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Carbon Emission Disclosure and Financial Performance: A Bibliometric Analysis

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ABSTRACT

This study aims to review carbon emission disclosure and financial performance relationship literature spanning 2013-2023 to provide future research directions. The study analyzed 77 articles from the Scopus database, authored by 208, and published in 34 journals. The final dataset comprised 77 publications with 277 articles removed during the screening. The method used in this study adopts a Structured Literature Review by using a hybrid approach that combines content analysis and *bibliometric citation* techniques. The result of the Systematic Literature Review and bibliometric analysis indicated that the interest in the area of carbon emission disclosure and financial performance has significantly increased from 2013 to 2023. The applicant for bibliometric analysis uncovered some general characteristics such as research flow, influential journal authors, and centers of excellence. This study also discovers with main research methods, main theoretical underpinnings, and future research directions. This study recommendations the future research and adds to the synthesis of current and developing research streams.

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1. INTRODUCTION

Carbon emissions are now a growing concern in the world, with many companies implementing strategies to tackle global warming as part of their core policies due to an awareness of the need to be environmentally friendly. From 1990 to 2022, there was an increase in carbon emissions from 37.15 billion metric tons of fossil fuels and other industrial fuels. The main gas responsible for carbon emissions is carbon dioxide, which continues to increase by more than 60% (Tiseo, 2023). Environmentally friendly actions taken by companies can be done through improving energy efficiency and waste management and several other factors. Regulatory reforms carried out by companies are due to stakeholder pressure aimed at addressing increasing environmental issues, climate change, and energy transition which are important in financial and social issues (Cadez et al., 2023; Cadez et al., 2019). In addition, investors are currently paying attention to green financing as one of the considerations in investing (Ward, 2017). To consider their investment decisions, investors need information related to carbon emissions.

According to Kelvin et al. (2017), carbon emissions disclosure includes energy consumption, corporate governance, risks and opportunities related to climate change, performance in reducing carbon emissions, and carbon emissions intensity. As the implementation of carbon accounting is costly and reduces revenue, not all companies choose to do so. In addition, disclosure of carbon emissions is not a mandatory act.

However, some country like Australia has a special committee to reduce carbon emissions, which requires businesses to do carbon disclosure. This kind of regulation will increase awareness about new habits in a business that used to damage the environment for the sake of big profits and can still operate well if they reduce pollutants. So, concrete environmental initiatives and disclosures can increase a company's value (Saka & Oshika, 2014). This is in line with Anggraeni (2015) that state disclosure of carbon emissions increases firm value. Hapsoro (2018) also found stock trading volume is also affected by carbon emission disclosure. Thus, Investors respond positively to the disclosure of carbon emissions because they consider this information very important in determining the sustainability of a business (Anggraeni, 2015).

Implementing carbon emissions disclosure as a corporate ethic will increase the social trust of stakeholders, especially customers who used to utilize eco-friendly goods. According to Kelvin et al. (2017), this increases the profitability of businesses by increasing their revenue. Rising profitability will increase the value of the company. Good corporate governance also determines firm value. Agency theory underlies the idea of good corporate governance, which demands trust for financial performance outcomes. Financial performance moderates the effect of carbon emissions disclosure and good corporate governance on financial performance (Kurnia et al., 2020). So, financial performance has a close relationship with carbon emission disclosure.

To find out more about the disclosure of carbon emissions and environmental performance based on the description of the background above, the researchers are interested in analyzing previous studies on this topic through Systematic Literature Review and bibliometric analysis. We use the Scopus database to do this research. The data obtained from Scopus is then processed and synthesized by following the rules of Systematic Literature Review. The objectives to achieve the purpose of the study are stated below:

1. To check the key information and publication trends of Carbon Emission Disclosure and Financial Performance.
2. To examine the concept of Carbon Emission Disclosure on Financial Performance evolve.
3. To find out the the research keywords in the literature on Carbon Emission Disclosure on Financial Performance
4. To ascertain the main perspectives on the literature in terms of influential journals, centers of excellence, articles, authors, keywords, and theoretical foundations that are worth reading for further research.

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Research Questions

The indicators used in this study look at various sides such as the journals that write most often, annual scientific production, topic development and so on which try to answer the following research question:

Research Question 1: What are the key information and publication trends of Carbon Emission Disclosure and Financial Performance?

Research Question 2: How does the concept of Carbon Emission Disclosure on Financial Performance evolve?

Research Question 3: What are the research keywords in the literature on Carbon Emission Disclosure on Financial Performance?

Research Question 4: What are the main perspectives on the literature in terms of influential journals, centers of excellence, articles, authors, keywords, and theoretical foundations that are worth reading for further research?

Research Hypotheses

HO: There are some form of trend on the literature regarding Carbon Emission Disclosure and Financial Performance

Literature Review

In recent years, mitigation of emissions has become a worldwide concern that is integrated into social, economic, and environmental issues (Das & Jayaraman, 2014). Industry and global supply chain operations have improved a country's economic performance. On the other hand, global warming and carbon emissions have caused many social and environmental problems. Today, businesses are incorporating green procedures into their operations, including green product design, distribution, purchasing, warehousing, and transportation to support improved environmental and socioeconomic sustainability (Khan et al., 2019).

The issue of carbon emissions has become a global concern that has increased research in the field of carbon disclosure. This was marked by the birth of an international political commitment that was universally agreed upon in Rio de Janeiro, Brazil in June 1992 (Borghei, 2021). The agreement gave birth to the idea of a new economic era. The *Earth Summit* is an idea formed to realize an economic concept of development that can meet the needs of the current generation but not at the expense of the interests of future generations. The agreement was motivated by the realization that high economic growth would hamper the sustainability of development growth itself. With this awareness, the United Nations Framework Convention on Climate Change (UNFCCC) made an international amendment called the Kyoto Protocol. The essence of the conversion is to require Anex 1 members to reduce greenhouse gas (GHG) emissions including carbon dioxide. The Kyoto Protocol is divided into 2 periods, the first period is 39 industrially developed countries in the Annex 1 group committed to cutting greenhouse gas emissions relatively to return to a state of 5 percent starting in 2008-2012. In the second period, Annex 1 member countries are required to reduce greenhouse gas emissions by 18% starting in 2013-2020.

Following the commitment to the Kyoto Protocol, The Paris Agreement was born in 2015. The Paris Agreement also increased the amount of research on carbon (Bazhair et al., 2022). The Paris Agreement was signed by 196 countries that committed to fighting global warming and adapting to climate change. This commitment encourages companies to respond to the agreement, increasing the number of publications in the field of carbon emissions.

Global awareness of carbon emissions is characterized by investor and stakeholder attention that encourages companies to disclose carbon emissions resulting from their operations is becoming increasingly common (Delmas et al., 2015). In addition, to aid asset valuation and investment decisions, shareholder coalitions such as Ceres (Coalition for Environmentally Responsible Economies) support greater transparency in carbon management and emissions strategies . Thus, companies must respond to investor demands to disclose carbon emissions. As stated by Kelvin et al. (2019), disclosure of carbon emissions has a positive effect on *abnormal stock returns*. In line with

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this, Ulupui et al. (2020) stated that company profitability calculated by Return On Asset, which measures financial performance, increases when carbon emissions are disclosed. Research done by Kurnia et al. (2020) shows that disclosure of carbon emissions has a positive influence on firm value. It can be concluded that in the future, carbon performance will improve financial performance in the long term (Ghosh et al., 2023). Since there is often ample evidence supporting the idea that corporate financial performance and carbon emissions disclosure are interrelated, we try to make a deeper meta-analysis to see the past and future flow of this kind of study.

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2. METHODS

This research adopts a Structured Literature Review by using a hybrid approach that combines content analysis and *bibliometric citation* techniques (Massaro et al., 2016). The content analysis review is to conduct a quantitative literature review by extracting and gaining insight into the content of the substantive article. Then interpret textual material that can answer relevant and manageable research questions from the retrieved data. (Gaur & Kumar, 2018).

Bibliometric analysis is the quantitative aspect of this research. Bibliometric analysis is a new method for reviewing literature in accounting and auditing. (Mustikarini & Adhariani, 2022).. Nevertheless, bibliometric analysis is useful as a literature review that uses statistical and quantitative analysis of published research. The bibliometric method has two main objectives including performance analysis and science mapping. Performance analysis means evaluating the performance of research and the dynamics of scientific fields. Bibliometric analysis is important to review more research with its strong and efficient quantitative techniques. This is supported by systematic, transparent, and replicable literature reviews. (Aria & Cuccurullo, 2017)Therefore, bibliometric analysis can help to find writings that have a major influence on the literature. (Zupic & Čater, 2014)In addition, bibliometric analysis can help find influential papers (Zupic & Čater, 2014), level the research field with less subjective bias, and provide more reliable objective analysis. As academic studies grow, bibliometric analysis significantly improves the quality of reviews. In addition, this study uses cartographic analysis or visualization techniques to visualize the evolution and development of research streams and intellectual structures in the field of Carbon Emission Disclosure over 10 years. Thus, integrating content analysis, bibliometric, and enhanced visualization techniques is the best way to answer the research questions.

Figure 1 shows the screening results by following the four phases in the PRISMA protocol, namely identification, screening, eligibility, and inclusion. The screening results using the PRISMA protocol resulted in 77 studies that are suitable for research in this study.

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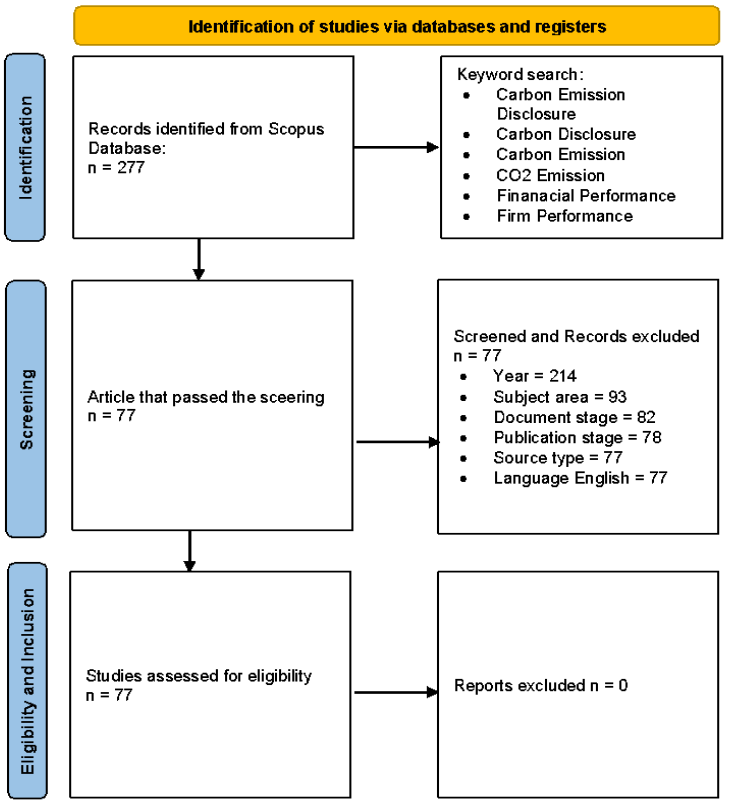

Figure 1. PRISMA Protocol for the Initial Phase of Bibliometrics

In identifying methods, the first thing to do is to search based on the keywords of the research question and the keywords chosen are carbon emission disclosure with proxies (carbon emission disclosure, carbon disclosure, carbon emission, and CO2 emission) and financial performance with related proxies (financial performance and firm performance). Based on the keywords used, researchers found 277 articles. Then the researchers conducted a review and eligibility stage by filtering for keywords related to the research topic on carbon emission disclosure and financial performance from the Scopus database.

Identification is done by using a search on the Scopus platform with the following query: (TITLE-ABS-KEY ("carbon emission disclosure" OR "carbon disclosure" OR "carbon emission" OR "CO2 Emission") AND TITLE-ABS-KEY ("financial performance" OR "firm performance") AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")). The final filtered articles used with this identification are 77 articles which are the most suitable (Table 1).

Table 1. Screening and Filters

STEP	KEYWORDS AND FILTERS	TOTAL
1	Keywords used "carbon emission disclosure" or "carbon disclosure" or "carbon emission" or "CO2 emission" and "firm performance" or "financial performance".	277
2	YEAR RANGE: 2013-2023	214
3	SUBJECT AREA: BUSINESS, MANAGEMENT & ACCOUNTING	93
4	DOCUMENT TYPE: ARTICLE	82
5	PUBLICATION STAGE: FINAL	78

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6	SOURCE TYPE: JOURNAL	77
7	LANGUAGE: ENGLISH	77

Furthermore, in analyzing bibliometric data with 2 software packages, namely: bibliometric R-Package and VOSviewer. (Aria & Cuccurullo, 2017).. Bibliometric R-Package is used to produce bibliometric descriptive analysis. The descriptive analysis of bibliographic data included information on journals, authors, document types, and topic trends for the selected period.

Then the researcher answers each question formulated in Table 2. First, the authors applied dynamic analysis of co-citation to determine the development of carbon emission disclosure. Co-citation analysis is suitable for mapping intellectual heritage based on those with high influence. Furthermore, the researcher visualized the relationship with bibliometrix R-Package and presented it with content analysis to provide a narrative of its development. Secondly, we identified keywords of research in the field by using bibliographic coupling and visualized with VOSviewer. Bibliographic coupling is suitable for focusing on present and future activities from the literature. Thirdly, we identified the influence of the perspectives of authors, articles, journals, institutions, countries, methods, and theories using content analysis and bibliometric citation using bibliometrix R-Package. As a result, the researcher will present a reference for future research.

Tabel 2. Methodology and Software for Data Analysis

Research Question	Content Analysis	Bibliometric Techniques	Bibliometric Software
RQ1: What are the key information and publication trends of Carbon Emission Disclosure and Financial Performance?	No	Bibliometric citation analysis	*Bibliometrix* R-Package
RQ2: How does the concept of Carbon Emission Disclosure on Financial Performance evolve?	Yes	Dynamic co-citation analysis and visualization	*Bibliometrix* R-Package
RQ3: What are the research keywords in the literature on Carbon Emission Disclosure on Financial Performance?	Yes	Bibliometric Coupling and Visualization	VOSviewer
RQ4: What are the main perspectives on the literature in terms of influential journals, centers of excellence, articles, authors, keywords, and theoretical foundations that are worth reading for further research?	Yes	Bibliometric citation analysis	*Bibliometrix* R-Package
RQ5: What are the future research directions?	Yes	Bibliometric citation analysis	*Bibliometrix* R-Package

Discussion of Findings

3.1 Descriptive Analysis

This research was conducted by reviewing 77 articles on Carbon Emission Disclosure on Financial Performance in 2013-2023 from 34 journals based on the Scopus database. Every year from 2013-2023 there were 19 journals produced. A total of 208 authors wrote 77 studies with an average citation level of 43.23. Almost all studies were conducted by multi-authors (96%, n=200) and only 4% (n=8) conducted research alone. Research on the relationship between carbon emissions and financial performance is of global interest today. Several studies have been conducted to explore the relationship between carbon performance and financial performance. (Yan et al., 2022). Based on measurements with bibliometric analysis of Total Global Citation (TGC), there was an increase in 2014-2015 (Figure 2), this was driven by the incessant awareness of environmental and sustainability issues. This is marked by the Kyoto Protocol held in 2012 which targets developed countries listed as Annex 1 members to reduce carbon emissions by 18% starting in 2013-2020. (Irwhantoko & Basuki,

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2016).. As a result of this awareness, companies then pay more attention to the environmental impact of their operational activities. This encourages researchers to test the factors that affect carbon emissions and test the effect of carbon emissions disclosure on firm value.

Table 3. Main Information

Description	Results
Main Information About Data	
Timespan	2013:2023
Sources (Journals, Books, Etc)	34
Documents	77
Annual Growth Rate %	19.62
Document Average Age	3.48
Average Citations Per Doc	43.23
References	1
Document Contents	
Keywords Plus (ID)	270
Author's Keywords (DE)	281
Authors	
Authors	208
Authors Of Single-Authored Docs	8
Authors Collaboration	
Single-Authored Docs	8
Co-Authors Per Doc	2.99
International Co-Authorships %	29.87
Document Types	
Article	77

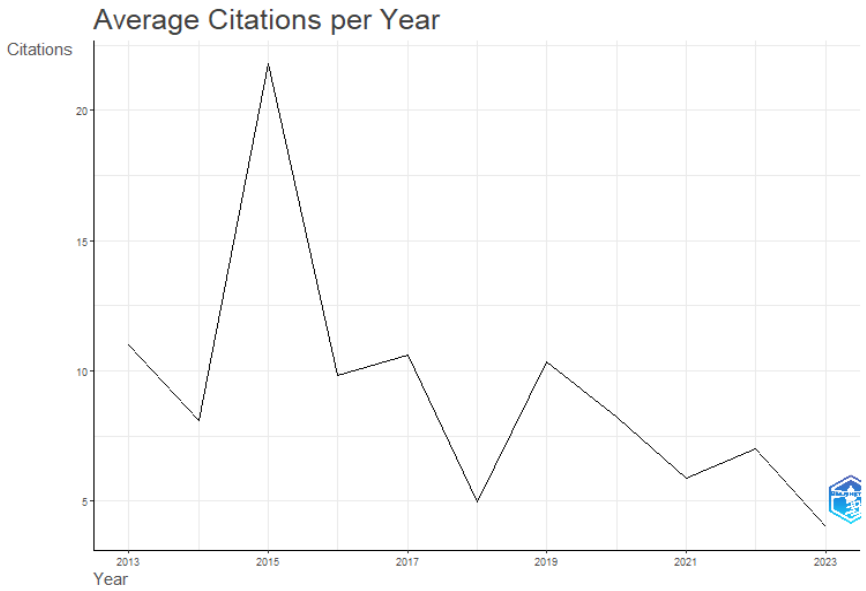

Figure 2. Average Citation Per Year

3.2 Development of Carbon Emission Disclosure Literature on Financial Performance

Based on developments on the topic of carbon emission disclosure is divided into 2 parts, namely the emergence of the second period of the Kyoto Protocol for annex 1 member countries to reduce carbon emissions by 18% starting in 2013-2020. Then continuing the commitment of the Kyoto Protocol, The Paris Agreement was born with the signing of 196 countries committed to

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reducing the greenhouse effect starting in 2020-2030. Both events encouraged research into carbon emissions.

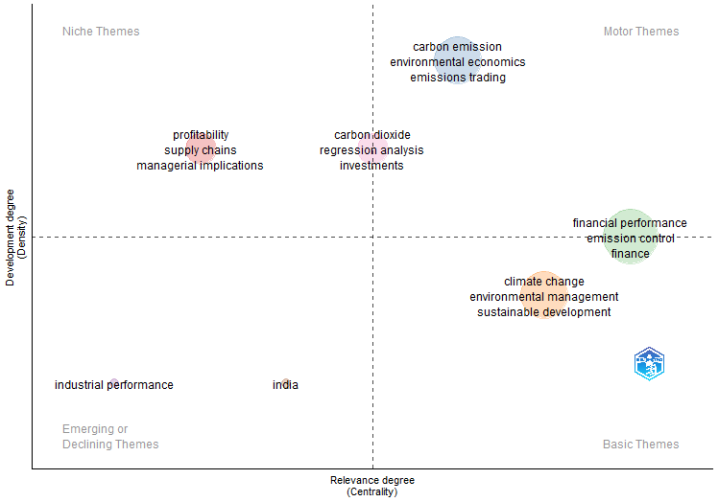

Figure 3a. Thematic Evolution 2013-2020

The results of data processing with Bibliometrix R-Packange regarding thematic evolution with the keyword authors First (Figure 3a) 2013-2020 is the second period of the Kyoto Protocol implemented with significant challenges compared to the previous period. This period is the beginning of the development of topics on carbon emissions, still rarely discussed about supply chains, commerce, and competition. The second (Figure 3b), 2021-2023 at the start of The Paris Agreement this period the development of the topic of carbon emissions accelerated. During this period, topics that are rarely discussed are profitability, supply chain, and managerial implications. Carbon emissions are closely related to carbon dioxide. In this period, the topics of carbon emissions, environmental economics, and performance assessment began to be discussed by many researchers. Although carbon emission has become almost a basic topic and motor theme compared to other topics in business, management, and accounting research, there is still not much research done (n=77).

Figure 3a. Thematic evolution 2021-2023

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3.3 Research Flow

The following research streams are filtered based on those that have author relationships with each other. From the data processing with VOSviewer with a maximum of 5 authors in each article. 197 authors were selected that can be run. However, of the 197 authors, there are only 10 authors who have a relationship with each other, resulting in 3 clusters as shown in Figure 4.

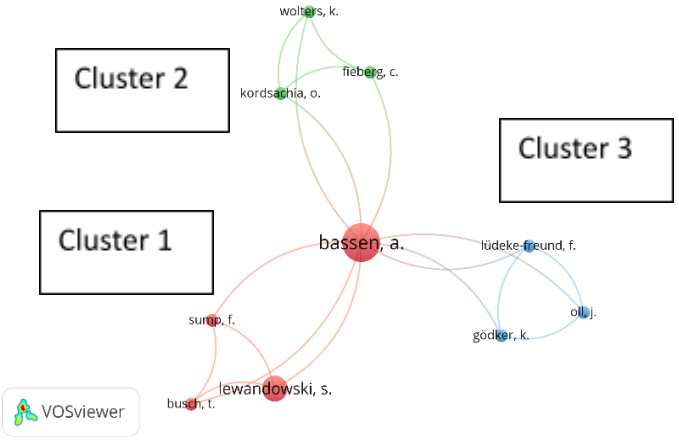

Figure 4. Co-Authorship Network

Cluster 1: Carbon Emissions Disclosure and Financial Performance

Carbon Emission Disclosure in the field of accounting has a close relationship with financial performance. in research, Busch et al, (2022) found that there is a strong relationship between increased carbon emissions and short-term financial performance. On the other hand, there is evidence that increased carbon emissions are associated with increased long-term financial performance success. These results were generated with some additional analysis and robustness checks by testing ROA and Tobin's Q respectively with Carbin performance, SIZE (market value), SIZE (number of employees), Capital intensity, Cash Flow, R&D intensity, and Observation R^2. Whereas the study of Lewandowski, (2017) shows the findings of annual reported carbon emissions and financial performance have a *curvilinear* relationship. Based on these findings, there is usually a positive correlation for companies that perform better in terms of carbon emissions, but there is a negative correlation for companies that perform worse. As a result, companies can only benefit from climate change mitigation when they exceed a certain carbon performance threshold.

Cluster 2: Carbon Emissions Disclosure and board gender diversity

The disclosure of carbon emissions is related to the gender diversity of the board of commissioners in the company. Research results (Kordsachia et al., 2023) showed that high gender diversity is associated with lower corporate carbon emissions and higher stock returns on climate change. By taking advantage of the increasing awareness of climate change, there is strong evidence that managing environmental issues is one way that gender-diverse boards can add value to shareholders. As we find a strong correlation between female board representation and the residual reduction in corporate carbon emissions over the sample period 2002 to 2019, our results are also in line with several studies that find a positive relationship between female board members and CSR performance.

Cluster 3: Carbon Emissions Disclosure and Investor Decision Making

Disclosure of carbon emissions has a relationship with investor decision-making. In research (Bassen et al., 2019) there is a tendency for investor decisions with intuitive characteristics to make decisions by paying attention to the performance of climate funds compared to financial performance. This is driven by concern for the environment so investors also make climate-friendly investments.

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3.4 Key Aspects of the Literature on Carbon Emission Disclosure on Financial Performance

3.4.1 Influential Journals

Based on Figure 5, it can be seen that the average journal production on the topic of carbon emission disclosure and financial performance is 7 each year (n=77/11). The number of article publications increased sharply in 2021 with the number of publications being 13. Then in the following year, it decreased to 10, and in 2023 it increased again to 12. The journals most related to the topic of carbon emission disclosure and financial performance are the journal Business Strategy and The Environment (n = 17) and Journal Of Cleaner Production (n = 17) as shown in Figure 6. This is in line with the results of Bradford's Law from Bibliometrix R-Package.

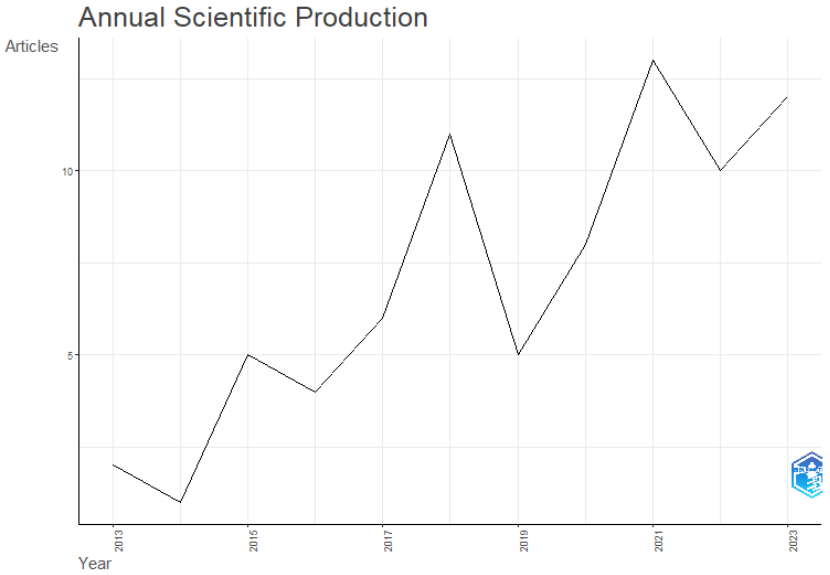

Figure 5. Annual Scientific Production

Bradford's Law is a law of exponentially diminishing returns and dispersion and predicts that for a given subject area, a small core of journals will contain a large proportion of articles on that subject, while the remaining articles will be spread across several larger journals. Bradford's Law is useful for knowing each specialization that identifies core publications in that field that provide publications on a particular field. Based on the results of processing with Bibliometrix R-Package, Bradford on the topic of Carbon Emission Disclosure and Financial Performance Core journals that most often discuss these topics are Business Strategy and The Environment and Journal Of Cleaner Production.

Figure 6. Most Relevant Source

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3.4.2 Centers of Excellence

Leading institutions in this field, are considered as "centres of excellence" in the study of Carbon Emission Disclosure as shown in Figure 8. The University of Hamburg and Western Sydney University have published 4 journals each on the topic of Carbon Emission Disclosure and Financial Performance. Meanwhile, MSCI, the National Institute of Technology, and the University of Salamanca published 3 articles each on this topic. Based on the number of articles produced per year (Figure 9), it can be seen that the University of Hamburg has increased from 2016-2023. This is the same as Western Sydney University which experienced an increase in production from 2015-2023. The University of Hamburg and Western Sydney University have more concern about the topic so they continue to strive to publish research on the topic.

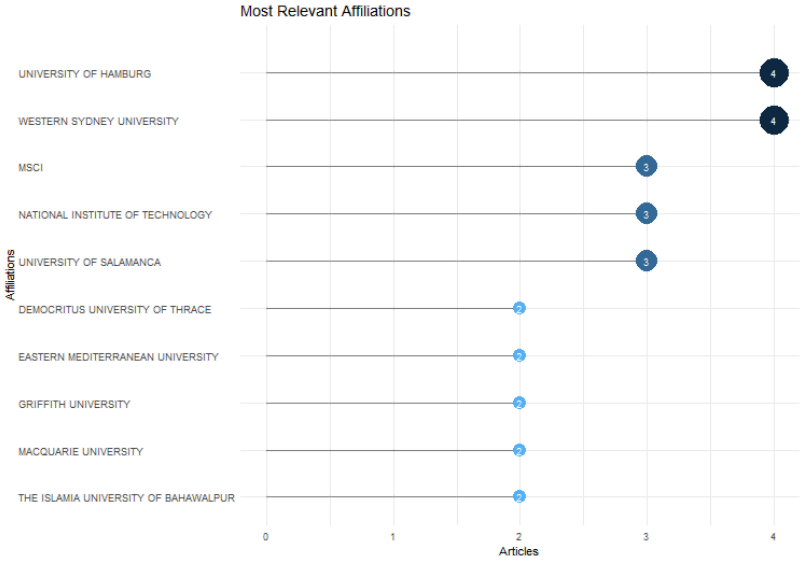

Figure 7. Most Relevant Affiliation

One of the things that supports this, as quoted in the Indonesia Climate Change Trend Fund (2021) is the special concern in Australia regarding carbon such as the program carried out by Australia to support the blue carbon program with Indonesia to deal with global warming. In addition, there is also Australia's commitment to reduce carbon emissions (Kurnia et al., 2020). Based on the country of origin of corresponding authors in Multiple Corresponding Publication (MCP) and Single Country Publication, Australia and China are the countries with the most MCP and SCP (n=8). Similar to the most cited countries, Australia is the most cited country, namely n = 785, followed by China, namely n = 434. This is in line with the origin of the centers of excellence and the origin of the Corresponding Author, namely the University of Hamburg and Western Sydney University. China is an industrialized country, where most carbon emissions are generated from industry. So that China has special attention regarding carbon emissions, one of which is researching the effect of carbon emissions on financial performance.

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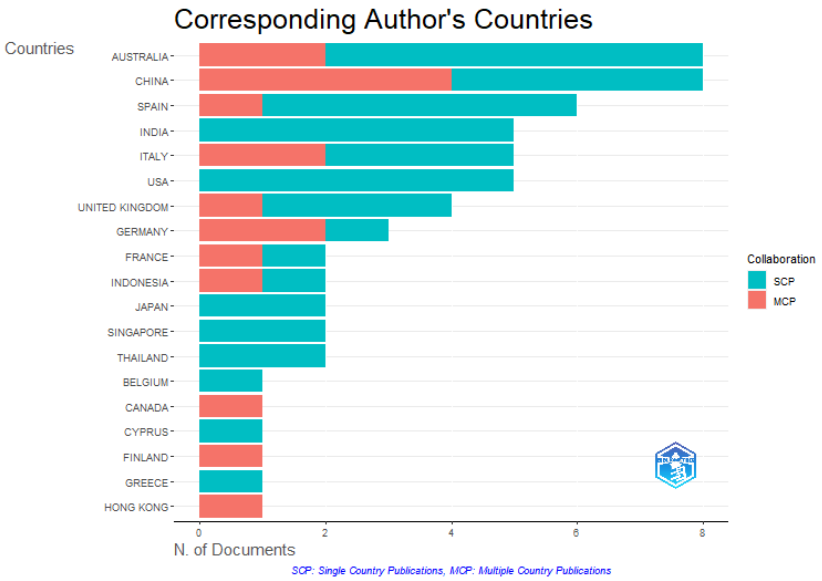

Figure 8. Corresponding Author's Countries

3.4.3 Influential Articles and Authors

Carbon Emission Disclosure is currently a concern in many circles, this is due to the encouragement of sustainability and care for the earth. Companies that are carbon emitters are now required to disclose the carbon emissions generated from their operations. Thus, carbon emissions disclosure literature affects (and is affected by) corporate financial performance in the accounting discipline. Table 4 presents 10 articles that have influence in the literature and contribute to the topic of Carbon Emission Disclosure and Financial Performance. Lee KH (2015) with an article entitled Green R&D For Eco-Innovation And Its Impact On Carbon Emissions And Firm Performance became the author with the most cited article with a total citation of 525 with a total annual citation of 58.34.

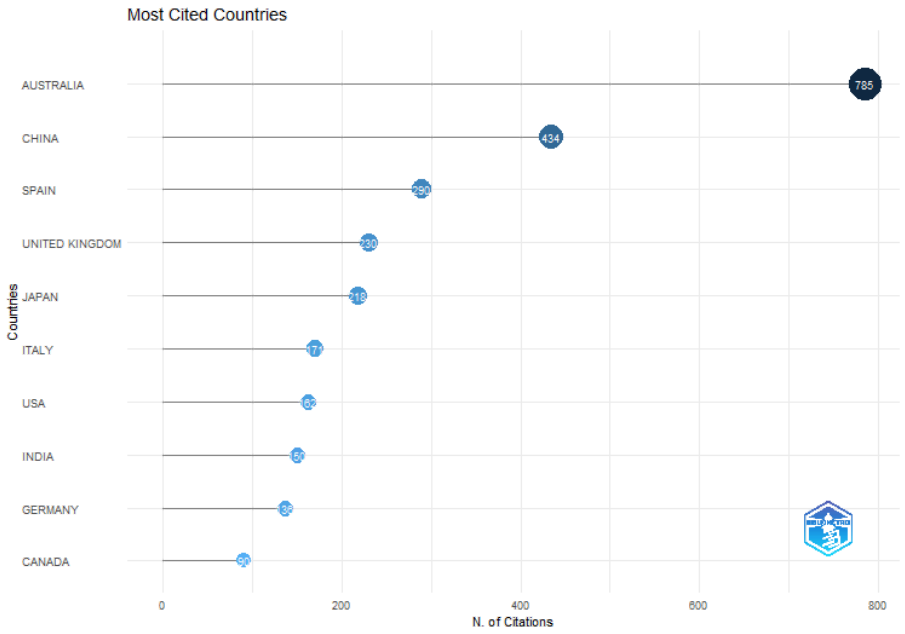

Figure 9. Most Cited Countries

In addition, Lee KH in another article, The Impacts Of Carbon (CO2) Emissions And Environmental Research And Development (R&D) Investment On Firm Performance has been cited as many as 145 with an average annual citation of 16.1. Then some authors have a great influence, namely Gallego-

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Álvarez I with a total citation of 161 and a total annual citation of 17.89 with the title of the article Carbon Emission Reduction: The Impact On The Financial And Operational Performance Of International Companies. Gallego- Álvarez I also has another article that has a great influence with the title Climate Change And Financial Performance In Times Of Crisis which has been cited 81 times with a total annual citation of 8.1. Even so, in 10th place is Bassen A who only published the article in 2022, but was able to have a fairly broad influence because it discussed the topic of Corporate Carbon and Financial Performance again with a total of 31 citations.

Table 4. Author Production Overtime

Author	year	TI	TC	TCBY
Lee KH	2015	Green R&D For Eco-Innovation And Its Impact On Carbon Emissions And Firm Performance	525	58,3333333
Gallego-Álvarez et al.	2015	Carbon Emission Reduction: The Impact On The Financial And Operational Performance Of International Companies	161	17,8888889
Lee KH	2015	The Impacts Of Carbon (Co2) Emissions And Environmental Research And Development (R&D) Investment On Firm Performance	145	16,1111111
Isabel Gallego-Álvarez	2014	Climate Change And Financial Performance In Times Of Crisis	81	8,1
Fernández-Cuesta	2019	The Effect Of Environmental Performance On Financial Debt. European Evidence	49	9,8
Castro	2019	The Effect Of Environmental Performance On Financial Debt. European Evidence	49	9,8
Castaño Fj	2019	The Effect Of Environmental Performance On Financial Debt. European Evidence	49	9,8
TANG Q	2018	Corporate Governance and Carbon Transparency: The Australian Experience	47	7,83333333
Tang Q	2016	Corporate Ecological Transparency: Theories and Empirical Evidence	38	4,75
BBASSEN	2022	Corporate Carbon and Financial Performance Revisited	31	15,5

3.4.4 Main Research Methods

Based on the literature review of the 20 most cited studies from 2013-2023 a search based on keywords taken shows 95% (n = 19) using quantitative methods. In this quantitative method, panel data is tested with regression to determine the relationship between the variables being tested, as in the study of Zhu et al., (2020) tested the relationship between the effect of carbon tax policy on green financial performance, green financial activities, green financial accounting and financial information disclosure in energy companies in China. Research results from Fernández-Cuesta et al., (2019)with regression analysis showed that CEP was a general negative driver of debt because straightforward reasoning indicates that a firm would produce less carbon emissions when production decreases and that a lower dimension of production would require less financing.

The study used exploratory research and a systematic literature review (Kushwaha & Sharma, 2016). Research conducted by Kushwa was conducted to exploit the relationship between green initiatives and firm performance which has a positive relationship with sustainable development, whereas firm performance, which is the outcome of green initiatives has a direct relationship with sustainable development, but the performance of the firm that is not the result of green initiatives has not a positive relationship hence we can say there is a negative relationship. The firm that does not focus or less concentrate on green initiatives has no contribution or very little contribution to sustainable development. (Kushwaha & Sharma, 2016).

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3.4.5 Main Theoretical Underpinnings

Based on the top 20 journals with the most citations, the most frequently used theory is RBV or Resource-Based View ((Lee & Min, 2015), (I. Gallego-Álvarez et al., 2015), (Backman et al., 2017), (Alsaifi et al., 2020). The Resource-Based View is a theoretical framework that focuses on a company's internal resources and capabilities as a source of competitive advantage. It suggests that companies can achieve superior financial performance by effectively managing and utilizing their unique resources. (Alsaifi et al., 2020).. In research, Backman et al., (2017) RBV encourages public policy makers to obtain the maximum benefit from companies in their jurisdiction through making regulations regarding climate change due to emissions from their company operations.

In addition, another theory used in these 20 journals is the Natural Resource-Based View (NRBV) in research Lee & Min, (2015). NRBV in research Khalil & Nimmanunta (2023) find that environmental investment is facilitative to develop the company's competitive advantage. Another theory used in the 20 best journals is the Stakeholder Theory in the research of Lewandowski (2017); and Jaggix et al.. Stakeholder theory in Jaggi's research shows that investors and others have a demand for the disclosure of environmental information, especially carbon emissions because social and environmental issues have recently become sensitive. Jaggi et al.'s research, (2018) also used the legitimacy theory, the two theories have a relationship.

3.5 Future Research Directions

Awareness of the sustainability of a company is currently becoming more of a concern for the world. One of the things related to sustainability is the issue of corporate carbon emissions, which is currently a concern, especially for investors. (Bassen et al., 2019). The world's concern about carbon emissions is also shown by the birth of commitments to reduce carbon emissions such as the Kyoto Protocol. (Lee et al., 2015) and the Paris Agreement (Jones et al., 2017). The existence of commitments regarding carbon emissions encourages a lot of research to be carried out on the topic. Several things can guide future research.

3.5.1. Carbon emissions and related measurements

Carbon emissions are usually calculated with dummy variables based on the index used. Many studies have used indices developed by (Bae Choi et al., 2013). Choi developed the index by creating a checklist by determining the breadth and depth of information related to climate change and carbon emissions included in published reports.

Researchers studying carbon emissions also use an index from the Carbon Disclosure Project (CDP). CDP was initiated in response to investor concerns about climate risks to financials. CDP is a project that originated in the UK in 2000 and has grown to become the largest registrar of corporate emissions, so its data is the most frequently used. (Hahn et al., 2015).. As CDP continues to grow and provide information on corporate carbon emissions, the data obtained from CDP is used as a tool to regress a study on carbon emissions.

3.5.2. Carbon Emissions and Financial Performance

Carbon emissions have a close relationship with financial performance, but the relationship between carbon emissions and carbon performance in several studies has not produced consistent findings. In research conducted by Secinaro et al. (2020) Profitability calculated by ROE is positive towards the intensity of carbon emissions in public companies listed in Europe. However, in research Palea & Santhià (2022) However, Palea & Santhià (2022) conducted research on automotive companies that produce a lot of pollution the results of their research found strong and consistent indications that carbon emissions and financial performance have a negative effect. Based on the two examples of research that have been done, show the inconsistency of results so that it can be a guide for future researchers to research carbon emissions and financial performance.

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4. CONCLUSION

This research is a 10-year review of the topic of carbon emissions concerning financial performance using a systematic literature review combined with bibliometric analysis and qualitative content analysis. The data used in this study came from Scopus so there are limitations in this study where Scopus cannot provide topics only specific to carbon emissions about financial performance. This research uses 77 studies that have passed the systematic literature review protocol. The most influential journals on this topic as seen from the number of articles are Business Strategy and The Environment and Journal of Cleaner Production. Meanwhile, based on the center of excellence, it can be seen that the agencies come from Australia, which is seen from the highest number of citations. This is in line with the origin of correspondence from the most frequently cited countries, namely Australia and China. Previous studies show that there are various topics related to carbon emissions with various methods. Future research can develop research with more diverse topics to consider by looking at the development of research themes. In addition, other variables that are closely related and more complex can also be developed.

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