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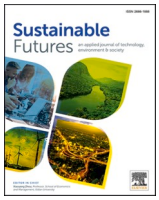

Mapping green tax: A bibliometric analysis and visualization of relevant research

Haitham Nobanee [a,b,c,*], Saif Ullah [d]

[a] College of Business, Abu Dhabi University, UAE
[b] Oxford Centre for Islamic Studies, University of Oxford, UK
[c] Faculty of Humanities & Social Sciences, The University of Liverpool, UK
[d] Department of Management, Technology and Information Science at Ziauddin University, Pakistan

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ABSTRACT

Research on "green tax" has seen significant development as societies prioritize addressing environmental degradation and climate change. This paper retrieved 20,685 SCOPUS documents, focusing on 1502 from 2015 to 2022. The study provides an overview of research, trends, and future directions. Researchers have explored green tax's effectiveness in reducing pollution, impact on economic growth, and potential to incentivize sustainable practices. Future directions may involve innovative tax design, analyzing distributional effects, assessing international cooperation, promoting clean technologies, and using green tax revenues for environmental initiatives. This evolving research offers valuable insights for policymakers striving for sustainable development.

1. Introduction

The term "green tax" is emerging due to the focus on converting the economy into a green economy. In 1920, the American economist Pigou proposed a tax or punishment for harmful activities for the environment and society. The green economy encourages economic activities that help to reduce pollution and carbon emissions, increase transition energy efficiency and resource utilization, and reduce destruction to the ecosystem. The transition into green economy objectives can be achieved through different measures, including imposing taxes on activities that are harmful to the environment or incentives for green initiatives. There are two ways to accomplish this important objective, including emission trading policy based on the amount of pollution control and carbon trading market. Green tax is levied on harmful environmental activities, including Carbon dioxide (CO_2) emissions and other harmful gasses. Environmental pollution has become an ever-increasing problem since the industrial revolution, and many regulators have introduced many controlled measures to control pollution [1]. Many countries imposed green taxes in different forms, including a carbon tax. Pollution tax is a better control measure than other measures, including subsidies, fees/charges, permit trading, etc. [1]. The overall logical justifications for pollution taxes as a control measure for reducing pollution levels are based on their ability to provide a direct price signal, promote market efficiency, allow for tailored solutions, and generate revenue.

In 1960, the environmental crisis initiated the debate about pollution tax. The Organization of Economic Cooperation and Development (OECD) [2] proposed environmental taxation, which is considered a theoretical basis. The next decade saw many environmental taxes, including carbon, Sulfur, and emission taxes. The 1990s decade saw the introduction of new taxes like environmental, ecological, and green taxes. The concept of carbon tax got attention and became a favorite research agenda from international organizations and economists due to its cost-reduction effectiveness. A carbon tax also helps to mitigate global climate change. Most carbon dioxide is produced by burning fossil fuel, oil, coal, and natural gas. Therefore, a carbon tax can help to reduce CO2 emissions. During the next decade, various environmental taxes were introduced, including carbon, Sulfur, and emission taxes. In the 1990s, new types of taxes, such as environmental, ecological, and green taxes, were also implemented. The concept of carbon tax garnered attention and became a favored research agenda for international organizations and economists due to its effectiveness in reducing costs. A carbon tax can also help mitigate the effects of global climate change, as the majority of carbon dioxide is generated by burning fossil fuels such as oil, coal, and natural gas. Therefore, implementing a carbon tax can

* Corresponding author at: College of Business, Abu Dhabi University, UAE.
E-mail addresses: haitham.nobanee@oxcis.ac.uk, haitham.nobanee@liverpool.ac.uk, haitham.nobanee@adu.ac.ae (H. Nobanee).

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help to reduce CO2 emissions and encourage a shift towards more sustainable and clean energy alternatives. [3]. Green taxes are a type of environmental tax that is implemented by developed and developing countries to attain sustainable development goals. These taxes are designed to incentivize individuals and businesses to adopt more sustainable practices and reduce their environmental impact. They can take various forms, such as carbon taxes, pollution taxes, or taxes on waste disposal. The implementation of green taxes is crucial for achieving sustainable development as they encourage a shift towards cleaner and more efficient technologies, reduce the use of non-renewable resources, and discourage environmentally damaging practices. By providing financial incentives for environmentally sustainable behaviors, green taxes can help promote a greener economy and reduce the negative impact of human activities on the environment. Green taxes are a valuable policy tool for promoting sustainable development and addressing environmental challenges. Through their implementation, countries can work towards achieving a more sustainable future for all.

Tan et al. (2022) have suggested that consideration of social and industrial aspects is required to implement environmental taxation. Their economies are growing, and these objectives can be achieved through different types. Many economies are trying to achieve economic growth through fossil fuels which can create global warming. There is a need to take proper actions to control global warming, including reducing carbon emissions. Energy transition and global warming issues are creating numerous challenges for financial and economic activities [4]. Fossil fuel attracts investment as it is still 60% of total energy investment, and renewable energy investment is less than 22%. [5]. Tan et al. (2022) have suggested that implementing environmental taxation requires consideration of social and industrial aspects. Economies aim for growth, which can be achieved through different means. However, many economies currently seek economic growth using fossil fuels, which can worsen global warming. Therefore, it is necessary to take proper actions to control global warming, such as reducing carbon emissions. Energy transition and global warming issues present numerous challenges for financial and economic activities [4]. Despite this, fossil fuel attracts investment, comprising 60% of total energy investment, while renewable energy investment remains at less than 22% (IEA, 2017). Moreover, Fang, Chen, B. and Chen, Z. [6] provide a comprehensive analysis of the global energy transition, highlighting the progress made in renewable energy adoption, the challenges posed by embodied energy, and the continued dominance of fossil fuels in the global energy mix.

Hence, mapping green tax is an emerging research area that has gained importance due to the growing need to reduce greenhouse gas emissions and promote sustainable development. Despite the increasing interest in this field, a research gap exists in mapping green tax globally. A study by Li et al. [7] highlights the importance of mapping green tax policies to provide insights into their distribution, effectiveness, and potential impact on environmental and economic outcomes. The authors note that while there is a growing body of literature on green tax policies, there is still a lack of comprehensive and systematic mapping. Another study by Kozłowski et al. [8] emphasizes the need to map green tax policies to identify gaps and inconsistencies in their implementation across different countries and regions. The authors argue that mapping green tax policies can help identify best practices and areas for improvement in promoting sustainable development.

Furthermore, a study by Rizo-Maestre et al. [9] highlights the importance of mapping green tax policies in the European Union to improve their effectiveness in reducing greenhouse gas emissions. The authors note that a comprehensive mapping of these policies can help identify potential overlaps and inconsistencies in their implementation and areas for further policy development. The mapping of green tax policies is an emerging research area with increasing importance for promoting sustainable development and reducing greenhouse gas emissions. Therefore, a systematic and comprehensive mapping of green tax policies is necessary to identify best practices, potential gaps, and areas for improvement in their implementation.

Recently, Kansal and Sharma [10], Niu, Liu, and Song [11], and Zhang, Yao, and Xu [12] have studied insights into the effectiveness of green taxes in mitigating environmental issues, particularly in developing countries like China. However, none of these studies explore bibliometric visualization concerning the research on green tax. Thus, there is a gap in the literature regarding the use of bibliometric visualization to understand the growth and trends in research on green tax. They suggest that future studies could explore bibliometric visualization to better understand the research landscape on mapping green tax and identify potential areas for further research.

This paper aims to study the background, historical development, current research, and future green tax directions. The bibliometric analysis has become an essential aspect of research for literature development to know the current state of research and future directions. Zhang, Wang, Liang, and Chen [3] reviewed the literature from 1989 to 2014 in a detailed paper on the carbon tax. This paper has extended the earlier research work from 1989 to 2014 till 2022. The current research has used many documents and addresses the following questions regarding green Tax. i) what is the current trend and state of green tax research? ii) what are the top articles, authors, countries, citations, and journals regarding the number of documents or citations? iii) the intellectual development of the topic, iv) future direction and important trends emerging from this topic. This research paper has used the SCOPUS database for data retrieval. Many studies in various fields, from management and finance, have used this database for bibliometric analysis. The Scopus database is one of the most extensive collections of multiple topics and an abstract/citation database [13].

This paper contributed to the literature about green tax/carbon tax or environmental Tax in several ways by presenting a detailed and comprehensive review of studies till 2022. This study also covers a comprehensive state of research on green Tax, future direction, and important themes for future research and also contributes to the theoretical development of green tax. This paper has extended the research period and provided fresh insight and exciting findings. We contribute fresh insights into the existing knowledge and literature theory by finding that China is the leading research output economy on green tax while previously it was the U.S. The underwriting results show that the Journal of cleaner production produced the highest number of papers and got the highest citations in the last seven years. China is the top country for research output. The results show that the most popular keywords used in this analysis are carbon and environmental tax.

The remainder of this manuscript is structured as follows: Section 2 presents the data and methods, and Sections 3 and 4 present the results, discussion, and the study's conclusion.

2. Methodology and data

Bibliometric analysis helps intellectual development using a systematic and structured process and analyzing documents, citations, authors, co-authors, regions, countries, quality, and productivity in a specific field [14]. The scientific field and specific research advancements can be used to understand better and develop structure and theory [15]. Bibliometric analysis provides quantitative measurements of scholarly impact, such as citation counts and publication counts, which can be used to evaluate the performance of individual researchers, institutions, and funding agencies. Bibliometric analysis can also track trends in research, identify key players and collaborations in a particular field, and inform research policy and decision-making. Additionally, bibliometric analysis can identify emerging topics and research areas and map a particular field's intellectual structure [16,17].

Moreover, Block and Fisch [18] have suggested that a bibliographic study should consider understanding the structure of a specific research field, as only listing references and brief descriptions should not be considered a bibliographic study. Therefore, a bibliographic study must be developed beyond several documents, leading authors, and countries

and focus on the scientific field's development process. The bibliometric analysis provides a powerful tool for presenting an analysis of any topic [19].

The present study used bibliometric analysis methodology utilizing quantitative and qualitative mapping and bibliometric visualizations. This provides a comprehensive view of research, identifies emerging trends, supports decision-making, and facilitates evaluation of research impact and communication. The scope and key findings of the articles are also collected through traditional content and systematic analysis because these are structured approaches to analyzing qualitative data by ensuring that findings are grounded in the data and not biased by the researcher's assumptions or preconceptions. The systematic analysis also helps ensure that the research is rigorous and transparent and that findings are trustworthy and can be replicated by other researchers. By analyzing data systematically and structured, researchers can identify patterns, themes, and relationships in the data, which can then be used to develop theories, generate hypotheses, and inform practice. Traditional content and systematic analysis are crucial tools for qualitative research seeking to generate meaningful and trustworthy insights from their data [20].

VoSviewer software is used to perform citations and co-citation analysis and identify the intellectual structure of current research on green tax. VoSviewer performed the co-citation network and identified the knowledge flow through themes and clusters. Cluster analysis is performed using weighted citation measures by identifying lead papers. This way helps us to develop a comprehensive and detailed evaluation of the literature development of green Tax. This approach is also used by Khatib, Abdullah, Hendrawaty, and Elamer (2017). The literature is mapped using VoSviewer software, a powerful software to link keywords and construct a visualized map. This is a widely used software, and many studies in different fields used this for bibliometric study, including [21] [corporate governance], [22] [emerging organization structure]; [23] [auditing]; [24] [Innovation]). A recent study by Block and Fisch [25] outlined those bibliometric studies should clearly define the search process for transparency and clarity. Therefore, this study has used a comprehensive search process, and 20,685 documents were retrieved using the words, i.e., tax, charge, fee, duty, levy, fund, and fund collaboration degree analysis. The words fuel, transport, petrol, oil, and gas tax are also added in the above search query.

Zhang, Wang, Liang, and Chen [3] studied carbon tax from 1989 to 2014. Therefore, we have taken the period from 2015 to 2022. Table 1 shows the search query results for tax documents using the titles, abstracts, and keyword criteria. However, for relevant documents, we searched titles only and found 3958 papers. To refine the search, we excluded erratum, books, retracted, and abstract reports and found 3918 documents. We have excluded books, trade journals, and undefined sources and found 3531 papers. On November 13, 2022, by adding all open and closed sources and including all subjects, we found 1502 documents in the SCOPUS database. The documents published after this date are not included in this research study. Scopus database is one of the main abstract and reference databases. Scopus covers a massive number of titles from many publishers and peer-reviewed journals in different fields. The Scopus database allows the researcher to import final results in a single Excel file, including publisher, author, affiliation, reference, and citation matric, and consider the advantage of this bibliography database. Therefore, we have used Scopus as a search database as a single source due to its comprehensive coverage of documents and citations. The search query is presented in Table 1.

The literature was cleaned using seven levels for multiple criteria sets. Fig. 1 shows the process applied for delimiting literature (PRISMA chart). PRISMA chart provides a transparent and comprehensive overview of the search and selection process of studies included in a systematic review or meta-analysis. It can help readers understand the rigor of the review process and assess the potential bias in selecting studies. The PRISMA chart shows that level 1 was used to decide the database selection, and we selected the Scopus database due to its coverage of documents and citations. At level 2, we found 20,685 documents by searching titles, abstracts, and keywords. At level 3, we limited our search to titles and excluded 16,727 documents while remaining 3958. The next level was to limit documents to types, and we excluded 40 papers by selecting only the articles as the document type. At level 5, we excluded 387 documents by selecting source type. At level 6, we excluded 201 documents by selecting English only language. The last step was to refine the search by choosing the year (2015–2022), and we got only 1502 documents. These 1502 documents were used for further analysis. The detailed process is explained in Fig. 1.

Table 1
The search query for green tax documents.

Description	Conditions	Number of Documents
Search query TITLE-ABS-KEY	**We have combined the following word**: "climate change, climate, carbon, CO_2, environment, green, emission, waste, landfill, pollution, energy, road, revenue neutral, revenue-neutral, solid waste disposal, waste disposal, so2, sulfur, sulfur dioxide emission*, sulfur emission*, sulfur, sulfur dioxide, Sulfur dioxide emission*, NOx, nitrogen, nitrogen oxide emission, NO1, NO1 emission*, nitrogen dioxide emission*, NO_2, NO_2 emission*, resource, **with the following words**: "tax, charge, fee, duty, levy, fund. **We have also added the following keywords:** "fuel tax, transport tax, petrol tax, oil tax, gas tax", **then we have searched the titles, abstracts, and keywords**	**20,685 Documents**
Search query TITLE	To get the most related documents, we searched the "title" only	**3958 Documents**
Document type	We have excluded erratum, books, retracted, and abstract report	**3918 Document**
Source type	We have excluded books, trade journals, and undefined sources	**3531 Documents**
Language	We have limited the search to documents written in English.	**3330 Documents**
Years	We have limited the search to the period of (2015– 2022)	**1502 Documents**
Access	Both open-access and non-open-access documents are included	
Query search date	November 13, 2022	
Subject area	All subject areas were included	

Apart from statistical analysis and document analysis based on types, seven methods are used before interpretation and discussion. These include descriptive analysis, citation analysis, documents, sources, authors, organizations, countries, co-citation analysis, co-authorship analysis, and co-occurrence analysis: authors' keywords. The detailed flowchart is presented in Fig. 2.

3. Analysis and results discussion

3.1. Descriptive analysis

The descriptive analysis, also called the top-down approach, collects studies based on general characteristics like names of countries, fields, or types of documents. The meaning of the results is less depictive of the actual research assessment [26]. The descriptive analysis is necessary for understanding the distributional impacts of green and environmental taxes Atkinson, G., & Hamilton, K. [27], as well as identifying potential unintended consequences and addressing environmental taxes concerns [28,29]. Hence, in this study, descriptive analysis is important for providing a comprehensive understanding of the distributional impacts of green taxes, assessing the effectiveness of different policy instruments in achieving emissions reduction targets, and identifying potential areas for improvement in policy design and implementation. The descriptive

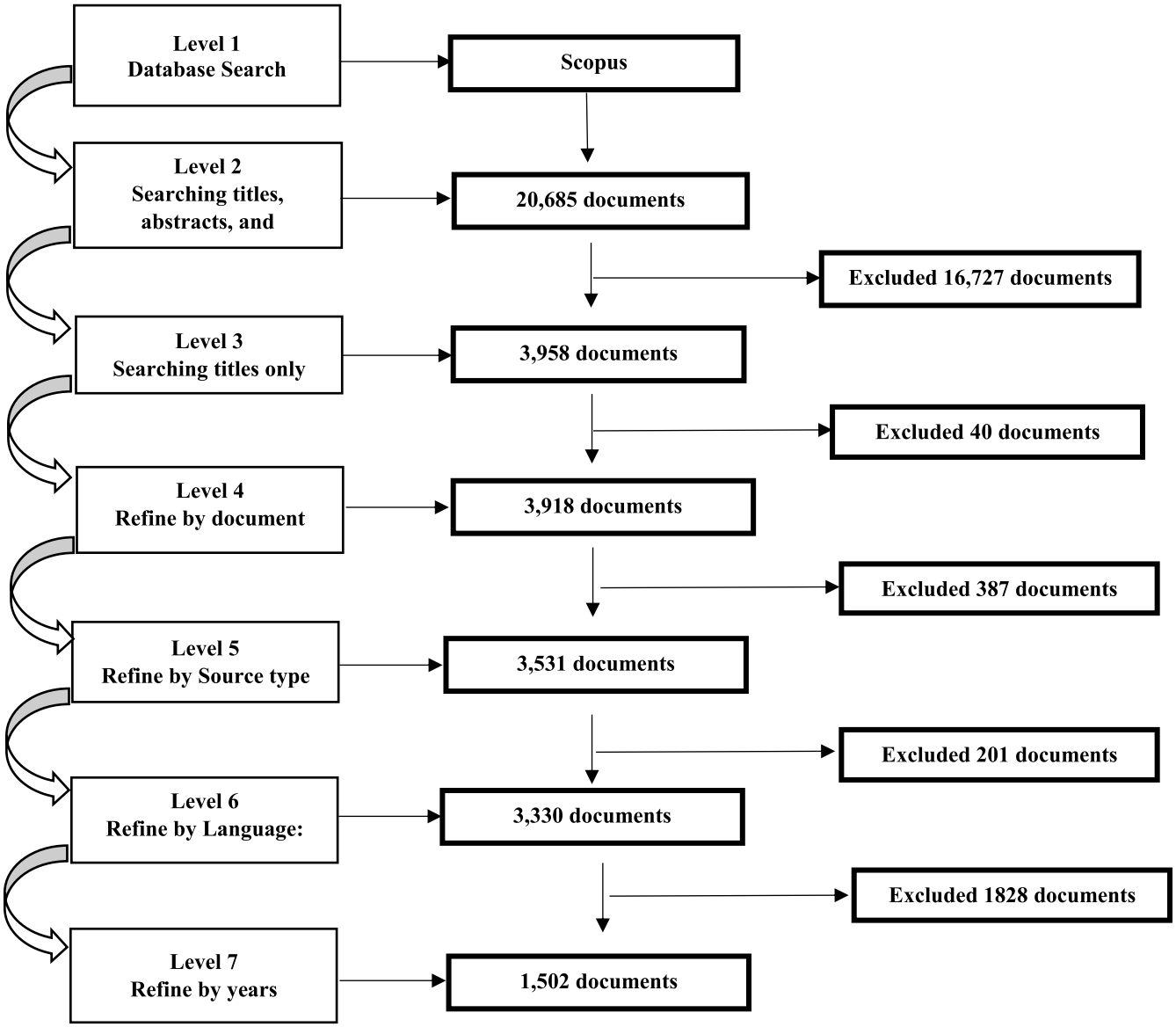

Fig. 1. Process applied for delimiting literature (PRISMA chart).

analysis also helps to know the publication trend of green Tax. The paper's first objective is answered by answering basic information like the total number of publications, journals, citations, and counties.

3.1.1. Distribution of documents by type

Different documents are divided into different types and represented through pie charts in Fig. 3. Documents are distributed to a wide range, from data papers at least 0.1% to articles 84.1%. The short survey is 0.1%, letters 0.3%, editorial 0.6%, book chapters 1.2%, notes 1.5%, reviews 2.5%, conference papers 9.6%, and articles 84.1%. Most of the literature comprises articles that show the original research trends. The details results are shown in Fig. 3.

3.1.2. Citation analysis

Another popular and widely used technique of bibliometric analysis is Citation analysis. Citation analysis includes patterns, frequency examination, and graphs of citations of articles. Citations establish links among scholarly works [30]. Open research journals are likely to receive more citations than closed-access journals. The count of citation analysis is calculated using the citation of the article citations by other articles, which shows the impact and popularity of the article in the particular field [31]. We have analyzed the citations of 1502 articles based on several counts of citations provided by the Scopus database—the top 10 articles presented in the table from the detailed analysis. However, two of the top 10 articles are published in the Journal of cleaner production. We further analyzed the sample and identified the citation trends.

3.1.3. Documents, sources, authors

The study further analyzed document types, top journals, top sources, and top authors because this can provide valuable insights into the state of research help in understanding the landscape in a particular field or topic of study, and help us to make informed decisions about work. Analyzing document types can help gain insights into the depth and breadth of research in a particular area. Examining the top journals and sources in a field can provide information on the most influential publications and outlets for disseminating research findings. Finally, analyzing the top authors can help identify the key contributors to a field or topic and potential collaborators or mentors for future research. The detailed bibliometric analysis is presented below.

3.1.4. Organizations, countries

The research on green tax is dispersed across different countries. We

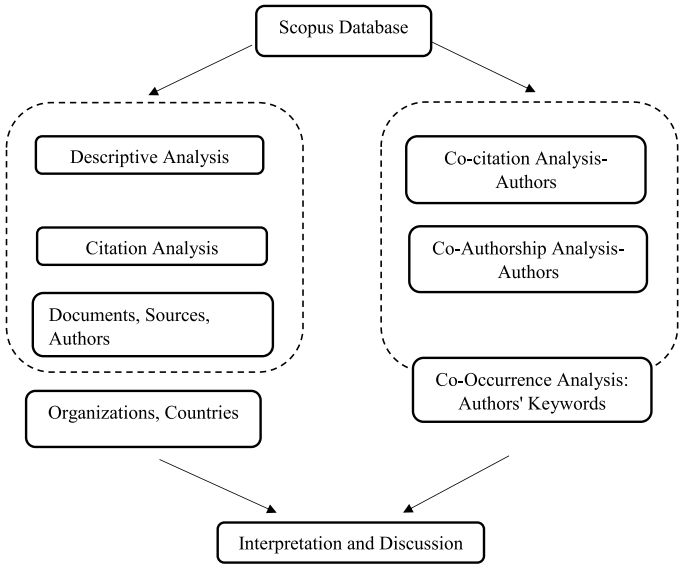

Fig. 2. Flowchart of statistical and document analysis.

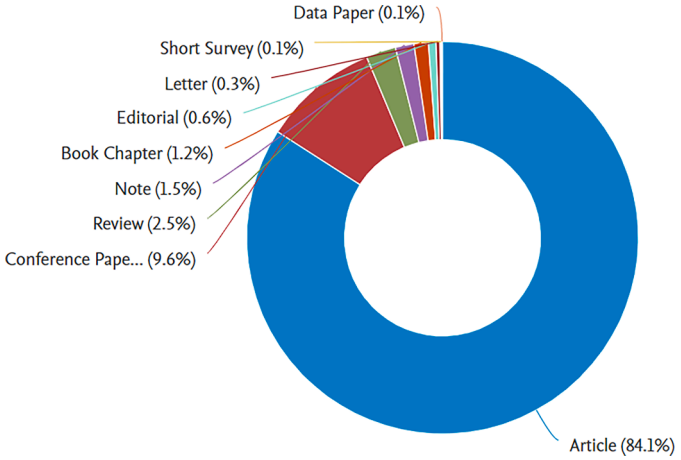

Fig. 3. Distribution of documents by type.

found that China is the leading country with 506 documents and 8179 citations. Previously, Zhang, Wang, Liang, and Chen [3] studied carbon tax from 1989 to 2014 and found that the U.S. is the top country in research on green tax. This shift shows China's rapid industrialization and encourages researchers to explore green Tax in China. Overall, green taxes are important in China's efforts to promote sustainable development and protect the environment. As the country grows and develops, it will be important to continue exploring and implementing policies that promote green and sustainable practices.

3.1.5. Co-citation analysis- authors

Block and Fisch [18] suggested that co-citation helps to develop themes, structure literature, and identify gaps in a scientific field or research topic. The co-citation refers to when we find two items in a single document. It helps to identify the more cited reference in a document in a subject area and content. Co-citation also shows a similar topic, theory, methodology, and empirical discipline when two publications are cited more than once in a single document. We used VoSviewer software to measure the link strength between two documents and the connection between pair references. Co-author citation analysis is also important to know the trend in research. The trend shows that Lin, B has 306 citations with the highest strength of the link. The detailed analysis is shown in the table. The finding of this study confirms the strength of different concepts.

3.1.6. Co-authorship analysis- authors

The co-authorship analysis is also important for identifying trends and group analysis of research on green Tax. By analyzing collaboration patterns among researchers and institutions, co-authorship analysis can provide insight into the development of the field, the emergence of new research topics and perspectives, and the evolution of research networks and communities.

3.1.7. Co-occurrence analysis: authors' keywords

The author's keywords are also important in the bibliometric analysis. Comerio and Strozzi [32] have suggested that keyword co-occurrence is an insightful technique to develop scientific construct as keywords provide a coherent explanation of the content of the documents. The higher numerical value of the connection between two keywords shows the strength of the relationship. The number of time occurrences represents the strength of the link between keywords in the same article. The keyword analysis is representative of the general content of the article.

3.2. Results and discussions

3.2.1. Evolution and growth in green tax research over time

The results show enormous growth in research on green tax. They started in 2015 with 124 publications, 103 documents in 2016, 140 documents in 2017, 201 documents in 2018, 197 documents in 2019, 222 documents in 2020, 236 documents in 2021, and doubled in 2022 with 279 publications. Annual Growth Rate (AGR) of Published Articles Per Year (PAPY %) varies from 2% to 44% but increases from 2017 onward. The 22% growth in 2022 shows the topic's importance due to recent climate and environmental drives and the focus on the green economy. A total of 1502 articles show huge interest in the subject. The details are reported in Table 2, and the trend is shown in Fig. 4.

The annual growth rate (AGR) is calculated by changing the ending value from the beginning and dividing the beginning value, which calculates the growth rate as a percentage.

$$\mathrm{AGR} = [(\mathrm{Endingnumber} - \mathrm{Beginningnumber}) \,/\, (\mathrm{Beginningnumber})] * 100$$

AGR formula can be useful for quickly comparing growth rates between different data sets, providing an exact percentage value that is easy to understand and interpret.

3.2.2. Top cited documents

Table 3 shows the top cited documents on green tax. Aghion et al. [33] published a study in the Journal of Political Economy, a top-cited document with 299 citations. Moreover, Guo and Liu [34] in Energy Sources, Part B: Economics, Planning, and Policy, received 226 citations and secured second place followed by Yang and Chen [35] in Omega,

Table 2
The rate of production of articles per year and the annual growth rate.

Year	No. of Articles Published per Year	Percentage of No. of Articles Published Per Year	Cumulative growth of Published Articles Per Year	Annual Growth Rate (AGR) of Published Articles Per Year (%)
2015	124	8.26%	8.26%	
2016	103	6.86%	15.11%	-17%
2017	140	9.32%	24.43%	36%
2018	201	13.38%	37.82%	44%
2019	197	13.12%	50.93%	-2%
2020	222	14.78%	65.71%	13%
2021	236	15.71%	81.42%	6%
2022	279	18.58%	100.00%	18%
Total	1502	100.00%		

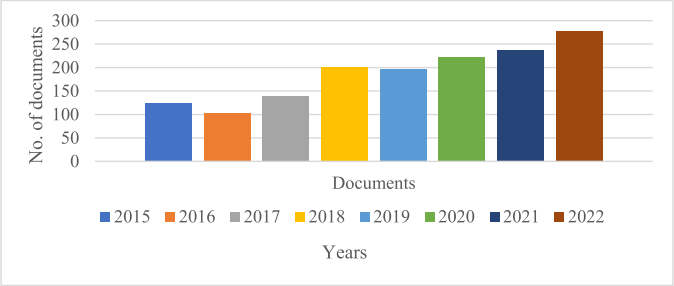

Fig. 4. Publication growth of green tax research for all documents and journal articles.

Table 3
Top cited documents.

Rank	Document	Citations
1	[33]	299
2	[34]	226
3	[35]	201
4	[36]	195
5	[37]	174
6	[38]	172
7	[39]	170
8	[40]	160
9	[41]	156
10	[42]	147

who received 201 citations. The article published in Science of the Total Environment by Hao et al. [36] received 195 citations. Also, Chen and Hu [37] and Xu et al. [38] published articles in the Journal of cleaner production and received 174 and 172 citations, respectively. In addition, Liu and Lu [39] published in Applied Energy and Choi and Luo, [40] in Transportation Research Part E: Logistics and Transportation Review and received 179 and 160 citations, respectively. Besides that, He et al. [41] published in the Journal of cleaner production, and Murray and Rivers, [42] in energy policy received 156 and 147 citations, respectively. The top 10 cited documents obtained more than 1900 citations and 502 citations by the Journal of cleaner production. It also shows that top research significantly impacts citation analysis on the topic. Fig. 5 also presents a visualization map of the top documents.

3.2.3. *Top journals*

The top list of journals is demonstrated in Table 4 and Fig. 6, while the year-wise trends are reported in Fig. 7.

The top-cited journal analysis shows that the Journal of cleaner production published the highest number of articles, i.e., 64 documents, and received 2133 citations. Energy policy followed with 49 published documents and 1319 citations. Sustainability (Switzerland), applied Energy, International Journal of production economics, energy, energy economics, Journal of environmental management, the science of the total environment and Journal of environmental economics and Management published 75, 16, 15, 17, 33, 14, 8 and 15 articles respectively and received 756, 597, 579, 522, 515, 470, 340 and 320 citations respectively. The top cited journals significantly impact the research trend and drive the green tax research.

3.2.4. *Publications and citations by authors*

Numerous authors have published on this topic and received citations. Wang L. published five documents and received the highest number of 455 citations, followed by Zhang J., who published seven articles and received 488 citations. Cats O. published three articles with

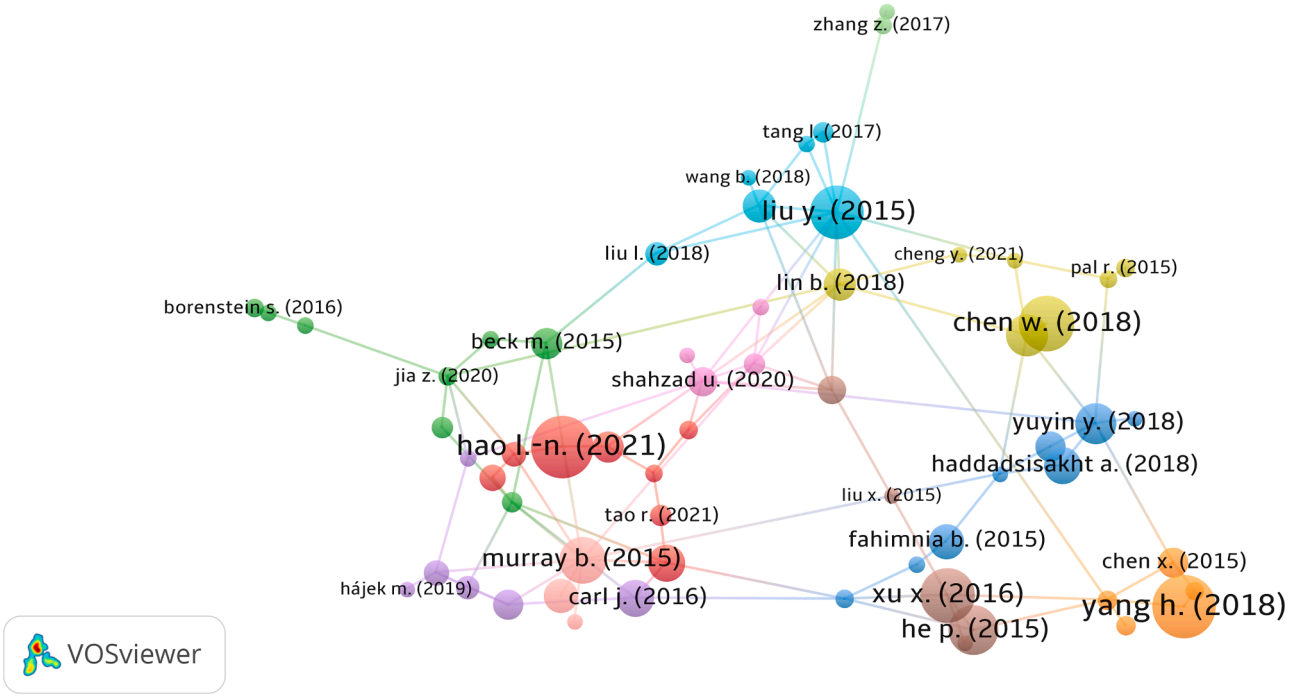

Fig. 5. Top cited documents.

Table 4
Top cited journals.

Rank	Source	Documents	Citations	Scopus Cite Score	Publisher
1	Journal of Cleaner Production	64	2133	15.8	Elsevier
2	Energy Policy	49	1319	12.4	Elsevier
3	Sustainability (Switzerland)	75	756	5.0	MDPI
4	Applied Energy	16	597	20.4	Elsevier
5	International Journal of Production Economics	15	579	14.3	Elsevier
6	Energy	17	522	13.4	Elsevier
7	Energy Economics	33	515	11.3	Elsevier
8	Journal of Environmental Management	14	470	11.4	Elsevier
9	Science of The Total Environment	8	340	14.1	Elsevier
10	Journal of Environmental Economics and Management	15	320	8.5	Elsevier

380 citations, and Wang X. published four articles and received 352 citations. Tirachini A. published two articles with 272 citations, and Cauchemez S., Cowling B., J., Du Z., Meyers L.A., and Xu X. published 1 article with 230 citations each. Zhang A., Sun X, Wandelt S., Wang J., and Wang L. published 6, 7, 6, 12, and 5 articles and received 213, 204, 202, 200, and 455 citations, respectively. The top cited documents are demonstrated in Table 5 and Fig. 8.

The top cited documents authors are depicted below in Fig. 7.

3.2.5. Top cited organizations

London School of Economics- center for Economic Performance and Grantham Research Institute, Harvard University, Imperial College, INSEAD published 1 article with 299 citations each. Shanghai Jiao Tong University published two articles with 264 citations. Rutgers University-Department of Chemical Biology, Princeton University, Rutgers University- Department of Medicine, Rutgers University -Department of Molecular Biology and Biochemistry, Rutgers University-Rutgers Cancer Institute published 1 article with 266 citations each. Table 6 and Fig. 9 show the top-cited organizations below.

3.2.6. Top cited countries

Table 7 shows the top-cited countries from 2015 to 2022 in the Scopus database. China is leading with 506 documents and 8179 citations, followed by the United States with 251 and 4308 citations. The United Kingdom is in third place with 104 documents and 1902 citations, followed by Canada with 79 documents and 1791 citations. Australia, France, and Germany are in fifth, sixth, and seventh place with 61, 59, 63 documents and 996, 919, and 877 citations, respectively. Japan, Hong Kong, and India are in 8th, 9th, and 10th place with 61, 18, and 40 documents and 736, 587, and 568 citations. Table 7 and Fig. 10 show the top-cited countries below.

3.2.7. Co-citation analysis of authors

Co-citation analysis of authors is also important in establishing total link strength. Lin B. is in 1st place with 306 citations and 11,067 total link strength, followed by Zhang X., with 280 citations and 10,967 total link strength. Liu, Y., Zhang, Y., Xu, X. is in 3rd, 4th, and 5th place with 280, 259, and 240 citations and 9241, 9205, and 9200 total link strength. Wang, Y. Li, Y. Li, X. Liu, Z. Wang, C. is in 6th, 7th, 8th, 9th, and 10th place with 268, 252, 233, 193, 229, and 8914, 7734, 7720, 7578,

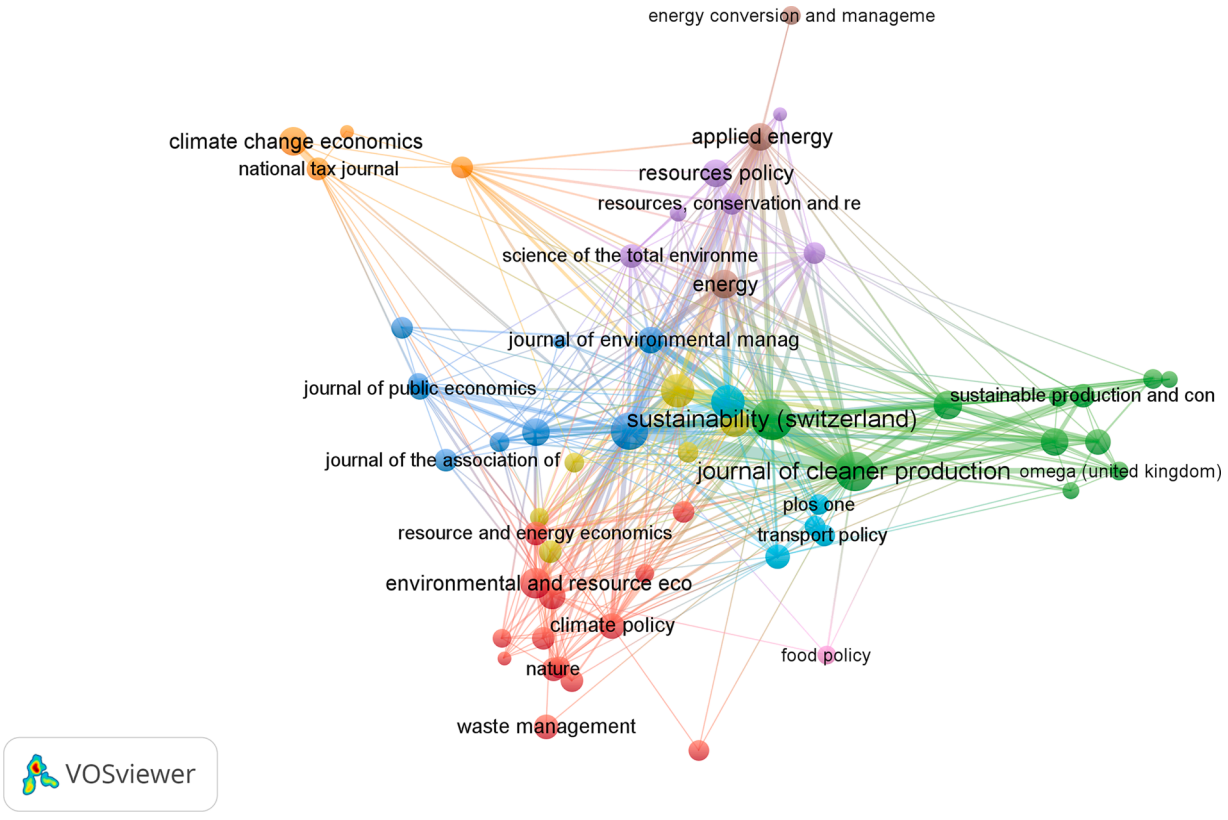

Fig. 6. Top sources.

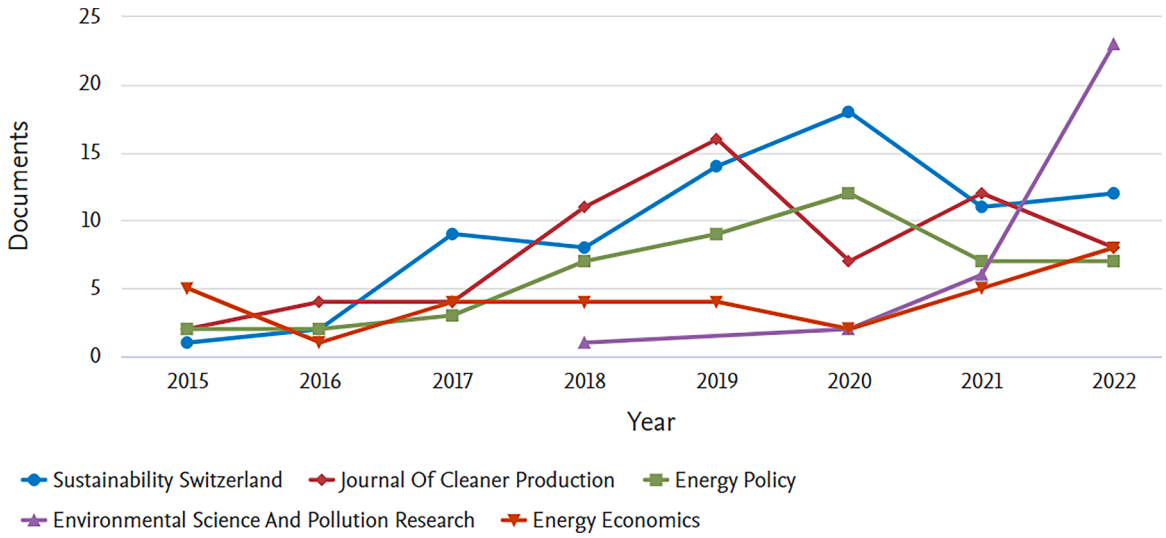

Fig. 7. Documents by source by year.

Table 5
Top cited authors for the 464 articles discovered in the Scopus database.

Rank	Author	Documents	Citations
1	Wang L.	5	455
2	Zhang J.	7	448
3	Cats O.	3	380
4	Wang X.	4	352
5	Tirachini A.	2	272
6	Cauchemez S.	1	230
7	Cowling B.J.	1	230
8	Du Z.	1	230
9	Meyers L.A.	1	230
10	Xu X.	1	230
11	Zhang A.	6	213
12	Sun X.	7	204
13	Wandelt S.	6	202
14	Wang J.	12	200
15	Wang L.	5	455

and 7226 total link strength. Table 8 and Fig. 11 report the co-authors' citation outcomes.

3.2.8. Co-authorship analysis of authors

Co-authorship of authors analysis at the authors' level show that Liu Y. Wang Y. and Dai H. are in 1st, 2nd, and 3rd place with 16, 20, and 4 documents, 392, 150, 212 citations and 23, 23, and 18 total link strength. Zhang W., Liu Z., and Zhang J. are in 4th, 5th, and 6th place with 8, 9, and 17 documents, 255, 311, 168 citations, and 18, 17, and 16 total link strength. Xie Y. Li Z. Yang Y. Tang L. is in 7th, 8th, 9th, and 10th place with 5, 11, 5, and 4 documents, 194, 221, 245, 184 citations, and 15, 14, 14, and 13 total link strength. Table 8 and Fig. 12 show the co-authorship analysis below.

3.2.9. Keyword analysis

The keywords analysis is important, which shows the evaluation of different keywords. The carbon tax is a highly used keyword with 376 occurrences, followed by environmental Tax with 135 occurrences. Climate Change, Climate Policy, Carbon Emissions, CO2 Emissions, Carbon Tax Policy, Environmental Policy, Economic Growth, and Renewable Energy have 61, 36, 32, 31, 26, 26, 25, and 24 occurrences, respectively. The results show that carbon tax and environmental tax are among the most popular keywords used in this analysis. The keywords analysis is reported in Table 10 and Fig. 13.

3.3. Overall discussion of clusters findings

The detailed analysis of the literature on green tax culminated in 16 clusters. These clusters are explained below.

Cluster 1: Carbon Emissions and Neutrality

The extensive literature available on CO2 emission carbon neutrality. Growth in GDP increases CO2 emissions, while environmental taxes, green innovation, and renewable energy reduce CO2 emissions. CO2 emission in China increases due to tertiary sector development and regional growth. G-7 economies should focus on interlinked concepts of green innovation, renewable energy, and environmental taxes. Carbon taxes are more effective than greenhouse gas (GHG) in reducing carbon emissions.

Cluster 2: Climate Change and Energy Policies and Regulations

Climate change and energy policies depend on perceived effectiveness and fairness. Public opinion about climate change taxes is an important policy challenge. The findings suggest that the European public lived in countries with less trust in the political system. The public is less convinced about controlling climate change with taxes and vice versa. Therefore, awareness is less effective than trust in the political system in the case of taxes on climate change. The studies found that Pareto optimality and financial balance cannot be achieved in global climate governance. However, this issue can be resolved through global climate funds, which can convert non-bankable projects into bankable ones.

Cluster 3: Carbon Tax Reform

The carbon tax reforms are an important area of study in green taxes. The carbon tax policies can help in reducing carbon emissions, but the impact on consumer welfare is minimal. Carbon tax reforms considering production networks are more effective in reducing carbon emissions than targeting a single sector. On the other side, a frequent flyer levy is more progressive than a carbon tax. Carbon tax hurts sectoral productivity and positively affects carbon emissions. However, carbon tax recycling can reduce sectoral outputs' negative impact and achieve reduced carbon emission goals. The government can offer carbon credit, and companies can use carbon credits, significantly affecting company sustainability's competitiveness. Commercial banks can help reduce carbon emissions through green investments and offering green loans.

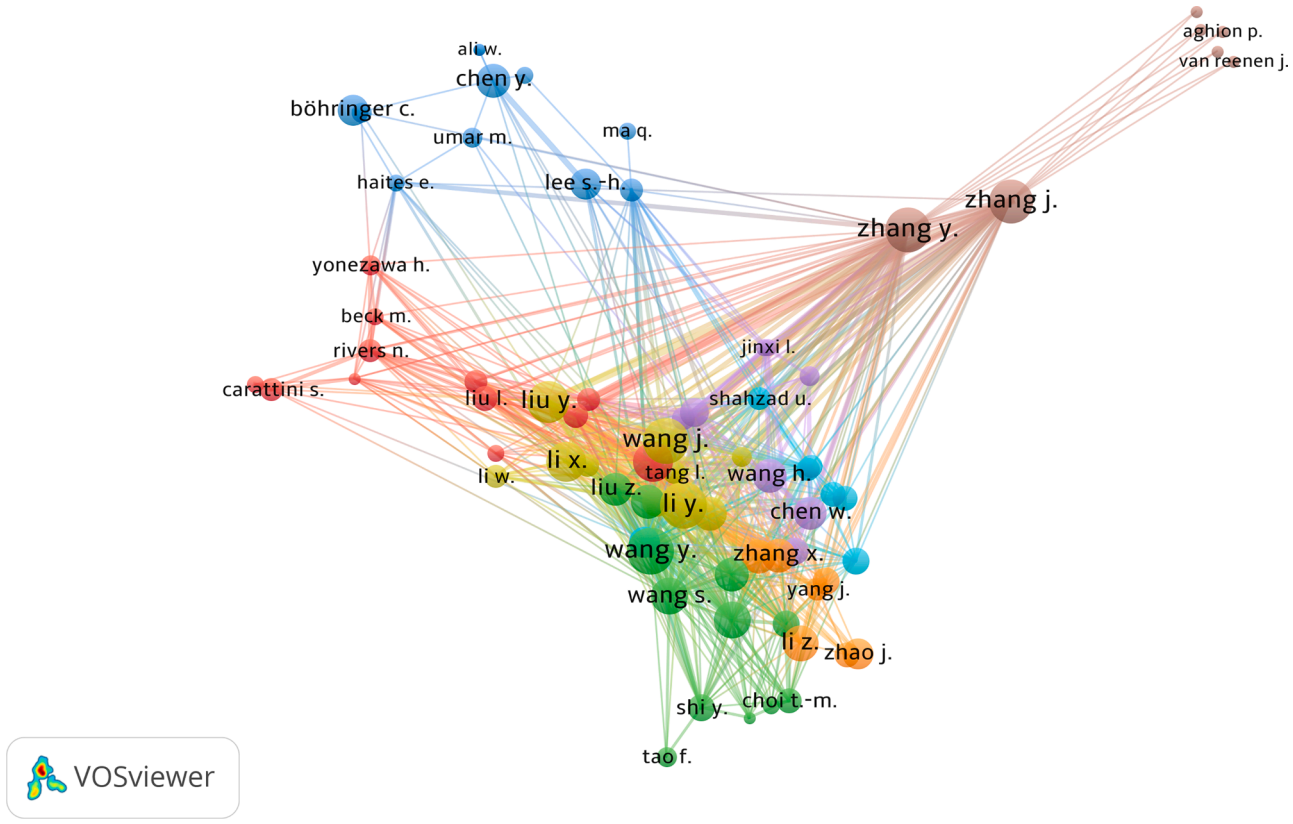

Fig. 8. Top cited authors.

Table 6
Top cited organizations.

Rank	University	Country	Documents	Citations
1	London School of Economics-center for Economic Performance	United Kingdom	1	299
2	London School Of Economics-Grantham Research Institute	United Kingdom	1	299
3	Harvard University	United States	1	299
4	Imperial College	United Kingdom	1	299
5	INSEAD	France	1	299
6	Shanghai Jiao Tong University	China	2	264
7	Rutgers University- Department of Chemical Biology	United States	1	226
8	Princeton University	United States	1	226
9	Rutgers University- Department of Medicine	United States	1	226
10	Rutgers University -Department of Molecular Biology and Biochemistry	United States	1	226
11	Rutgers University-Rutgers Cancer Institute	United States	1	226

Cluster 4: Energy efficiency

The improvement in Energy efficiency can reduce carbon emissions in the transportation industry. Energy tax improves energy efficiency in the short term, while vehicle tax in the long run. Vehicle environmental tax improves energy efficiency in both the short and long term. The upgradation of industrial structures improves the impact of environmental taxes on energy efficiency. Countries with high GDP groups have more impact on energy efficiency improvement than countries with low GDP. Standards of energy taxes are less regressive than energy efficiency. Improved energy efficiency and carbon tax policies can help in sustainable development.

Cluster 5: Environmental R&D and Green Innovations

Tax reforms enhanced green innovation, and designing compensation schemes intensified this effect while profitability played an intermediary role. Ecofriendly innovations have more impact on carbon mitigation. Carbon tax helps to develop innovation and environmental policies. A joint tax subsidy policy is more effective than a single tax policy for higher investment in green innovation and better social welfare. Environmental taxes help promote innovation in China. However, innovation quality differs in different regions, and quality is higher in environmental taxes. Environmental Subsidies also play a role in innovation.

Cluster 6: Economic Growth, Green Growth, poverty, and social welfare

There is an N-shaped relationship between GDP and Carbon emission. There is also a double-dividend effect of environmental tax in the long run. However, the double-divined hypothesis is invalid for African Countries. While interacting with real GDP per capita, tax revenue from environmental taxes reduces the economic growth rate. On the other side, higher levels of GDP per capita countries positively affect environmental taxes on the economic growth rate. Environmental taxes have a positive impact on green growth in the short term. However, environmental taxes do not affect green growth in the long run.

Cluster 7: Public policies, public opinions, Employment, and political economy

Trade can help modify energy policies, as trade flow is an exogenous

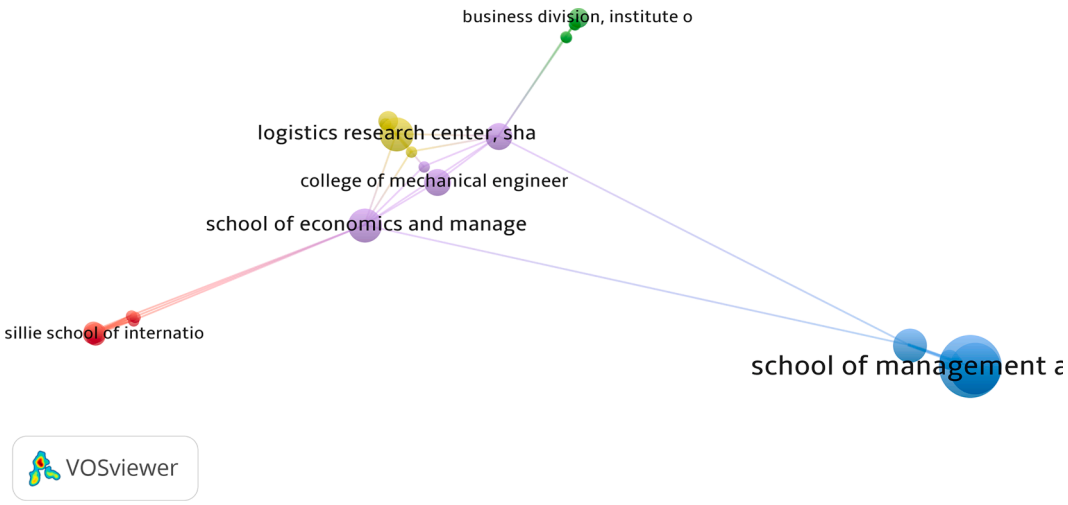

Fig. 9. Top cited organizations.

Table 7
Top cited countries.

Rank	Country	Documents	Citations
1	China	506	8179
2	United States	251	4308
3	United Kingdom	104	1902
4	Canada	79	1791
5	Australia	61	996
6	France	59	919
7	Germany	63	877
8	Japan	61	736
9	Hong Kong	18	587
10	India	40	568

Table 8
Co- citations of authors.

Rank	Author	Citations	Total Link Strength
1	Lin, B.	306	11,067
2	Zhang, X.	280	10,967
3	Liu, Y.	280	9241
4	Zhang, Y.	259	9205
5	Xu, X.	240	9200
6	Wang, Y.	268	8914
7	Li, Y.	252	7734
8	Li, X.	233	7720
9	Liu, Z.	193	7578
10	Wang, C.	229	7226

factor in green investment. Environmental taxation should be used for financial incentives rather than an unemployment and environmental degradation control policy. Carbon tax helped to alleviate unemployment in coal resource-based areas. However, carbon tax hinders employment through the demand effect. The carbon tax has not been affected in the form of transfer payments.

Cluster 8: Renewable Energy

Clean fuel technologies access can reduce carbon emissions. Nuclear

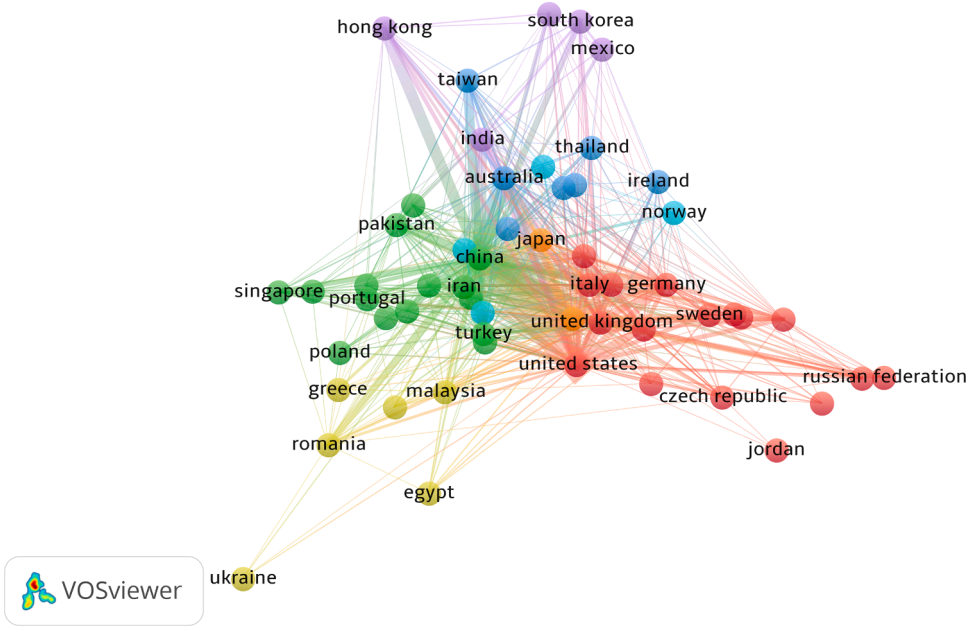

Fig. 10. Top cited countries.

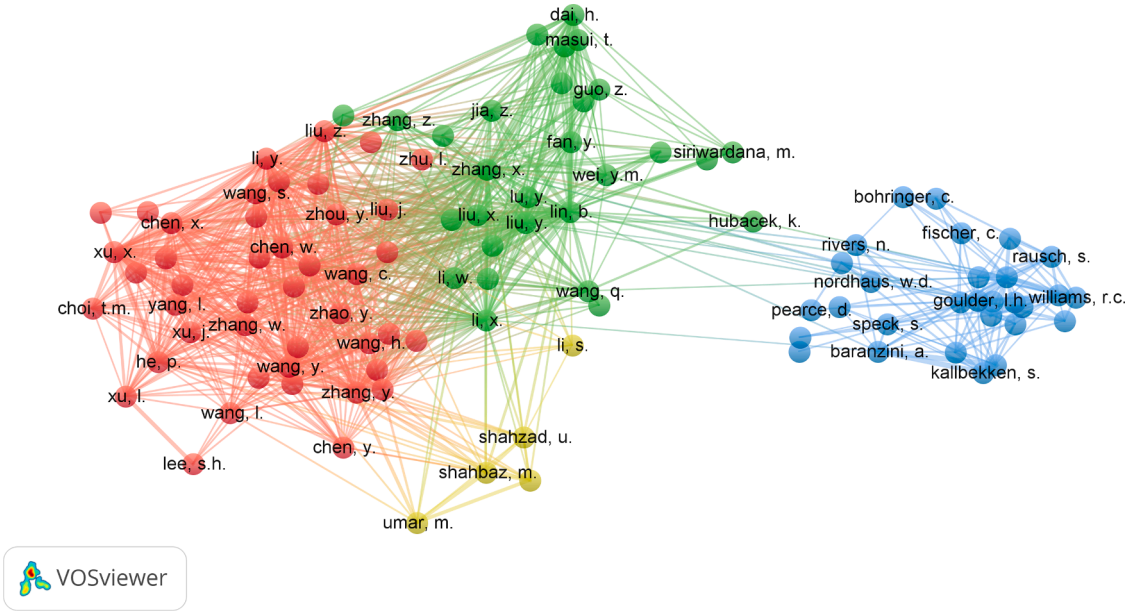

Fig. 11. Co-citation analysis at the authors' level.

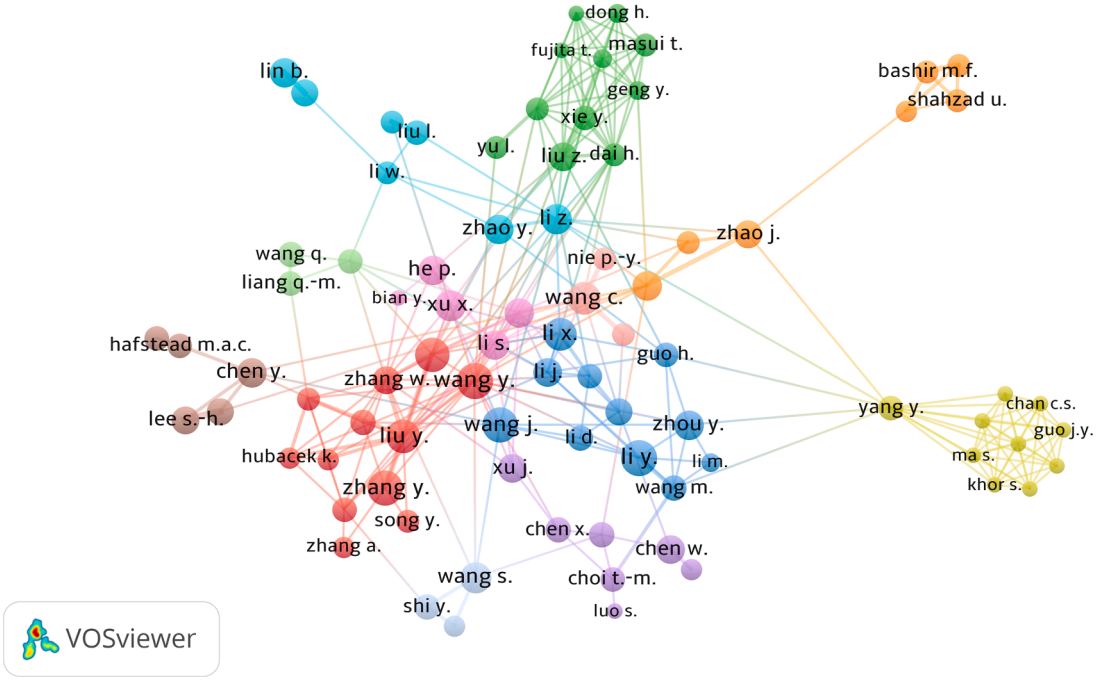

Fig. 12. Co-authorship of authors analysis at the authors' level.

and alternative energy also decrease carbon emissions. Renewable energy is popular due to carbon pricing and clean fuel technologies. An environmental tax has a negative impact on renewable energy in the short term and a positive in the long term, and the relationship is bi-directional. There is a positive impact of renewable energy on C02 emission but in higher quantiles, while there is a negative impact on China under different quantiles. The long-term analysis also shows that renewable energy and environmental taxes also help reduce pollution in China.

Cluster 9: Carbon Pricing and Trading

Policy-based measures can be converted into market-based ones after linking carbon reduction with cost. There is limited support for rebates against carbon taxes in Canada and Switzerland. IBCT can reduce the risk of carbon leakages and protect domestic manufacturers. This policy can help in reducing environmental damage. However, carbon reduction technologies should be developed besides implementing this policy.

Cluster 10: Climate Finance and Green Climate Fund

The lending community needs new strategies as climate finance faces deadlocks. Most attention was given to own funding in the green climate fund compared to allocation strategies. In conventional viewpoints, funds were devoted to financing non-bankable projects. Global climate funds may be better used for de-risking and channeling private and

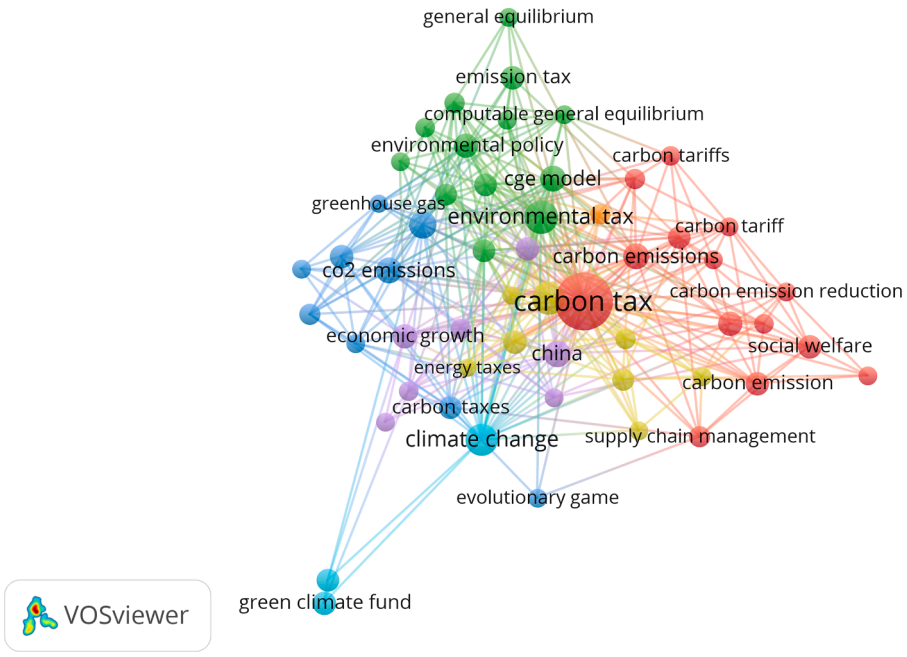

Fig. 13. A Visualization map of the most frequent keywords.

public finance sources. There is a positive impact of recipients' vulnerability on overlap and adaption funding but not mitigation funding. Moderately vulnerable countries receive more climate-related funds than most and less vulnerable countries. There is evidence of distributive justice in climate funds. The countries with higher readiness receive more investment. The green finance approach can help in an effective carbon tax policy. The green finance approach is more effective than the current market approach. The current approach has two times lower carbon tax than 2019 GHG mitigation regulations and a tax burden.

Cluster 11: The social cost of Carbon and recycling, Sustainability, and sustainable development

Environmental taxes have an asymmetric influence on ecological sustainability over different quantiles. There is a link between the social cost of carbon estimates, climate duties, and abatement cost analyses. Both techniques, i.e., minimalist approach and sufficiency-bounded' are evolving and contentious. Linking economic benefits with Carbon costs can help sustainable development. The implementation of green taxes is crucial for achieving sustainable development as they encourage a shift towards cleaner and more efficient technologies, reduce the use of non-renewable resources, and discourage environmentally damaging practices. Carbon tax increases the welfare loss of residents.

Cluster 12: Environmental Regulations

Environmental taxes weaken the transfer of property and distributional and justify the delegation of environmental taxes due to their regulatory nature,. This delegation is also as per the constitution due to the origination clause. That regulation may be strict when the capital endowment is above average. The inefficiency is not dependent on policymaking timing.

Cluster 13: Supply Chain

The government's imposition of a pollution tax is necessary for the public to pay attention to pollution issues. If pollution tax is levied separately, negative pollution tax may have occurred. Carbon tax can play an important role in reducing carbon emissions by encouraging investment in carbon mitigation technologies. It also demotivates investors if the rate of carbon tax is very high. In India, INR 2500 is the best price for carbon to reduce carbon emissions.

Cluster 14: Energy Consumption

The profile of the customer is important for controlling the electricity demand. Urban areas have more energy price elasticity than rural residents do. Homeowners with subsidies used more electricity than those without subsidies. The prices can be instrumental in controlling electricity during peak periods. There should be a differential carbon tax policy by China. The studies recommended making independent contracts, international cross-border cooperation and unique contracts.

Cluster 15: Corruption

Enterprises with different bargaining powers have different strategies for collecting environmental taxes. Weak bargaining power enterprises prefer the OBV strategy. High tax rates are also one of the reasons for incentives for enterprises to bribe environmental inspectors. Inequality increases due to oil windfall and benefits the wealthy population. This income inequality also results in political unrest and protests, which is more prevalent in democratic nations.

Cluster 16: environmental taxes

Environmental taxes help in promoting innovation, and green subsidies positively affect cleaner production willingness. Green subsidies were more effective than environmental taxes before 2015. However, after 2015, environmental taxes are more effective than green subsidies. Trade-off components were critical in competition and the benefit of cost of production.

4. Future research and limitations

4.1. Future work area

Fig. 14 below provides a comprehensive summary of our current understanding of climate change tax, encompassing insights from prior research, suggested avenues for future studies in existing literature, and our own proposed directions for further research within the scope of this

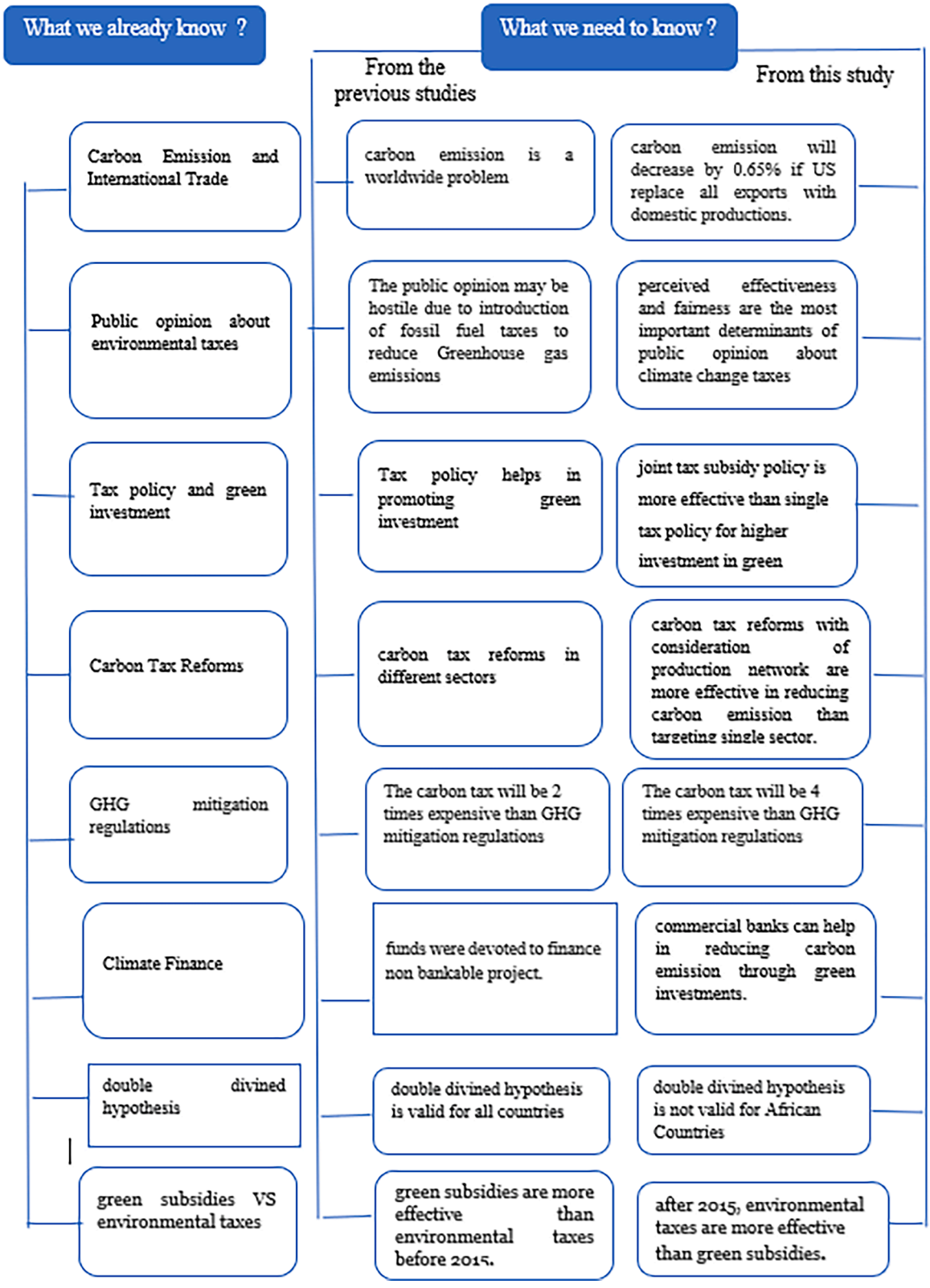

Fig. 14. Directions for future research.

study.

4.2. Limitations

The research is limited to 2015 to 2022, as study from 1989 to 2014 was already available. The research is limited to a single source Scopus database. However, Scopus, one of the most extensive and detailed databases, contains document coverage.

5. Conclusions

The green tax is considered an emerging topic in environmental and

Table 9
Co-authorship of authors.

Rank	Author	Documents	Citations	Total Link Strength
1	Liu Y.	16	392	23
2	Wang Y.	20	150	23
3	Dai H.	4	212	18
4	Zhang W.	8	255	18
5	Liu Z.	9	311	17
6	Zhang J.	17	168	16
7	Xie Y.	5	194	15
8	Li Z.	11	221	14
9	Yang Y.	5	245	14
10	Tang L.	4	184	13

Table 10
Occurrences of keywords.

Rank	Keyword	Occurrences
1	Carbon Tax	376
2	Environmental Tax	135
3	Climate Change	61
4	Climate Policy	36
5	Carbon Emissions	32
6	CO2 Emissions	31
7	Carbon Tax Policy	26
8	Environmental Policy	26
9	Economic Growth	25
10	Renewable Energy	24

finance research. Green tax can be the most helpful way to control environmental damages and cope with climate change issues. In the last seven years, an enormous amount of literature has been published due to the importance of the issues and policy implications. The rapid industrial growth and growing issue of environmental damages resulted in the need for policies to curb environmental damages. Despite the huge literature on this issue, the review literature using the latest bibliometric analysis is missing or rarely available. The results show that carbon tax and environmental tax are among the most popular keywords used in this analysis.

We have used the bibliometric analysis to assess the development of literature on green tax and future directions for research. We have retrieved data from the Scopus database, and 1502 documents were retrieved for analysis. Overall analysis shows that the number of articles has grown exponentially since 2017. Interestingly, China is leading in several publications on green tax. A careful bibliometric analysis of 1502 documents shows a shift in the trend of research on green tax as China is leading the research documents. The Journal of cleaner production has published the highest number of research articles and received the highest number of citations.

The findings of this study suggest that designing green tax policies can help promote environmentally sustainable behavior by providing economic incentives to individuals and businesses that reduce their environmental impact. Therefore, Government policymakers should include carbon taxes, pollution taxes, congestion charges, renewable energy subsidies, energy-efficient building incentives, green procurement policies, and environmental impact assessments in their policy-making framework because policies related to these can promote the adoption of sustainable technologies and stimulate demand for environmentally sustainable products and services. Moreover, Governments should implement green procurement policies that require public agencies to purchase environmentally sustainable products and services. This can help to stimulate demand for green products and services and promote the development of environmentally sustainable supply chains.

The article contributes in several ways, including updating previous studies and outlining future directions for researchers. This paper has limitations like other research using a single database for literature search. Including more databases like the Web of Science may narrow the topic but enrich the analysis. But, the advantage of using the Scopus database is its comprehensive coverage of literature and citations of peer-reviewed research. Hence, as a result of limitation, the finding of this study may not cover all publications on green tax. Future research could try to compare the output results from multiple sources.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used Grammarly Software (https://app.grammarly.com/) in order to avoid errors in English language. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Table 9

Declaration of Competing Interest

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Data availability

Data will be made available on request.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.sftr.2023.100129.

Appendix A. Citation, content, and cluster analysis of the journal articles

Cluster	Authors	Main Objective	Main Finding
Carbon Emissions, Neutrality	Zhao, B., & Yarime, M. [43].	The study aims to integrate trade elasticities into the analysis of the impact of carbon tariff and carbon emission and trade flow using cross-industry and cross-country impact of carbon tariff. They forecasted a model of carbon tariffs under different scenarios for US-China trade.	The study found the role of carbon elasticizes in the impact of carbon tariff with a threshold carbon tariff of $\$42/tCO_2$. Trade elasticities play an important role in carbon tariff design. They indicated carbon emissions would decrease by 0.65% if the US replaced all Chinese, Canadian, Japanese or Mexican exports with domestic productions.

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Cluster	Authors	Main Objective	Main Finding
	Ma, Q., Murshed, M., & Khan, Z. [44]	The study aims to analyze the impact of emission taxes on CO2 emission in Chinese Provinces using data from 1995 to 2019, along with other variables like investment, R&D expenditure, and technological innovations.	The study revealed that CO2 emission in China increases due to tertiary sector development and regional growth. However, CO2 decreases due to increased energy investment, renewable energy technological innovation, and R&D expenditures.
	Xie P., Jamaani F.	The study aims to explore variations in carbon emissions due to green innovation, energy productivity, renewable energy and environment tax in G-7 countries.	The study found that growth in GDP increases CO2 emissions while environmental taxes, green innovation, and renewable energy reduce CO2 emission in the G-7 economies. They recommended that the G-7 countries focus on interlinked concepts of green innovation, renewable energy, and environmental taxes.
Climate Change and Energy Policies and Regulations	Bergquist, M., Nilsson, A., Harring, N. et al. [45]	The study aims to explore the role of public acceptance and its determinants in climate change. They used a meta-analytic approach to explore the role of public opinion about climate taxes.	The study found that perceived effectiveness and fairness are the most important determinants of public opinion about climate change taxes. They also found a weak relationship between knowledge, self-enhancement values, and demographic variables.
	Ding, J., Wang, Y., Wang, S. et al. [46]	The study aims to discuss environmental funds as progress is very slow. Green climate funds can be a paradigm shift as they will help most vulnerable societies mitigate climate risk. They suggest changing the premise of Baumol and Oates's public externality model for global climate governance. They deduced special pricing by contracting Pareto optimality criteria and market equilibrium models for climate governance.	The study found that Pareto optimality and financial balance cannot the achieved in global climate governance. Global climate funds can be alternatively interpreted and convert nonbankable projects into bankable ones. Research.
	Fairbrother, Sevä, Kulin [47]	The study aims to find public opinion may be hostile due to introducing fossil fuel taxes to reduce Greenhouse gas emissions. They pointed out that there is a public trust issue about environmental taxes by the government.	The study found that the European public lived in countries with less trust in the political system. The country is less convinced about controlling climate change with taxes and vice versa. Therefore, awareness is less effective than trust in the political system in the case of taxes on climate change.
Carbon Tax Reform	King, Tarbush, Teytelboym [48]	The study aims to find intersectoral linkages of carbon taxes due to their complexity. The imposition of a carbon tax on the emissions of one sector may increase overall emissions. They aim to analyze the effect of incremental taxes on sectors on aggregate emissions.	The study found that carbon tax reforms considering production networks are more effective in reducing carbon emissions than targeting a single sector.
	Tsai, Lu, Hsieh [49]	The study aims to develop three scenarios based on the carbon emission mechanism and trade to carbon offset using constraint theory and activity-based cost with green mathematical programming models. Carbon trading is also necessary to offset emissions in operations. They also proposed that tire companies can recycle defective tires, reduce costs, and add additional income.	The study found that tire recycling can reduce costs and increase income. Companies can use carbon credits, significantly impacting company sustainability's competitiveness. The sensitivity analysis of sustainable caron emission can be used as a reference in carbon management.
	Fouquet, O'Garra [50]	The study aims to compare the excessive consumption' levy and the effectiveness and progressivity of the carbon tax.	The study found that both policies reduce carbon emissions, but the impact on consumer welfare is minimal. They found that a frequent flyer levy is more progressive than a carbon tax.
	Xing, Pan & Deng [51]	The study aims to present a stock-flow model to find the impact of a carbon tax on low-carbon transition with special attention to commercial banks.	The study found that commercial banks can help reduce carbon emissions through green investments. Banks can issue green loans.
Energy efficiency	Li, J., Du, Q., Lu, C. et al. [52].	The study aims to develop a CGE model for carbon tax implementation analysis in the transportation industry. The designed four scenarios of carbon tax recycling to stimulate the policy of double dividends for a carbon tax.	The study found that carbon tax hurts sectoral productivity and positively impacts carbon emissions. However carbon tax recycling can reduce sectoral outputs' negative impact and achieve reduced carbon emission goals. Improving Energy efficiency can reduce carbon emissions in the transportation industry. Improved energy efficiency and carbon tax policies can help in sustainable development.
	He, Sun, Niu, Long & Li [53]	The study aims to empirically study the energy taxes, vehicle taxes, and environmental taxes on energy efficiency using the ARDL approach on the OECD countries.	The study found that energy tax improves energy efficiency in the short term, while vehicle tax in the long run vehicle environmental tax improves energy efficiency in both the short and long term. The upgradation of industrial structures improves the impact of environmental taxes on energy efficiency. Countries with high GDP groups have more impact on energy efficiency improvement than countries with low GDP.
	Levinson, A.,()	The study aims to compare theoretical and empirical energy efficiency analysis and points out that policymakers are concerned about the tax burden on low-income families despite recommendations from economists. They preferred to regulate energy efficacy.	The study found that, in theory, standards of energy taxes are less regressive than energy efficiency. Levinson compared taxes on gas with the fuel economy of cars based on revenue equivalent and found that taxing gas is less regressive.

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(*continued*)

Cluster	Authors	Main Objective	Main Finding
Environmental R&D and Green Innovations	Yongxi Yi, Zhongjun Wei, Chunyan Fu [54]	The study aims to study the design of optimal subsidy tax policies and the impact of joint tax subsidy policies to encourage green innovation. They developed a Stackelberg differential game model between polluting oligopoly and regulator.	Yi, Wei, and Fu [54] found that a joint tax subsidy policy is more effective than a single tax policy for higher investment in green innovation and better social welfare.
	Jie Wang, Xianchun Liao, Yue Yu [55]	The study aims to study the micro firms' level data to find the impact of resource tax reform in resources-related industries for green innovation.	Wang, Liao, and Yu [55] demonstrated that taxes reforms enhanced green innovation, and designing compensation schemes intensified this effect while profitability played an intermediary role.
	Wang, Khurshid, A., Qayyum, S. et al. [56]	The study aims to study the impact of innovation, environmental policies, and energy consumption on sustainable development using a dynamic panel data model and Granger causality in Central-Eastern European countries.	Wang, Khurshid, A., Qayyum, S. et al. [56] found that ecofriendly innovations have more impact on carbon mitigation. The impact of environmental policies on reducing carbon emissions is more in the long than the short run. They found that energy consumption, Urbanization, and trade openness are leading polluters. They also found bidirectional and unidirectional causality in innovation, environmental policies, and energy consumption on sustainable development. They conclude that carbon tax can be used while sustainable development is achieved through innovation, energy consumption and environmental policies.
Economic Growth, Green Growth, poverty, and social welfare	Yasmeen, Zhang, Tao & Shah [57]	The study aims to study the relationship between carbon dioxide emissions and environmental taxes, energy consumption and economics growth in China, Malaysia, and Finland based on the double-dividend hypothesis and environmental Kuznets curve theory (EKC).	Yasmeen, Zhang, Tao, and Shah [57] found an N-shaped relationship between GDP and Carbon emission. They also found the double-dividend effect of environmental tax in the long run. They also found evidence of environmental taxes to reduce carbon emissions.
	Hassan, Oueslati & Rousselière [58]	The study aims to explore the impact of environmental taxes on economic growth while comparing countries that implemented environmental tax reforms or not.	Hassan, Oueslati, and Rousselière [58] found that taxes revenue from environmental taxes while interacting with real GDP per capita, reduces the economic growth rate, while higher levels of GDP per capita countries have a positive impact of environmental taxes on the economic growth rate.
	Yu L, Gao X, Liu J, Feng Y, Zhang S, Andlib Z. [59]	The study aims to study the impact of environmental taxes on Carbon emissions and green growth in China.	Yu, Gao, Lyu, Feng, Zhang and Andlib [59] found a negative impact of environmental taxes on CO2 emission and a positive on green growth in the short term. However, environmental taxes negatively impact CO2 emissions and do not impact green growth in the long run.
Public policies, public opinions, Employment, and political economy	Carfora, Pansini & Scandurra, [60]	The study aims to investigate the renewable policies strength of the EU and energy investment using spatial econometric methods.	Carfora, Pansini and Scandurra [60] showed that trade can help modify energy policies as trade flow is an exogenous factor in green investment.
	Degirmenci & Aydin, [61]	The study aims to investigate the double dividend hypothesis for environmental taxes for African Countries to reduce environmental pollution.	Degirmenci and Aydin [61] found that the double-divined hypothesis is invalid for African Countries. They suggested that environmental taxation should be used for financial incentives rather than a control policy for unemployment and environmental degradation.
	Li, Yao, Guo & Li, [62]	The study aims to investigate the impact of a carbon tax on employment in coal resource-based areas. The y also disaggregated employment effect from factor, demand, cost, and investment pull effects.	Li, Yao, Guo and Li [62] found that carbon tax helped to alleviate unemployment in coal resource-based areas. The carbon tax has not been affected in the form of transfer payments. However, carbon tax hinders employment through the demand effect.
Renewable Energy	Fang, Yang, Tian and Ma, [63]	The study aims to investigate renewable energy consumption and the role of environmental tax.	Fang, Yang, Tian and Ma [63] found a negative impact of an environmental tax on renewable energy in the short term. Still, a positive in the long term, and the relationship is bi-directional.
	Yue, Peng, Anser, Nassani, Haffar and Zaman, [64]	The study aims to investigate the impact of nuclear and alternative energy.In reducing carbon emission in five selected island economies.	Yue, Peng, Anser, Nassani, Haffar and Zaman [64] found that clean fuel technologies access can reduce carbon emissions, and nuclear and alternative energy also decrease carbon emissions. Carbon pricing encourages renewable energy and clean fuel technologies. Nuclear power and alternative energy can help reduce carbon emissions, cost of carbon emissions, and green economies.
	Hsu, Zhang, Ch, Aqdas, Chupradit and Nawaz [65]	The study aims to explore China's environmental sustainability and its determinants like greenhouse gas emissions, environmental innovation and environmental taxes. Carbon neutrality targets are important for sustainable development, which can be achieved through control of non-renewable energy sources, green innovation and environmental taxes.	Hsu, Zhang, Ch, Aqdas, Chupradit and Nawaz [65] found a positive impact of renewable energy, innovation and environmental taxes on C02 emission but in higher quantiles, while there is a negative impact on China under different quantiles. The long-term analysis also shows that renewable energy, economic innovation and environmental taxes also help reduce pollution in China.
Carbon Pricing and Trading	Mildenberger, Lachapelle, Harrison, K. et al. [66].,	The study aims to explore the role of public support in rebates for taxpayers for carbon taxes.	Mildenberger, M., Lachapelle, E., Harrison, K. et al. [66] found limited support for rebates against carbon taxes in Canada and Switzerland. Due to conflicts of interest

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Cluster	Authors	Main Objective	Main Finding
			among different groups about climate policy, political parties should be careful as these are not automatically converted into votes.
	An, Zhou, Wang, Shi, Taghizadeh-Hesary [67]	The study aims to explore the increase popularity of block carbon tax as per block tax theory. They also discussed the suitability of IBCT in Asia pacific countries due to size biases in emission reduction. They investigated the impact of IBCT and Flat Carbon Tax on CO2 emissions.	Zhou, Wang, Shi, and Hesary (2022) favor the IBCT over FCT in SAPC countries. IBCT can reduce the risk of carbon leakages and protect domestic manufacturers. This policy can help in reducing environmental damage. However, carbon reduction technologies should be developed besides implementing this policy.
	Luo, Zhang, Gao, Liu, Shi and Wang [68]	The study aims to develop a life cycle carbon cost model (LIME) to test the carbon cost model.	Luo, Zhang, Gao, Liu, Shi, and Wang [68] found that policy-based measures can be converted into market-based measures after linking carbon reduction with carbon cost. Linking economic benefits with Carbon costs can help China's sustainable development.
Climate Finance and green climate fund	Islam [69]	The study aims to discus the impact of distributive justice on climate finance globally using two-decade data from 130 countries.	Islam [69] found the positive impact of recipients' vulnerability on overlap and adaption funding but not mitigation funding. The found that moderately vulnerable countries receive more climate-related funds than most and less vulnerable countries. Islam [69] found evidence of distributive justice in climate funds. The countries with higher readiness receive more investment.
	Tong, Yue, Xue [70]	The study aims to construct the general equilibrium model to test the carbon peak feasibility.	Tong, Yue and Xue [70] found that carbon taxes are more effective than greenhouse gas (GHG) in reducing carbon emissions. The carbon tax will be 4 times more expensive than GHG mitigation regulations. The green finance approach can help in an effective carbon tax policy. The green finance approach is more effective than the current market approach. The current approach has two times lower carbon tax than 2019 GHG mitigation regulations and a tax burden.
	Amighini, Giudici, Ruet, [71]	The study aims to empirically analyze the global climate fund strategy and portfolio structure and analyze how nonbankable projects can be skillfully funded.	Amighini, Giudici and Ruet [71] pointed out that the lending community needs new strategies as climate finance face deadlocks. Most attention was given to own funding in the green climate fund compared to allocation strategies. In conventional viewpoints, funds were devoted to financing the nonbankable project. Global climate funds may be better used for de-risking and channeling private and public finance sources.
The social cost of Carbon and recycling, Sustainability, and sustainable development	Ullah, Luo, Adebayo, & Kartal, [72]	The study aims to explore economic or market measures of ecological sustainability. They revealed that the literature focuses on non-economic or regulatory measures for climate change and ecological quality. They emphasized policy shifts.	Ullah, Luo, Adebayo, & Kartal [72] found the asymmetric influence of environmental taxes on ecological sustainability over different quantiles.
	Zhang & Zheng, [73]	The study aims to explore the impact of government levies, global commerce (trade), economic development and energy efficiency on carbon emissions.	Zhang & Zheng [73] found that government levies, energy efficiency, and exports positively impact carbon emissions, but imports and economic growth have negative results. However, energy efficiency has a higher impact than other variables.
	Hickey [74]	The study aims to examine the social cost of carbon estimates, climate duties and abatement cost analyses.	Hickey [74] found that both techniques, i.e., minimalist approach and sufficiency-bounded' are evolving and contentious.
Environmental Regulations	Wu, Kaijie [75]	The study aims to explore the possibility of shifting the focus of climate change lawmaking from congressional lawmaking to delegated lawmaking, and this may be a good initiative. Environmental regulations can be more easily delegated than Taxes.	Wu and Kaijie (2021) found that due to their regulatory nature, environmental taxes weaken the transfer of property and distributional and justified the delegation of environmental taxes. This delegation is also as per the constitution due to the origination clause.
	Yamagishi [76]	The study aims to show that the endogenized environmental regulation level is loose if compared with the optimum and then dependent on the capital endowment of voters.	Yamagishi [76] found that regulation may be strict when the capital endowment is above average. The inefficiency is not dependent on policymaking timing.
Supply Chain	Hashmi, Jalil, Javaid [77]	The study aims to discuss the real-life problem of the leather industry and formulate a close-loop multi objectives supply chain model with carbon pricing. They tried to analyze different scenarios of carbon pricing.	Hashmi, Jalil and Javaid [77] found that INR 2500 is the best price for carbon to reduce carbon emissions.
	Wang, Wang & Huang, [78]	Wang, Wang and Huang [78] developed an analytical model for pollution tax for the decision of two port-based supply chains.	Wang, Wang and Huang [78] showed that the government's imposition of a pollution tax is necessary for the general public to pay attention to pollution issues. If pollution tax is levied separately, negative pollution tax may have occurred.
	Luo, Zhou, Song, Fan [79]	The study aims to study carbon tax policy using four game-theoretic models. The two scenarios of investment in carbon mitigation technologies or otherwise decisions are compared.	Luo, Zhou, Song and Fan [79] found that carbon tax can play an important role in reducing carbon emissions by encouraging investment in carbon mitigation technologies. It also demotivates investors if the rate of carbon tax is very high.

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Cluster	Authors	Main Objective	Main Finding
Energy Consumption	González-Medrano, M., Martín, T., G., [80].,	The study aims to identify lacking public-private partnerships in Europe and presented recommendations about the critical success factor of the Portuguese high-speed rail network.	González-Medrano and Martín [80] recommended independent contracts, international cross-border cooperation and unique contracts.
	Albatayneh, A., Juaidi, A., Abdallah, R., Peña-Fernández, A., Manzano-Agugliaro, F., [81]	The study aims to explore the fair tariff prices of electricity applications and the possibility of application by controlling demand and promoting sustainability.	Albatayneh, Juaidi, Abdallah, Peña-Fernández and Manzano-Agugliaro [81] found that homeowners with subsidies used more electricity than those without subsidies. This may profile of the customer is important for controlling the electricity demand. The prices can be instrumental in controlling electricity during peak periods.
	Liu J, Gong N, Qin J. [82].,	The study aims to investigate the impact of energy prices on the welfare of the consumer in China. Carbon tax policies can control the consumption of energy as well as pollution.	Liu, Gong and Qin [82] found that urban areas have more energy price elasticity than rural residents. They found that carbon tax increases the welfare loss of residents. There should be a differential carbon tax policy by China.
Corruption	Alexeev, M., Zakharov, N., [83]	The study aims to focus on oil rents and compare the relationship between income inequality and oil windfall in unequal countries.	Alexeev and Zakharov [83] found income inequality increases due to oil windfall and benefits the wealthy population. This income inequality also results in political unrest and protests, which is more in democratic nations.
	Kou, P., Han, Y. & Li, Y. [84]	The study aims to compare the bargaining power and differentiated between Offering Bribes to Environmental Inspectors voluntarily and under pressure. They developed a game model to study corruption for enterprises and environmental inspectors.	Kou, Han, & Li [84] found that enterprises with different bargaining powers have different strategies for collecting environmental taxes. Weak bargaining power enterprises prefer the OBV strategy. High taxes rate is also one of the reasons incentives for enterprises to bribe environmental inspector.
environmental taxes	Li, z., Zheng, c., Liu, A., Yang, Y., Yuan, X., [85]	The study aims to explore the impact of environmental taxes on subsidies on cleaner production. They differentiated green subsidies and environmental taxes. Therefore, there is a need for different policies.	Li, Zheng, Liu, Yang and Yuan [85] found that environmental tax and green subsidies positively impact cleaner production wiliness. They found that green subsidies are more effective than environmental taxes before 2015. But, after 2015, environmental taxes are more effective than green subsidies.
	Qiu, Y., Jin, Y. [86]	The study aims to investigate the impact of environmental taxes on production in a duopoly where one trading partner has no manufacturing facility.	Qiu & Jin [86] found that trade-off components were critical in competition and benefit of cost of production.
	Zhao, A., Wang, J., Sun, Z., Guan, H., [87]	The study aims to empirically examine the impact of environmental taxes on heavy-polluting industries in China.	Zhao, Wang, Sun and Guan [87] found that environmental taxes help promote innovation in China. However, innovation quality differs in different regions, and quality is higher in environmental taxes. Environmental Subsidies also play a role in innovation.

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