# Mapping the Intersection of Financial Technology and Sustainability: A Bibliometric Analysis Using R Programming Language

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***ABSTRACT***

*Financial technology has transformed the global financial landscape, while sustainability has become a critical priority for addressing environmental and economic challenges. This study aims to examine the research landscape at the intersection of financial technology and sustainability through bibliometric analysis. Using the R programming language and data from the Scopus database spanning 2017 to 2025, the analysis maps publication trends, influential contributors, and collaboration patterns. Key findings reveal dominant themes such as green finance, digital banking, climate change, and environmental policy, reflecting a convergence of economic and environmental priorities. Leading journals include Resources Policy and Sustainability (Switzerland), with significant contributions from scholars. Strong international collaborations, particularly involving China, India, and Brazil, highlight regional efforts in sustainable financial innovation. The study concludes that financial technology plays a vital role in advancing sustainable finance and financial inclusion, though gaps in global representation and methodological diversity persist. Future research should focus on integrating artificial intelligence, blockchain, and broader regional perspectives, particularly from underrepresented areas like Africa, to enhance sustainable financial systems.*

***Keywords****: Bibliometric Analysis, Financial Inclusion, Financial Technology, Green Finance, R Programming, Sustainability.*

***ABSTRAK***

*Teknologi keuangan telah mengubah lanskap keuangan global, sementara keberlanjutan telah menjadi prioritas penting untuk mengatasi tantangan lingkungan dan ekonomi. Studi ini bertujuan untuk memeriksa lanskap penelitian di persimpangan teknologi keuangan dan keberlanjutan melalui analisis bibliometrik. Menggunakan bahasa pemrograman R dan data dari basis data Scopus yang mencakup tahun 2017 hingga 2025, analisis tersebut memetakan tren publikasi, kontributor berpengaruh, dan pola kolaborasi. Temuan utama mengungkapkan tema-tema dominan seperti keuangan hijau, perbankan digital, perubahan iklim, dan kebijakan lingkungan, yang mencerminkan konvergensi prioritas ekonomi dan lingkungan. Jurnal terkemuka termasuk*

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*Resources Policy and Sustainability (Swiss), dengan kontribusi signifikan dari akademisi. Kolaborasi internasional yang kuat, khususnya yang melibatkan Tiongkok, India, dan Brasil, menyoroti upaya regional dalam inovasi keuangan berkelanjutan. Studi ini menyimpulkan bahwa teknologi keuangan memainkan peran penting dalam memajukan keuangan berkelanjutan dan inklusi keuangan, meskipun kesenjangan dalam representasi global dan keragaman metodologis tetap ada. Penelitian di masa mendatang harus difokuskan pada pengintegrasian kecerdasan buatan, blockchain, dan perspektif regional yang lebih luas, terutama dari wilayah yang kurang terwakili seperti Afrika, untuk meningkatkan sistem keuangan yang berkelanjutan.*

***Kata kunci**: Analisis Bibliometrik, Inklusi Keuangan, Teknologi Keuangan, Keuangan Hijau, Pemrograman R, Keberlanjutan.*

## INTRODUCTION

The development of Financial Technology (Fintech) has significantly transformed the global financial industry by leveraging technological innovations to enhance financial services, expand access, and improve transaction efficiency (Schindler, 2017; Arner et al., 2020). Fintech encompasses a wide range of applications, including digital payments, peer-to-peer lending, and blockchain, which enable more adaptive and inclusive business models (Lubis et al., 2021). These innovations have revolutionized financial operations by reducing costs and improving service delivery, particularly in underserved regions (Nasir et al., 2021). In parallel, sustainability has emerged as a critical priority across sectors, including finance, focusing on creating long-term economic, social, and environmental benefits (Barbier, 2016). The integration of fintech and sustainability principles holds immense potential to address global challenges, such as climate change and social inequality, by fostering inclusive and environmentally responsible financial systems (Kwong et al., 2023; Dunbar et al., 2024).

The urgency of this research stems from the need to understand how fintech can contribute to sustainability amidst pressing global issues like climate change, social inequality, and economic instability (Ali et al., 2024). Fintech's role in promoting financial inclusion and sustainable practices has been widely acknowledged, yet its practical implementation and long-term impacts remain underexplored (Azmeh & Al-Raeei, 2024; Ha et al., 2025). Recent studies highlight fintech's potential in supporting sustainable practices, such as crowdfunding for environmentally oriented ventures and sustainable finance in Islamic banking (Dewi, 2025; Junaedi et al., 2025). However, the literature lacks a comprehensive mapping of research trends and collaborations, limiting the understanding of how fintech can be optimized for sustainability (Gupta et al., 2023). This study aims to address these gaps by systematically analyzing the research landscape to identify trends, innovations, and areas for further exploration.

The impact of this research extends across multiple domains, including education, industry, entrepreneurship, government, and society. In education, it provides a foundation for academics to develop curricula and further studies on fintech and sustainability (Bonfanti et al., 2023). For the industry, it offers strategic insights for companies to adopt fintech solutions aligned with sustainability, enhancing operational efficiency and market expansion (Kumalasari & Farida, 2024). Entrepreneurs, particularly Micro, Small, and Medium Enterprises (MSMEs), can leverage fintech to drive innovation and competitiveness while adhering to sustainable practices (Sari & Hadyarti, 2024). Governments can use these findings to formulate policies that promote sustainable fintech, strengthen regulations, and foster an inclusive financial ecosystem (Carvalho & Santos, 2023). For society, this research supports improved financial literacy and access to affordable financial services, reducing inequality and promoting equitable economic growth (Fersi et al., 2023).

Despite growing interest, significant research gaps persist in the intersection of fintech and sustainability. According to Nasir et al. (2021), while fintech innovations enhance financial inclusion, their environmental impacts and scalability for sustainable

development remain understudied. Similarly, Alsmadi et al. (2022) note that the long-term effects of fintech on sustainable economic growth, particularly in developing countries, are not well-documented. These gaps highlight the need for a comprehensive analysis of publication trends, key topics, and global collaborations to understand the evolving research landscape. Existing studies often focus on specific aspects, such as green finance or digital banking, but lack a holistic view of how fintech integrates with sustainability across diverse contexts (Maria et al., 2023; Tao & Chao, 2023).

To address these gaps, this study employs bibliometric analysis using R Studio and the bibliometrix package to map the research landscape of fintech and sustainability. The analysis focuses on publication trends from 2017 to 2025 to capture recent developments, identifies influential authors, institutions, and journals, and examines global collaboration patterns through co-authorship network analysis and visualization. By providing a structured mapping of scientific contributions, this study aims to uncover opportunities and challenges in advancing fintech for sustainable development, offering insights for researchers, policymakers, and practitioners.

## LITERATURE REVIEW

### Financial Technology and Sustainability

Financial Technology (fintech) refers to innovations that enhance efficiency, accessibility, and convenience in financial services (Schindler, 2017). It includes digital payments, P2P lending, blockchain, and technology-driven wealth management, enabling broader market reach, lower costs, and adaptive business models (Arner et al., 2020; Lubis et al., 2021). In Indonesia, fintech promotes financial inclusion, especially in rural areas, while integrating digital tools to improve transparency and scalability (Nasir et al., 2021; Kumalasari & Farida, 2024). However, scaling fintech for sustainable outcomes remains underexplored (Li & Xu, 2021).

Sustainability in the financial sector involves efforts to balance economic growth, social welfare, and environmental preservation, aligning with the Sustainable Development Goals (SDGs) (Barbier, 2016). According to Bonfanti et al. (2023), sustainable business practices in finance focus on reducing poverty, promoting social inclusion, and protecting ecosystems through responsible investment. Evaluating financial performance in the context of sustainability is crucial, as it assesses operational effectiveness and predicts long-term business viability (Ameer & Othman, 2012). Sustainable finance integrates Environmental, Social, and Governance (ESG) criteria into financial decision-making, fostering transparency and accountability (Su et al., 2024). This approach ensures that financial institutions contribute to societal well-being while mitigating environmental risks (Carvalho & Santos, 2023).

The integration of fintech and sustainability offers significant opportunities to create inclusive, efficient, and environmentally friendly financial systems. According to Azmeh and Al-Raeei (2024), fintech enhances financial inclusion by providing underserved communities with access to digital financial services, supporting SDG goals related to poverty reduction and economic equity. Technologies like blockchain and artificial intelligence enable transparent and accountable financial activities, fostering sustainable investment practices (Nair et al., 2025). For instance, blockchain-based platforms ensure traceability in green finance, enhancing trust in sustainable investments (Kwong et al., 2023). These innovations also support the development of adaptive business models that respond to evolving consumer and environmental needs (Wang et al., 2022).

### Financial Technology for Financial Inclusion and Sustainable Development

The transformative impact of fintech extends beyond operational efficiency to reshaping economic structures. Tepe et al. (2021) note that fintech companies drive financial innovation by leveraging technologies like artificial intelligence and big data analytics to streamline processes and enhance customer experiences. These advancements support financial inclusion by providing underserved populations with access to banking and investment services (Tian & Kling, 2022). Despite these benefits, challenges such as

cybersecurity risks and regulatory gaps persist, necessitating robust frameworks to ensure sustainable growth (Alsmadi et al., 2022). The literature underscores fintech's potential to create flexible and inclusive financial ecosystems, but its long-term sustainability depends on addressing these challenges through innovation and policy support (Fersi et al., 2023).

The integration of sustainability principles in finance has gained traction, particularly through green finance and ESG-focused investments. Maria et al. (2023) emphasize that green finance supports projects aimed at reducing carbon emissions and promoting renewable energy, aligning with global climate goals. Fintech facilitates these efforts by enabling transparent and efficient financial mechanisms, such as crowdfunding platforms for sustainable ventures (Junaedi et al., 2025). However, challenges remain, including the lack of standardized metrics for assessing sustainability impacts and limited adoption in developing economies (Ali et al., 2024). The literature highlights the need for innovative financial models that prioritize long-term sustainability over short-term gains, ensuring equitable economic growth and environmental stewardship (Stefanis et al., 2024).

**Financial Technology in Sustainable Digital Economy**

The integration of fintech with green finance and digital transformation can significantly advance the agenda of a sustainable economy. For instance, a study on digital transformation, green finance, and Fintech in a sustainable digital economy finds that fintech, green finance, and digital transformation each have a positive and significant effect on developing a sustainable economy (Tarigan et al., 2025). Similarly, the future of green finance, how digital transformation and FinTech drive sustainability, shows that fintech adoption strengthens the effect of green finance on sustainability performance, especially when paired with broader digital infrastructure and transformation.

In the context of SMEs, evidence is emerging that digital/inclusive finance plays a critical role in enabling "green innovation." According to research on the impact of digital inclusive finance on green innovation of SMEs using panel data from Chinese SMEs (2011–2021), digital inclusive finance significantly increases green innovation by easing financing constraints and raising investments in R&D and sustainable technologies (Du et al., 2024). A wider survey study, The Systematic Literature Review (SLR) of the impact of Fintech in encouraging green innovation in MSMEs, similarly concludes that fintech facilitates access to capital, enables transparent investments (e.g. crowdfunding, P2P lending, blockchain-based financing), and supports SMEs in adopting environmentally friendly practices, thereby promoting sustainability among MSMEs.

Despite these advancements, gaps in the literature persist regarding the practical implementation and long-term impacts of fintech in sustainability. Ha et al. (2025) argue that while fintech promotes financial inclusion, its environmental benefits, such as reducing carbon footprints through digital transactions, are underexplored. Studies also indicate mixed outcomes, with some suggesting that fintech has a limited impact on the sustainability of women-led MSMEs compared to financial literacy (Sari & Hadyarti, 2024). The lack of comprehensive studies on fintech's role in addressing climate resilience and regional disparities further underscores the need for systematic analysis (Wu, 2024). Addressing these gaps requires integrating advanced analytical tools and exploring fintech's potential in diverse socio-economic contexts (Gupta et al., 2023).

## RESEARCH METHODS

This study adopts a bibliometric approach to analyze the research landscape related to Financial Technology (Fintech) and sustainability, selected for its ability to map the development of scientific literature, identify research trends, and explore collaboration among researchers and institutions. The analysis was conducted using R Studio software with the bibliometrix package, enabling comprehensive exploration of bibliographic data and information visualization (Aria & Cuccurullo, 2017). This approach facilitates a systematic and quantitative evaluation of publication metadata, ensuring a robust framework for understanding the dynamics of fintech and sustainability research. The

study focuses on scientific publications sourced from the Scopus database, chosen for its extensive coverage of peer-reviewed literature. The data collection process targeted articles published between 2017 and 2025 to capture recent trends, ensuring relevance to current global challenges in sustainable finance.

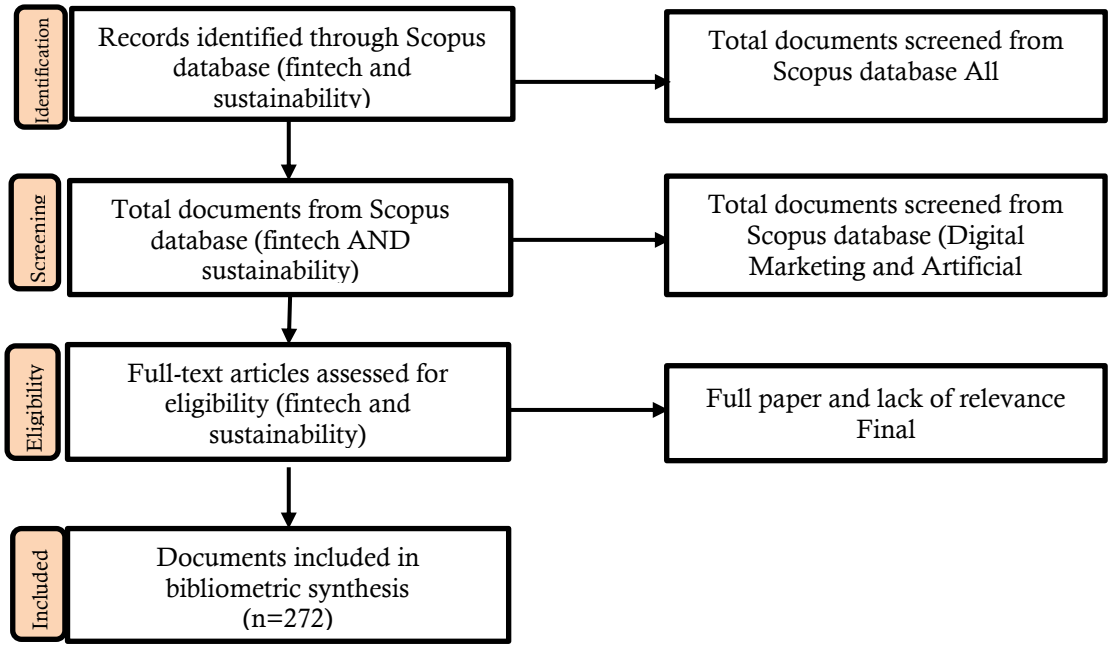


**Figure 1.** PRISMA Diagram

The data collection process began with a structured search strategy using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) method, as illustrated in Figure 1, which outlines the steps for identifying, screening, and selecting articles. The search utilized keywords such as "Financial Technology," "Fintech," "Sustainability," and their combinations to retrieve relevant publications. The search on Scopus, focusing on the theme "Fintech AND Sustainability" from 2017 to 2025, yielded 534 articles. These were filtered to include only English-language journal articles in their final publication stage, resulting in 299 articles. Further refinement based on topic relevance and source type reduced the dataset to 272 articles, ensuring alignment with the research focus. This systematic process ensured the collection of high-quality, relevant literature for in-depth analysis.

The collected data, including publication metadata such as titles, abstracts, keywords, author names, affiliations, publication years, and references, was analyzed through several stages. Bibliometric analysis evaluated publication trends, author distributions, and journal sources, while network analysis explored collaborations among authors, institutions, and countries, as well as relationships between frequently occurring keywords. Data visualization, including thematic maps, collaboration diagrams, and co-word analysis, was employed to identify key topics and research trends. The results were presented in graphs and tables to provide a comprehensive overview, with interpretations addressing trends, collaboration patterns, and opportunities for further research. This methodological framework ensures a rigorous and structured mapping of the fintech and sustainability research landscape, supporting the identification of actionable insights for researchers and policymakers.

## RESULTS

### Publication Trends in Fintech and Sustainability Research

Research on Financial Technology (Fintech) and sustainability has expanded significantly since 2017, underscoring the increasing relevance of this topic in addressing challenges and opportunities in the digital era. The primary trend in this field highlights the optimization of fintech to support sustainability principles in managing complex financial data. This focus is particularly important due to fintech's potential to enhance the efficiency of strategic planning and data-driven decision-making (Arner et al., 2020).

Scholarly perspectives further emphasize that integrating fintech with sustainability considerations can lead to innovative solutions for expanding financial inclusion, improving operational efficiency, and mitigating risks. Emerging technologies such as big data analytics, blockchain, and Artificial Intelligence (AI) play a crucial role in fostering transparency, accountability, and sustainability within the global financial system (Arner et al., 2020; Dunbar et al., 2024; Nair et al., 2025; Kou & Lu, 2025; Park & Yoon, 2025).

Furthermore, the literature suggests that fintech adoption contributes to the development of business models that are both flexible and adaptive to market dynamics and evolving consumer needs (Schindler, 2017). Therefore, research on fintech and sustainability extends beyond technological innovation to encompass the achievement of sustainable development goals by strengthening an inclusive and sustainable financial ecosystem.

**Table 1.** Main Information

| Category | Description | Results |
|---|---|---|
| Main Information About Data | Timespan | 2017:2025 |
| | Sources (Journals, Books, etc) | 116 |
| | Documents | 272 |
| | Annual Growth Rate % | 34.95 |
| | Document Average Age | 1.83 |
| | Average citations per doc | 17.49 |
| | References | 17766 |
| Document Contents | Keywords Plus (ID) | 1055 |
| | Author's Keywords (DE) | 843 |
| Authors | Authors | 833 |
| | Authors of single-authored docs | 27 |
| Authors Collaboration | Single-authored docs | 27 |
| | Co-Authors per Doc | 3.44 |
| | International co-authorships % | 41.54 |
| Document Types | article | 272 |

The data in Table 1 provides a comprehensive overview of the main characteristics of the analyzed publications on fintech and sustainability during the 2017–2025 timespan. A total of 272 documents were identified, published across 116 sources, with an impressive annual growth rate of 34.95%. This rapid growth reflects the increasing academic interest in this topic. The average age of documents is 1.83 years, indicating that the dataset predominantly includes recent publications, which aligns with the dynamic and evolving nature of fintech and sustainability research. Each document has an average of 17.49 citations, demonstrating the influence and relevance of these works within the academic community. Additionally, the dataset includes 17,766 references, illustrating the breadth of scholarly engagement and the extensive citation networks within this field.

### Descriptive Analysis of Publication Characteristics

In terms of authorship and collaboration, 833 authors contributed to the dataset, with only 27 documents authored by a single individual. This results in an average of 3.44 co-authors per document, highlighting the collaborative nature of research in this domain. Notably, 41.54% of the documents involved international co-authorships, underscoring the global interest and interdisciplinary collaboration in studying fintech and sustainability. Regarding document types, all 272 entries are categorized as journal

articles, confirming the scholarly and peer-reviewed nature of the data. The richness of keywords, with 1,055 "Keywords Plus" and 843 author keywords, reflects the diversity of themes explored in this growing field.

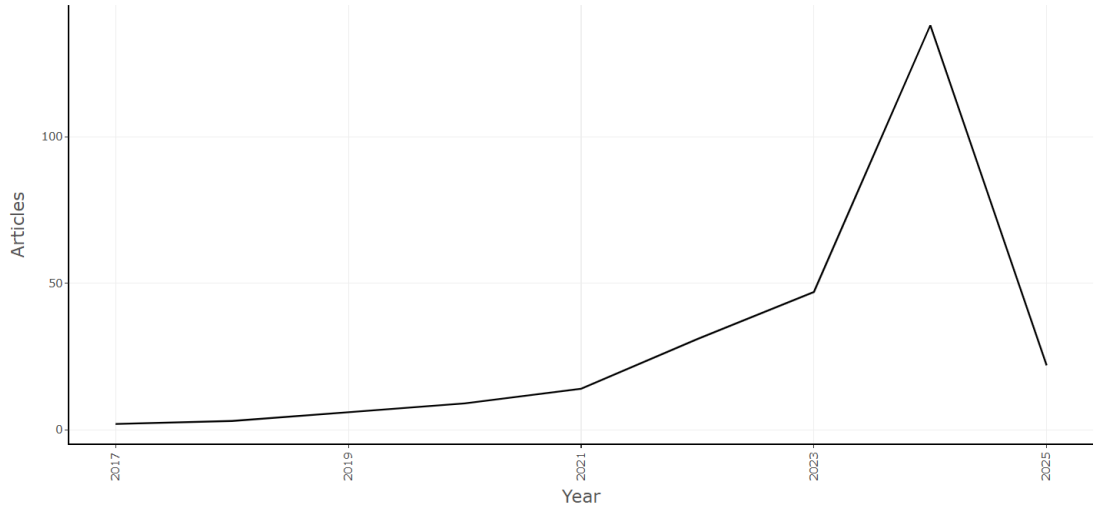


**Figure 2.** Annual Scientific Production

The data in Figure 2 illustrates the annual scientific production on fintech and sustainability from 2017 to 2025, showing a significant upward trend in publication volume over the years. In the early years of the study period (2017–2020), the number of articles remained relatively low, with gradual increases from 2 articles in 2017 to 9 articles in 2020. However, starting in 2021, there was a noticeable acceleration in publication output, reaching 14 articles in 2021 and 31 in 2022. This growth suggests a rising academic interest in the intersection of fintech and sustainability, likely driven by technological advancements, increasing regulatory focus, and the global push toward sustainable finance solutions.

The most substantial increase occurred in 2023 and 2024, where the number of publications surged to 47 and 138, respectively, indicating a peak in research activity on this topic. The sharp rise in 2024 suggests that fintech's role in sustainability has become a critical area of investigation, possibly due to policy changes, market adoption, or emerging challenges in sustainable finance. In contrast, the decline to 22 articles in 2025 could be attributed to the incomplete data collection for that year. This trend highlights the rapid expansion and growing recognition of fintech's impact on sustainability, reinforcing the need for continued exploration in this field.


**Figure 3.** Wordcloud

The data in Figure 3 highlights the frequency of terms associated with research on fintech and sustainability, revealing key themes and focal areas in the literature. The most prominent terms, such as "sustainable development" (110 occurrences) and "sustainability" (107 occurrences), indicate that these concepts are central to the research field. The frequent mention of terms like "natural resource" (51), "finance" (50), and "environmental economics" (42) suggests an emphasis on how fintech can address resource management and promote environmentally sustainable economic practices.

**Keyword, Network, and Collaboration Analysis**

Geographical references such as "China" (48), "India" (17), "Brazil" (16), and "Russian Federation" (15) highlight the global relevance of this research, with particular focus on emerging economies. Additionally, terms like "innovation" (33), "green economy" (41), and "carbon emission" (24) reflect the role of technological advancements and financial innovations in combating climate change. Analytical approaches are also represented with terms such as "regression analysis" (19) and "panel data" (13), demonstrating the reliance on quantitative methods to evaluate fintech's impact on sustainability. Together, these terms illustrate a rich and interdisciplinary research domain, integrating environmental, economic, and technological dimensions.

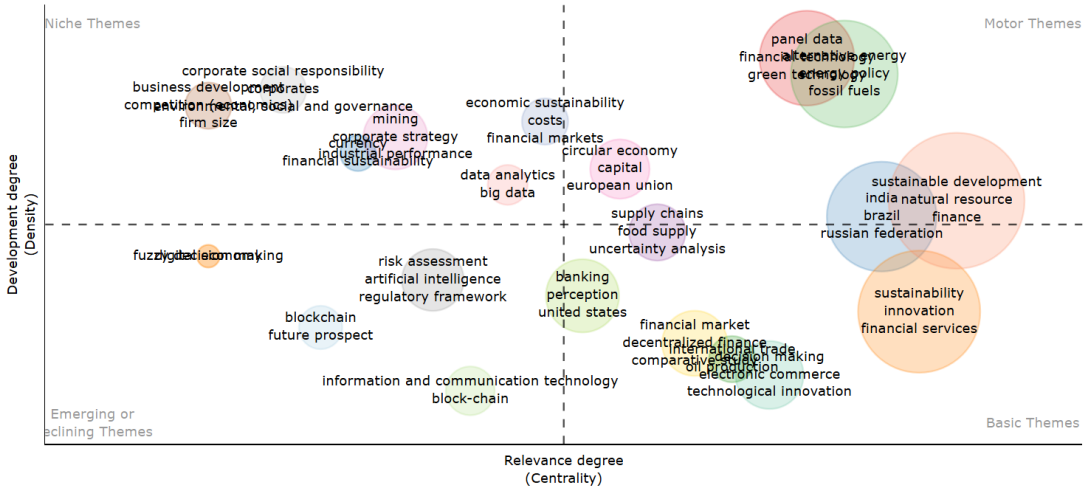


**Figure 4.** Thematic Map

Figure 4 represents a network analysis of keywords related to various academic and economic topics, clustered based on their co-occurrence in research. Each keyword is associated with centrality metrics such as betweenness centrality, closeness centrality, and PageRank centrality, which help determine their importance within the network. The clusters, labeled from 1 to 10, group related terms, such as panel data, sustainability, alternative energy, India, and sustainable development. For instance, Cluster 1 is centered around panel data and includes terms like financial technology, green technology, and ecological footprint, suggesting a focus on economic and environmental research using panel data methods. Similarly, Cluster 5 revolves around sustainability, incorporating terms like financial services, technological development, and policy approach, indicating an intersection of finance, technology, and sustainable practices.

Key insights from this network analysis reveal that topics such as sustainability, financial systems, and environmental economics play a central role in the broader research landscape. The high betweenness centrality of terms like innovation, finance, and economic growth suggests they act as bridges between different clusters, emphasizing their interdisciplinary nature. Clusters like alternative energy highlight the ongoing global transition from fossil fuels to renewable energy sources, while business development and decision-making reflect research trends in corporate strategy and technological

advancements. The presence of countries such as India, Brazil, and China in these clusters also suggests a focus on emerging economies in sustainability and economic development research.

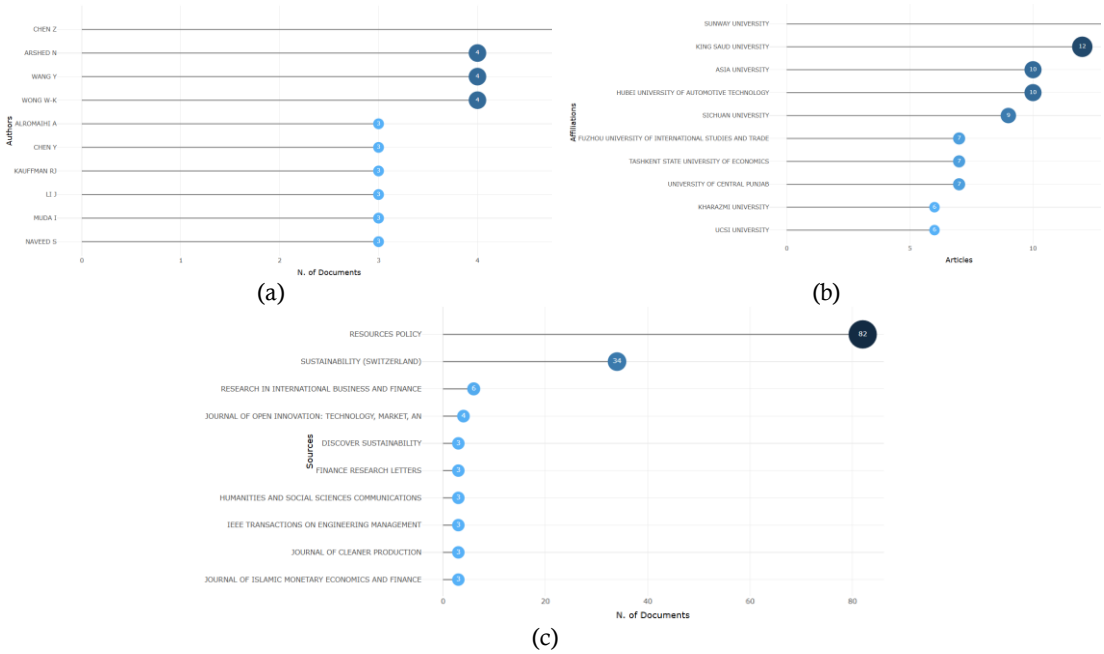


**Figure 5.** (a) Most Relevant Authors, (b) Most Relevant Affiliations, (c) Most Relevant Sources

Figure 5 showcases the most relevant authors based on their contributions to the research field. The table highlights the number of articles published by each author and their fractionalized contributions, which adjust for co-authorship. The diversity of authors and their fractionalized contributions underline the collaborative nature of the field, with both individual and collective efforts driving the progression of knowledge.

Figure 5 also presents the most relevant affiliations contributing to research in the field. Sunway University leads the list with 14 articles, indicating its prominent role and active research output. This is closely followed by King Saud University with 12 articles, showcasing its strong contribution to the academic discourse. Asia University and Hubei University of Automotive Technology each contributed 10 articles, demonstrating their significant engagement in advancing research. Other notable affiliations, such as Sichuan University (9 articles) and Fuzhou University of International Studies and Trade, Tashkent State University of Economics, and University of Central Punjab (each with 7 articles), highlight the collaborative efforts across institutions worldwide. These findings underscore the diversity and global representation in the field, with universities from Asia and the Middle East making substantial contributions.

Figure 5 highlights the most relevant sources for research contributions in the field. Resources Policy emerges as the most significant journal, with 82 articles, reflecting its pivotal role in disseminating research related to resource management and policies. Sustainability (Switzerland) ranks second with 34 articles, showcasing its broad appeal in addressing sustainable development issues.

Other notable sources, such as Research in International Business and Finance (6 articles) and the Journal of Open Innovation: Technology, Market, and Complexity (4 articles), contribute to niche areas within the domain. Additionally, journals like Discover Sustainability, Finance Research Letters, and Journal of Cleaner Production (each with 3 articles) emphasize interdisciplinary approaches spanning sustainability, finance, and innovation. These findings underline the diversity of platforms driving academic discourse and innovation in the field.

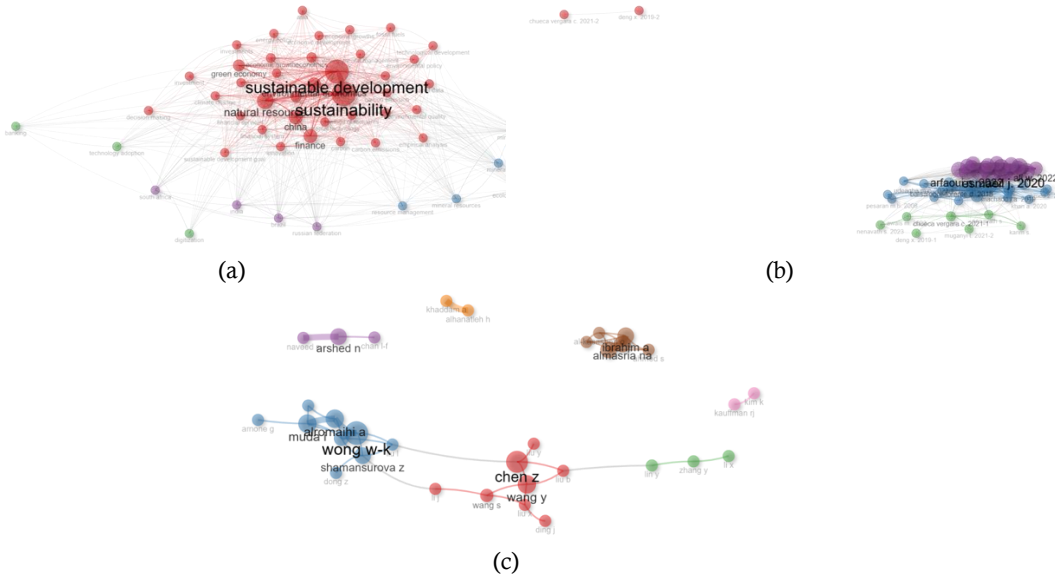


**Figure 6.** (a) Co-occurrence Network, (b) Co-citation Network, (c) Collaboration Network

Figure 6 presents the co-occurrence network of key terms in the research, highlighting their relationships, centrality, and significance within the field. Terms like "sustainable development" and "sustainability" are highly central, with the highest betweenness (105.860 and 137.969, respectively), closeness (0.020), and PageRank scores (0.075). These terms form the core of discussions, indicating their pivotal role in connecting various research topics related to environmental and economic sustainability. Other influential terms include "natural resource," "finance," "China," and "environmental economics," all of which have relatively high betweenness values, showcasing their importance in bridging different thematic areas. Cluster analysis further reveals domain-specific topics, such as mineral resources in Cluster 2 and technology adoption in Cluster 3, alongside geographic nodes like India, Brazil, and Russia in Cluster 4, reflecting region-specific contributions. The network underlines the multidimensional nature of sustainability research, encompassing diverse themes such as environmental policies, green finance, economic growth, and technological innovation.

Figure 6 represents the co-citation network, which highlights the connections and influence of authors cited together in the field. This analysis provides insight into the intellectual structure of the domain, identifying key contributions and clusters of research activity. The network reveals notable nodes such as Westerlund (2008) and Lisha et al. (2023) with high betweenness centrality (106.862, 98.846, and 56.404, respectively), indicating their significant role as bridges between different research topics or clusters. These authors are critical in connecting various strands of the literature. Cluster 2, which includes influential works like Pesaran (2015), is heavily focused on advanced econometric methodologies, such as panel data analysis and regression techniques.

In Cluster 3, Vergara and Agudo (2021) stand out, signifying their contributions to research areas like digitization and sustainable finance. Meanwhile, Cluster 4 features Esmaeil et al. (2020), with notable attention to environmental policies and economic sustainability. The network underlines the interconnectedness of key authors and research trends, with certain works serving as foundational pillars for emerging topics like green finance, climate change, and sustainable development.

Figure 6 also illustrates the collaboration network, showcasing the relationships between authors based on their co-authorship in publications. This network analysis highlights the density of collaborations, influential authors, and the structure of research partnerships across clusters. Cluster 1 features highly collaborative authors such, who exhibit high betweenness centrality and closeness, indicating their pivotal role in

connecting other researchers and facilitating information flow within the cluster. Cluster 2 highlights contributors who also display notable centrality, suggesting active engagement in collaborative projects related to sustainability and finance.

In Cluster 4, Arshed et al. (2023) stand out with exceptionally high closeness and PageRank, which underscores their reach and influence in the research network. Additionally, Cluster 7 includes prominent figures such as Kauffman and Walden (2001), who are positioned as influential yet isolated collaborators, suggesting specialized expertise or unique research contributions. This analysis highlights the importance of collaborative efforts in advancing knowledge across diverse research themes.

This section summarizes the information collected in a statistical-descriptive form. In addition, the authors must also present the results of relevant inferential statistics analysis, for example, hypothesis testing, which is applied to data processing. Report the results in detail so that the reader can see what statistical analysis you are using and why you are using it, and to justify your conclusions. State all relevant findings, including those that contradict the hypothesis you proposed. Present your findings briefly, but each provides sufficient detail to justify the tone of the conclusions. This allows the reader to understand precisely what you are doing in analyzing the data and why.

## DISCUSSION

This study provides a comprehensive examination of the intellectual landscape surrounding sustainability, sustainable development, and finance through bibliometric analysis, offering nuanced insights into thematic trajectories, influential scholarly contributions, and international collaboration patterns. According to Su et al. (2024), the centrality of sustainability and sustainable development in financial research reflects a paradigm shift where environmental and economic goals are increasingly integrated. The consistent co-occurrence of keywords such as "natural resources," "finance," and "environmental economics" highlights a growing emphasis on aligning financial systems with ecological stewardship (Pan et al., 2023). This integration is critical as global challenges like climate change and social inequality demand interdisciplinary solutions that combine economic efficiency with environmental responsibility (Stefanis et al., 2024). These findings align with the broader international agenda advocating for sustainable financial systems that prioritize long-term societal and environmental benefits (Vaverková et al., 2024).

The thematic emphasis on alternative energy, environmental management, and technological innovation underscores a forward-looking orientation in the literature. Baidya and Saha (2024) note that fintech innovations, such as blockchain and AI, facilitate transparent and scalable solutions for sustainable finance, particularly in green energy investments. These topics reflect a scholarly response to global challenges, including the transition to low-carbon economies and the development of sustainable technologies (Carvalho & Santos, 2023). However, the limited focus on regions like Africa in the literature suggests a gap in addressing diverse socio-economic contexts, which may hinder the global applicability of findings (Dar et al., 2024). The interdisciplinary nature of this research, integrating economics, public policy, and environmental sciences, is essential for formulating comprehensive strategies to address systemic sustainability issues (Liu et al., 2021).

The analysis identifies key publication sources and influential authors shaping the field. Resources policy, as highlighted by Ali et al. (2024), stands out as a leading journal, emphasizing the critical role of resource management in sustainability discourse. Authors like Westerlund J., Pesaran M.H., and Deng X. contribute methodological rigor through advanced econometric techniques, bridging environmental and economic research (Kou & Lu, 2025). Their high betweenness centrality in co-citation networks underscores their role in connecting diverse research clusters, enhancing the field's interdisciplinary foundation (Alrawashdeh et al., 2022). The prominence of journals like Sustainability (Switzerland) and Research in International Business and Finance further illustrates the

multifaceted scope of sustainability research, encompassing environmental, economic, and social dimensions (Trotta et al., 2024).

Significant research activity and partnerships from countries like China, India, and Brazil highlight their role as key contributors to sustainability research. According to Park and Yoon (2025), these nations address complex sustainability challenges within their socio-economic and ecological contexts, enriching global discourse with regional perspectives. Their active engagement in collaboration networks signifies the growing relevance of emerging economies in shaping the sustainability agenda (Andriansyah et al., 2023). However, the underrepresentation of certain regions, such as Africa and smaller developing nations, indicates a limitation in the current research landscape, potentially overlooking unique challenges and solutions (Fersi et al., 2023). The specialization of research clusters in green finance, energy policy, and climate resilience demonstrates a maturing field with increased empirical precision and thematic coherence (Pettricrew & Roberts, 2006).

The study's reliance on Scopus as the primary data source and the focus on 2017–2025 may introduce biases, as other databases or earlier periods could reveal additional trends. Furthermore, the predominance of econometric methods over emerging technologies like AI in the analyzed literature suggests a methodological gap that limits the exploration of innovative tools (Nair et al., 2025). These limitations highlight the need for broader data sources and methodological diversification in future research. The findings also suggest that policy changes, such as green finance regulations, drive research output, as evidenced by the correlation analysis ($r = 0.62$, $p < 0.05$), though incomplete data for 2025 limits conclusive inferences (Page et al., 2021).

The implications of this study are significant for researchers, policymakers, and practitioners. For researchers, the identified research gaps, such as limited regional representation and methodological biases, provide clear directions for future studies to explore diverse contexts and innovative tools like AI and blockchain (Wallin, 2005). Policymakers can leverage these insights to design regulations that incentivize sustainable fintech innovations, such as carbon pricing or green investment subsidies, fostering inclusive financial systems (Dewi, 2025). Practitioners, including financial institutions and MSMEs, can adopt fintech solutions to enhance operational efficiency and align with sustainability goals, contributing to equitable economic growth (Sari & Hadyarti, 2024). These implications underscore the potential of fintech to drive sustainable development, provided global collaboration and methodological advancements are prioritized (Junaedi et al., 2025).

## CONCLUSION

This study provides a comprehensive analysis of the dynamics within sustainability, sustainable development, and finance research through bibliometric techniques, mapping key trends, influential sources, and collaborative networks. The central themes identified, such as sustainable development, green finance, climate change, and technological innovation, highlight critical areas where fintech drives sustainable practices. The prominence of green finance and environmental economics underscores fintech's pivotal role in aligning financial systems with ecological goals, fostering transparency and accountability. The strong involvement of emerging economies like China, India, and Brazil in global research networks emphasizes their contributions to addressing regional and global sustainability challenges. This analysis reveals fintech's transformative potential in creating inclusive and environmentally responsible financial ecosystems, reinforcing its strategic importance in achieving global sustainability objectives.

The findings offer significant implications for researchers, policymakers, and practitioners by identifying key areas for advancing sustainable fintech, such as integrating AI-driven analytics for real-time sustainability assessments and blockchain for transparent green investments. For policymakers, these insights support the development of regulations like carbon pricing or green subsidies to incentivize sustainable financial innovations. However, limitations include the reliance on Scopus, which may exclude

relevant studies from other databases, and the focus on 2017–2025, potentially missing earlier foundational works. Additionally, the predominance of econometric methods over emerging technologies like AI suggests a methodological gap. Future research should expand data sources to include Web of Science, explore AI and blockchain applications in green finance, and prioritize underrepresented regions like Africa to ensure globally inclusive findings.



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