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Research Article

Effectiveness of Emission Control Policies: Bibliometric Insights Across Economic Contexts

Livia Ayu Intan Lestari[1*], Aida Roestiyadi[2], Cyntia Widya Ariastuti[3]

[1-2] Semarang State University, Indonesia; e-mail: liviaayu@students.unnes.ac.id
* Corresponding Author: Livia Ayu Intan Lestari

Abstract: Global climate change has prompted analysis of emission control policies, including carbon trading mechanisms and carbon taxes, to achieve a low-carbon economy. This study utilizes a bibliometric approach (2020–2025) with the Scopus database, which is processed using the RStudio application with Bibliometrix and Biblioshiny analysis and also uses the VOSviewer application, to identify publication trends and the effectiveness of emissions policies in different economic contexts, such as G20 countries or developed countries with developing countries. Thematic analysis results show dominant topics such as emissions trading, carbon capture, renewable energy, and a focus on economic development and technological innovation. The reviewed literature confirms that higher carbon tax rates are more effective in reducing emissions in G20 countries, while in developing countries, the implementation of a combination of strict carbon taxes and emissions trading mechanisms can promote substantial decarbonization. Overall, this bibliometric study confirms the growing research interest in green economy solutions and supports the urgency of adaptive, evidence-based emissions policies in various economic contexts.

Keywords: Bibliometrix; Carbon Trading; Economics; Emission Control; Policy Effectiveness

1. Introduction

Climate change is currently one of the biggest global challenges that greatly affects our lives and threatens ecological, social, and economic stability. According to the IPCC in 2022, climate change is "a mounting threat to our wellbeing and a healthy planet". Therefore, controlling greenhouse gas emissions is crucial in order to achieve sustainable development and a green economy. Various environmental policies have been created, such as carbon taxes and carbon trading systems, to provide financial incentives, particularly for reducing CO2 and other pollutant emissions, while encouraging the adoption of more efficient energy utilization technologies. The application of a cost per ton on emissions can also help create economic incentives for producers and consumers to transition from fossil fuels to optimize energy efficiency and allocate investment in low-carbon technologies. Carbon pricing was developed to appreciate the social costs associated with carbon emissions and to facilitate the transition to more environmentally friendly technologies. This approach is also in line with the United Nations Sustainable Development Goals, specifically the 17 Sustainable Development Goals (SDGs), particularly in relation to climate action (SDG 13) and responsible consumption and production (SDG 12). At the international level, technological innovation is recognized as playing a very important role in balancing economic growth through environmental preservation, improving resource efficiency, and promoting sustainable development. Thus, regulations related to emission control and carbon trading mechanisms are the most important instruments and keys in efforts to promote the transition to a low-carbon and green economy.

This study uses a bibliometric and biblioshiny analysis tool approach to examine scientific publications related to regulations on emissions control and carbon trading. The publication data was taken from the Scopus database, which was then analyzed using the R Studio application (Bibliometrix and Biblioshiny) and VOSviewer software to map research

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trends and other scientific structures in this field. A similar approach has also been applied in previous studies, for example, Yao et al. (2023) who used R Studio and VOSviewer to analyze literature on electric vehicles related to energy efficiency and emission reduction. This approach allows for the identification of research trends, research patterns, even collaboration between researchers, and thematic developments in the topics of environmental and carbon policy as a whole. In addition, analysis of this model can measure a publication in terms of revealing the most explored issues at the time, as well as seeing cross-country or cross-institutional collaboration networks in related research, and the central narratives that may dominate the related literature. The application of bibliometric methods also enables the identification of gaps in unexplored research and areas that require further exploration, as shown in a study analyzing trends in carbon tax research and sustainable transnational business (Kusumawati et al., 2025).

This study focuses on comparing the effectiveness of policies in controlling emissions and implementing carbon trading among G20 countries or developed countries with developing countries. G20 countries or developed countries collectively contribute to most of the global greenhouse gas emissions, so regulations established in these regions are crucial to achieving global climate mitigation targets. Wahyudi & Leny (2025) found that higher carbon tax rates in G20 countries or developed countries are closely related to lower emission levels, indicating that carbon tax policies are effective in reducing emissions. Meanwhile, many other developing countries have also implemented various mechanisms to tackle emissions, such as carbon trading, which can be an important tool in making a clean energy transition in the region. For example, Sunanda et al. (2025) reported that a combination of strict carbon taxes and carbon trading schemes in the energy sector in Indonesia has substantially promoted decarbonization, although it requires enormous investment to achieve this. This cross-contextual economic comparison is important for understanding the challenges and opportunities in designing effective and equitable climate policies.

Efforts to improve through various regulations are one of the goals for sustainable development, focusing on environmentally friendly and low carbon emission principles that have achieved broad agreement among policymakers and the academic community, with a particular focus on shifting industry towards greener practices. Within this framework, systematic bibliometric analysis provides scientific evidence for formulating data-driven emissions policies. This study is expected to support these efforts by providing empirical insights into research trends and collaboration in the fields of climate policy and the green economy. Relevant results will enrich the formulation of evidence-based emissions policies, while supporting the increasingly urgent low-carbon development framework. Through this comprehensive analysis of various literature, policymakers and researchers can be expected to identify strategic areas and gaps between studies, so that national and international carbon emission reduction policies can be aligned with the latest scientific findings and be evidence-(Sachan et al., 2025).

2. Literature Review

The IPCC study shows that developing countries generally have higher emission intensities than G20 countries or developed countries. This is because much of the technology used is inefficient and fuel sources are more carbon intensive. This condition has influenced the creation of a policy framework to control carbon emissions. For example, in G20 countries or developed countries such as the European Union, an emissions trading system (ETS) has long been in place. The results of a study LSE (2016) show that the EU ETS succeeded in cutting carbon emissions by around 10% during the 2005–2012 period without harming economic performance or companies. The regulation did not have a negative impact on profits or employment, and in fact increased company revenues by 15% and fixed assets by 8%. These findings support Porter's Hypothesis, which states that effective environmental regulations can drive innovation and significantly more efficient economies of scale. The implementation of carbon trading schemes, such as those implemented in the European Union, shows that this policy instrument can effectively reduce greenhouse gas emissions while maintaining economic competitiveness and even increasing company revenues and fixed assets (Dechezleprêtre et al., 2023). This application also indicates that market-based instruments can be a driver of environmentally friendly technological innovation, in line with the goal of achieving sustainability.

Conversely, in developing countries, the results of the study show a different context. In China, for example, firm-level microeconomic studies found that the implementation of ETS did not have a significant impact on reducing industrial competitiveness; instead, it actually increased productivity in the companies involved. Using the difference-in-differences method, Wen et al. (2021) report strong evidence that ETS promotes the economic performance of companies in China, supporting Porter's assumption that carbon policies can spur green

innovation without sacrificing industrial growth. However, the implementation of ETS in developing countries is still very difficult and also faces institutional challenges. A panel analysis of a province in China found that the effectiveness of ETS is highly dependent on market coverage and design. The study concluded that renewable energy strategies are consistently effective in reducing carbon emissions, while the benefits of carbon trading are only significant in provinces that have implemented ETS. In other words, carbon price incentives can encourage companies to reduce emissions, but this only applies strongly in regions with active ETS systems. In fact, the reduction in emissions from ETS is only visible locally, meaning that the more provinces that adopt ETS, the greater the contribution to national emission reductions.

However, to date, climate policy literature tends to analyze emissions control and carbon trading in specific economic contexts without directly comparing G20 countries or developed and developing countries. For example, many studies focus on the implementation of the EU ETS or other developed country carbon markets, while analyses in developing countries focus on cases in China or regional ETS pilots. The study by Lu et al. (2025) also notes the lack of comprehensive literature on China's national carbon market and the lack of multidimensional analysis. This cross-context comparison is important given that mitigation strategies must be tailored to local economic conditions. Given the evidence that ETS provides significant benefits in Europe and China, comparative studies between G20 countries or between developed and developing countries are needed to understand how economic factors, such as industrialization levels, energy structures, and institutional capacities, affect the effectiveness of emissions control and carbon trading. This will fill the literature gap and help design policies that are more adaptive to different economic contexts.

3. Research Method

This study uses a bibliometric approach, namely a quantitative method to systematically analyze scientific publications. The bibliometric approach was chosen for its ability to objectively identify patterns in publications, collaboration networks, and main themes in the literature. Bibliographic data was collected from the Scopus database, which is widely known as a curated and high-quality source of bibliometric data. The search process was conducted using the main keywords "economics," "emission control," and "carbon trading" for the period 2020–2025 (in accordance with the focus of the study).

The research methodology included the following stages: 1) Literature Search and Selection: Literature data collection was conducted by searching for data available on Scopus using the above criteria and keywords. The search was also limited to the 2020–2025 period and document types in the form of scientific articles (research articles and reviews). The initial search results were then filtered to remove duplicates, irrelevant articles, or articles that were not relevant to the topic. After screening and checking the eligibility of scientific articles, 1,615 relevant articles were obtained for further analysis. 2) Metadata Data Export: Metadata from the 200 articles (e.g., title, abstract, author keywords, year of publication, author, affiliation, and reference list) were exported from Scopus to a processable format. Export Metadata Data: Metadata from articles that have been obtained (e.g., title, abstract, author keywords, year of publication, author, affiliation, and reference list) is then exported from Scopus to CSV format so that it can be used with Bibliometric analysis tools. The data is then imported into the analysis tool for systematic processing. 3) Bibliometric Analysis: The main analysis was conducted using the RStudio application with the Bibliometrix and Biblioshiny analysis tools. This analysis includes identifying the number of publications each year, the most productive authors, leading journals, countries or institutions with the most contributions, and the distribution of dominant keywords. The output from Biblioshiny is in the form of interactive graphs and analysis tables that help in understanding the dynamics of publication growth, collaboration patterns, and literature distribution. 4) Network Visualization: To deepen structural analysis, data is also exported to the VOSviewer application. With VOSviewer, collaboration networks can be mapped, such as networks of authors or institutions and keyword co-occurrence or co-citation. VOSviewer also maps relationships between authors or topics based on the frequency of relationships. This visualization also helps identify active research groups, dominant research themes, and the intellectual structure of the field of carbon trading and emissions control. A similar approach using keyword co-occurrence maps has been used in related bibliometric studies. 5) Biblioshiny Output: After obtaining initial visualizations from the Biblioshiny analysis results, they are then critically reviewed. Annual publication trend graphs, keyword distributions, and lists of the most influential authors are reviewed to ensure relevance and consistency with the research objectives. This stage serves as an initial validation in the preparation of the basis and interpretation of the results of a study. 6) Identify Research Trends: From the results of

bibliometric analysis, researchers then identify existing research trends, examine patterns of scientific collaboration, and identify dominant topics in the literature related to emissions control and carbon trading. This information is used to map the main themes in a study and determine the intellectual structure of the relevant field. In addition, this analysis also identifies research gaps, namely topics that have been under-explored or minimally published, which could provide opportunities for future research.

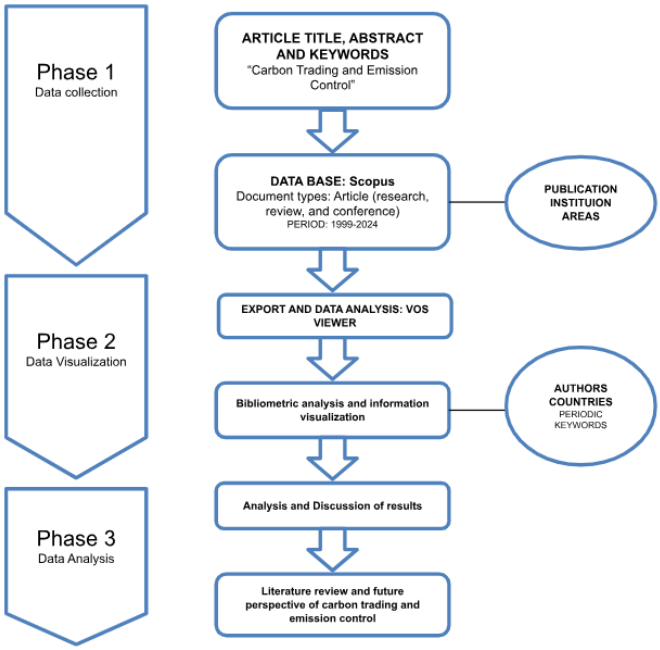

Figure 1. Methodology Phases Applied to the Present Work

All of the above stages were systematically arranged to ensure validity and reproducibility in the analysis. The use of Scopus as a database source and a combination of RStudio applications (with Bibliometrix and Biblioshiny tools) and VOSviewer is a common practice in bibliometric studies to obtain a comprehensive picture of the development of specific research in a field. The results of this analysis are expected to provide insights into the effectiveness of policies through emission control from the perspective of research trends and collaboration between researchers in different economic contexts.

4. Results and Discussion

The main information is data obtained from bibliometric analysis on publications related to carbon trading and emissions control in the period 1905–2026. Figure 2 shows the research time frame from 1905 to 2026, during which a total of 15,083 documents were published in 2,297 different sources. The data also shows an average annual growth rate of 1.92% in publications, indicating a consistent increase in academic interest in the topic of emission control policies. The trend analysis is based on the year of publication, which shows that the increase in literature has been gradual, with an acceleration in the modern era, in line with growing global awareness of environmental issues and climate change. This may be related to international policies such as the Kyoto Protocol (1997) and the Paris Agreement (2015), which have encouraged scientific attention to the effectiveness of emission control policies. Although the annual growth rate appears relatively moderate, cumulatively, this data confirms that the volume of research in this field has grown significantly over the past century, in line with the increasing importance and strategic nature of this topic in scientific studies and public policy.

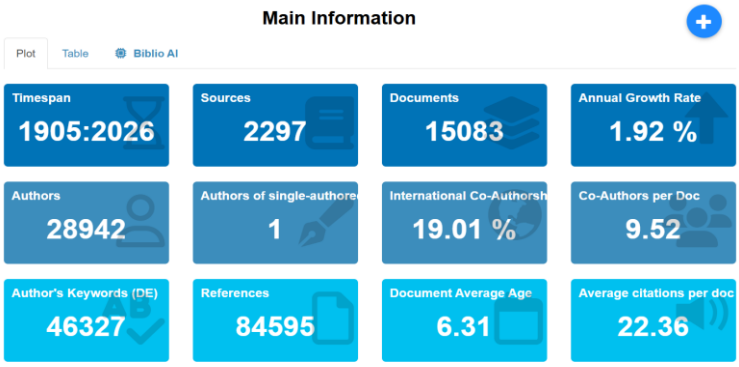

Figure 2. Main Information Overview (using R Studio)

A total of 28,942 authors participated and contributed to the collection of documents, with 19.01% of the documents also involving international collaboration (cross-border authors). Interestingly, there was only one publication that was the work of an individual, unlike most similar studies that involve multidisciplinary collaboration. The involvement of hundreds of researchers is also necessary because emissions policy analysis requires expertise from various disciplines, including environmental engineering, social sciences, and economics, in order to assess the effectiveness of the regulations implemented. Multidisciplinary approaches have become increasingly important in understanding the interconnections between policy, technology, and environmental outcomes (Liu et al., 2022; Zhang et al., 2023). Moreover, global cooperation enhances the credibility and applicability of emission reduction research, particularly in aligning with sustainable development goals (Chen et al., 2024). International collaboration also facilitates data sharing and the harmonization of methodologies, leading to more robust cross-country comparisons (Rahman et al., 2023). However, given that environmental issues are transboundary in nature, increased international collaboration in the future is highly desirable in order to enrich policy perspectives and their application in various economic contexts (Wang & Li, 2021; Lee et al., 2025).

Each document has an average of 9.52 authors and 46,327 unique keywords, indicating a wide and varied range of research topics, from emission reduction techniques to the government policies underlying their implementation. On average, each document lists several keywords, indicating a specific but complementary focus within the framework of this study. There are also 84,595 references cited. The average age of the documents is 6.31 years, reflecting the rapid dynamics of scientific updates, with each document receiving an average of 22.36 citations, demonstrating the significant academic impact of these publications in a data collection. The high citation rate emphasizes that studies on emission control policies are an important reference in scientific discussions and public policy, demonstrating the relevance of this topic in the global research community. These statistics provide us with an initial overview of the development, collaboration, and general characteristics of research on this topic.

Number of publications per year on the topics of carbon trading and emissions control in the period 1905–2026. Figure 3 shows the trend in publications obtained from annual bibliometric analysis from the early 20th century to the present. The graph shows that the number of publications was relatively low and stable between 1905 and the 1990s, but since then, publications and research related to emissions control and trading have increased. This increase has been gradual, with a very significant surge after 2010. This drastic increase shows a response from the scientific community to the growing urgency of global climate change and the development of mitigation mechanisms such as carbon trading and carbon taxes as potential solutions. This is also in line with the increasing global awareness of climate change and the push to reduce carbon emissions.

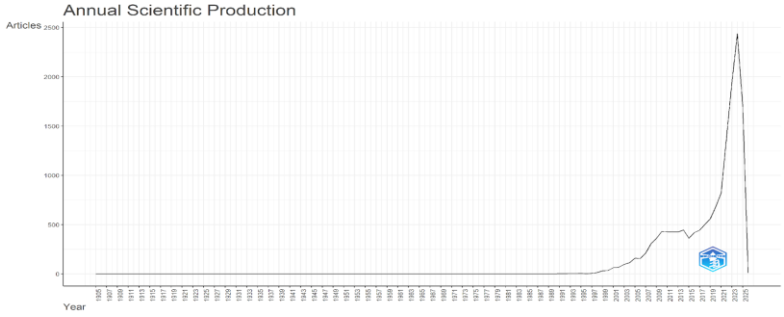

Figure 3. Annual Scientific Production (using R Studio)

Publication peaked around 2021–2022 with nearly 2,400 articles per year. However, it should be noted that despite a very significant increase in the number of publications, there are indications of a decline after 2021, particularly in research on carbon taxes, which may be due to a shift in focus or global policy dynamics (Kusumawati et al., 2025). The sharp decline in the 2025–2026 data reflects the effect of partial (incomplete) data for the last year. Overall, this graph confirms the trend of increasing publication intensity in the last decade. `

Journals or publications with the largest number of documents. Figure 4 shows a graph ranking the most productive journal sources discussing the topics of emissions control and carbon trading. First, the graph shows that Energy Policy dominates as the journal that has published the most on this topic, with 2,013 documents, followed by Sustainability (Switzerland), which has also published 466 documents on related topics, and the Journal of Cleaner Production with 462 documents. The dominance of these three journals indicates that topics related to carbon trading and emission control are more widely discussed in interdisciplinary journals that emphasize the integration of environmental, economic, and social aspects, rather than purely in the field of energy. This is consistent with the global literature trend that links carbon trading with sustainable development goals (SDGs), thereby expanding the academic and practical impact of this research.

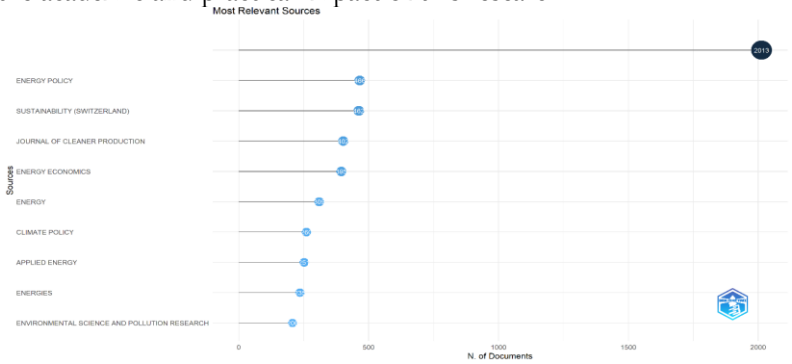

Figure 4. Most Relevant Sources (using R Studio)

There are also other journals, such as Energy Economics, which yielded 402 documents, followed by Energy with 395 documents, Climate Policy with 309 documents, Applied Energy with 260 documents, Energies with 255 documents, and finally Environmental Science and Pollution Research with 238 documents. This shows that publications related to this topic are spread across more specific channels according to their scientific fields. For example, the journals Energy Economics and Applied Energy specifically examine aspects of energy efficiency, market dynamics, and the economic impact of emissions policies. Meanwhile, the journal Climate Policy plays an important role in linking scientific literature with the international framework for negotiations on climate change. Environmental Science and Pollution Research shows the link between carbon trading and local and regional pollution impacts. Thus, the concentration of publications in these key journals reveals a pattern of centralization of literature in strategic channels, which not only serve as a medium for publication but also as a center for discourse formation and a key reference in emissions control and carbon trading research. These findings also show that most of the literature is published in a few top key journals, which underlines the focus of research on selected media in the field of energy and emissions control.

Countries with the highest number of citations. Figure 5 shows the countries with the highest number of citations in publications related to this topic. Korea ranks first in terms of citations, with a total of 3,613 citations. Korea's dominance in first place reflects the strength of their research in the fields of energy, environmentally friendly technology, and emissions policy. High citation rates are usually correlated with the quality of international journals and publications, as well as the extent of international collaboration networks. Korea is also known for its active investment in renewable energy and the development of carbon capture and storage (CCS) technology, so their research results are widely referenced by global researchers. This can also be linked to Korea's commitment to clean energy transition after the Paris Agreement, which makes their scientific publications relevant and often used as a basis for policy and further research.

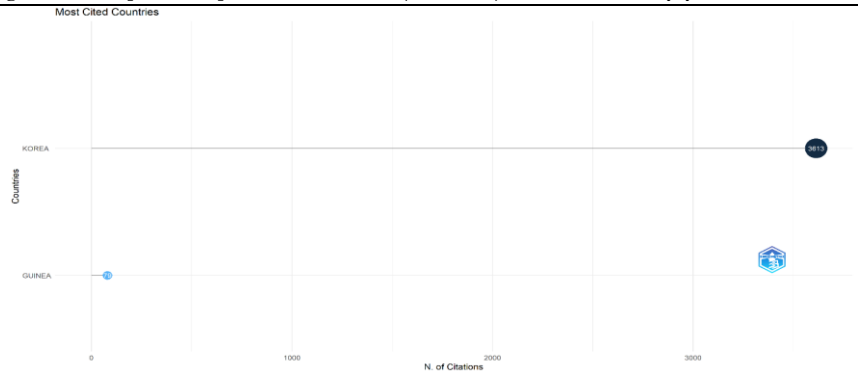

Figure 5. Most Cited Countries (using R Studio)

Meanwhile, in the graph generated by this bibliometric analysis, Guinea ranks second with 79 citations, far behind Korea. However, Guinea's presence on this list is quite interesting because the country does not usually dominate the global publication landscape on carbon issues. Guinea's high citation rate in the dataset is most likely related to several key publications discussing the context of West Africa, particularly regarding deforestation, fossil fuel dependence, or the potential for forest-based carbon trading. Often, one or two important articles relevant to the global discourse can attract high citations, statistically placing countries such as Guinea in a prominent position. This shows that, in addition to developed or industrialized countries such as Korea, developing countries can also play an important role in the literature if their publications directly intersect with global issues such as climate mitigation and carbon market mechanisms.

Keyword co-occurrence network map. Figure 6 shows the thematic network formed from the author's keywords obtained through VOSviewers analysis. This visualization illustrates the thematic structure and relationships between key concepts in academic literature discussing carbon trading, emission control, and other related environmental issues. Each node (circle) represents a keyword that is frequently used in scientific research, while the lines (edges) indicate the frequency of co-occurrence between two keywords in a single document. The size of the nodes also reflects the frequency of occurrence of a keyword, and the colors group words into clusters based on thematic relevance.

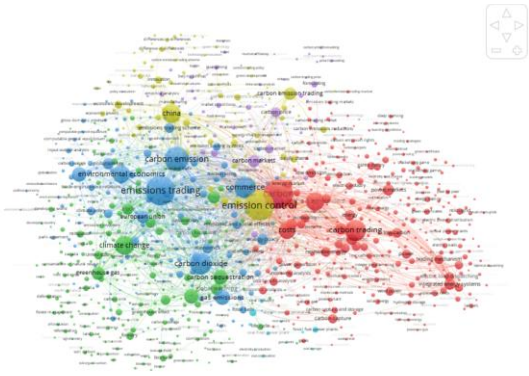

Figure 6. Network Visualization (using Vos Viewer)

The red cluster appears dominant on the right side of the map and includes keywords such as carbon trading, emissions, renewable energy, power markets, trading mechanisms, and low carbon economy. This cluster generally indicates a focus on the technical aspects and economic mechanisms of carbon trading, including its integration into renewable energy systems and electricity distribution. The interrelationship between keywords such as wind power, solar energy, and hydrogen storage shows that the literature in this cluster highlights the development of low-carbon energy systems that play a role in supporting emission control. Meanwhile, the emergence of other keywords such as costs and game theory indicates an analytical and economic approach in assessing the effectiveness of carbon trading systems.

Meanwhile, the blue and green clusters located in the center and left of the map show a more macro perspective and related policies. The blue cluster, for example, has keywords such as emissions trading, carbon emissions, carbon dioxide, and environmental economics, which indicate an orientation towards environmental policy and economic frameworks on an international scale. Other keywords that appear, such as European Union, climate change, and greenhouse gas, also indicate global involvement and the influence of international agreements such as the Paris Agreement. On the other hand, the green cluster connects concepts such as carbon sequestration, forest management, agriculture, and land use, which

indicate a nature-based solutions approach to emissions mitigation. The involvement of developing countries is also evident through keywords such as developing country, which indicates the importance of the geographical dimension in the discussion of this topic.

Then, the yellow cluster occupies a more centralized position and becomes the meeting point of several paths between clusters. Keywords such as emission control, China, economic impact, and emissions trading scheme indicate a focus on policy and the economic impact of emissions intervention, particularly in the context of large countries such as China. The strategic position of the yellow cluster shows that the debate on emission control is multidisciplinary and serves as a nexus between technical, policy, and economic aspects. Its strong connections with other clusters also illustrate how the theme of emissions cannot be separated from energy governance, economic frameworks, and global geopolitical dynamics. Therefore, this network map not only reveals the structure of knowledge in academic literature, but also reflects the complexity and interconnections across issues in emissions control and carbon trading policies.

Figure 7 is a co-occurrence map of keywords that maps the relationships between keywords in scientific literature on emissions control and carbon trading. Each node (circle) represents a keyword that is frequently used in scientific publications, while the lines connecting the nodes indicate the frequency of co-occurrence of these words in a document. The size of the nodes reflects the level of popularity or frequency with which the words are discussed in the research, while the colors are used to distinguish clusters or thematic groups that are closely related.

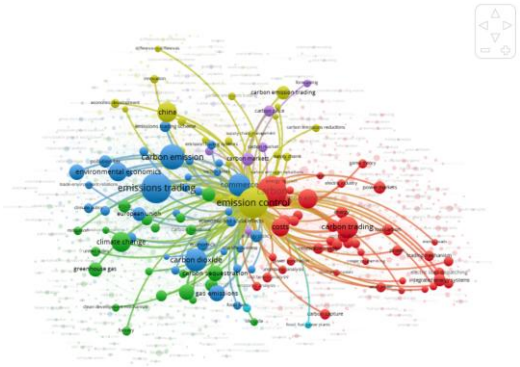

Figure 7. Network Visualization of Term Emission Control (using Vos Viewer)

The central node in this visualization is "emission control," which is large and strategically positioned in the middle, indicating that this topic is the main focus of this research. The red cluster, which includes words such as "carbon trading," "costs," and "renewable energy," points to the technical and economic issues of carbon regulation implementation. Meanwhile, the blue cluster contains keywords such as "emissions trading," "environmental economics," and "climate change," which indicate a policy-based and environmental economics approach. The green cluster shows links to ecological and scientific aspects such as "carbon dioxide," "carbon sequestration," and "greenhouse gas." On the other hand, the yellow cluster highlights the role of countries such as "China," as well as other words such as "carbon emission trading" and "markets," emphasizing the geographical and institutional context.

The lines connecting the nodes show cross-thematic relationships or connections, which reinforce the understanding that the issues of emissions control and carbon trading do not stand alone, but are interrelated issues involving policy, technology, economics, and the environment. This network visually confirms the diversity of approaches and the importance of multidisciplinary collaboration in addressing global climate change issues.

Figure 8 is an overlay visualization generated using VOSviewer software. This network map connects various keywords or concepts that frequently appear in scientific literature related to the topics of emissions control, carbon trading, and environmental policy. Each node (circle) represents a keyword, and the larger the node, the more frequently the keyword appears in the data set. The lines connecting the nodes indicate the frequency of co-occurrence with the keyword. The thicker and more numerous the lines, the stronger or more frequent the connection between the keywords in the research.

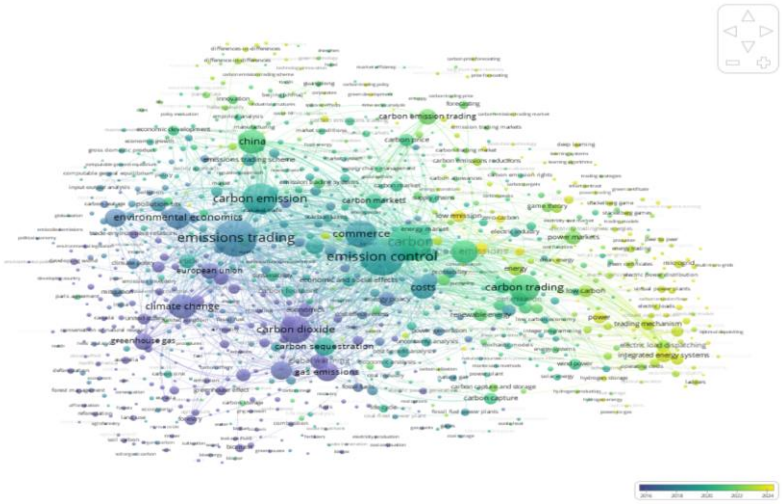

Figure 8. Overlay Visualization of Term Emission Control (using Vos Viewer)

The colors in this visualization represent the time dimension, namely the year of publication of the publications that most frequently use the keyword. The color scale at the bottom right shows the time range from 2016 (purple) to 2024 (yellow). Purple or dark blue indicates that the term is dominant in older literature, while yellowish green indicates newer and developing topics. For example, keywords such as emissions trading, carbon emissions, and climate change appear in shades of purple-blue, indicating that these topics have long been the focus of research. Conversely, keywords such as game theory, power markets, integrated energy systems, and trading mechanisms appear in bright yellow, indicating that these topics have gained attention in recent years.

In terms of cluster structure, the "emission control" node is located at the center of the map with a large size and green color, indicating its central position in scientific discourse and high relevance in recent publications. The purple cluster dominating the left side of the map shows long-studied themes such as environmental economics, greenhouse gases, and climate policy. Meanwhile, the right side of the map, dominated by yellow, displays more recent clusters, raising issues such as renewable energy, carbon capture and storage, and energy market modeling. This shows a shift in the focus of scientific literature from conventional environmental policy analysis to technical and market-based approaches in addressing the climate crisis.

Therefore, this visualization provides a broader picture of the temporal and thematic dynamics in research related to emissions control and carbon trading. Topics such as climate change and emissions policy remain fundamental, but there is an increased focus on low-carbon technology solutions and market efficiency in the latest literature. The close relationship between topics also shows that these studies are closely interlinked in building cross-sectoral understanding, ranging from the environment and economy to renewable energy.

5. Conclusion

Based on bibliometric analysis using Scopus publication data (2020–2025), this study found that research interest in emission control policies continues to increase over time, as reflected in the rise in the number of publications and citations. The main topics that emerged include carbon trading, carbon capture, renewable energy, and technological innovations for a low-carbon economy. There is also extensive collaboration between researchers and across countries, as well as a concentration of publications in leading journals such as Energy Policy, Sustainability, and the Journal of Cleaner Production. These findings also show that scientific studies are increasingly focusing on green economy solutions and evidence-based policy implementation in response to climate change.

Comparative studies of economic contexts highlight differences in policy effectiveness among countries. In G20 countries or developed and developing countries, implementing high carbon taxes has proven effective in reducing emissions, while in developing countries, combining strict carbon tax policies with emissions trading mechanisms greatly encourages decarbonization of the energy sector. In other words, carbon pricing policies and emissions trading systems designed in accordance with national economic characteristics are crucial for a clean energy transition. This conclusion is in line with previous studies showing that environmentally-based market policies not only reduce emissions but also trigger economic innovation without sacrificing industrial growth.

Therefore, this bibliometric analysis confirms the urgency of implementing adaptive and evidence-based policies in various economic contexts. This study shows that the literature on emissions control covers a wide range of themes and approaches, from environmental economics to nature-based solutions. These findings can serve as a reference for policymakers and researchers to identify strategic areas and research gaps that need attention. Thus, national and international emission control policies can be more aligned with the latest scientific findings and achieve sustainable development goals.

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