Research article

The Growth of Green Accounting in Indonesia: A Bibliometric Analysis Using R

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Abstract.
In this disruptive era, the problem of delay (delay), affordability (access) in the exchange of information and data is an issue that worries the public, especially in the judicial process, which if ignored, will cause new problems for justice seekers, especially in the Religious Courts. In addition, the issue of integrity (integrity) is an aspect that needs to be optimized in the community service process so that the Religious Courts become a place that can provide justice for the wider community. This study seeks to explore several factors that encourage the birth of an information technology-based system within the Supreme Court (e-litigation), as well as the strategy of the Siak Sri Indrapura Religious Court in realizing a modern judicial process with integrity. The research data was obtained by conducting interviews with judges and court officials, observation, and documentation in the field, and then the data were analyzed using descriptive qualitative methods. The results of this study indicate that the Siak Sri Indrapura Religious Court applies internal coaching strategies and legal socialization to the community to realize a modern and integrity judicial process to get the best predicate in the implementation of E-Litigation.

Keywords: Strategy; modern; integrity

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1. Introduction

1.1. Background

In their daily activities, companies have an impact on environmental problems and nature conservation. The accounting sector can play a role in environmental conservation efforts related to environmental costs, and the implementation of green accounting could be a key factor that can improve the company's financial performance. Issues related to the green industry and environmental accounting are urgent to be formulated by the government. The concept of environmental accounting for companies encourages the ability to minimize environmental problems (1). Environmental accounting will produce a quantitative assessment of the costs and impacts of environmental protection. Green accounting activities consisted of environmental awareness, environmental

involvement, and environmental reporting. The concept of harmonious culture (green culture) emphasized the harmonization with God, human beings, and the environment to reach happiness (2). As we all know, industrial activities have a positive impact on the economy; on the other hand, they harm the environment. Therefore, it must be controlled and balanced. So that issues related to green industry and environmental accounting are increasingly urgent to be formulated by the government (3), as a policy regulator, with all the support, input, and feedback from green accounting stakeholders.

1.2. Objectives

The analysis focused on describing the titles, keywords, authors, journals, and characteristics of articles on green accounting, retrieved from the Dimensions database (https://www.dimensions.ai/). Papers on this topic are interesting to discuss considering the importance of scientific research for generating ideas and innovations in response to economic problems, especially in the finance and accounting sectors. From this visual analysis generated from R Biblioshiny, we can determine how green accounting can improve the financial performance of companies in Indonesia, a developing country.

1.3. Literature Review

A decade has passed since *Wasting Assets*, a study of Indonesia by Robert Repetto and colleagues at the World Resources Institute, drew widespread attention to the potential divergence between gross and net measures of national income. This was by no means the first 'green accounting' study. Martin Weitzman, John Hartwick, Partha Dasgupta and Geoffrey Heal had all conducted seminal theoretical work in the 1970s. But the World Resources Institute study demonstrated that data were adequate even in a developing country to estimate adjustments for the depletion of some important forms of natural capital and that the adjustments could be large relative to conventional, gross measures of national product and investment. The adjusted, net measures suggested that a substantial portion of Indonesia's rapid economic growth during the 1970s and 1980s was simply the unsustainable 'cashing in' of the country's natural wealth. Green accounting is a type of accounting that attempts to factor environmental costs into the financial results of operations. It has been argued that gross domestic product ignores the environment and therefore policymakers need a revised model that incorporates green accounting (4,5). Green accounting (also known as environmental accounting) seeks to better measure sustainability by expanding gross measures of

national welfare (product, investment, etc.) to include non-market values, in particular ones associated with environmental goods and services. In the article ”Urgency of Green Accounting Standards”, Andreas Lako had discussed the misconception of the conventional accounting treatment for social and environmental responsibility costs or CSER costs and green business costs, as well as the urgency of implementing Green Accounting Standards (GAS) to green the accounting practices and reporting of accounting information for corporate entities. Greening of Financial Accounting Standards (FAS) and entities accounting practices is very important and urgent to do because in addition to dismissing allegations from various parties that accounting and accountants have produced accounting information that is inaccurate and misleading and a source of crisis triggers social and environmental, also intended to support the realization of the green business and green economy movement to realize sustainable development and overcome social and environmental crises.

The objectives of green accounting are Segregation and elaboration of all environment-related flows and stocks of traditional accounts; Linkage of physical resource accounts with monetary environmental accounts; Assessment of environmental costs and benefits; Accounting for the maintenance of tangible wealth; Elaboration and measurement of indicators of environmentally adjusted product and income (5,6). Green accounting has superiority over conventional accounting systems, namely conventional accounting does not fully take into account pollution preventive expenditure. Green accounting considers pollution preventive expenditure and also environment impact studies. Also, conventional accounting does not measure the depletion of natural resources and the degradation of the environment. Green accounting considers the costs of depletion of natural resources and changes in environmental quality.

2. Methodology

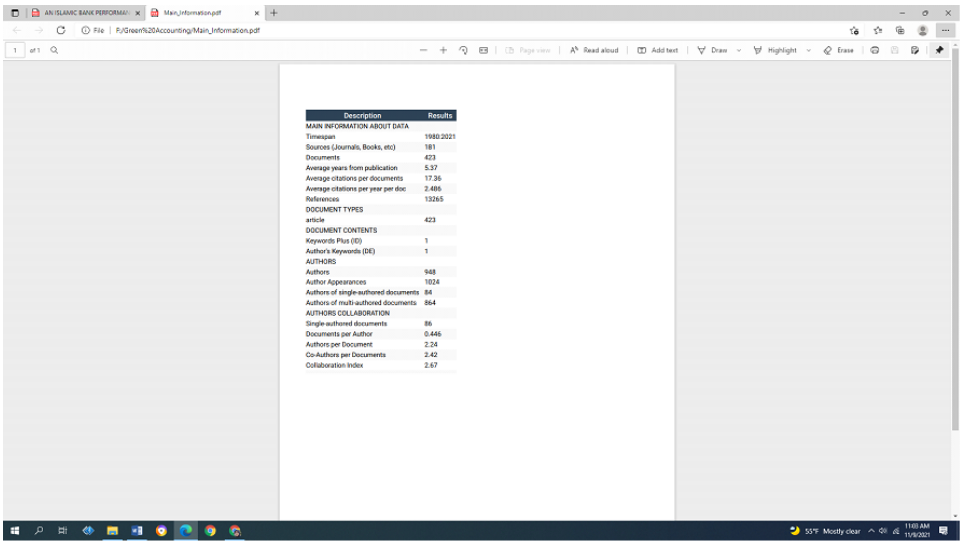
Ethics statement: This research did not involve human subjects. Therefore, neither institutional review board approval nor informed consent was needed. Study design: This was a literature-based descriptive study involving a bibliometric analysis. Setting: This study used publication data related to green accounting sourced from the Dimensions database. The Dimensions database is an alternative indexation with the criterion that all articles have a specific DOI. The search terms were “green accounting” and “Indonesia” in the full data. This search was conducted in October 2021 and yielded 423 documents. Data on keywords, authors, journals, and the characteristics of these documents on the term of Green accounting were analyzed using the R-based Biblioshiny app, which is

freely available from: https://bibliometrix.org/. Statistical methods: Descriptive data are presented as numbers, percentages, and rankings. Descriptive statistical analyses were carried out to present the timeline and distribution of the articles.

3. Result and Discussion

3.1. Publication Types of Sources

Based on the article data retrieved from Dimensions, it was obtained 423 documents only consisted of one type, i.e. journal articles. With timespan from 1980 to October 2021.



Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1980:2021
Sources (Journals, Books, etc)	181
Documents	423
Average years from publication	5.37
Average citations per documents	17.36
Average citations per year per doc	2.486
References	13265
DOCUMENT TYPES	
article	423
DOCUMENT CONTENTS	
Keywords Plus (ID)	1
Author's Keywords (DE)	1
AUTHORS	
Authors	948
Author Appearances	1024
Authors of single-authored documents	84
Authors of multi-authored documents	864
AUTHORS COLLABORATION	
Single-authored documents	86
Documents per Author	0.446
Authors per Document	2.24
Co-Authors per Documents	2.42
Collaboration Index	2.67

Figure 1: Main Information.

3.2. Three-Fields Plot

The three fields plot shown below is an illustration of three elements, consisting of a list of journal sources, authors name, and topic (Fig. 1), and allowed their relationships to be analyzed. It also showed the topics discussed by the authors and the journals in which authors published their research. This plot also presented the quantity of each element, the journals with the most publications on the relevant topics, and the most productive writers. These three elements are plotted with gray linkages that show their relationship with each other, starting from the name of the top 11 indexed journals, followed by the authors, and each author is then linked to the topic of their publication. The size of each rectangle in each list indicates the number of papers associated with

that element. The first element, on the left, is the name of the journals. The top 20 authors with their journals were indexed in the three fields plot as having published papers on the topic of green accounting, and the top journal that published the most papers on this topic was the *Business Strategy & Environment*. The second element in the middle contains the author's names. Authors who published articles in journals that were recognized are associated with some key elements. However, some others did not publish in indexed journals and therefore do not have any connection with any of the journals listed, namely Darus F and Chariri A. Each of the authors is also associated with frequently used keyword topics on the right. The 20 top authors are listed in this plot. The size of the rectangle shows the number of papers written by each author. In this plot, Gallego-Alvarez I, Pucheta-Martinez, and Yusoff H had the largest rectangles. The third element contains the topic-related keywords that appeared most frequently in the papers. Each topic is associated with authors who published extensively on that topic. There are 18 keyword topics are listed, and the keyword that appeared most frequently was "environmental" as indicated by the size of the light green rectangle, which dominated the other rectangles. It also appeared that the topic of "environmental" was used by almost all of the registered authors, which aligns with the focus of this research on scientific papers related to green accounting.

Figure 2: Three-Fields Plot.

3.3. Source Impact

In addition to the quantity and relevance of publications, this study also analyzed the impact of each journal that published papers on the topic of green accounting by calculating the journal's H-index, which is depicted in the bar chart shown in Fig. 2. Along with a numerical representation of the H-index value of each journal, this diagram also shows the impact of each journal through the shade of blue, with a darker color indicating higher-impact journals. Of the journals listed, two journals are of most interest to authors with the theme of Green accounting, namely "Accounting Auditing & Accountability Journal" occupied the top position in terms of impact with an H-index of 12 and a black bar on the chart, and "Business Strategy and the Environment" in the second position with H-index of 11. Eighteen other journals had an H-index of 11 and less, are colored light blue on the diagram, indicating their relatively low impact.

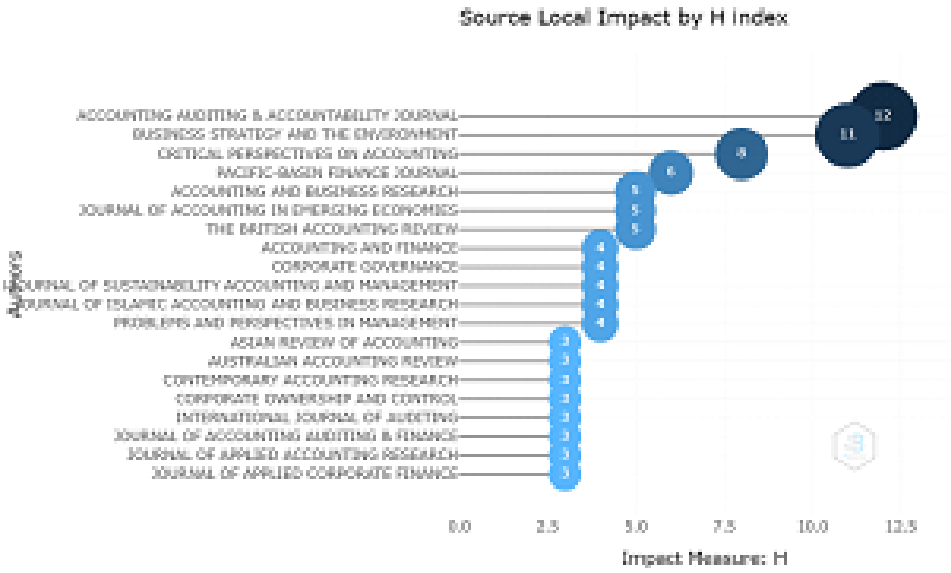


Figure 3: H-index value of Top 20 journal.

3.4. Source Growth

This study also discusses the development of journals that are the source of research on the theme of green accounting. The curve above shows the development of the annual occurrence of each journal from 1980 to 2021. The articles with the theme of Green accounting have continued to develop since Mattessich R (1980) publish an article by title: "On the Evolution of Theory Construction in Accounting: a Personal Account" (7). The curve illustrates that research with the theme of green accounting first appeared in 1980, then tends to flatten from 1980 to 2001, but has a significant increase in its

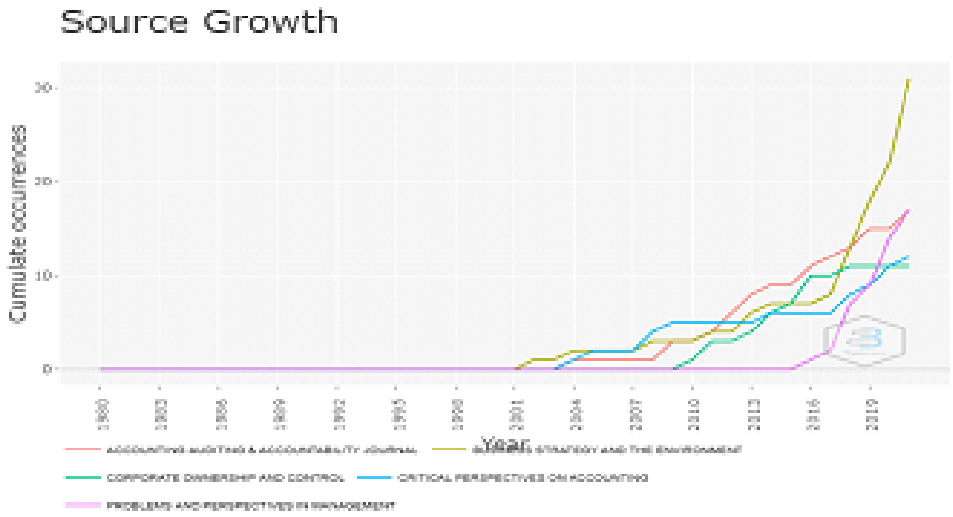


Figure 4: Source Growth.

publication from 2017. Overall, the curve above shows that the journal started to develop in 2001, have a stable growth for a few years, and then started to increase from 2017 until now. The development of articles with this theme can be seen from the increase in the number of articles published from 2017 to October 2021, and it can still be increased for the next years. This continuous increase could be caused by the still interesting research with the theme of green accounting. Because as is well known, environmentally-based accounting is still not widely adopted by the manufacturing industry, only a voluntary adoption, not mandatory. So researchers are interested in conducting an in-depth study of this theme.

3.5. Most Relevant Author

Authors who have published their papers can also be sorted by the number of published documents, ranging from 2 to 6. The magnitude of the number of documents is marked in black color on the top bar chart. The figure below shows that the author with the highest number of documents is Gallego-Alvarez I with 6 published articles marked with black color dots. Meanwhile, 19 other authors obtained vary from 4, 3, and 2 number of documents, which indicates that the study and research on the theme of green accounting with the object are Indonesia is quite high.

Figure 5: Most Relevant Author.

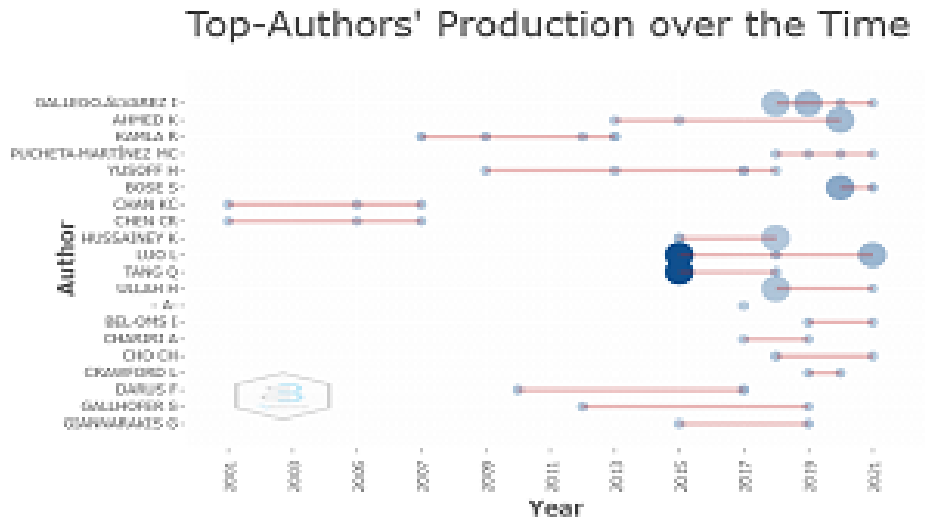


Figure 6: Top Author's Productivity.

3.6. Top Author's Productivity

Productivity not only is measured in published journals, but also in the author in particular. Where in the picture above shows the productivity of the top 20 authors during the period of the study, namely from 1980 to 2021. This productivity is shown by a red line from the beginning of the author publishing his research until the last year the author was recorded to publish his research. Also, the circle in the red line shows the number of papers issued according to the applicable year. The figure above presents a description of the author who has written research related to green accounting research for a long time until recently. The top 20 authors who first published research related to

green accounting research, namely Chan KC and Chen CR from 2001 to 2007, however, no articles were found which they published after 2007. Of the articles that have been published, most of the author's articles documents have been published for a long time, but Luo L and Tang Q seem to write many articles in the year 2015, it can be seen from the deep blue color of the dots.

3.7. Author Impact

Figure 7: Author Impact.

Authors who have published their papers can also be sorted based on the resulting impact based on the H-index. H-index values of this bibliometric Top 20 authors range from 2 to 4. The magnitude of the impact is marked in blue color in the bar chart above. Wherefrom the picture above shows that there are 2 authors with the highest h-index with the achievement of number 4 marked with a very dark blue dot chart color that describes the maximum impact, namely Gallego-Alvarez I and Kamla R. Meanwhile, the other 18 authors obtained the H-index vary from range 3 to 2 level of H-index impact. Based on the data obtained, only a few authors have had a major impact factor examining the topic of Green accounting. This means that qualified researchers have not contributed much to this theme. The research with this theme is very helpful for developing an environmentally-friendly business.

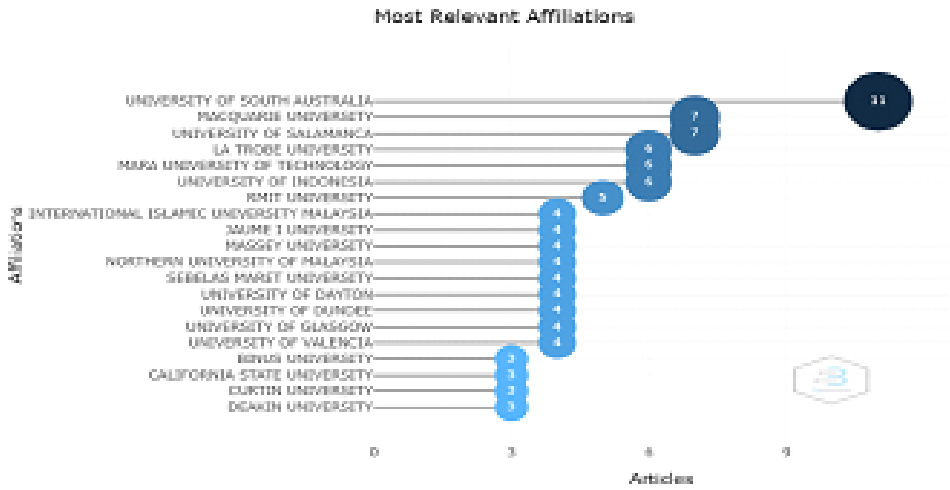


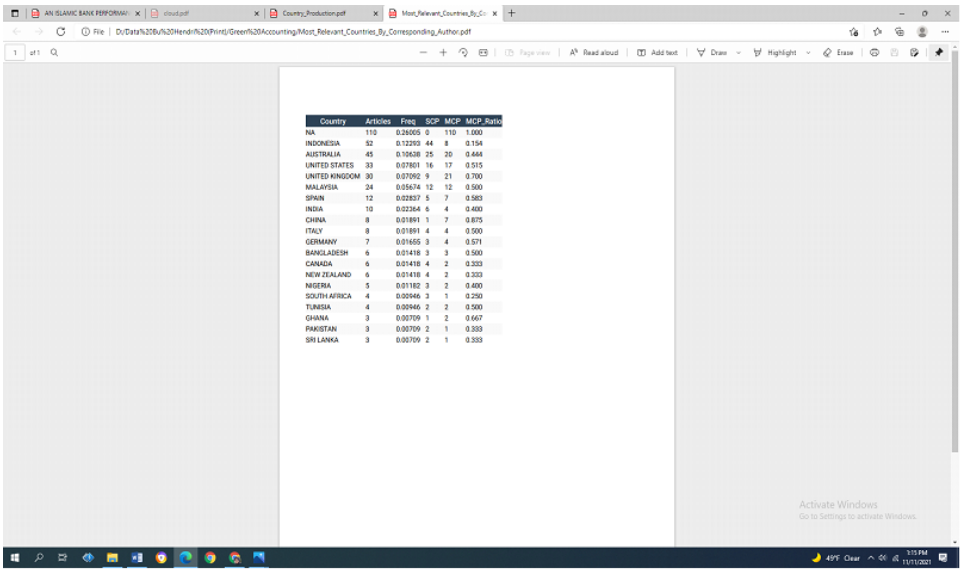
Figure 8: Most Relevant Affiliations.

3.8. Most Relevant Affiliations

The picture above shows the number of research documents with the theme of green accounting research based on the author's affiliation. The figure shows the top 20 affiliations and the number of published document intervals with a blue bar chart. The darker the blue indicates the more affiliation of the researcher. The number of documents published of the Top 20 most relevant affiliations ranged from 3 to more than 10 documents. The University of South Australia is an affiliate that is in the top position with several publications of more than 10 documents. Furthermore, Macquarie University is in second place with the number of publications of 7 documents. Meanwhile, the other 18 affiliates only published less than 6 documents. The most productive affiliation is The University of South Australia, this is very interesting because it indicates that the affiliates who research green accounting in Indonesia are not from Indonesia itself.

3.9. Corresponding Author's Country

The figure below shows the author's correspondence countries contained in each article with the calculation of the form of the entire collaboration of SCP (single country collaboration) or collaboration of one country, and MCP (multiple country collaboration) or collaboration between several countries. Here are the top 20 countries included in this data and the document quantity interval between 3 to more than 50 published paper documents with the theme of green accounting. The exact number of the published article based on countries is shown in Table 2.



Country	Articles	Freq	SCP	MCP	MCP_Ratio
NA	110	0.26005	0	110	1.000
INDONESIA	52	0.12293	44	8	0.154
AUSTRALIA	45	0.10638	25	20	0.444
UNITED STATES	33	0.07801	16	17	0.515
UNITED KINGDOM	30	0.07092	9	21	0.700
MALAYSIA	24	0.05674	12	12	0.500
SPAIN	12	0.02837	5	7	0.583
INDIA	10	0.02364	6	4	0.400
CHINA	8	0.01891	1	7	0.875
ITALY	8	0.01891	4	4	0.500
GERMANY	7	0.01655	3	4	0.571
BANGLADESH	6	0.01418	3	3	0.500
CANADA	6	0.01418	4	2	0.333
NEW ZEALAND	6	0.01418	4	2	0.333
NIGERIA	5	0.01182	3	2	0.400
SOUTH AFRICA	4	0.00946	3	1	0.250
TUNISIA	4	0.00946	2	2	0.500
GHANA	3	0.00709	1	2	0.667
PAKISTAN	3	0.00709	2	1	0.333
SRI LANKA	3	0.00709	2	1	0.333

Figure 9: Author's Countries.

The results obtained are that Indonesia is in the first ranks as a country with the highest quantity of author correspondence with more than 50 published papers. Furthermore, in second place is Australia with 45 published papers. USA and UK occupy the third and fourth positions with the number of publications of 33 and 30 documents. Furthermore, 16 other countries are in the next rank with less than 30 papers each. This data shows the need for an increase in the number of paper publications on the theme of green accounting in other countries, especially Indonesia, to research better new ideas and innovations related to green accounting so that it is hoped that it can produce better output. The information from the table above can be visualized in Fig. 10.

3.10. Most Cited Country

This paper also classifies research with the theme of this research. This research also classifies research on the theme of green accounting based on the author's country of origin who is widely quoted. There are several countries quoted with the number of occurrences ranging from 0 to almost reach the number of 1.800 occurrences. Australia is the most cited country, with more than 1.700 citations marked with the darkest blue diagram showing the largest number of citations and has high relevance to the theme of green accounting. Then, the USA is the second country with the most citations, with 1.026 citations. The next 18 countries have fewer than 800 citations. Several names of countries and regions of the world appeared in the word cloud, including Australia, USA,

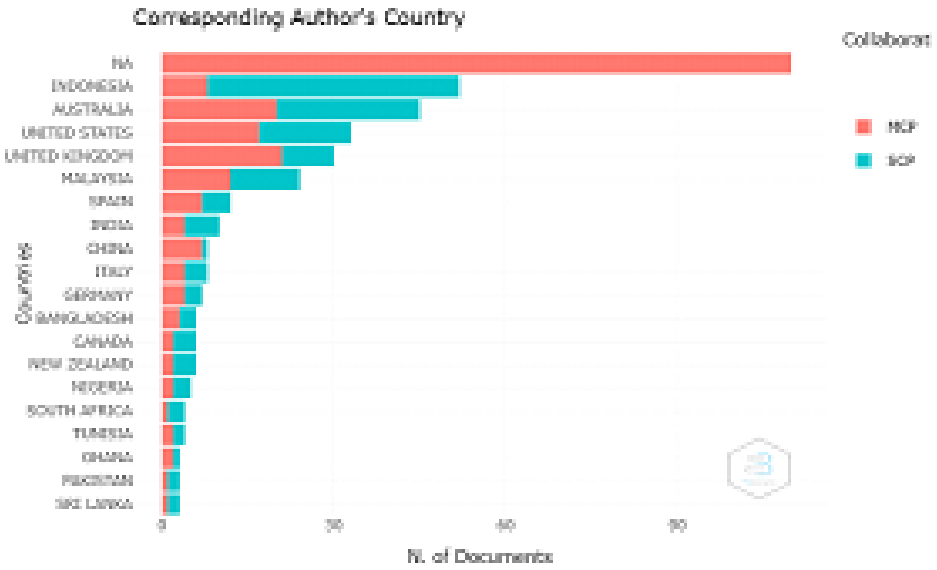


Figure 10: Corresponding Author's Country.

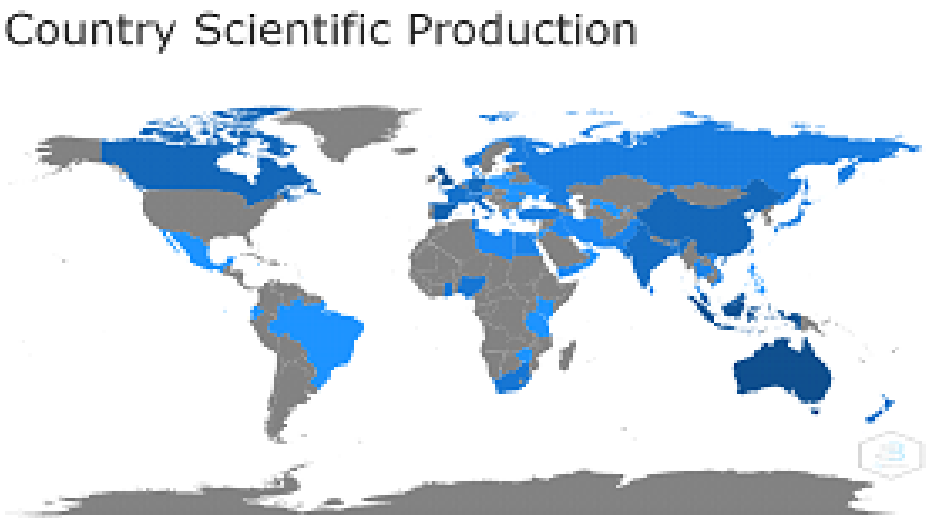


Figure 11: Country Scientific Production.

UK, China, Germany, and so on. This fact shows that several countries were frequent objects of study in research on green accounting.

3.11. Documents Analysis

The next part is to classify research on the theme of green accounting based on the most cited documents. There are several documents with a citation quantity between 0 and more than 600 appearances. The top document is marked with a dark blue diagram showing the comparison of the number of citations of a document relevant to the theme

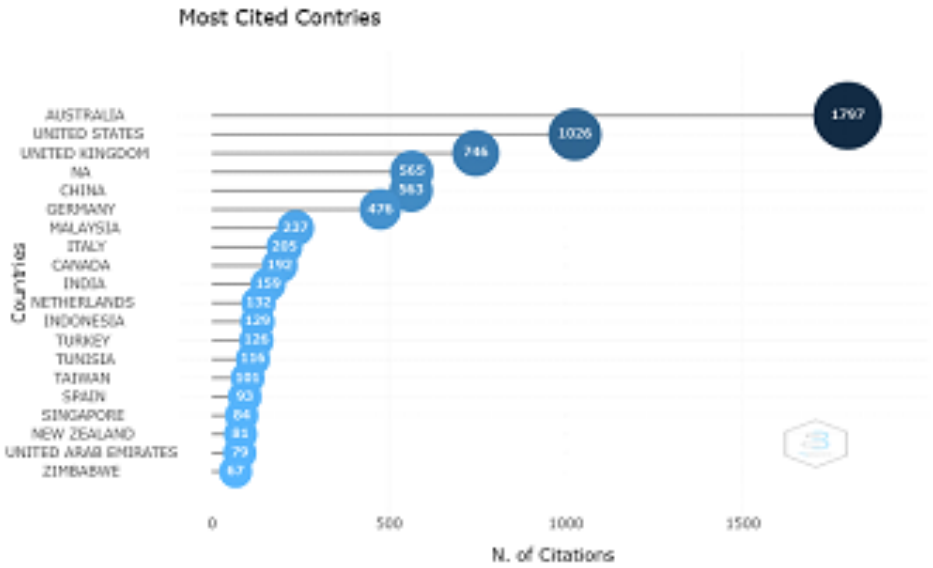


Figure 12: Most Cited Country.

of green accounting. Based on the graph below, the document that has been cited the most is Adams CA (2004) in Accounting Auditing & Accountability Journal, the title of his article is “The Ethical, Social and Environmental Reporting Performance Portrayal Gap” with 499 citations. Adams CA from Deakin University, Australia. In the second place is Liao L (2015), in The British Accounting Review in an article titled “Gender Diversity, Board Independence, Environmental Committee and Greenhouse Gas Disclosure” with 387 citations. Then, 18 other documents have several citations less than 350.

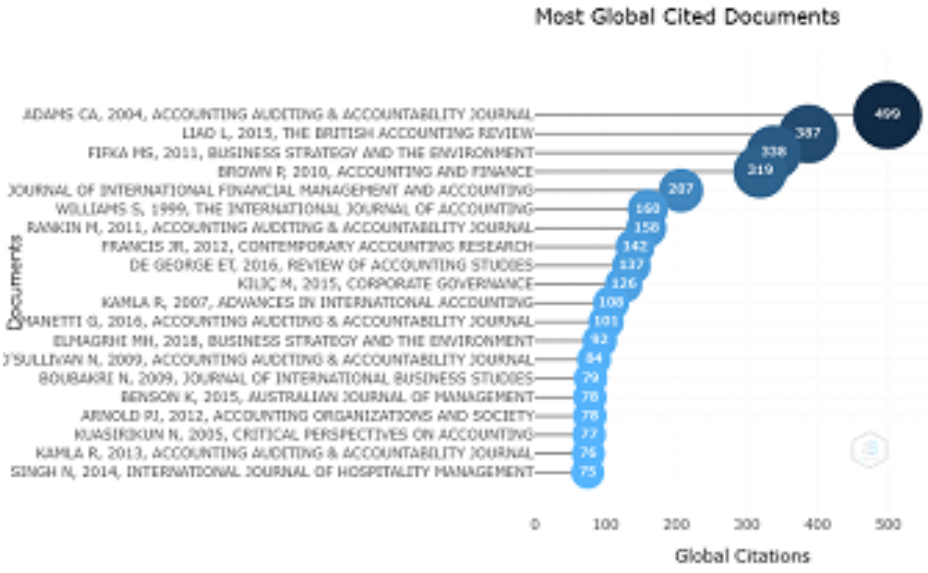


Figure 13: Most Cited Documents.

3.12. Most Relevant Word

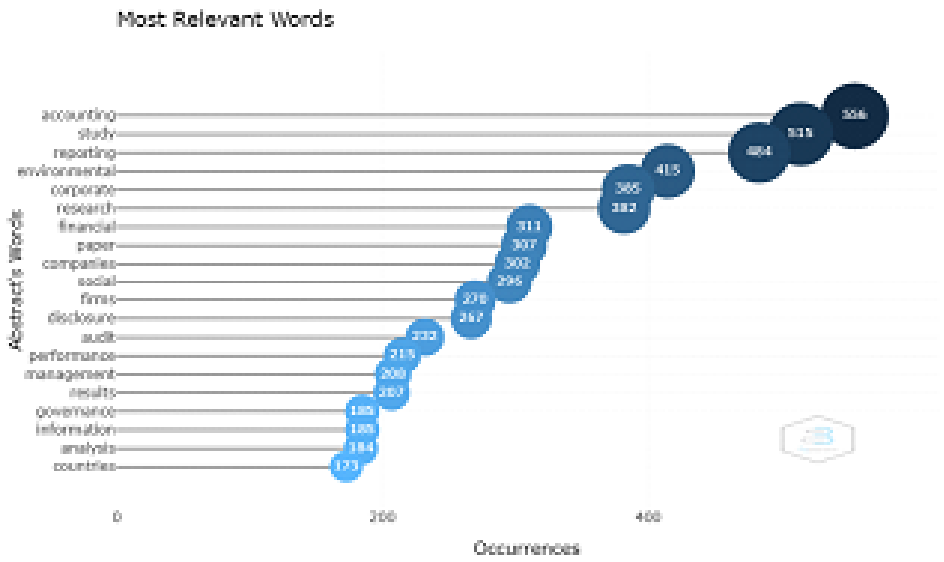


Figure 14: Most Relevant Word.

From the figure above, it can be seen that “accounting” is the most relevant word in the theme of Green accounting with 556 occurrences. This is not surprising because the other most relevant word is “study” and “reporting” with 515 and 484 citations.

3.13. Word Cloud

The next figure presents the Word Cloud, a visualization of the words that appeared most frequently in the papers on the topic of Green accounting. The most common word was “study”, the second most common word was “reporting” and the third most common word was “environmental”. The word cloud displays words in various sizes according to the number of times they appear. The placement of words is somewhat random, but the predominating words are placed in the middle so that they are more visible, given their large size.

3.14. Word TreeMap

The figure that visualized Most Relevant Word, Word Cloud, and Word TreeMap above is a description of the words that often appear in the data collection of papers studied under the theme of Green accounting in different forms but with almost the same results. Based on the three-figure above, the words accounting, study, and reporting are the words that most often appear in research on the theme of Green accounting.

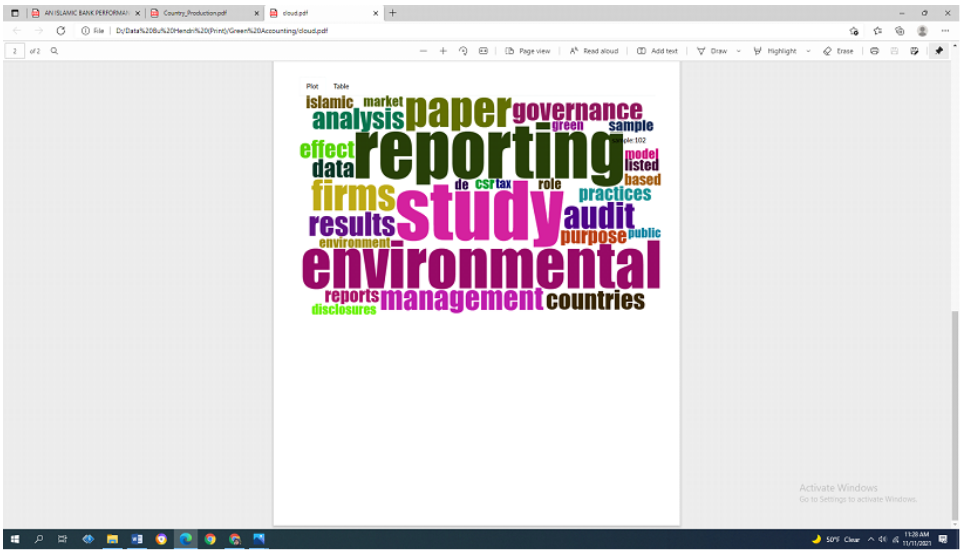


Figure 15: Word Cloud.

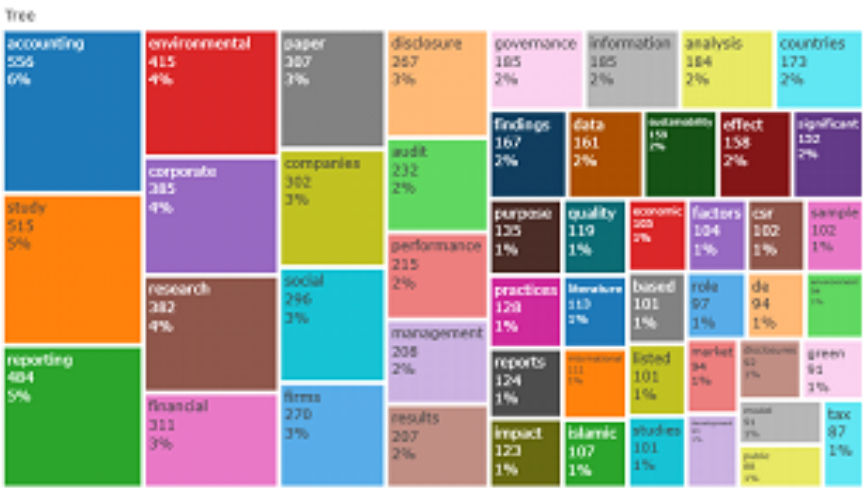


Figure 16: Word TreeMap.

3.15. Co-occurrence network

Next is the Co-occurrence network which displays words in a colored square by considering the relationship between one word and another. Clusters with the same color indicate that the words are related to each other, while the size of the square shows the size of the relationship between words. Based on the picture above, the words “study, corporate, reporting, environmental, and accounting” are the words that have the most relationship with other words in writing research on the theme of Green accounting.

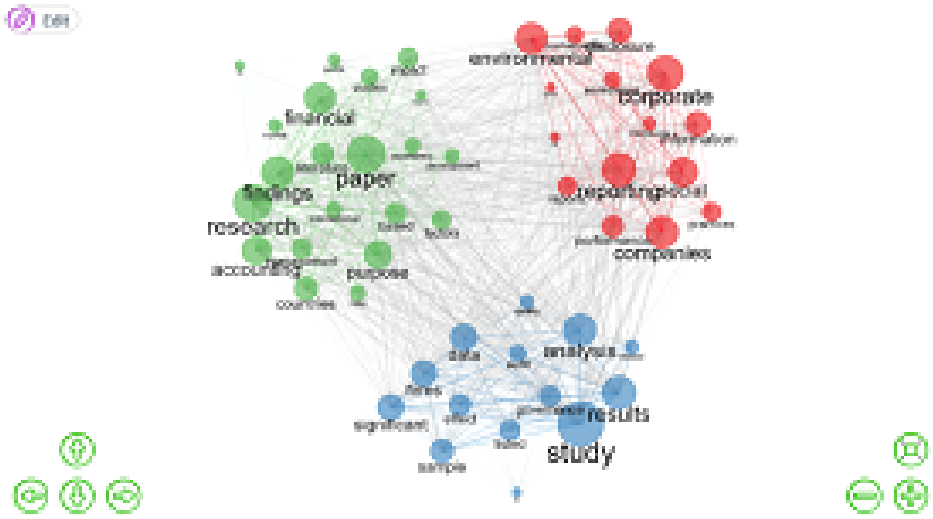


Figure 17: Co-occurrence Network.

3.16. Thematic Map

A thematic map was generated based on density and centrality, divided into four topological regions (Fig. 15). This result was obtained from a semi-automatic algorithm by reviewing the titles of all references analyzed in this study and additional relevant keywords (apart from the author's keywords) to capture deeper variations. The upper right quadrant shows "motor" or "driving" topics, indicated by high density and centrality; these topics, which included "paper, research, findings" and "study, corporate, results", should be developed further given their importance for future research. The quadrant in the top left shows specific topics that nonetheless are areas of rapid development, as indicated by high density but low centrality. The lower left quadrant contains topics that have been used but have experienced a downward trend, indicated by low centrality and density; this quadrant included "accounting, based, management" and "reporting, environmental, social". Finally, the lower right quadrant contains basic topics, indicated by high centrality but low density; these topics are important for research as general topics, and the topic is divided with the topic from the upper right quadrant.

3.17. Thematic evolution

The themes used in papers that are the object of research don't have a significant change, especially from papers that have recently been published when compared to papers that have been published for a long time. As we can see in the evolution of

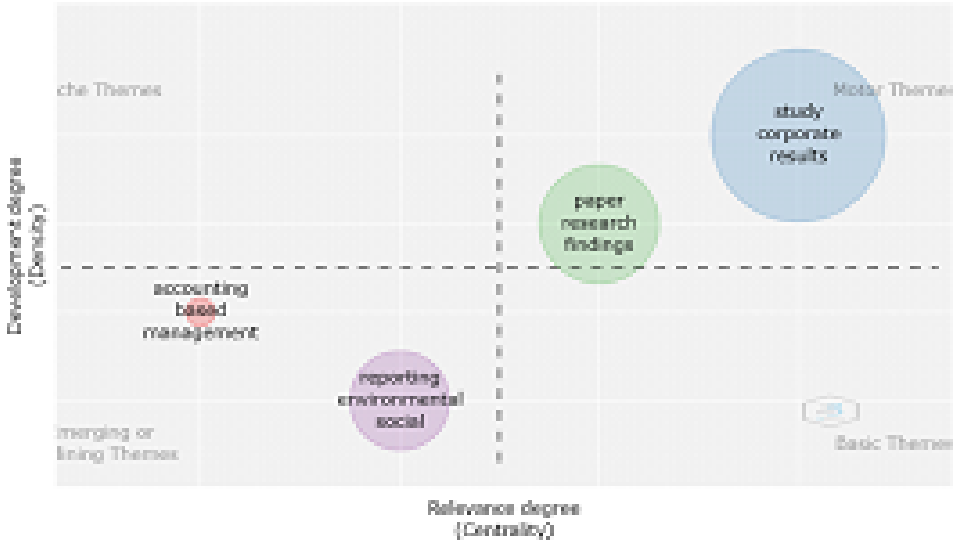


Figure 18: Thematic Map.

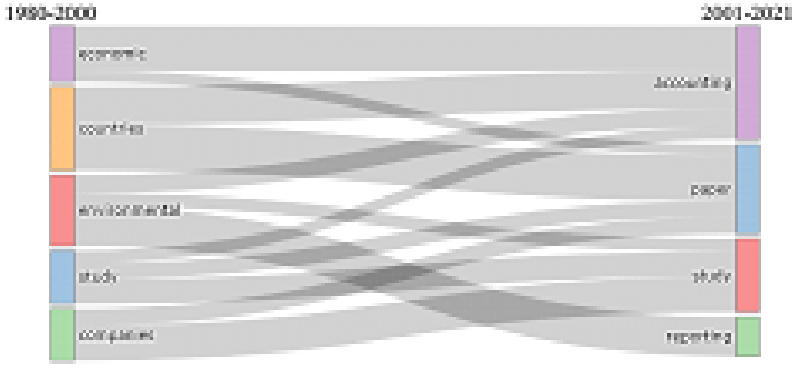


Figure 19: Thematic Evolution

the theme that is shown in the image above. Although the theme of this research is Green accounting, this data shows several sub-themes that are widely used. The left part shows some of the themes that are widely used from 1980 to 2000, there are 5 themes listed with almost the same sizes depending on the quantity of use of the theme. The themes of economics, countries, environmental, study and companies were the most widely used in that period. The second part or the right part shows the most recently used themes in the period between 2001 to 2021. There are 4 themes listed, of which the most used theme is accounting. Likely the same with the themes before 2001. This means there isn't any significant change in the themes of Green accounting.

3.18. Conceptual Structure Map

A conceptual structure map containing a visualization of the contextual structure of each word that appeared often in research papers on the topic of green accounting by mapping the relationship between one word and another through regional mapping (Fig. 5). Each word is placed according to the values of Dim 1 and Dim 2, Dim is a Diminutive particle, which is a specific term in bibliometric science, that produces a mapping between words whose values did not differ to a considerable extent. There are two divisions in this map: the red area and the blue area, each of which contains words that are related to each other. As shown below, the red area contained a high number and variety of words, which means that many research papers presented connections between the words listed in this part, which contained the words that appeared most often. But the blue area only contained one word, i.e. sample. It means the 423 journal articles which become the subject of this bibliometric analysis, do not have much to talk about “sample”.

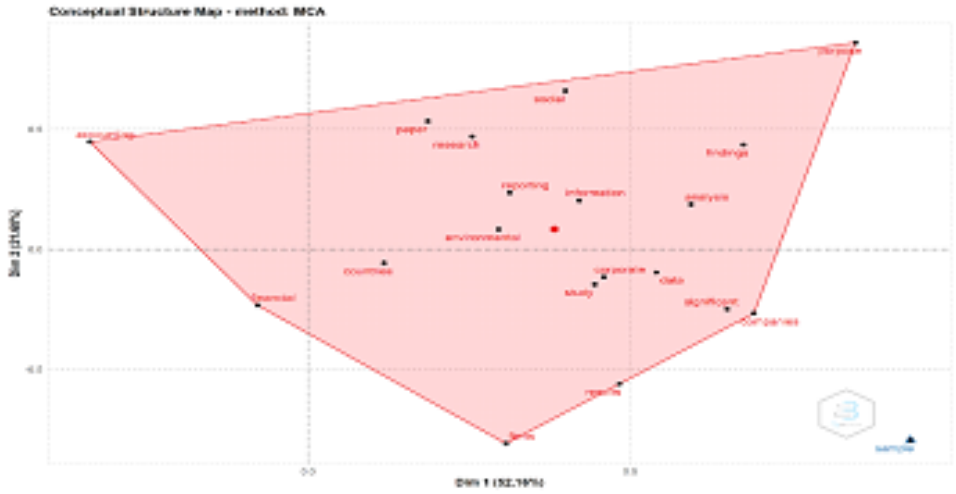


Figure 20: A Conceptual Structure.

3.19. Map Collaboration network

The next part is the collaboration network, between the authors with the same theme paper. In the picture above, you can see that some of the names of the authors are displayed and related. The relationship between the authors is shown by clusters of color equations and lines between one name and another. The size of each square also indicates the number of papers published on this theme. The figure above shows a collaboration between the 12 clusters of related authors. The red cluster shows

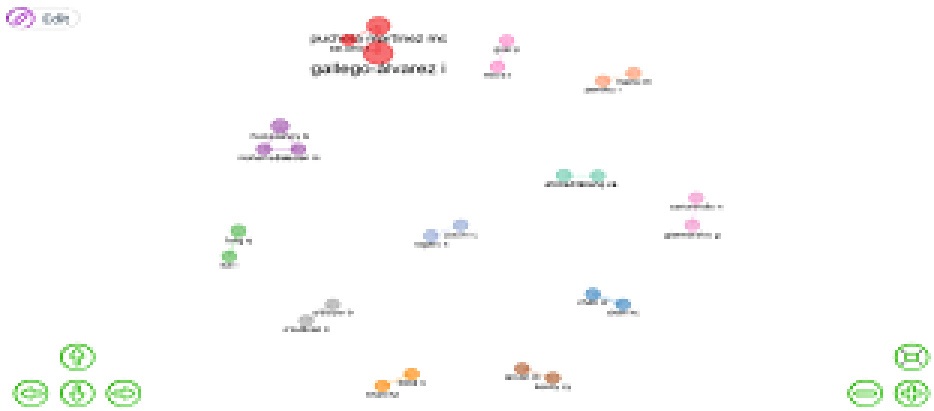


Figure 21

the collaboration between Gallego-Alvarez I, Bel Oms, and Pucheta-Martinez MC. The purple cluster shows the collaboration between Hussainey K, Hussien M and Mohamed M, and so on. The writers who are not related and indexed in the data above show that there is no collaboration between the authors and other authors in making papers related to the theme of green accounting.

3.20. Country Collaboration Map

Furthermore, this research will present countries that collaborate in producing scientific research with the theme of green accounting. The width of each color on the figure shows the countries with the most research production. There is a common thread that shows the linkages between countries. The thicker the threads indicate the more often these countries collaborate. Based on the map image, Australia and UK are the countries that have the most collaborations in research on the theme of green accounting.

3.21. Limitation

This study has several limitations. First, it only focused on articles published on the theme of Green accounting, as analyzed through a three fields plot that describes the relationship between journals, authors, and the topics used, an analysis of source impact that identified the most influential journals, and the most popular keywords, as shown in the word cloud, thematic map, and conceptual structure map. Other topics that could be explored include the names of the most popular authors on this topic, the most productive or commonly analyzed countries in this research area, the most productive institutions, and so on. The collection of articles was obtained from the Dimensions

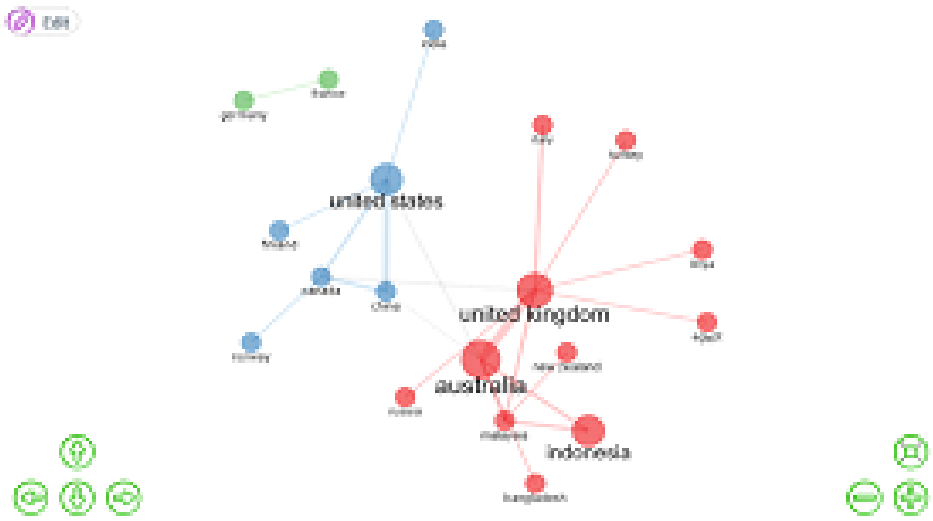


Figure 22: Country Collaboration Map.

database and was limited to October 2021, meaning that changes and developments may continue in the future. Suggestions for further research are to conduct a more complete bibliometric analysis with more elements to produce more comprehensive results.

4. Conclusion

Research trends with the theme of Green accounting continue to increase every year, but their development is still in certain countries. Researchers also have not routinely researched this theme. Some of the most productive writers are Gallego-Alvarez I and Pucheta-Martinez MC, both from Spain. However, the most productive affiliates are The University of South Australia, followed by Macquarie University, also in Australia, which shows that the writers who come from Australia and Europe are of good quality and other writers are very interested in quoting the article. Thus, it is necessary to encourage scholars to contribute to research on green accounting and to integrate that knowledge into accounting and finance practice. Because on the other hand, green accounting expands and complements the conventional system of accounting concerning cost: The use (depletion) of natural resources in production and final demand; and the changes in environmental quality, resulting from pollution and other impacts of production, consumption, and natural events.

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