

THE ROLE OF GREEN FINANCE AND FINANCIAL INCLUSION IN ADVANCING SUSTAINABLE DEVELOPMENT: INSIGHTS FROM A BIBLIOMETRIC ANALYSIS

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Abstract

The convergence of financial development objectives, green finance, and financial inclusion has attracted significant attention in the academic world amid challenging concerns about sustainable growth, economic inequalities, and climate change. This paper aims to thoroughly examine the current research in these interlinked fields by utilising advanced bibliometric tools to compile and review a large body of literature. By employing visualisation software such as "VOS-Viewer" and the "Biblioshiny" R package, this study examines literature from the Scopus database spanning 2009 to 2023. This study used the PRISMA statement to conduct a systematic, bibliometric analysis to reveal and understand knowledge structures, pinpoint research gaps, and identify emerging topics in sustainable growth, green finance, and financial inclusion. The results demonstrate an increasing amount of scholarly work acknowledging the potential of financial inclusion and green finance to contribute to achieving sustainable development goals. This study explores citation links between significant articles to provide valuable insights that guide researchers toward unexplored areas. Emphasising environmentally and socially responsible banking practices, the paper anticipates future trends, particularly in the context of China's financial influence, and underscores the importance of integrated approaches for harmonising economic development with environmental responsibility. Overall, the study aims to serve as a navigational tool for scholars, helping them understand the current research landscape and fostering further advancements across these interrelated areas.

1. Introduction

Over the last several decades, environmental destruction, manifested in problems such as air pollution, resource use, and soil erosion, has increasingly posed severe threats to global productivity, economic stability, and human well-being. As a result, both sustainable development and the green economy hold critical positions in all sectors, with the discipline of finance playing a critical role.

Gradually, the financial sector's movement towards using funds to support environmentally friendly and climate-resilient investments, commonly called green finance, has been growing.

Green finance comprises financial instruments, including green bonds, sustainable investments, carbon trading, and climate risk insurance, that collectively advance environmental objectives while boosting

economic growth. In 2016, at the G-20 conference in Hangzhou, China, the need for green finance was identified globally as a significant driver of mechanisms for environmental change (Azhgaliyeva, Beirne, & Mishra, 2022). The IFC, alongside other institutions, has made it clear that green finance refers to investment strategies that prioritize social equity, protect the environment, and support economic growth (Debrah, Darko, & Chan, 2022). Government agencies and financial experts, recognizing the potency of Green Finance, came to help. Interpretations of green finance proliferate in different regions. For example, the European Commission presents green finance as a series of financial instruments to encourage.

Recently, green finance has moved from its initial role as the central strategy for risk mitigation to the forefront of innovation and business success. These effects shape how financial institutions manage climate-related risks, advise on environmentally friendly innovations, and set regulatory standards (Bai & Lin, 2024). However, financial arrangements ignoring environmental conditions have contributed to worsening issues such as biodiversity loss and increased climate irregularity (Diaz-Rainey et al., 2023). As such, the financial aspects of policies impact key sustainable environmental results. As green finance is also being built, there is an increasing effort to achieve financial inclusion, ensuring that the pools of populations that have always been left behind are not left behind. According to scholarly evidence, the availability of financial systems helps the economic and environmental conditions, and increased involvement in sustainable finance can reduce carbon footprints (Kumar 2020). Furthermore, there is still no universally accepted systematic measure to assess financial inclusion in economies today. Several indices rank measures, such as access, usage, quality, and impact, are prioritized by the work of Garg et al. (2023) and Pham & Doan (2020).

Microfinance, one of the first mechanisms of financial inclusion, has pioneered and expanded access to small-scale financial services for previously underserved communities. Although microfinance has boosted the

financial participation of millions, it remains under constant scrutiny regarding its long-term impacts, such as high interest rates and the potential to veer off course (Gálvez-Sánchez et al., 2021). The failures show the need to create more unified and sustainable financial agendas. Green finance and financial inclusion are leading approaches to the United Nations' SDGs. The SDGs were established in 2015 by all countries to address eradicating poverty, reducing inequality, and protecting environmental health (Mestdagh et al., 2024). The SDG system is centered on the principle of "leaving no one behind", but new evaluation highlights the lack of momentum and the importance of increased cross-sector collaboration (ENB, 2019; Omar & Inaba, 2020). Omar & Inaba, 2020). In this context, developing robust, fair, and environmentally friendly financial systems is crucial to advancing long-term global development goals. Permata et al. (2023) reported that financial inclusion plays a dual role as a means of social empowerment and as an important piece of the environmental sustainability puzzle.

Despite growing global emphasis on sustainability, integrating green finance, financial inclusion, and financial development remains underexplored from a systematic and quantitative perspective. Although each concept contributes independently to sustainable development, their interrelationships and collective impact on achieving the United Nations Sustainable Development Goals (SDGs) are not fully understood. As ecological and socio-economic crises intensify, driven by urban mismanagement, unsustainable energy use, and agricultural degradation, there is an urgent need for cohesive financial strategies that support equitable and environmentally conscious growth. However, the academic literature on the convergence of these domains is fragmented, lacking a consolidated view of existing knowledge, research trends, and future directions. This bibliometric analysis aims to fill that gap by evaluating the intellectual structure, thematic evolution, and research frontiers of this interdisciplinary field.

1.1. Research Questions:

1. How do green finance, financial inclusion, and development contribute to sustainable economic practices?
2. What are the major research trends, influential contributions, and thematic developments in the literature at the intersection of green finance, financial inclusion, and financial development?
3. What are the existing knowledge gaps and emerging research themes that warrant further investigation to support sustainable development goals through financial mechanisms?
4. How can the insights from this bibliometric analysis inform policymakers, academics, and financial institutions in crafting integrated strategies for sustainable economic growth?

1.2. Research Objectives:

1. Using bibliometric techniques, map the intellectual and conceptual structure of the literature on green finance, financial inclusion, and financial development.
2. To identify the most influential authors, institutions, journals, and countries contributing to research in this interdisciplinary area.
3. To explore key themes, keyword co-occurrences, and citation networks that define the evolution and convergence of these concepts.
4. To detect gaps and under-researched areas that hinder the effective implementation of sustainable financial strategies aligned with the SDGs.
5. To provide evidence-based recommendations for future research and policy design to foster inclusive, environmentally responsible, and economically sustainable financial systems.

1.3. Significance of the Study:

The synergy between green finance, financial inclusion, and financial development is critical to achieving sustainable growth amid the global environmental and socio-economic crisis. This study, in scope, performs an exhaustive bibliometric review of existing research on the issue of how financial instruments can

contribute to inclusiveness and ecological progress. Theoretically, this research contributes to scholastic knowledge by tracing the development and organization of ideas in the literature. The research also identifies major scholars, research topics to develop, and conceptual associations that enhance knowledge of sustainable finance in academic circles. With the help of a comprehensive mapping of existing knowledge and ignored areas, this study lays the groundwork for further theoretical development and the synthesis of different disciplines. These findings serve as a crucial guide for policymakers, financial institutions, and development agencies seeking to improve environmental sustainability and inclusive finance. This research highlights outstanding methods, contemporary practices, and important issues that guide the crafting of better financial plans. This enhanced alignment helps create financial systems that support environmental sustainability, financial inclusion, and the long-term strength of the economy. In a period of heightened uncertainty due to climate risk, socio-economic inequities, and uneven economic conditions, this research provides an appropriate synthesis of evidence to support flexible and forward-looking policy strategies. By focusing on the relationship between finance and sustainability, the research provides more effective project implementation and governance strategies across different economic landscapes. Finally, this bibliometric study is important for steering academic and policy endeavors toward holistic financial strategies that can help achieve the United Nations Sustainable Development Goals, specifically those related to climate action, economic equity, and institutional development.

2. Methodology:

The present study leverages a systematic bibliometric review approach, following the PRISMA guidelines described by Page et al. (2021) to enhance transparency and enable replication. Starting with the development of explicit inclusion and exclusion criteria, the next step was to determine the search terms that best align with the research goals. The researchers searched the literature using the

Scopus database, which they considered an elite database for peer-reviewed studies. The search revealed keywords such as "green finance", "sustainable practices," "financial innovation," and "financial inclusion," which together encompassed a wide range of explorations of environmentally and inclusively sustainable financial systems. To ensure that studies on the broader dynamics of economic and financial systems were also covered, the search query included terms such as "financial

development" and "sustainable development." Keywords were chosen to emphasize the commonalities among green finance, financial inclusion, and financial development in achieving sustainability. A synopsis of the search methodologies and chosen keywords highlights how relevant articles were retrieved, as shown in Table 1. As per the PRISMA flow, the collected literature was rigorously screened for relevance and in English, and only peer-reviewed journal articles were used.

Table 1: Search Strategy to obtain the Dataset on the Scopus database

Search String	Search Term
Green Finance	"green financ*" OR "sustainable financ*" OR "sustainable practic*"
AND	
Financial Inclusion	"financial inclusion" OR "financial innovation" OR "financial services innovation" OR "inclusive innovation"
AND	
Financial Development	"financial development" OR "financial growth" OR "sustainable development"

2.1 Eligibility and Inclusion Criteria

Table 2: Inclusion and Exclusion Criteria

Criteria for Acceptance	Criteria for Rejection
➤ Only papers with titles related to Green finance, financial inclusion, and financial development were selected.	➤ A non-English language article was excluded.
➤ Only papers sourced from Scopus digital databases were considered.	➤ Master's and doctoral theses, conference papers, reviews, reports, retracted articles, editorials, notes, short surveys, and unpublished working articles.
	➤ Missing record papers were also excluded.

The articles with titles on financial inclusion, green finance, or the Sustainable Development Goals (SDGs) gathered from the Scopus database between 2019 and 2023 have been included in accordance with the criteria for this research study. Excluded were book chapters, theses and dissertations, proceedings of

conferences, reviews, reports, retracting papers, editorials, notes, short surveys, unpublished working articles, unreported working articles, and incomplete records. The careful selection process was designed to ensure that excellent, current, and relevant research was included within the specified subject area.

2.2 Selection of Keywords and Collection of Data

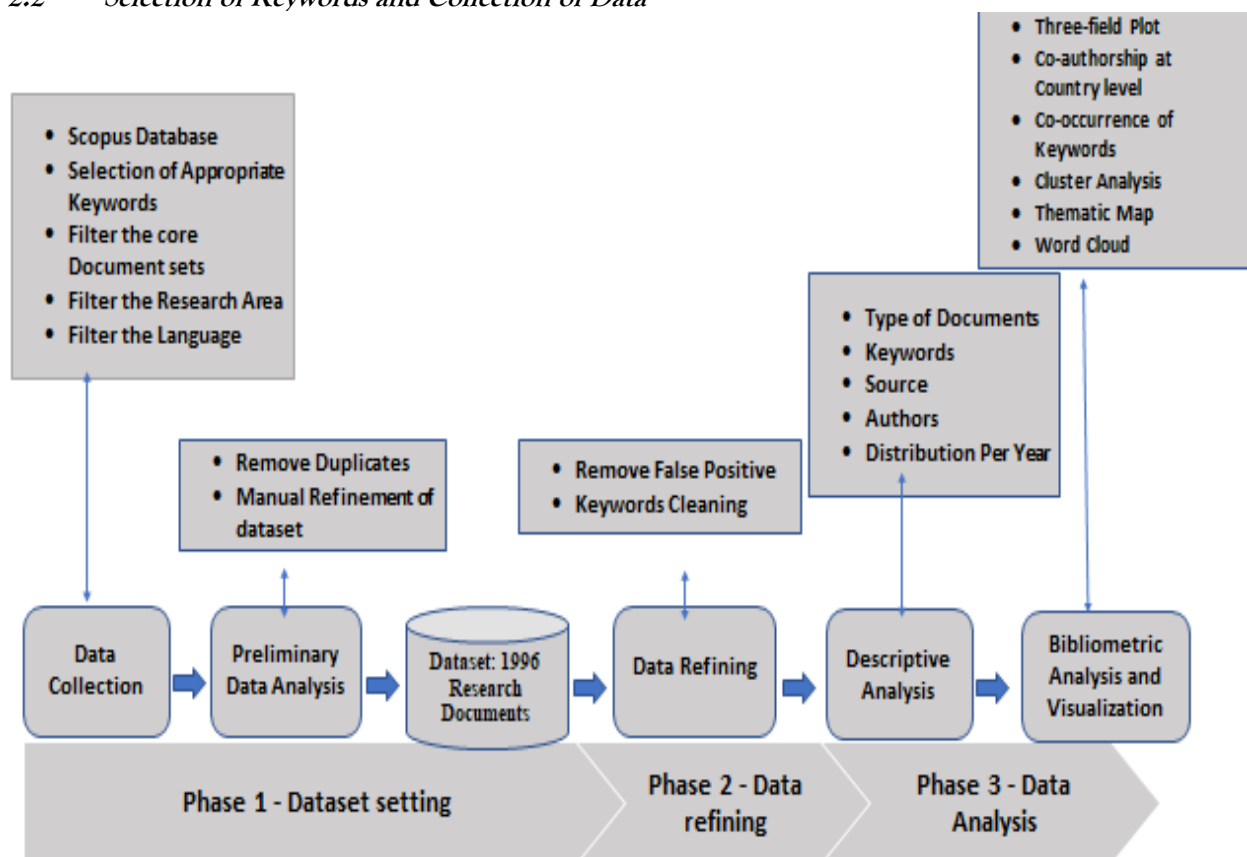


Figure 1: Keywords Selection and Data Collection

This study began with the careful development of a 1996 database. Figure 1 shows that the ensuing analysis methods were developed on this Dataset. A thorough approach to data refining was part of the second stage. The Dataset's validity was maintained by carefully removing duplicate records. To improve the reliability of the ensuing assessment, the natural editing process required the removal of incorrect results. The Dataset had undergone extensive keyword cleaning, an essential step to ensure accuracy for further studies. The distribution of papers across a period was carefully analysed, authors recognised, sources were recorded, and document types were thoroughly classified.

Data from the Scopus database has been incorporated into the Dataset, greatly enhancing it. As part of the procedure, relevant keywords were carefully selected, and filters were used to identify key document sets, specific research areas, and language issues. The

third phase required performing a thorough data analysis. A concise overview of notable patterns was provided using a three-field plot that highlighted significant data points. A national study on co-authorship provided insights into collaborative research projects and global academic networks. The Dataset's co-occurrence analysis showed extensive connections and thematic interconnections.

The clustering and theme-mapping tool revealed more complex patterns and links by analysing the Dataset's structure in greater detail. A word cloud was generated from the Dataset to highlight its prevalence and importance. However, since 1996, this multi-phase method, which begins with the development of a dataset and proceeds to rigorous data refinement and analysis, has provided an in-depth overview of the state of the study. Researchers can utilise these results to determine current patterns, draw informed findings, and direct more research.

2.3 Prisma Flowchart Diagram

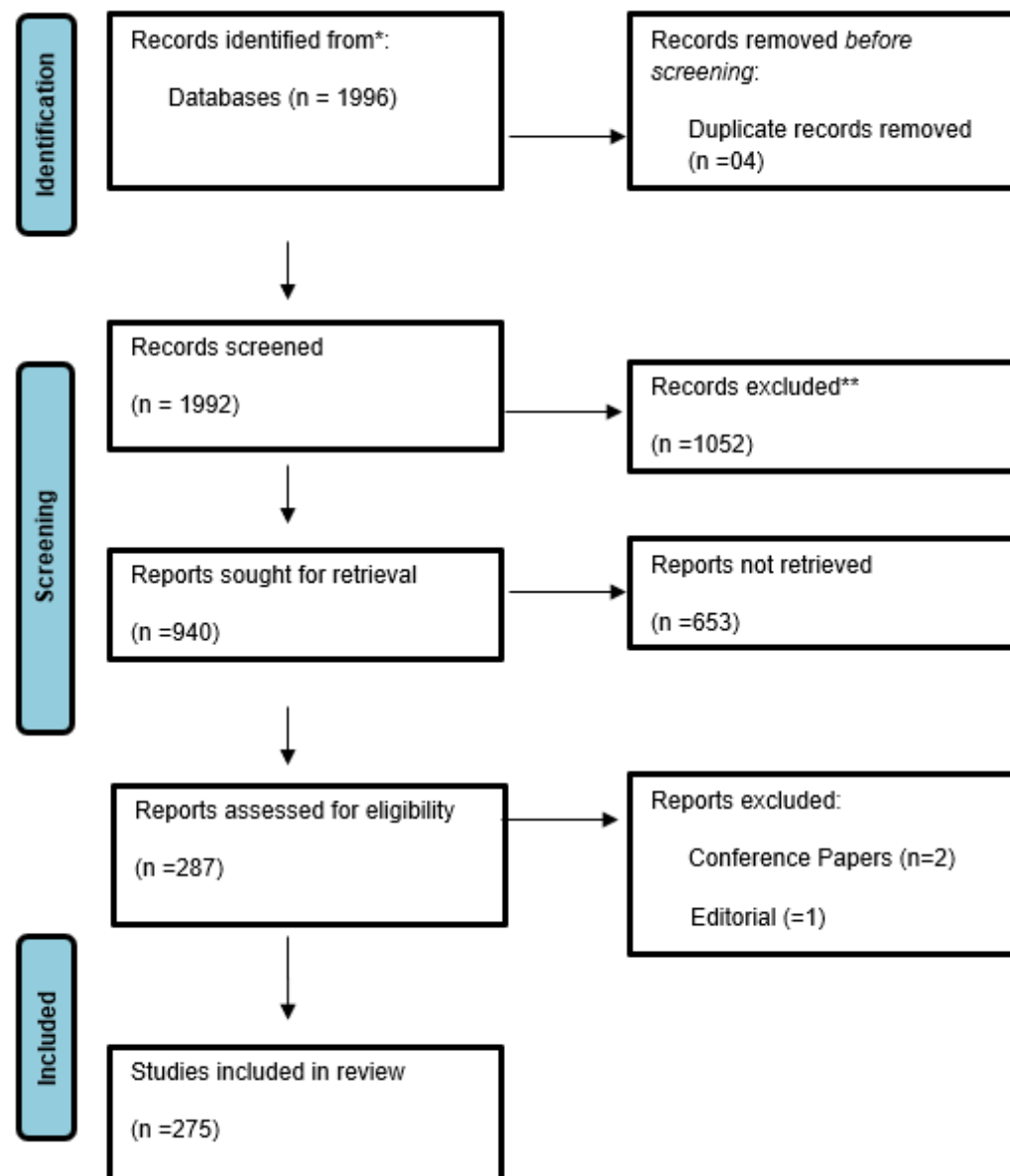


Figure 2. Prisma Flowchart Diagram

Figure 2 illustrates the methodology used in creating the first Dataset, which involved collecting records from the Scopus database from 1996. The database proposed 1996 records for exclusion for further consideration. By removing four cases of duplication, the Dataset was subsequently modified to contain 1992 separate records. By applying predetermined criteria (relevance, document type, and language), 1,052 records were excluded during the screening process. Finally, the Dataset was reduced to 940 records, the

content of which was to be fully evaluated. However, it was impossible to retrieve 653 records due to access restrictions or insufficient information to support retrieval.

In conclusion, 275 records were accessed before being intensively analyzed using bibliometric and content analysis. This final Dataset tests patterns in publication, thematic evolution, and unaddressed research sectors of green finance, financial inclusion, and development. By following this methodology,

we can select literature that aligns with the

study's goals and provides transparency.

3 Results and Discussion:

3.1 Year-Wise Publications

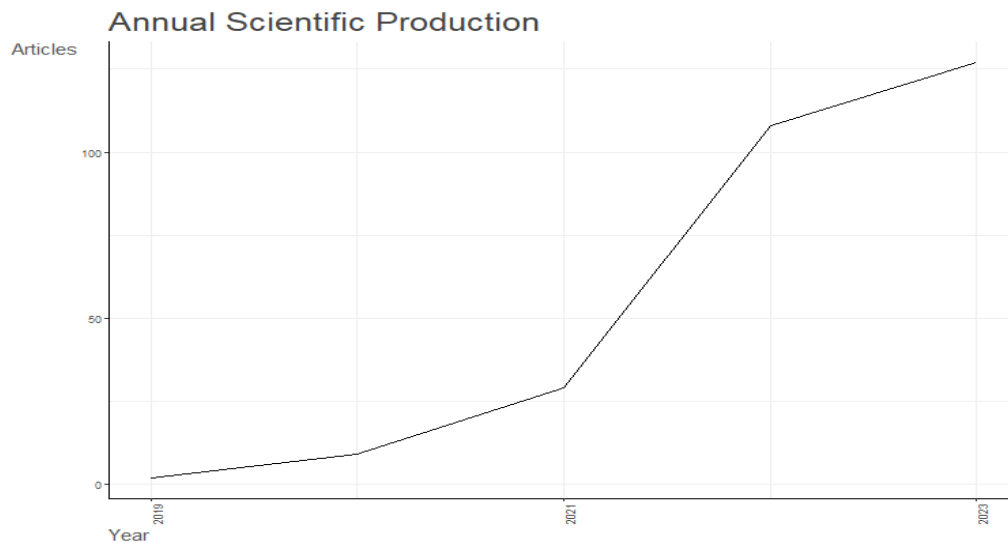


Figure 3: Annual Scientific Production

Figure 3 illustrates a significant increase in researchers' interest in green finance, financial inclusion, and sustainable development goals, as evidenced by the 246 papers published over the 4 years from 2019 to 2023. With 127

papers, 2023 has the most research ever recorded, indicating a high level of scientific activity and a sustained dedication to scholarly investigation across various fields.

3.2 Annual Citation Per Year:

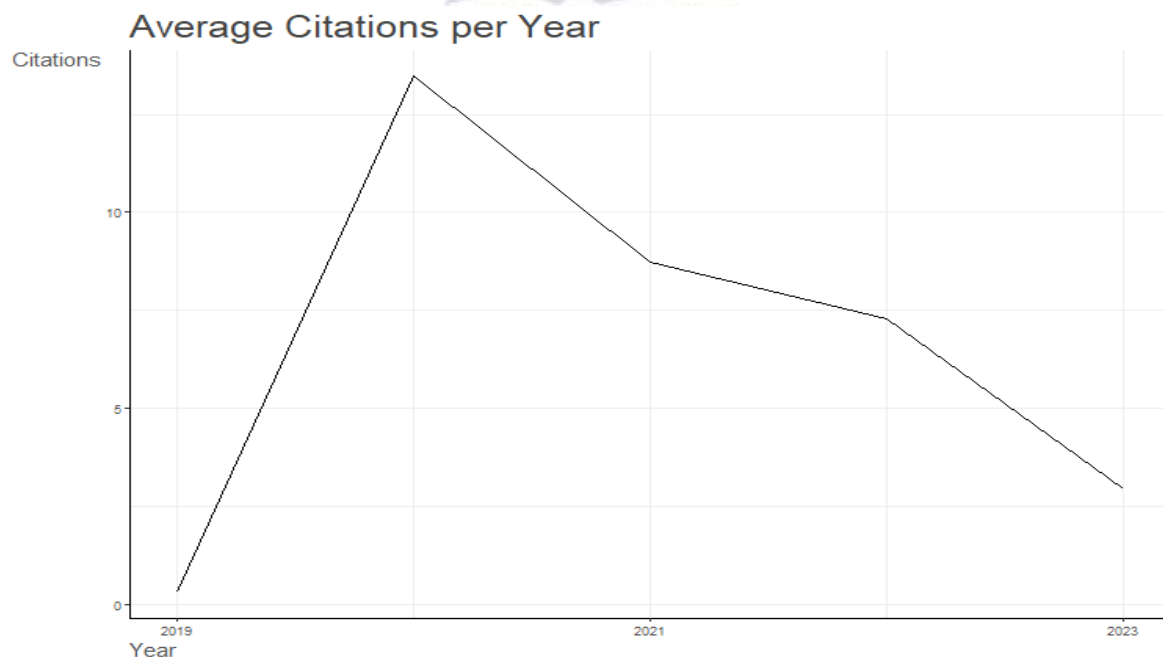


Figure 4: Annual Citation per Year

The dynamic features of articles are examined in this study in Figure 4, with particular

attention paid to essential metrics like Average citation per article (ACA) and Average Citation

per year (ACY). Even at a low ACA of 1.5, the research shows a significant variation, with just two articles published in 2019 averaging 0.3 ACY. In 2020, notable increases in ACA (53.89) and ACY (13.47) were observed. However, a decrease was observed in the

following years (2021 and 2022), indicating a possible stabilisation of content concentration. ACA falls to 2.95 in 2023, suggesting a more targeted strategy.

3.3 Three-field plot:

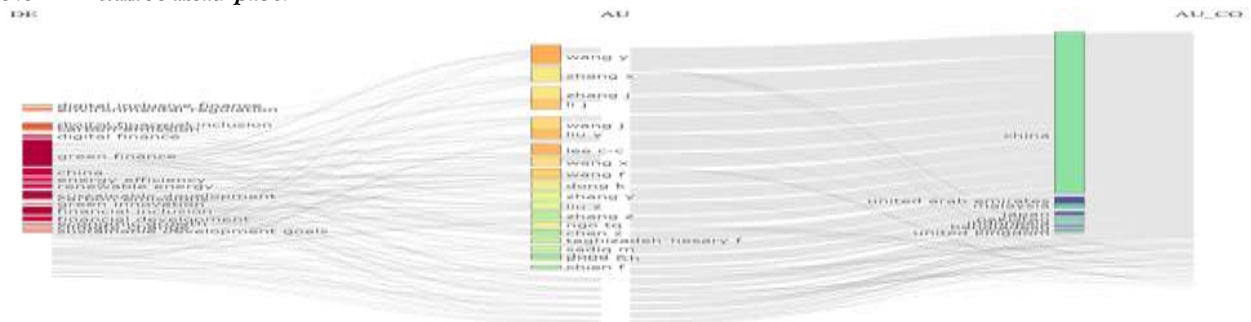


Figure 5: Three-field plot

The illustration of a three-field plot shown in Figure 5 defines the connections between leading researchers, geographical areas, and thematic keywords associated with literature on green finance, financial inclusion, and financial development. This visualisation serves as an important tool for identifying the top researchers, key themes, and origins of scholarship in green finance, financial inclusion, and financial development. The plot identifies China as the dominant contributor, highlighting the limits and scope of research in the mentioned fields – green finance, financial inclusion, or financial development. A high

level of involvement and international collaboration has turned the UAE into one of the prominent players, with a focus on expanding discussions on green finance and sustainable development. The plot confirms that world-level academic cooperation is essential for advancing understanding and encouraging sustainable finance. There is a need for continuous investigation in green finance, the SDGs, and financial inclusion, as argued by Rodrigues and Mendes (2018). More directed academic effort can help to create ideas for practical plans and frameworks in this fast-developing field.

3.4 Most Relevant Sources

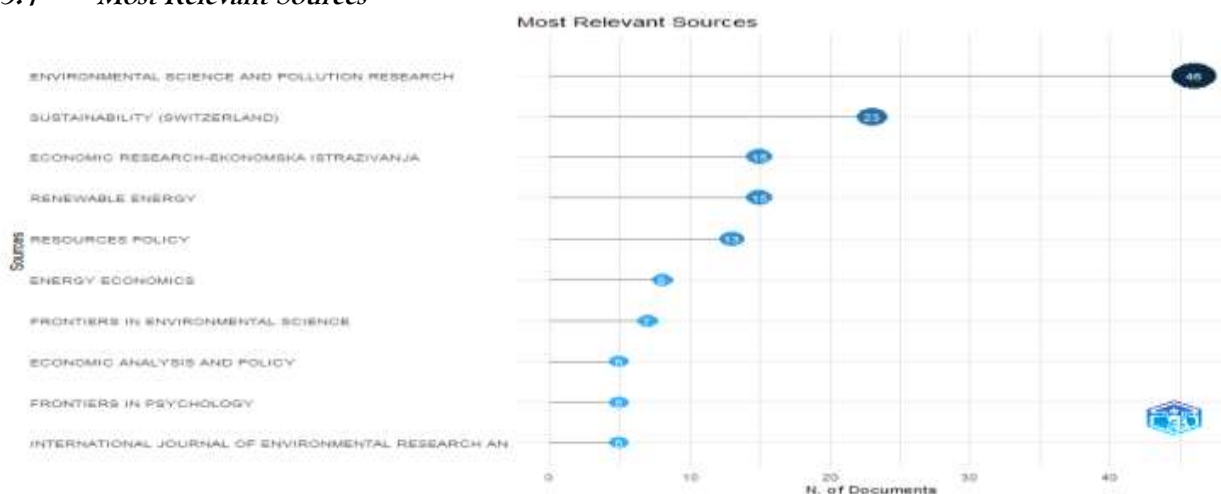


Figure 6: Most Relevant Sources

Schramade (2017) suggests that analyzing the most relevant sources is vital for researchers to identify the primary journals that publish more on green finance, financial inclusion, and financial development goals. Figure 6 shows that the journal "Environmental Science and

Pollution Research" is the leading source with 46 articles, followed by "Sustainability (Switzerland)" with 23 articles. Moreover, two sources, "Economic Research-Ekonomiska Istrazivanja" and "Renewable Energy," reported the same number of articles (15) in this field.

3.5 Lotka Law

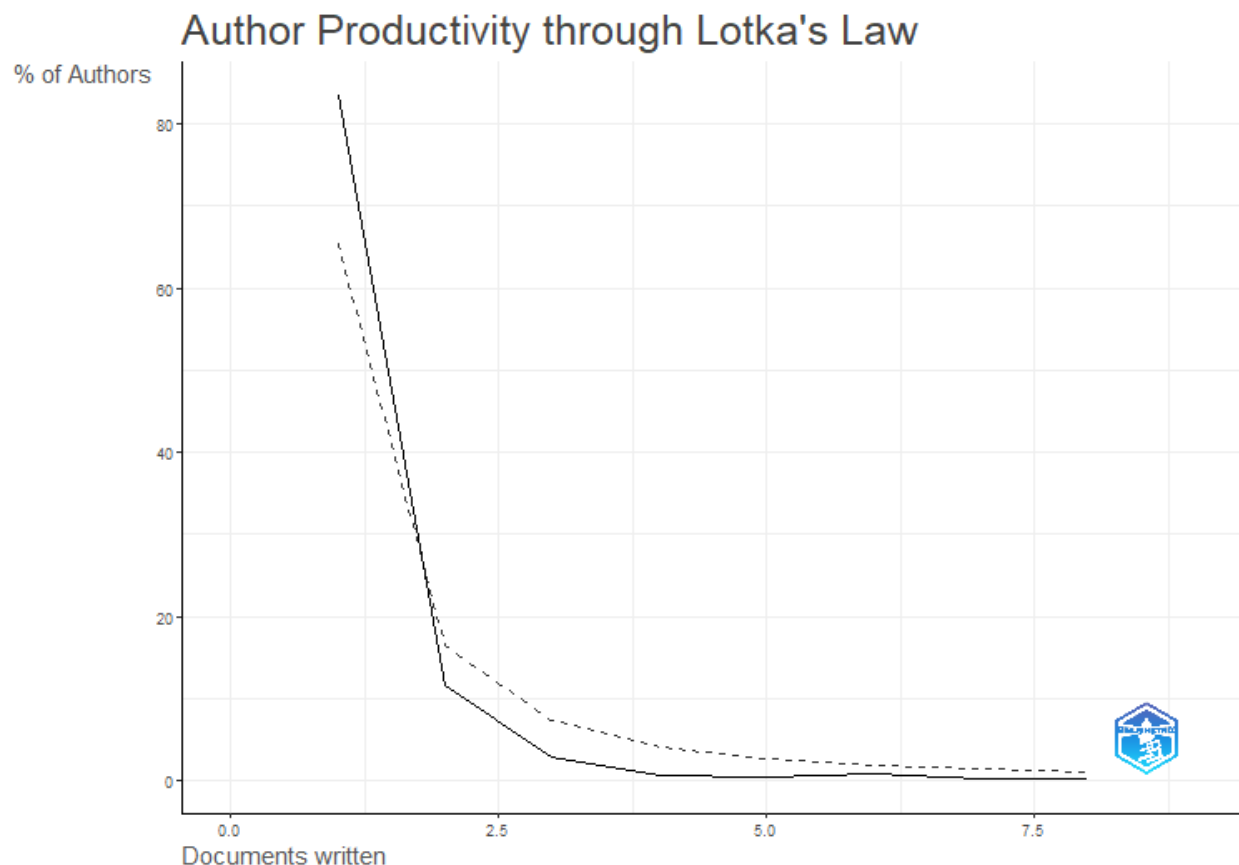


Figure 7: Lotka's law

Regarding the number of authors per article, illustrated in Figure 7, the Dataset includes various papers. One author accounts for 602 of the articles (roughly 83.4%). This points to a widespread practice in individual authorship, in which scholars contribute to the conversation on environmental economics, green finance, and related subjects separately. Of the total publications, 83 had two authors, making up around 11.5%. Working with two authors is less typical than a single author's contribution, but it is still significant and indicates a level of co-authorship in the scholarly investigation of the topic (Vatananan-Thesenvitz, Schaller, and Shannon, 2019). Articles authored by three individuals comprise 20 instances (2.8%), indicating a more minor

but notable presence of multi-authored works involving more extensive collaboration. Articles with four (5 instances, 0.7%) and five authors (3 instances, 0.4%), on the other hand, have an even lower frequency (Yang and Masron, 2022). Fewer than five authors are listed in an article; six-author articles appear six times (0.8%), while seven-author articles appear twice (0.3%). Finally, one case (0.1%) of an article with 8 authors is found. The study's authorship frequency distribution provides insight into the typical working methods of scholars focusing on green finance. The fact that lone writers write most publications suggests that individual academics make significant contributions to the intellectual landscape, but collaborations,

albeit less typical, broaden the field's perspective.

3.6 Corresponding Author Countries

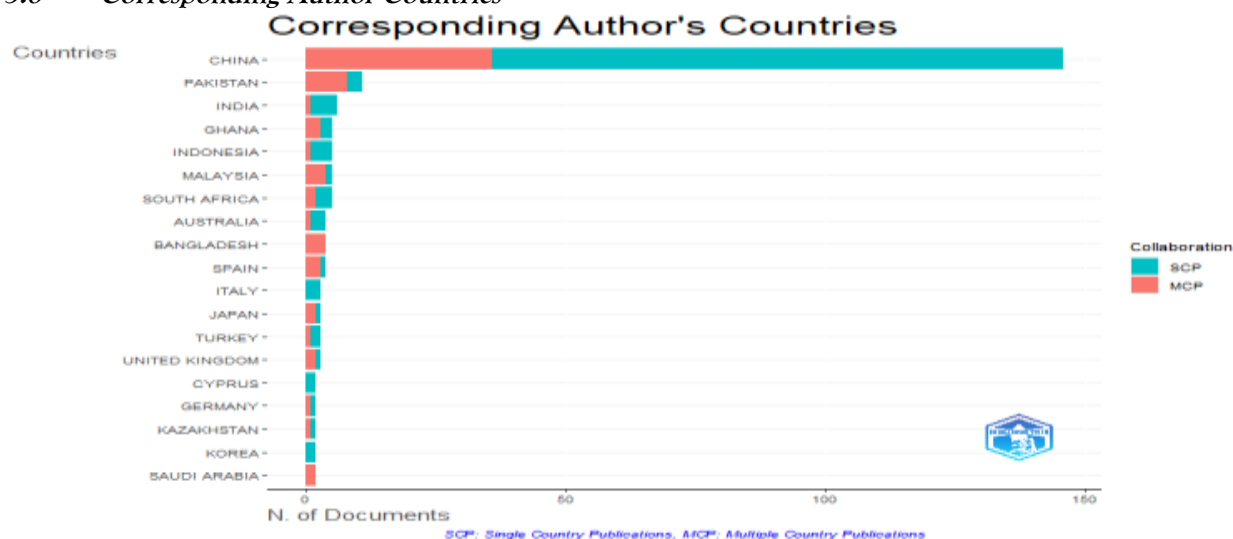


Figure 8: Corresponding Author Countries

Figure 8 presents a dataset of green finance research articles by country and relevant metrics. Notably, China leads in the total number of articles (146) and the Sustainable Contribution Points (SCP), scoring 110. China also exhibits a relatively balanced distribution between Main Contribution Points (MCP) and SCP, emphasising a holistic research approach. With 11 articles, Pakistan has a high Main Contribution Points Ratio (MCP_Ratio) of 0.73, suggesting that meaningful contributions are prioritised over teamwork. Numerous other nations, such as Ghana, Indonesia, and India, demonstrate various research methodologies.

Interestingly, Italy and Korea focus on theoretical or foundational aspects of green finance, as evidenced by their notable Sustainable Contribution Points, but lack Main Contribution Points. The information highlights how green finance research is distributed globally, with nations across the world making significant contributions to the conversation. Every nation's profile showcases its distinct focus on environmentally responsible finance and sustainable practices (Ullah, Muhammad, and Chen, 2023).

3.7 Countries Scientific Production

Country Scientific Production



Figure 9: Country Scientific Production

The Dataset outlined in Figure 9 shows the overall contribution in this field by providing a frequency distribution of green finance research articles by geographic region (Ullah, Muhammad, and Chen, 2023). With an essential recurrence of 498 articles, China distinguishes itself and shows its leadership in green finance research. Pakistan comes in second with 56 articles, demonstrating a critical commitment to the discussion. Several other regions are also actively involved; critical frequencies are seen in Ghana, India, Malaysia, and Indonesia, showing a general interest in sustainable finance practices. It is interesting to

note that countries from various continents, such as South Africa, Australia, and the UK, likewise make significant commitments. The information shows an overall commitment to understanding and advancing green finance, with different geological regions participating in research initiatives. The dispersion of articles over several continents and nations suggests a common interest in environmental sustainability and the role of finance in resolving associated issues. Together, the examinations from these districts contribute to the global collection of information on green finance.

3.8 Countries' Production Over Time: Country Production over Time

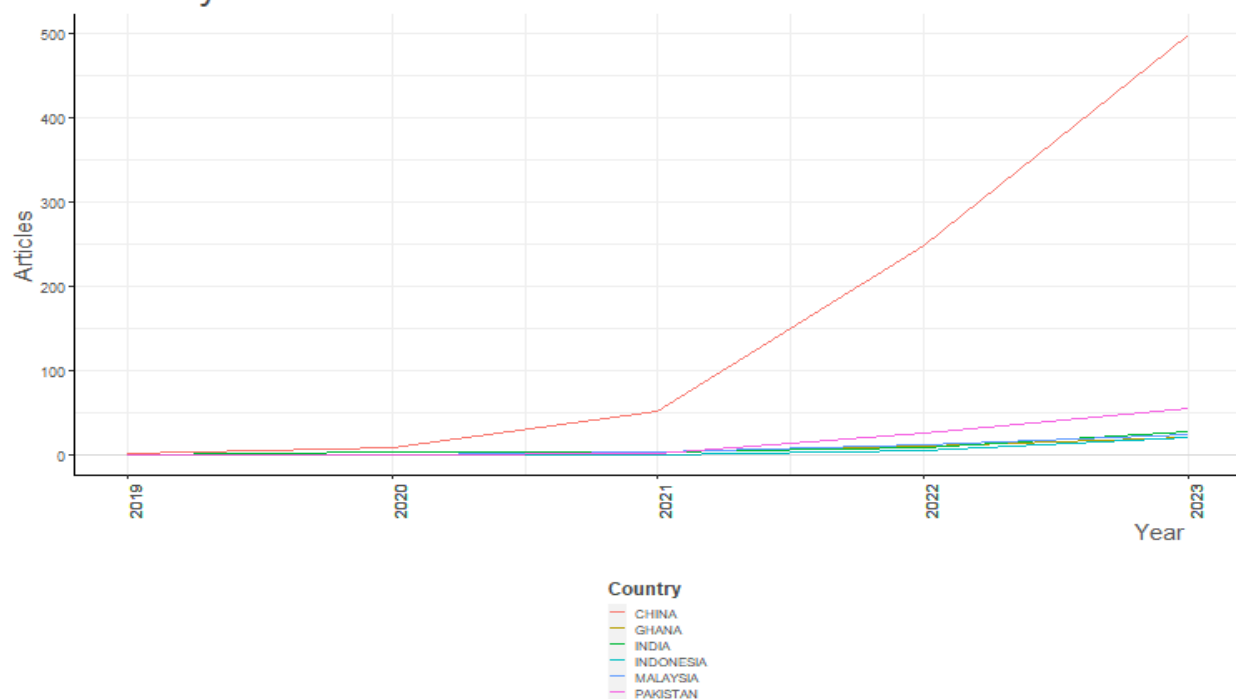


Figure 10: Country Production Over Time

The information presented represents the authentic distribution of research articles on green finance across different countries. Figure 10 shows that China has become a significant contributor, as evidenced by the articles' consistent increase from 1 in 2019 to 498 in 2023. The rising emphasis on green finance among Chinese scholars and examination foundations is reflected in this pattern. Research from Ghana and India is likewise trending upward. There is a recognisable rise in research interest in India, as confirmed by the

number of articles, which rose from 0 in 2019 to 27 in 2023. Ghana, moreover, shows development, with 21 articles in 2023 compared with 0 in 2019, demonstrating an expansion in the field of study (Ahmed, Hu, and Umair Saeed Bhutta, 2024). Malaysia's most prominent in-line participation rate expanded from three articles in 2021 to 24 in 2023. This suggests Malaysia's obligation to conduct an extra examination of green finance. Pakistan has experienced significant development, as evidenced by the increase in

articles from 2 in 2021 to 56 in 2023. This critical rise marks Pakistan's growing influence in the global debate over green finance. There were 21 articles in Indonesia in 2023, up from 6 in 2022, suggesting that the nation has become increasingly interested in sustainable

finance methods. The data show that many nations actively participate in the discussion, indicating that all nations are committed to advancing the study of green finance and sustainable financial practices.

1.9. Most Cited Countries:

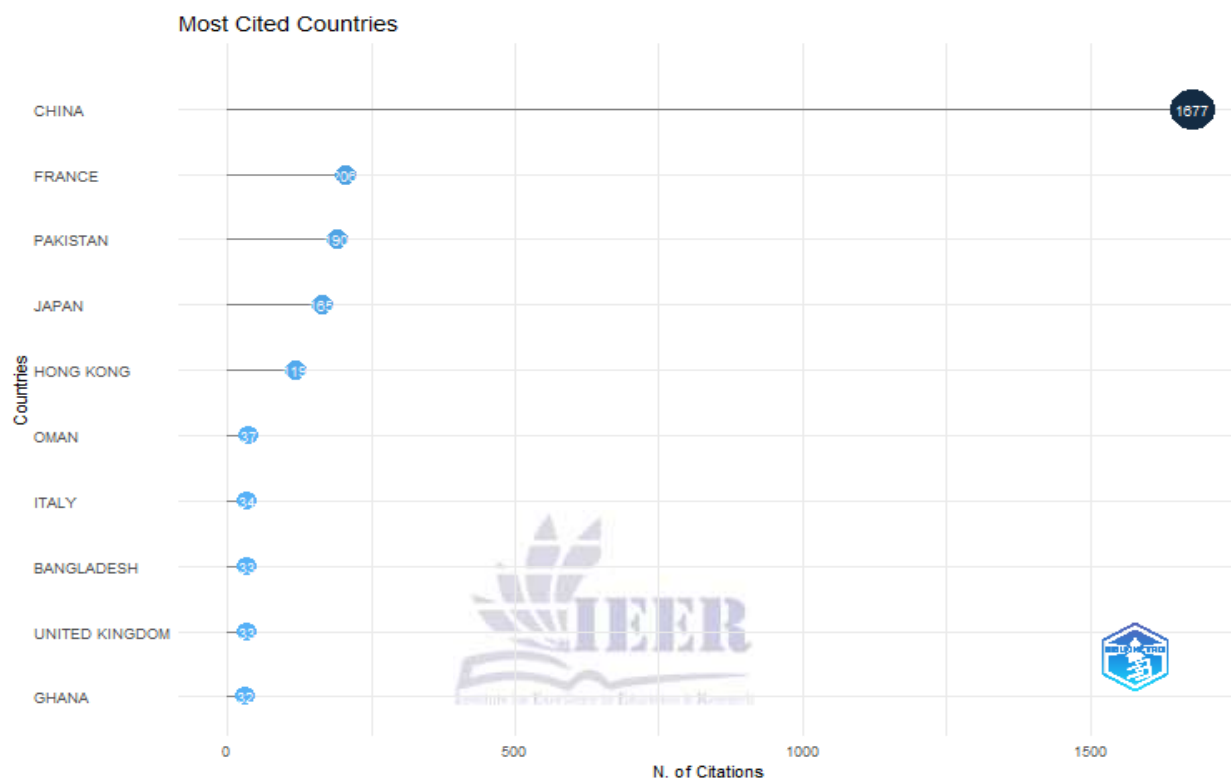


Figure 11: Most Cited Countries

Figure 11 indicates that China is the most prominent contributor to green finance, financial inclusion, and financial development goals, with 1677 citations, averaging 11.5 per article. With 206 All-out References, France has the distinct distinction of being the country with the most articles. This implies that each French article has received significant attention, even if the total research output is lower, as evidenced by its remarkable Average Article Citations of 206. This study highlights the significant and worthwhile contributions the French have made to the field. Pakistan's performance is impressive, with a robust Average Article Citations of 17.3 and a comparatively low Total Citations of 190.

Although Pakistan delivers less exploration with significant impact, its distribution has a

critical effect and adds to the global conversation on green finance. The data exhibits great support and cross-line collaboration in green finance research, with vital contributions from Bangladesh, Italy, Japan, and Hong Kong. Nonetheless, the shortfall of recorded references for certain nations, Indonesia, Iraq, Jordan, Latvia, and Saudi Arabia, highlights expected ways for advancement and joint effort in these domains. Thus, a combination of quantity and impact characterises the global landscape of green finance research. While certain countries, particularly China and France, showcase a combination of high output and substantial citation impact, others contribute meaningfully, with varying emphasis on quantity versus impact. The data invites further

exploration of the factors influencing the global distribution of green finance research and provides a foundation for upcoming

collaborations and focused research initiatives in countries with untapped potential.

1.10. Most Global Cited Documents

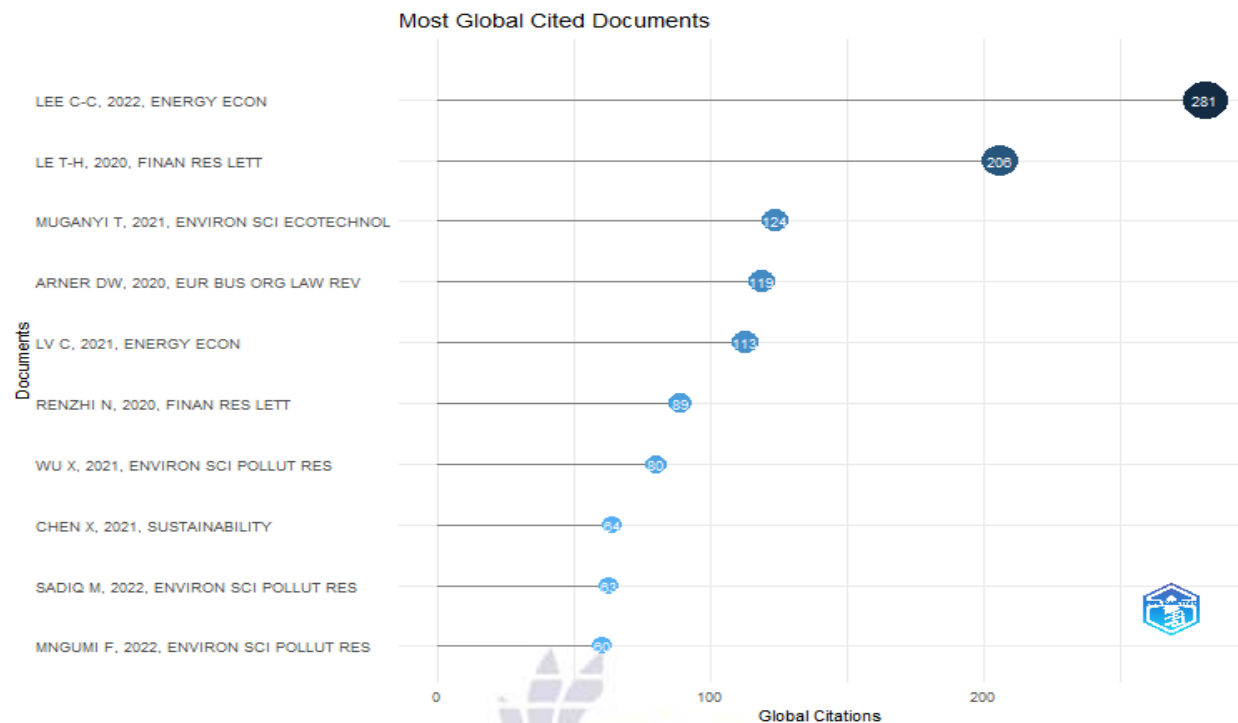


Figure 12: Most Global Cited Documents

This study's prominence in the reference measure, the Dataset under assessment, gives an exhaustive assessment of insightful articles at the nexus of ecological science and financial matters. With 281 references, the "LEE C, 2022" passage in "Energy Financial Matters" stands out, demonstrating a strong presence in the local area. The scope of the diaries, including "Natural Science and Ecotechnology" and "Financial Investigation and Strategy," is chosen to emphasize the multidisciplinary character of the exploration. There is evidence of fleeting elements at work: "XIONG Q, 2023" has a massive effect immediately, with 30 references around the same time, while other articles show a dynamic

collection of references demonstrating a range of short- and long-term outcomes. "ANU, 2023," with a standardised complete reference proportion of 7.112, offers a nuanced viewpoint on supported insightful pertinence over time. Remarkable geographic diversity is evident in the consideration of authors from Pakistan, South Africa, and China, highlighting the worldwide scope of this field's exploration. As shown in Figure 12, "ZHONG K, 2022," which was distributed in "PLOS ONE," the Dataset further stresses the connections across disciplines and mirrors the combination of ecological exploration and social change (Ahmed, Hu, and Umair Saeed Bhutta, 2024).

the most frequently utilised term, showing significant areas of strength for the elements of the country. "The following statement, "economic development," emphasises the central concept of China's expansion. Words like "finance," "speculations," and "monetary framework" feature how significant monetary instruments are to the progression of the economy. While terms like "carbon dioxide" and "fossil fuel byproduct" infer a promise to handling natural worries, especially those connected to discharges and environmental change, phrases like "economic turn of events" and "green economy" recommends a deliberate exertion towards earth capable development. "Elective energy" and "energy effectiveness" feature the overall endeavours to find greener, more sustainable energy sources.

Terms like "development" and "board information," which emphasise exact investigation and state-of-the-art research techniques, are another way the Dataset imparts systemic elements. The "relapse investigation" and "natural financial matters"

fields employ a multidisciplinary approach to addressing ecological issues from a financial perspective. The expansion of "Coronavirus" demonstrates the Dataset's strength by recognizing the pandemic's impacts on the climate and the economy. Words like "manageability" underscore the idea of finding a balance between ecological obligations and economic development, while "industry," "business," and "modern design" demonstrate a careful understanding of China's economic landscape. Data envelopment analysis, "government," and "public policy" imply understanding how governance and policy influence environmental and economic outcomes. The use of "poverty" underscores the significance of comprehensive development and reveals a social soul. The common subjects of monetary contemplations, feasible turn of events, and other methods highlight how China's economic and environmental conditions have been thoroughly analysed in academic discourse.

1.13. Tree Map:



Figure 15: Tree Map

In academic discussions, sustainable development, economic perspectives, and various research paradigms emphasise the in-depth analysis of China's economy and environment. The deep-seated desire to understand China's economic structure, growth trends, and financial systems is reflected in the heavy focus on economic topics. Researchers explore topics such as "finance," "investments," and the "financial system" to provide a deep dive into the economic forces driving China's development. Sustainable development is a recurring theme (Ahmed, Hu, and Umair Saeed Bhutta, 2024). It is a serious effort to reconcile environmental stewardship with economic growth. The terms "green economy," "sustainable development," "carbon emission," and "climate change" reflect the scholarly community's interest in exploring strategies to promote environmentally responsible growth. Energy efficiency and "alternatives" are part of a global effort to transition to cleaner, more sustainable energy sources. The use of a variety of methods,

including "innovation," "panel data," "regression analysis," and "data envelopment analysis," demonstrates a methodologically rich landscape. By directing observational evaluations utilising cutting-edge research methods, scholars offer a diverse image of China's ecological and economic worries. This systemic variety reflects the exploration's interdisciplinary nature, incorporating social issues, ecological and economic matters, and innovative critical thinking strategies. Nonetheless, the recurring topics of sustainable development, financial considerations, and the use of different analytical approaches demonstrate the breadth and depth of scholarly research on China's environmental and economic conditions. Given China's advancement, this top-down examination examines how we might interpret the intricate relationship between ecological stewardship, economic development, and advanced research strategies, as shown in Figure 15 (Sahabuddin et al., 2023).

1.14. Word Frequency Over Time:

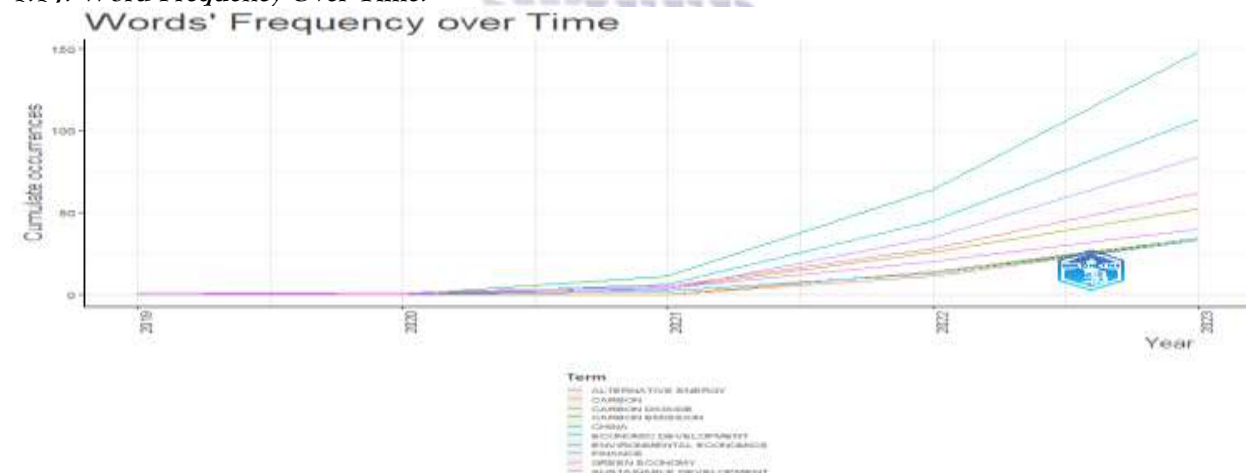


Figure 16: Word Frequency Over Time

The tabular data in Figure 16 illustrate how the Dataset's emphasis has changed, revealing a dynamic evolution in scholarly attention. Terms in 2019 are relatively low-key, with only one reference to "finance" and no terms about China or other specific topics. "Finance" became more popular in 2020, suggesting that financial concerns have increased. The rise of environmental terms such as "carbon dioxide" and "sustainable development" indicates an

increasing emphasis on environmental issues. China is discussed, but not in numerical terms. Significant gains in 2021 point to clear progress that may have been affected by global events or changes in research priorities. The terms "China," "economic development," and "finance" have the highest frequency in the next two years, 2022 and 2023. This increase results from increased scholarly focus on China's financial systems, economic

environment, and sustainable development objectives. It also highlights the growing understanding of the complex relationships between environmental sustainability, finance, and economic growth. The patterns are

consistent with an increasing narrative of intellectual interest and knowledge of the environmental consequences of China's economic actions.

1.15. Clusters by Authors Coupling:

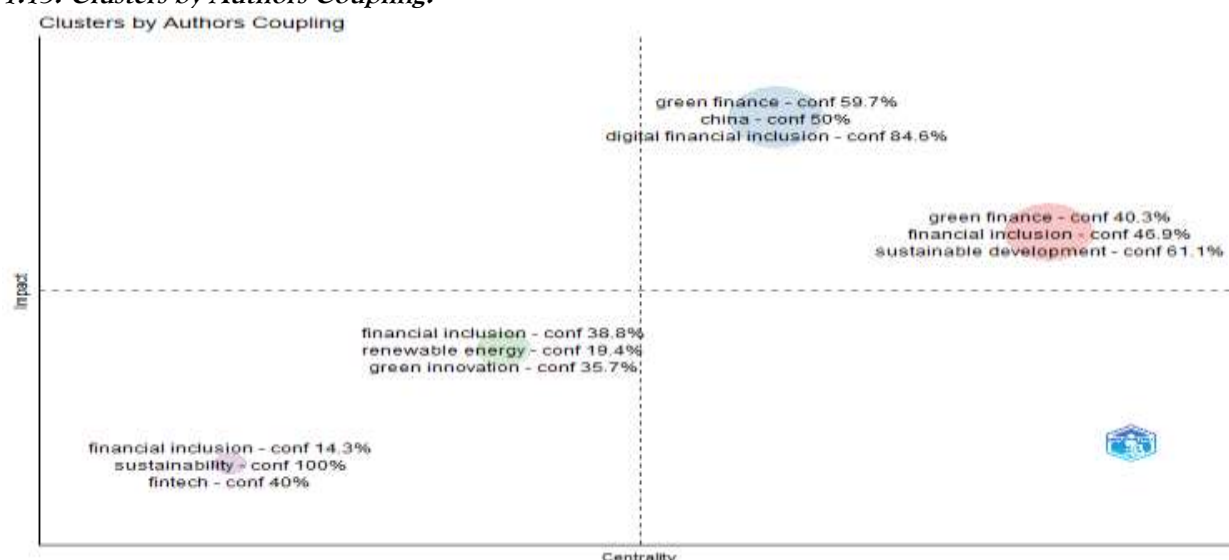


Figure 17: Cluster by Author Coupling

The analysis parameters indicated in Figure 17 focus on the "DE," which could refer to "Development Economics" or another context-specific field. The specified number of terms (n) for this analysis is set at 250, suggesting an exploration of a substantial number of terms within the designated field. The "minfreq" parameter, set at 1, indicates that even terms with the lowest frequency should be considered in the analysis. The label for terms is designated as "DE," the analysis involves unigrams (grams set at 1), representing single terms rather than combinations. The impact measure is set to "global," indicating a broad assessment of these terms' impact within the specified field.

Stemming is disabled (set to FALSE), indicating that the analysis considers individual word forms rather than their root or stems. The parameter "n.labels" is set to 3, suggesting that the analysis aims to identify and label 3

distinct clusters or groups in the data. The size parameter, set at 0.3, likely pertains to the size of the terms in the visualization. The community repulsion and repel parameters are set to 0 and FALSE, respectively, indicating no specified repulsion between communities and that repelling is not activated.

The clustering algorithm is a "walktrap," suggesting a community detection approach based on random walks within the network of terms. The goal of this algorithm is to identify tightly related terms and provide insights into potential thematic clusters. Therefore, these parameters suggest a deep analysis of terms within the given field, emphasising single terms (units) and detecting clusters using a walking trap. The lack of stemming indicates a preference for considering different word forms, while the global impact measure indicates an overall assessment of the significance of terms across the entire Dataset.

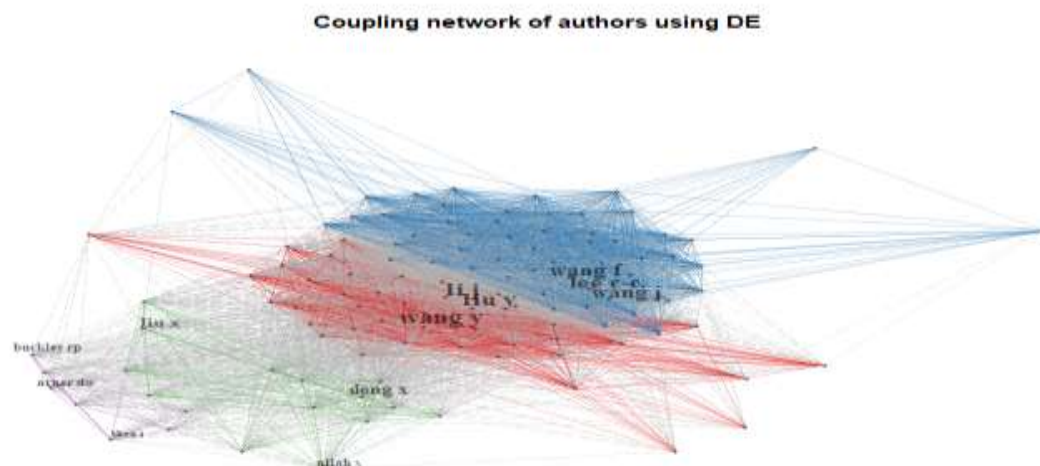


Figure 18: Coupling Network of Authors

The provided Dataset in Figure 18 shows each author's Normalised Local Citation Scores and corresponding clusters. Cluster 1 comprises contributors from diverse backgrounds; Wang L, Taghizadeh-Hesary F, and Iqbal N have a high number of citations, indicating notable influence among academics. The scores for this cluster show a wide range, from 1 to 26. With an extremely high score of 80.5 in Cluster 2, Lee C-C has a significant impact. Other writers with ratings ranging from 25.5 to 42.67, such

as Mohsin M and Ngo Q-T, also significantly influence. Cluster 3 is led by Huy PQ and Zhao J, with moderate citation ratings of 17 and 17.5, respectively. Cluster 4 has a high overall impact, with authors such as Arner DW and Buckley RP sharing a score of 59.5, indicating a solid academic influence. With a score of 19, Khan I is the only contributor in Cluster 5. When considered as a whole, the data illustrate differences in writers' academic impact across groups.

1.16. Authors' Keyword Network:



Figure 19: Authors' Keyword Network

A clustering analysis reveals the relevance and connections among particular ideas by identifying unique thematic groupings within the chosen topics, as shown in Figure 19. Cluster 1 focuses on financial inclusion, fintech, and sustainability, emphasising the link between integrating sustainable practices in financial institutions, the accessibility of financial services, and advances in technology in the finance sector. This cluster refers to a growing tendency in financial systems toward greater inclusion and environmental awareness. The second group significantly affects environmental factors within financial structures, including carbon emissions, green finance, and geographical spillover effects. The spatial spillover effect is highlighted, implying the geographical effects of sustainable practices. This emphasises the need for defined, localised interventions to reduce carbon emissions

through green finance systems. Environmental protection, sustainable development, and sustainable finance are grouped into Cluster 3, which promotes an integrated ecological and economic balance approach. This cluster underscores the value of integrating financial practices with broader environmental protection and sustainable growth goals, recognizing finance's crucial role in achieving sustainability. Cluster 4, which merges financial development with renewable energy, provides a last instance of how economic growth and the need for renewable energy sources are overcome. This cluster highlights the importance of finance in promoting a transition to renewable energy sources and supports acknowledging the mutually beneficial impact between financial development and sustainable energy practices.

1.17. Thematic Map:

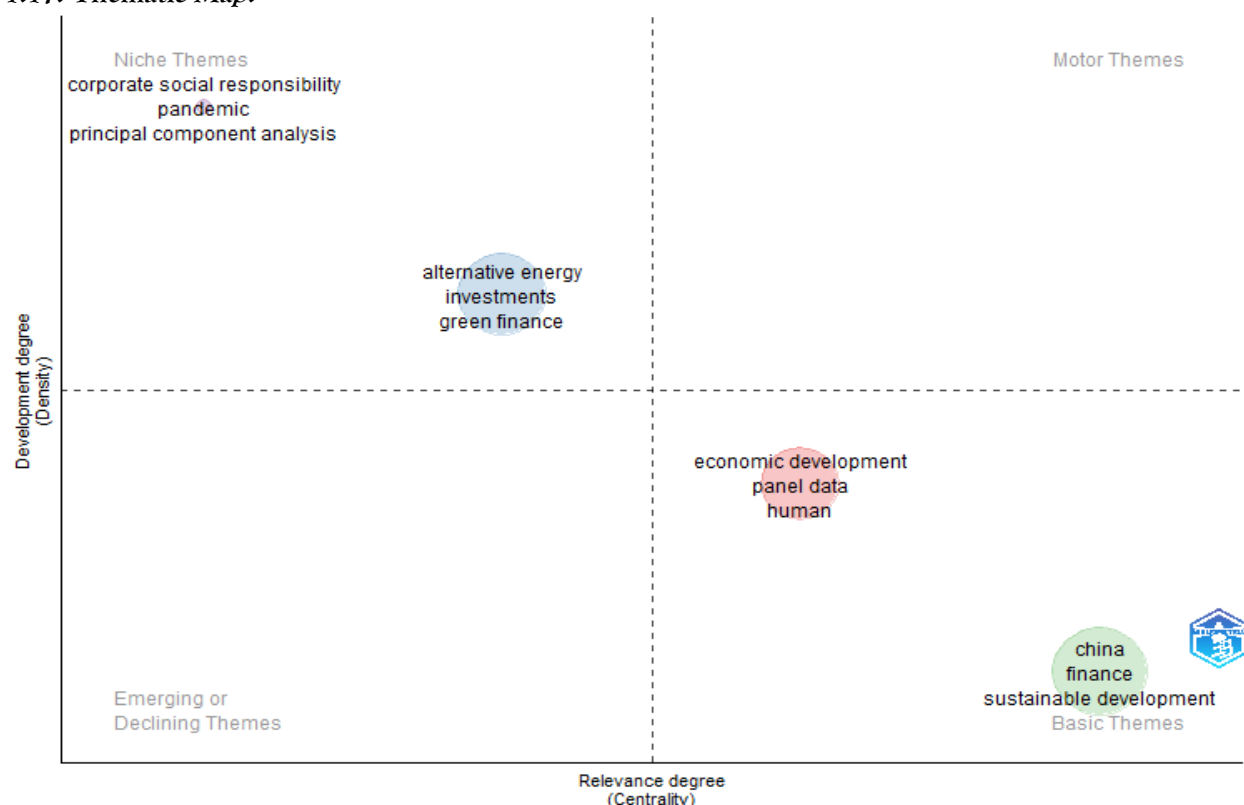


Figure 20: Thematic Map

Figure 20 shows that a wide range of writers can be seen in the Dataset, including authors' Normalised Local Citation Scores and related clusters, especially in Cluster 1. This cluster includes people from diverse backgrounds,

demonstrating a cross-disciplinary effort. Wang L, Taghizadeh-Hesary F, and Iqbal N are prominent figures in this cluster, with high citation counts that demonstrate their noteworthy influence in academia. An

interdisciplinary, collaborative approach to scholarly work is needed to achieve broad impact across various fields. Their high Normalised Local Citation Scores emphasise how their research influences dispute resolution and the growing body of knowledge, and how the academic community recognises and cites their work. The presence of influential figures within Cluster 1 highlights the diversity and collective impact of scholars from various backgrounds, fostering a rich, collaborative academic environment.

4. Conclusion

The paper provides a detailed analysis of current trends in green finance, financial inclusion, and the Sustainable Development Goals, and identifies key research priorities and neglected areas that warrant continued inquiry. The present study's serology utilizes a mix of bibliometric and qualitative systematic review approaches, thus minimizing analytical bias and increasing the replicability of results for future research. Data selection and analysis were based solely on the Scopus database, and all results were rigorously verified.

Our analysis highlights the most important trends and thematic shifts in academic discussion on green finance, green investment, and the green finance gap. It also highlights the best researchers, regions, organizations, publishers, and journals that are prominent in developing this area. The presented methodology may be helpful to researchers who are interested in the topic.

A significant finding identifies the lasting disjuncture of green finance, stalling the pursuit of inclusive green growth. The primary cause of this problem is the incompatibility between financial regulations and environmental policies. We need concerted effort in the form of legislation, with governments lobbying for environmental policies that guide financial resources towards eco-friendly activities (Desalegn & Tangl, 2022).

Moreover, the present research counters the assumption that financial inclusion matters only for low-income groups in developing countries. Research from developing nations and institutions is fundamental, but research from wealthier countries is also vital. This

indicates that financial inclusion is important worldwide and helps overcome differences in socio-economic status. The article adds unique insights by mapping the domain of studies on financial inclusion (indicating prominent experts, collaborative relationships, and thematic areas under study), thereby facilitating scholars' alignment with current field developments and the design of their methodological paths (Gálvez-Sánchez et al., 2021b).

4.1. Limitations of the Study:

Although this bibliometric analysis provides valuable insights into the interplay among green finance, financial inclusion, and financial development, it should be acknowledged that it also has limitations.

This study focused on peer-reviewed journal articles in Scopus, excluding grey literature, conference proceedings, book chapters, and reports that might contain valuable information. Therefore, the Dataset may not adequately cover the full scope of existing research in the field. Second, there may be limited representation of dynamic, interdisciplinary language within the topic, and systematic keyword selection. Excluding or selecting specific terms can change the articles considered in the analysis. Moreover, there is a risk of skewed research findings if we only base our research on English-language publications. Third, employing thematically dominated quantitative bibliometric techniques limited the analysis and, therefore, the extent to which the background context and theory of the literature could be understood. In addition, differences in network layouts and thematic categories generated by different bibliometric tools may undermine the reproducibility and consistency of results. Also, differences in the time frame, database availability, and filtering options could influence the broader validity of the results. Scholars may aggregate data from databases (such as Web of Science and Google Scholar) and employ mixed methods to enhance future research reliability.

4.2. Future Recommendations:**4.2. Future Recommendations (Rewritten):**

➤ Future research should cover a broader range of publication formats, including conference proceedings, policy briefs, working papers, institutional reports, and journal publications, to better understand the evolving discourse on green finance, financial inclusion, and development.

➤ The researchers must embrace a broader, more flexible approach to keyword strategy and use machine learning or text mining to identify the most relevant contributions in this emerging terrain of green finance, financial inclusion, and development.

➤ Integrating bibliometric views with qualitative research approaches can enrich insights, reveal why scholarly trends are what they are, and shed light on the motivators and consequences of important topics.

➤ Given the increased attention to banking in recent times, research can examine how banking institutions ensure that environmentally and socially responsible financial practices increase as levels of awareness and regulation intensify.

➤ This renewed attention to a green economy and energy efficiency implies that research should examine how advances, such as green fintech, ESG regulations, and sustainable investment strategies, accelerate the shift to more sustainable and robust economic systems.

➤ Future work could examine how multinational alliances and partnerships influence the implementation of inclusive and sustainable financial strategies across regions.

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