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Article

Compliance Behavior in Environmental Tax Policy

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Abstract: This study examines compliance behaviour in the context of environmental tax policies, highlighting the essential role that these policies play in achieving the objectives of sustainable development. Environmental taxes are crucial instruments to reduce environmental damage and increase energy efficiency. Nevertheless, taxpayer compliance, which is impacted by several variables, including social acceptability, regulatory quality, and perceptions of fairness, is a key component of these policies' efficacy. In contrast to earlier research, which frequently concentrated on certain tax kinds or discrete policy mechanisms, this study takes a broad approach, looking at a range of environmental taxation instruments. Emerging trends, significant factors influencing compliance behaviour, and noteworthy contributions from eminent authors and organizations are all identified by means of bibliometric and scientometric analyses. In order to create fair and effective environmental tax policies, interdisciplinary approaches and international collaboration must be used. Along with presenting policies to improve environmental regulation compliance, the study offers insightful advice for businesses that can help them innovate toward sustainability and adjust to shifting policy. It also provides a solid theoretical base for future researchers by highlighting important areas that require more investigation, especially when it comes to the wider effects of environmental taxes on various industries.

Keywords: environmental tax; carbon tax; compliance behavior; sustainable development; tax policy

1. Introduction

Sustainable development has become a global policy, agreed upon by the United Nations (UN) on Sustainable Development (SDG) and in international agreements to promote environmental taxes as a policy tool [1,2]. Environmental tax programs have supported climate action under SDG 13, affordable and clean energy under SDG 7, and responsible consumption and production under SDG 12 [3,4]. Environmental taxes aim to reduce greenhouse gas emissions, promote energy efficiency, and encourage sustainable industrial practices by integrating environmental costs within the scope of economic activity [5,6].

The Paris Agreement emphasizes the importance of market-based instruments, one of which is an environmental tax that aims to meet global climate targets. In addition, the Paris Agreement discusses increasing financial flows, technology transfer, and capacity building to achieve clean emissions by mid-century [7,8]. Carbon pricing and energy levies are integral to this strategy, incentivizing industries to adopt cleaner technologies and reduce their carbon footprint [9,10]. Alignment between national policies and global commitments allows countries to utilize environmental taxes to drive progress toward a low-carbon economy [11,12].

Achieving this requires compliance in paying the tax. Compliance can ensure that these policies' environmental and economic benefits are realized. Factors that encourage or hinder compliance, such as public perceptions of fairness, regulatory quality, and social acceptability of tax measures, are essential for successfully implementing environmental tax policies [13,14]. Van Vuuren et al [15]

study explained that achieving SDG targets and fulfilling international climate agreements requires balancing law enforcement, incentives, and community engagement.

In this bibliometric analysis, we explore three main research inquiries:

- a. What are the main factors influencing compliance behavior in environmental taxation, and how do these aspects change between nations and industries?
- b. Which writers, organizations, and nations have contributed most significantly to the study of environmental tax compliance, and what are the well-known joint ventures in this area?
- c. What are the most common research themes, patterns, and developing fields of study, and how have these topics changed over time?

By answering these queries, this study adds to the current discussion on the creation of efficient environmental policies by pointing out areas of need and potential for further investigation into environmental tax compliance.

2. Literature Review

2.1. Environmental Tax

Environmental taxation is a policy instrument that has gained significant attention in recent years due to its potential to address environmental challenges while influencing economic behavior. The implementation of environmental taxes, energy taxes, and carbon taxes has evolved from being primarily adopted by a few developed nations in Europe and the OECD to becoming more widespread across developed, developing, and emerging countries [16]. These taxation policies are designed to have diverse effects on the economy, residents, and climate change, aiming to reduce carbon emissions by enhancing innovation and energy efficiency, which are crucial drivers of environmental sustainability [17].

Research has shown that environmental tax changes may impact welfare and unemployment, especially in emerging nations with traits like a large informal economy and rural-urban mobility [18]. Research on the influence of environmental taxes on businesses' green innovation has also been conducted, emphasizing the significance of integrating market-based tax policies such as environmental taxes with tax incentives for research and development to foster green innovation successfully [19]. Moreover, environmental taxes have been extensively advocated in industrialized nations as the main tool for market-based policy [20].

According to research, environmental tax incentives boost company investment and export growth, make it easier for companies to disclose their CSR information, and support environmentally conscious business practices [21]. There is a need for accurate research and evaluation of the efficacy of environmental tax policies, nevertheless, since there have been cases when detrimental tax expenditures have outweighed environmental taxes [22]. Furthermore, research has examined the inadvertent outcomes of environmental tax incentives, highlighting the need to comprehend the wider ramifications of these initiatives [21].

Economic incentives and tax penalties have been recognized as driving policies in Spain regarding building and demolition waste management, showing the beneficial impacts of these policies on waste recycling and the market for recycled aggregates [23]. In comparison, research on incentive policies for building and demolition waste recycling in China has shown how crucial it is to strike the correct mix between environmental taxes and subsidies to manage trash [24]. Furthermore, it has been shown that tax incentives might inadvertently increase the energy efficiency of investments, highlighting the potential of tax incentives as a tool for accomplishing environmental objectives [25].

The interaction between carbon taxes and innovation externalities has been examined to determine the optimal timing of climate change policy implementation, emphasizing the need for tailored R&D instruments and a combination of climate change and R&D policies to effectively target climate change goals [26]. Furthermore, tax incentives have been found to enhance corporate Environmental, Social, and Governance (ESG) performance, contributing to the body of research on the relationship between tax incentives and corporate behavior [27]. In the context of China, incentive-based environmental regulations have been shown to have a significant impact on carbon

intensity reduction in certain provinces, highlighting the role of incentives in driving environmental outcomes [28].

2.2. Tax Compliance Behavior

Global tax systems rely significantly on tax compliance behavior, which affects both revenue collection and the overall efficacy of fiscal policy. Policymakers and tax authorities must comprehend the factors influencing compliance behavior to create policies promoting voluntary conformity to tax laws. The complexity of tax compliance behavior has been the subject of several research, which have shed light on the different processes and elements that affect people's and companies' desire to abide by the law [29–31]

The study conducted by Hikmah et al [32] emphasizes the importance of tax knowledge and justice that can shape tax compliance behavior. Individuals or organizations that have a level of understanding of regulations and taxation can significantly affect compliance in paying taxes. Perceptions of fairness in the tax system play an important role in compliance. Taxpayers view tax regulations as fair and correct, so people tend to voluntarily comply with their tax obligations [33].

Numerous research has focused on the voluntary nature of tax compliance behaviour, emphasizing the importance of elements including attitudes, societal norms, and intents in promoting compliance [34–36]. People's intent to abide by tax rules, their views toward taxes, and societal norms influence their compliance. Comprehending these normative and psychological elements is essential to forecasting and encouraging tax compliance across various taxpayer categories.

Moreover, regulatory frameworks and enforcement instruments significantly influence encouraging tax compliance behaviour. Research has investigated the efficacy of enforcement tactics, including tax agent training and compliance model implementation, in raising tax compliance rates [32]. Good enforcement influences taxpayer behaviour by signalling that tax authorities take compliance with tax legislation seriously and discourage non-compliance.

Several external elements, such as work competency, social perceptions, and financial performance, have also been studied related to tax compliance behaviour [34]. Work competency affects how well employees follow safety guidelines, which may extend to how they behave when paying taxes in an organizational setting. The fact that people's inclination to abide by tax regulations can also be influenced by their opinions of the government, society, and their financial situation highlights the complex nature of tax compliance behaviour.

The impact of tax education, belief systems and early intervention on compliance behaviour has been studied extensively. Educating an individual about taxes at an early age has the potential to promote compliance at an early age that may influence future behaviour. In conclusion, the factors that influence individual and corporate tax compliance decisions have been identified in the literature on tax compliance behaviour. Normative, psychological and coercive external influences can drive compliance behaviour and ensure tax system effectiveness.

3. Materials and Methods

The systematic literature review was conducted using qualitative methods that provide a thorough and objective explanation of the literature on environmental tax compliance behavior. This approach reviews knowledge and identifies gaps in the literature [37,38]. Because it is evidence-based, this approach is suitable for making recommendations to policymakers.

This study uses bibliometric and scientometric analyses, which provide a solid basis for understanding the structure and dynamics of environmental tax compliance research. Both analyses are used to identify trends, patterns, and the impact of the literature on a field [39–41]. The objectives of both analyses include identifying research gaps for the development of conceptual models or theoretical frameworks and deepening insights into the impact of research on environmental tax compliance behavior.

The bibliometric analysis focuses on collecting and mapping metadata from publications related to environmental taxes and compliance behavior [42]. Meanwhile, scientometric analysis focuses

more on measuring the scientific impact of the publications identified in the bibliometric analysis [43,44]. Outputs from scientometric analysis include; assessing the impact of research, such as the number of citations, the h-index, identifying collaborative networks between researchers or institutions, analyzing the evolution of concepts [45,46]. Figure 1 is an illustration of the methodology used in this study.

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-study (PRISMA) criteria to guarantee a fair and open scientometric study. This process had four steps: inclusion, eligibility, screening, and search.

In the first stage, the Scopus database was used because it has wide coverage, reliable citation data, and normalisation features [47]. So, it was chosen as the determinant of search strings and databases in scientometric research on environmental tax compliance behaviour. From the data collection results, 1979 documents were found.

In the second and third stage, having a publication category in the form of journals, and duplication elimination. The final stage is the English language, title suitability, abstract, and keywords. The database search using the keywords (TITLE-ABS-KEY ('green tax' OR 'eco-tax' OR 'ecological tax' OR 'carbon tax' OR 'pollution tax' OR 'sustainability tax' OR 'environmental levy' OR 'climate tax' OR 'resource tax' OR 'energy tax' OR 'environmental duty' OR 'environmental charge' OR 'environmental fee' OR 'pigovian tax' OR emissions AND tax) AND TITLE-ABS-KEY (ABS-KEY ('compliance' OR 'response' OR 'behaviour')) AND PUBYEAR > 1999 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE , 'ar') AND (LIMIT-TO (PUBSTAGE , "final") AND (LIMIT-TO (LANGUAGE , "English") AND (LIMIT-TO (SRCTYPE , "j")). This search returned 1,383 documents published between 2000 and 2024.

Fourth stage, The programs Biblioshiny and VOSviewer were used for the scientometric analysis. This step included science mapping through co-authorship co-citation network analysis and performance analysis (e.g. citation trends, most influential journals and authors). The main study themes in environmental tax compliance were identified using co-word analysis and thematic evolution to determine the conceptual framework.

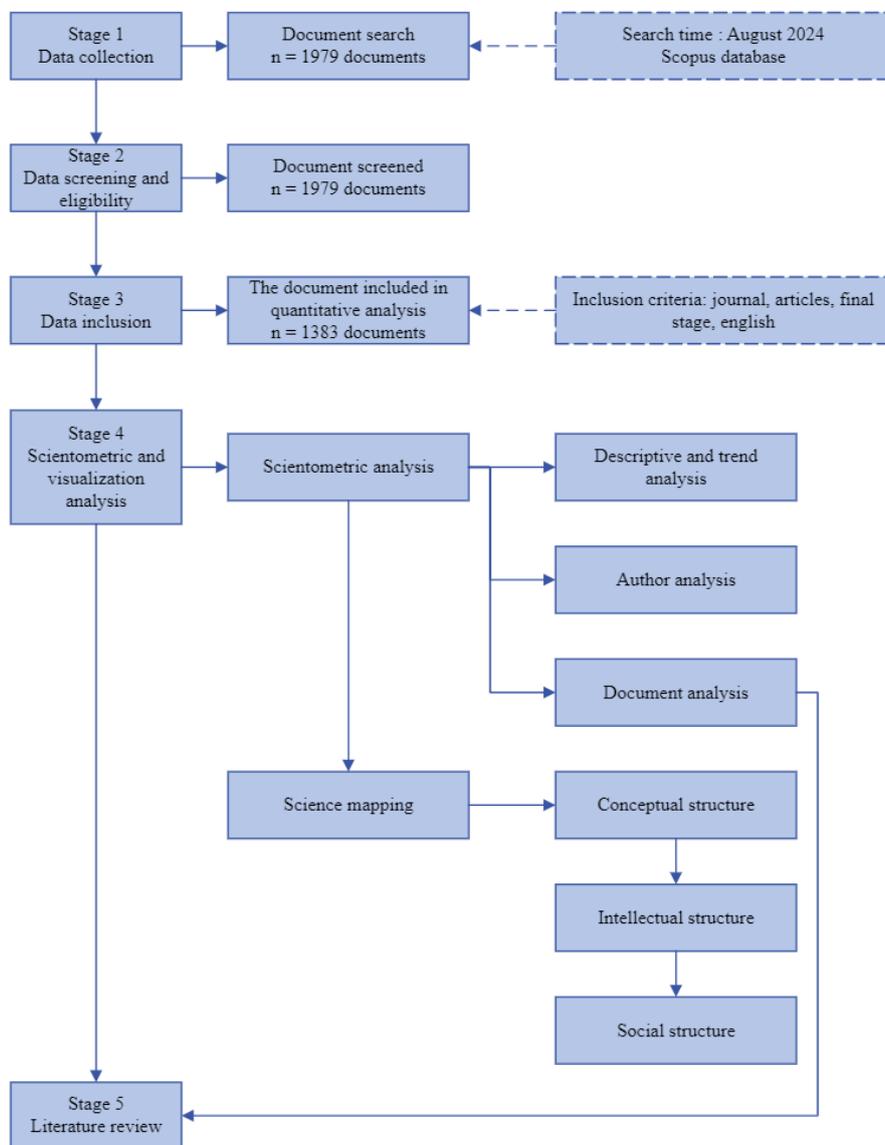


Figure 1. Methods for Article Selection and Analysis Procedures.

4. Results

4.1. Descriptive and Trend Analysis

Bibliometric analysis in this study used 1383 articles from 531 sources with a publication time of 2000 to 2024. In general, the article's topic follows the theme of this research, namely environmental policy, corporate strategy, and regulatory effectiveness in encouraging behavior toward sustainability. The increase in the number of publications on behavior in environmental tax studies every year is 9.025%. The average age of the articles referenced in this study is 6.95 years. On average,

each document has been cited 24.19 times; these results indicate that research on this theme is active and has a recognized contribution to the wider literature. In this analysis, the number 6157 shows that research on the theme of behavior in environmental tax is quite broad and covers a variety of diverse perspectives. Author's keywords (DE) indicates the total number of keywords assigned in all the articles analyzed covering a wide range of specific topics and subtopics [48]; in this study, 3855 keywords were generated, which provided a basis for identifying trends and patterns. The total number of authors who contributed to the analysis of all articles in this study was 3346, and the number of authors who published articles without collaborating with other authors was 231, with a total of 242 articles. On average, each document on the compliance behavior in environmental tax theme was written by about 3 authors. Almost 25% of all documents in this research theme were written by authors from more than one country.

Table 1. Summary of the descriptive information.

Description	Indicator	Results
Main information	Timespan	2000:2024
	Sources (Journals, Books, etc)	531
	Documents	1383
	Annual Growth Rate %	9,02
	Document Average Age	6,95
	Average citations per doc	24,19
	References	59915
Document Contents	Keywords Plus (ID)	6157
	Author's Keywords (DE)	3855
Authors	Authors	3346
	Authors of single-authored docs	231
Author Collaboration	Single-authored docs	242
	Co-Authors per Doc	3,03
	International co-authorships %	24,95
Documen types	Article	1383

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Figure 2 shows the trend of the number of publications and citations over 24 years (2000 - 2024). In the pre-COVID-19 period from 2000 to 2020, there was a significant and consistent increase with some fluctuations until it reached its peak in 2020 (2632 total citations and 99 articles) of total citations and number of articles published. The number of published articles increased significantly from 2021-2023 until the highest number of published articles was 162 in 2023. However, in 2024, there was a decrease in the number of articles published, namely 127. It is inversely proportional to the total citations decreasing after COVID-19 until it reaches its lowest point of 151 citations in 2024. The graph in Figure 2 shows that although the number of publications increases significantly yearly, the total citations have decreased. There is an urgent need for relevant and influential research that provides a new perspective on environmental tax compliance challenges.

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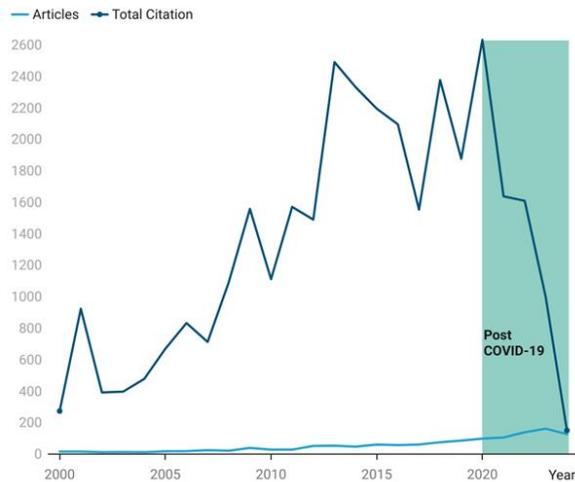


Figure 2. Trend Analysis.

4.2. Source Analysis

Figure 3 shows the list of journal sources most relevant to the research topic of behavior in environmental tax based on the number of published articles. Energy policy and economics dominate by producing 69 and 64 articles, respectively, where these publishers play a significant role in the analyzed literature. In addition to energy-focused journals, some journals cover sustainability issues [49]. Published by Sustainability with 52 articles and the Journal of Cleaner with 49 articles, it shows that the research topic has a broad scope. The research also emphasizes economic analysis and environmental resource management, which are critical in understanding the impacts of environmental policies, such as research published in the journal Environmental and Resource Economics (48 articles) and Journal of Environmental Economics and Management (34 articles). The journals Climate Policy (33 articles) and Ecological Economics (31 articles) show that environmental policies, including mitigation and adaptation strategies, are a significant concern in the literature. The journals Energy and Environmental Science and Pollution Research published various aspects of environmental issues, with 31 and 27 articles, respectively. This research focuses on a multidisciplinary approach, including economics, public policy, and sustainability.

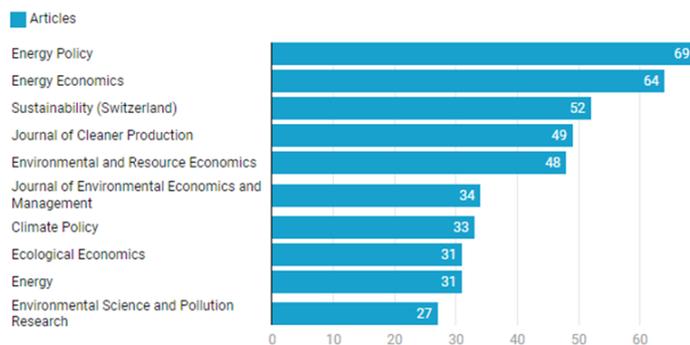


Figure 3. Most Relevant Source.

The most cited countries (Figure 4) show each country's publications' quantity and quality. China's productivity in this research topic is very high, as evidenced by the number of articles published, as many as 1185 documents, followed by the United States with 674 papers. However, this country is still a significant contributor in numbers less than China. Other countries such as the UK (240 articles), Canada (175 articles) and Australia (163 articles) show significant contributions in the number of documents published. China also dominates in research impact based on total citations (6576). However, the United States almost matches the total citations with 5962 citations. In terms of average citations per article, Australia stands out with an average of 35 citations per article, followed by Canada with an average of 30 citations per article, indicating that although there are documents, the articles published in Australia are of high quality and often referenced. Supported by the data in Table 2, it highlights that although China has many articles, most of the research is conducted nationally, or the SCP is greater than the MCP. In contrast, countries such as Australia and Canada have higher MCP ratios due to international collaborations, which are essential in improving research quality and global relevance.

Table 2. Most Relevant Countries by Corresponding Author.

Country	Articles	SCP	MCP	Freq	MCP_Ratio
China	318	257	61	0.23	0.192
USA	194	147	47	0.14	0.242
United Kingdom	59	44	15	0.043	0.254
Germany	55	37	18	0.04	0.327
Canada	54	34	20	0.039	0.37
Australia	46	26	20	0.033	0.435
Spain	41	30	11	0.03	0.268
Japan	35	26	9	0.025	0.257
France	31	25	6	0.022	0.194
Italy	29	23	6	0.021	0.207

*SCP: Single Country Publication *MCP: Multiple Country Publication.

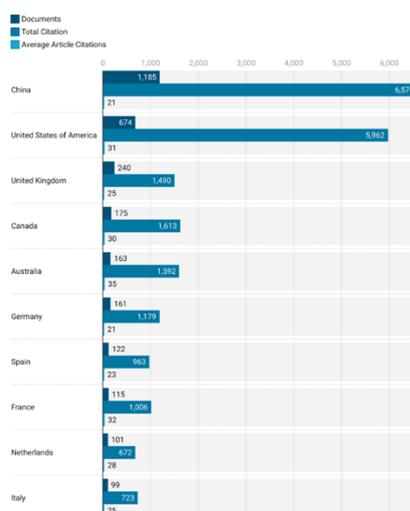


Figure 4. Most Relevant Source.

Tsinghua University, Jiangsu University, and Chongqing University are leading institutions in China that dominate in the publication of articles related to environmental tax research topics; China is one of the countries that is very active in formulating environmental policies and involving tax instruments as a way to reduce emissions and improve energy efficiency. Several universities in Figure 5 are experts in energy technology and policy, such as North China Electric Power University and Huazhong University of Science and Technology that study how environmental taxation can be integrated into the behaviour of companies and society in reducing emissions. Peking University, in seventh place in the number of published articles, focuses on the compliance behaviour of countries with high levels of industrialization. At the same time, the University of Maryland, with the same number of published articles, examines effective policies for encouraging environmentally friendly behaviour in developed countries. Although China dominates, the graph shows significant contributions from institutions in the United States and Europe.

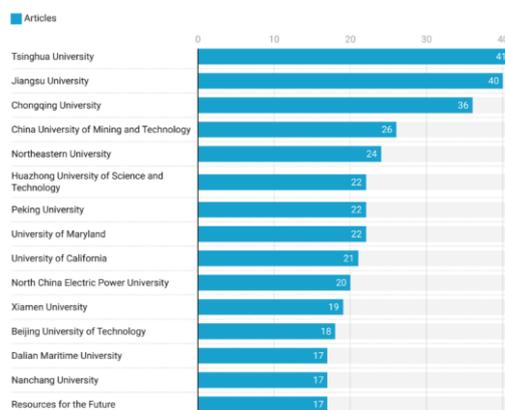


Figure 5. Most Relevant Affiliations.

4.3. Author Analysis

The number of cited articles indicates the level of contribution and influence of the authors in their work. It is an essential reference on the topic of behaviour in environmental tax [50]. Three authors are very influential in the research topic of behaviour in environmental tax with the most article contributions. Among them, the article written by Goulder [51] has the highest number of citations with 132 articles, in second place Nordhaus [52] with 118 articles, and followed by B. Lin and Z. Jia [53] the number of article citations is 112. C. Böhringer and T. F. Rutherford [54] and C. Fischer and M. Springborn [55] have 92 citations, followed by Y. Wang, L. Qi, and W. Cui [56] with 81. Authors ranked four to ten have a total number of article citations in the range of 69 to 92 articles, which shows a fairly even contribution among these authors.

In Figure 6 and Table 3, analysis has different purposes; author impact analysis provides impact and shows each author's relationship. Y. Zhang et al and L. Wang et al [57,63] are in the first position with the highest number of publications among other authors, publishing 17 and 9 articles, respectively. The high number of publications does not guarantee that it will impact the number of citations because it is the quality of the article and the relevance to the study. The author impact analysis will generate the h-index, m-index, and g-index values to show an article's many citations. Zhang et al [57] owns the highest h-index with ten articles and significantly and consistently impacts this topic. In addition, Zhang et al [57] has the highest g-index with a value of 15, followed by J. Li et al [59] with 12 articles. The result shows that other authors widely cite articles written by both authors. Z. Li et al [60] is the author with the fastest impact; in a relatively short time, he obtained an m-index value of 2.333 within two years (2022 to 2024). Y. Chen, T. A. I. I et al [65] is the author who

has the highest number of citations, namely 451; this shows that Y. Chen, T. A. I. I et al [65]'s writing is very famous and has a broad impact. Author Y. Chen, T. A. I. I et al [65] started publishing in 2008, and L. Liu and J. Xu [58] published his articles in 2009.

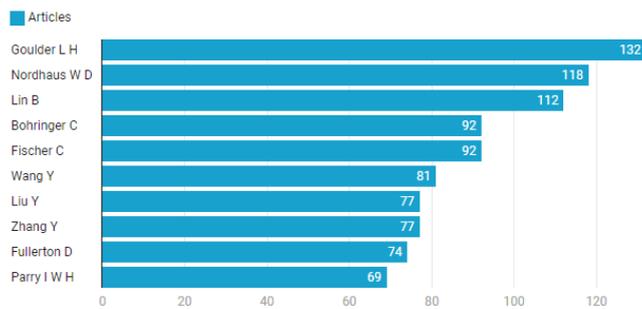


Figure 6. Authors with the Highest Number of Citation Articles.

Table 3. Author Impact.

Author	h_index	g_index	m_index	TC	N P	PY_start
[57]	10	15	0.833	244	17	2013
[58]	8	9	0.5	255	9	2009
[59]	7	12	0.636	296	12	2014
[60]	7	7	2.333	140	7	2022
[61]	7	11	0.538	143	11	2012
[62]	6	9	0.857	176	9	2018
[63]	6	9	0.545	260	9	2014
[64]	5	6	0.357	292	6	2011
[65]	5	7	0.294	451	7	2008
[66]	5	6	0.556	90	6	2016

4.4. Document Analysis

Table 4 shows that a multidisciplinary approach combining policy, technology, circular economy, and risk analysis is critical to understanding environmental tax compliance. Studies by W. Chen and Z. H. Hu [67] and D. Krass, T. Nedorezov, and A. Ovchinnikov [68] highlight how tax policies and incentives can influence green technology adoption and government and producer behavior. The important role of green technology in supporting environmental tax policy is evidenced by studies written by M. Binswanger [69], G. Guandalini, S et al [70], and S. Pinzi et al [71]. Research conducted by Y. Geng et al [72] highlights how the circular economy approach is important in sustainable development policies and resource efficiency. Z. Dai et al [73] showed the importance of statistical modeling and simulation in understanding environmental risks, especially in compliance with carbon tax policies.

Table 4. Top 10 cited documents of compliance on behavior environmental tax.

Ref.	Title	Year	Total Citations	Author Keywords
[68]	Environmental Taxes and the Choice of Green Technology	2013	597	Green Technologies Sustainability Environmental Policy

Ref.	Title	Year	Total Citations	Author Keywords
				Environmental Taxes Subsidies and Rebates
[69]	Technological progress and sustainable development: what about the rebound effect?	2001	509	Rebound effect Technological progress Energy efficiency Time Allocation Energy Taxes
[71]	The Ideal Vegetable Oil-based Biodiesel Composition: A Review of Social, Economical and Technical Implications	2009	417	Biodiesel Production Vegetable Oils Sustainability Transesterification Optimization Non-edible Feedstocks
[70]	Power-to-gas plants and gas turbines for improved wind energy dispatchability: Energy and economic assessment	2015	308	Power-to-gas Electrolysis Energy storages Wind power Grid balancing Green gas
[67]	Using evolutionary game theory to study governments and manufacturers' behavioral strategies under various carbon taxes and subsidies	2018	292	Governments Manufacturers Carbon taxes Government subsidies Evolutionary game
[72]	Implementing China's circular economy concept at the regional level: A review of progress in Dalian, China	2009	283	Circular economy Sustainable Development Resource efficiency Eco-Industrial Parks Environmental Management
[74]	Techno-economic analysis and environmental impact assessment of energy recovery from Municipal Solid Waste (MSW) in Brazil	2014	249	Municipal Solid Waste Landfill Biogas Waste-to-Energy (WtE) Techno-economic analysis Life cycle assessment (LCA)
[75]	A Dirty Word or a Dirty World? Attribute Framing, Political Affiliation, and Query Theory	2010	239	Attribute framing Constructed preference Consumer choice Political affiliation Query theory
[73]	CO2 Accounting and Risk Analysis for CO2 Sequestration at Enhanced Oil Recovery Sites	2016	235	CO2 Sequestration Enhanced Oil Recovery Risk Analysis Geostatistical Modeling Monte Carlo Simulations
[76]	Dynamic behavior of CO2 spot prices	2008	228	CO2 emission certificates Emission trading Spot price process Stochastic optimal control

The graph in Figure 7 shows that issues around carbon emissions, environmental taxes, and climate policy have remained a major research focus over the years. Environmental taxes and carbon

taxes were the most discussed topics in 2011. The development of carbon pricing, climate policy, and electric vehicles increased from 2015 to 2023, in line with the growing global environmental concern. Environmental regulation and emissions trading have become frequently discussed in recent years (post-COVID-19), indicating a focus on applicable policy and regulatory mechanisms [65]. Evolutionary games and uncertainty highlight human behavior in dealing with environmental policies, including ecological tax compliance behavior in 2013 – 2023 [67]. This research is on a path that is highly relevant to current global issues and can significantly contribute to developing more effective policies in promoting environmental tax compliance.

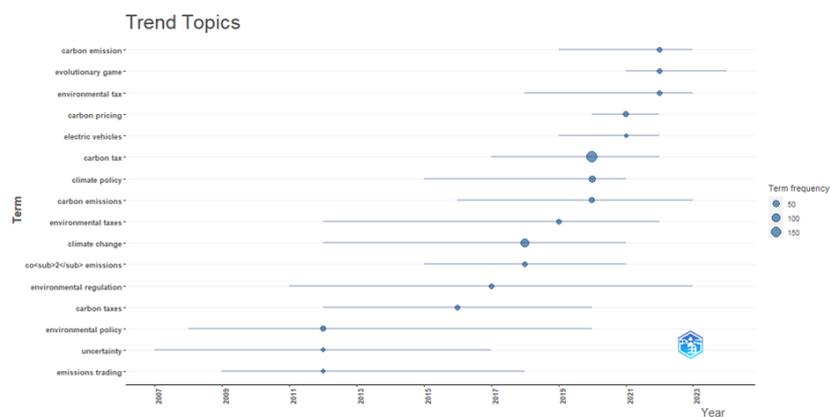


Figure 7. Tren Topics.

4.5. Conceptual Structure

Figure 8 shows the evolution of research topics from 2000 to 2024. From 2000 to 2009, the focus was on pollution mitigation and basic emission-related regulations, with research topics dominated by air pollution, pollution abatement, carbon taxes, and climate change. Meanwhile, the issues of sustainability and environmental regulation were introduced in this period in the form of a basic policy context. The period from 2010 to 2019 saw a shift, with topics becoming more specific (carbon taxes, environmental taxes, carbon emissions and efficiency). This period saw increased attention on carbon taxation and emission reduction strategies. The focus shifts to the latest trend (2020-2024), which is more complex such as sustainable development, carbon price, decarbonization, and carbon neutrality. This topic shows the integration of environmental policies aimed at long-term sustainability. Commitment and optimality in environmental policy are relevant to this research.

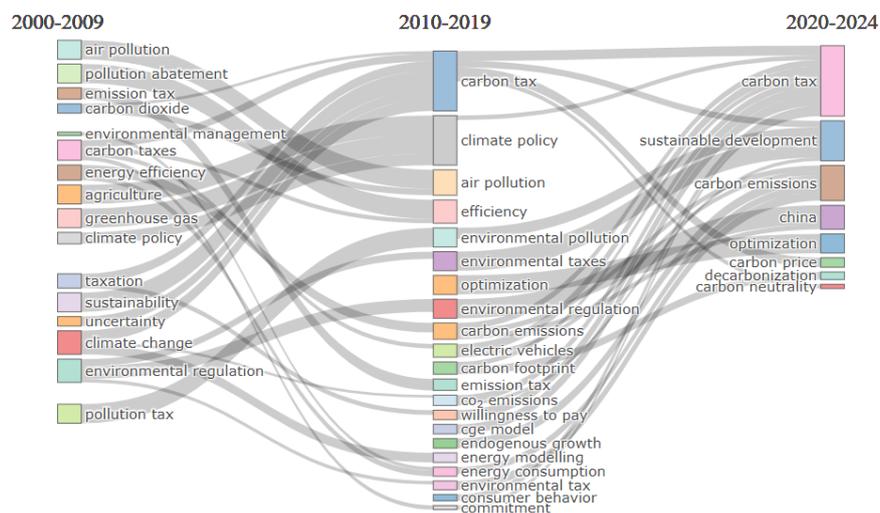
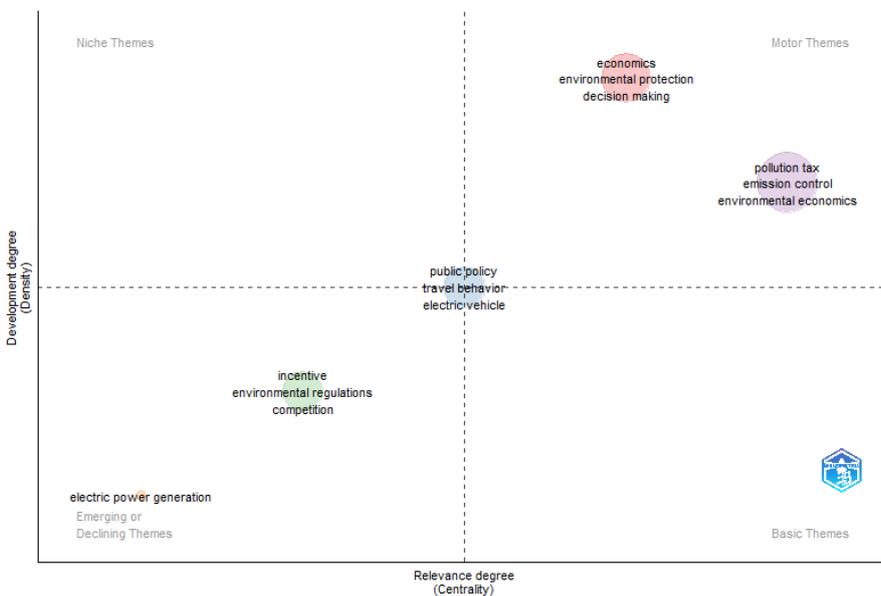
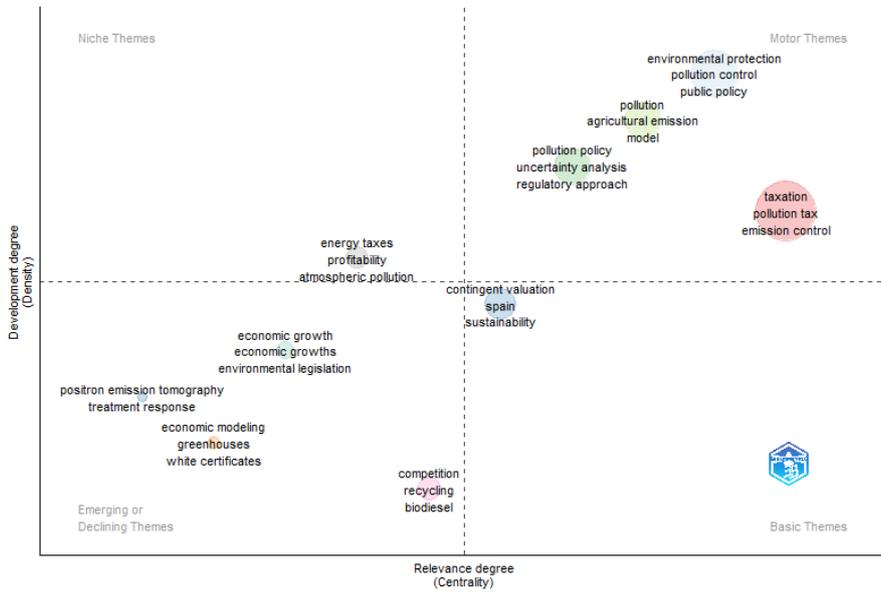


Figure 8. Thematic Evolution.

In thematic map analysis, the grouping of research topics is divided into two dimensions, namely density and centrality. Density is used to measure the development of a topic; if a topic has a high density, then the theory, methodology, and application are mature and broad. While centrality measures the relationship between issues in the field of study, high centrality will be the highlight. The thematic map is divided into four quadrants that show themes. The first theme is motor, which is in the top right and has the potential to grow and be highly relevant. The second theme is niche, which is on the top left and has high development and more specific relevance. The third theme is emerging or declining, which is in the bottom left and has less developed topics and low relevance. The fourth theme is basic in the bottom right, with a high level of main relevance but limited topic development [39,44].



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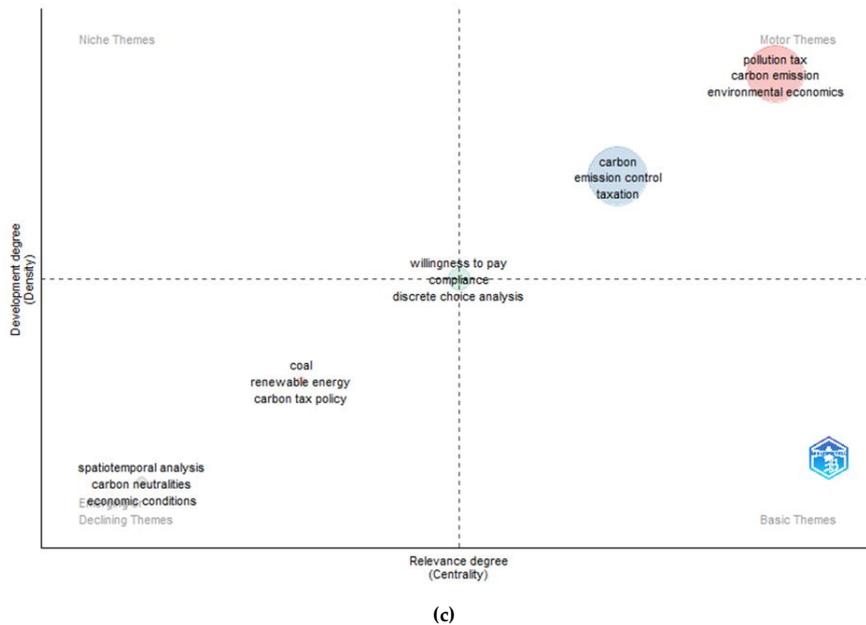


Figure 9. Thematic Map (a) Periode: 2000-2010, (b) Periode: 2010-2020, (c) Periode: 2020-2024.

Studies focusing on environmental protection, pollution control, and public policy were conducted from 2000 to 2010. This period saw increased public awareness of the environment, climate change, and regulation. In motor themes, the topics of environmental protection and pollution control are found, which shows that environmental management and emission control policies are very relevant. Topics that emerged in niche themes included energy taxes and profitability, which showed an effort to explore understanding the economic impact of environmental taxes. The issues of economic growth and environmental legislation show a shift in focus from traditional economic growth to regulation-based pollution control.

In the decade 2010-2020, there was a shift in research topics to be more specific and applicable to fiscal instruments in controlling emissions. In the motor themes section, pollution tax, emission control, and environmental economics dominate, relevant to the increasing international efforts to achieve climate targets through implementing carbon taxes. Niche themes such as economics and decision-making highlight the importance of economic analysis and decision-making in the context of environmental protection. At the same time, basic themes such as public policy and electric vehicles show that public policy is beginning to focus on transportation issues and adopting green technologies.

From 2021 to 2024, many studies have been on taxation, pollution tax, and emission control. The result shows an increasingly clear research direction on concrete strategies to control emissions through tax policies and strict regulations. The emergence of basic themes such as compliance, willingness to pay, and discrete choice analysis shows an increased interest in understanding environmental tax compliance that behavioural factors and individual preferences can influence. The relevance of behavioural research on environmental tax is increasingly apparent, as it shows that psychological and economic factors are key in determining the effectiveness of fiscal policy in the environmental field.

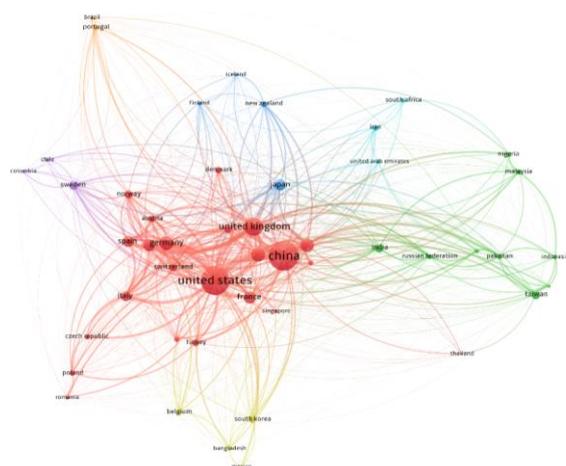


Figure 11. Coupling countries.

5. Discussion

The purpose of analyzing environmental tax compliance behavior is to provide insights so as to formulate sustainable development policies. With increasing public focus on the SDGs, environmental taxes are becoming a tool to mitigate climate change and encourage environmentally friendly economic practices. However, the success of this program is highly dependent on tax compliance. Feelings of fairness, regulatory clarity, and social participation significantly influence it. An increase in publications on environmental taxes indicates academic interest in this area. However, the decline in citation rates post-COVID-19 suggests a gap between studies and applications. This gap has become a concern. There is a need for research that is not only theoretical but also insights that can be applied to address the complexities of environmental taxation in the context of cyberspace [77,78].

China and the US dominate the number of citations and publications due to their significant academic, economic, and environmental footprints. Both countries have extensive research infrastructures and want to address environmental challenges by creating innovative policies. Although China has the highest number of publications, Australia and Canada have high research quality and relevance due to their high level of international collaboration. This condition shows that cooperation between countries can lead to high-impact research as studies are prepared to face global challenges. The thematic evolution of research that began in the 2000s on pollution control and behavioral compliance in recent years reflects increasingly complex environmental governance.

A key finding of this research is the central role of perceived fairness and transparency in shaping environmental tax compliance. Economic theory explains that taxpayers will comply if the tax system is fair and rules are transparent and accountable. Public involvement and insight into paying taxes are very important because they can increase the legitimacy of environmental taxes and encourage voluntary compliance. A combination of incentives and enforcement mechanisms is vital in promoting compliance. These approaches help achieve economic and environmental outcomes expected to balance the carrot-and-stick dynamics in policy implementation.

In this study, we highlight the importance of international cooperation in improving research quality and environmental tax policies' effectiveness. In addition, developing an effective environmental tax policy requires a multidisciplinary approach that integrates economic analysis with behavioral science and technology insights. Future research should explore the interdisciplinary nexus, focusing on developing practical and context-specific strategies to improve the implementation and impact of environmental taxes on a global scale.

6. Conclusion

From the results of the analysis, it can be concluded that environmental taxes (carbon and energy) are needed to achieve sustainable development goals and mitigate climate change. Creating success in this policy requires compliance of environmental tax actors because several factors can affect compliance, such as perceptions of fairness, tax knowledge, regulatory quality, and social involvement. This study proves that the number of publications regarding compliance behavior in environmental tax has increased every year but has decreased the number of citations after the COVID-19 pandemic. The results of this analysis indicate that relevant and practical research is needed to overcome the challenges of environmental taxes. Countries such as China and the United States dominate the number of publications and citations, driven by active collaboration across countries.

Following this study, we can make several suggestions regarding policies to improve compliance with environmental taxes. Firstly, since people have perceptions of compliance, fairness and people's perceptions must be considered when designing regulations. This purpose will be achieved by being more transparent, such as educating the public about the purpose and benefits of environmental taxes and including communities, companies, and policymakers in the public consultation process.

In addition, compliance is strengthened by a combination of incentives and law enforcement. In its application, incentives such as subsidies or tax breaks can be given to industries and companies that have implemented environmental taxes, and strict sanctions will be imposed on violators. This approach can balance positive and negative factors, thus encouraging compliant behaviour.

International cooperation is necessary to improve the quality of research and policy implementation. China and the United States have strong research capacity, so they can share knowledge and experience with other countries in formulating and implementing more effective environmental tax policies.

In addition, the development of environmental tax policy needs to use a multidisciplinary approach by integrating technology, economics, and risk analysis to deal with the complexity of policy implementation and evaluate its effectiveness on an ongoing basis. This allows policymakers to respond quickly to challenges and adapt policies to the needs of the field. By applying these approaches, we hope that environmental tax policy can become an effective fiscal instrument and tool to influence behaviour and create more inclusive and participatory sustainable development.

7. Patents

This section is not mandatory but may be added if there are patents resulting from the work reported in this manuscript.

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