Mapping the intellectual landscape of green economy and sustainable finance: A bibliometric analysis (2014–2024)

Stephen Bishibura Erick[1]
Bonamax Mbasa[2]
Kulwa Mang'ana[3]

[1]serick@irdp.ac.tz
[2]bmbasa@irdp.ac.tz
[3]kulwa.mangana@gmail.com

[1]https://orcid.org/0009-0007-1400-9734
[2]https://orcid.org/0009-0007-8072-6408
[3]https://orcid.org/0000-0002-2319-080X

[1,2]Institute of Rural Development Planning (IRDP), [3]Nelson Mandela African Institute of Science and Technology (NM-AIST), Tanzania

https://doi.org/10.51867/scimundi.6.1.15

ABSTRACT

This study conducts a comprehensive bibliometric analysis of scholarly research on green economy and sustainable finance from 2014 to 2024. Drawing upon a dataset of 692 peer-reviewed publications indexed in Scopus and analysed using the Bibliometrix R package, the study maps the field's intellectual landscape, thematic development, and collaborative networks. The findings reveal a consistent increase in scientific output, with a pronounced surge in publications after 2018. This growth trend aligns with global policy milestones such as the Paris Agreement, the European Union [EU] Sustainable Finance Action Plan, and the proliferation of Environmental, Social, and Governance [ESG] integration and green bonds. China emerges as the most productive country, while institutions such as Jiangsu University, the Southwestern University of Finance and Economics, and the Lebanese American University lead in publication volume and collaboration intensity. Keyword co-occurrence and thematic mapping identify dominant themes related to green finance, environmental sustainability, ESG frameworks, and renewable energy, alongside emerging topics like climate risk disclosure and transition finance. Conceptual and co-word network analyses further reveal the interdisciplinary integration of finance, economics, policy, and environmental science. The study also demonstrates the growing decentralization of institutional influence and the rise of both North–South and South–South collaborations. These findings offer valuable insights into the evolving structure of research in sustainable finance and inform future academic inquiry and policy development.

Keywords: Climate Change, Environmental Sustainability, Financial Innovation, Green Economy, Green Finance, Renewable Energy, Sustainable Finance

I. INTRODUCTION

The green economy and sustainable finance have emerged as essential paradigms in responding to escalating environmental and climate challenges, especially in the wake of intensifying carbon emissions, ecosystem degradation, and the global transition toward low carbon development models. A green economy is defined by low carbon emissions, resource efficiency, and social inclusivity, fostering environmental sustainability alongside economic growth (Gupta *et al*., 2023) (Korobov *et al*., 2021; Zhilkina *et al*., 2020). Complementarily, sustainable finance refers to financial services and investments that incorporate environmental, social, and governance (ESG) considerations into business and policy decisions, aiming to fund and accelerate sustainable development initiatives (Fu, 2024; Surenthran *et al*., 2024). Green finance, a central mechanism within sustainable finance, includes instruments such as green bonds, climate transition bonds, ESG investment portfolios, and green credit.

These financial tools are crucial in aligning capital flows with climate targets, renewable energy expansion, and sustainability metrics (Li *et al*., 2023; Liza *et al*., 2024). The incorporation of green financial policies in national agendas has demonstrated substantial impacts, particularly in emerging economies such as China, where empirical studies show strong linkages between green credit, financial innovation, and reduced carbon emissions (Yang *et al*., 2019; Zhongping *et al*., 2023). Recent developments in both international policy and financial markets have intensified interest in these domains. The operationalization of the Paris Agreement, the United Nations Sustainable Development Goals (SDGs), and the EU Green Deal have all contributed to mainstreaming sustainability within economic planning and financial governance. This shift has been paralleled by a surge in academic research examining the mechanisms,

impacts, and innovations of sustainable finance and green economic transitions (Huang & Zhang, 2021). Empirical studies have evaluated the role of green finance in boosting green total factor productivity (Lee & Lee, 2022), driving technological innovation (Tan & Zhu, 2022), and enhancing regional environmental efficiency (Zhao *et al*., 2024).

Recent studies has highlighted more the importance of green fiscal policies government led financial strategies explicitly designed for sustainability to achieve both environmental and economic goals. These policies help reduce pollution and carbon emissions, offering dual benefits by improving environmental health and boosting economic performance. Zhu *et al*., (2024) explored how targeted fiscal actions can simultaneously promote pollution control and carbon reduction, speeding up transitions to low carbon, sustainable economic systems. Additionally, the role of sustainable finance in supporting global carbon neutrality efforts has been widely studied. Ma (2024) showed through thorough empirical analysis that financial initiatives focused on environmental sustainability play a crucial role in advancing clean technology and innovation, helping to meet ambitious international carbon neutrality targets.

Within urban contexts, sustainable finance is vital in enhancing energy efficiency, a critical concern for sustainable urban development given the increasing concentration of populations and activities in cities. The Organization for Economic Co-operation and Development [OECD,] highlighted urban energy efficiency as integral to addressing urban environmental impacts. Complementing this, Guo and Tan (2024) analyzed how mature green financial frameworks significantly enhance urban energy efficiency through strategic investments in renewable energy infrastructure, energy saving technologies, and conservation initiatives. Zhao *et al*. (2024) supported these findings, providing robust evidence that green finance pilot zones significantly improve regional environmental efficiency through localized and targeted interventions.

The financial sector, especially banking, has adopted innovative sustainable financing practices, effectively reducing ecological impacts while simultaneously enhancing economic opportunities. Pulicherla *et al*. (2022) explored green banking innovations in India, noting the rising adoption of sustainable financial products such as green loans and investment funds. A comparative analysis by Sharma and Bajaj (2023) identified disparities in sustainable finance adoption between developed and developing nations, with advanced economies typically leading due to established regulatory environments and market maturity. However, some developing countries, notably China, have achieved significant progress, highlighting the accelerating global shift towards sustainability focused financial practices. Specialized financial instruments such as climate transition bonds have gained prominence by enabling targeted sectorial decarbonization efforts. Zhao *et al*. (2024) illustrated how climate transition bonds in Japan have significantly funded innovative technological solutions and sustainable practices within traditionally high-emission industries. Additionally, Islamic sustainable finance is increasingly influential, as demonstrated by Faizi *et al*. (2024), who mapped the integration of Islamic finance principles with environmental sustainability goals in Indonesia, thereby expanding the inclusivity and applicability of sustainable finance mechanisms. The profound synergy between the green economy and sustainable finance is evident, as finance provides the necessary capital for green economic activities, and the green economy offers tangible investment opportunities and a framework for measuring real-world impact

Given the complexity and dynamic nature of green economy and sustainable finance research, this paper aims to provide a comprehensive bibliometric review of the synergistic relationship between the green economy and sustainable finance. By employing advanced bibliometric methods, we seek to illuminate the historical evolution, current trends, and future directions of research at the intersection of these two critical concepts. Specifically, this study will analyse the growth and structure of scholarly publications, identify influential research contributions, discern key conceptual clusters, and pinpoint geographical and institutional collaboration patterns within this domain. Through this systematic analysis, we intend to offer valuable insights for researchers, policymakers, and practitioners engaged in fostering a sustainable and resilient global future. This bibliometric exploration will contribute to a deeper academic understanding of how economic and financial systems are adapting to and driving environmental sustainability, ultimately informing more effective strategies for addressing the pressing environmental challenges of our time.

1.1 Research Objective (s)

This study seeks to systematically map and evaluate the intellectual development of green economy and sustainable finance research between 2014 and 2024. Specifically, the study pursues the following objectives:

1. To examine the annual growth trajectory and citation performance of scholarly publications in the domain of green economy and sustainable finance.
2. To identify the most influential authors, institutions, countries, and publication outlets contributing to the field.
3. To analyze the intellectual structure of the research domain using co-word network analysis and thematic mapping techniques.
4. To assess the temporal evolution of dominant and emerging research themes across the study period.
5. To evaluate international and institutional collaboration patterns through co-authorship network analysis.

II. THEORETICAL REVIEW

2.1 Conceptual Foundations of Green Economy

The concept of the green economy emerged as a response to increasing environmental degradation and climate change pressures within conventional growth models. It is generally defined as an economic system that promotes low-carbon development, resource efficiency, and social inclusion while reducing environmental risks (Lee & Lee, 2022). Unlike traditional economic paradigms that treat environmental externalities as secondary considerations, the green economy framework integrates ecological sustainability into macroeconomic planning and structural transformation strategies.

The green economy literature emphasizes decoupling economic growth from environmental degradation and promoting innovation-driven transitions toward renewable energy, green infrastructure, and environmentally responsible production systems. As a result, research within this domain spans environmental economics, development studies, innovation policy, and sustainability governance.

2.2 Conceptualization of Sustainable Finance and Green Finance

Sustainable finance extends the principles of environmental sustainability into the financial system. It refers to the integration of environmental, social, and governance (ESG) considerations into investment decisions and financial market operations (European Commission, n.d.). This shift reflects the increasing recognition that climate risk, transition risk, and environmental degradation constitute financially material risks.

Within this broader framework, green finance is commonly understood as a subset of sustainable finance focused specifically on environmental objectives. It includes instruments such as green bonds, green credit facilities, sustainability-linked loans, and climate-related investment mechanisms. However, the literature frequently reveals definitional overlap between green finance and sustainable finance, with some studies using the terms interchangeably while others distinguish between environmental-only and broader ESG-based frameworks.

This conceptual ambiguity contributes to fragmentation within the research landscape. Studies vary in their operational definitions, outcome measures, and policy interpretations, making it difficult to systematically assess how the field has evolved over time.

2.3 Theoretical Fragmentation and the Need for Knowledge Mapping

The intersection of green economy and sustainable finance represents an interdisciplinary convergence between environmental policy, macroeconomics, financial economics, and sustainability governance. However, the literature remains geographically concentrated, methodologically heterogeneous, and conceptually overlapping. Research streams examine diverse outcomes such as carbon emissions, green innovation, environmental efficiency, ESG performance, and financial stability, often without a unified conceptual structure.

Given this theoretical and disciplinary fragmentation, a systematic mapping of the intellectual landscape becomes necessary. Bibliometric analysis provides a structured approach to identify dominant conceptual clusters, emerging research fronts, and patterns of collaboration within the field (Zhou *et al*., 2020). By examining publication trends, keyword co-occurrence, and collaboration networks, the present study seeks to clarify how the theoretical and empirical streams within green economy and sustainable finance have evolved between 2014 and 2024.

III. METHODOLOGY

This study employs a bibliometric analysis approach to systematically review and analyze scholarly literature related to the green economy and sustainable finance. The bibliometric method was chosen due to its robustness in quantifying and visualizing research outputs, detecting trends, and mapping thematic and collaborative networks within academic fields (Wasnik *et al*., 2024). The Scopus database was selected for this study due to its extensive and multidisciplinary coverage of peer reviewed academic journals, conference proceedings, and book chapters. Scopus is widely recognized for its comprehensive bibliographic data, making it highly suitable for bibliometric analyses. The structured search query used for data retrieval from Scopus on 31 July 2025 was as follows:

TITLE-ABS-KEY ("green economy" AND ("financial management" OR "green finance" OR "sustainable finance" OR "environmental accounting")) AND PUBYEAR > 2013 AND PUBYEAR < 2025 AND (EXCLUDE (DOCTYPE , "tb")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (EXACTKEYWORD , "Green Economy") OR LIMIT-TO (EXACTKEYWORD , "Green Finance") OR LIMIT-TO (EXACTKEYWORD , "Sustainable Development") OR LIMIT-TO (EXACTKEYWORD , "Environmental Economics") OR LIMIT-TO (EXACTKEYWORD , "Economic Development") OR LIMIT-TO (EXACTKEYWORD , "Innovation") OR LIMIT-TO (EXACTKEYWORD , "Investments") OR LIMIT-TO (EXACTKEYWORD , "Sustainability") OR LIMIT-TO (EXACTKEYWORD , "Finance") OR LIMIT-TO (EXACTKEYWORD , "Green Development") OR LIMIT-TO

(EXACTKEYWORD , "Financial System") OR LIMIT-TO (EXACTKEYWORD , "Economics") OR LIMIT-TO (EXACTKEYWORD , "Financial Management") OR LIMIT-TO (EXACTKEYWORD , "Economic Growths") OR LIMIT-TO (EXACTKEYWORD , "Economic And Social Effects") OR LIMIT-TO (EXACTKEYWORD , "Environmental Sustainability") OR LIMIT-TO (EXACTKEYWORD , "Environmental Regulations") OR LIMIT-TO (EXACTKEYWORD , "Green Innovation"))

Initially, a total of 754 publications were retrieved using the search query. Publications included in the analysis were limited to peer reviewed journal articles, conference papers, and book chapters published in English. Publications classified as editorials, letters, reviews, book reviews, non-peer-reviewed papers, and publications in languages other than English were excluded. Additionally, any publication missing essential bibliographic details was excluded. Following these criteria, the final count of publications analyzed was reduced to 692 (Figure 1). Extracted data were subjected to thorough preprocessing, involving cleaning, standardization, and deduplication, ensuring data accuracy and consistency.

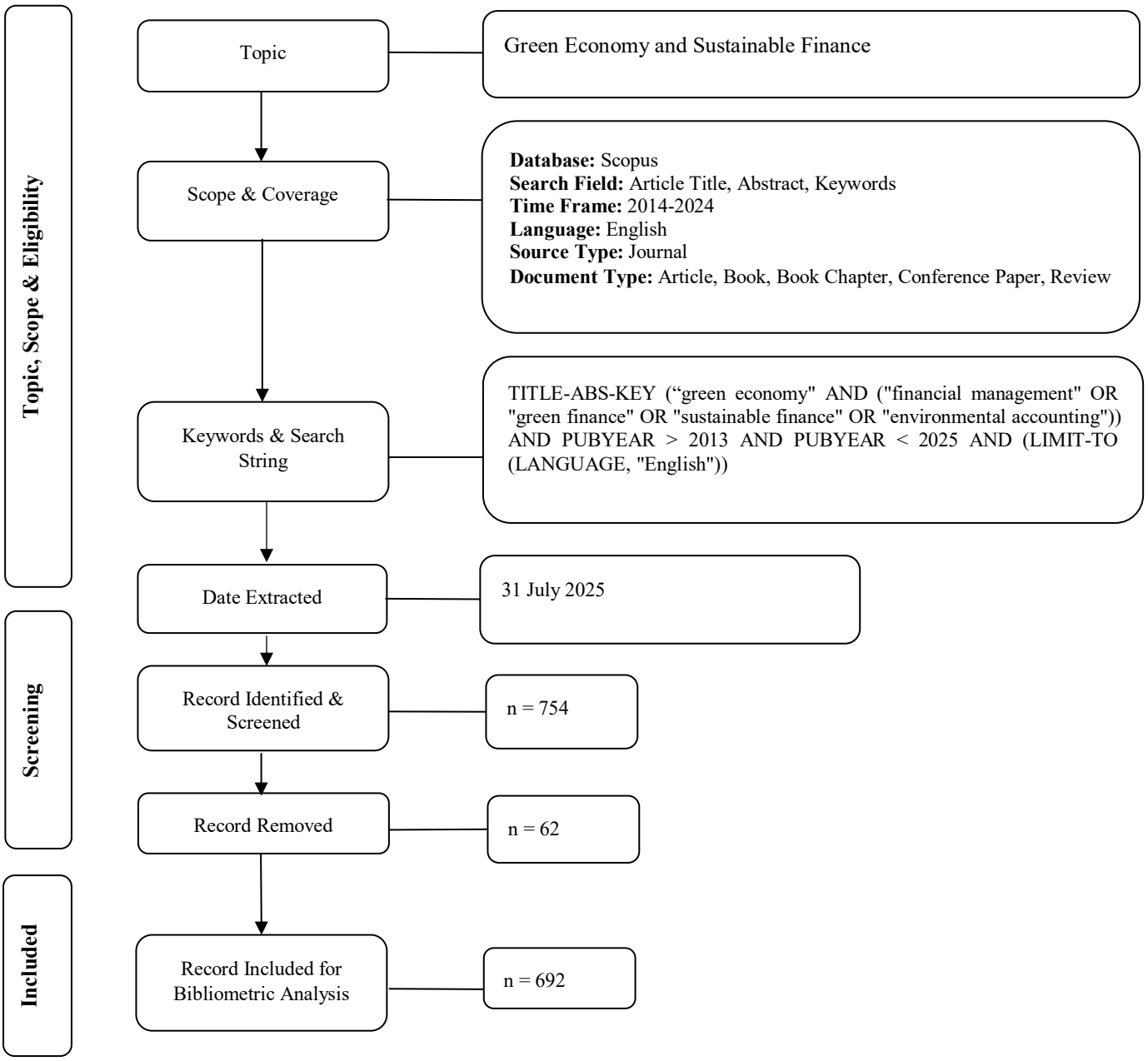

Figure 1
Flow Diagram of the Search Strategy

The analysis was conducted in two key stages (Figure 2)

Performance Analysis: This stage focused on characterizing the overall publication trends within the dataset. Bibliometric metrics were employed to analyze publication volume, citation counts, authorship patterns, publication

outlets (journals), and institutional affiliations. These metrics provided insights into the most productive authors, influential journals, and leading research institutions contributing to the field

Science Mapping: This stage delved deeper into the intellectual structure and thematic relationships within the research domain. Network analysis techniques, primarily co-occurrence analysis, were utilized to explore the frequent co-appearance of keywords within the publications. This allowed the identification of dominant conceptual clusters, thematic evolution over time, and the central themes that define the field. The co-occurrence-based approaches included keyword frequency analysis, thematic mapping, and conceptual structure visualization, revealing the underlying knowledge organization and emerging research priorities. Co-citation analysis was not applied in this study.

This study employed R software, a powerful open source that is widely used for statistical computing and data visualization, to analyze and visualize the bibliometric data extracted from the scopus database. Within R, Bibliometrix was the primary tool chosen for its functionalities specifically designed for bibliometric analysis. For the purposes of science mapping and performance analysis, Biblioshiny, a web interface specifically designed for Bibliometrix, was utilized. Biblioshiny offers a user-friendly interface for interacting with the powerful functionalities of Bibliometrix (Aria & Cuccurullo, 2017). However, it is worth also to acknowledge that other software options exist for bibliometric analysis and visualization, such as VOSviewer. Though, the choice of R, Bibliometrix, and Biblioshiny in this study was based on their specific strengths in terms of R integration, rapid updates, and a user-friendly interface for science mapping and performance analysis.

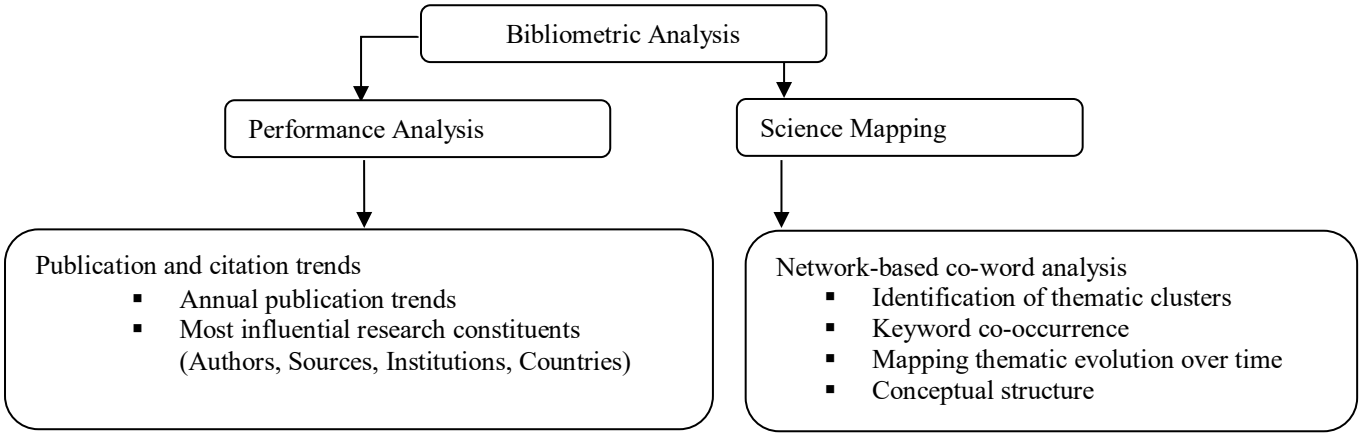

Figure 2
The Two-Stage Bibliometric Analysis Workflow Applied in this Study

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Annual Scientific Production

The annual scientific output on green economy and sustainable finance from 2014 to 2024 demonstrates a clear and sustained upward trajectory, indicative of the field's increasing academic maturity and relevance. In the initial years (2014–2017), scholarly activity remained limited, with annual publication counts not exceeding three articles. This relatively modest output reflects the emergent status of the field during that period, when linkages between finance and sustainability were only beginning to crystallize within academic discourse. A marked increase in publication volume became evident from 2018 onwards (Figure 3), with annual outputs rising to 9 publications in 2018, 31 in 2019, and escalating significantly to 87 in 2020. The trend continued with 131 publications in 2021, peaking in 2022 with 135 articles, the highest recorded in the dataset. Although 2023 sustained a high level of output (111 publications), a moderate decline observed in 2024 (47 publications as of mid-year) is likely attributable to indexing lags rather than a genuine reduction in scholarly interest.

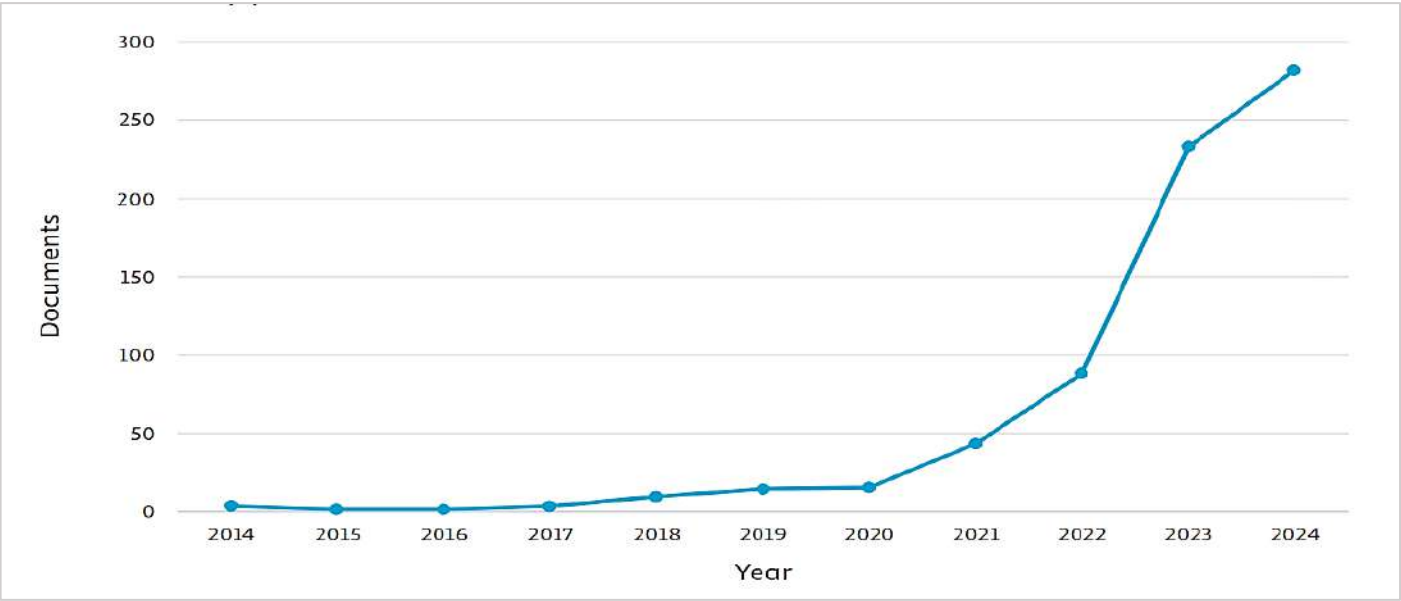

Figure 3
Annual scientific production (2014-2024)

This accelerated growth corresponds with the increasing integration of sustainability into global financial policy and regulatory frameworks. The post 2018 surge in publications temporally aligns with the implementation of the European Union's Sustainable Finance Action Plan, the proliferation of Environmental, Social, and Governance (ESG) considerations in institutional investment, and the rapid expansion of green bond markets. For example, Tsipas *et al*., (2024) examine the efficiency of green bonds in emerging markets, while Zhang *et al*., (2024) explore ESG performance as a driver of corporate green innovation in China. The institutionalization of sustainable finance principles through policy instruments such as the EU green taxonomy has also contributed to the field's conceptual consolidation and scholarly attention (Tettamanzi *et al*., 2024). The annual growth pattern not only signals a transition from fragmented inquiries to a coherent research agenda but also reflects the field's interdisciplinary nature. Contributions increasingly draw from finance, economics, environmental studies, and public policy, positioning green economy and sustainable finance as a critical domain for addressing complex, cross-cutting global sustainability challenges.

4.1.2 Country Scientific Productivity

The country level distribution of publications reveals that China leads as the most productive country, contributing over 500 publications during the study period (Figure 4). This is reflective of China's state driven emphasis on ecological modernization and substantial investments in green infrastructure and finance. Prominent institutions such as Tsinghua University and Fudan University appear frequently in the authorship data. Following China, the United Kingdom, Pakistan, India, and Malaysia constitute the next most productive countries. The UK's output is rooted in academic centers like the University of Oxford and LSE, which have pioneered interdisciplinary research on sustainability and finance. Pakistan and Malaysia, meanwhile, reflect growing regional interest in Islamic green finance and renewable energy policy. The United States, while typically strong in financial scholarship, appears in the top ten but with fewer publications than expected. This may be attributed to thematic differences in classification or the preference of U.S. based researchers for alternative indexing platforms. Other countries in the top 10 include Russia, Australia, Saudi Arabia, and Turkey.

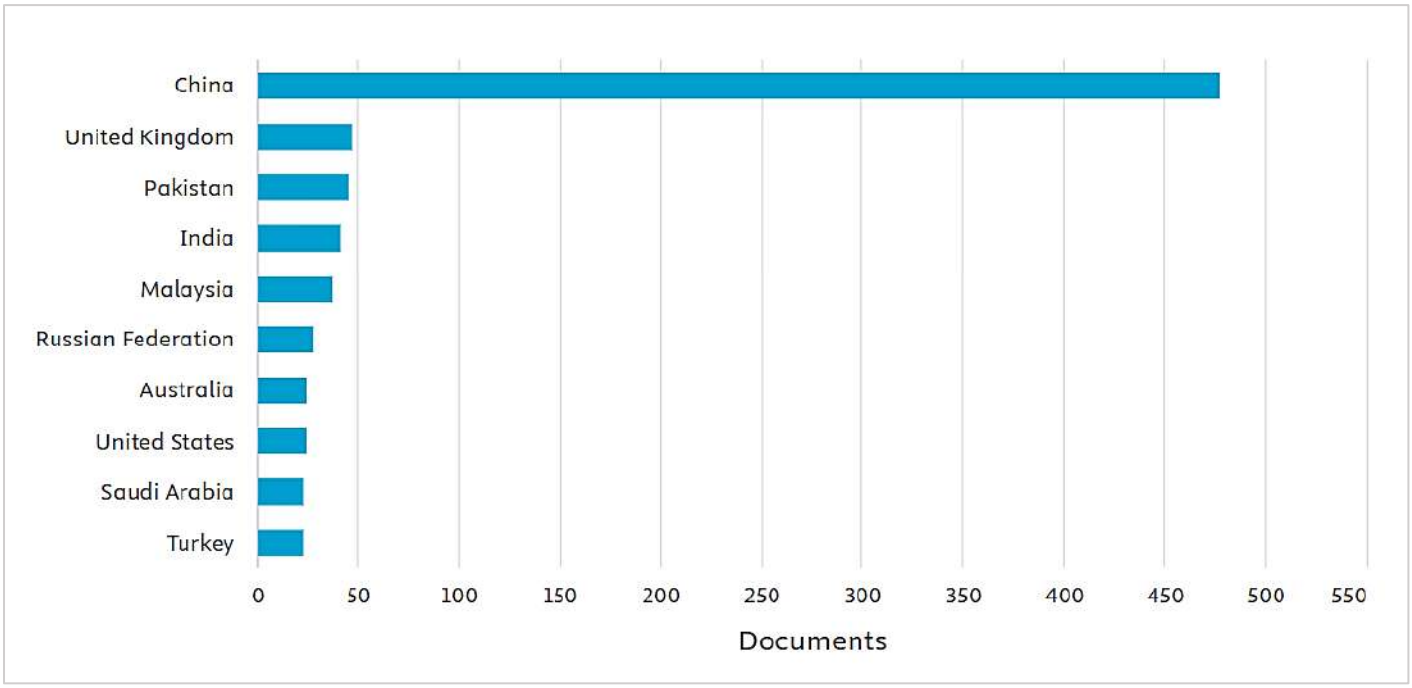

Figure 4

Top Contributing Countries on Green Economy and Sustainable Finance (2014–2024), Based on Number of Publications

4.1.3 Most Productive Authors and Contributing Affiliations

The analysis of publication counts across the dataset from 2014 to 2024 (Figure 5) highlights the most prolific contributors to green economy and sustainable finance scholarship. The most productive author in the field is Farhad Taghizadeh-Hesary, with 10 publications related to green economy and sustainable finance. His research frequently explores the intersection of fiscal policy, energy transition, and regional development, particularly in Asia. Following closely is Chi-Chuan Lee (C.C. Lee), with 8 publications, known for highly cited work examining the productivity effects of green finance in China. Other leading contributors include Muhammad Mohsin (6 publications), Dong K., and R.L. Ibrahim, each with 5 or more scholarly outputs. These authors have shaped the field through both empirical modeling and policy analysis, contributing to regional and global understandings of sustainable finance mechanisms.

Institutional output analysis (Figure 6), indicates that Jiangsu University leads in productivity, with 19 publications during the study period. Southwestern University of Finance and Economics and the Lebanese American University follow closely, each contributing a substantial volume of work. Notably, the Adnan Kassar School of Business and the University of International Business and Economics also appear among the top contributors, reflecting a strong academic presence in both Asia and the Middle East. Other notable institutions include Tokai University (Japan) and Zhongnan University of Economics and Law (China), indicating that research on green finance and sustainability is increasingly diverse in institutional origin. These affiliations represent major centers of research on environmental policy integration, green innovation, ESG finance, and carbon market mechanisms. The dominance of authors such as Taghizadeh-Hesary and Lee, along with institutions based in China, Japan, and the Middle East, underlines the geopolitical diversity and regional leadership in this field. While Chinese institutions contribute a high volume of output, the citation impact varies, suggesting that some institutions prioritize quantity while others achieve influence through landmark publications. Inclusively, this pattern reveals a maturing research landscape with emerging centers of excellence outside traditional Western academic strongholds.

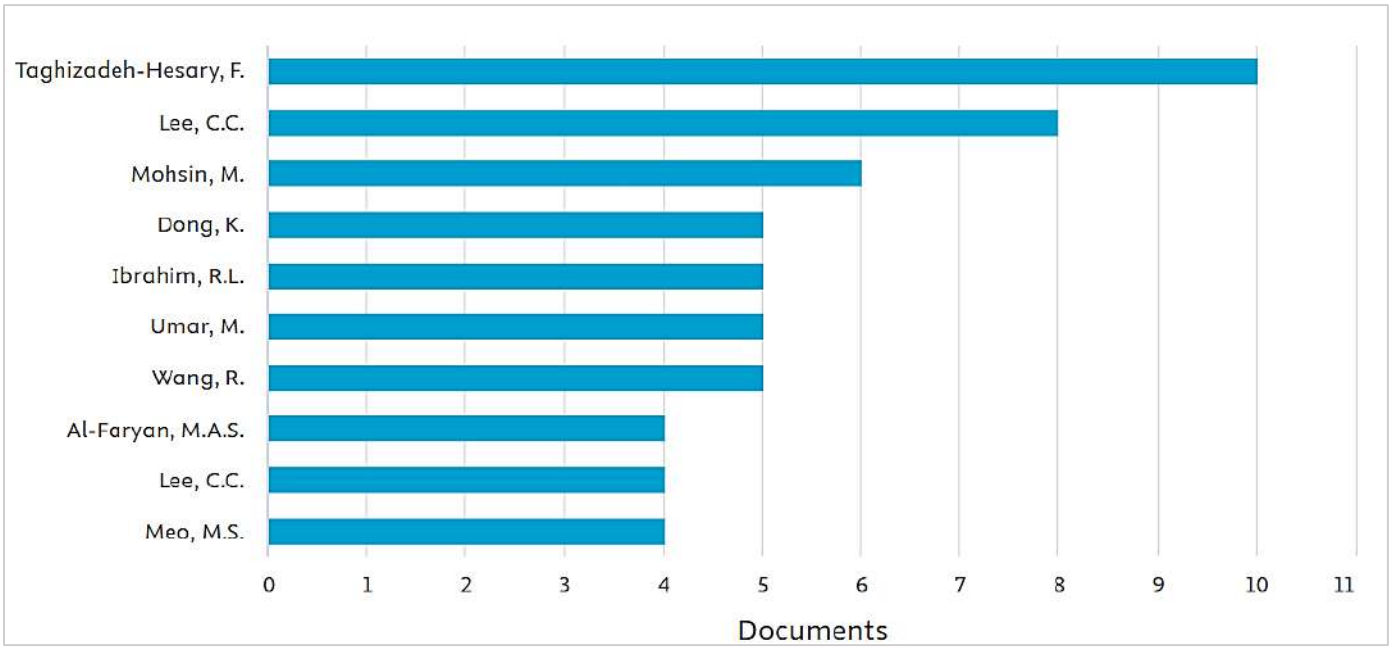

Figure 5

Top 10 most Productive Authors on Green Economy and Sustainable Finance (2014–2024), Based on Number of Publications.

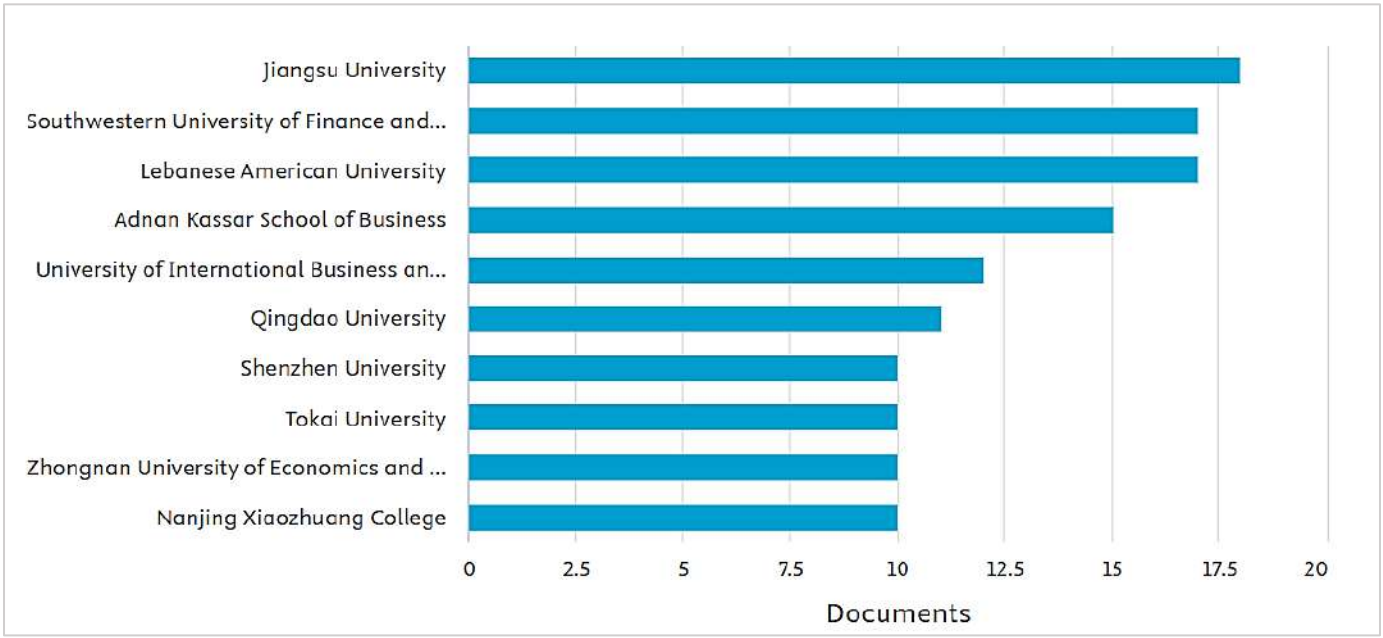

Figure 6

Top 10 Contributing Affiliations on Green Economy and Sustainable Finance (2014–2024).

4.1.4 Most Globally Cited Documents

Citations serve as indicators of scholarly influence and recognition. Analyzing the most globally cited documents within the dataset reveals the foundational works shaping the field of green economy and sustainable finance between 2020 and 2024. The most cited paper is by Lee and Lee (2022), titled *How does green finance affect green total factor productivity? Evidence from China*, with 841 citations. This study investigates the role of green finance in enhancing green total factor productivity in China, positioning it as a key contribution in linking financial mechanisms to sustainability outcomes (Lee & Lee, 2022). Following closely is Zhang *et al*. (2021) with *public spending and green economic growth in BRI region: Mediating role of green finance*, cited 609 times. The paper offers a comprehensive econometric evaluation of how public fiscal spending and green finance collectively influence economic growth in the Belt and Road Initiative (BRI) countries (Zhang *et al*., 2021).

Also notable is the work by Irfan *et al*. (2022), *Influence mechanism between green finance and green innovation*, cited 555 times, which explores how regional policies mediate the relationship between finance and

innovation in the green sector (Irfan *et al*., 2022). Zhou *et al.* (2020), in their study *Impact of green finance on economic development and environmental quality*, with 485 citations, use provincial panel data from China to assess how green financial tools influence macroeconomic and environmental indicators (Zhou *et al*., 2020). Finally, Tan and Zhu (2022), with 414 citations, present *The effect of ESG rating events on corporate green innovation in China*, offering a nuanced look into how ESG ratings catalyze innovation through financial and managerial channels (Tan & Zhu, 2022).These highly cited publications (Figure 7) emphasize policy analysis, innovation linkages, and macroeconomic impacts of green finance. Their strong citation performance indicates their role as core references in both academic and policy-oriented literature.

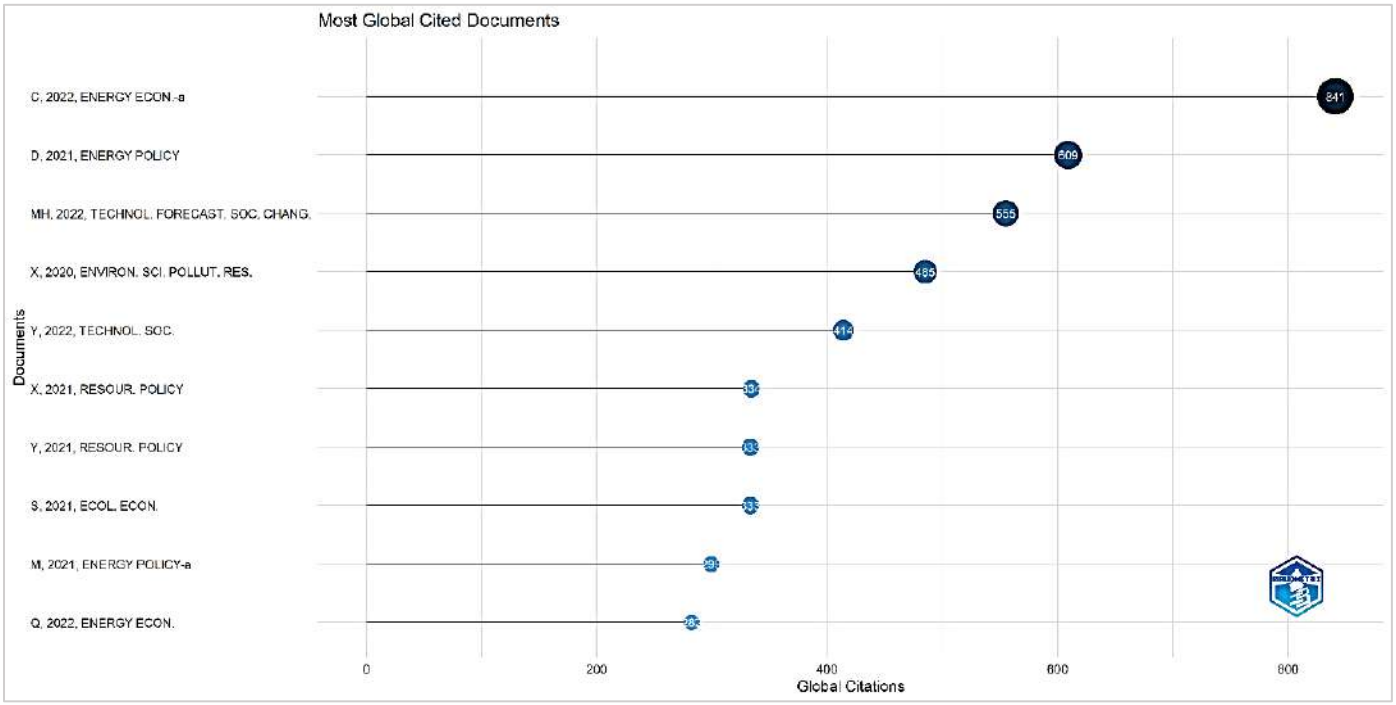

Figure 7

Top 10 most globally cited publications on green economy and sustainable finance (2014–2024), based on total citations.

4.1.5 Keyword Frequency and Emerging Topics

The analysis of keyword frequency (Figure 8) offers a clear overview of the dominant research themes in green economy and sustainable finance between 2014 and 2024. The most frequently occurring keywords include *"green economy," "sustainable development," "green finance," "economic development," "China,"* and *"environmental economics."* These terms reflect a strong scholarly focus on aligning financial systems with environmental sustainability and development objectives, particularly within regional and policy-driven contexts. The prominence of "green economy" and "green finance" signifies the consolidation of these concepts as foundational pillars of the field, while the frequent mention of "China" underscores its importance as both a policy laboratory and an empirical focus in the global green finance discourse

Figure 8
Top 10 most Frequent Keywords in Green Economy and Sustainable Finance Literature (2014–2024).

To further understand the relative importance of key concepts, a TreeMap visualization (Figure 9) was generated using author keywords. This diagram reflects the hierarchical structure and weight of dominant research topics, with larger blocks indicating higher frequency and thematic emphasis. "Green economy," "sustainable development," and "green finance" occupy the most substantial portions, reinforcing their role as foundational pillars of the field

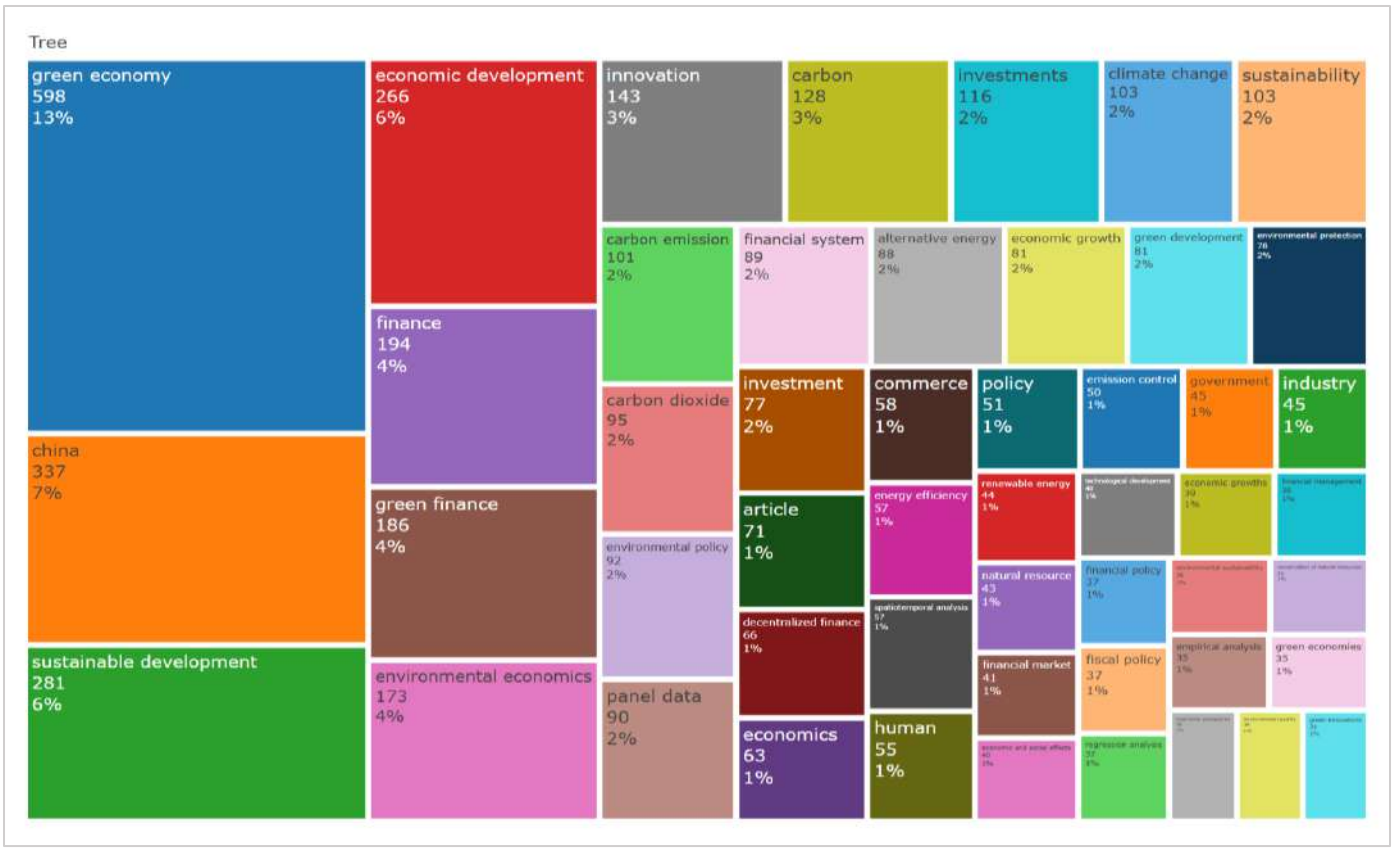

Figure 9
TreeMap of Author Keyword Occurrences in Green Economy and Sustainable Finance Literature (2014–2024).

Temporal analysis of keyword growth (Figure 10) further reveals the thematic evolution of the field. From 2014 to 2017, the occurrence of key terms remained relatively modest. However, a marked acceleration is observed from 2020 onwards. Notably, *"green economy"* saw a dramatic rise, becoming the most dominant term by 2024, followed closely by *"green finance," "economic development," "sustainable development,"* and *"China."* This growth suggests a shift in scholarly attention toward the operationalization of green transition strategies and the financial mechanisms supporting them. The rise in terms like *"innovation," "finance,"* and *"investments"* in recent years points to increased interest in the role of financial markets and instruments in enabling sustainable economic transformation. These trends collectively indicate that the field is moving from conceptual exploration to applied, policy relevant research that seeks to measure and support real world sustainability outcomes.

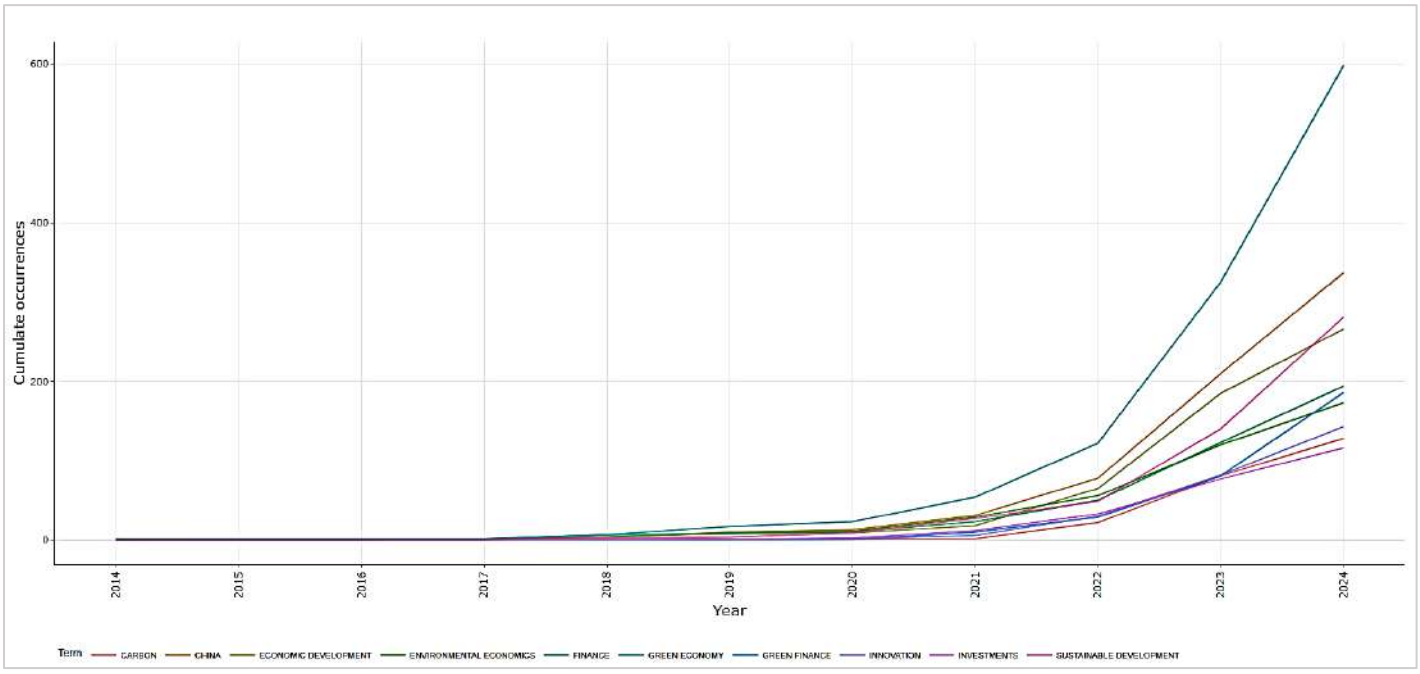

Figure 10
Thematic Evolution of Key Research Topics (2014–2024).

4.1.6 Thematic Mapping

The thematic map (Figure 11) offers a strategic visualization of key research themes in the green economy and sustainable finance literature. It organizes keyword clusters along two axes, which are the centrality, indicating relevance to the broader field, and density, representing the degree of internal thematic development. This quadrant-based approach enables identification of core, emerging, and peripheral themes.

In the upper-right quadrant, labeled *Motor Themes*, we find *"green economy," "finance,"* and *"China."* These topics are both central and well-developed, suggesting they form the intellectual and empirical core of the field. Their strong conceptual cohesion and frequent co-occurrence with other keywords highlight their importance in policy, economic modeling, and sustainability discussions. The inclusion of *"China"* reinforces earlier findings that position the country as a significant contributor to both the academic and policy dimensions of green finance. In contrast, the lower-left quadrant *Emerging or Declining Themes* includes *"sustainable development," "green finance,"* and *"investments."* These themes show lower density and centrality, which may indicate either fragmentation or early-stage evolution. Given their presence in trend analyses and rising publication frequency, it is more plausible that they represent growing areas of interest not yet fully integrated into the field's dominant research networks. Interestingly, the upper-left (Niche Themes) and lower-right (Basic Themes) quadrants remain largely unoccupied. This may reflect a lack of highly specialized or foundational subfields, suggesting opportunities for future research diversification.

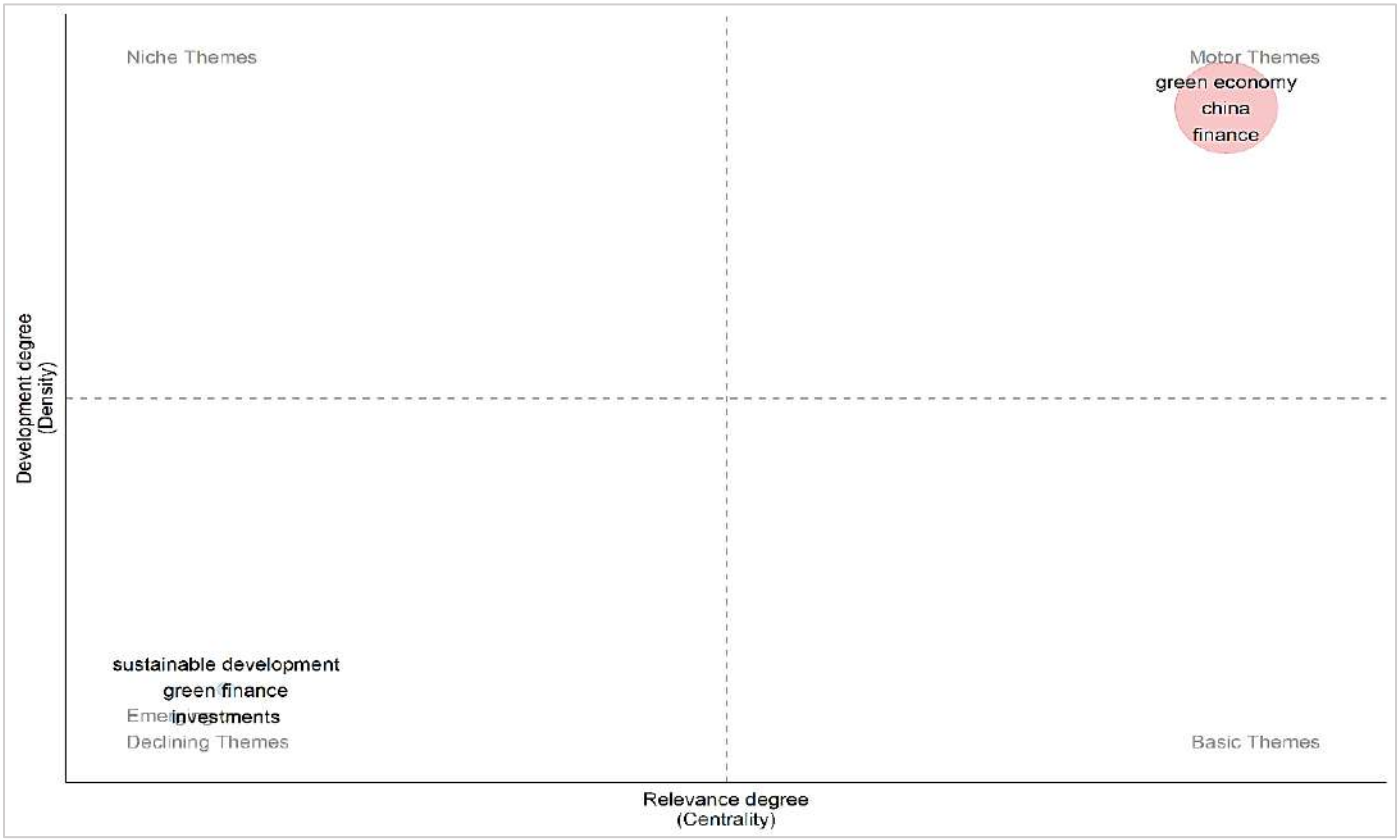

Figure 11
Thematic Map of Keyword Clusters on Green Economy and Sustainable Finance (2014–2024), Based On Centrality and Density Scores.

To uncover the intellectual structure of the research domain, a co-word network analysis was conducted using author and index keywords. This method identifies clusters of terms that frequently co-occur, thereby illuminating the conceptual organization of the field. The resulting network visualization (Figure 11) reveals two dominant thematic clusters. The first cluster, represented in red, includes terms such as *"innovation," "environmental economics," "carbon," "economic development,"* and *"China."* This group is closely aligned with data-intensive and policy-oriented research, focusing on macroeconomic frameworks, technological progress, emissions control, and national development strategies. The prominent placement of *"China"* underscores the country's substantial contribution to both academic output and real-world policy experimentation in green economic transformation. The second cluster, depicted in blue, centers on keywords such as *"green finance," "climate change," "sustainable development," "renewable energy,"* and *"clean energy."* This cluster reflects an environmentally focused agenda, engaging with sustainable finance mechanisms designed to mitigate climate risks. The inclusion of terms like *"economic growth," "financial system,"* and *"energy policy"* further illustrates the interdisciplinary links between economic models, financial instruments, and ecological sustainability.

The dense interconnections between these clusters highlight the integrative nature of the field, which bridges economics, finance, energy systems, and environmental science. Notably, bridging concepts such as *"green economy," "sustainability,"* and *"green finance"* appear as central nodes in the network. Their position indicates that they serve as conceptual linkages between empirical policy analysis and normative goals of environmental stewardship.

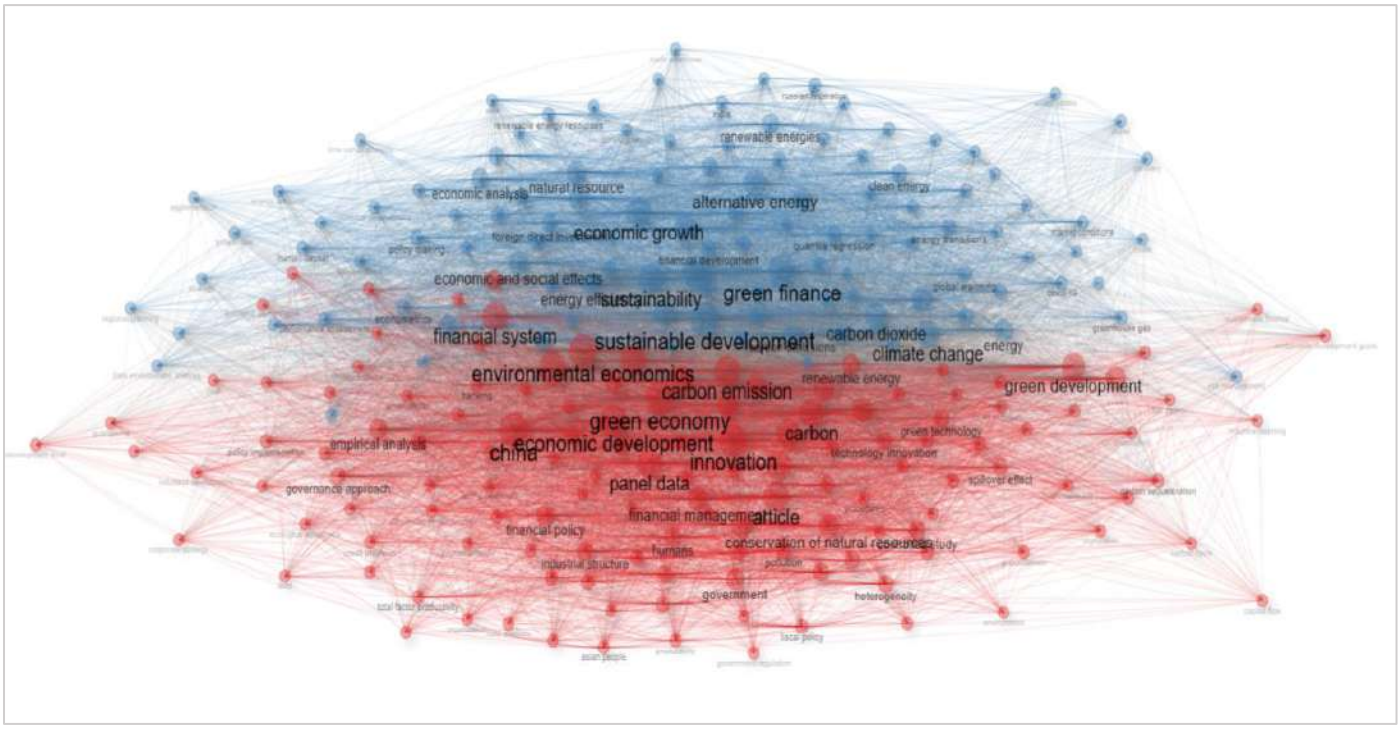

Figure 12

Conceptual Structure Map of Green Economy and Sustainable Finance Research (2014–2024), Based on Co-Word Network Analysis.

The map visualizes thematic clusters derived from keyword co-occurrence analysis using multidimensional scaling. Each cluster represents a group of conceptually related research themes. The spatial proximity between terms indicates conceptual similarity, while color differentiation reflects cluster membership.

The conceptual structure map reveals two dominant thematic clusters. The first cluster centers on macroeconomic sustainability and environmental innovation, linking green economy with economic growth, carbon emissions, and policy instruments. The second cluster emphasizes financial mechanisms, including green finance, ESG integration, and climate-related investment instruments. The spatial separation between clusters suggests partial conceptual differentiation, while overlapping keywords indicate increasing interdisciplinary convergence.

Complementing the thematic map, a co-occurrence network of author keywords (Figure 13) was constructed to capture the structural interrelations between research concepts. Two primary clusters emerged. The first, centered on “green economy,” “carbon,” and “economic development,” aligns with policy driven and macroeconomic research. The second cluster includes “green finance,” “climate change,” and “renewable energy,” reflecting a finance-environment nexus. Their proximity and centrality indicate a growing convergence of scholarly discourse around sustainability and financial innovation.

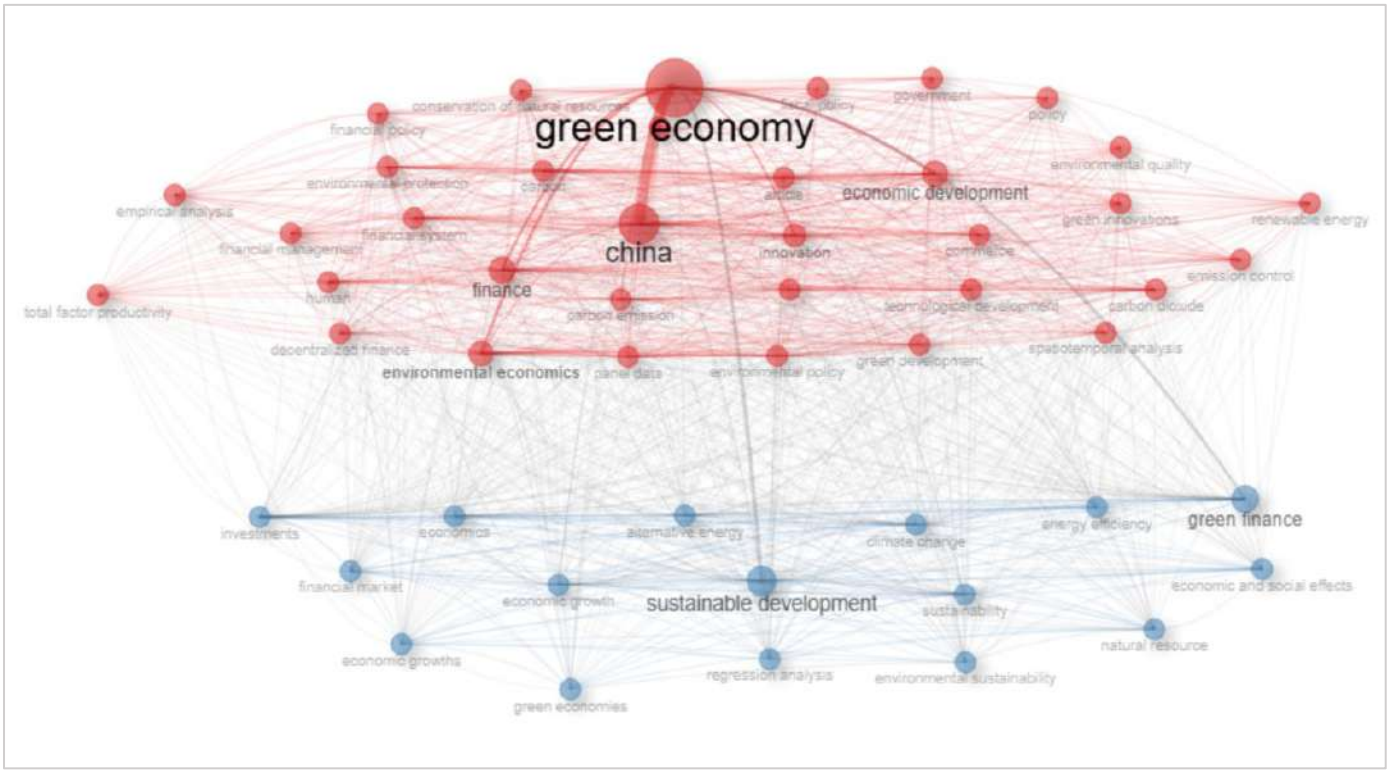

Figure 13
Keyword Co-occurrence Network of Green Economy and Sustainable Finance Research.

Nodes represent keywords meeting the minimum occurrence threshold, while links indicate co-occurrence relationships within documents. Node size reflects keyword frequency, and color grouping represents thematic clusters identified through community detection algorithms.

4.1.7 Collaboration Network Analysis

Collaboration among authors, institutions, and countries is a vital dimension in understanding the co-production and diffusion of knowledge in green economy and sustainable finance. The country-level collaboration network (Figure 14) reveals that China maintains the most extensive and dense network of co-authorship ties. Chinese researchers frequently collaborate with counterparts in Malaysia, India, and the United Kingdom, reflecting China's strategic integration into transnational sustainability dialogues. These connections align with broader international efforts, including China's Belt and Road green finance initiatives and participation in global climate finance frameworks. The United Kingdom and Malaysia also emerge as important collaborators, bridging research efforts across Europe, Asia, and the Middle East. While the United States does not dominate in publication volume within this dataset, it maintains bilateral links particularly with the UK and select European countries highlighting its continued engagement in cross-regional sustainability research.

At the institutional level, the most active organizations include Jiangsu University, Southwestern University of Finance and Economics, and the Lebanese American University, each forming robust co-authorship clusters. These institutions demonstrate strong collaborative behavior, particularly in policy focused and empirical research on green finance. Contrary to expectations, elite universities such as Tsinghua, Oxford, and Melbourne do not appear prominently in this dataset, suggesting that impactful collaboration is currently concentrated within a broader and more regionally distributed set of academic actors. The collaboration networks reveal an increasingly globalized research architecture, with both North–South and South–South partnerships expanding in scope. While China leads in density and output, intellectual contributions are distributed across a wide variety of national and institutional actors, reflecting the growing complexity and interdisciplinarity of sustainability finance research.

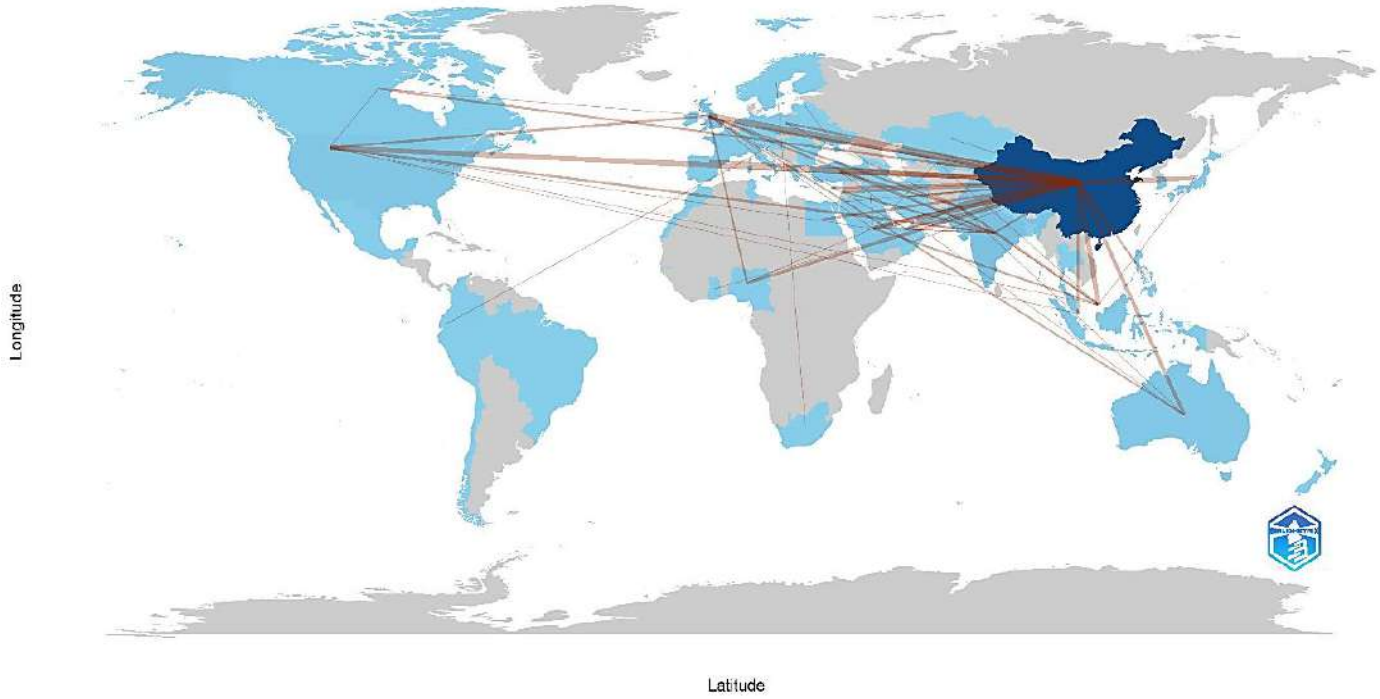

Figure 14
International Co-Authorship Network on Green Economy and sustainable Finance (2014–2024), Based on Country Collaboration.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

This bibliometric study provides a comprehensive overview of the intellectual, conceptual, and collaborative development of green economy and sustainable finance research between 2014 and 2024. Based on a dataset of 692 peer-reviewed publications retrieved from Scopus and analyzed using the Bibliometrix R package, the study maps the evolution of scholarly output, highlights leading contributors, and uncovers the structural and thematic dynamics shaping the field. The findings reveal a marked increase in research output over the past decade, particularly following the adoption of global policy frameworks such as the Paris Agreement and the United Nations Sustainable Development Goals (SDGs). China emerges as the most productive country in both publication volume and collaboration centrality, followed closely by Malaysia, India, and the United Kingdom. Conceptual analysis indicates that the field has undergone substantial maturation. Early research themes were largely focused on environmental sustainability and climate change; however, more recent work demonstrates a shift toward finance specific mechanisms, including green bonds, ESG integration, and climate risk disclosure. These emerging concepts, particularly after 2020, reflect a growing convergence between environmental objectives and financial innovation. Thematic and structural mappings further highlight the interdisciplinary character of the field, linking economics, finance, environmental science, and policy. Central concepts like “green economy,” “sustainability,” and “economic development” function as thematic bridges, facilitating knowledge integration across domains. Collaboration network analysis highlights strong and evolving global partnerships. China functions as the central hub in international co-authorship, with significant collaboration ties to the UK, Malaysia, and India. While the United States features in bilateral partnerships, it is not dominant in this dataset. At the institutional level, co-authorship clusters are concentrated among mid-tier universities in Asia and the Middle East, revealing the growing importance of South–South and regional collaborations in driving research productivity and innovation.

This study is not without limitations. It relies solely on English-language publications indexed in Scopus, potentially excluding valuable contributions from non-English-speaking regions or regionally focused journals. Expanding the analysis to include other databases such as Web of Science or Dimensions and incorporating multilingual sources could enhance future studies. Despite these limitations, the field of green economy and sustainable finance is vibrant, globally interconnected, and rapidly evolving. It holds significant promise for advancing both scholarly understanding and practical solutions for transitioning to a sustainable global financial system.

5.2 Recommendations

Based on the findings of this bibliometric analysis, future research on green economy and sustainable finance should expand both methodologically and conceptually. Scholars are encouraged to incorporate multiple databases beyond Scopus and include multilingual publications to enhance representativeness and reduce regional bias. Further studies should apply advanced bibliometric techniques such as co-citation analysis and bibliographic coupling to better uncover the intellectual foundations and theoretical evolution of the field. Empirical research should also move beyond macro-level trend analysis toward impact-oriented assessments of green financial instruments, climate risk disclosure, transition finance, and sustainable fintech innovations. Comparative cross-country studies are particularly needed to examine how institutional quality, regulatory environments, and financial market maturity shape the effectiveness of sustainable finance mechanisms.

From a policy and practice perspective, governments and financial institutions should strengthen regulatory frameworks, ESG disclosure standards, and green taxonomies to enhance transparency and reduce greenwashing risks. Policymakers are encouraged to support innovation through targeted fiscal incentives, green credit systems, and climate finance pilot programs, particularly in emerging economies. Financial institutions should integrate climate risk stress-testing, sustainability-linked lending, and measurable environmental performance indicators into core financial operations. Furthermore, enhanced international and interdisciplinary collaboration between academia, policymakers, and industry actors will be essential to accelerate the transition toward a resilient and sustainable global financial system.

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