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CARBON TAX IN INDONESIA: A BUZZWORD OR A RESEARCH PRIORITY? A BIBLIOMETRIC EXPLORATION

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Abstract

Carbon tax is an important fiscal instrument in supporting Indonesia's commitment to reducing carbon emissions and achieving the Net Zero Emission target by 2060. This study aims to map the development of scientific literature on carbon tax in Indonesia through a bibliometric approach. Analysis was conducted on various publications which were then classified into four main thematic clusters, namely: (1) Carbon Tax Policy & Socio-Economic Impacts, (2) Energy Transition & Low Carbon Technologies, (3) Economic Modeling & Dynamic Systems, and (4) Industry, Regional & Sector Specific Implementation. The results of the study show that although the number of publications has increased, there are still a number of research gaps, such as limited longitudinal and regional studies, minimal integration of multidisciplinary approaches, and low attention to SMEs and areas outside economic centers. Based on these findings, this study recommends the need to strengthen long-term data-based research, develop more complex and contextual simulation models, and increase cross-sector collaboration in order to produce more inclusive and effective carbon tax policies. This study is expected to be a basis for compiling a strategic research agenda and supporting evidence-based fiscal policy-making in the environmental sector.

Keywords: carbon tax, carbon emissions, energy transition, environmental fiscal policy, bibliometrics

INTRODUCTION

Climate change has become a real and urgent global challenge, prompting countries to implement policies to significantly reduce greenhouse gas emissions (Syahrudin et al., 2024). Indonesia, as one of the largest carbon emitters in Southeast Asia, has a major responsibility in the climate change mitigation agenda (Dyarto & Setyawan, 2021). In supporting global commitments, the Indonesian government has stated its target through the Nationally Prepared Contribution (NDC) document to achieve Net Zero Emission by 2060 (Damanik et al., 2025; Thamrin et al., 2025).

One of the strategic steps taken is the implementation of a carbon tax, which was officially introduced in the 2021 Tax Regulation Harmonization Law (UU HPP) and began to be implemented in 2022 (Wulandari & Semertzidis, 2024). The carbon tax is positioned as a fiscal instrument to internalize the negative externalities of carbon emissions, encourage energy efficiency, and accelerate the transition to clean energy (Rahma et al., 2025; Claudia et al., 2024). Tax policy plays a crucial role in shaping corporate investment decisions, as it directly affects expected returns, fiscal risk, and the regulatory certainty required for long-term business planning (Bawono & Handika, 2023).

Although in theory carbon tax has great potential, its implementation in Indonesia still faces a number of challenges. These obstacles include: low tax rates, limited emission data, resistance from industry, and minimal public understanding of this policy (Wiwoho et al., 2024; Jupesta et al., 2024). Research by Kamil et al. (2023) and Yusuf & Resosudarmo (2015) also show that the success of this policy is greatly influenced by perceptions of fairness and public support (Putri et al., 2025).

As attention to this policy increases, various scientific studies have emerged to analyze the economic effectiveness, distribution of social impacts, technological readiness, and industrial response to carbon taxes (Mahadevan & Nugroho, 2021; Miyata et al., 2013; Sembiring et al., 2023). However, there are still few studies that systematically map the direction of scientific development, research trends, and gaps in studies (Syahruddin et al., 2024). Therefore, a bibliometric approach is important to use. This method allows quantitative analysis of scientific literature by mapping publication trends, collaboration networks, dominant keywords, and thematic structures. Thus, this study aims to provide a comprehensive overview of the development of carbon tax research in Indonesia and identify relevant research gaps to support evidence-based policy making.

RESEARCH METHODS

This study uses a bibliometric approach to analyze the development and structure of knowledge about carbon tax in Indonesia. The process of identifying articles in this study began with a search through Scopus using the keywords "Carbon Tax" AND "Indonesia", which resulted in 85 documents in the form of articles and conference proceedings. The first filtering was carried out based on the category of scientific fields, namely economics, management, accounting, and finance, so that 10 irrelevant articles were excluded. Of the remaining 75 articles, the next stage was filtering based on title, abstract, and keywords, but all articles still met the criteria. Finally, filtering was carried out based on language, by only including English-language articles, so that 1 article was eliminated. Thus, there were 74 articles that were declared eligible for analysis in this bibliometric study. The bibliographic data obtained were analyzed using Bibliometrix software in R and Vosviewer. Classification into four clusters was carried out manually based on content analysis of titles and abstracts to clarify the focus and gaps in existing research.

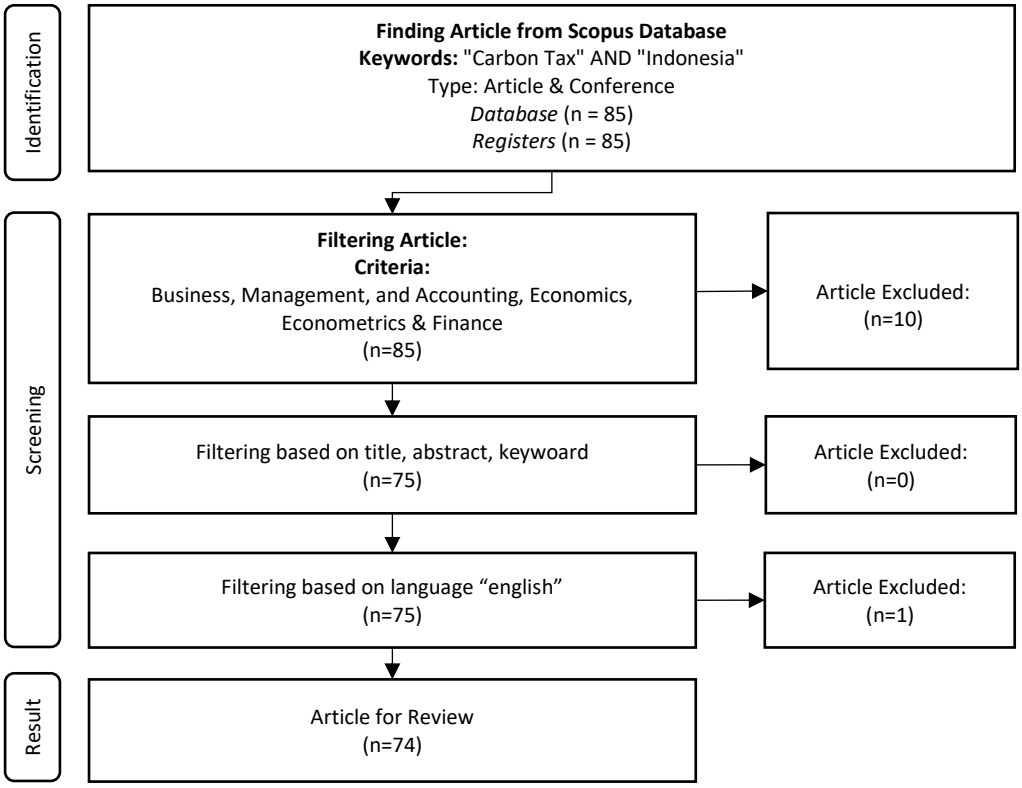

Figure 1. Proses Identifikasi Artikel
Source: Created by authors, 2025

RESULTS

Bibliometrix Result

This study uses a bibliometric approach to quantitatively analyze publication patterns, scientific collaborations, and the development of key themes in the carbon tax literature in Indonesia. Through analysis of trends, keywords, and author networks, this approach provides a comprehensive overview of the direction of research developments, while identifying research gaps that can be used as a basis for further studies and policy formulation.

Trend of Publication

The graph shows the development of the number of scientific publications related to carbon tax in Indonesia during the period 2018 to 2025. At the beginning of the period, namely 2018 and 2019, the number of publications was still very low, each only recording 2 titles, indicating that this issue has not become a major focus in national research. The trend began to show an increase in 2020, and reached 7 publications in 2021, along with increasing awareness of the urgency of environmental policy and the introduction of the carbon tax discourse in the national policy framework. However, in 2022, there was a slight decrease to 5 publications, which likely reflects a lull or uncertainty in policy developments or research directions. A significant spike was seen in 2023 and peaked in 2024 with 15 and 22 publications respectively, reflecting increasing academic interest along with the official implementation of the carbon tax through the Law on Harmonization of Tax Regulations (UU HPP) and increasing global pressure on national climate action. Overall, this graph shows a trend of increasing scientific attention to the topic of carbon taxes, which reflects the increasing urgency of environmental fiscal policy studies in supporting Indonesia's efforts to face the challenges of climate change and the transition to low-carbon development.

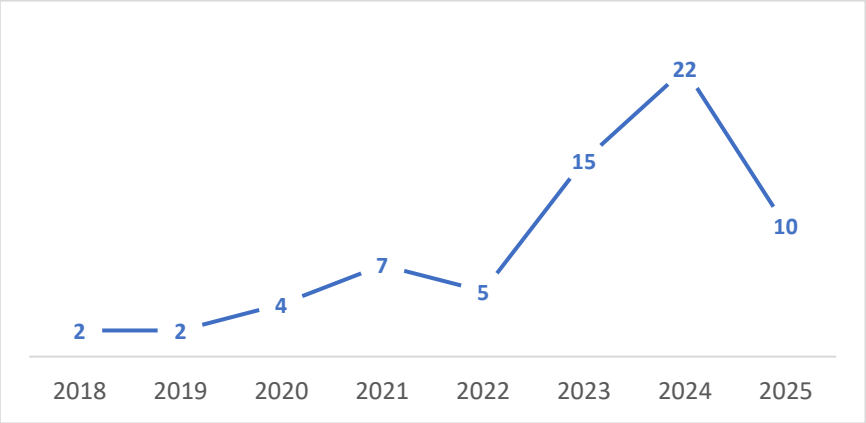

Figure 2. Publication Trend
Source: Created by authors, 2025

Most relevant sources

The graph shows the ten main scientific sources that publish the most research related to carbon tax in Indonesia. IOP Conference Series: Earth and Environmental Science is in the top position with 9 documents, indicating the dominance of publications through environmental conference proceedings. Followed by the International Journal of Energy Economics and Policy with 6 documents, and Sustainability (Switzerland) with 4 documents, reflecting the relationship between carbon tax research and energy and sustainability issues. Several other journals such as E3S Web of Conferences, Energy Policy, and Journal of Cleaner Production are also important media in research dissemination. In general, these data show that the topic of carbon tax is widely published in various journals that focus on the environment, energy policy, and sustainable development.

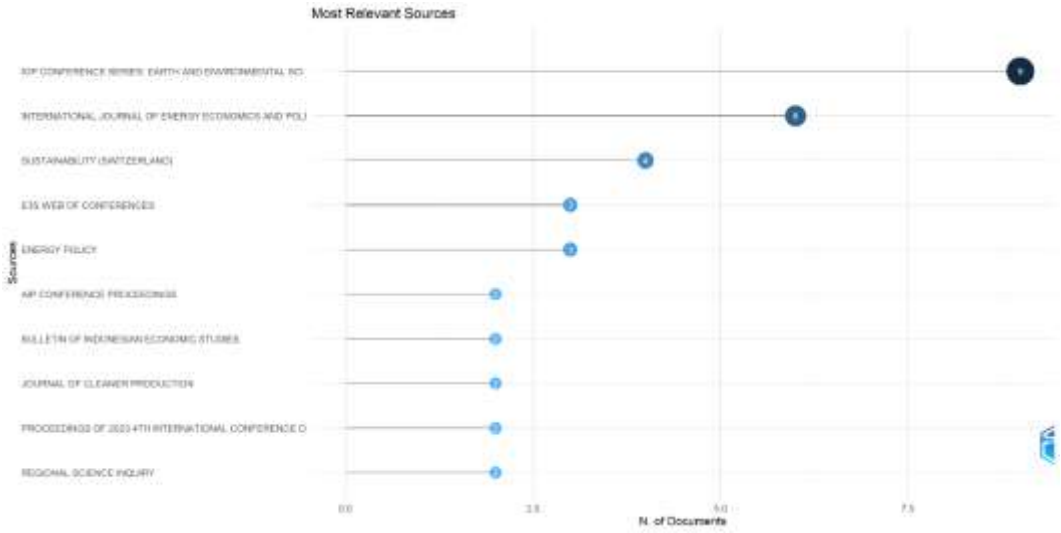

Figure 3. Most Relevant Source
Source: Created by authors, 2025

Most relevant Affiliations

The graph shows the most active institutions in carbon tax publications in Indonesia. Universitas Gadjah Mada and Universitas Indonesia are in the top positions with 6 publications each, indicating their important roles in environmental policy research. Followed by Sanata Dharma University and Universitas Padjadjaran with 4 publications, indicating significant contributions from private and regional institutions. Several other institutions such as BINUS, Delft University of Technology, ITB, SBM ITB, Universitas Diponegoro, and Universitas Lampung each recorded 1 publication, reflecting the involvement of various institutions, including international collaborations. In general, these data show that carbon tax research is spread across various institutions, with a dominance of large universities but also contributions from private and foreign universities.

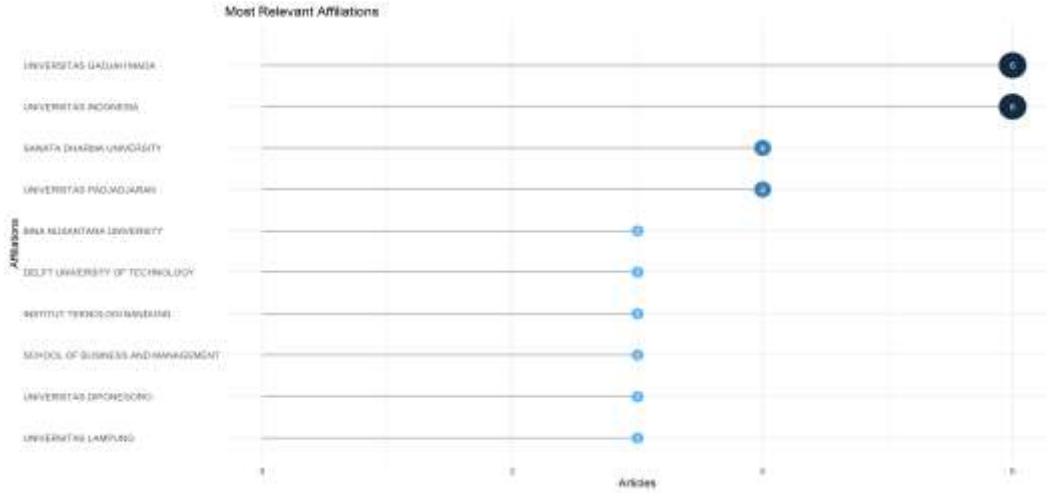

Figure 4. Most Relevant Affiliations
Source: Created by authors, 2025

Co-occurance network analysis

The following figure is the result of a visualization of the keyword network from scientific publications on carbon tax in Indonesia analyzed using VOSviewer. In this visualization, each node represents a frequently occurring keyword, while the color depicts thematic groups (clusters) and the connectivity lines indicate the level of interrelationship between keywords. The keyword “carbon

tax" appears as the largest and most central node, indicating that this topic is the main focus in the literature. Other keywords such as emission control, carbon, renewable energies, costs, and environmental economics also appear dominant and form a number of thematic clusters.

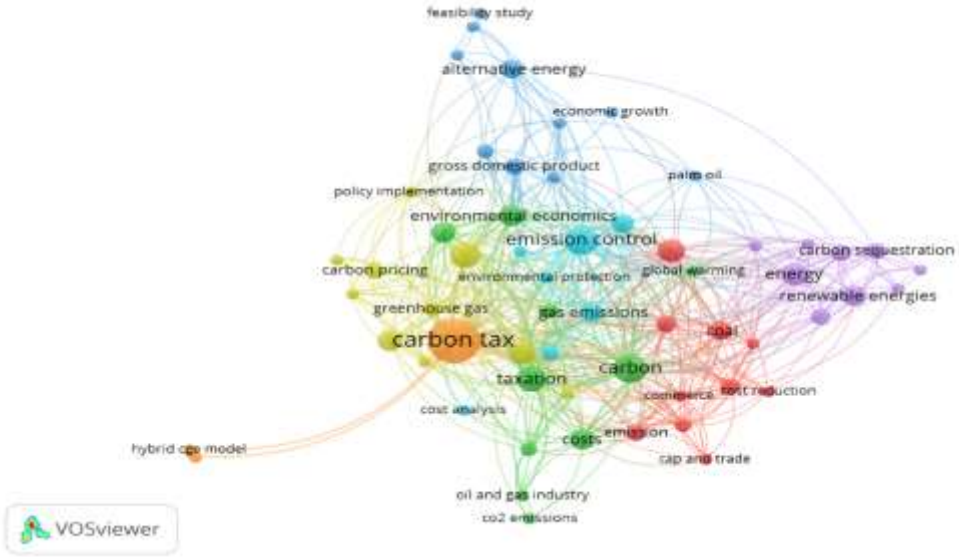

Figure 5. Co-occurance network analysis
Source: Created by authors, 2025

This visualization can be mapped into four main research clusters: Cluster 1: Carbon Tax Policy & Socio-Economic Impacts is centered on the keyword "carbon tax" which is closely related to terms such as carbon pricing, greenhouse gas, taxation, policy implementation, and environmental economics. This reflects research that focuses on carbon fiscal policy, the distribution of its impacts on society, and public perception and acceptance. Cluster 2: Energy Transition & Low Carbon Technologies emerges through keywords on the right and top of the visualization, such as renewable energies, energy, alternative energy, carbon sequestration, and feasibility study. This cluster shows the research orientation on the development of clean energy, low-emission technologies, and energy transition strategies to support carbon emission reduction.

Cluster 3: Economic Modeling & Dynamic is characterized by keywords such as hybrid cge model, economic growth, cost analysis, co2 emissions, and environmental protection. This cluster focuses on quantitative approaches, such as economic modeling and dynamic simulation, used to measure the economic and environmental impacts of carbon tax policies. Cluster 4: Industry, Regional & Sector Specific Implementation is seen through keywords such as coal, commerce, cap and trade, emission, and cost reduction, which are generally located in the red area of the visualization. This cluster refers to the implementation of carbon tax policies in specific sectors, such as the coal and energy industries, as well as the analysis of regional readiness and sectoral responses to the policy.

Table 1. Four Main Cluster

Cluster	Research Question	Authors
Cluster 1. Carbon Tax Policy & Socio-Economic Impacts (34 Articles)	How do public perception, income level, and trust in government influence the effectiveness of carbon tax policies in Indonesia?	Andrianus et al., (2024); Azhar et al., (2024); Claudia et al., (2024); Darwili et al., (2025); Dissanayake et al., (2020); Dyarto & Setyawan, (2021); Edwards et al., (2022); Erfian et al., (2024); Gabler, (2005); Handogo et al., (2020); Hartono et al., (2023); Indrianti et al., (2025);

		Jaelani et al., (2024); Jupesta et al., (2024); Kamil et al., (2024); Ladewi et al., (2024); Lisanawati & Kristina, (2025); Mahadevan & Nugroho, (2021); Miyata et al., (2013); Putra et al., (2021); Putri et al., (2025); Rahma et al., 2025; Rosalie et al., (2024); Shrestha & Marpaung, (1999); Sule et al., (2021); Syahruddin et al., (2024); Thamrin et al., (2025); Wibert et al., (2020); Wirawan et al., (2024); Wiwoho et al., (2024); Wulandari et al., (2024); Wuri et al., (2024); Wuri et al., (2025); Yusuf & Resosudarmo, (2015).
Cluster 2. Energy Transition & Low Carbon Technologies (23 articles)	How does the carbon tax policy affect the adoption of renewable energy technologies and low-carbon practices among households and SMEs in Indonesia?	Aji & Putro (2024); Amheka & Higano (2015); Amheka & Higano (2018); Atmo, Aji (2024); Amheka (2015); Amheka (2018); Atmo, et al., (2022); Dewi, et al., (2022); Haramaini, et al., (2022); Hasudungan & Sabaruddin (2018); Hersaputri, et al., (2024); Junianto, et al., (2023); Kennedy, et al.,(2024); Langer, et al., (2023); Leonard, et al., (2023); Nurhayati, et al., (2024); Purwienanti & Purwanto, (2023); Rendroyoko, et al., (2024); Rifansyah & Hakam (2024); Roelfsema, et al., (2014); Rokhmawati, et al., (2024); Rokhmawati, et al., (2025); Sarjiya, et al., (2023); Sasmito & Soo-Jin (2023); Sembiring, et al., (2021); Shidiq, et al., (2024)
Cluster 3. Economic Modeling & Dynamic Systems (13 Articles)	What are the projected macroeconomic and environmental impacts of carbon tax implementation in Indonesia based on integrated modeling approaches?	Dewanatan, et al., (2020); Lusiana, et al., (2023); Marpaung, et al., (2010); Nong, et al., (2021); Perkasa, et al., (2023); Raksajati, et al., (2024); Ramadhani & Koo, (2022); Setiawan, et al., (2023); Shadiq, et al., (2023); Tiwari, et al., (2021); Xiong, et al., (2019); Yi, et al., (2023); Zulanda, et al., (2024)
Cluster 4. Industry, Regional & Sector Specific Implementation (4 Articles)	How does carbon tax influence the competitiveness of key industries and reveal regional disparities in Indonesia's transition to a low-carbon economy?	Beryll et al., (2023); Damanik (2025); Handayani et al., (2023); Stevens (2019)

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DISCUSSION

Cluster 1. Carbon Tax Policy & Socio-Economic Impacts

This cluster includes studies that discuss public perception, distributional impacts, social justice, and policy dynamics in carbon tax implementation. Articles in this cluster examine how carbon tax policies are accepted by the public (Wulandari et al., 2024), especially low-income groups, and how factors such as trust in government, transparency, and political support influence policy effectiveness (Dyarto & Setiawan, 2021). Several studies also evaluate the impact on household welfare and propose compensation schemes or revenue recycling to mitigate negative impacts

(Kamil et al., 2023; Miyata et al., 2013). This cluster is important for understanding the social and political dimensions of the transition to a low-carbon economy.

The results of the analysis show that a large number of studies focus on policy studies and the socio-economic impacts of carbon tax implementation in Indonesia (Rahma et al., 2025). Research in this cluster reveals that the success of carbon tax implementation is highly dependent on public support, perceptions of fairness, and the effectiveness of policies in achieving environmental goals without causing heavy economic burdens on vulnerable groups (Mahadeva & Nugroho, 2021; Wuri et al., 2024). Studies such as Investigating Consumer's Attitudes and Distributional Implications of Carbon Tax highlight that public understanding of the policy is still limited, and public acceptance is greatly influenced by trust in the government and openness of information (Wiber et al., 2020; Erfian et al., 2025).

In addition, several studies emphasize that carbon taxes can be regressive if not accompanied by revenue recycling mechanisms, such as direct compensation to poor households or clean energy subsidies (Yusuf & Resosudarmo, 2015; Hartono et al., 2023). Therefore, inclusive and data-based policy design is important so that carbon taxes are not only environmentally effective but also socially just (Thamrin et al., 2025). These studies also underline the importance of policy communication and public education as part of the implementation strategy (Azhar et al., 2024; Claudia et al., 2024).

Most studies focus on initial public perceptions, but there are few longitudinal studies that track changes in attitudes after implementation. In addition, area-based approaches are still limited, so that variations in impacts between regions are not yet visible. Recommendations for further research include long-term surveys in various provinces and analysis of the relationship between public trust, fiscal transparency, and the effectiveness of carbon tax policies.

Cluster 2. Energy Transition & Low Carbon Technologies

Articles in this cluster focus on the role of carbon taxes in encouraging the adoption of low-emission technologies such as renewable energy (solar, geothermal), electric vehicles, and energy efficiency in the energy sector (Junianto et al., 2023; Sarjiya et al., 2023). Research shows that carbon taxes can accelerate the energy transition when combined with fiscal incentives and regulatory certainty (Roelfsema et al., 2014; Hasudungan & Sabaruddin, 2018). Several studies use case studies of energy projects or feasibility simulations to show how carbon taxes improve the competitiveness of clean technology investments (Rokhmawati et al., 2023; Amheka & Higano, 2015). This cluster reflects the close link between environmental fiscal policy and technological innovation.

The discussion in this cluster shows that carbon tax serves as a policy instrument that provides price signals to encourage energy transition (Atmo et al., 2022). Several studies have shown that the implementation of carbon tax increases the economic feasibility of renewable energy projects, such as floating solar PV, geothermal, and battery electric vehicles (Aji & Putro, 2024; Rendroyoko et al., 2024; Hersaputri et al., 2024). In this context, carbon tax acts as a catalyst for low-carbon technology innovation and investment shift from fossil fuels to clean energy sources (Purwienanti & Purwanto, 2023; Rifansyah & Hakam, 2024; Haramaini et al., 2022).

However, the adoption of this technology is not only influenced by carbon prices, but also by fiscal incentives, regulatory clarity, and infrastructure readiness (Leonard et al., 2023). Studies such as Evaluating Indonesia's Solar Policy and System Dynamics Modeling of Geothermal show that policy uncertainty, inconsistent electricity prices, and minimal financial support are the main obstacles to accelerating clean energy (Sasmito & Soo-Jin, 2023). Therefore, carbon tax policies must be comprehensively integrated with the national energy roadmap, financial support, and electricity sector reform (Dewi et al., 2022; Kennedy et al., 2024).

Research has focused heavily on large-scale renewable energy, while studies on the impact of carbon taxes on technology adoption by households and SMEs are still minimal. In addition, there has been no evaluation that comprehensively combines technical, economic, and regulatory aspects. Future research is recommended to examine the feasibility of clean energy projects with an

integrated approach, as well as assess the combined effects of carbon taxes and fiscal incentives in encouraging energy transition.

Cluster 3. Economic Modeling & Dynamic Systems

This cluster includes studies that use quantitative approaches such as Computable General Equilibrium (CGE), GTAP, System Dynamics, and other predictive models to simulate the economic and environmental impacts of carbon tax policies (Ramadhani & Koo, 2022; Nong et al., 2021). The articles in this cluster provide estimates of macroeconomic impacts such as changes in GDP, industrial output, energy consumption, and emission reductions (Dewanatan et al., 2020). These models are also used to analyze different scenarios of carbon tax rates and incentive schemes, providing a quantitative basis for policymakers (Shadiq et al., 2023). This cluster is crucial in providing data-based evidence for long-term policy planning (Tiwari et al., 2021).

Research in this cluster provides significant methodological contributions through the use of Computable General Equilibrium (CGE), GTAP-E, and System Dynamics Modeling in evaluating the macroeconomic impacts of carbon taxes (Shadiq et al., 2023). Studies such as Scenario Analysis Using STIRPAT Model and Economic Impact of the Emission-Reduction Policy present policy scenario simulations that reflect responses to different levels of carbon tax rates, as well as their implications for the energy sector, household consumption, and economic growth (Xiong et al., 2019; Raksajati et al., 2023).

These findings suggest that carbon tax can reduce emissions and improve energy intensity, but also has the potential to reduce economic output in the short term, especially in the energy and heavy industry sectors (Marpaung et al., 2021; Lusiana et al., 2023). However, with the right fiscal compensation mechanisms, such as subsidized green investment and household transfers, the negative impacts can be minimized (Setiawan et al., 2023). This dynamic model also helps estimate when carbon emissions will peak (carbon peaking) and how much the carbon tariff threshold can drive significant changes in the national energy structure (Perkasa et al., 2023; Zulanda et al., 2024). Thus, this cluster is very important in providing empirical evidence for policy design based on data simulation (Xi et al., 2023).

The models used are mostly short-term and do not accommodate social or spatial complexity. In fact, carbon policies have long-term impacts and involve many actors with different behaviors. Therefore, it is important to develop integrated models such as the Integrated Assessment Model (IAM) and agent-based modeling to simulate more realistic scenarios in the Indonesian context.

Cluster 4. Industry, Regional & Sector Specific Implementation

This cluster consists of studies that examine the impact of carbon taxes more specifically on certain industries, geographic regions, and business sectors such as cement, petrochemicals, and SMEs (Andrianus et al., 2024). Articles in this cluster evaluate the readiness of these sectors for carbon regulation and assess regional disparities in terms of economic impacts and opportunities for clean technology development (Amheka & Higano, 2018; Beryll et al., 2023). Several studies also discuss the need for policy adaptation to suit local characteristics, including training needs, financing, and access to information (Damanik et al., 2025). This cluster provides practical and contextual perspectives on policy implementation in the field.

The results of the analysis show that there is a non-uniform impact of carbon tax across sectors and regions. Several case studies, such as in the cement industry (Junianto et al., 2023) and the petrochemical industry (Dewanatan et al., 2020), show that the implementation of carbon tax can encourage energy efficiency and clean technology investment, but also increase production costs, thus affecting project feasibility (Stevens, 2019). Therefore, the industrial sector requires commensurate incentives, such as tax reductions, access to green financing, or recognition of carbon credits.

At the regional level, research by Kamil et al., (2023) shows that the fiscal and economic impacts of carbon taxes vary between regions, depending on the economic structure and dependence on fossil fuels. Regions with a carbon-intensive industrial base tend to be more negatively impacted, requiring special strategies such as reallocation of carbon tax revenues and regional economic transition programs (Darwili et al., 2025; Rifansyah et al., 2024). In addition, studies in the SME and agricultural sectors show that their readiness is still very limited, both in terms of technical aspects and knowledge of carbon footprints and certification of environmentally friendly products (Handayani et al., 2024).

Studies on strategic sectors such as cement, steel, and petrochemicals are still limited, even though these sectors have high emissions and are at risk of carbon tax burdens. On the other hand, there are still few studies that map the economic impact of carbon taxes by region, as well as how SMEs can respond to this policy. Further research needs to be directed at evaluating the readiness of carbon-intensive industries, regional mapping based on input-output data, and developing technical guidelines for SMEs to face carbon tax regulations.

CONCLUSION

Research on carbon tax in Indonesia has shown quite rapid development and reflects broad attention from various disciplines. Through bibliometric classification, it was found that the main topics are divided into four large clusters, namely: socio-economic policies and impacts, energy transition and low-carbon technology, economic modeling and dynamic systems, and implementation in specific industrial sectors and regions. Each cluster has a unique focus and contribution to the development of knowledge, but also leaves a number of research gaps that still need to be explored further. These gaps include the limitations of long-term studies, the lack of integrated cross-sector approaches, the less than optimal use of behavior-based predictive models, and the low attention to the readiness of the SME sector and regions outside Java. Therefore, this mapping is an important basis for directing a more strategic research agenda that is responsive to national policy needs.

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