

UNDERSTANDING TRENDS IN GREEN ACCOUNTING STUDIES: A BIBLIOMETRICS ANALYSIS

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Abstract

The concept of sustainable business, which emerges as one of the consequences of environmental degradation, is currently a significant focus for many entities. Having the ability to incorporate business costs with environmental sustainability within an accounting system becomes a distinct advantage for companies. The term for this concept is referred to as "green accounting". This article aims to explore and map research related to Green Accounting using bibliometric methods, covering the observation period from 1976 to 2023. Data were sourced from the Scopus database using keywords "green accounting" and "environment accounting". The Scopus search yielded a total of 421 articles or documents discussing Green Accounting. The employed method was bibliometric analysis, utilizing R-Studio Biblioshiny and Vos Viewer software. The results of this mapping indicate a progressive increase in publication volume over time, particularly within the last two decades. The majority of publication sources stem from the Social and Environmental Accountability Journal and are predominantly authored by individuals from the United Kingdom and the United States. The primary trending topics in green accounting research revolve around the central theme of environmental accounting, which is presently undergoing evolution and generating several other new topics.*

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1. Introduction

The issues of the environment and sustainability are increasingly garnering significant attention from various quarters, including government entities, corporations, and the general public. (Bosi et al., 2022; Kuzey & Uyar, 2017). Economic growth and human activities have exerted a significant impact on the environment, including ecosystem degradation (OECD, 2021). Degradation of natural resources and climate change are among the impacts resulting from economic growth and human activities. The demands on companies are growing, requiring them to embrace a new perspective: the responsibility towards stakeholders. This requires taking into account the interests of the community, workers, and customers in addition to management and shareholders. To effectively manage a company's relationship with its environment, accounting is essential. Social responsibility and environmental responsibility are very important from an accounting perspective, especially when it comes to disclosure and reporting (Riduwan & Andayani, 2018).

Several companies nowadays possess financial management systems that not only concentrate on the economic aspects of the company but also consider their environmental impacts (Amrigan et al., 2023; Muslichah, 2020). As the economy continues to advance, the existing accounting systems primarily adhere to a financial-focused approach, often neglecting to include environmental factors like environmental costs and corporate expenses. Within the context of environmental preservation, accounting science assumes a role by means of voluntary disclosure within financial statements pertaining to environmental expenditures (Taygashinova & Akhmetova, 2019). Green accounting, or environmental accounting, is the name for an accounting system that takes into account costs that affect the environment (Aniela, 2012). In this context, the concept of green accounting emerges as an approach that emphasizes the integration of environmental aspects into the measurement of economic and financial performance. Maunders & Burritt (1991) were among the first to propose the concept of green accounting.

Green accounting has been advanced by Schaltegger & Burritt (2017) as an integral element of conventional financial accounting that takes into account both ecological and social costs and benefits and assists decision-making in favour of sustainable development. It provides information on the effect of activities on nature and the communities around them (Aniela, 2012).

It is the practice of measuring, recording, and reporting on environmental damages as a result of economic or business affairs. This is an attempt to understand the impacts of economic growth on the environment as well as aid in making wise decisions towards achieving sustainable development (Ritu & Chawla, 2021). The concept embodies numerous techniques and instruments for measuring ecosystem costs, estimating the

impacts of future climate change, and incorporating environmental aspects into financial accounting.

Moreover, it is pertinent to develop new models for the implementation of green accounting within accounting systems. This is based on the Aznar Bellver et al. (2015); De Posgrados et al. (2014); and Urraca Vergara et al. (2016) models, acquiring an agreement on key issues for including green accounting within the accounting discipline and taking into account critical environmental factors to be conveyed in financial reports, such as prevention, integration, and best practices.

Because it affects financial information, the creation and implementation of a green accounting model that results in the integration of environmental processes, units, and activities is crucial. In the literature, several definitions of "green accounting" have been put forth. Gonzalez & Mendoza (2021); Deegan (2013); Gallhofer & Haslam (1997); Greenham (2010); and Yang & Zhao (2018) argue that green accounting captures the environmental effect that a business creates throughout all of its revenue-generating activities. This will therefore make it achievable for businesses to generate more thorough and trustworthy financial data based on environmental and economic indicators that make it easier to evaluate the development and state of the business. This is valuable for decision-making (Ojito et al., 2017).

Numerous studies have proposed frameworks that take into account the environmental impact of companies within their accounting systems. Consequently, researchers consistently emphasize the necessity of incorporating new environmental processes and data into the General Accounting System (Bellver et al., 2015; Van Thanh et al., 2016). As a result, publications concerning green accounting continue to proliferate.

The progression of articles on green accounting is further evidenced by the increasing number of articles discussing this theme, particularly within Scopus-indexed journals. Hence, there is a need for mapping publications that specifically address green accounting. Bibliometric research typically aims to analyse the development, trends, and research focus on this topic within scholarly literature (Waltman & Noyons, 2018). Through bibliometric approaches, researchers can identify the primary contributors in this field, collaboration networks among researchers, changes over time in research emphasis, and the impact of relevant publications (Kim & Chung, 2018).

Therefore, this study specifically aims to achieve the following objectives:

1. To identify the most relevant publication sources in green accounting research;
2. To ascertain the authors and institutions that play the most significant roles in green accounting research;
3. To determine the most frequently cited documents in green accounting research;
4. To understand the conceptual framework within green accounting research

This research can assist future researchers in identifying important topics to be explored within the realm of green accounting. It can also aid academics in understanding the

evolution of green accounting over time, ensuring that the information conveyed to students is founded on accurate grounds.

2. Research Methodology

The compilation of this article aims to map the research outcomes from studies that have addressed green accounting over time. The methodology employed is bibliometric analysis using Biblioshiny from R-Studio and Vos Viewer. The research data is derived from the Scopus database, obtained through searches utilizing the keywords 'green accounting' and 'environmental accounting' to gather all relevant articles. The search was conducted in July 2023 with the search terms “green accounting” OR “environment* accounting,” limited to the fields of economics and business. The Scopus data was extracted in CSV format and processed using R-Studio's Biblioshiny and Vos Viewer. Data collection yielded a total of 421 relevant articles published between the years 1976 and 2023.

3. Result and Discussion

This section presents the collected data and analysis outcomes from the Scopus database, covering the research period from 1976 to 2023 (with a cut-off in July 2023). General information about the datasets of articles related to Green Accounting is extracted from R-Studio's Biblioshiny and is displayed in Figure 1 and Table 1.

Figure 1. Main Information



Source: Scopus Database, 2023

Table 1. Document Types

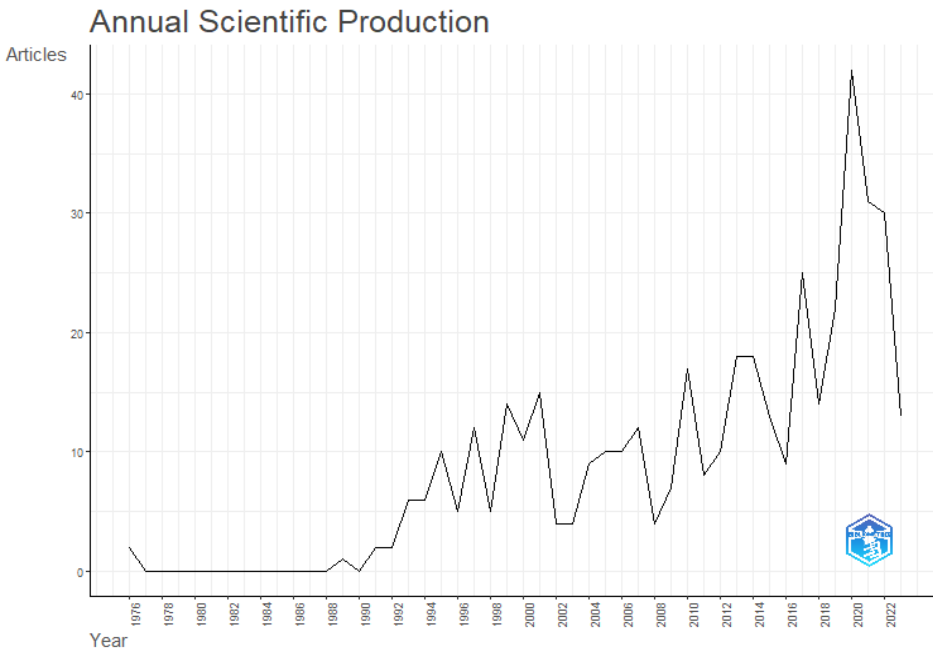
DOCUMENT TYPES	Result
Article	301
Book	7
Book chapter	44
Conference paper	17

Editorial	11
Note	13
Review	28
Total	421

Source: Scopus Database, 2023

Figure 1 displays statistics of the dataset based on the number of contributing sources to the related topic publications (180), average growth rate (4.06), average citations per document (26.59), average document age (11.6), and total references (17,617). The table also indicates that the majority of documents were published in the form of articles (301 documents). The Green Accounting literature dataset also encompasses a total of 528 author keywords. Out of the total 778 authors contributing to green accounting-related publications, 124 documents were written by a single author, while the remaining were authored by two or more individuals with an international co-authorship rate of 15.2%. There are a total of 421 documents, and from Table 1, most publications came from articles (301), and there are several other publications in the form of book chapters (44 documents), reviews (28 documents), and conference papers (17 documents).

Figure 2. Annual Scientific Production

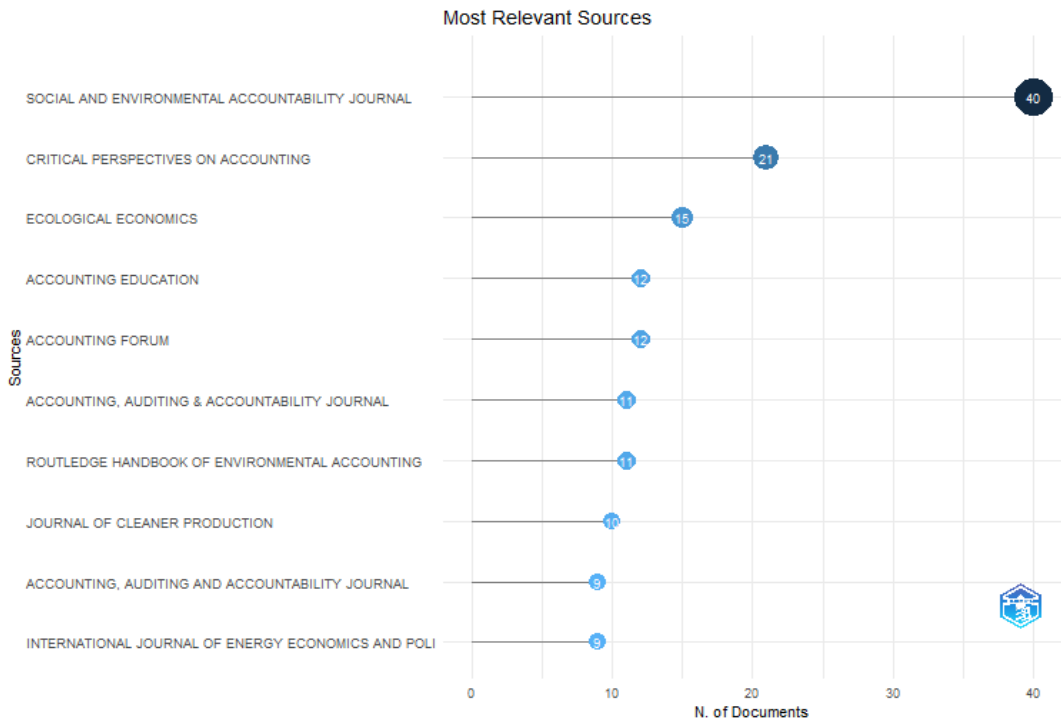


Source: Research results

Figure 2 shows the annual publication trend results. This shows a bar graph representing the number of publications per year. Looking at the figure above, there is clear evidence that in the past twenty years, the number of academic writings on green accounting has

increased at a very rapid pace. Green accounting publications first attracted some attention in 2017, and since then, their number has increased gradually every year. Green accounting achieved its peak with 42 publications registered in 2020. The outcome shows the high number of publications about green accounting this year compared to previous years, like in 2019, where there were 22 publications, and in 2018, there were 14 articles.

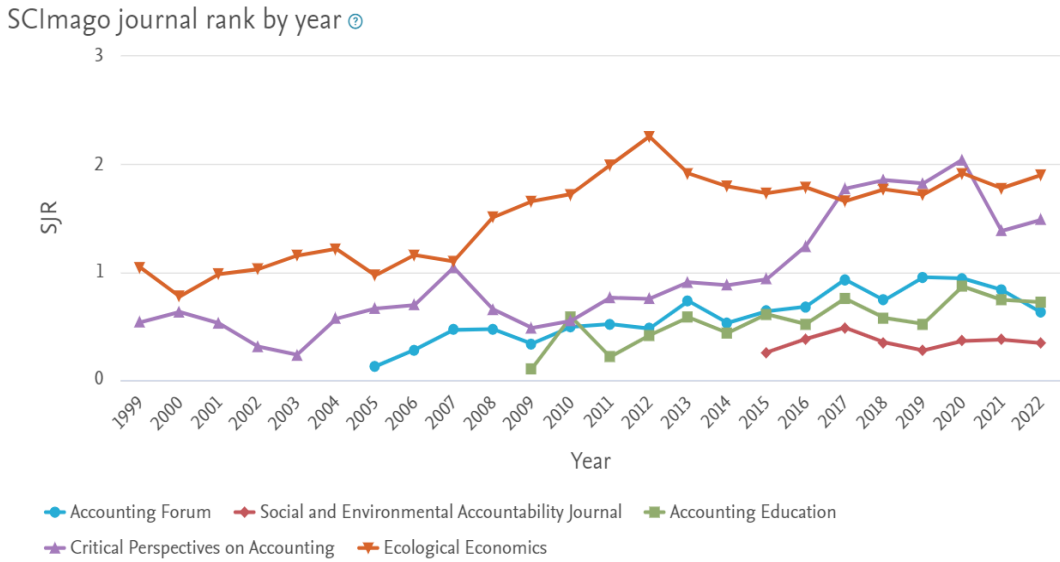
Figure 3. Most Relevant Sources



Source: Research results

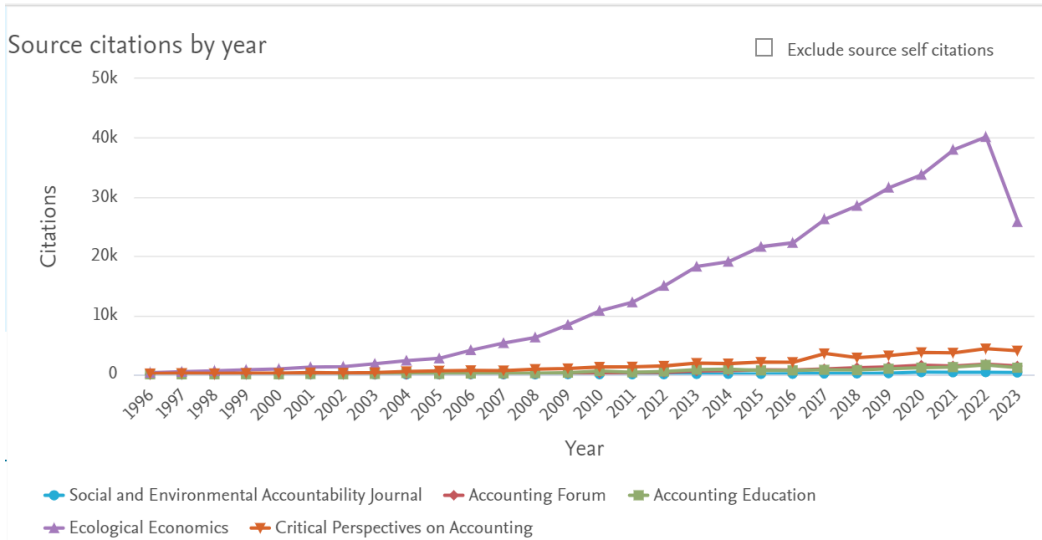
As shown in Figure 3, relevant green accounting journals hold the top positions. In comparison to other sources, the Social and Environmental Accountability Journal is considered the most important source, with forty documents related to green accounting. This disparity is stark, as only twenty-one articles were published under Critical Perspectives on Accounting, which was in second place. It is followed by Ecological Economics with 15 documents, followed by other sources with publication counts below 13 documents. However, when comparing the SCImago Journal Rank by year and Source Citations by year, as shown in Figures 4 and 5, Ecological Economics holds the highest SJR ranking with a score of 1.899 and the highest total citations in 2022 compared to other journals. The next rankings in SCImago Journal rank by year and total citations are occupied by Critical Perspectives of Accounting in second place and Accounting Forum in third place.

Figure 4. SCImago Journal Rank by Year



Source: Scopus Database, 2023

Figure 5. Source Citations by Year



Source: Scopus Database, 2023

Table 2. Publication by Author

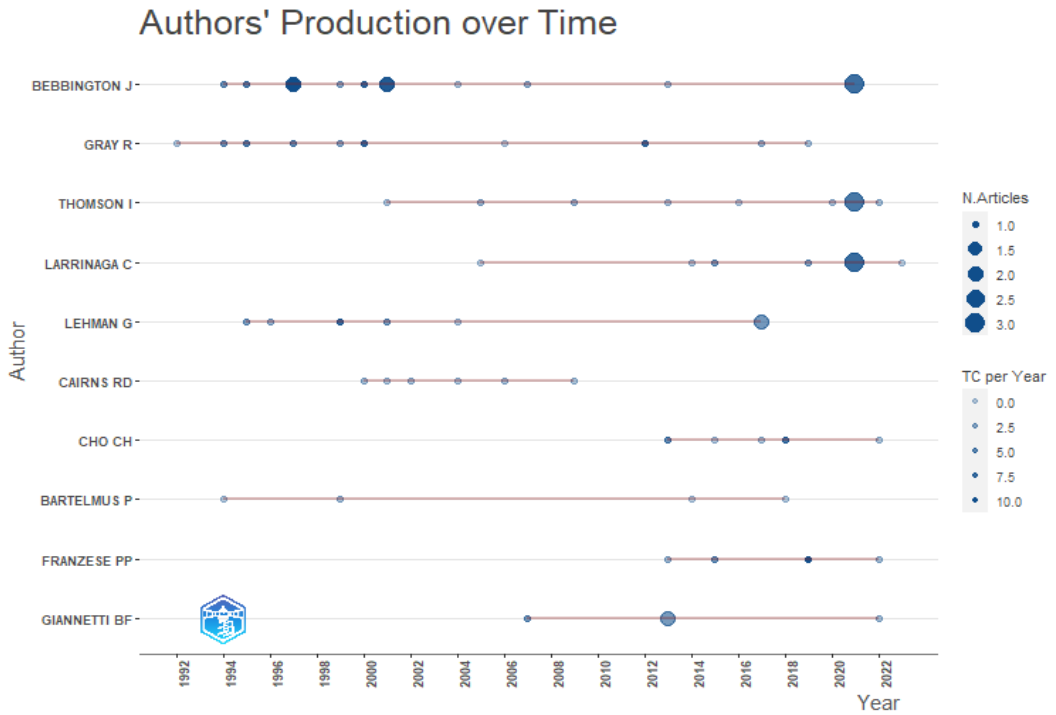
Authors	Affiliation	Articles
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Bebbington Jan	The Pentland Centre for Sustainability in Business	14
Gray Rob H.	School of Management, St Andrews	10
Thomson Ian H.	Birmingham Business School	10
Larrinaga Carlos	Universidad de Burgos	8
Lehman Glen	University of South Australia	7
Cairns Robert D.	Université McGill	6
Cho Charles H.	ESSEC Business School	5
Bartelmus Peter L.P.	Universität Heidelberg	4
Franzese Pier Paolo	Parthenope University of Naples	4
Giannetti Bf	Universidade Paulista	4

Source: Scopus Database, 2023

Table 2 presents the top 10 authors in the field of green accounting, each contributing a minimum of 4 publications. From this table, Bebbington Jan (14 publications) from The Pentland Centre for Sustainability in Business emerges as the leading author contributing to studies in green accounting, followed by Gray Rob H. from School of Management St Andrews and Thomson Ian H. from Birmingham Business School with 10 publications each. Subsequently, there are several authors with fewer than 10 publications, including Larrinaga C., Lehman G., Cairns RD., and others.

Figure 6. Authors Production over time



Source: Research results

Figure 6 above illustrates the productivity of authors over the years. Bebbington J. has the highest and most consistent publication output, spanning from 1994 to 2021, indicated by the blue circles transitioning from thick to small along the red line. These circles represent the number of articles produced. The red line signifies the author's activity in their research, progressing from their initial works to their most recent publications. The circles within the red line indicate the quantity of papers published each distinct year. Bebbington was most active in publishing her articles in 1996, 2000, and 2021. Following her is Gray R., who has a total of 10 articles published from 1992 to 2019, as well as Thomson and Larrinaga, who predominantly published their articles in 2021.

Table 3. Productivity based on Country

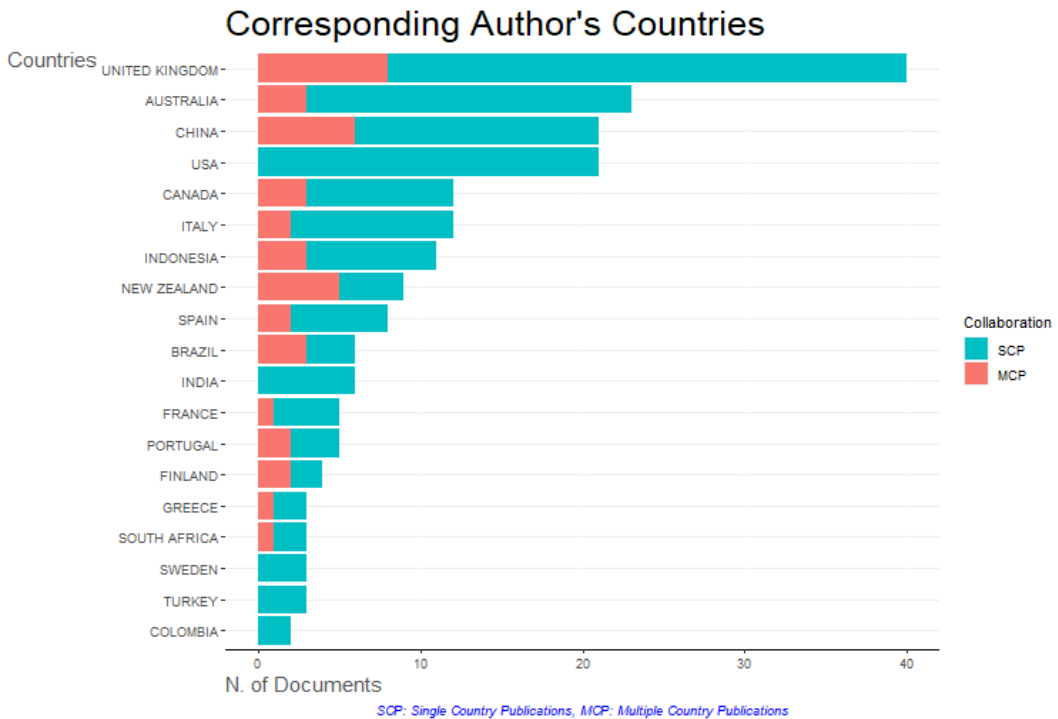
Country	Number of Documents
United Kingdom	112
United States	81
China	70
Italy	60
Australia	59

Indonesia	51
Spain	46
Brazil	35
India	25
New Zealand	24

Source: Scopus Database, 2023

Furthermore, to assess the productivity of countries in generating publications related to the theme of green accounting, Table 3 provides the top 10 most productive countries with a minimum of 10 published documents. It is evident that the United Kingdom is the most productive, producing 112 documents, surpassing the second rank, the United States, with 81 documents. China takes the third position with 70 documents. The results of this analysis underscore that these countries contribute significantly to publications within the field of green accounting.

Figure 7. Author Correspondence by Country of Origin

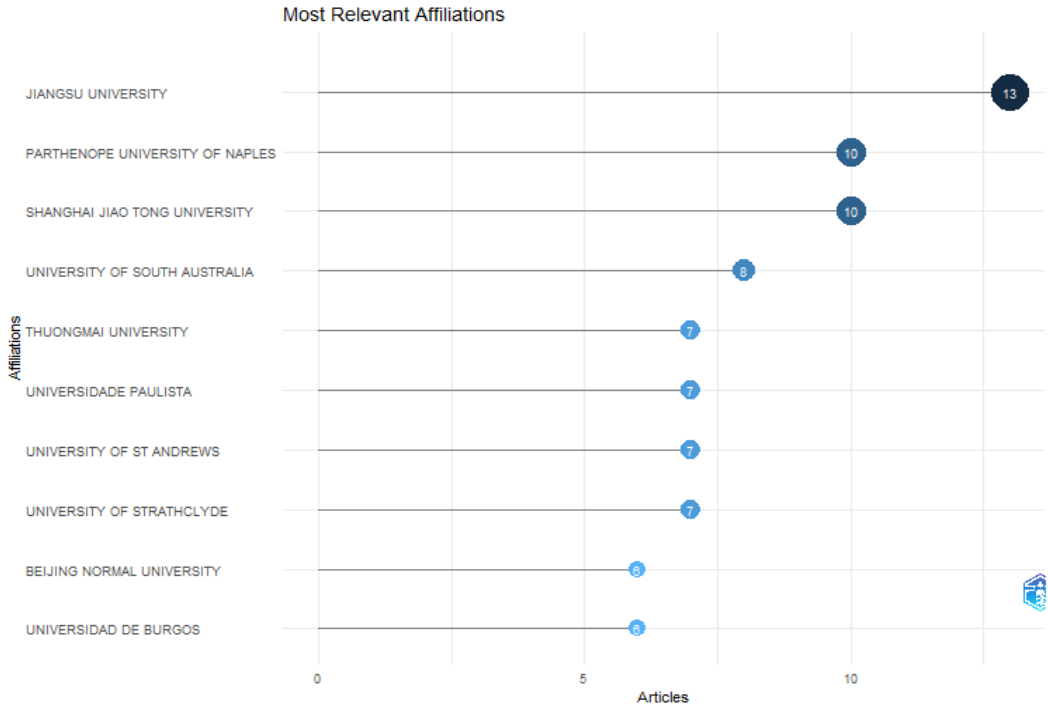


Source: Research results

Figure 7 maps author correspondence based on their country of origin in each article within the topic of green accounting and determines whether these collaborations are SCP (single-country publication) or MCP (multi-country publication). Based on this data,

the United Kingdom holds the first rank with the highest author correspondence, with over half of its publications being single-country collaborations. The second position is held by Australia, although collaborations with other countries account for only 1/4 of their total documents. In third place is China, where 1/3 of the publications are produced through collaborations with other countries.

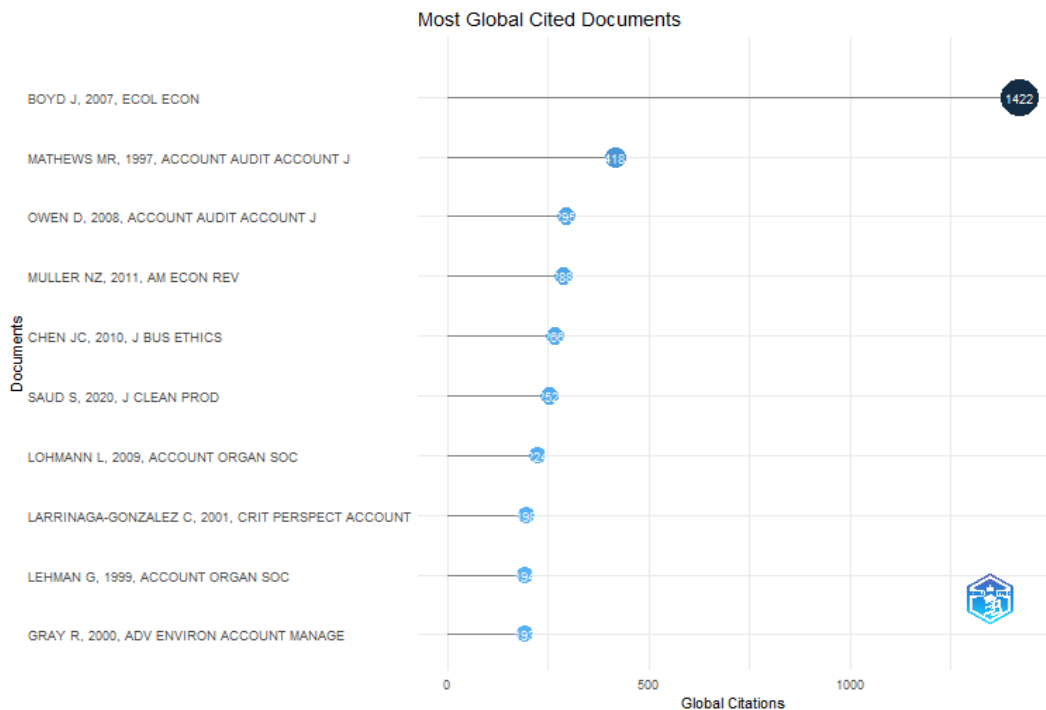
Figure 8. Most Relevant Affiliation



Source: Research results

Figure 8 displays the most productive institutions publishing articles on the topic of green accounting. The top institution is Jiangsu University with 13 documents, followed by Parthenope University of Naples and Shanghai Jiao Tong University with 10 documents each. Apart from these top three institutions, there are several other institutions with document counts below 10, such as the University of South Australia with 8 documents.

Figure 9. Most Global Cited Documents



Source: Research results

Figure 9 depicts the 10 most frequently cited documents in green accounting research. The three most cited documents in this field are articles by Boyd & Banzhaf (2007) with the title “What are ecosystem services? The need for standardized environmental accounting units”, followed by Mathews (1997) with the article titled “Twenty-five years of social and environmental accounting research: Is there a silver jubilee to celebrate?” and Owen (2008) with the article titled “Chronicles of Wasted Time? A Personal Reflection on the Current State of and Future Prospects for Social and Environmental Accounting Research”. Boyd & Banzhaf (2007) published their article in the Ecological Economics journal, while Mathews(1997); and Owen (2008) published their article in Accounting, Auditing and Accountability Journal.

Boyd & Banzhaf (2007) has a total of 1,422 citations and investigates standardized ecosystem measurement units. The purpose of these measurement units is to enable the comparison of ecosystems with conventional goods and services definitions found in the GDP and national accounts of other countries. The existence of such uniform measurement units is expected to provide a foundation for environmental performance measurement by governments, conservation efforts, and the environmental market.

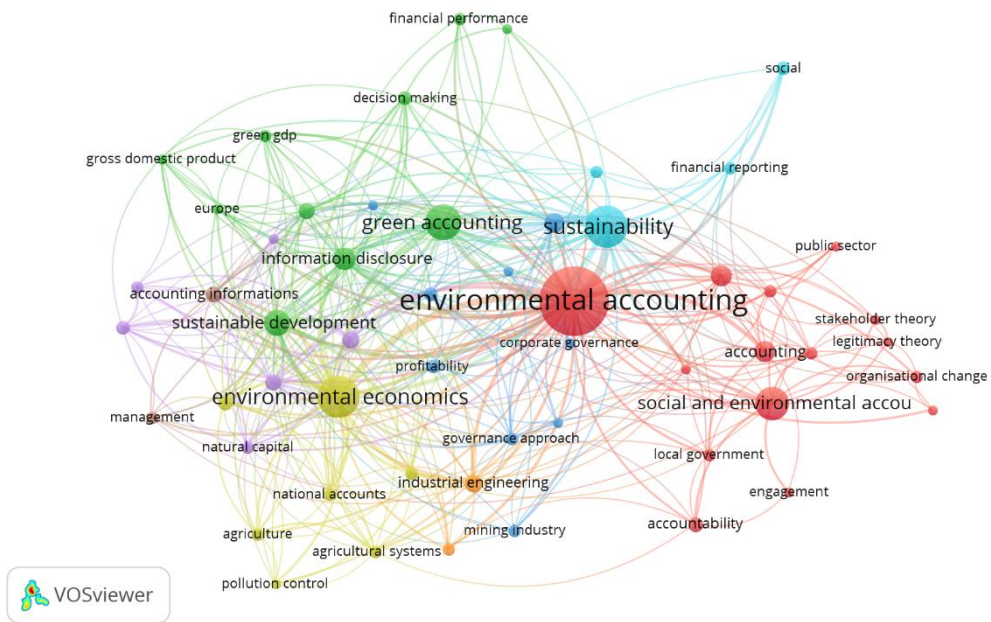
Mathews (1997) has a total of 418 citations and reviews the literature from the past 25 years on social and environmental accounting. Its main goal is to assess the position, respond to the questions raised in the title, and offer a framework or classification that

others can utilize. It uses three time periods (1971–1980, 1981–1990, and 1991–1995) in order to perform a thorough review. It also divides the literature into a number of subgroups, such as normative statements, empirical studies, philosophical discussions, non-accounting literature, teaching materials and textbooks, regulatory frameworks, and other reviews.

Owen (2008) has a total of 195 citations and intends to give a critical summary of the advancements and research in social and environmental accounting, emphasizing the function and significance of the Accounting, Auditing, and Accountability Journal. It also provides some perspectives on potential future developments in the field. To perform this literature review, a collection of works from 1988 to 2007 was collected.

Based on these top three articles, it appears that research in this field is predominantly conducted using literature review methods to establish frameworks and measurement units that can be utilized and applied. The presence of such frameworks and measurement units is expected to serve as a foundational reference for various entities when implementing green accounting.

Figure 10. Network Map Based on Authors' Keywords

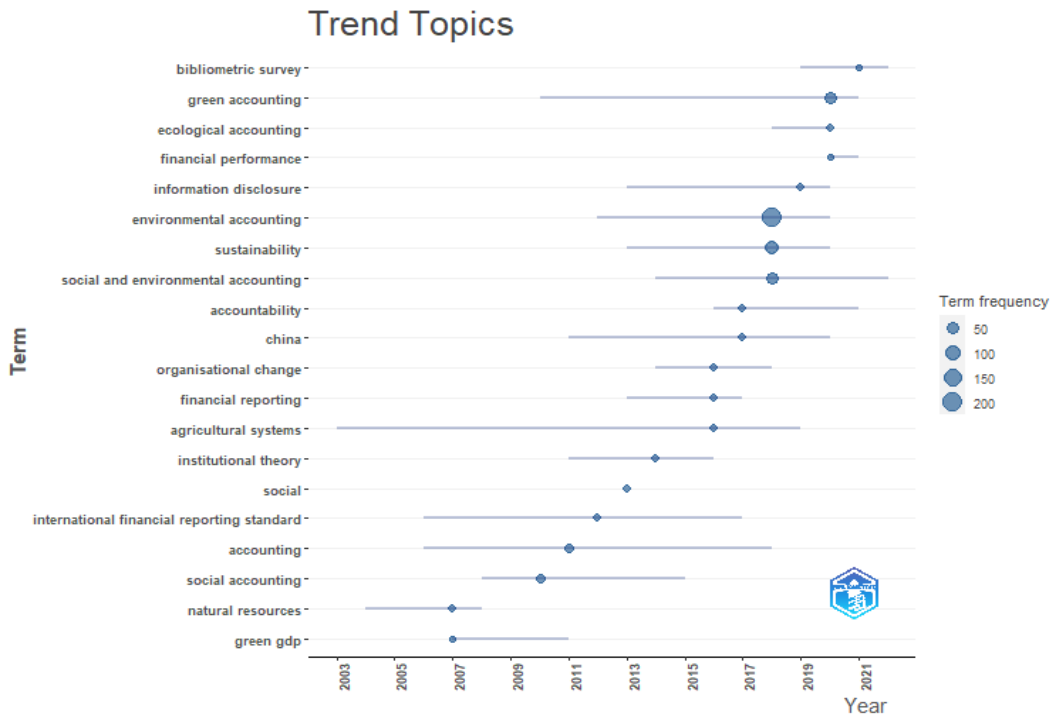


Source: Research results

Figure 10 illustrates the co-occurrence network of author keywords. The analysis results were obtained using Vos Viewer. The size of the circles indicates the frequency of occurrence of each keyword and its associations with other keywords, while the colours indicate the same clusters. The co-occurrence network analysis of keywords reveals that green accounting literature can be categorized into five distinct clusters represented by

five different colours. The red cluster is the central one, with the main keyword “environmental accounting.” This keyword serves as a central node connecting all other clusters. The blue cluster focuses on the topic of sustainability and is more connected to the green cluster with the main keyword “green accounting”. The yellow cluster is the next central cluster, interconnecting the other four clusters with environmental economics as the main keyword. The purple cluster, on the other hand, is focused on accounting information and ecosystem services and is predominantly connected to the yellow cluster.

Figure 11. Trends in Topics within Green Accounting Publications



Source: Research results

Based on the trend analysis depicted in Figure 11, it is evident that the topic of environmental accounting is the most frequently discussed topic in green accounting publications. This topic first emerged in 2012 and has consistently been addressed by many researchers up to 2020. The trend of discussing this topic is gradually being followed by social and environmental accounting, starting in 2014 and continuing to the present day. Meanwhile, the topic of agricultural systems captured attention for an extended period, from 2003 to 2019.

4. Conclusion

Publications related to green accounting can be found in the Scopus database from 1976 to 2023 (cut-off: July 2023). More than 75% of the publications in this field are generated from articles. This topic continues to evolve up to the year 2023, as shown by the upward

trend in the graph. This development is supported by the most productive sources of publications and authors, which can assist researchers in this field by providing initial information and references for their work.

A total of 421 scholarly publications were analyzed to gain a deeper understanding of the trends and research patterns in the domain of green accounting. The year 2020 witnessed the highest productivity in research publications on green accounting, with a total of 42 documents. The Social and Environmental Accountability Journal emerged as the most prolific journal, publishing articles on this topic. Ecological Economics holds the highest SJR ranking and total citations in the field of green accounting. Among authors, Bebbington J., Gray R., and Tomson I. were the most productive in terms of the number of publications, while Boyd J. and Banzhaf S.'s (2007) article garnered the most influence based on its citations. Jiangsu University emerged as the institution with the highest production of articles related to green accounting, while the United Kingdom and the United States appear to be the largest contributors to this field.

In terms of international collaboration, the United Kingdom stands out as the country with the highest number of multi-country collaborative works. The co-occurrence analysis of author keywords reveals the main topic in the field of green accounting, which is environmental accounting. This topic has dominated since 2012 and is currently expanding and extending into other trending topics, such as social and environmental accounting.

Based on the findings of this study, it is evident that research in the field of green accounting continues to be a highly sought-after topic. This is illustrated by the evolution and transformation of several classical topics that have previously dominated this research domain. For instance, the classic topic of environmental accounting has expanded to include the emerging field of social and environmental accounting. However, regrettably, green accounting research seems to have shifted its focus more towards external effects, thereby moving away from other central topics in accounting, such as accounting information. For future research on the topic of green accounting, it would be beneficial to re-focus on accountability and the accounting information generated as a result of implementing green accounting practices.

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