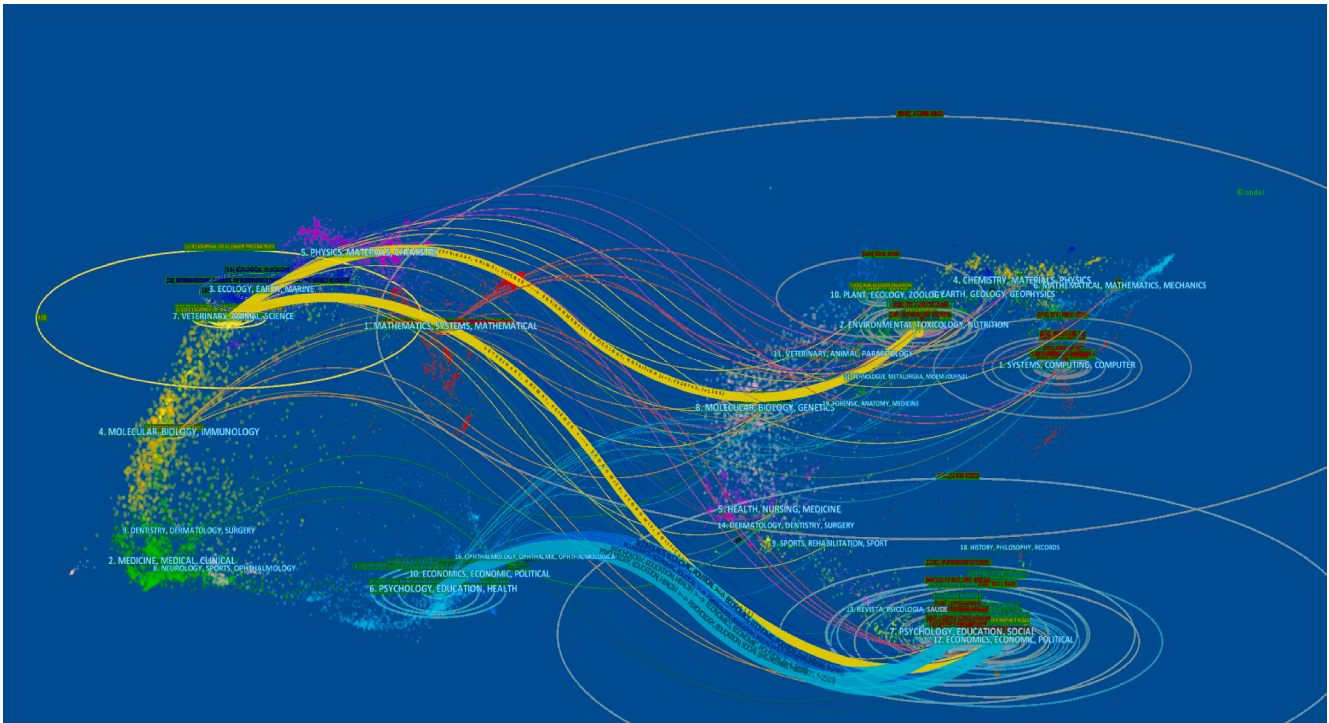
Fig. 10. Dual overlay map of citing and cited journals.
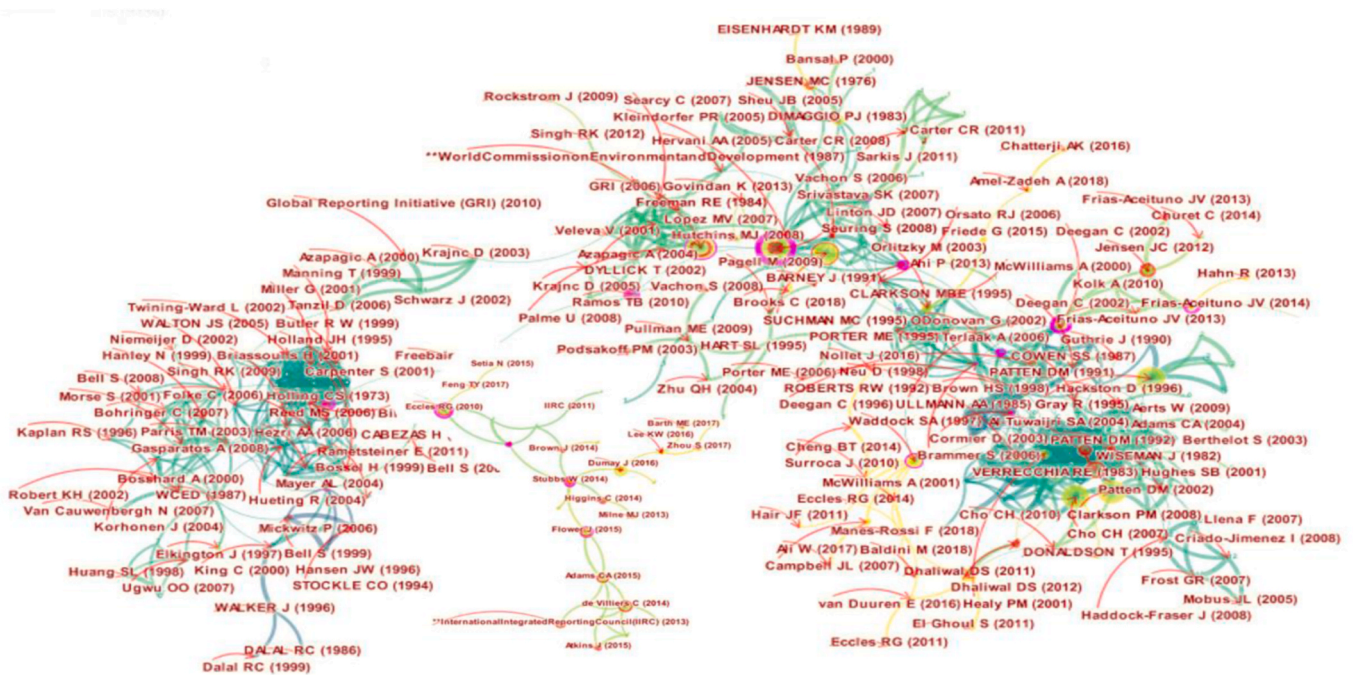Source: Authors' explanation

Fig. 11. Reference Co-citation network.
Source: Authors' explanation

through Kyoto Protocol. Companies were under increasing pressure from governments and society to limit emissions into the environment due to their operations by efficiently utilizing renewable resources and adopting cleaner technologies. By the mid-2000s, large investors demanded an analysis of ESG issues. Socially Responsible Investing gave rise to ESG investing. The term ESG investing was first noted in the report 'The Global Compact,' 2004, which reported that the best way to manage the company's overall quality is with ESG reporting. Accordingly, a firm's performance is not only based on financial aspects but also on ESG aspects. Fig. 13 gives a brief timeline of important events that have shaped ESG factors over the years.

Table 7

List of top 40 papers with the highest citations.

S. No.	Authors. (Year)	Citations	S. No.	Authors. (Year)	Citations
1	Rao, P; Holt, D., (2005)	1002	21	de Villiers, Charl; van Staden, Chris J.., (2006)	259
2	Clarkson, Peter M.; Li, Yue; Richardson, Gordon D.; Vasvari, Florin P.., (2008)	954	22	Cheng, Jao-Hong; Yeh, Chung-Hsing; Tu, Chia-Wen. (2008)	238
3	Linton, Jonathan D.; Klassen, Robert; Jayaraman, Vaidyanathan. (2007)	788	23	Mayer, Audrey L.., (2008)	230
4	Patten, DM. (2002)	570	24	Parguel, Beatrice; Benoit-Moreau, Florence; Larceneux, Fabrice. (2011)	228
5	Hassini, Elkafi; Surti, Chirag; Searcy, Cory. (2012)	511	25	Singh, Rajesh Kumar; Murty, H. R.; Gupta, S. K.; Dikshit, A. K.., (2007)	219
6	Evans, Annette; Strezov, Vladimir; Evans, Tim J.., (2009)	470	26	Ahi, Payman; Searcy, Cory. (2015)	218
7	Govindan, Kannan; Khodaverdi, Roohollah; Jafarian, Ahmad. (2013)	467	27	Dumay et al. (2016)	202
8	PATTEN, DM. (1991)	466	28	Flower, John. (2015)	200
9	Choi, HwanSuk Chris; Sirakaya, Ercan. (2006)	438	29	Flagestad, A; Hope, CA. (2001)	199
10	Boehringer, Christoph; Jochem, Patrick E. P.., (2007)	433	30	Jensen, Julia Catharina; Berg, Nicola. (2012)	197
11	Jenkins, H; Yakovleva, N., (2006)	433	31	Valentin, A; Spangenberg, JH. (2000)	196
12	Chaabane, A.; Ramudhin, A.; Paquet, M.., (2012)	428	32	Plumlee, Marlene; Brown, Darrell; Hayes, Rachel M.; Marshall, R. Scott. (2015)	192
13	Moldan, Bedrich; Janouskova, Svatava; Hak, Tomas. (2012)	379	33	Hottle, Troy A.; Bilec, Melissa M.; Landis, Amy E.., (2013)	191
14	Reed, Mark S.; Fraser, Evan D. G.; Dougill, Andrew J.., (2006)	358	34	Artiach, Tracy; Lee, Darren; Nelson, David; Walker, Julie. (2010)	190
15	Cho, Charles H.; Roberts, Robin W.; Patten, Dennis M.., (2010)	315	35	Wolf, Julia. (2014)	179
16	Lyon, Thomas P.; Maxwell, John W.., (2011)	313	36	Adams, Carol A.., (2015)	178
17	Shen, Li-Yin; Ochoa, J. Jorge; Shah, Mona N.; Zhang, Xiaoling. (2011)	311	37	Searcy, Cory. (2012)	177
18	Mori, Koichiro; Christodoulou, Aris. (2012)	308	38	Hezri, Adnan A.; Dovers, Stephen R.., (2006)	174
19	de Villiers et al. (2014)	265	39	Cormier, D; Gordon, IM; Magnan, M.., (2004)	174
20	Richardson, AJ; Welker, M., (2001)	262	40	Delmas, Magali; Blass, Vered Doctori. (2010)	171

Source: Authors' explanation

Table 8

Clusters of Co-citation network.

Cluster-ID	No. of Members	Silhouette Score	Mean Year	LLR Cluster Label
#0	47	0.906	1999	Environmental Performance
#1	41	0.927	2004	Sustainable Supply Chain
#2	32	0.923	2000	Environmental Disclosure
#3	32	0.923	1999	Sustainability Indicator
#4	30	0.988	2014	Integrated Reporting
#5	23	0.95	2004	Corporate Sustainability Rating
#6	23	0.927	2003	Corporate Sustainability Performance
#7	21	0.956	2002	Sustainability Indicator
#8	16	0.953	2011	Moderating Effect
#9	11	0.912	1998	Sustainability Indicator
#11	5	0.978	2004	Chemical Processes
#12	5	0.974	2007	Urban Sustainability

Source: Authors' explanation

4.2. Regional comparison: developed vs developing

Concerning sustainability, the firm's country of origin affects the adoption, the extent, and the quality of sustainability reporting. As per prior literature on sustainability reporting, the country of origin plays a dominant role due to differences in various forms like socio-cultural norms, institutional characteristics of education, labour, and legal system. Following Fig. 13 presents a brief timeline of the evolution of ESG regulation.

The governance mechanism is stricter in developed countries in comparison with emerging ones. As in latter's case, the managers do not face any curbs while issuing equity to finance low-return investments. Developing countries initiated a general environmental and administrative framework at U.N. Summit held in Rio de Janeiro in 1992. New actors such as environmental NGOs and the media emerged in the 1990s. Similar to developed countries, institutional styles are increasingly adopted in developing countries. The top stock exchanges that comply with disclosures on ESG are Shanghai, Johannesburg, Shenzhen, and Bovespa Stock Exchange (KPMG, 2010).[3] With the rapid pace in economic growth of BRIC economies, large organizations are attaining much international visibility and coming under the lens of stakeholders on financial and sustainability matters. Hence, companies adopt GRI standards in BRIC economies, intending to bridge the legitimacy gap internationally by integrating global ESG norms with their business operations.

4.3. Mandatory vs voluntary ESG disclosure

Several countries with mandatory disclosure of sustainability practices and a well-developed regulatory framework are Sweden, Norway, Finland, Denmark, Germany, Switzerland, Belgium, France, Canada, Australia, and New Zealand. Large public companies in E.U. mandatorily disclose information related to their social and environmental norms and practices following the directives of the European Parliament. Countries where the ESG framework is developing rapidly include the U.S., U.K., Italy, and Japan. Countries shifting towards developed ESG regulations include China, South Africa, Indonesia, Argentina, and Thailand. Whereas in India, Malaysia, Vietnam, Nigeria, the Philippines, and Brazil, the ESG regulatory framework is underdeveloped.

The disclosure of ESG information is influenced by different pressures existing in the system in which a company operates, corresponding to stakeholders, legislatures, institutional, and market groups. The level of development of the ESG framework in a country is a function of many factors, including political governance system, culture, corruption, and

---

[3] https://home.kpmg/content/dam/kpmg/pdf/2011/03/KPMG-International-Annual-Review-2010.pdf.
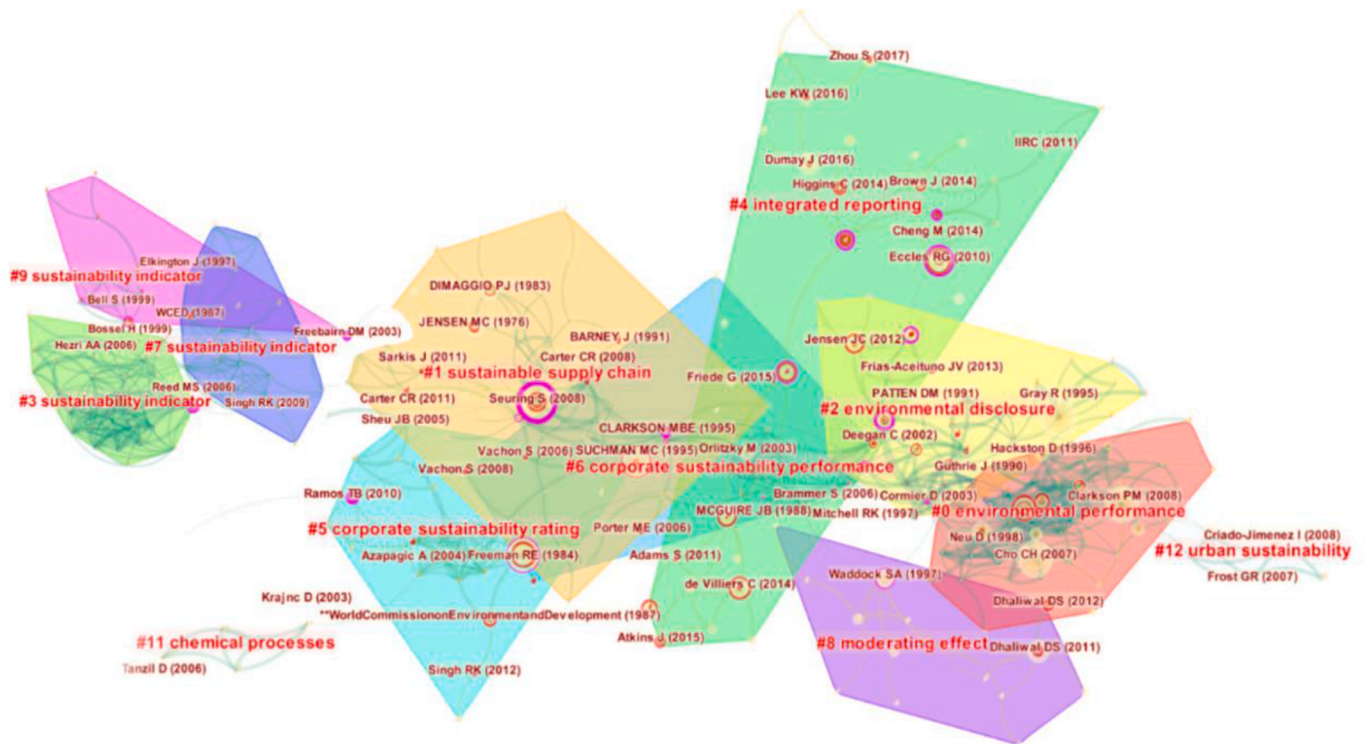
Fig. 12. Clusters of Co-citation network.
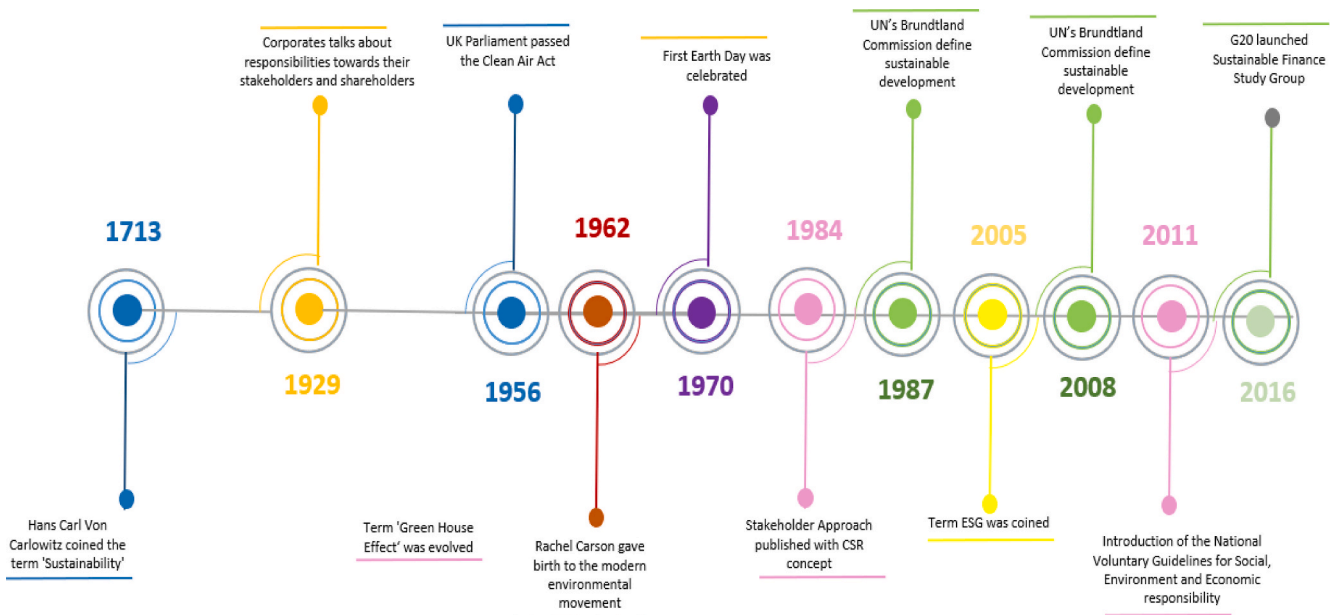Source: Authors' explanation

Fig. 13. A brief timeline of the evolution of ESG Regulation.
Source: Authors' explanation

economic development. European countries pioneered the regulation of ESG data, with many other countries still evolving their ESG framework. Companies need to focus on specific ESG related elements that create value for business, society, and shareholders.

The quality of organizational sustainability management is improved or degraded by accounting systems, disclosure practises, and legislation. Disasters caused by climate change were reported in financial accounts, and because they frequently resulted in the destruction of company assets, the cancellation of contracts, and customer losses, management was forced to make strategic decisions. However, management and business understanding of climate change and associated energy concerns remained fragmented and unimportant. Even while the global climate change system made progress over the last 25 years and had a solid start, it still fell short of what was needed to handle this issue.

Accounting for sustainability and ESG measures has become the need of the hour, as in many nations, there are no such standardized

disclosure practices which causes huge disparity in the system. Through this research, we suggested the requirement of a legislation system which has to be common for all nations and made mandatory to adopt such frameworks.

5. Discussion, implications, and limitations

The discussion section includes the discussion of the major research questions. In response to RQ1, the result from the current publication trends in ESG disclosures implies that the published papers have had a massive surge in the last five years (*i.e.*, from 2016 to 2021), particularly from 2019 to 2021. The wave started in 1970 with social reporting, especially in the U.S. and Western Europe. After a decade gap, environmental reporting resurfaced in 1980. KPMG reported that about 95 per cent of the world's top 250 companies had published a sustainability report in the 1990s. In most developing and emerging economies, the process of materializing ESG disclosures was not required until 2020. However, due to continuous external pressure toward sustainability reporting (SR), the influence of ESG disclosures on financial performance gained importance. In response to RQ2, we identify the work forming the intellectual backbone of the ESG framework. The mapping analysis of the well-known experts and collaborations within this topic's publishing shows the essential relations with a different body of structured literature. Centrality scores have a huge impact and save time by helping the researcher develop their theoretical and conceptual framework in the early stages of their research. With the highest centrality (0.70), as presented in Table 7, Seuring and Müller (2008) worked on three different aspects (a) supply chain, (b) sustainability, (c) triggers (motivation), and barriers (limitations) towards green-environmental-friendly production process connecting various knowledge points and areas of research. Similarly, Reed et al. (2006) (Centrality = 0.53) and (Deegan, 2002) (Centrality = 0.42) have also presented a theoretical foundation for NFD, and these studies connect the focal points for different clusters. Considering the output of key study themes (RQ3) on ESG, sustainability, and corporate financial performance, Cluster #4 has received the highest burstiness and is related to Integrated Reporting (IR). IR aims to report in detail all financial, operational, and sustainable information to focus on value creation activity in the short, medium, and long term. In addition, it has become the latest reporting innovation at the international level. The literature analyses the outcome and benefits of IR compared to sustainability reporting because the former offers future and forward-looking information instead of past information, such as (Dumay et al., 2016; Higgins et al., 2014). The topic of IR *vs* sustainability is still in debate. We have identified many studies deploying the strategy for ESG disclosures and their quantification favouring integrated reporting systems as a newer outcome.

We identify the work that has received tremendous consideration from the academic and scientific community during a particular period. This surge has been noticed by the burstiness of various research papers, meaning that these are the areas becoming unnoticed during their publication but later attained massive importance in the eyes of researchers and policymakers. With the sudden rise in publication, researchers have instructed much upcoming research in this knowledge domain. Burst detection offers a changing situation in literature by providing a new research area, opening up new research fields, or offering a new trend in a timeline of a particular area of research (RQ5). Further, we have identified the high-impact transformation discoveries using the scientometric analysis, considering the sigma value of the document (Table 7). Transformative discoveries are identified by the high centrality and high burstness value, significantly impacting existing literature with many citations. We discovered that the trend in disclosure is shifting from voluntary ESG disclosure to Integrated mandatory reporting, which entails system reporting of financial, production, strategy, outcome, and non-financial (social and environmental) disclosure over the company's short, medium, and long-term

performance. This is a forward-thinking approach to accounting and reporting that is gaining traction (RQ6).

The implications of this study include the importance of research supporting different stakeholders on NFD, especially ESG reporting and activities. The specific research significance is mentioned in the following section. The first implication of this study is that this paper explains the link between ESG activities and sustainable development through a scientometric assessment. This study can serve as a theoretical basis for follow-up research to define and examine the links between ESG activities and sustainable development from a more in-depth perspective. Particularly, the present study is uncovering the various new aspects related to ESG disclosures. The study has identified different clusters, namely sustainable corporate performance, environmental performance, environmental disclosures, sustainable supply chain, sustainability indicators and integrated reporting. Based on such detailed cluster analysis, the authors found the implication of the ESG domain is not limited to environmental science, but it has its relevance in management, businesses, humanities, and public policy. The concept of ESG has evolved years back, however, its implementation still required effort. In addition, the ESG dimension in the corporate world of emerging countries is under the development stage. Many studies have found a positive ESG and corporate financial performance (CFP) nexus, but many areas like the inclusion of ESG in supply chain management, sustainable urban development and integrating reporting is the area where theoretical and practical policy interventions are required. A positive ESG-CFP nexus has led toward the standard mandatory implementation of ESG norms at the macro and micro levels. Another implication is that the significance of this research is to guide stakeholders on what it means to have reliable and trusted NFD information, thereby promoting higher levels of trust between companies and stakeholders. This trust will ultimately lead stakeholders to better understand the company's future investments, which are also related to the company's financial performance. Also, this study signify that the effective financial reporting offers stakeholders with the capacity to analyse and comprehend financial data within the context of the performance of the company in general and, more importantly, hints as to the capacity for the organization to develop, grow, and remain sustainable. The findings of this study show the factors that influence countries ESG framework, such as a country's ESG framework depends on its political governance system, culture, corruption, and economic progress. Through many countries, particularly European countries, pioneered ESG data regulation, while many others are still developing their framework. Thereby, the study significance will contribute the development of those countries ESG framework. The findings of this study provide the reporting body with up-to-date information on how the ESG paradigms are moving and gaining prominence among academia, industry leaders, and management. In addition, the findings also generate significant interest from regulators and policymakers to work with companies and support initiatives to ensure the quality of NFD information. Finally, the study implications emphasize the transparency of financial certainty, and the ESG elements produce value for company, society, and shareholders.

The study has several inherent drawbacks in the analysis technique used despite the several advantages. The bibliometric technique produces clear and precise conclusions dependent on the researcher's current theoretical knowledge base. The technique is not a replacement for comprehensive literature review methods; instead, it supports technical decisions based on substantial SLR (Zupic and Čater, 2015). Long publication times, self-citations, and atypical citations contribute to skewed co-citation analysis results. Last but not least, we employed a single database, Web of Science, for analysis, considering only SSCI and SCI-indexed papers, and focused solely on subject selection. Some key contributions may be overlooked due to the lack of coverage.

6. Conclusion

The study considers the technical analysis of co-citation using

Citespace to record the intellectual structure of ESG disclosures. We aim to demonstrate the critical research area in ESG disclosure, sustainability, environmental accountability, social responsibility, green indicators, and sustainable practices. The findings of the study are mainly based on conceptual aspects and contemporary trends occurring in the field of environmental and social disclosures. In conclusion, this study finds that NFD specifically affects environmental performance through ESG and controls carbon emissions from supply chain management operations through ESG practices. NFDs also influence sustainability reporting by different industries and multinational companies. As an indicator of sustainability performance, NFD adds value to financial and non-financial corporate communications that support decision-making within the company. These sustainability metrics are used to assess and improve company performance. In most cases, however, larger companies may make environmental disclosures voluntarily and positively impact financial performance in an immediate and modest manner. Finally, NFD achieves higher levels of social, economic and environmental sustainability, promoting sustainability principles around financial reporting.

This study also focuses on some future research directions. First, social and governance disclosures have already attained huge attention in developed and developing countries. However, including environmental concerns in the social and governance disclosures are in the initial stages of their incorporation in most developing countries and demand more research on ESG practices. Second, for the above content and thematic analysis, we found that companies are required to innovate the supply chain mechanism linked with climate change in reality, and it is imperative to plan for the future, especially in the post-pandemic world. Thirdly, though going green global has been a topic of discussion for researchers and industries to help with environmental stability and climate change for a long time, we highlight the profitability and sustainability dimensions *vis-a-vis* firm performance within the value chain analysis concerning ESG disclosures. The value chain of MNCs operating globally, especially in developing countries, aids in the improvement of economic performance and motivates toward achieving sustainable competitive advantage through ESG practices and mandatory/voluntary disclosures. Also, the link between ESG disclosure and stakeholders' engagement, satisfaction, and involvement has not been explored much in the literature. As a result, the effect of ESG disclosures on stakeholders' behaviour against the firm could be an area of concern for future research.

Declaration of competing interest

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

Data availability

Data will be made available on request.

Acknowledgement

Appendix A

The key string included: "Non-Financial Reporting" OR "ESG" OR "Social Disclosure" OR "Sustainability Measures" OR "Environmental Ratings" OR "Environmental Quality aspects" OR "Integrated Reporting" OR "Social Value Measurement" OR "Corporate Environmental Impact" OR "Sustainability Methodology" OR "Sustainability Exposures" OR "Sustainability Indices" OR "Sustainability Scoring" OR "Sustainability Disclosure" OR "Sustainability Ratings" OR "Sustainability Combined Scores" OR "Sustainability Materiality" OR "Sustainability Integration" OR "Sustainability Disclosure Scores" OR "Sustainability Ratings" OR "Sustainability Performance" OR "Sustainability Assessment Index" OR "Sustainability Indicators" OR "Sustainability Development Index" OR "Sustainability Components" OR "Sustainability Scorecard" OR "Sustainability Performance Indicators" OR "Sustainable Value creation" OR "Sustainability Performance Measures" OR "Sustainability Performance Management" OR "Sustainable Supply Chains" OR "Social and Environmental performance" OR "ESG Performance measurement systems" OR "Sustainable Indicators" OR "Green Supply Chains" OR "Sustainability assessments" OR "Sustainable governance indicators" OR "Sustainable Reporting" OR "Sustainability Performance measurement" OR "Sustainable Value Creation" OR "Sustainability performance" OR "Sustainability Performance measurement systems" OR "governance disclosure" OR "environmental disclosure" OR "social disclosure" OR "green innovation reporting" OR "green innovation practices" OR "Environmental Social Governance" OR "Climate governance accounting".

Appendix B

Research questions and Method used.

S. No.	Research Questions	Research Objectives	Methodology
RQ1	What are the current publication trends in ESG disclosures?	To comprehend how ESG research articles have changed over time	Publication Trend
RQ2	Who are the most well-known experts and collaborations within this topic's publishing lists?	To locate worldwide partnerships and suitable authors for collaboration	Network of Author and co-authorship
	2a. Prominent Countries and Institutions	To comprehend the powerful author network	Country and Institutions
	2b. Prominent Authors	To determine which nations and entities actively contribute to current literature	Co-authorship Analysis
RQ3	Which key themes involve the ESG disclosures and sustainability?	To recognise co-occurring keywords and concepts in order to comprehend the concept and contents.	Keyword occurrence analysis
RQ4	Which are the most influential articles in the ESG and sustainability disclosures?	To determine the publishing subject categories utilised	Document Co-Citation Network
RQ5	What is the intellectual structure of current research?	To determine how often certain authors, papers, and journals are mentioned in other documents together.	Cluster Analysis of Co-citation analysis
RQ6	What areas require massive attention in ESG disclosure practices?	To identify the research gaps and provide paths for future study, as well as to evaluate the temporal structure of research themes based on semantic similarity	Suggesting Future Research, avenues based on the analysis

Source: Authors

References

Ahmed, T., Rahman, M.M., Aktar, M., Gupta, A.D., Abedin, M.Z., 2022. The impact of economic development on environmental sustainability: evidence from the Asian region. Environ. Dev. Sustain. https://doi.org/10.1007/s10668-022-02178-w.

Alda, M., 2021. The environmental, social, and governance (ESG) dimension of firms in which social responsible investment (SRI) and conventional pension funds invest: the mainstream SRI and the ESG inclusion. J. Clean. Prod. 298 https://doi.org/10.1016/j.jclepro.2021.126812.

Arayssi, M., Jizi, M., Tabaja, H.H., 2020. The impact of board composition on the level of ESG disclosures in GCC countries. Sustainability Accounting, Management and Policy Journal 11, 137–161. https://doi.org/10.1108/SAMPJ-05-2018-0136.

Azapagic, A., 2004. Developing a framework for sustainable development indicators for the mining and minerals industry. J. Clean. Prod. 639–662. https://doi.org/10.1016/S0959-6526(03)00075-1.

Berthelot, S., Cormier, D., Magnan, M., 2003. Environmental disclosure research: review and synthesis. J. Account. Lit. 22, 1–41.

Brammer, S., Pavelin, S., 2006. Voluntary environmental disclosures by large UK companies. J. Bus. Finance Account. 33, 1168–1188. https://doi.org/10.1111/j.1468-5957.2006.00598.x.

Brammer, S.J., Pavelin, S., 2006. Corporate reputation and social performance: the importance of fit. J. Manag. Stud. 43.

Carter, C.R., Rogers, D.S., 2008. A framework of sustainable supply chain management: moving toward new theory. Int. J. Phys. Distrib. Logist. Manag. 38, 360–387. https://doi.org/10.1108/09600030810882816.

Chai, S., Chu, W., Zhang, Z., Li, Z., Abedin, M.Z., 2022a. Dynamic nonlinear connectedness between the green bonds, clean energy, and stock price: the impact of the COVID-19 pandemic. Ann. Oper. Res. https://doi.org/10.1007/s10479-021-04452-y.

Chai, S., Xiaoli, Y., Zhang, Z., Abedin, M.Z., 2022b. Regional imbalances of market efficiency in China's pilot emission trading schemes (ETS): a multifractal perspective. Res. Int. Bus. Finance 63. https://doi.org/10.1016/j.ribaf.2022.101758.

Chen, C., Chen, Y., Horowitz, M., Hou, H., Liu, Z., Pellegrino, D., 2009. Towards an explanatory and computational theory of scientific discovery. J. Inf. 3 (3), 191–209.

Chen, C., Ibekwe-SanJuan, F., Hou, J., 2010. The structure and dynamics of cocitation clusters: a multiple-perspective cocitation analysis. J. Am. Soc. Inf. Sci. Technol. 61, 1386–1409. https://doi.org/10.1002/asi.21309.

Chen, C., Leydesdorff, L., 2014. Patterns of connections and movements in dual-map overlays: a new method of publication portfolio analysis. J. Am. Soc. Inf. Sci. Technol. 65, 334–351. https://doi.org/10.1002/asi.22968.

Chen, C., Song, M., 2019. Visualizing a field of research: a methodology of systematic scientometric reviews. PLoS One 14. https://doi.org/10.1371/journal.pone.0223994.

Chen, Z., Xie, G., 2022. ESG disclosure and financial performance: moderating role of ESG investors. Int. Rev. Financ. Anal. 83 https://doi.org/10.1016/j.irfa.2022.102291.

Cheng, J.H., 2011. Inter-organizational relationships and knowledge sharing in green supply chains-Moderating by relational benefits and guanxi. Transport. Res. Part E 47, 837–849. https://doi.org/10.1016/j.tre.2010.12.008.

Cho, C.H., Patten, D.M., 2007. The role of environmental disclosures as tools of legitimacy: a research note. Account. Org. Soc. 32, 639–647. https://doi.org/10.1016/j.aos.2006.09.009.

Clarkson, M.B.E., 1995. A stakeholder framework for analyzing and evaluating corporate social performance. Acad. Manag. Rev. 20, 92–117.

Clarkson, P.M., Li, Y., Richardson, G.D., Vasvari, F.P., 2008. Revisiting the relation between environmental performance and environmental disclosure: an empirical analysis. Account. Org. Soc. 33, 303–327. https://doi.org/10.1016/j.aos.2007.05.003.

Cochran, W.G., 1991. Sampling Techniques, third ed.

Comerio, N., Strozzi, F., 2019. Tourism and its economic impact: a literature review using bibliometric tools. Tourism Econ. 25, 109–131. https://doi.org/10.1177/1354816618793762.

Cosma, S., Venturelli, A., Schwizer, P., Boscia, V., 2020. Sustainable development and european banks: a non-financial disclosure analysis. Sustainability 12. https://doi.org/10.3390/su12156146.

Cupertino, S., Vitale, G., Ruggiero, P., 2022. Performance and (non) mandatory disclosure: the moderating role of the Directive 2014/95/EU. J. Appl. Account. Res. 23, 163–183. https://doi.org/10.1108/JAAR-04-2021-0115.

de Villiers, C., Rinaldi, L., Unerman, J., 2014. Integrated reporting: insights, gaps and an agenda for future research. Account Audit. Account. J. 27, 1042–1067. https://doi.org/10.1108/AAAJ-06-2014-1736.

Deegan, C., 2002. Introduction: the legitimising effect of social and environmental disclosures - a theoretical foundation. Account Audit. Account. J. https://doi.org/10.1108/09513570210435852.

Deegan, C., Rankin, M., Tobin, J., 2002. An examination of the corporate social and environmental disclosures of BHP from 1983-1997: a test of legitimacy theory, Accounting. Auditing & Accountability Journal. https://doi.org/10.1108/09513570210435861.

Delmas, M., Blass, V.D., 2010. Measuring corporate environmental performance: the trade-offs of sustainability ratings. Bus. Strat. Environ. 19, 245–260. https://doi.org/10.1002/bse.676.

Dhaliwal, D.S., Li, O.Z., Tsang, A., Yang, Y.G., 2011. Voluntary nonfinancial disclosure and the cost of equity capital: the initiation of corporate social responsibility reporting. Account. Rev. 86, 59–100. https://doi.org/10.2308/accr.00000005.

Dhaliwal, D.S., Radhakrishnan, S., Tsang, A., Yang, Y.G., 2012. Nonfinancial disclosure and analyst forecast accuracy: international evidence on corporate social responsibility disclosure. Account. Rev. 87, 723–759. https://doi.org/10.2308/accr-10218.

Dhifaoui, Z., Khalfaoui, R., Abedin, M.Z., Shi, B., 2022. Quantifying information transfer among clean energy, carbon, oil, and precious metals: A novel transfer entropy-based approach. Finance Res. Lett. 49 https://doi.org/10.1016/j.frl.2022.103138.

Dobija, D., Arena, C., Kozłowski, Ł., Krasodomska, J., Godawska, J., 2022. Towards sustainable development: the role of directors' international orientation and their diversity for non-financial disclosure. Corp. Soc. Responsib. Environ. Manag. https://doi.org/10.1002/csr.2339.

Dumay, J., Bernardi, C., Guthrie, J., Demartini, P., 2016. Integrated reporting: a structured literature review. Account. Forum 40, 166–185. https://doi.org/10.1016/j.accfor.2016.06.001.

Dumay, J., Bernardi, C., Guthrie, J., La Torre, M., Dumay, J., Bernardi, C., La Torre, M., 2020. Barriers to implementing integrated reporting: an contemporary academic perspective.

Dumay, J., Guthrie, J., Farneti, F., 2010. GRI sustainability reporting guidelines for public and third sector organizations: a critical review. Publ. Manag. Rev. 12, 531–548. https://doi.org/10.1080/14719037.2010.496266.

Eccles, R.G., Ioannou, I., Serafeim, G., 2014. The impact of corporate sustainability on organizational processes and performance. Manag. Sci. 60, 2835–2857. https://doi.org/10.1287/mnsc.2014.1984.

Einhorn, E., 2005. The nature of the interaction between mandatory and voluntary disclosures. J. Account. Res. 43, 593–621. https://doi.org/10.1111/j.1475-679X.2005.00183.x.

Erkens, M., Paugam, L., Stolowy, H., 2015. Non-financial information: state of the art and research perspectives based on a bibliometric study. Comptab. Controle Audit. 21, 15–92.

Escrig-Olmedo, E., Rivera-Lirio, J.M., Muñoz-Torres, M.J., Fernández-Izquierdo, M.Á., 2017. Integrating multiple ESG investors' preferences into sustainable investment: a fuzzy multicriteria methodological approach. J. Clean. Prod. 162, 1334–1345. https://doi.org/10.1016/j.jclepro.2017.06.143.

Flower, J., 2015. The international integrated reporting council: a story of failure. Crit. Perspect. Account. 27, 1–17. https://doi.org/10.1016/j.cpa.2014.07.002.

Freebairn, D.M., King, C.A., 2003. Reflections on collectively working toward sustainability: indicators for indicators. Aust. J. Exp. Agric. https://doi.org/10.1071/EA00195.

Freeman, R.E., Harrison, J.S., Wicks, A.C., Parmar, B., Colle, S. de, 2010. Stakeholder Theory: the State of the Art. Cambridge University Press.

Friede, G., Busch, T., Bassen, A., 2015. ESG and financial performance: aggregated evidence from more than 2000 empirical studies. Journal of Sustainable Finance and Investment 5, 210–233. https://doi.org/10.1080/20430795.2015.1118917.

Frost, G.R., 2007. The introduction of mandatory environmental reporting guidelines: Australian evidence. Abacus 43, 190–216. https://doi.org/10.1111/j.1467-6281.2007.00225.x.

Galbreath, J., 2015. Are boards on board? A model of corporate board influence on sustainability performance. J. Manag. Organ. 18.

Gangi, F., Varrone, N., Daniele, L.M., Coscia, M., 2022. Mainstreaming socially responsible investment: do environmental, social and governance ratings of investment funds converge? J. Clean. Prod. 353 https://doi.org/10.1016/j.jclepro.2022.131684.

Gao, S., Meng, F., Gu, Z., Liu, Z., Farrukh, M., 2021. Mapping and clustering analysis on environmental, social and governance field a bibliometric analysis using scopus. Sustainability 13. https://doi.org/10.3390/su13137304.

Garcia, A.S., Mendes-Da-Silva, W., Orsato, R., 2017. Sensitive industries produce better ESG performance: evidence from emerging markets. J. Clean. Prod. 150, 135–147. https://doi.org/10.1016/j.jclepro.2017.02.180.

Goldenberg, D., 2017. Scientometrics and its positive consequences. Revista Brasileira de Cirurgia Plástica (RBCP) – Brazilian Journal of Plastic Sugery 32. https://doi.org/10.5935/2177-1235.2017rbcp0077, 471–471.

Gualandris, J., Golini, R., Kalchschmidt, M., 2014. Do supply management and global sourcing matter for firm sustainability performance?: an international study. Supply Chain Manag. 19, 258–274. https://doi.org/10.1108/SCM-11-2013-0430.

Gupta, S., Goldar, B., 2005. Do stock markets penalize environment-unfriendly behaviour? Evidence from India. Ecol. Econ. 52, 81–95. https://doi.org/10.1016/j.ecolecon.2004.06.011.

Haddock-Fraser, J., Fraser, I., 2008. Assessing corporate environmental reporting motivations: differences between "close-to-market" and "business-to-business" companies. Corp. Soc. Responsib. Environ. Manag. 15, 140–155. https://doi.org/10.1002/csr.147.

Hasan, M.M., Nekmahmud, M., Yajuan, L., Patwary, M.A., 2019. Green business value chain: a systematic review. Sustain. Prod. Consum. https://doi.org/10.1016/j.spc.2019.08.003.

Hendiani, S., Lev, B., Gharehbaghi, A., 2021. Diagnosing social failures in sustainable supply chains using a modified Pythagorean fuzzy distance to ideal solution. Comput. Ind. Eng. 154 https://doi.org/10.1016/j.cie.2021.107156.

Hezri, A.A., Dovers, S.R., 2006. Sustainability Indicators, Policy and Governance: Issues for Ecological Economics. https://doi.org/10.1016/j.ecolecon.2005.

Higgins, C., Stubbs, W., Love, T., 2014. Walking the talk(s): organisational narratives of integrated reporting. Accounting. Auditing and Accountability Journal 27, 1090–1119. https://doi.org/10.1108/AAAJ-04-2013-1303.

Hoque, M.E., 2017. International journal of economics and financial issues why company should adopt integrated reporting? Int. J. Econ. Financ. Issues 7, 241–248.

Jensen, J.C., Berg, N., 2012. Determinants of traditional sustainability reporting versus integrated reporting. An institutionalist approach. Bus. Strat. Environ. 21, 299–316. https://doi.org/10.1002/bse.740.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. J. Financ. Econ. 3, 305–360.

Khalfaoui, R., et al., 2022. How do climate risk and clean energy spillovers, and uncertainty affect U.S. stock markets? Technol. Forecast. Soc. Change 185. https://doi.org/10.1016/j.techfore.2022.122083.

Klarin, A., Suseno, Y., 2022. An integrative literature review of social entrepreneurship research: mapping the literature and future research directions. Bus. Soc. https://doi.org/10.1177/00076503221101611.

Kleinberg, J., 2002. Bursty and hierarchical structure in streams. In: 8th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.

Korom, P., 2019. A bibliometric visualization of the economics and sociology of wealth inequality: a world apart? Scientometrics 118, 849–868. https://doi.org/10.1007/s11192-018-03000-z.

Kuo, L., Yu, H.C., 2017. Corporate political activity and environmental sustainability disclosure: the case of Chinese companies. Baltic J. Manag. 12, 348–367. https://doi.org/10.1108/BJM-07-2016-0149.

Liu, Y., Kim, C.Y., Lee, E.H., Yoo, J.W., 2022. Relationship between sustainable management activities and financial performance: mediating effects of non-financial performance and moderating effects of institutional environment. Sustainability 14. https://doi.org/10.3390/su14031168.

Loprevite, S., Ricca, B., Rupo, D., 2018. Performance sustainability and integrated reporting: empirical evidence from mandatory and voluntary adoption contexts. Sustainability 10. https://doi.org/10.3390/su10051351.

Lourenço, I.C., Branco, M.C., 2013. Determinants of corporate sustainability performance in emerging markets: the Brazilian case. J. Clean. Prod. 57, 134–141. https://doi.org/10.1016/j.jclepro.2013.06.013.

Moneva, J.M., Cuellar, B., 2009. The value relevance of financial and non-financial environmental reporting. Environ. Resour. Econ. 44, 441–456. https://doi.org/10.1007/s10640-009-9294-4.

Monteiro, S.M., da, S., Aibar-Guzmán, B., 2010. Determinants of environmental disclosure in the annual reports of large companies operating in Portugal. Corp. Soc. Responsib. Environ. Manag. 17, 185–204. https://doi.org/10.1002/csr.197.

Nekmahmud, M., Naz, F., Ramkissoon, H., Fekete-Farkas, M., 2022a. Transforming consumers' intention to purchase green products: role of social media. Technol. Forecast. Soc. Change 185. https://doi.org/10.1016/j.techfore.2022.122067.

Nekmahmud, M., Ramkissoon, H., Fekete-Farkas, M., 2022b. Green purchase and sustainable consumption: a comparative study between European and non-European tourists. Tourism Manag. Perspect. 43 https://doi.org/10.1016/j.tmp.2022.100980.

Nicolò, G., Zampone, G., Sannino, G., de Iorio, S., 2022. Sustainable corporate governance and non-financial disclosure in Europe: does the gender diversity matter? J. Appl. Account. Res. 23, 227–249. https://doi.org/10.1108/JAAR-04-2021-0100.

Noh, S., So, E.C., Weber, J.P., 2019. Voluntary and mandatory disclosures: do managers view them as substitutes? J. Account. Econ. 68 https://doi.org/10.1016/j.jacceco.2019.101243.

Orsato, R.J., 2006. Competitive environmental strategies: when does it pay to be green? Calif. Manag. Rev. 48, 127–143.

Patten, D.M., 1991. Exposure, legitimacy, and social disclosure. J. Account. Publ. Pol. 10, 297–308.

Paul, J., Criado, A.R., 2020. The art of writing literature review: what do we know and what do we need to know? Int. Bus. Rev. 29 https://doi.org/10.1016/j.ibusrev.2020.101717.

Paul, J., Rosado-Serrano, A., 2019. Gradual Internationalization vs Born-Global/International new venture models: a review and research agenda. Int. Market. Rev. https://doi.org/10.1108/IMR-10-2018-0280.

Petit, G., Sablayrolles, C., Yannou-Le Bris, G., 2018. Combining eco-social and environmental indicators to assess the sustainability performance of a food value chain: a case study. J. Clean. Prod. 191, 135–143. https://doi.org/10.1016/j.jclepro.2018.04.156.

Pfeffer, J., Salancik, G.R., 2003. The external control of organizations: A resource dependence perspective. Stanford University Press.

Radu, C., Francoeur, C., 2017. Does innovation drive environmental disclosure? A new insight into sustainable development. Bus. Strat. Environ. 26, 893–911. https://doi.org/10.1002/bse.1950.

Ramos, T.B., Caeiro, S., 2010. Meta-performance evaluation of sustainability indicators. Ecol. Indicat. 10, 157–166. https://doi.org/10.1016/j.ecolind.2009.04.008.

Raucci, D., Tarquinio, L., 2020. Sustainability performance indicators and non-financial information reporting. Evidence from the Italian case. Adm. Sci. 10 https://doi.org/10.3390/admsci10010013.

Reed, M.S., Fraser, E.D.G., Dougill, A.J., 2006. An adaptive learning process for developing and applying sustainability indicators with local communities. Ecol. Econ. 59, 406–418. https://doi.org/10.1016/j.ecolecon.2005.11.008.

Roberts, R.W., 1992. Determinants of corporate social responsibility disclosure: an application of stakeholder theory. Account. Org. Soc. 17, 595–612.

Ronda-Pupo, G.A., 2017. The effect of document types and sizes on the scaling relationship between citations and co-authorship patterns in management journals. Scientometrics 110, 1191–1207. https://doi.org/10.1007/s11192-016-2231-8.

Sarkis, J., Zhu, Q., Lai, K.H., 2011. An organizational theoretic review of green supply chain management literature. Int. J. Prod. Econ. https://doi.org/10.1016/j.ijpe.2010.11.010.

Seuring, S., Müller, M., 2008. From a literature review to a conceptual framework for sustainable supply chain management. J. Clean. Prod. 16, 1699–1710. https://doi.org/10.1016/j.jclepro.2008.04.020.

Sheu, J.B., Chou, Y.H., Hu, C.C., 2005. An integrated logistics operational model for green-supply chain management. Transp Res E Logist Transp Rev 41, 287–313. https://doi.org/10.1016/j.tre.2004.07.001.

Siew, R.Y.J., Balatbat, M.C.A., Carmichael, D.G., 2016. The impact of ESG disclosures and institutional ownership on market information asymmetry. Asia-Pacific Journal of Accounting and Economics 23, 432–448. https://doi.org/10.1080/16081625.2016.1170100.

Singh, R.K., Murty, H.R., Gupta, S.K., Dikshit, A.K., 2009. An overview of sustainability assessment methodologies. Ecol. Indicat. https://doi.org/10.1016/j.ecolind.2008.05.011.

Soriya, S., Rastogi, P., 2021. A systematic literature review on integrated reporting from 2011 to 2020. J. Financ. Report. Account. 20 (3/4) https://doi.org/10.1108/JFRA-09-2020-0266.

Stolowy, H., Paugam, L., 2018. The expansion of non-financial reporting: an exploratory study. Account. Bus. Res. 48, 525–548. https://doi.org/10.1080/00014788.2018.1470141.

Tlili, M., ben Othman, H., Hussainey, K., 2019. Does integrated reporting enhance the value relevance of organizational capital? Evidence from the South African context. J. Intellect. Cap. 20, 642–661. https://doi.org/10.1108/JIC-02-2019-0034.

Turzo, T., Marzi, G., Favino, C., Terzani, S., 2022. Non-financial reporting research and practice: lessons from the last decade. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2022.131154.

Veltri, S., Silvestri, A., 2020. The value relevance of corporate financial and nonfinancial information provided by the integrated report: a systematic review. Bus. Strat. Environ. 29, 3038–3054. https://doi.org/10.1002/bse.2556.

Vitolla, F., Raimo, N., Rubino, M., 2019. Appreciations, criticisms, determinants, and effects of integrated reporting: a systematic literature review. Corp. Soc. Responsib. Environ. Manag. 26, 518–528. https://doi.org/10.1002/csr.1734.

Wagner, M., 2010. The role of corporate sustainability performance for economic performance: a firm-level analysis of moderation effects. Ecol. Econ. 69, 1553–1560. https://doi.org/10.1016/j.ecolecon.2010.02.017.

Wang, H., Khan, M.A.S., Anwar, F., Shahzad, F., Adu, D., Murad, M., 2021. Green innovation practices and its impacts on environmental and organizational performance. Front. Psychol. 11 https://doi.org/10.3389/fpsyg.2020.553625.

Xie, J., Nozawa, W., Yagi, M., Fujii, H., Managi, S., 2019. Do environmental, social, and governance activities improve corporate financial performance? Bus. Strat. Environ. 28, 286–300. https://doi.org/10.1002/bse.2224.

Zhao, X., 2017. A scientometric review of global BIM research: analysis and visualization. Autom. ConStruct. https://doi.org/10.1016/j.autcon.2017.04.002.

Zupic, I., Čater, T., 2015. Bibliometric methods in management and organization. Organ. Res. Methods 18, 429–472. https://doi.org/10.1177/1094428114562629.