

Green Finance in The Modern Economy: A Bibliometric Exploration of Its Role

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ARTICLE INFO	ABSTRACT
Received: 18 Dec 2024	<p>Introduction: This Bibliometric Study explores the role of Green Finance in the Modern Economy. This study shows that Modern Economy shifts to a low carbon economy. The purpose of this study “Green Finance in the Modern Economy: A bibliometric exploration of its role”, to review the literature that has already been published on green finance as well as how it contributes to the Modern Economy.</p> <p>Objectives: This bibliometric study aims to review study on role of Green Finance in order to identify the research trends and areas of Green Finance with the help of Scopus Database and Vos Viewer over a period of 10 years, from 2014 to 2024</p> <p>Method: The Methodology of this bibliometric review paper involves research design, data collection, processing & analysing of data, network visualization and finding of the result. This research relies on a comprehensive approach which involves collecting data from Academic database- Scopus by applying a keyword-based searching method. After bibliographic information has been retrieved and purified, an in-depth analysis is performed which involves co-occurrence of keyword, citation analysis, co-occurrence of author keywords, co-authorship analysis of countries, contribution of Green Finance Nation-wise analysis. The bibliometric analysis shows a significant rise in the publications related to Green Finance and its importance over the last ten years.</p> <p>Results-: The Developments and trends in the Green Finance research are systematically explored in this study using bibliometric techniques. Using this technique, the literature provides a quantitative and qualitative summary that reveals significant research areas, famous publications and trends in the published work. The study determines geographical developments and focuses on the sequential growth of the green finance research. This novelty helps more to understand how different parts of the Nation are adopting and contributing to Green Finance along with the point of view has shifted over the years.</p> <p>Conclusion: This bibliometric study highlights the increasing reputation of green finance in the modern economy, especially as nations aim for sustainable development in the face of crucial ecological issues.</p> <p>Keywords: Green Finance, Sustainable Development, Bibliometric Study.</p>
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INTRODUCTION

In the Modern Economy, Green Finance is and essential tool which promotes innovation and investment in Environment Friendly Companies. It encourages public as well as private Sector to engage in ecofriendly practices by integrating revenue generation into keeping with Eco Conscious aims. This introduction main aim is to outline the role of green finance in the Modern Economy’s that promotes the Growth and Sustainable Development. Green Finance has been increasing role in solving environmental issues like environmental damage, changing climate and

the Global Warming. The advancement of the Finance sector and protection of the Environment both advantageous for tremendously from Green Finance. To encourage transparency in moving towards a green modern economy to following methods are accessible – 1) motivating public and private sector to boost green investment. 2) establishing environment friendly management to make sure that the regulations and rules are followed. (Basyith et al., 2024). By specifying the difference between finance and eco responsible behavior, green finance make sures that financial decision execute into the account of what might happen to the Environment in the future generations. (Aleknėvičienė & Bendoraitytė, 2023).

The Advancement of Sustainable investment in Jordan is greatly supported by Green Finance. Sustainability in Finance plays a major role in boosting investment in renewable energy sources with ethical farming having the significant contribution. (Alqurran T, 2024) . Green Finance has improved China's energy perseverance especially in the social and economic domains. Green Finance is essential for the Growth of China east and west because it can promote energy resilience through shifts in the business practices and innovations in green technology. (Nepal, 2024) . China has been recently using green finance, green innovation and tax on environment to deal with the effect of climate change (Mehboob, 2024).

China's green growth plan needs to focus more on environmental protection but China does not have enough funding. For the purpose of promoting the societal investment in ecofriendly companies the guidelines for businesses on establishing green financial system that came into effect in 2016. (He, 2024). Financial and Government regulation encourage green investment and decrease the amount of risky lending occurring in the financial service sector. (Raberto et al., 2019). In an atmosphere of Romanian companies, there is an association between Revenue, technological innovation and corporate social responsibility. There is a strong association between these variables can enhance efficiency, output and revenue. (Popescu & Popescu, 2019). The influence of green finance, corporate governance norms and sustainability initiatives on the share price and earnings of the private companies. The external factors and emission policy variables have a significant influence on share price and earnings. (Basyith et al., 2024).

Green financing acts an association among Government initiatives and money invested, establishing together the green real economy in an effort to promote ecofriendly environment. (Aleknėvičienė & Bendoraitytė, 2023) The advancement of energy technology is additionally supported by green finance framework and improved finance technology connection contributes to the decreasing amount of pollution. (Yi, 2024) Sustainability and economic development are adversely impacting, in an attempt to improve the quality of the environment Government and lawmakers increase expenditures in green technologies.

Green Finance is a tool that institutions utilize during the effort of promoting the transition towards greener and more sustainable Economy. Green Financial Instrument are going to offered by major financial institutions and groups that actively promotes ecofriendly change. While larger financial institution offers green loan more at times, smaller financial institution regularly employs and for greater amount of revenue only to those banks which reduce lending to polluting companies and boost emissions are the ones that regularly offer environment friendly bonds. (Berendo et al., 2023) Through developing an individual desire to use model for green financial products adopting Alipay's ant forest as an instance. Estimated expenses and environmental impact have no major effect on buyer desire, operational, interpersonal and psychological significance did. (Peng, 2018) . Green Finance has attracted concern recently from policymakers and scholars because of rising globally awareness of the effect of climate change, sustainable development and protecting the environment.

The global twenty has to play a vital role in financial wellness and growth with the goal of promoting collaboration worldwide and expanding modern world Economy. (Aanchal Nigam Verma, 2023) Banks major green finance options include sustainable investments, renewable insurance, green credit or loans and green infrastructure. Key variables influencing bank's green financing methods comprise of rate of interest, beliefs, social integration, climate change guidelines and rules regarding banking. (Akomea-Frimpong, 2022). Encourage combined industrial development and Sustainable developments an intention where numerous nations during the globe stock, particularly mentioned by United Nation framework convention for the promotion of Sustainable Development. Major initiatives in this particular direction involves more investment in green technology. A number of variables affecting the development of Eco Conscious output have been investigated. In this investigation the effects of foreign

direct investment, green financing and environmental regulation are analyzed in 27 Chinese Provinces during 2010 to 2021. (Tong, 2022).

Green Finance is a significant development in the banking industry that is important to the European Green Initiatives. The researcher explores the opinions and understanding of green initiatives and the possibilities of Demand for Green Financial product in Poland and Romania. (Siemionek-Ruskań, 2022). In an effort to gain an understanding of how green finance could promote the Sustainable Development Goals (SDGs), by inspiring businesses to utilize sustainable financial policies. This investigation indicates an in-depth analysis of the existing research and determining out how effectively green finance supports green finance initiatives and connect investment decisions with ethical and environmental concerns. Green Finance supports SDGs by investing to those projects which promote growth in the Economy and protecting the Environment. (Ali, 2023).

CSR reflects an advantageous impact on green finance acceptance showing that how business integrate CSR with green finance can create an environment friendly tourism. Coordination, higher education and financial incentives are essential for sustainable tourist activity as well as spreading knowledge of the positive impact of corporate sustainable social responsibility. (Rahman et al., 2024) Government fiscal stability enhances the consequence of green revenue on energy efficiency growth. Green financing essentially enhances solar power development but having little impact on other forms of renewable energy. (Zheng et al., 2023).

Green Finance having a favorable influence on the high-quality energy development at average of 1 % rise in the green finance index improves HED approximately 0.767%. (Wang, 2024). The financing of green projects has a significant impact on the actualization of eco-conscious value for goods and substantial outcome continue to be obtained in rectifying for endogenous. (Song, 2024)

The green finance approach effectively encourages environmentally responsible growth and the government concentration on safeguarding the environment become more successful in encouraging sustainable practices. (Shen M. M., 2024) Contribution of Government in encouraging equitable growth and emphasizes the critical importance in putting into effect green financing initiatives and policies that can be adjusted to the specific circumstances with the goal of improving innovation demonstration regional policy. (Shen M. M., Has green finance policy promoted ecologically sustainable development under the constraints of government environmental attention?, 2024).

A growing need for green financial products and green lending, specifically long-term investments such as green bonds has grown because of the influence of climate change and the successful completion of the European Green Deal. (Leitão, 2023) .According to Nobel prize winner Jeffrey Sachs , green financing is important simply because climate disruption has become the worldwide environmental issue, whether the existing pattern of International fossil-fuels use keep going, the temperature on earth will continue to rise from 4 to 6 degree Celsius level beyond which is pre industrial level, creating disaster on agricultural production, human well -being and ecosystem (Moon, 2018) China has been particularly harm badly by rising temperatures and environmental issues because the consequences of the fast urbanization and economic growth.

China has recently taken the responsibility to develop significant initiatives for preventing the pollution. (Mehboob M. M., 2024) Green finance policy can have a greater valuable contribution to business sustainability performance especially investee corporations that have higher institutional investments. (Lei, 2024) The use of green finance which is an emergent economic method has been considered to represent the most efficient instrument towards promoting the sustainable economic transformation. (Hu, 2023)

OBJECTIVES

- To conduct and organized review and analyze the growth and trends in green finance research over time through bibliometric methods.
- To examine the contribution of various researchers, writers and publications in the area of the study.
- Identify the key influential works and authors in the field of green finance to assess their contribution and relevance.
- Investigate the International collaboration and new technologies shaping green finance to provide insights for future research and policy development.

METHODS

A bibliometric review study combines statistical methods to analyze and reveal trends developments and significant findings in this study. The bibliometric data for this study is extracted from the Scopus database that is notable for its thorough representation of articles reviewed by experts and significant impact publications. To identify documents and articles which are relevant to our bibliometric review concept and academic purpose, I involve the bibliometric review method. Combining the keywords described in Table 1 the Scopus records were explored for article of relevance.

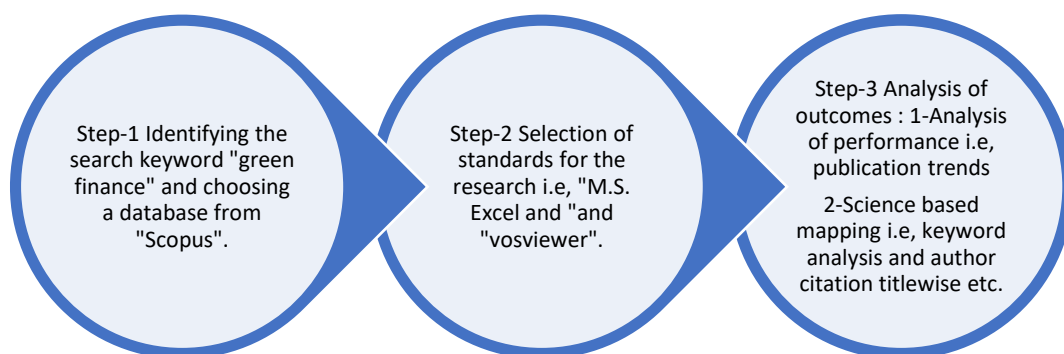


Figure: 1 Flow chart representing a Bibliometric review

Researcher own compilation

This bibliometric review material and methodology portion has following sections are as follows:

Data Source

This bibliometric study based on previously published articles which can be stored in Scopus Database. Articles on Green Finance are collected from the Scopus database which includes the 10-year period (2014-2024), was gathered and retrieved for the purpose of this study. This study investigated Worldwide output among world most active Countries implementing the data analysis features of the Scopus database with the help of Vos Viewer software.

This Study includes Journal Articles, Conference Paper and Review Paper. During reviewing the keywords search outcomes for the main topic, the author, source, publication type, country, domain and association have been considered in this account. The study involves analyzing journal articles, conference paper and review paper related to green finance using bibliometric methods to understand the role of green finance in the modern economy. Keywords search outcomes for the main topic are reviewed, considering factors such as author, source, publication type, country, domain and association to identify relevant literature in Green Finance

Document search Steps

After implementing the search limit, the search result was reduced to 513 and then removal of research papers to 248.

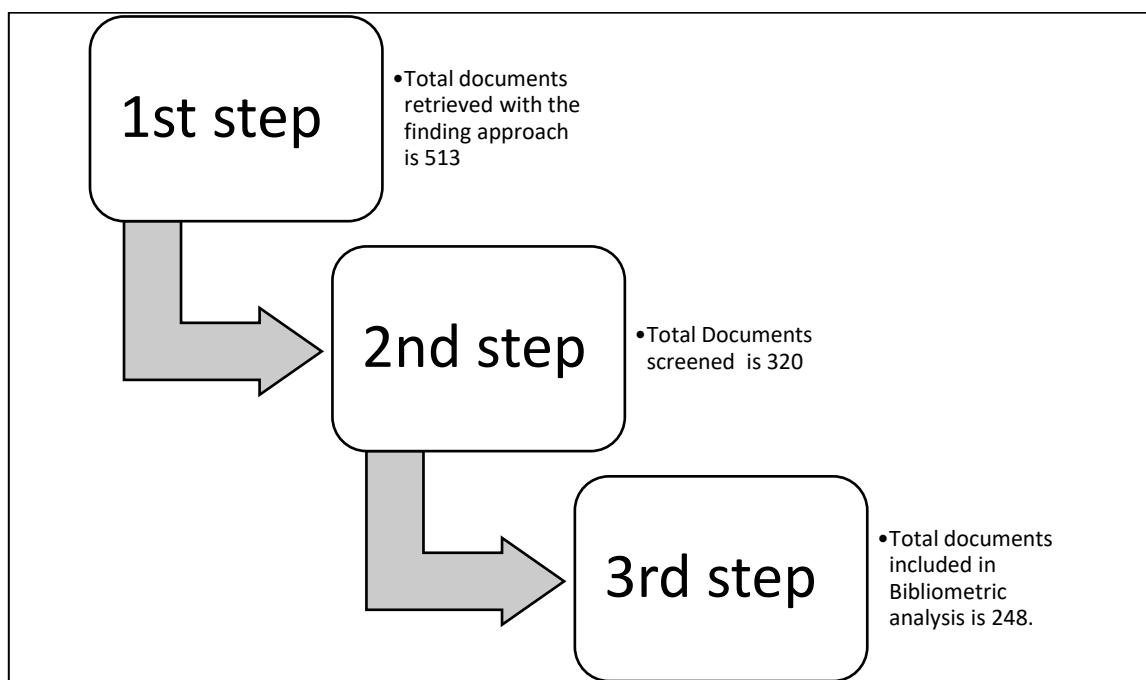


Figure: 2 Documents Search Steps

Researcher own compilation

The image illustrates a three-step process used in a research methodology, showing the progression and filtering of documents at each stage.

Components of the image

1st step: Initial total documents retrieved with the finding approach :513

2nd step: Documents screened further :320

3rd step: Documents included in bibliometric analysis :248

The process effectively narrows down the number of documents from 513 to 248, indicating a rigorous screening and selection methodology. The significant reduction in documents by nearly 52% from the first to the third step highlights the stringent criteria applied, ensuring only the most relevant studies are included in the final bibliometric analysis. This enhances the reliability and validity of the research outcomes.

Data Search Strategy

The keyword includes major search terms which includes “Green Finance”, “Sustainable Finance”, “Green bonds”, “Sustainable Development”, “ESG”, “Climate Finance”. Similar keywords are “Climate finance”, “Green banking”, “Sustainable investment”. AND OR & NOT are instance of Boolean operators, e.g. (“Green Finance” OR “Green bonds”) AND (“Modern Economy” OR “Green Economy”). The search fields include title, abstract, and keywords. The document type includes Articles, Review paper, Conference paper and Reports. The exporting of data from Scopus in the form of CSV file.

RESULTS

Bibliometric Maps

The data about citation, author keywords and bibliography of 248 publications were evaluated using Vos viewer version 1.6.20. Scopus is available to the Research Scholars at Integral University Lucknow. Vos viewer is a software designed for developing bibliographic maps. A selection of items associated with author keywords or countries has been created for the purpose of this research and items from the bibliographic maps are included additionally.

If the two authors cooperate to publish a research publication that is specific to country, the co-authorship analysis may help to determine the connection between two countries publication status. The co-occurrence analysis can also be helpful to identify the level of how various author keywords are connected to each other in a paper.

Keyword Analysis

Keyword analysis constitutes a key component in bibliometric analysis of green finance as it highlights the topic key issues, trends and developing areas of the study. The keyword sets that reveal the most important problems in research papers may offer valuable information regarding investigation priority topics. Researchers are able to identify which ideas dominating the field of the study, track the development of novel study areas as well as reveal loopholes within the existing body of research through assessing the number along with links of key phrases all through a vast collection of research papers.

As an instance, the keyword including “green finance”, and “sustainable development” might come up constantly showing as these terms are important in current issues within the field of green finance. The word finance was occurred among the 246-research paper and out of the 1595 keywords only 78 meet thresholds are on the topic of “Role of Green Finance” along with “finance” word coming at 93 times, “Green Finance” at 107 times, “Sustainable Development” at 61 times, “Investment” at 34 times, “Economic” at 24 times, “Climate change” at 30 times, “Green Innovation” at 20 times and “China” at 24 times. This indicates majority of study showing China has been showing development in green financing. This study additionally shows the findings of the country bibliometric evaluation which shows China has authored the number of research paper on this area. A significant number of research paper covered topic related to green finance such as green innovation, climate change, sustainability, sustainable finance, green bonds and green investments

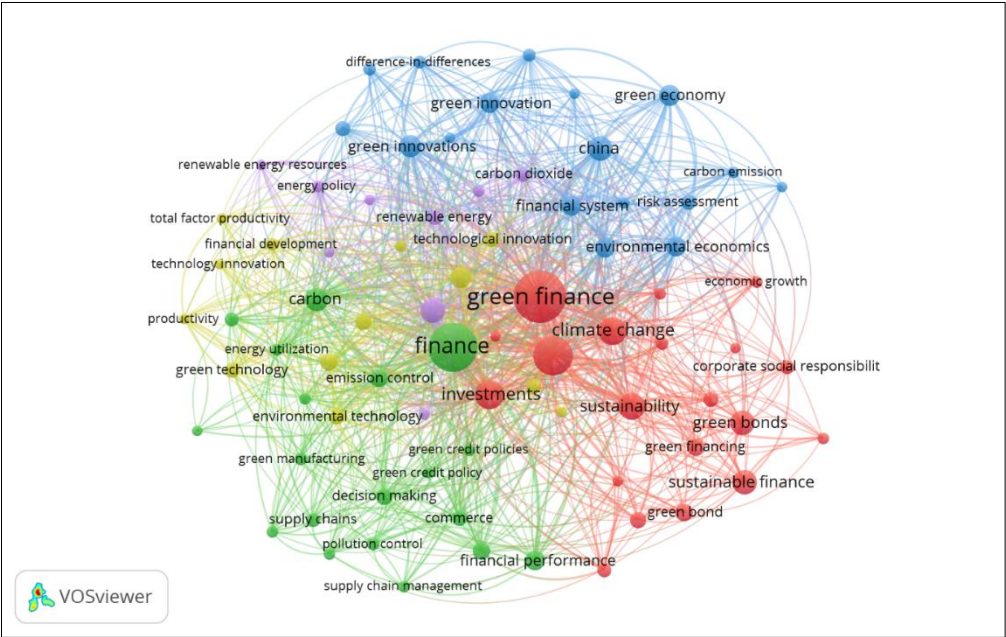


Figure:3 Keyword Analysis

Table:1 Keyword Analysis

Finance	93
Green Finance	107
Sustainable Development	61
Investments	34
Economics	24
Climate Change	30
Green Innovation	20
Carbon	21

China	24
Environmental Promotion	18
Sustainability	28

Co-occurrence of All keywords

The co-occurrence of all keywords analysis demonstrates the notable themes, branches and emergent topics in green financing study. Analysing the combination of keywords to previously discussed network shows that the term “Finance” has total link strength of 441 and total link of 74 into 2 clusters. As a consequence, across all the research papers it can be considered the word finance is the most common. The word “Green Finance” has total link strength of 346 and total link of 71 into 1 broad cluster. “Renewable energy” has total link of 25, total link strength of 45 and 5 clusters. The word “Environmental technology” has 4 cluster, 40 total link and 68 total link strength. “Sustainability” has 1 cluster, 47 links and 120 total link strength. While “Carbon dioxide has 5 cluster, total link 33 and total link strength of 58.

Keyword co-occurrence analysis shows an in-depth overview of how separate themes in green financing are interrelated. This examination illustrates the logic framework in the field of the study as well as exposing possibilities towards promoting green finance research and regulation through pointing out significant clusters to operate, emerging fields and chronological changes.

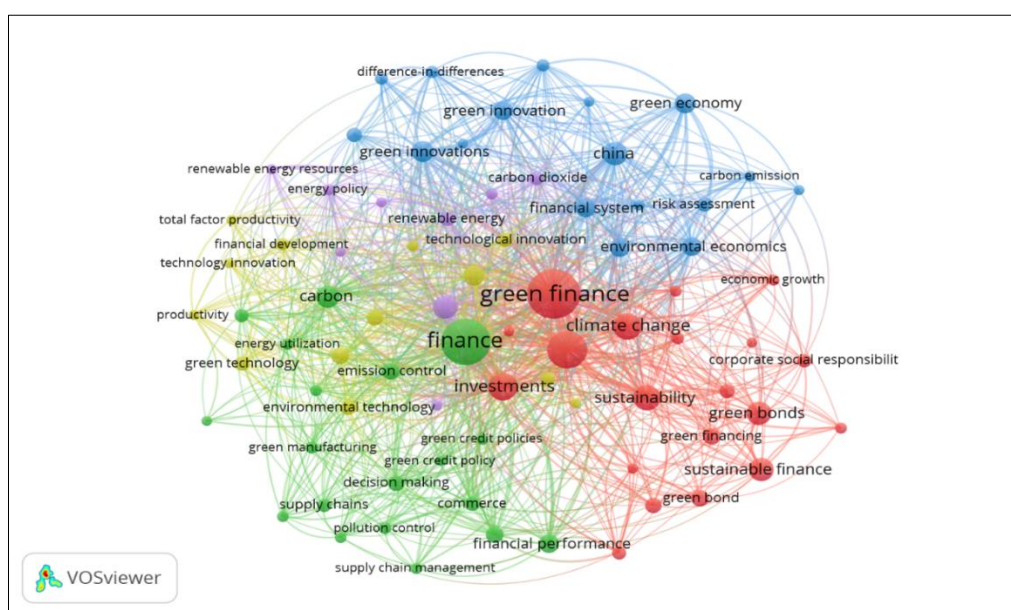


Figure:4 Analysis: Co-occurrence of All Keyword

Author citation title wise

The author citation title-wise investigation is significant component of this bibliometric paper because it indicates some of the prominent authors along with articles in green finance. This approach deals with reference data gathered from resources which include Scopus to reveal scholars whose work is significantly influenced both discussion and advancement of the discipline. The most cited researchers are identified through overall citations and standard citations each period respectively indicate the broader influence and future worth of the investigation.

Akomea-frimpong, Isaac has a maximum no of citation i.e. 175 and the research paper named as “a review of studies on green finance of banks, research gaps and future directions”. while zhang tao has 32 citations a paper named as “can green finance policies affect corporate financing? evidence from China’s green finance innovation and reform pilot zones”.

Thus, author citation title-wise evaluation reflects notable contributions in green finance in addition to exposing gaps within the research which include undiscovered local studies or growing areas like virtual green financing.

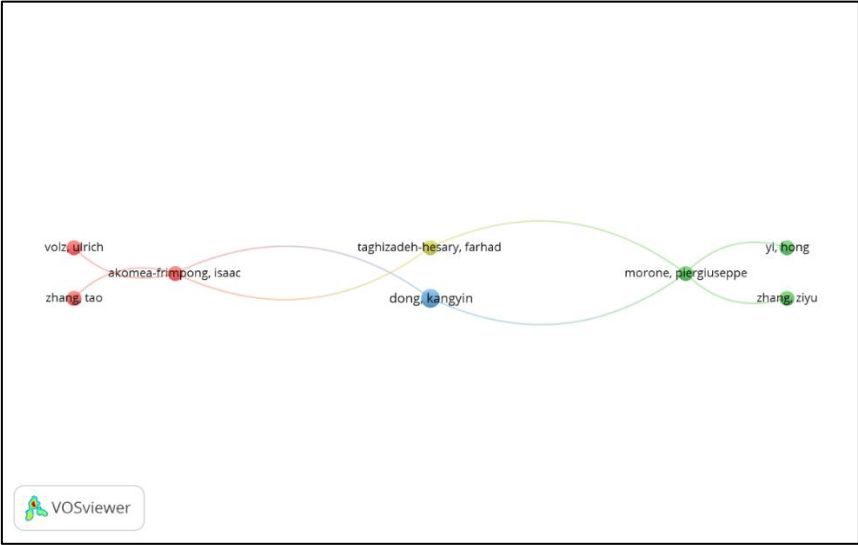


Figure:5 Analysis of author Citation title wise

Table:2 Author Citation title wise

Citation	Authors	Title
175	Akomea-frimpong, isaac	A review of studies on green finance of banks, research gaps and future directions
119	Morone, piergiuseppe	Measuring investments progress in ecological transition: The Green Investment Financial Tool (GIFT) approach
105	Volz, Ulrich	Sustainable finance in Japan
32	Zhang, tao	Can green finance policies affect corporate financing? Evidence from China’s green finance innovation and reform pilot zones

Co-occurrence of Authors Keywords

The co-occurrence of author keywords is key component of the bibliometric study because this highlights setup, associations and emerging pattern in green finance discipline. Within the framework of green finance, a study of contributor’s keywords co-occurrence highlights the linkage of multiple areas of study as well as emerging themes. Emerging themes covering terms like, “Sustainability”, “Climate change” and “Green bonds” indicates the growing importance of green financing study. Furthermore, the appearance of these terms among growing keywords like, “Green innovation” shows how technological advancements has been playing a more significant part in the development of green finance. This method of analysis discusses the linkage of different areas of topics and helps in the determining the identification of clusters of connected topics by analysing the number of times a number of authors defined terms show up in the similar articles

In the co-occurrence of authors keywords, minimum number of occurrences are 5 and out of the 818 keywords only 22 meet the threshold. The word “Green Finance” has 1 cluster, total link 20 and total strength are 85. while the word “Sustainable Finance” has total link 4, total strength link 35 and 4 cluster. “Green Bonds” has 2 cluster, total link 11 and total link strength are 31.

The overlapping appearance of author keywords shows an informative overview of green finance conceptual setting, revealing both existing and newly discovered research paths. This analysis provides individuals to gain a better understanding the current scenario of the respective discipline and guiding future studies. This discussion not just enhances our knowledge of the field through emphasizing important areas of interest and cooperation, additionally

offers practical recommendations for intellectuals, lawmakers and professionals collaborating towards advancing the worldwide green finance agenda.

Table:3Analysis of author keywords co-occurrence

Green finance	107
sustainability	22
Sustainable development	242
Sustainable finance	23
Green bonds	23
Climate change	18
Green financing	13
Green innovation	15
China	12

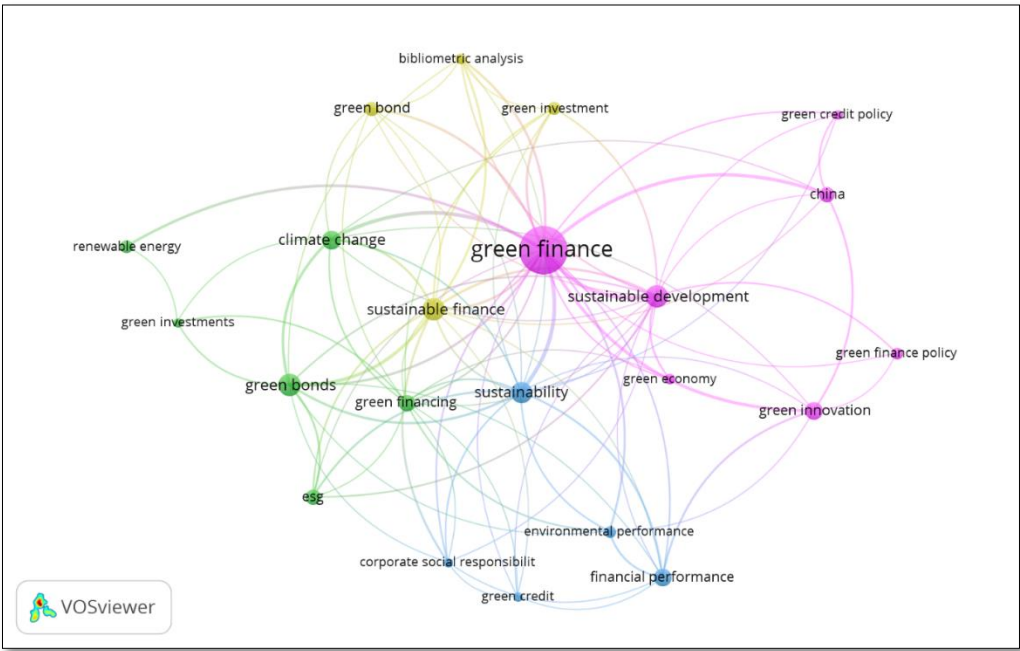


Figure:6 Analysis of author keywords co-occurrence

Contribution of Green Finance Nation-wise

The achievement of green finance analysis is significantly across nations representing numerous goals, structures of policy and different stages of development in the economy. Highly developed nations like United States, China and United Kingdom are currently in the leading edge of green financing study. These countries have given priority to innovative financial options involving “green loans”, renewable expenditures and business environmental initiatives.

China has grown up as an essential provider of green finance and green loans partly because of government backed laws and developments in energy from renewable source. Chinese research frequently points out the crucial role

governments initiatives and legislative structures for promoting growth over time. China has been authored 112 publications on green finance which is greater than any other Country while United Kingdom has 19 publications.

The national contribution in green finance study highlights an evolving relationship among developed and emerged economy, each of them providing different perspectives and target towards the region. Highly developed nations perform well in development and economic platforms whereas developing countries give information about policy-based and equitable money options.

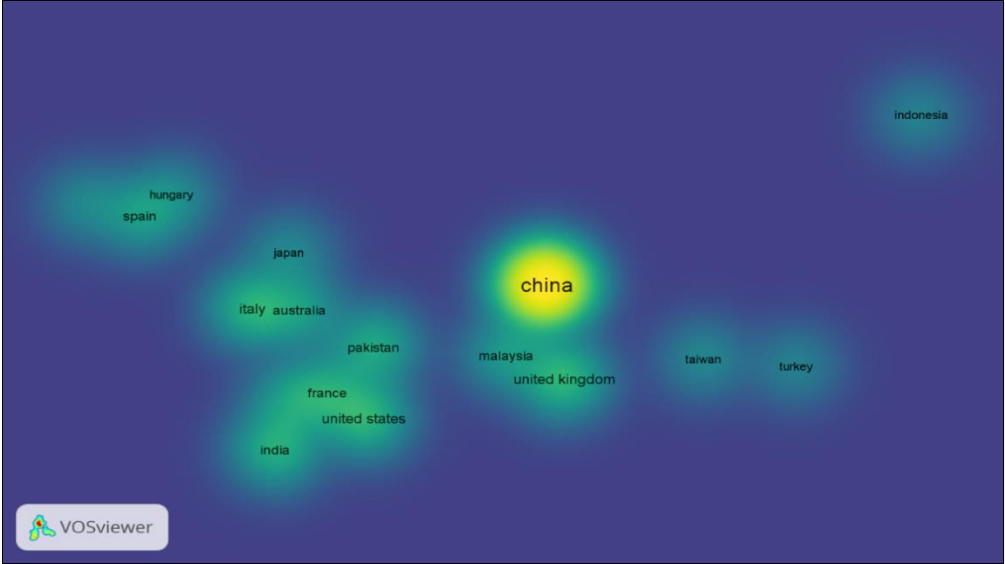


Figure: 7 Contribution of Green finance Nationwise

Table:5 Contribution of Green Finance Nation wise

Countries	Publication
China	112
United Kingdom	19
United States	18
India	16

Co-Authorship analysis of Countries

This discussion of co-authorship analysis of countries reveals the global collaboration for enhancing green finance study. However advanced nations contribute in generating and sharing significant impact investigations, developing nations growing involvement conveys an improvement regarding more equitable studies.

China has 112 documents and highest no of citations that is 4327. China has 6 cluster, total link 12 and total link strength of 41. United States has 3 cluster, 7 total links and 12 total link strength. Hungary has 4 cluster, 1 link and total link strength both. India has 5 cluster; total link is 12 and total link strength of 4. The appearance of 5 clusters highlights the diversity of research studies being explored in India hopefully embracing disciplines significant to local as well as global trends. India should focus on establishing worldwide collaborations with the goal of expanding its research value and enhance number of references materials.

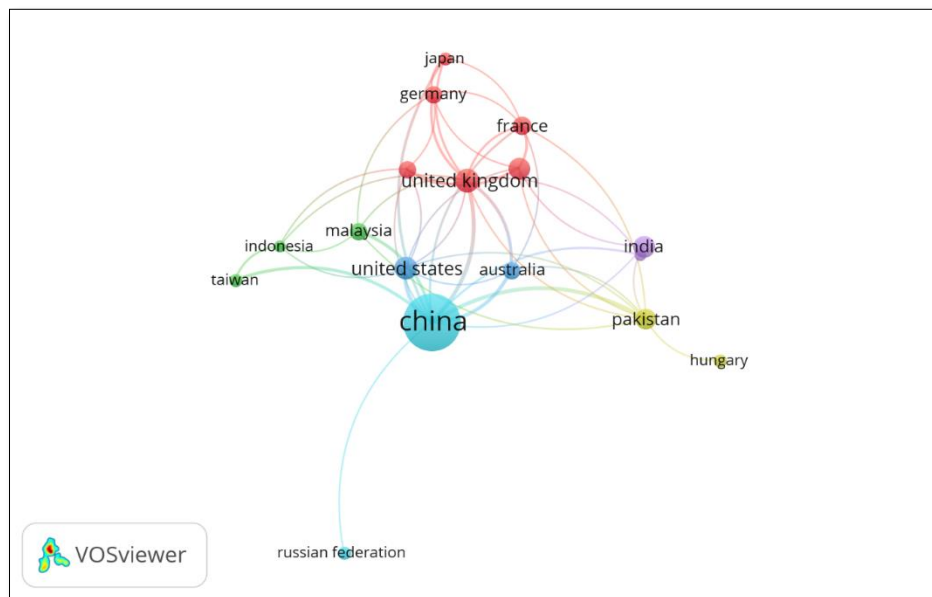


Figure:8 Co-Authorship analysis of Countries

Research Publication Growth

The recent boom in academic articles in green finance indicates the areas the expanding role in dealing with worldwide ecological issues. During the initial stages, professional dedication was limited and centred mainly on philosophical concepts and the essential inclusion of sustainable development within the economy.

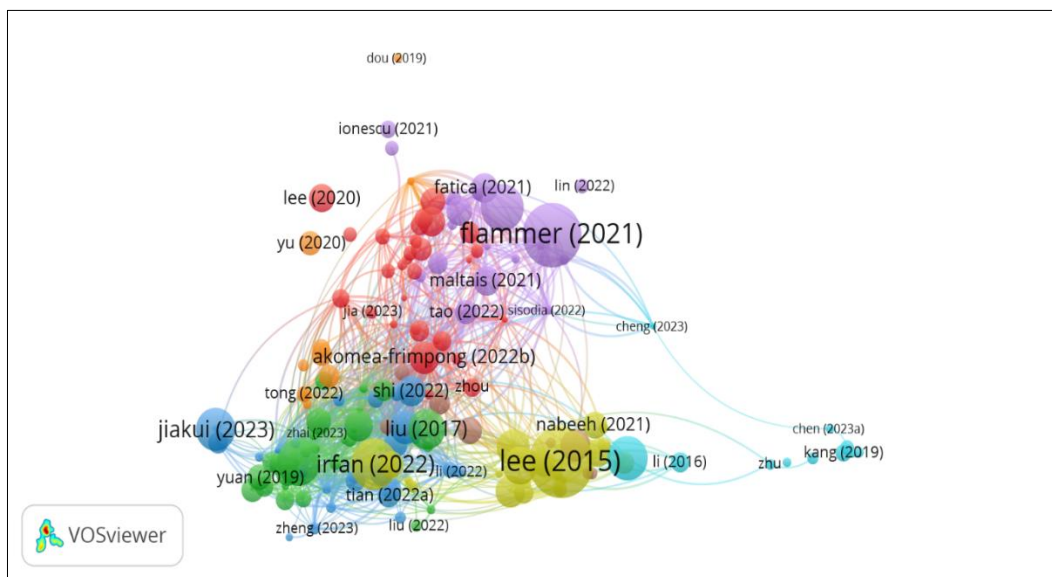


Figure:9 Growth of Research Publication

Most of the studies are conducted between 2019 to 2023. China has highest no of publications because the Chinese Government has made significant investment in Research Development having the aim of contribution to establishing the Worldwide leader in Research and Development. The study includes 512 publication, 57 countries and 579 institutions. The expansion of academic development has been accompanied through technological innovations especially with the growth of eco-conscious financial technology and machine learning that gave novel opportunities to promote sustainable banking procedures. During the last few decades, here is a significant rise in the quantity of articles covering these topics, which reflecting an increasing trend about research that involves multiple discipline. Green finance has transformed from an emerging concept to an established branch of analysis reflected through the continual increase in academic publication.

DISCUSSION

Conclusion

The role of green finance has increased parallel with the Development of the Economies worldwide towards Green Practices that are more Ecofriendly. Green bonds, Sustainable finance, ESG, CSR, Environmental risk control and many more topics covered in this bibliometric Study. Many academic articles explore how green finance contributed to the reduction of global warming by funding low carbon and green energy projects. A significant amount of research originated from China and United Kingdom. However, interest in emerging economies is increasing, an essential component in the world's transition towards environmental sustainability is being played by Green Finance. Exploring the entire potential of green finance depends on the continuous research and worldwide cooperation.

This bibliometric analysis emphasizes the growing importance of green finance in the contemporary economy, especially as countries aim for sustainable development in the face of urgent environmental issues. In the last ten years, there has been a notable increase in the amount of research focusing on green finance, showing a growing emphasis on environment friendly practices in various industries. The result shows that China is a major producer of green finance studies, highlighting its significant commitment to researching and developing low carbon technologies.

The examination shows important patterns, like the increasing incorporation of environmental, social and governance (ESG) factors in financial decision-making procedures, and the expanding range of eco-friendly financial instruments such as green bonds. These advancements not just back sustainable projects but also stimulate economic expansion by encouraging investments in renewable energy and technology. Nevertheless, despite the growth of green finance, obstacles persist, especially in guaranteeing fair access to funding and upholding the standards of research publications. Continuous cooperation among researchers, policymakers and financial institutions is crucial to fully maximize the benefits of green finance and support a more seamless shift towards a sustainable global modern economy. The study lays the groundwork for upcoming research and policy formation in this crucial area.

Practical Implications

The transition towards sustainable low carbon modern economy is encouraged by green finance. The following are the consequences of Role of green finance in the Modern Economy are as follows:

- Adaptable Eco-conscious development is the main goal of sustainable investment in infrastructure.
- New perspectives for the money invested in the environment friendly and clean technology fields.
- More significant concentration on green and responsible business approaches.

Significance and Limitation

The review explores the existing research on Green Finance. This review deals with the essential topics, concepts, patterns as well as recognised journals. Green Finance acts as an indicator for the development of green finance innovations and eco-responsible business operations. This bibliometric study helps decision makers within organizing areas for administrative and infrastructure funding through the identification of recent topics which include renewable technology and blockchain innovation in green financing. The accessibility along with the Quality of published information limits bibliometric analysis. A number of works might not be accessible. The selection of articles represent articles till 2024 consequently recent developments in green finance could not be recognized in this study.

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