

Green Finance Meets FinTech: Mapping the Evolution of a Sustainable Finance Research Frontier

Pushti Ganatra, Joshitha Reddy Kolanu, Tanishka Magdum, Sean Solano Paul*

Researcher, John Nash Research Program, Mumbai, India – 400030

*Corresponding Author

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ABSTRACT:

The global commitment to the United Nations' Sustainable Development Goals has driven increasing integration of sustainability into financial systems worldwide. As climate change becomes more urgent, there is rising pressure to align financial systems with sustainability goals. In this context, green finance and financial technology (FinTech) are often seen as tools that can support more sustainable investment. However, research in this area is still developing and spread across different disciplines, making it difficult to understand how these ideas connect. This study examines existing research on green finance and FinTech through a bibliometric and network analysis. Using a dataset of 168 peer-reviewed papers retrieved from the Scopus database, the study analyses publication trends, key contributors, and relationships between research themes using tools such as Bibliometrix and VOSviewer. The findings show that interest in this field has grown rapidly in recent years, with a large share of research coming from countries such as China and India. While topics like FinTech and green finance appear frequently, newer areas such as artificial intelligence and digital financial systems are also becoming more prominent. At the same time, a key pattern emerges: most studies either focus on how these technologies work or on their broader economic and environmental impact, but rarely connect the two clearly. This suggests that, despite growing attention, there is still limited understanding of how financial technologies translate into real sustainability outcomes. The study highlights the need for more integrated approaches to better understand this relationship.

Key words: Green Finance; Bibliometric analysis; FinTech; Carbon Neutrality

INTRODUCTION

At the Paris Agreement, adopted during the COP21 climate summit, global leaders committed to limiting the rise in global temperatures and reducing greenhouse gas emissions in order to mitigate the long-term impacts of climate change. The agreement emphasized the need to align financial systems with environmental sustainability objectives and strengthen international cooperation in climate action. Building on this commitment, the United Nations introduced the Sustainable Development Goals (SDGs), which provide a framework for integrating environmental sustainability into economic and financial decision-making processes. These global initiatives highlight the importance of directing financial flows toward activities that support carbon neutrality and environmentally sustainable development (Kwong, Kwok, & Wong, 2023).

FinTech is increasingly studied for its ability to improve financial transparency, efficiency, and accessibility through digital innovation. According to Kwong et al. (2023), FinTech introduces technological advancements that enhance financial processes, improve data availability, and support innovative financial instruments aligned with sustainability goals. Similarly, the Green FinTech 2.0 published by the UK Centre for Greening Finance and Investment highlights that advancements in artificial intelligence, big data analytics, and digital infrastructures enable improved measurement of environmental performance and climate-related financial risks. As climate change increasingly affects financial stability and investment decisions, FinTech has become an important research focus due to its potential to enhance sustainable finance mechanisms and support the transition to carbon neutrality (Green FinTech 2.0, UK Centre for Greening Finance and Investment).

FinTech, a contraction of “Financial Technology”, refers to technology-enabled financial solutions encompassing the entire spectrum of financial services and products (Arner, Barberis and Buckley, 2015). Green finance refers to the allocation of capital toward companies and projects whose activities support environmental sustainability and climate change mitigation (Ozili, 2022). The intersection of Green Finance and FinTech is a key area of research that examines how technological innovation can support environmentally sustainable investment. Green finance focuses on allocating capital, such as loans and investments, to support environmentally sustainable activities, while FinTech provides digital tools that improve environmental data measurement, transparency, and the efficiency of financial decision-making (Kwong et al., 2023). The integration of FinTech tools with green finance supports climate risk modelling and the development of financial instruments that contribute to carbon neutrality (Kwong et al., 2023). Therefore, the intersection of FinTech and Green Finance plays an important role in facilitating technology-enabled solutions that support sustainable finance.

Despite the increasing importance of Green FinTech, existing research remains fragmented across disciplines such as finance, economics, environmental studies, and information systems. Kwong et al. (2023) emphasise that the literature examining the relationship between Green Finance and FinTech is still developing and lacks a clearly defined intellectual structure. Many studies examine financial innovation or sustainability independently, resulting in a limited understanding of how digital technologies contribute to environmentally sustainable financial systems (Kwong et al., 2023). As research output continues to grow, it becomes necessary to systematically assess the progression of this interdisciplinary field in order to identify dominant themes, influential contributions, and emerging research directions.

Bibliometric analysis offers a structured approach to mapping academic literature, evaluating research trends, and highlighting gaps requiring further investigation, particularly in emerging areas shaped by technological innovation (Sanga & Aziakpono, 2023). Therefore, a bibliometric and network-based examination of the literature on Green Finance and FinTech provides valuable insights into how this research domain is evolving and where future scholarly attention is needed (Kwong et al., 2023; Sanga & Aziakpono, 2023). This paper analyses publication trends, key contributors, collaboration networks, and thematic clusters within the technology-enabled sustainable finance literature using data from the Scopus database until 2026, in order to identify the intellectual structure and future research directions of Green Finance and FinTech.

LITERATURE REVIEW

FinTech has been widely recognised as a transformative force within the latest financial systems. Lee and Shin (2018) describe fintech as a disruptive innovation reshaping traditional financial markets by leveraging information technology to enhance efficiency, reduce transaction costs, and improve the quality of financial services.

Green finance aims to reallocate capital towards more environmentally sustainable investments; however, existing literature highlights significant inefficiencies in this process. Campiglio (2016) argues that financial systems play a crucial role in supporting the transition to a low-carbon economy, yet they often fail to allocate sufficient capital toward green investments due to risk uncertainty, market imperfections, and structural constraints. In addition, empirical evidence suggests that the combined development of fintech and green finance contributes directly to environmental sustainability outcomes. Zhou et al. (2024) find that green finance, supported by fintech development, plays a significant role in reducing carbon emissions and improving environmental quality, highlighting its importance in achieving long-term sustainability goals. Liu (2025) finds that the interaction among fintech development, green finance, and environmental policy significantly reduces CO₂ emissions, highlighting the importance of financial technologies in advancing carbon neutrality goals.

Given these limitations in green finance, recent literature has increasingly examined how fintech can address these inefficiencies and reshape sustainable financial systems. The intersection of fintech and green finance emerges from the ability of digital technologies to address inefficiencies inherent in sustainable capital allocation. While green finance seeks to redirect capital toward environmentally sustainable investments, its effectiveness is often constrained by information gaps and risk uncertainty. In this context, fintech provides mechanisms to improve allocation efficiency. Liu and You (2023) show that fintech reduces information

asymmetries and enhances green credit allocation, enabling more targeted financing of sustainable activities. Hu et al. (2025) demonstrate that fintech-enabled green finance influences firm-level investment behavior and financial performance, with varying impacts across different stages of the corporate life cycle. Furthermore, these effects are not uniform. Al Doghyan and Chong (2023) demonstrate that the relationship between fintech adoption and environmental sustainability is mediated through green finance, green investment, and green innovation, indicating that technological financial systems contribute to sustainability indirectly by enabling innovation-driven transitions. Hemanand et al. (2022) show that AI-driven models enhance the evaluation of green finance initiatives by improving predictive accuracy and supporting more informed decision-making in sustainability-oriented investments. However, Zaid et al. (2025) argue that the effectiveness of fintech in supporting green finance depends on institutional quality, digital infrastructure, and technological readiness.

Despite these advances and the increasing volume of research on fintech and green finance, the existing literature remains fragmented and uneven in its scope. In light of this fragmentation, several studies have adopted bibliometric and network-based approaches to better understand the structure of research on fintech and green finance. For instance, Kwong et al. (2023) conduct a bibliometric analysis of green finance and fintech research, identifying key themes, intellectual clusters, and emerging research directions. Their study highlights that the literature is widely dispersed across multiple domains, including financial innovation, environmental sustainability, and technological development, with limited integration between them.

Addressing this need, bibliometric and network-based analyses reveal the interconnectedness of research topics by mapping relationships among keywords, citations, and thematic clusters. Kwong et al. (2023) show that areas such as green finance, fintech innovation, and sustainability transitions are linked but often develop in parallel rather than as a unified research stream. By systematically mapping these relationships, such approaches provide a more comprehensive understanding of how knowledge in the field is structured. As a result, bibliometric and network analysis have become important tools for capturing the complexity of sustainable finance research and for identifying how fintech innovations are positioned within this evolving landscape.

RESEARCH METHODOLOGY

Bibliometric analysis is a research method that studies academic publications using data such as citations, authorship, and keywords. Green finance and Fintech are particularly well-suited to this type of analysis because they have grown rapidly and span multiple disciplines, including economics, environmental studies, and financial systems. In addition, the growing role of Fintech has added another layer of complexity, as digital technologies now influence how financial systems support environmental goals (Kwong et al., 2023; Xu et al., 2024). As a result, the number of academic publications in this field has increased significantly over time, making it difficult to study using only qualitative methods. Bibliometric analysis helps address this challenge by organizing large amounts of research into clear patterns and themes. It allows researchers to identify key contributors, track the field's growth, and understand how different topics are connected. Because of these advantages, bibliometric analysis provides a reliable and efficient approach for examining the overall structure and development of green finance research.

The research follows a systematic process that includes data collection, data filtering, and analysis. Scopus was selected because it is one of the most comprehensive and reliable databases for academic research. It includes peer reviewed journal articles and provides detailed metadata, such as author information, institutional affiliations, keywords, and citation counts. These features make it highly suitable for bibliometric studies, as they allow for accurate comparison and analysis across a large number of publications (Baas et al., 2021; Singh et al., 2023). In addition, Scopus allows users to export structured datasets that can be used with bibliometric software for further analysis. The search was conducted using keywords such as “green finance” and “Fintech”. These keywords were selected because they directly reflect the study's focus and are widely used in the literature. Boolean operators such as ‘AND’, ‘OR’ were used to combine these terms and improve the precision of the search results.

The initial search in Scopus returned 1,200 publications. To ensure that the dataset was both relevant and reliable, a detailed filtering process was applied. First, duplicate records were removed. Next, the titles and abstracts of the remaining papers were reviewed to exclude studies that were not directly related to green finance or Fintech.

Papers with missing or incomplete bibliographic information were also removed to maintain consistency in the dataset. Finally, only journal articles and review papers were included, while other document types, such as editorials and short notes, were excluded. After completing these steps, the final dataset consisted of 168 high quality publications. This filtering process helped ensure that the analysis was based on accurate and relevant data (Khan et al., 2022; Singh et al., 2023).

The analysis in this study is based on two main methods: performance analysis and science mapping. Performance analysis focuses on measuring the productivity and impact of research within the field. It examines factors such as the number of publications, citation counts, and contributions from authors, journals, institutions, and countries. This helps identify the most influential contributors and understand how research output has changed over time.

Science mapping is used to explore relationships among research topics and to understand the field's overall structure. This includes keyword co-occurrence analysis, which identifies commonly studied themes, as well as co-citation analysis and bibliographic coupling. Co-citation analysis helps identify important studies that are frequently cited together, while bibliographic coupling highlights newer studies that share similar references. These techniques show that green finance research is centred around key themes such as carbon emissions, renewable energy, and green technology development (Kwong et al., 2023; Khan et al., 2022). They also demonstrate how the field has evolved over time, moving from a focus on basic environmental concerns to more complex financial and technological approaches (Xu et al., 2024).

To carry out the analysis, this study uses VOSviewer and Bibliometrix. VOSviewer is used to create visual maps that show connections between authors, keywords, and publications, making it easier to understand patterns within the data. Bibliometrix, which is based on the R programming language, is used for statistical analysis and helps ensure that the research process is transparent and reproducible. These tools are widely used in recent bibliometric studies and support both performance analysis and science mapping (Singh et al., 2023; Gusenbauer, 2022).

This study highlights how bibliometric analysis can effectively be used to understand the development and structure of green finance and Fintech research. By examining patterns in publications, citations, authorship, and keywords, the study provides a clear overview of how the field has grown and how different research areas are connected. The findings show that green finance has evolved into a fast growing and interdisciplinary field, influenced not only by economic and environmental concerns but also by the increasing role of Fintech (Khan et al., 2022; Li et al., 2023; Kwong et al., 2023). The use of bibliometric methods allows for a more systematic and data driven understanding of this growth, making it easier to identify key contributors, major themes, and emerging areas of research. Overall, this approach helps organize a large and complex body of literature into meaningful insights, providing a strong foundation for future research and a better understanding of how green finance and Fintech continues to develop.

Bibliometric analysis provides a systematic approach for examining the intellectual structure and evolution of an emerging research field. Nevertheless, its findings should be interpreted in light of several methodological assumptions and limitations. First, this study relies on citation counts as an indicator of scholarly influence. Recently published articles may appear less influential simply because they have had insufficient time to accumulate citations. Second, keyword co-occurrence analysis assumes that frequently co-occurring keywords represent conceptually related research themes. However, keyword selection is largely determined by individual authors, leading to potential inconsistencies arising from differences in terminology, spelling variations, or conceptual ambiguity. Fourth, the study relies exclusively on the Scopus database. Although Scopus provides broad disciplinary coverage and high-quality bibliographic metadata, some relevant publications indexed in Web of Science may not be captured. These limitations do not diminish the value of the present analysis but suggest that the reported citation patterns, collaboration networks, and thematic structures should be interpreted as broad indicators of research evolution rather than absolute measures of scientific influence.

RESULT FINDINGS

This section presents empirical findings from the bibliometric and network analyses of the literature on Green

Finance and FinTech. The analysis draws upon a corpus of 168 peer-reviewed documents indexed in the Scopus database, spanning from 2021 to 2026. Using the Bibliometrix R package, VOSviewer, and structured data analytics, the results are organized around five core sub-analyses: (1) general performance statistics; (2) annual publication trends; (3) keyword and co-word analysis; (4) country-of-origin and co-authorship network; and (5) most cited publications and source analysis. Together, these findings map the intellectual structure of technology-enabled sustainable finance and identify emerging research frontiers at the convergence of FinTech innovation and green capital allocation.

4.1. Main Information About the Corpus

Table 1 summarises the bibliometric dataset used in this study. It includes 168 documents across 77 sources published between 2021 and 2026. This period marks the point at which research on green finance, FinTech, and carbon neutrality began to expand rapidly following the post-COVID rise in ESG. The field shows a strong annual growth rate of 39.77%, which is higher than the rates reported for green finance and FinTech individually (Kwong et al., 2023). This indicates that Green FinTech linked to carbon neutrality is a fast-growing area of research. The average document age of 1.56 years also indicates that most of the work in this field is recent.

A total of 453 authors contributed to the dataset, with only 21 single-authored papers and an average of 3.1 authors per document. The international co-authorship rate of 46.43% suggests a high level of global collaboration. In total, the corpus contains 22,144 references, drawing from multiple disciplines. It includes 138 research articles and 30 review papers, showing that the field is both producing new findings and developing its theoretical base.

Table 1. Main Bibliometric Information of the Green Finance–FinTech Corpus

Description	RESULTS
MAIN INFORMATION ABOUT DATA	
Timespan	2021–2026
Sources (Journals, Books, etc.)	77
Documents	168
Annual Growth Rate (%)	39.77
Document Average Age (years)	1.56
Average Citations per Document	22.42
Total References	22,144
DOCUMENT CONTENTS	
Keywords Plus	505
Author's Keywords	440
AUTHORS	
Authors	453
Authors of Single-Authored Documents	21
AUTHORS COLLABORATION	
Single-Authored Documents	24
Co-Authors per Document	3.1

International Co-Authorships (%)	46.43
DOCUMENT TYPES	
Article	138
Review	30

Note(s): Data retrieved from Scopus database. Analysis performed using Bibliometrix R package and VOSviewer 1.6.18.

4.2. Annual Publication Trends

Figure 1 shows the yearly growth of publications from 2021 to 2026. The field grows rapidly from 3 papers in 2021–2022 to 18 in 2023, 53 in 2024, and 75 in 2025. The 2026 count (16 so far) suggests continued momentum. This growth is faster than that observed in the broader green finance literature (Kwong et al., 2023). The surge from 2023 is driven by net-zero commitments after COP-26, advances in AI and data tools, new ESG regulations, and the rise of carbon markets. Overall, the sharp increase shows the field has quickly moved from a niche area to a major focus within finance research.

Figure 1. Annual Publication Trend in the Green Finance–FinTech Literature (2021–2026). Source: Scopus database; analysis via Bibliometrix R.

Year	2021	2022	2023	2024	2025–26*
Publications	3	3	18	53	91 (75+16)

* 2026 represents partial-year data (as of March 2026).

4.3. Keywords and Co-Word Analysis

Table 2 lists the top 20 keywords. “FinTech” (108) and “green finance” (107) appear with similar frequency, suggesting that the field focuses on their intersection rather than treating them separately. “Sustainable finance” ranks next, placing both within a broader framework. Terms like “natural resources” and “environmental sustainability” highlight the focus on real-world impacts such as emissions and resource use. Technology-related terms, including “AI finance” and “digital transformation,” highlight AI’s growing role in this area. Keywords like “bibliometric analysis” and “systematic review” suggest researchers are actively reviewing the field, while “financial inclusion” and “supply chain resilience” reflect interest in social impact and post-pandemic sustainability concerns.

Table 2. Top 20 Author Keywords in the Green Finance–FinTech Literature

Rank	Keyword	Occurrences		Keyword	Occurrences
1	FinTech	108	11	Financial Inclusion	11
2	Green Finance	107	12	Bibliometric Analysis	12
3	Sustainable Finance	24	13	FinTech Adoption	9
4	Natural Resources	18	14	Systematic Literature Review	9
5	Sustainable Development	17	15	Economic Growth	7
6	Environmental Sustainability	17	16	Digital Transformation	7
7	Digital Leadership	16	17	China	7

8	Supply Chain Resilience	16	18	Financial Technology	6
9	AI Finance	15	19	Sustainable Performance	6
10	Sustainability	13	20	Artificial Intelligence	6

4.4. Country of Origin and Co-Authorship Network

Table 3 shows the geographic distribution of authors. China leads with 75 contributions, more than double India (27), reflecting its strong role in green finance, FinTech adoption, and government-driven sustainability policies. India (27) and Malaysia (23). Saudi Arabia (20) also ranks highly. European countries such as the UK (10) and France (9) contribute moderately, while the US (7) appears less prominent. The 46.43% international co-authorship rate shows that, although research is globally collaborative, it is often focused on specific national contexts, especially China (Kwong et al., 2023).

Table 3. *Geographic Distribution of Authors in the Green Finance–FinTech Corpus*

Rank	Country	Affiliations	Rank	Country	Affiliations
1	China	75	9	Australia	8
2	India	27	10	United States	7
3	Malaysia	23	11	Italy	6
4	Saudi Arabia	20	12	Bangladesh	5
5	Pakistan	10	13	Turkey	4
6	United Kingdom	10	14	Poland	4
7	France	9	15	South Korea	3
8	Germany	—	16	Singapore / Vietnam	3

4.5. Most Cited Publications and Journal Sources

Table 4 shows the ten most-cited papers, with an average of 22.42 citations per document. The most-cited study (2022) with 512 citations establishes a link between FinTech innovation and green growth in China. It is followed by Yang et al. (2021), with 386 citations, which introduced a widely used framework that connects FinTech, green finance, and economic development. Another key paper (2021) with 292 citations explores the two-way relationship between FinTech and sustainability, a concept now central in the field. Most other top-cited studies are recent (2023), focusing on specific mechanisms such as carbon reduction, BRICS contexts, and policy impacts, indicating a shift from general analysis to detailed investigation. Overall, the literature is strongly policy-focused, producing practical evidence on how digital finance can support decarbonisation (Sanga & Aziakpono, 2023).

Table 4. *Top 10 Most Cited Publications in the Green Finance–FinTech Corpus*

No.	Title	Year	Source	Citations
1	The impact of fintech innovation on green growth in China: Mediating effect	2022	Resources Policy	512
2	Nexus between green finance, fintech, and high-quality economic development: Empirical evidence from China	2021	Resources Policy	386
3	FinTech and sustainability: Do they affect each other?	2021	Sustainability	292

4	The drivers of environmental sustainability in BRICS economies: Do green finance and fintech matter?	2023	Sustainable Dev.	204
5	Green finance, fintech, and environmental sustainability: Fresh policy insights from BRICS nations	2023	Finance Res. Lett.	178
6	The role of fintech in promoting green finance and profitability: Evidence from China	2023	Resources Policy	139
7	Striving for the United Nations (UN) SDGs in presence of FinTech and green finance	2023	Sustainable Dev.	109
8	The fourth industrial revolution and environmental efficiency: The role of green finance and FinTech	2022	Resources Policy	109
9	Empirical evidence of fintech and green environment: Using the green finance index	2024	Resources Policy	101
10	Analysis of the carbon emission reduction effect of FinTech and its transmission mechanism	2023	Resources Policy	96

4.6. Leading Journal Sources

Table 5 lists the top ten journals. *Resources Policy* leads with 31 articles (18.5%), highlighting its key role in linking green finance with resource economics. This shows the field focuses on carbon and resource issues through an economic lens. *Review of Management Literature* (15) and *Sustainability* (13) follow, with the latter benefiting from open access. *Sustainable Development* (10) and *Finance Research Letters* (6) complete the top five, showing the field's reach into mainstream finance. Most top journals are highly ranked (Q1), indicating that Green FinTech research is gaining visibility in leading academic outlets (Kwong et al., 2023).

Table 5. Top 10 Source Journals for Green Finance–FinTech Research

Rank	Journal	Articles	Publisher
1	Resources Policy	31	Elsevier
2	Review of Management Literature	15	Various
3	Sustainability (Switzerland)	13	MDPI
4	Sustainable Development	10	Wiley
5	Finance Research Letters	6	Elsevier
6	Discover Sustainability	5	Springer
7	Journal of Risk and Financial Management	4	MDPI
8	International Review of Economics and Finance	3	Elsevier
9	Business Strategy and the Environment	2	Wiley
10	World Development Sustainability	2	Elsevier

Note(s): Article counts reflect documents indexed in the Scopus query from 2021 to 2026. *Resources Policy's* dominance ($31/168 = 18.5\%$) signals that this journal is the definitive outlet for empirical research in Green FinTech.

4.7. Keyword Word Cloud

Figure 2 shows a word cloud of the most frequent keywords in the 168-document dataset, with size reflecting frequency. “FinTech” and “green finance” dominate, confirming that the field centres on their intersection. Secondary terms like “sustainable finance,” “natural resources,” and “environmental sustainability” reflect its policy and real-economy focus. Smaller terms such as “artificial intelligence” and “financial inclusion” appear less frequently. Overall, the word cloud shows that the literature spans both technology-focused and macro-level themes, capturing the broad scope of Green FinTech research (Kwong et al., 2023).



Figure 2. Word Cloud of Author Keywords in the Green Finance–FinTech (2021–2026). Source: Scopus database; analysis via Bibliometrix R package.

4.8. Three-Fields Plot (Sankey Diagram)

Figure 3 shows a three-fields (Sankey) plot linking keyword clusters, author countries, and journal sources. It highlights both output and connections that are not visible in tables (Aria & Cuccurullo, 2017). The “FinTech and green finance” cluster is strongly linked to China-based authors, whose work is mainly published in *Resources Policy* and *Sustainability*, confirming the field’s focus on China-led, quantitative, resource economics research. In contrast, themes like “sustainable development” and “carbon neutrality” are more spread across countries such as India, Malaysia, and Pakistan, with outputs in a wider range of journals. European and North American contributions appear more limited, with weaker connections. Overall, the plot shows that this field is largely driven by Global South and East Asian researchers and helps identify where and how research is being developed and published (Sanga & Aziakpono, 2023).

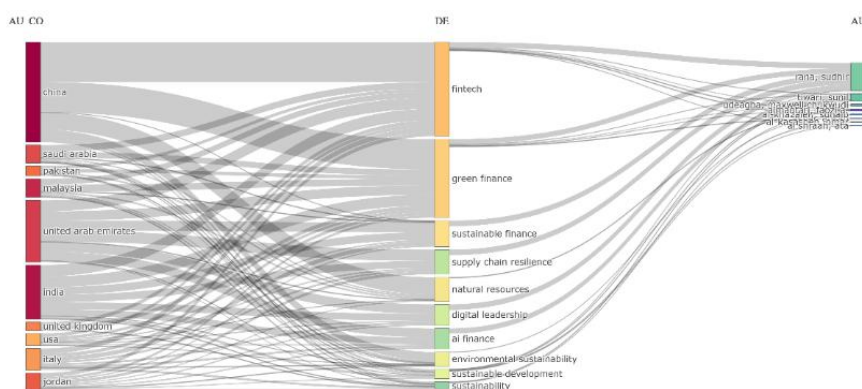


Figure 3. Three-Fields Plot Connecting Keyword Clusters, Author Countries, and Source Journals. Source: Scopus database; analysis via Bibliometrix R package.

4.9. Most Relevant Affiliations

Figure 4 ranks institutions by number of publications, showing a strong concentration in Chinese and Malaysian universities. City University of Macau and Capital University of Economics and Business lead the way, highlighting East Asia’s central role. Universiti Kebangsaan Malaysia (UKM) also stands out, aligning with Malaysia’s Green Finance Roadmap (Kwong et al., 2023). The limited presence of European and North American institutions suggests weaker contribution from the Global West in this area.

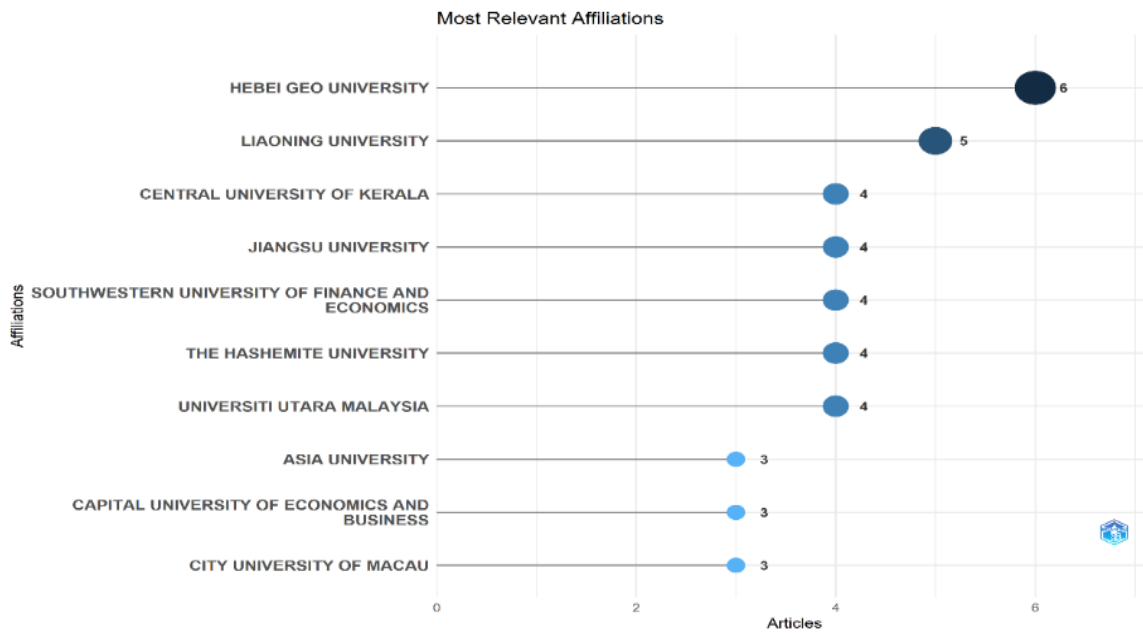


Figure 4. Most Relevant Institutional Affiliations by Article Count in the Green Finance–FinTech Corpus. Source: Scopus database; analysis via Bibliometrix R package.

4.10. Most Relevant Authors

Figure 5 ranks authors by number of publications. Rana S. leads with 15 papers, standing out as a key contributor in this fast-growing field (Kwong et al., 2023). A second group, Zhang Y., Wang Y., Tiwari S., and Xu J.; each with 3–4 papers, shows an emerging core research community. The dominance of South and East Asian authors reflects the geographic trends in Table 3, while the limited spread across other authors suggests the field is still developing depth (Aria & Cuccurullo, 2017).

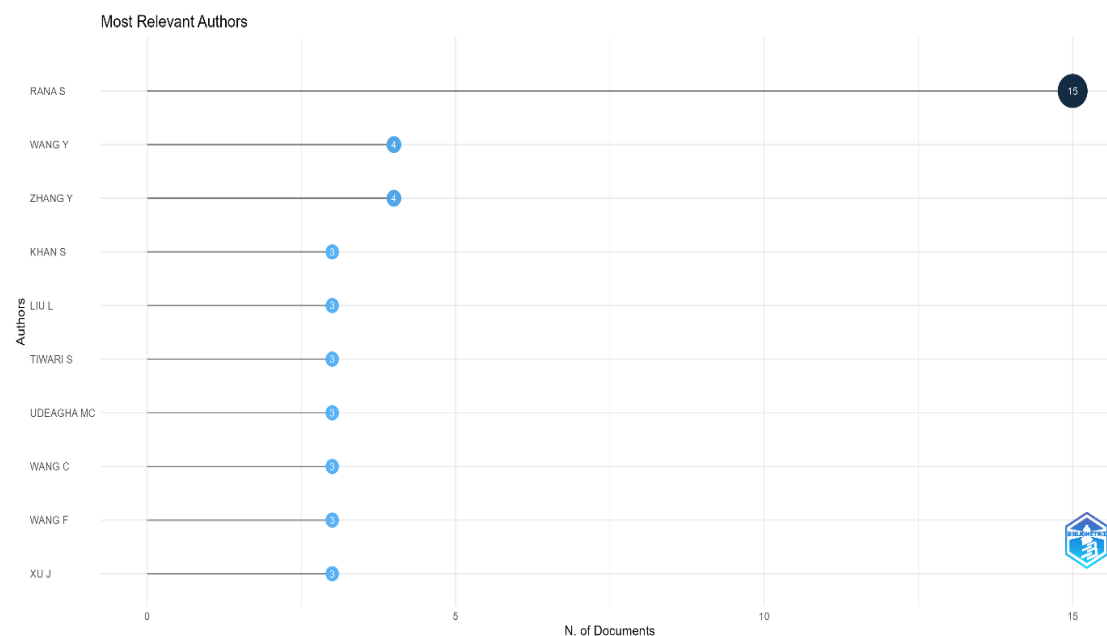


Figure 5. Most Relevant Authors by Document Count in the Green Finance–FinTech Corpus. Source: Scopus database; analysis via Bibliometrix R package.

4.11. Most Locally Cited Authors

Figure 6 shows citation counts within the dataset, highlighting key influences. Pesaran M. H. stands out for his econometric methods, widely used to study long-run links between FinTech and carbon emissions (Muganyizi et al., 2021). Taghizadeh-Hesary F. is also central in shaping green finance theory. The difference between locally

cited method experts and globally cited empirical authors (Table 4) suggests the field builds new findings on established econometric foundations (Sanga & Aziakpono, 2023).

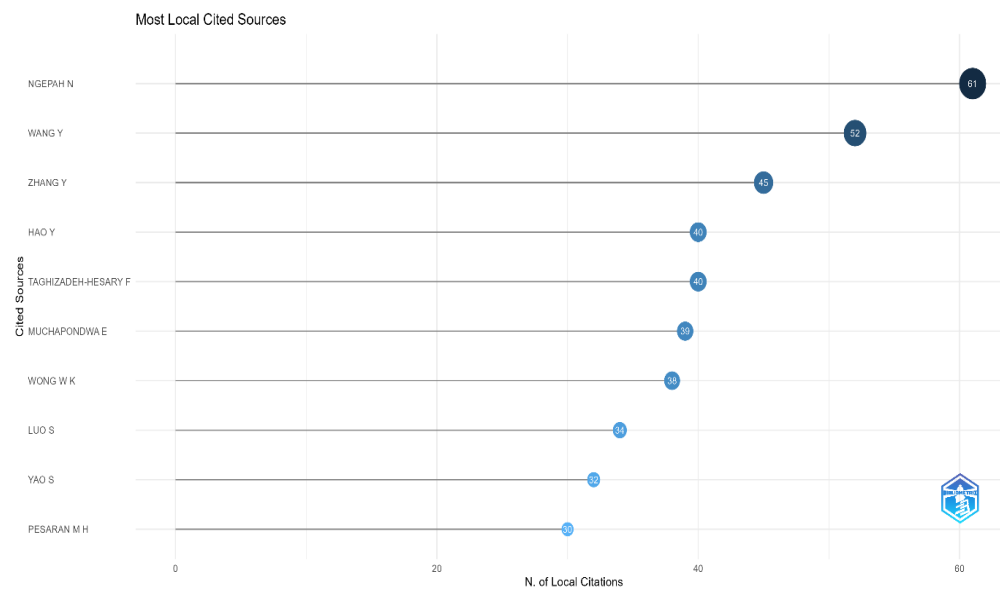


Figure 6. Most Locally Cited Authors in the Green Finance–FinTech Corpus. Source: Scopus database; analysis via Bibliometrix R package.

4.12. Single vs. Multiple Country Publications by Country

Figure 7 compares domestic publications (SCP) and international collaborations (MCP). China’s output is mainly domestic, reflecting a strong internal research system. In contrast, Malaysia, Saudi Arabia, and European countries show higher levels of international collaboration (Aria & Cuccurullo, 2017). This aligns with the 46.43% collaboration rate in Table 1 and suggests that high-MCP countries are strong partners for future research (Kwong et al., 2023).

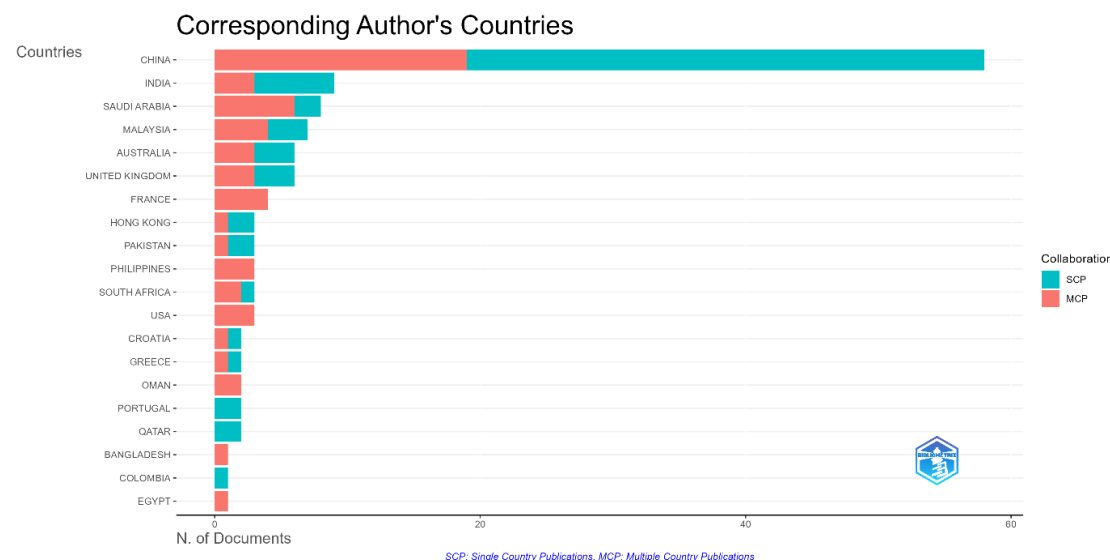


Figure 7. Single Country Publications (SCP) vs. Multiple Country Publications (MCP) by Country. Source: Scopus database; analysis via Bibliometrix R package.

4.13. Trend Topics Over Time

Figure 8 tracks keyword prominence over time, with bubble size showing frequency. The early years (2021–2022) focus on broad topics such as “sustainable finance,” “carbon neutrality,” and “green bonds.” From 2023 onward, more specific terms such as “AI finance,” “blockchain,” and “carbon market” have increased, indicating a shift towards testing concrete mechanisms (Muganyi et al., 2021).

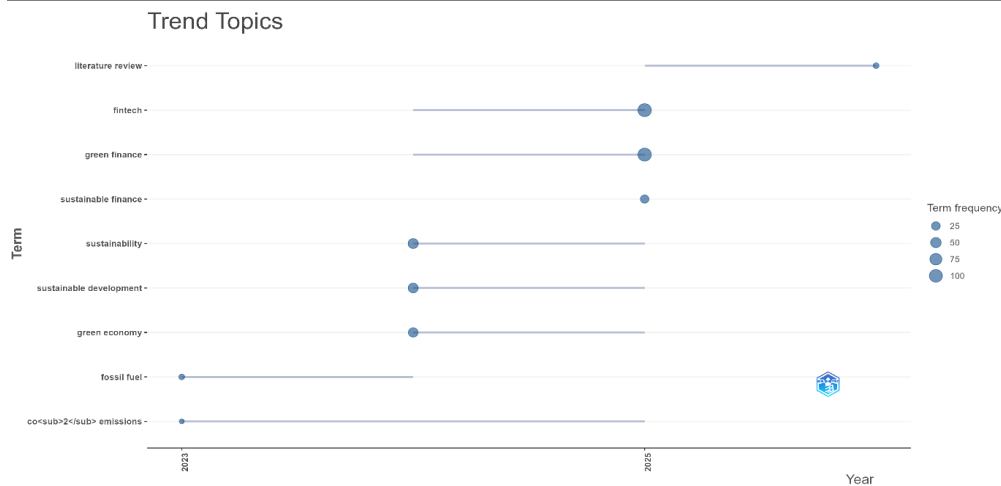


Figure 8. Trend Topics Over Time in the Green Finance–FinTech Corpus (2021–2026). Source: Scopus database; analysis via Bibliometrix R package.

4.14. Thematic Map

Figure 9 maps themes by centrality (relevance) and density (development) across four quadrants. “FinTech” and “green finance” appear as Motor Themes, forming the core of the field. Blockchain and carbon markets fall into the Niche quadrant, while “sustainable development” and “China” are Basic themes—widely used but less developed (Muganyi et al., 2021). Emerging themes such as “AI finance” and “financial inclusion” remain underdeveloped, highlighting key opportunities for future research (Sanga & Aziakpono, 2023).

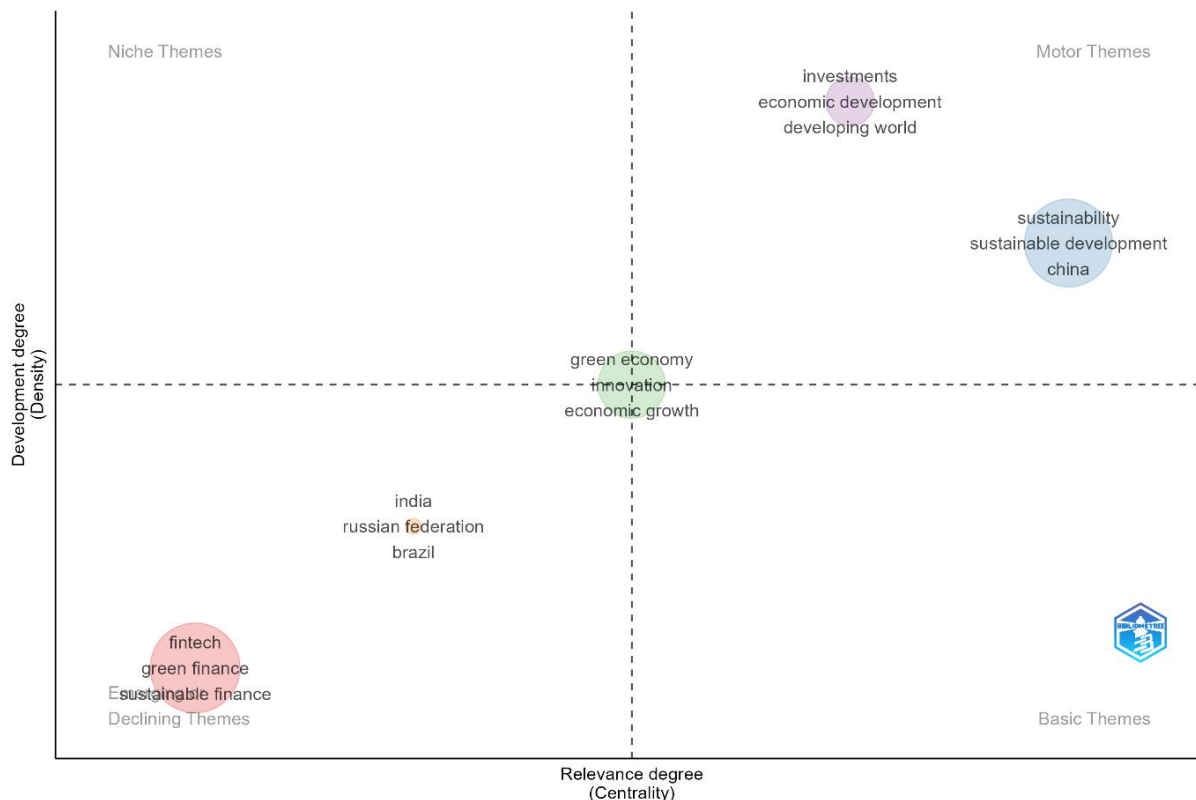


Figure 9. Thematic Map of the Green Finance–FinTech Literature. Source: Scopus database; analysis via Bibliometrix R package and VOSviewer 1.6.18.

In thematic mapping, motor themes represent well-developed and highly central research topics that drive the intellectual development of the field. Their high density and centrality indicate both conceptual maturity and strong connections with other research domains. The positioning of FinTech and green finance within this quadrant confirms that these topics constitute the intellectual core of technology-enabled sustainable finance and are likely to remain dominant research priorities as digital financial systems continue to evolve. Basic themes

represent topics with high centrality but relatively low internal development. Themes such as sustainable development and China provide the conceptual foundation for the literature and support numerous studies, although additional theoretical refinement is still required. Niche themes, characterised by high density but lower centrality, represent specialised research areas such as blockchain and carbon markets that have developed sophisticated internal knowledge but remain weakly integrated with the broader literature. Finally, emerging or declining themes exhibit both low density and low centrality. The positioning of AI finance and financial inclusion suggests that these topics are still developing and have not yet become integral components of Green Finance research.

4.15. Country Co-Authorship Network

Figure 10 shows country collaborations in VOSviewer, where node size reflects output and link thickness shows collaboration strength. China is the central hub, connected to most countries, highlighting its leading role (Aria & Cuccurullo, 2017). India, Malaysia, Pakistan, and Bangladesh form a close cluster, likely due to shared contexts. A separate European group appears but is weakly connected to Asia, suggesting the field is largely centred around the Global South (Kwong et al., 2023).

China's dominant position within the collaboration network reflects its substantial investment in digital finance, green finance policies, and environmental governance. Greater collaboration between researchers from Asia, Europe, and North America could broaden theoretical perspectives, improve methodological diversity, and enhance the external validity of empirical findings. Expanding research in these contexts would improve understanding of how FinTech supports green transitions under varying institutional, economic, and technological conditions. Capacity-building initiatives, international research partnerships, targeted funding programmes, and collaborative research networks may help promote greater geographic diversity and strengthen the global relevance of future Green Finance research.

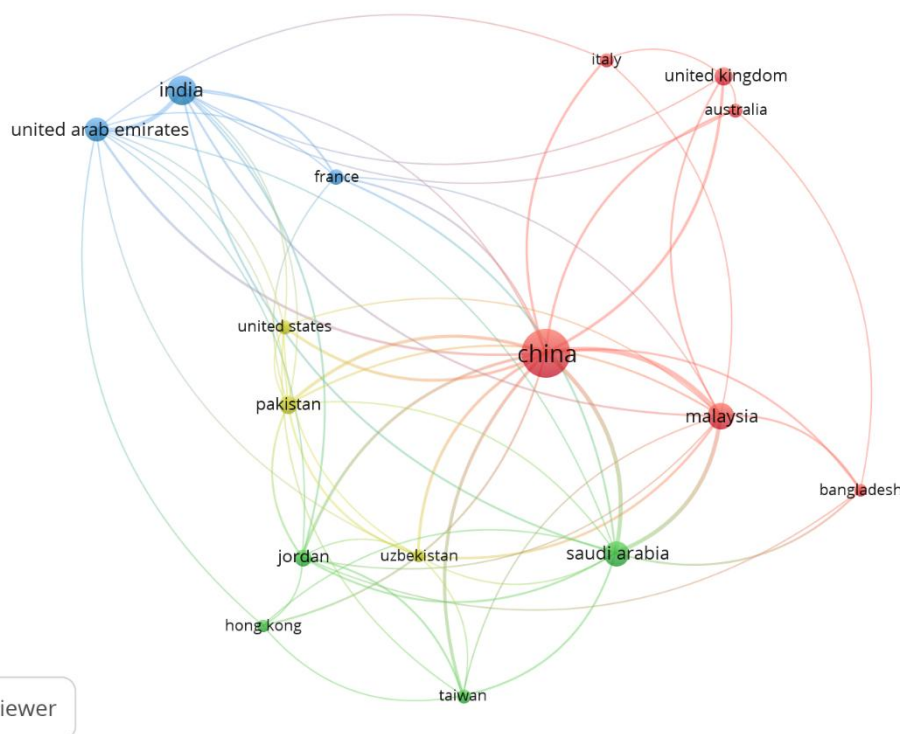


Figure 10. Country Co-Authorship Network in the Green Finance–FinTech Literature. Source: VOSviewer 1.6.18; data from Scopus database.

4.16. Keyword Co-Occurrence Network

Figure 11 shows keyword links using VOSviewer, forming four main clusters: FinTech–green finance, sustainability and governance, digital technologies (“AI,” “blockchain,” “digital transformation”), and macroeconomic outcomes (“financial inclusion,” “economic growth”) (Aria & Cuccurullo, 2017). Weak

connections between the digital technology and macroeconomic clusters highlight a gap—studies usually focus on either mechanisms or outcomes, not both (Kwong et al., 2023). This gap offers a key area for future research, especially linking causal analysis with broader economic outcomes (Muganyi et al., 2021).

The keyword co-occurrence network reveals four interconnected but unevenly integrated research clusters. The largest cluster focuses on FinTech-enabled financial innovation, while additional clusters emphasise sustainability and governance, digital technologies, and macroeconomic outcomes. Notably, the relatively weak connections between the digital technology cluster (AI, blockchain, digital transformation) and the macroeconomic outcome cluster (economic growth, financial inclusion, environmental performance) suggest that existing studies frequently investigate technological mechanisms or sustainability outcomes independently rather than analysing the causal pathways linking the two. This fragmentation may reflect disciplinary boundaries between finance, information systems, environmental economics, and computer science, as well as methodological challenges associated with integrating firm-level technological data with macroeconomic sustainability indicators. Bridging this gap will require greater interdisciplinary collaboration involving economists, finance scholars, environmental scientists, and data scientists. Future research could adopt multi-level empirical designs combining firm-level digital innovation measures with national sustainability indicators, mixed-method approaches integrating bibliometric evidence with case studies, or longitudinal panel models capable of tracing how FinTech innovations translate into measurable environmental and economic outcomes over time.

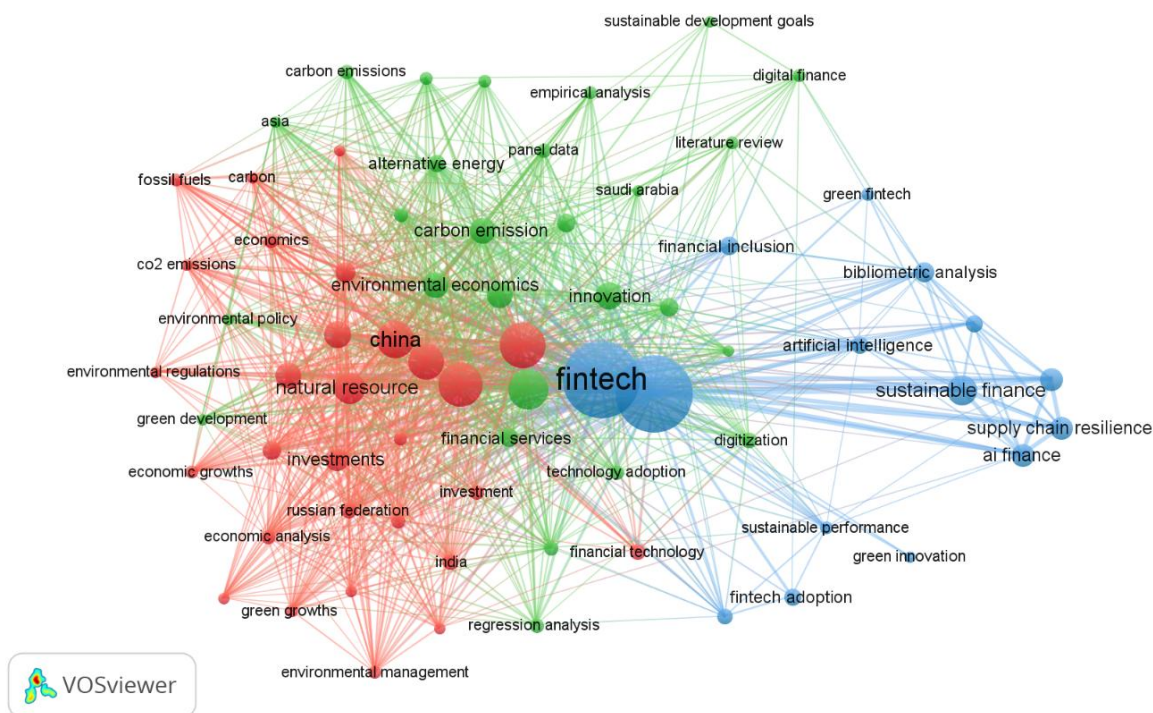


Figure 11. Keyword Co-Occurrence Network in the Green Finance–FinTech Literature. Source: VOSviewer 1.6.18; data from Scopus database.

4.17. Source Co-Citation Network

Figure 12 shows how journals are connected based on how often they are cited together, giving an idea of the field’s main knowledge sources. *Resources Policy* appears at the centre of the network, aligning with the findings in Table 5 and highlighting its role as both a key publication outlet and a major reference source. A closely connected group of journals in resource and sustainability economics, such as *Energy Economics* and *Environmental Science and Ecotechnology*, forms the first level of citations. More general finance journals appear in the second level (Muganyi et al., 2021). The inclusion of econometrics journals reflects the strong influence of Pesaran M. H., and suggests that research in Green FinTech is mainly based on advanced panel data methods (Sanga & Aziakpono, 2023).

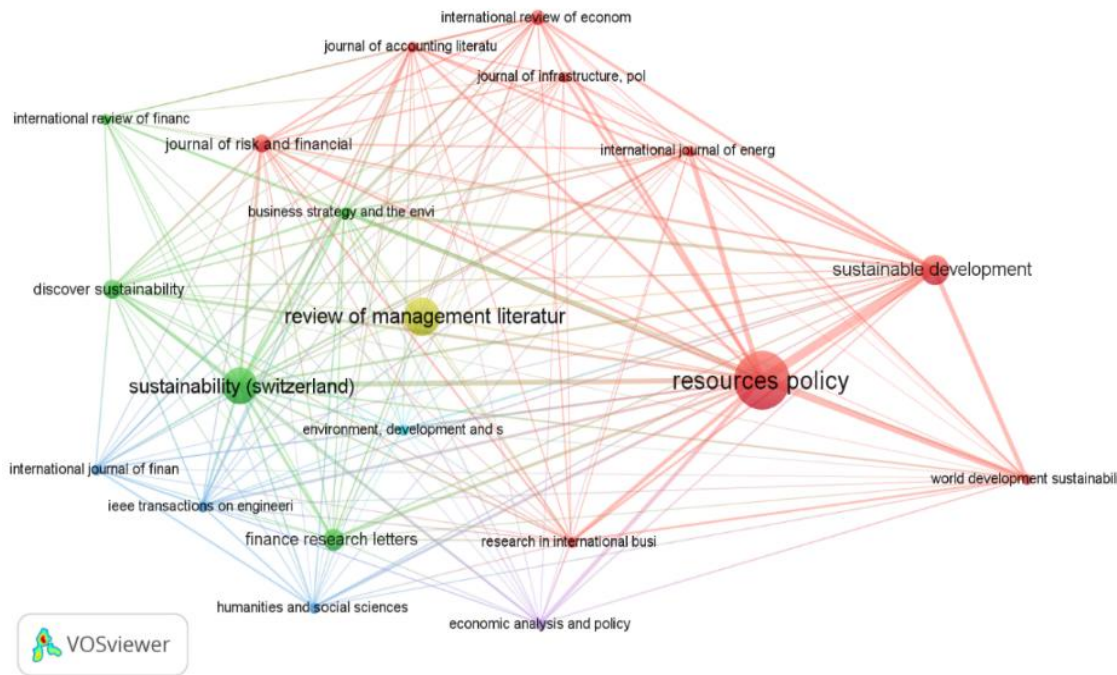


Figure 12. Source Co-Citation Network in the Green Finance–FinTech Literature. Source: VOSviewer 1.6.18; data from Scopus database.

CONCLUSION & LIMITATIONS

This study provides a comprehensive bibliometric and network analysis of the intersection between Green Finance, FinTech, and Carbon Neutrality, drawing on 168 peer-reviewed publications indexed in Scopus from 2021 to 2026. Beyond mapping the intellectual structure of the literature, the findings also provide important implications for policymakers and practitioners. The rapid growth in publications indicates that Green Finance and FinTech has evolved from an emerging interdisciplinary topic into a maturing research field. However, the evidence also suggests that the literature remains imbalanced, with substantial attention devoted to conceptual discussions and technology development, while comparatively fewer studies investigate how digital financial innovations generate measurable environmental and economic outcomes.

The bibliometric evidence identifies a clear research gap between technology-oriented studies and outcome-oriented research. Policymakers should recognise that advances in digital finance alone do not automatically translate into sustainability benefits unless supported by appropriate governance structures, institutional quality, and regulatory frameworks. Closing this gap requires stronger empirical evidence linking digital financial innovations with carbon reduction, green investment performance, financial inclusion, and long-term sustainable development outcomes. From a practical perspective, FinTech offers considerable opportunities to strengthen green finance through artificial intelligence, blockchain technologies, big data analytics, and digital financial platforms. These technologies can improve environmental data collection, climate-risk assessment, ESG reporting, carbon accounting, investment transparency, and monitoring of sustainable finance projects. Improved digital infrastructures may therefore enhance both the efficiency and credibility of green financial markets.

The findings also provide useful guidance for future policy development. Regulatory sandboxes can encourage responsible experimentation with green FinTech innovations while maintaining financial stability. Standardised environmental data frameworks and ESG reporting protocols can improve transparency and comparability across markets. Similarly, incentive structures that promote digital innovation in sustainable finance including green investment tax incentives, digital infrastructure support, and international research collaboration can accelerate the transition towards more resilient and environmentally sustainable financial systems.

This study has several limitations. First, the analysis relies on the Scopus database, which, despite its comprehensive coverage, may exclude relevant publications indexed to the Web of Science. Second, only

English-language publications were included, potentially limiting the representation of research produced in other languages. Third, citation-based indicators should be interpreted cautiously because citation counts may be influenced by publication age, self-citation, disciplinary citation practices, and the time required for newly published studies to accumulate citations. Moreover, highly cited publications may sometimes reflect scholarly debate or controversy rather than exclusively indicating scientific influence. Fourth, keyword co-occurrence analysis depends on author-selected keywords, which may introduce inconsistencies due to differences in terminology, conceptual overlap, or indexing practices. Finally, bibliometric studies primarily analyse published literature and are therefore susceptible to publication bias, including the underrepresentation of null findings and the concentration of research output in countries with stronger academic infrastructures. Consequently, the findings should be interpreted as a structured representation of the current Green Finance–FinTech literature rather than a complete reflection of all ongoing research activities.

Ethical Approval: Author's state that no ethical approval is required as there was no involvement of human subjects or animals

Conflict of Interest: Author's state that there is no potential conflicts of interest.

Data Availability Statement: The authors state that the data sourced for this study have been taken from the public database, which is available on Scopus.

REFERENCES

- Arner, D.W., Barberis, J.N. and Buckley, R.P. (2015) 'The Evolution of FinTech: A New Post-Crisis Paradigm?', *Georgetown Journal of International Law*, 47, pp. 1271–1319. <https://ssrn.com/abstract=2676553>
- Ozili, P.K. (2022) 'Green finance research around the world: a review of literature', *International Journal of Green Economics*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4066900
- Lee, I., & Shin, Y. J. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. *Business horizons*, 61(1), 35-46.
- Campiglio, E. (2016). Beyond carbon pricing: The role of banking and monetary policy in financing the transition to a low-carbon economy. *Ecological economics*, 121, 220-230.
- Zhou, Z., Chau, K. Y., Sibghatullah, A., Moslehpour, M., Tien, N. H., & Shukurullaevich, K. N. (2024). The role of green finance, environmental benefits, fintech development, and natural resource management in advancing sustainability. *Resources Policy*, 92, 105013.
- Liu, Y. (2025). Whether fintech, natural resources, green finance and environmental tax affect CO2 emissions in China? A step towards green initiatives. *Energy*, 320, 135181.
- Jia, Z., Feng, T., & Jing, H. (2025). Digital finance and sustainable lending in rural china: The role of fintech in green credit expansion. *Finance Research Letters*, 108340.
- Chien, F., Zhang, Y., & Sadiq, M. (2025). Fintech innovation in green finance: A disruptive force or a complementary tool?. *International Review of Economics & Finance*, 104658.
- Al Doghan, M. A., & Chong, K. W. (2023). Fintech adoption and environmental sustainability: Mediating role of green finance, investment and innovation. *International Journal of Operations and Quantitative Management*, 29(2), 296-315.
- Hemanand, D., Mishra, N., Premalatha, G., Mavaluru, D., Vajpayee, A., Kushwaha, S., & Sahile, K. (2022). Applications of intelligent model to analyze the green finance for environmental development in the context of artificial intelligence. *Computational Intelligence and Neuroscience*, 2022(1), 2977824.
- Zaid, M. A. K., Khan, M. F., Al-Mekhlafi, A. W. A. G. S., Al Koliby, I. S., Saoula, O., Saeed, H. A. E. M., & Mohammad, R. A. (2025). The future of green finance: How digital transformation and FinTech drive sustainability. *Discover Sustainability*, 6(1), 480.
- Kwong, R., Kwok, M. L. J., & Wong, H. S. (2023). Green FinTech innovation as a future research direction: a bibliometric analysis on green finance and FinTech. *Sustainability*, 15(20), 14683.
- Khan, S. A. R., Yu, Z., Sharif, A., & Golpîra, H. (2022). Determinants of economic growth and environmental sustainability: A bibliometric analysis. *Environmental Science and Pollution Research*, 29(20), 29730–29745.

14. Li, X., Du, J., & Long, H. (2023). Dynamic analysis of global green finance research: A bibliometric review. *Journal of Cleaner Production*, 382, 135245.
15. Xu, L., Chen, Y., & Zhao, X. (2024). Evolution and future trends of green finance research: A bibliometric analysis. *Finance Research Letters*, 59, 104563.
16. Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2021). Scopus as a curated, high-quality bibliometric database for academic research. *Quantitative Science Studies*, 2(1), 377–386.
17. Singh, V. K., Singh, P., & Karmakar, M. (2023). Application of bibliometric analysis in research evaluation: A review of methods and tools. *Library Philosophy and Practice*, 2023, 1–20.
18. Kwong, R., Kwok, M. L. J., & Wong, H. S. M. (2023). Green Fintech innovation as a future research direction: A bibliometric analysis on green finance and Fintech. *Sustainability*, 15(20), 14683.
19. Gusenbauer, M. (2022). Google Scholar to overshadow them all? Comparing the sizes of 12 academic search engines and bibliographic databases. *Scientometrics*, 127(2), 1115–1139.