

## Research Article

# Carbon Emissions Disclosures: A Bibliometric Review

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This study aims to examine the research output on Carbon Emissions Disclosures from 2005 to 2023. This study found a link between Carbon Emissions Disclosures, GHG Disclosure, and Climate Change Disclosures. The relationship between all three has received research attention. The study describes the interaction between Carbon Emissions Disclosures, GHG Disclosures, and Climate Change Disclosures. It is a bibliometric analysis of the literature and assesses the current state of science. Data for this study were generated from the 42 top-level academic journals registered in the Scopus database. Understanding of Carbon Emissions Disclosure, GHG Disclosure, and Climate Change Disclosure was shaped and enhanced through researchers' collaborative network maps. Their reach extends to a variety of networks, core themes, and streams, as research topics evolve. The results of this research can be used by academic researchers to aid their understanding of Carbon Emissions Disclosures, GHG Disclosures, and Climate Change Disclosures, to identify the current context and to develop future research agendas. The findings of this research can increase industry practices on Carbon Emissions Disclosures, GHG Disclosures, Climate Change Disclosures, and how these can be used as tools to address various challenges.

**Keywords:** carbon emissions disclosures, GHG disclosures, climate change disclosures, bibliometric review

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## 1. Introduction

Humans continue to develop and increasingly find progress in various fields of expertise. However nature gets old as time passes. Global climate change has moved many individuals in the world to care more about the environment and take real action to fix the nature.

Carbon Emissions Disclosure Report plays an important role in transmitting the results of carbon accounting to stakeholders with very different backgrounds and goals. Voluntary frameworks and schemes have been developed and can be used to report Carbon Emission Disclosures to investors or other stakeholders [1].

Carbon Emissions Disclosure usually contained only in the primacy of legitimacy motivation and companies that had high reporting quality. This high quality reporting,

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i.e. Voluntary Reporting contained initiative items and a framework that incorporated clear Carbon Emissions Accounting [2]. This behavior of concern for Carbon Emissions Disclosure can be seen through Annual Reports and Disclosure Reports of Carbon Emissions, as well as through the company's official website [3].

There was an assumption that the existence of Carbon Emissions Accounting has made managements and accountants more focused on economic interests compared to functions for human interests in general. Carbon Emissions Accounting is also used as a commodity that can be calculated for the company's profits rather than focusing on the welfare of nature itself [4]. Carbon Emissions Accounting is one dimension of Environmental Accounting, but it is a unique dimension. GHG emissions or Carbon Emissions are different from water, air and chemical pollution, and are regulated by different laws and regulations, so they deserve to be studied separately [5].

One of the reasons why the issue of Carbon Emissions Accounting research is important is because GHG emissions or Carbon Emissions have become a social concern, capable of rolling out influential large-scale regulations, as well as being in the spotlight in various countries. As part of stakeholders, we do not fully understand the disclosure decisions made by managers of large companies and small companies. This is an important issue because Mandatory and Voluntary Reporting are often only a source of information intended for investors, regulators, and the public [3].

Authors understand that the importance of reporting corporate disclosures will have a major impact on stakeholders. Therefore, this research is presented as a bibliometric review of Carbon Emission Disclosures, GHG Disclosures, and Climate Change Disclosures. This study will examine various sources of literature that can be used as a reference for further research. This research is also expected to raise the possibility of various themes that can be used as the basis for future research.

## 2. Literature Review

The roots of the concept of Environmental Accounting emerged in the 1990s, but Carbon Emissions Accounting quickly developed as its own field within corporate environmental management. Developments in international climate policy have led to the evolution of corporate Carbon accounting frameworks and standards (such as the GHG protocol). Apart from other carbon and GHG emissions, recent research developments tend to address climate change adaptation issues as well [1].

Legitimacy Theory has long been recognized as essential to the survival of any company. Legitimacy is the common perception or assumption that the actions of an

entity are desirable, appropriate or appropriate within some socially constructed system of norms, values, beliefs and definitions. Legitimacy is given to a company by its external parties, which reflects collective perceptions and beliefs about the company. Companies that have legitimacy are seen as trustworthy and worthy of support while companies that do not have legitimacy are seen as less acceptable and less trustworthy, may be negligent, and tend not to secure the resources needed for the survival of the company [6].

The way entities interact with the natural environment is increasingly seen as an important aspect of corporate legitimacy. The entity is at risk of violating the social contract that is implicitly monitored by stakeholders. Company activities that damage the environment or create risks or even the results of company operations that have an environmental impact are sometimes unacceptable in the eyes of stakeholders. Disclosure is one way for entities to try to convince stakeholders that the company's existence and business operations are running properly. Company disclosures must be able to convince stakeholders that the company's operations do not pose risks that are not acceptable to the public. Companies operate as citizens who are responsible for the environment and risk legitimacy, thus business operations will run properly [5].

Research showing a demand for information on climate change has clear relevance to Carbon Accounting. Climate change is a very significant problem facing the planet. Research should contribute to a body of evidence that creates awareness and encourages companies to increase transparency, in addition to increasing stakeholder interests, as well as providing important company information [7].

In fact, companies that refuse to disclose Carbon Emissions information, as well as companies that provide incomplete information and companies that do not respond to Carbon Disclosure Project (CDP) surveys have higher information asymmetries. Compared to companies that provide complete information and choose to make reports available to the public, that can be a factor in reducing information asymmetry. Disclosure of Carbon Emissions not only provides important information about corporate social responsibility, but also contributes to enriching the information environment which leads to reduced information asymmetry in the Capital Market for companies. More direct stakeholder pressure could encourage more companies to provide comprehensive Carbon Emissions information and choose to make it available to the public [8].

One effective tool for informing about carbon is using Voluntary Disclosures, which aim to protect against problems resulting from loss of control over sensitive company information and to reduce the possibility of adverse market reactions to the information (e.g., stock price declines) [5]. Based on criticism of the social and environmental

accounting literature, corporate social and environmental reporting is motivated by management's desire to legitimize corporate existence and behavior [9]. Companies have provided Carbon Disclosure information in response to climate change challenges and that patterns of Carbon Disclosure are likely to be influenced by social, economic, and legal factors [10].

### 3. Research Methods

This study investigated Carbon Emissions Disclosure as an environmental risk management communication tool and an effective solution for climate change mitigation. We systematically reviewed the literature collected through Scopus, keeping track of all studies where the keyword combinations Carbon Emission Disclosures, GHG Disclosures, and Climate Change Disclosures resulted in 42 papers for these studies. This section provides a theoretical and methodological framework for studying the progress of this topic in recent years.

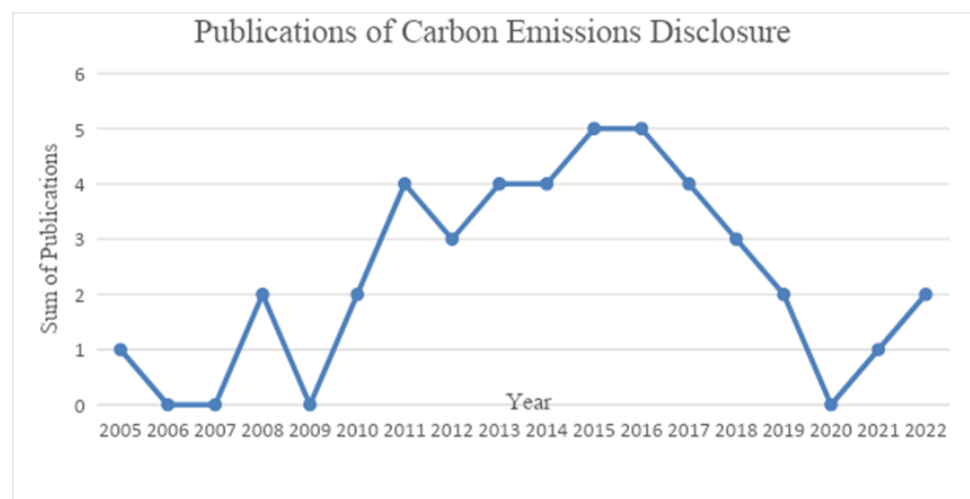
Studies related to climate change have explained the importance of and how to reduce the risks of climate change to ensure sustainable global growth. Governments are responsible for maintaining regulations to deal with climate change and environmental hazards. In addition, effective policies at the international and national levels are critical to addressing carbon emissions and increasing climate resilience around the world. In addition, the government is responsible for passing legislation to address funding challenges addressing climate and environmental risks. Countries globally underestimate the complexity of the multiple drivers, such as greenhouse gas emissions, carbon emissions and deforestation, that lead to climate change, and how these factors reduce the associated risks [11].

As one can observe, climate change is one of the most complex problems facing the country. This topic can be studied from various perspectives, such as political, economic, scientific, social, ethical and moral. Climate change is not only a regional problem but also a global problem that will last for centuries if it is not addressed now. This study investigates the contribution of other research papers in addressing Carbon Emissions Disclosure and this climate change-related issue from various dimensions over the years.

We used bibliometric citation analysis to capture a wealth of literature on Carbon Emissions Disclosure for climate change by analyzing 42 articles from 2005 to 2022. It analyzed the following topics: main research sources, key literature areas, and related

future research issues. This analysis identified three streams of research: Carbon Emission Disclosures, GHG Disclosures, and Climate Change Disclosures (see Table 6). The number of documents issued from 2005 to 2022 is summarized in Figure 1; The influential sources are in Table 2; and keywords with high occurrence in the literature are in Table 2 and Figure 2.

We searched for articles with keywords deemed representative of Carbon Emissions Disclosure. Our search query in the Scopus database includes the following keywords: Carbon Emission Disclosures, GHG Disclosures, and Climate Change Disclosures.



**Figure 1:** Publications of Carbon Emissions Disclosure.

The bibliometric approach helps researchers prepare and coordinate their reading and critically and systematically approach broad fields of study to develop detailed, rigorous, and synthetic knowledge of these fields. Therefore, VOSviewer is used for visualization, Excel tables and charts. The theme of bibliometric indicators is very complex, and there are multiple sources of data, including different levels of analysis and different types of metrics. A reliable and robust bibliometric analysis must start with a properly structured database that considers all available information at all levels [11].

## 4. Results and Discussion

### 4.1. Descriptive Statistics: Number of Documents

VOSviewer software is used to determine the number of documents. A total of 42 articles were published between 2005 and 2022 (Figure 1). 2015 and 2016 had the highest number of publications. The number of publications has increased in recent

years due to an increase in natural disasters, which have attracted the attention of researchers worldwide (Figure 1).

## 4.2. Influential Sources

In the analysis to determine the importance of article sources based on the number of documents published, the Accounting, Auditing and Accountability Journal and Business Strategy and the Environment lead among article sources (Table 1).

TABLE 1: Influential Scientific Journals.

Influential Source	Sum of documents
Accounting, Auditing and Accountability Journal	4
Business Strategy and the Environment	4
Accounting and Finance	3
Accounting Research Journal	3
Accounting and Business Research	2
British Accounting Review	2
Journal of Business Ethics	2
Journal of International Financial Management and Accounting	2
Social and Environmental Accountability Journal	2
Accounting Forum	1
Australian Accounting Review	1
Australian Journal of Management	1
Business and Society	1
Corporate Social Responsibility and Environmental Management	1
Financial Accountability and Management	1
International Journal of Accounting	1
International Journal of Accounting and Information Management	1
International Journal of Climate Change Strategies and Management	1
Journal of Accounting and Organizational Change	1
Journal of Applied Accounting Research	1
Journal of Contemporary Accounting and Economics	1
Journal of Financial Economics	1
Managerial Auditing Journal	1
Meditari Accountancy Research	1
Pacific Accounting Review	1
Strategic Management Journal	1
Sustainability Accounting, Management and Policy Journal	1

### 4.3. Keywords

VOSviewer software is used to determine the occurrence of keywords. The minimum number of three keyword occurrences results in 22 keywords that meet the research requirements. Disclosure of Carbon Emissions has become the most common buzzword in the literature over the last 18 years. Thus, three streams of disclosure were defined: Carbon Emissions Disclosures, GHG Disclosures, and Climate Change Disclosures. Accounting, Auditing and Accountability Journal then Business and Environmental Strategy are two of the most influential sources. Overall Keyword can be seen in Figure 2.

TABLE 2: Keyword.

Keyword	Occurrences
Firm Size	23
CDP	17
Leverage	17
Carbon Emission Disclosure	13
Climate Change Disclosure of GHG Emission	13
Climate Change Disclosure	12
ROA	12
Industry Sectors	8
GHG Emissions	5
Board Independence	5
ROE	4
Carbon Emission	4
Corporate Governance	4
Board Size	4
Tobin's Q	4
Duality	3
Carbon Performance	3
Kyoto Protocol	3
Profitability	3
Environmental Performance	3
Board Diversity	3
Environmental Committee	3

Source: Authors data (Processed, 2023)

## 5. Finding and Conclusion

We build a research plan based on the results of a bibliometric study. First, all the papers that construct the citation map have been identified. Second, all papers included in the study were reviewed. Third, paper titles and keywords in the research sample that matched the flow were examined. Fourth, the future research agenda is translated into research questions.

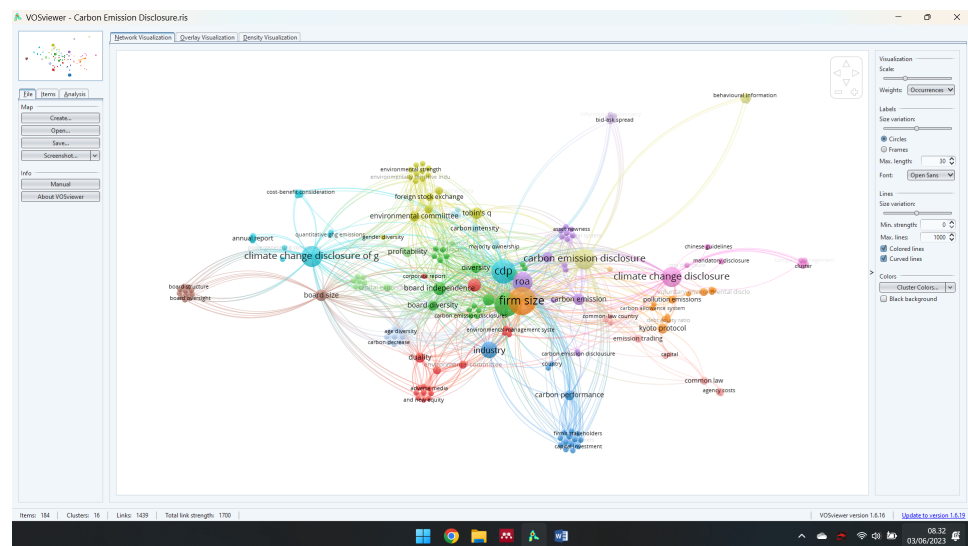


Figure 2: Publications of Carbon Emissions Disclosure.

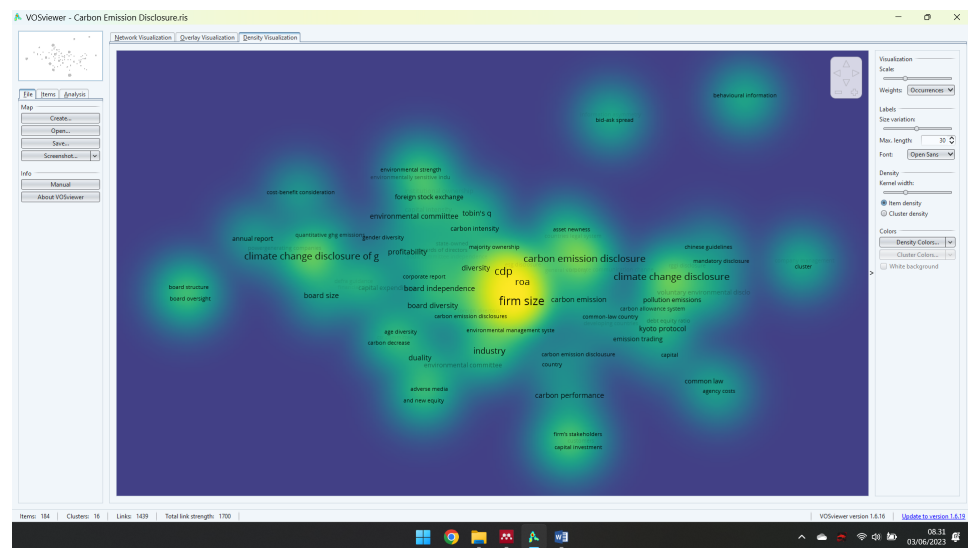
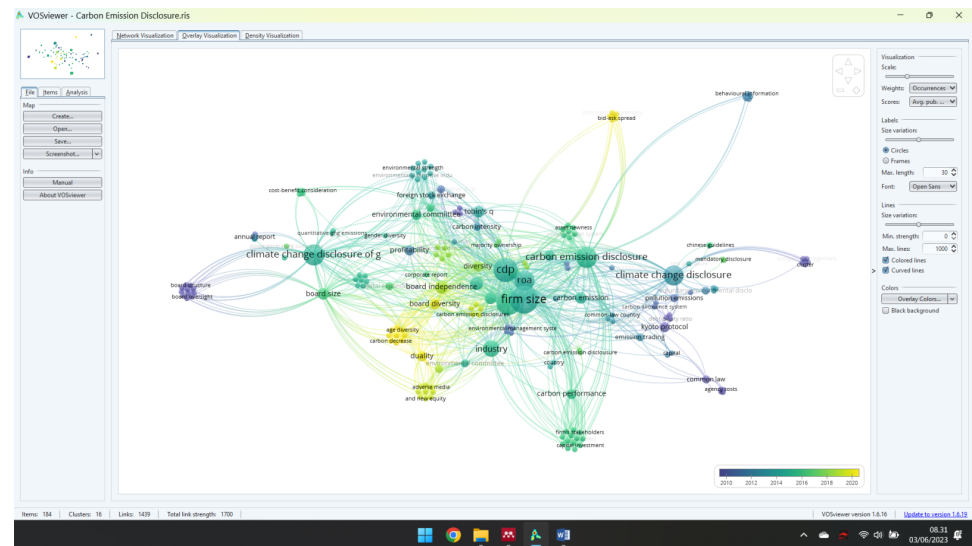


Figure 3: Network Visualization of Carbon Emissions Disclosure.

The role of Voluntary Disclosure, on the one hand, is to inform shareholders, regulators and other stakeholders about the environmental impact that is due to the company's operational activities. As well as initiatives undertaken to reduce these impacts, and on





**Figure 4:** Overlay Visualization of Carbon Emission Disclosure since 2005-2020.

the other hand, to create and maintain a socially responsible image [3]. The low level of disclosure in both the Annual Report and the Sustainability Report indicates that the company cannot be relied upon to make Voluntary Disclosures. Companies must report the level of Carbon Emissions in the audited Financial Statements section of the Annual Report to ensure the completeness and correctness of these disclosures [12].

Variation in the nature and extent of disclosure suggests that while disclosure is a response to Legitimacy issues, legitimacy tactics vary across firms. The stakeholder evaluation of a company is based, inter alia, on the communication of information about corporate actions and/or on symbolic behavior. Disclosure decisions focus on disseminating information about instrumental actions taken by companies to reduce their carbon footprint, or perhaps rhetorical statements designed to create an impression of environmental responsibility, not necessarily accompanied by relevant actions. The first is what is described as a behavioral management approach and the last is a symbolic management approach [6].

Research is needed that can examine whether and how findings from different sample-based studies can be combined to create more general insights that can be applied to different contexts (including under-researched contexts such as carbon disclosure in developing countries) [13].

In general, the results of previous research studies are critical of Disclosure of Carbon Emissions. The results of this critique can be grouped into three main categories:

1. Category/Index of Carbon Emissions Disclosure ([9]; [3]; [14]; [15]; [6]).

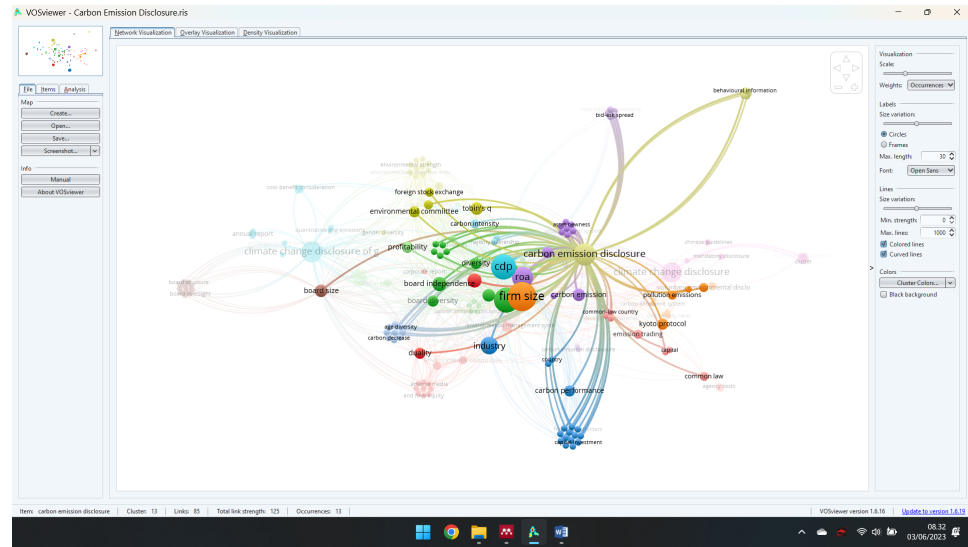


Figure 5: Network Visualization of Category/Index of Carbon Emissions Disclosure.

1. Category/Index of GHG Emissions Disclosure ([16]; [17]; [18]; [7]; [19]; [20]; [21]; [22]; [23])

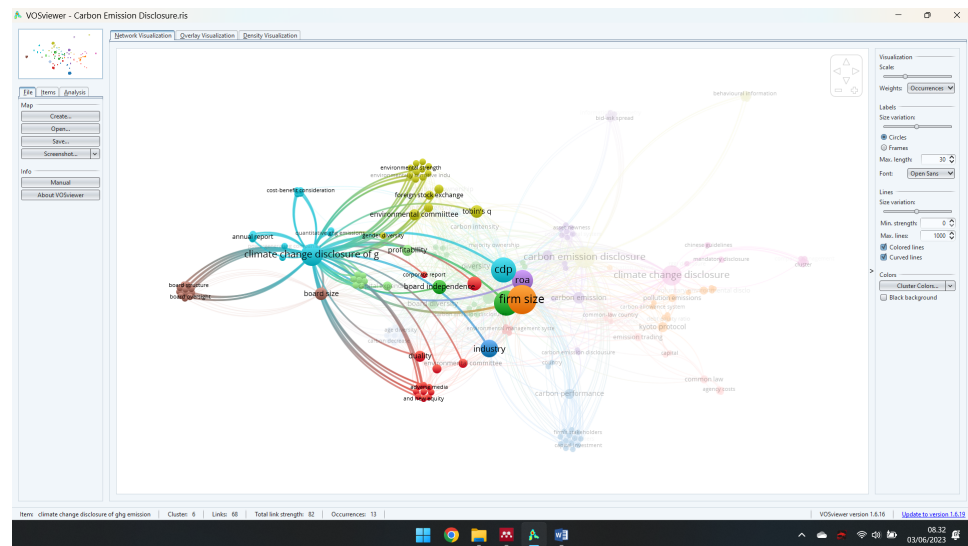
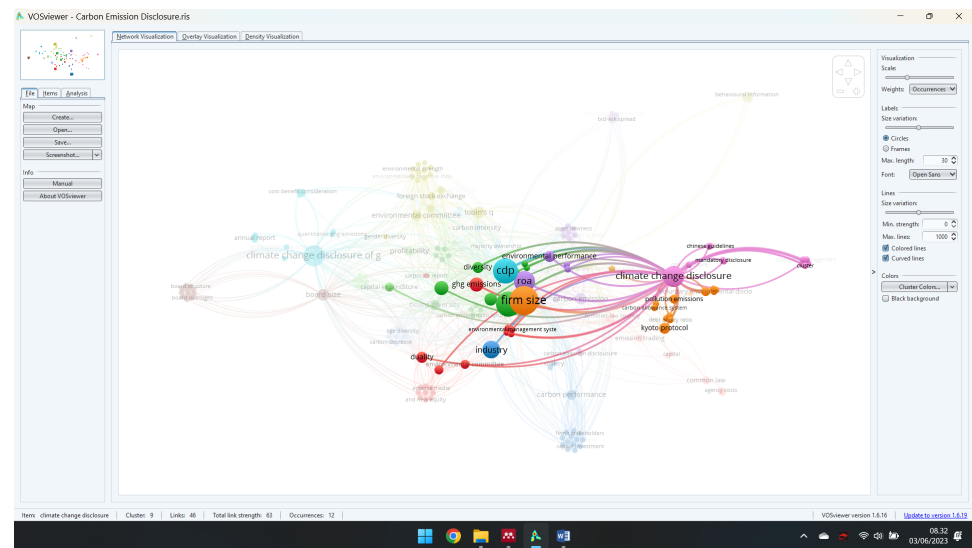


Figure 6: Network Visualization of Category/Index of GHG Emissions Disclosure.

1. Category/Index of Climate Change Disclosure ([24]; [25]; [12]; [26]; [27]; [28]; [29])

## 6. Implications, Limitations, and Suggestions

This study shows that response policies must be robust enough to recognize the relationship between climate change and Disclosure of Corporate Carbon Emissions.



**Figure 7:** Network Visualization of Category/Index of Climate Change Disclosure.

The impact of climate change on an individual's long-term health is difficult to measure. Developed and developing countries should take the initiative to disseminate climate change costs and environmental risk issues. Such partnerships between different economies can help cope with stickiness more efficiently. This implies that the Disclosure of Carbon Emissions and climate change can serve as a communication tool to stakeholders. Previous research data shows that governments and several other institutions have spent billions of dollars to understand the reasons behind the inevitable global warming, which poses several environmental risks to the world [11] [30]. Policies that facilitate communication between economies around the world encourage individuals to pay more attention to the Disclosure of Carbon Emissions related to climate change and the importance of insurance. The aftermath of such a global disaster now requires the government to care about environmental problems. Legislation to control climate change must be consistent with all authorities to minimize its impact. In addition, policy makers need to introduce special subsidies to address distortions in implementing climate control strategies. Companies must also invest in clean, state-of-the-art technology to protect themselves from emerging financial regulatory costs.

## References

- [1] Csutora M, Harangozo G. Twenty years of carbon accounting and auditing - A review and outlook. *Soc Econ.* 2017;39(4):459–80.
- [2] Gibassier D, El Omari S, Naccache P. Institutional work in the birth of a carbon accounting profession. *Account Audit Account J.* 2020;33(6):1447–1476.

- [3] Alrazi B, de Villiers C, Van Staden CJ. The environmental disclosures of the electricity generation industry: A global perspective. *Account Bus Res.* 2016;46(6):665–701.
- [4] Martineau R, Lafontaine JP. When Carbon Accounting Systems Make Us Forget Nature: From commodification to reification. *Sustainability Accounting, Management And Policy Journal.* 2020;11:487–504.
- [5] Luo Z. Temporal and spatial evolution of nitrous oxide emissions in China: Assessment, strategy and recommendation. *J Clean Prod;* 223. Epub Ahead of Print 2012. <https://doi.org/10.1016/J.Jclepro.2019.03.134>
- [6] Hrasky S. Carbon footprints and legitimization strategies: Symbolism or action? *Account Audit Account J.* 2012;25(1):174–198.
- [7] Haque S, Deegan C, Inglis R. Demand for, and impediments to, the disclosure of information about climate change-related corporate governance practices. *Account Bus Res.* 2016;46(6):620–664.
- [8] Adhikari A, Zhou H. Voluntary disclosure and information asymmetry: Do investors in US capital markets care about carbon emission? *Sustainability Accounting, Management and Policy Journal.* 2011;13:195–220.
- [9] Liu YS, Zhou X, Yang JH. Corporate carbon emissions and financial performance: Does carbon disclosure mediate the relationship in the UK? *SSRN Electronic Journal.* 2017;26:413–425. <https://doi.org/10.2139/ssrn.2941123>
- [10] Luo L, Lan YC, Tang Q. Corporate incentives to disclose carbon information: Evidence from the CDP Global 500 Report. *J Int Financ Manag Account.* 2012;23(2):93–120.
- [11] Nobanee H, Dilshad MN, Abu Lamdi O, Ballool B, Al Dhaheri S, AlMheiri N, et al. Insurance for climate change and environmental risk: A bibliometric review. *Int J Clim Chang Strateg Manag.* 2022;14(5):440–461.
- [12] Cowan S, Deegan C. Corporate disclosure reactions to Australia's First National Emission Reporting Scheme. *Account Finance.* 2011;51(2):409–436.
- [13] Borghei Z. Carbon disclosure: A systematic literature review. *Accounting and Finance.* 2021;61(4):5255–5280.
- [14] Bae Choi B, Lee D, Psaros J. An analysis of Australian company carbon emission disclosures. *Pac Account Rev.* 2013;25(1):58–79.
- [15] Chu CI, Chatterjee B, Brown A. The current status of greenhouse gas reporting by Chinese companies: A test of legitimacy theory. *Manag Audit J.* 2013;28:114–139.
- [16] Hollindale J, Kent P, Routledge J, Chapple L. Women on boards and greenhouse gas emission disclosures. *Account Finance.* 2019;59(1):277–308.

- [17] Momin MA, Northcott D, Hossain M. ND, Hossain M. Greenhouse gas disclosures by Chinese power companies: Trends, content and strategies. *Journal of Accounting and Organizational Change*. 2017;13(3):331–358.
- [18] Yang HH, Farley A. Convergence or divergence? Corporate climate-change reporting in China. *International Journal of Accounting & Information Management*. 2016;24(4):391–414. Epub Ahead of Print.
- [19] Comyns B, Figge F. Greenhouse gas reporting quality in the oil and gas industry: A longitudinal study using the typology of “search”, “experience” and “credence” information. *Account Audit Account J*. 2015;28(3):403–433.
- [20] Tauringana V, Chithambo L. The effect of DEFRA guidance on greenhouse gas disclosure. *Br Account Rev*. 2015;47(4):425–444.
- [21] De Aguiar TR, Bebbington J. Disclosure on climate change: Analyzing the UK ETS effects. *Account Forum*. 2014;38(4):227–240.
- [22] Haque S, Deegan C. Corporate climate change-related governance practices and related disclosures: Evidence from Australia. *Aust Account Rev*. 2010;20(4):317–333.
- [23] Galbreath J. Corporate governance practices that address climate change: An exploratory study. *Business Strategy and the Environment*. 2010;19(5):335–350.
- [24] Freedman M, Park JD. Mandated climate change disclosures by firms participating in the regional greenhouse gas initiative. *Social and Environmental Accountability Journal*. 2014;34(1):29–44.
- [25] Cotter J, Najah MM. Institutional investor influence on global climate change disclosure practices. *Aust J Manag*. 2012;37(2):169–187.
- [26] Freedman M, Jaggi B. Global warming disclosures: Impact of kyoto protocol across countries. *J Int Financ Manag Account*. 2011;22(1):46–90.
- [27] Rankin M. WC, Wahyuni D. An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system: Australian evidence. *Account Audit Account J*. 2011;24:1037.
- [28] Jeswani H, Wehrmeyer W, Mulugetta Y. Ww, Mulugetta Y. How warm is the corporate responses to climate change? Evidence from Pakistan and the UK. *Bus Strategy Environ*. 2008;17(1):46–60.
- [29] Freedman M, Jaggi B. Global warming, commitment to the Kyoto Protocol, and accounting disclosures by the largest global public firms from polluting industries. *International Journal of Accounting*. 2015;40(3):215–232.
- [30] Lahyani Fe. Corporate board diversity and carbon disclosure: Evidence from France. *Accounting Research Journal*. 2022;35(6):721–736.