

A Systematic Literature Review and Bibliometric Analysis on Green Finance: Future Research Agenda

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ABSTRACT

Over the last few years green finance has received global attention and emerged as crucial mechanism for integrating financial system with environmental sustainability performance and climate goal. This study has been adopted structured systematic search of review approach on green finance using SPAR-4-SLR and these article were published between 2015 to 2025. The present study integrates the Bibliometric analysis with systematic literature review. A total of 657 peer-reviewed papers were extracted using Scopus database. Bibliometric technique, including keyword co-occurrence analysis and Bibliometric coupling are employed using VOSviewer software to identify most contributing author, journal, and research cluster and emerging themes. The findings reveal a substantial growth in green finance domain after 2016, which emphasize strong academic and policy interest in climate related financial system. The current study identifies key thematic clusters and a wider knowledge themes including green finance policy frameworks, sustainability transition, innovation, energy transition and carbon reduction, green bonds, economic growth and sustainable development. The study also provide theme-wise direction for future research to improve the existing body of knowledge and to support the development of sustainable climate resilient financial systems. This research is useful for policymakers, academicians, financial institution by offering a structured understanding of green finance research trends and future research direction.

Keywords: Bibliometric, Environment, Green finance, sustainability

INTRODUCTION:

In the Era of fast moving technology there is growing concern about Environmental degradation, Climate change, resource depletion, green finance has become essential instrument for aligning country to move towards Sustainable development goals, connecting financial system with environmental imperatives. Green Finance plays a significant role in leading investment towards eco-friendly and climate resilient project (Khan et al., 2022). Recent research on green finance emphasizes that green finance is essential for achieving both climate goal and sustainable development objective. And it also offer a descriptive evaluation of green finance's role in attaining carbon neutrality, substantial investments in carbon reduction initiatives, strong regulatory frameworks, and ESG integration to prevent climate change and encourage inclusive growth (Fu 2023 & Liu et al., 2025). Sachs et al., (2019) and Agirman and Osman (2019) in their paper emphasize its theoretical foundations, defining Environmental finance (green finance) as a tool to finance sustainable development by investing in renewable energy, clean technologies, and ecosystem preservation. Green finance addresses market failures, such as externalities from fossil fuels, by incentivizing low-carbon transitions. Adding to this, research by Brockmann (2017) and Berensmann and Lindenberg (2016) expand the scope to comprise systemic reforms, such as

embedding environmental hazards into financial regulations standard and promoting divestment from high-carbon assets.

Globally, Increasing Investor awareness and international commitments for example the Sustainable development goals (SDG) and Paris agreement, sustainable finance has expanded. In the past decade, Institutional investor combine the environmental criteria into capital allocation decision on ESG based investment which has grown considerably. This shift as changed firm and financial institutions to adopt responsible investment practices which will help in improving transparency and expand their sustainability disclosures. Even with this progress, scholars note that achieving a real green transition remain complex (Minardi, 2023) multiple studies broaden these concepts to inclusive dimensions, joining green finance to social equity and digital innovation. Empirical studies provide strong evidence of green finance's tangible benefits, especially in reducing ecological footprints and increasing energy transitions. Khan et al. (2022) and Wang et al. (2024) Discover that climate mitigation finance significantly reduce ecological degradation, with decreasing in footprints by 20-40% through investments in renewables. Likewise, Kwilinski et al. (2025) illustrate that green finance improves ESG performance by directing funds to low-carbon projects, yielding up to 30% better environmental outcomes. The article by Tao and Chao (2023). Lou et al. (2022) gave Expansive impacts on

energy and ecosystems using Bibliometric tools to connect green finance with renewable energy adoption, reduced CO2 emissions and economic growth which enhance market incentives for sustainability. These results converge on green finance’s role in mitigating climate risks. A subsection of the literature give attention on green bonds as a leading instrument, assessing their pricing, market dynamics and pricing certifications. Ehlers and Packer (2017) and Zerbib (2017) investigate the “green bond premium,” these securities frequently trade at a minor premium (up to 9 basis points) due to investor request for ethical assets, though secondary market performance links with conventional bonds. They focus the importance of certification standards, such as those from the Climate Bonds Initiative to lower green washing and ensure proceeds fund verifiable green projects. Despite of rapid expansion of green finance across the globe still several economies continue to lag in their adoption and implementation (Zakari et al., 2023). Hence a systematic review of the existing literature review is important to assess progress of current study, identify research gaps, and offer future research directions. In this context, the present study purpose is to provide a comprehensive assessment of the green finance domain and seeks to address the following research questions:

What are the major research themes in the domain of green finance?

Which are the most contributing journals in the area of green finance?

Who are the most Prominent authors and the number of citations they have received?

What are the future research directions in Green Finance?

Niyazbekova et al. (2021) track green bond issuance growth globally from \$6.5 trillion in 2006 to \$120 trillion in 2022, assigning it to ESG driven investor preferences. He and Yan (2020) article apply this to China's coastal regions, promoting for personalised instruments like green funds for sustainable infrastructure. Pradhan and Krishna (2024) and Jangid et al. (2025) paper used Bibliometric analysis to analyse India's green finance landscape and found the themes like weak policy framework and integration of ESG into green finance

mechanism, with government initiatives mobilizing trillions in sustainable assets. In China, Astiwardhani, W. (2023) study focused on green finance’s connection to renewable energy and CO2 reductions. These papers explore how green finance plays a major part in lowering Co2 emission and adopting renewable energy project for eco-friendly. These research finds difficulties since financing green projects includes, data gaps, (high upfront cost) High initial Investment and regulatory fragmentation. Sachs et al. (2019) and Agirman and Osman (2019) gives different research perspectives, such as long-term risk modelling and behavioural finance. Research Gaps continue in social equity intersection, with limited studies on how green finance affects marginalized communities. Empirical study often depend on proxies like CO2 emissions, overlooking biodiversity metrics (Wang et al., 2024). Future research on green finance should discover technology aspects using innovative fintech's tools in scaling inclusive models and cross-sectorial comparisons to inform global standards. This present body of literature positions green finance as indispensable for sustainable development, with both conceptual and empirical evidence supporting its environmental and economic dividends. (Wang, H. 2025) however, realizing its full potential need overcoming silos through unified policies and innovative research, covering the way for a greener and more equitable future. Table 1: Condenses the review based studies conducted on green finance along with their main findings and the value added by the current research. Thus, the current research discourses the limitations of past review based studies and provides new insights based on a thorough evaluation of green finance and its emerging themes.

This article is organised as follows: segment two explains the research methodology, including Bibliometric procedures and the systematic review protocol. Section three presents the performance analysis of the existing literature on Green finance Section four presents the scientific map results and the thematic literature review, whereas in section five, the thematic-related research agenda based on the identified knowledge clusters is presented. The final section concludes with a discussion of theoretical implications, practical insights for Green finance.

Table 1. Review Based Studies on Green finance

Research article	Methodology	Major findings	Insights from the Present Study
<u>Tao & Chao (2023)</u> – ‘Bibliometric analysis...green finance and energy.’	Bibliometric Analysis (VOSviewer), Conceptual SLR	Inclusive Green Finance promotes green economic development, ecological innovation, and digital financial inclusion. China leads research output. Identified barriers: awareness, policy gaps, cost of green technology.	The study expands by linking inclusive green finance with emerging digital tools , exploring barriers specific to Indian MSMEs , and providing region-specific policy recommendations not covered earlier.

<u>Kaur & Negi (2025)</u> 'Inclusive green finance... bibliometric review.'	Bibliometric Analysis (VOSviewer), Conceptual SLR	Inclusive Green Finance promotes green economic development, ecological innovation, and digital financial inclusion. China leads research output. Identified barriers: awareness, policy gaps, cost of green technology.	The study expands by linking inclusive green finance with emerging digital tools , exploring barriers specific to Indian MSMEs , and providing region-specific policy recommendations not covered earlier.
<u>Mudalige (2023)</u> 'Emerging themes ... green finance.'	Systematic Literature Review + Bibliometric Analysis (Scopus + WoS)	Identified seven core themes: GF–sustainability, GF–investment, GF–innovation, GF–policy, GF–economy, GF–CSR, GF–barriers/awareness. Highlighted need for multi-dimensional GF research.	The study integrates these themes but adds new contextual evidence from India , especially behavioral, digital, and institutional factors , thus deepening thematic understanding.
<u>Desai & Patel (2025)</u> 'Research development... green finance.'	Mixed Method: SPAR-4-SLR + Bibliometric Analysis	Identified 7 knowledge clusters: green investment, economic growth, environmental performance, CSR, innovation, climate risk, financial development. Provided future research agenda and theoretical frameworks.	The study builds on this by: (1) customizing clusters for India, (2) integrating MSME perspective , (3) providing a practice-oriented model , and (4) linking GF adoption with digital financial inclusion .
<u>Nguyen Minh Sang (2024)</u> 'Evolution of green finance ... Bibliometric map.'	Bibliometric Study	Strong rise in GF publications after 2015; China leads output; growing attention to green bonds, credit policies, financial regulation, fintech. Identified conceptual clusters and future research paths.	The study augments by applying Sang's global themes to the Indian context , providing micro-level analysis, and introducing FinTech-enabled GF adoption pathways
<u>Mashari et al. (2023)</u> 'Green finance... carbon trading.'	Bibliometric Review (VOSviewer)	Found weak integration between green finance initiatives and carbon trading; identified significant potential for GF to support carbon markets in developing nations.	The research extends by examining missing financial linkages , proposing models for GF–carbon credit adoption , and assessing India's readiness for carbon-market-aligned financing.
<u>C.P. Abdul Gafoor (2023)</u> 'Trends and patterns ... green finance research.'	Bibliometric Analysis	Identified publication patterns, influential journals/authors, and conceptual hotspots in green finance research. Highlighted rapid growth and diversification of GF.	The research contributes by offering a thematic synthesis plus empirical direction , helping structure GF research beyond descriptive Bibliometric patterns.

RESEARCH METHODOLOGY

This study uses structured SPAR-4-SLR framework protocol proposed by [paul et al. \(2021\)](#) which systematically direct literature identification and assessing across three sequential phases. Alternatively, previous studies from [Maharshi et al. 2023](#), [Mudalige 2023](#) and [Kaur & Negi 2025](#) have used 'preferred reporting items for systematic reviews' (PRISMA) developed by [Shamseer et al. \(2015\)](#). However the PRISMA protocol is primarily limited to systematic literature reviews (SLRs) in general and provides limited rationales that scholar could adopt to legalize their review verdicts. In contrast the SPAR 4 reveals more detailed framework by classifying the review process into three

broad categories with 6 subsection, that is, (a) assembling (identification and acquisition); (b) arranging (organization and purification) and (c) assessing (evaluation and reporting). Such a structured approach is especially appropriate for Bibliometric reviews as it enables researchers to discuss the reasons for selecting a database, screening an assignment in selecting a dataset and identifying key analysis methods with respect to the area of Green finance. Such a structured approach is especially appropriate for Bibliometric reviews as it enables researchers to discuss the reasons for selecting a database, screening an assignment in selecting a dataset and identifying key analysis methods with respect to the area of Green finance.

Apart from SPAR-4-SLR, several other review frameworks exist within management scholarship, including the 6W Framework (Callahan, 2014), ADO Framework (Paul & Benito, 2018), and TCCM Framework (Jain, S Sharma (2024) (Theory–Context–Characteristics–Method) proposed by Paul and Rosado-Serrano (2019). However, the applicability of these frameworks to green finance based Bibliometric research remains largely constrained. Accordingly, the current study uses the SPAR-4-SLR protocol to retrieve, organise and assess relevant literature from Scopus, Web of Science and Google Scholar on Green finance and sustainability, the three-stage SPAR process guided the identification of keywords, search queries, filtering criteria, and the final selection of peer-reviewed articles.

Figure 1 explains the integration of the three-stage process of retrieving articles relevant to this study. Database used for this research is Scopus and the data were extracted and saved in csv format in excel sheet, for this study I have used VOSviewer software as it has the prospective to displays in sizeable Bibliometric maps in a simplified way. The study also adopts descriptive analytics it provides year-wise publication trend of the articles, the most contributing journal, author and most cited article. All the tables and graphs for SLR were done with the help of data saved in excel sheet.

Stage 1: Assembling refers to the identification of the relevant domain area and operationalizing the same through appropriate keywords (Paul et al., 2021). The

keywords of the study are ‘Green Finance’ OR Climate Finance OR Sustainable finance Environmental Finance. The study uses the Scopus database for obtaining the research articles. The Scopus database has been selected due to its large coverage and rigorous peer-review process of the indexed journals. Finally, keywords are searched in the ‘Title, Abstract and Keywords’ field, yielding 2,070articles.

Stage 2: Arranging refers to the data cleaning and sorting, where articles are removed according to the predefined inclusion and exclusion criteria and duplicates are removed. The search filters used in this study include year: from ‘2015 to 2025, subject areas: Business, Management and Accounting, Economics, Econometrics and Finance, document type: Article, source type: Journals, language: English. The study excludes books, book chapters, conferences, editorials and documents that were not in the English language. Finally, 657 articles were recovered and finalized after the organizing and purifying process of data.

Stage 3: Assessing involves assessing the performance of publications, evaluating the articles for qualitative survey and reporting the findings (Paul et al., 2021). The study uses Bibliometric techniques and scientific mapping, including keyword co-occurrence analysis and bibliographic coupling to identify key journals, authors, research themes, knowledge clusters and future research scope.

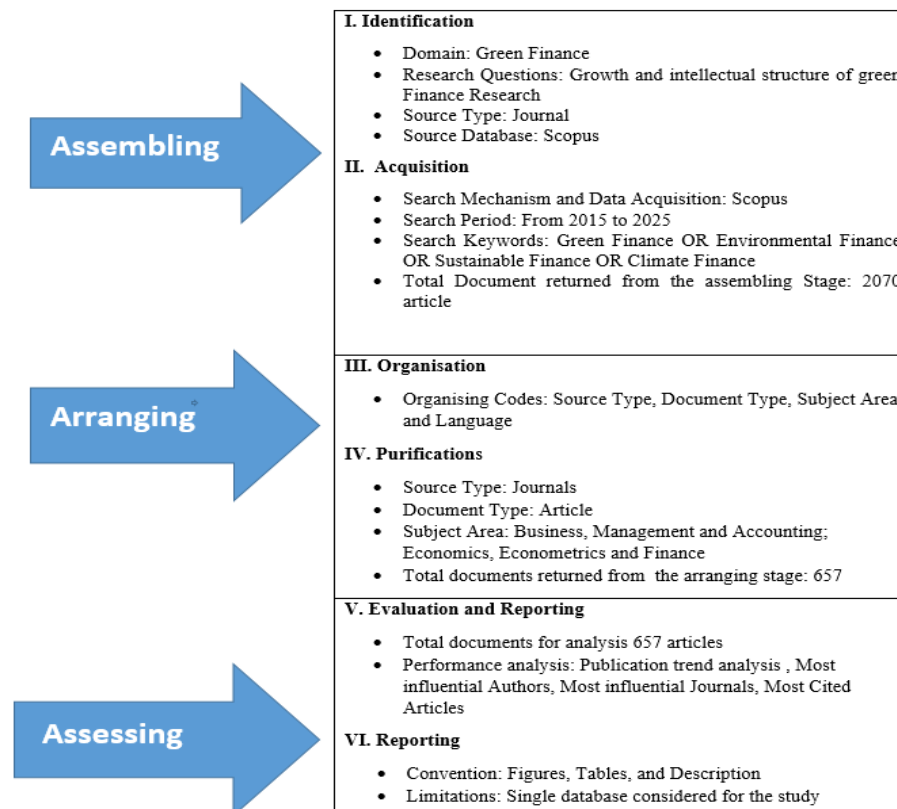


Figure 1 illustrate the three stages article-retrieval process followed in this study, based on the SPAR protocol

Table 2. Statistics of the Overall Data

Particulars	Results
Timespan	2015-2025
Sources	221
Documents	657
Mean age of documents	1.5 Years
Mean citations per document	21.81
Author keywords	3,563
Total authors	1,779
Single-authored article	112
Co-authorship (international)	82.93%
Co-authors per document	2.71

Source: Authors' compilation from the Scopus database.

Table 3: Inclusion and exclusion Criteria

Criteria	Inclusion	Exclusion
Document Type	Journal	Books, Books chapter, Conference proceedings, Editorials
Source Type	article	Trade publications, Book series, Magazines, Reports
Language Time Period	English 2015 to 2025	Any other language
Field of study	Business management and accounting; Economics; Econometrics; and Finance	Any other field

Source: The authors

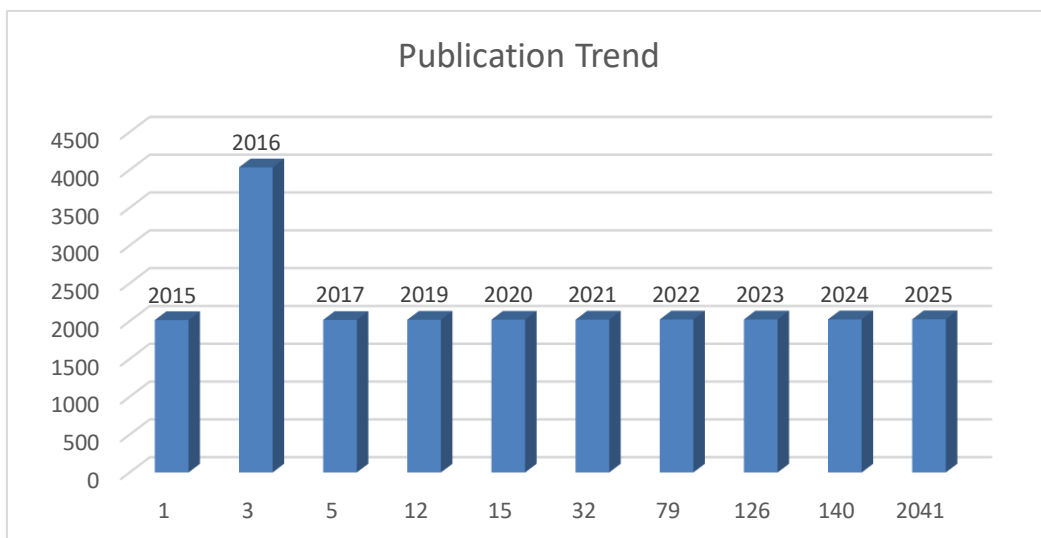


Figure. 2 Annual Publication Trend

Source: Authors’ computation from the Scopus database.

Figure 2 shows the annual publication result on green finance published over the study period from 2015 to 2025. The trend shows a considerable changes in the early years, followed by consistent pattern of publication in the later period. There is sharp raise of publication begins in 2016, indicating a substantial growth in research during that year. This spike may be accredited to increase interest in academia. However, the number of publication after 2016 seems to be declined and then in later years it will stabilizes. From 2017 forwards the publication count remains steady and almost same with minor variation in all the following years. This kind of consistency in a research domain suggests that this area of study has reached mature and sustained stage. The trend shows an initial phase growth followed by long term stability, reflecting that this topic has proven itself as a regular and ongoing area of academic research.

Table 4 Most Contributing Authors in Green Finance

Ran k	Author	Total publication	Total Citatio n	Citations per publication	h-index	First publication year
1	Kangyin Dong	239	16,477	68.94	67	2016
2	Pimonenko, T.	137	5,389	39.33	48	2014
3	Khan, M.A.	119	3,246	27.27	29	2016
4	Afshan, S.	64	4,468	69.81	32	2015
5	Ngo, T.Q.	26	219	8.4	9	2015
6	Fatica, S.	17	574	33.76	7	2010
7	Habib, A.	15	82	5.47	6	2016

Source: Authors’ compilation from the Scopus database.

The table 3 explains the most productive author in the area of green finance based on publication outputs, citation performance and h-index. Kangyin Dong is the highest ranked author with 239 publications, 16,477 citations and with more h index (67), indicating both excellent productivity in publication and achieving good number of citation counts since 2016. Pimonenko, T. & Khan, M.A. being a second and third most productive authors, with 137 and 119 publications, supported by significant citation counts (5,389 & 3,246) and h-index values (48 & 29), Shows as a strong and stable research influencer. Further, Afshan, S. in spite of relatively lower publication value (64), it records the highest citation per publication (69.81), reflecting the great quality and contribution followed by author Ngo, T.Q, Fatica, S, Habib, A. shows moderate to lower publication results and citations performance. However, their contribution in this green finance remain highly impactful.

Table 5 Top Influential Journals Based on Total Productivity (Number of Publications)

Sources	Total Publication	h-index	ABDC Rank	Publisher
International Journal of Energy Economics and Policy (September 07, 2024).	38	58	C	Econjournals
Economic Research-Ekonomska Istrazivanja	31	65	Not Listed	Taylor & Francis
Journal of Risk and Financial Management	29	54	B	MDPI
Energy Economics	27	230	A*	Elsevier
International Review of Economics and Finance	26	87	Not Listed	Elsevier

Journal of Cleaner Production	21	354	A	Elsevier
Sustainable Futures	20	24	Not Listed	Elsevier
Business Strategy and the Environment	16	173	A	Wiley-Blackwell Publishing
Green Finance	15	21	Not Listed	American institute of mathematical sciences
Borsa Istanbul Review	14	52	Not Listed	borsa istanbul anonim sirketi

Source: Authors' compilation from Scopus

The table 4 demonstrate the most influential journals according to the total research productivity, which is measured by the number of publications in green finance. The International Journal of Energy Economics and Policy appeared to be leading source with 38 publication, showing robust focus on energy policy, sustainability and green finance mechanism. The second source Economic Research-Ekonomiska Istrazivanja with 31 publication and the Journal of Risk and Financial Management (29 publication), emphasising on growing scholarly attention to sustainable investment, financial risk and climate related financial issues. The high impact journal such as Energy Economics, International Review of Economics and Finance and Journal of Cleaner Production plays a major role in advancing green finance research, as confirmed by their substantial publication counts and h-index values which is supported by strong ABDC rankings. Adding to this Sustainable Futures, Business Strategy and the Environment contribute to the multidisciplinary nature of green finance by combining sustainability, environmental policy perspective and corporate strategy. While some journals are not listed in ABDC ranking, their publication on green finance studies are growing consistently.

Table 6 Most Cited Articles on Green finance

Document Title	Author (Year)	Source	Citations
Sustainable development...financial performance.	<u>Zhou, G., Liu, L., & Luo, S. (2022).</u>	Business Strategy and the Environment	519
Beyond carbon pricing... in climate mitigation.	<u>Campiglio, E (2016)</u>	<i>Ecological Economics</i>	513
Impact of fintech....green growth.	<u>Zhou, G., Zhu, J., & Luo, S. (2022).</u>	<i>Ecological Economics</i>	469
ESG rating... corporate green innovation	<u>Tan, Y., & Zhu, Z. (2022).</u>	Technology in Society	468
Green finance.... CO ₂ emissions	<u>Meo, M. S., & Abd Karim, M. Z. (2022).</u>	Borsa Istanbul Review	431

Source: Authors' compilation from the Scopus database

Table 4 depicts the most cited articles in the green finance research domain, it points out studies that have exerted the highest scholarly influence in terms of citation impact. The article Sustainable development, Corporate financial performance and ESG concert by [Zhou et al. \(2022\)](#) is the high cited article along with 519 citations, this shows up robust academic interest in the relationship between firm level financial outcomes and ESG concert followed by the author [Campiglio \(2016\)](#) with Beyond carbon pricing: The role of banking and finance in climate mitigation which has 513 citation counts, here the high citation counts emphasises the role of financial institutions in climate change mitigation and strengthening green finance policies. Other most cited articles focused on examining fintech innovation and growth, ESG rating events and corporate green innovation and the role of green finance in lowering CO2 emission shows highest citation counts, this explains study is growing towards adopting technological innovation, sustainability metrics, and environmental performance. The current journal such as Business Strategy and the Environment, Ecological Economics, Technology in Society and Borsa Istanbul Review provides that multidisciplinary nature of green finance research.

Bibliometric Analysis

Bibliometric analysis quantitative and statistical method to analyse scientific publication and citation patterns for evaluating and perceiving the current position of research of a definite area of academic concerns ([Pritchard, 1969](#)). Due to its systematic and objective nature, Bibliometric analysis is largely map research trends and intellectual structure in developing and interdisciplinary areas. ([Donthu et al., 2021](#)). Adding to this Visualisation tools such as VOSviewer provides the graphical representation of Bibliometric networks, which includes keyword Co-occurrence, co-authorship, co-citation, thus improving the interpretation of complex scholarly relationships ([Van Eck & Waltman, 2010](#)).

Mapping knowledge cluster using Keyword Co-occurrence analysis

The study used keyword co-occurrence analysis the output are depicted in table 6 and figure 3 the keyword Green finance (343) appeared as the most predominant followed by other keywords such as green investment (104), Sustainable finance (94) and green economy (79), all of which are prominently indicated in the present body of knowledge.

The analysis of Keyword co-occurrence produced 4 different cluster associated with green finance.

Cluster 1: Green Energy and Environmental Policy

The very first cluster includes keywords like energy policy, renewable energy, environmental regulation and Environmental sustainability. This cluster highlight the

role of green finance in contributing to renewable energy adoption and energy policy frameworks for sustainable development. ([Ullah, S \(2023\)](#)) The cluster strongly emphasise regarding energy transition and environmental governance which assist in ESG Investing and moving towards green growth.

Cluster 2: Green Finance and Sustainable Economic Performance

The second cluster provide Keywords such as Green finance, green credit, sustainability and Economic Growth. These keywords act as central role of financial instrument in promoting sustainable economic results. It is found that in previous studies green financial instruments and green credit policies improve sustainability and economic resilience ([Hu & Christopher Gan 2025](#)) the exceptionally high occurrence and cumulative link strength of green finance shows its central position within the research network, highlighting its importance to countries to adopt sustainable practices while addressing environmental degradation.

Cluster 3: Climate change, ESG, and sustainable Finance

The third cluster explains climate mitigation to promote sustainability. It captures the growing combination of environmental, social, and governance (ESG) discussion into financial decision making. This cluster identified the Keywords such as climate finance, climate change, ESG, corporate sustainability, green investment and green bonds illustrate strong linkage, reflecting growing scholarly attention to financial tools and sustainability standards helped at mitigating climate issues and promoting long term sustainable finance strategies ([Jaishree & Satyanarayana Murthy Dogga 2025](#)).

Cluster 4 Green Economy and Financial systems

The final Cluster identifies the keyword such as Green economy, carbon Emission, financial Systems and environmental management, these keywords summarises systematic perspectives on the role of financial infrastructure and economic structure in attaining environmental sustainable outcomes. This Theme links with wider literature that discusses environmental Economics and institutional frameworks for green finance integration. ([H. Mudalige, 2023](#)). The strong occurrences and cumulative link strength associated with these cluster demonstrate the role of financial systems and institutional mechanism in enabling the transition toward a low carbon and environmentally sustainable economy.

These keyword co-occurrence analysis discloses that green finance research is structured around policy and energy transition, economic performance and ESG investment based sustainable finance, and green financial systems. These interrelated themes collectively provide the evolution of green finance.

	Green Bond	22	42
	Green Investment	104	224
	Sustainable Finance	94	115
Theme : 4 Green Economy and Financial Systems	Carbon emission	33	92
	Energy efficiency	15	45
	Environmental economies	51	161
	Environmental Management	10	37
	Financial Services	6	17
	Financial system	24	74
	Green economy	79	222

Source: Authors' gathering from the Scopus database.

Table 8 Knowledge Themes Bases on Bibliographic Coupling

Clusters	Article Title	Author(s) and Year	Total Citations
Theme : 1 Green Finance Frameworks and Institutional Implementation	'Central bank mandates.... green finance'	Simon Dikau , Ulrich Volz (2021)	833
	'Green start-ups in India... sustainable entrepreneurship'	Bhatnagar, M., Taneja, S., & Özen, E. (2022).	23
	'Green technology upgrading.. environmental policy and green finance'	Tan, X., Sun, Z., Chen, Z., & Chen, Z. (2021)	15
	'Green financing in Russia... development prospects'	Semenova, N. N., Eremina, O. I., & Skvortsova, M. A. (2020).	21
Theme : 2 Green Finance, Innovation, and Sustainability Transition	'Impact of Green Finance...banking Sector sustainability.'	Abuatwan, N. (2023).	35
	'Sustainable banking... sustainable economic development.'	Alieksieiev, I., & Mazur, A. (2022).	5
	'Green blockchain...sustainability.'	Alzoubi, Y. I., & Mishra, A. (2023).	104
	'Green finance mechanism... sustainable green innovation.'	Yafei Wang, Jing Liu, Xiaoran Yang, Ming Shi and Rong Ran (2023)	24
	'Agricultural Economic Growth... CO2 Emissions Nexus.'	Aluwani, T. (2023)	25
	'Impact of green finance... carbon emission in China.'	Yu, H., Jiang, Y., Zhang, Z., Shang, W. L., Han, C., & Zhao, Y. (2022).	112

Theme: 3 Green Finance, Energy Transition, and Carbon Emission Reduction	'The role of green finance... in OECD greenhouse gas emissions.'	Alvi, S., Ahmad, I., Nawaz, S. M. N., Connell, W., Anser, M. K., & Hassan, M. U. (2025).	14
	'Research on the impact of green finance... carbon emissions in China.'	Bai, J., Chen, Z., Yan, X., & Zhang, Y. (2022).	140
Theme: 4 Green Bonds and Sustainable Capital Markets	'Understanding the Greenium... Two-Factor Structural Model'	Agliardi, E., & Agliardi, R. (2021).	114
	'Role of green bonds... advancing sustainability.'	Maltais, A., & Nykvist, B. (2020).	675
	'Green Bond Pricing... Investment Performance.'	K. Thomas Liaw (2020)	95
	'Green Bond Issuance... European Union.'	Anamaria Dan and Adriana Tiron-Tudor (2021)	88
	Pricing of green bonds... financial institutions special?'	Fatica, S., Panzica, R., & Rancan, M. (2021).	596
Theme : 5 Green Finance, Economic Growth, and Environmental Protection	'Impact of green finance... green economic recovery in South Asian economies.'	Zhang, Y. (2023)	92
	'Green finance ... cryptocurrency markets.'	Nguyen Mau Ba Dang (2024)	7
	'Clean and dirty cryptocurrencies ... financial assets.'	Duan, K., Zhao, Y., Urquhart, A., & Huang, Y. (2023).	61
Theme 6: Green Finance as a Catalyst for Sustainable Development and Innovation	'Nexus between green finance ... bank sustainability.'	Banani, Ade; Sunarko, Bambang (2022)	23
	'Influence of green finance ... economic growth in Vietnam.'	Ngo, T. Q., Doan, P. N., Vo, L. T., Tran, H. T. T., & Nguyen, D. N. (2021).	35
	'Green finance and innovation... provincial carbon emissions in Indonesia.'	Taridala, S. A. A., Alzarliani, W. O., Fauziyah, E., Rianse, I. S., & Arimbawa, P. (2023)	18

Source: Authors' gathering from the Scopus database.

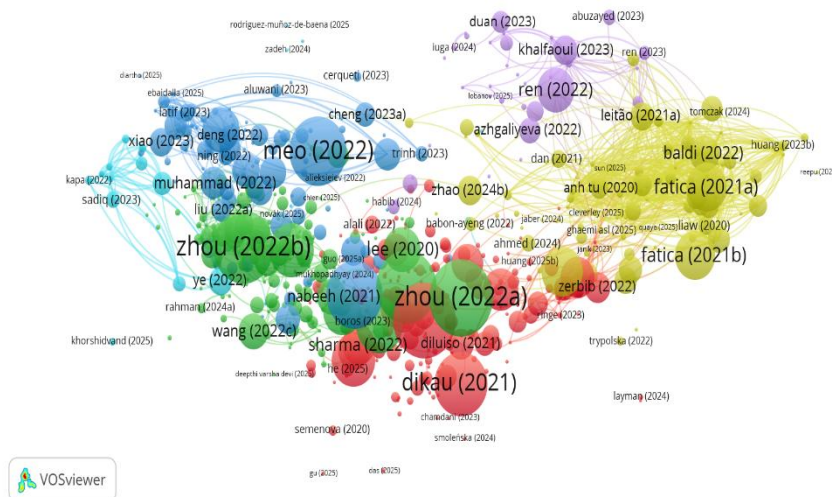


Figure 4 Bibliographic Coupling Analysis

Source: VOSviewer output based on the Scopus database

Note: The figure demonstrate the knowledge themes using bibliographic coupling.

Theme 1 Green Finance policy frameworks and institutional implementation

The first theme of Bibliometric coupling give attention on the regulatory and institutional foundations that enable the effective functioning of green finance systems. This particular theme emphasise the role of central banks and financial regulators in integrating sustainable goals into monetary and financial policies to encourage green finance adoption (Dikau & Volz, 2021). This also describes how institutional financial support facilitates green finance, majorly in developing economies like India (Bhatnagar et al., 2022), and it speaks about how green environmental policies and green finance incentives accelerate green technology progression (Tan et al., 2021). Adding to this other papers articulates that country specific analysis discloses national regulatory structures and institutional readiness effect the development and prospects of green financing mechanisms are demonstrated in the Russian Context (Semenova, 2020). As a whole this theme underscores the strong regulatory frameworks and institutional implementation are critical drivers of sustainable finance and green economic transformation.

Theme 2 Green finance, Innovation, and Sustainability Transition

The second theme in Bibliometric coupling focuses on how green finance mechanism drive sustainability results by innovation, institutional practices and technological intersection. Studies in this cluster illustrate that green finance act as an effective and positive instrument for sustainability performance of banking institutions with strong governance regulation But, female presence playing a moderating role in this filed most of the them are unaware about this concept and there is lack of awareness on technology, which is also a barrier for this study (AbuTawan, 2023). Though sustainable banking practices guide environmentally responsible resource allocation and help in long term economic growth of the

country (Alieksiejew et al., 2022). Technology advancement also plays a major role in sustainable transition, wherein Blockchain application are identified as emerging instruments that improve transparency and efficiency in sustainable financial systems (Alzoubi & Mishra, 2023).

Theme 3 Green finance, Energy Transition, and Carbon Emission Reduction

The third Theme explains the role of green finance in facilitating energy transition and lowering CO2 emissions across sectors and regions. Highly cited empirical study from china states that green finance plays a vital role in reducing carbon emission through technological innovation and structural transformation (Bai et al.2022). Carbon emission trading policies are found to stimulate corporate level green innovation utilising market based tools for emission reduction(Yu et al., 112 citations). At Macroeconomic level evidence further depicts that green finance stimulates enterprises sustainable green innovation through financial incentives and government policy mechanism (Wang et al., 2023). While sector specific research proves that intersection among green finance and fintech innovation boost renewable energy project agricultural growth, and CO2 emission reduction and also contribute of significant reduction in greenhouse gas emissions in OECD economies (Alwani, 2023 & Yu et al., 2022).

Theme 4 Green bond and Sustainable Capital Markets

Theme fourth theme is a highly influential research cluster focusing on the role of green bond in sustainable capital markets. The primary studies explain the structural and pricing mechanism of green bonds, especially the existence of a geranium, highlighting investor willingness to accept lower yields for environmental benefits, (Agliardi, 2022) on of the most cited (675) and influential contribution in this cluster describes how green bonds progress sustainability objective by channelling capital towards environmentally responsible projects (Nykvist 2020) further studies discussed about green bond pricing behaviours and investment performance, this confirms its growing importance over global financial markets (Ljawi,

2020). Empirical study by [Dan & Tirone-Tudor \(2021\)](#) also identify the key factors of green bond issuance in the European Union. Prominently cited studies reviews that financial institution plays a distinctive role in green bond pricing dynamics, reinforcing the credibility and efficiency of green bond markets ([Fatica et al., 2021](#)).

Theme 5 Green Finance, Economic Growth and Environmental protection

Green finance act as a driving system for environmental protection as well as in achieving economic growth. This theme explains in what way green finance helps in green economic development and adopting environmental friendly practices for sustainable future, with fintech acting as a mediating mechanism in south Asian economies ([Zhang, 2023](#)). Recent studies also identified the heterogeneous connection between green finance and crypto currency markets. ([Nguyen & Dang, 2024](#); [Duan et al., 2023](#)).

Theme 6 Green finance as a catalyst for sustainable Development and innovation

The last theme explores the role of green finance in improving financial performance, Creativity, and sustainability outcomes, especially in emerging economies. Previous experimental studies illustrate that green finance strengthens bank's sustainability and financial performance by encouraging energy accounting and innovation practices. ([Banani & Sunarko, 202](#)) During Covid -19 pandemic's Green finance positively influence economic development and resilience in Vietnamese economy ([Ngo et al., 2021](#)). At the cross country level green finance Integrates with innovation and agricultural finance contributes to sustainable economic growth carbon emission reduction as observed in Indonesia's regional context ([Taridala et al., 2023](#)). Collectively this finale theme provide an overview that green finance as a key enabler of innovation led sustainable development.

Future Research Direction

The current study conducts an inclusive analysis of green finance research and assess its evolution as a distinct academic discipline. This segment emphasise the areas of research that require further investigation.

Proposal 1: Green finance policy frameworks and institutional implementation

Existing study reveals that green finance policies are embedded with central bank and regulatory frameworks, which assist in shaping financial system to mitigate climate related risk ([Dikau & Volz, 2021](#)). Future studies must move beyond identifying green finance policies. It should work on understanding how and why these policies work differently across institutional settings. While central bank commands are aligned with sustainability objectives, there is limited knowledge about their real transmission into credit allocation, risk management, and environmental outcomes at the firm and sector level. Future studies should adopt comparative institutional and longitudinal designs to analyse how regulatory maturity, political commitment, and financial system shape the green finance effectiveness ([Semenova, 2020](#)). Likewise, research should discover whether policy based green

finance genuinely encourage green entrepreneurship or only reallocates existing capital ([Bhatnagar et al., 2022](#); [Tan et al., 2021](#)).

Proposal 2 Green Finance, Innovation and sustainability Transition

While, existing studies explore that green finance promote innovation, further study should reveal the behavioural and organisational mechanisms through which financial incentives explain into sustainable innovation outcomes ([Wang et al., 2023](#)). And study should examine how governance quality, leadership diversity, and managerial risk perceptions influence banks and firms responses towards green finance instruments ([Abutawan, 2023](#)). Although blockchain is evolving as a promising tool, future study must critically assess its regulatory feasibility, scalability, and environmental trade-offs instead of assuming technological neutrality ([Alzoubi & Mishra, 2023](#)). Considering these internal dynamics will clarify whether green finance leads to genuine transformation or symbolic compliance.

Proposal 3 Green finance, Energy transition and Carbon Emission Reduction

The third proposal on green finance as a tool for energy transition and carbon Emission Reduction directs that Future study should focus on identifying the casual pathways connecting green finance to emission reduction rather than depending solely on correlation based evidence ([Bai et al., 2022](#)) Further research should give emphasise on examining how green finance interacts with energy structure, industrial upgrading and carbon trading mechanism under fluctuating regulations policy intensity and regional context ([Yu et al., 2022](#)). There is also a scope to combine digitalization and climate policy uncertainty into energy finance models to better explain heterogeneous emission results across economies ([Alieksieiev et al., 2025](#)). Such methods will assist in determining whether green finance accelerates structural transition or only reduce emission for temporarily.

Proposal 4 Green bond Sustainable capital Markets

Despite extensive research on green bond, pricing and geranium effect, the future studies must focus on real environmental green bonds, evaluating whether bond financed projects deliver measurable sustainability outcomes ([Maltais & Nykvist, 2020](#)). Future researcher should explore how investor trust, certification standards, and disclosure quality influence green bond credibility over time ([Agliardi, 2019](#); [Fatica et al., 2021](#)). Additionally, comparative study between developed and emerging economies could explore how institutional strength and regulatory enforcement affect green bond effectiveness beyond capital mobilization ([Dan & Tirone-Tudor, 2021](#)).

Proposal 5 Green Finance, Economic Growth and Environmental Protection

The past studies explore that green finance is the major factor in fostering economic growth and environmental protection by fintech based mechanism ([Zhang, 2023](#)). future study must carry on whether such development trajectories remain sustainable in the long run. In the light of emerging findings of the complex interactions among

green finance and crypto currency markets (Nguyen & Dang, 2024; Duan et al., 2023). Adding to this, study can be expanded to assess environmental externalities, market volatility, and the role of policy uncertainty in transforming green finance effectiveness.

Proposal 6 Green Finance as a catalyst for sustainable Development and innovation

Study by Banani & Sunarko, 2022; Taridala et al., 2023 demonstrate Green finance improves innovation, financial performance and sustainable outcomes across sectors in emerging economies. Further research should expand to adopt integrated development frameworks to assess how these effects evolve over time. The other studies shows that green finance stabilizing role during economic crises (Ngo et al., 2021). Upcoming research should focus on its capacity to enhance economic resilience and innovation under future environmental and macroeconomic shocks.

Implication of Study

The current study offers numerous implications for academicians, corporate practitioners and policymakers. First, present research studies the development of green finance literature and provides future research directions to be carried out. The paper identifies four keyword-cluster and six knowledge themes thus helps future researchers in clearly understanding the connection between green finance and other pertinent which become a preliminary point for further probing. Second as result shown interdisciplinary nature of green finance which integrates economics, finance, environmental studies and technical innovation. Third Policymaker must integrate the green financing report framework with other financial and non-financial revelation like ESG reporting and a separate regulation policy for banks and financial institution and academicians should be enacted. Corporate practitioners must discover added sources of increasing green finance investment other than green bonds to expand green finance markets. And all the financial instruments like derivatives, shares and convertibles can also be provided with sustainable objectives. Despite of traditional finance perform better in short run, combining it with advanced new technology will help for corporate and financial institution to move towards sustainability which positively impact society as a whole in addition to financial benefits. This increases the reputation and public image of the business and institutions in long run.

CONCLUSION

This study provides evolving green finance research landscape by combing Bibliometric analysis with systematic literature review of 657 peer-reviewed papers

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2. Agirman, E., & Osman, A. B. (2019). Green finance for sustainable development: A theoretical study. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi*, 6(1),

published in 2015 and 2025. The study adopts SPAR-4-SLR protocol and Bibliometric techniques using VOSviewer, the, the study plots the thematic evolution, rational structure and research trajectories of the field of green finance. The result reveals that the extensive growth in green finance literature, especially after 2016, representing raising global concern over climate change, environmental governance and sustainable development.

The performance evaluation emphasize the dominance of china and emerging Asian economies which hold strong institutional frameworks and policy driven sustainability goals. Influential journal, author, and highly cited articles denotes Green finance is a multidisciplinary convergence of economics, finance, policy research and environmental studies. The keyword co-occurrence outcome identifies four cluster namely 1: Green Energy and Environmental Policy, 2: Green Finance and Economic Performance 3: Climate Change, ESG, and Sustainable Finance 4: Green economy and financial System and Bibliometric coupling analysis identify six main knowledge themes such as (1) Green finance policy frameworks and Institutional Implementation (2) Green finance, innovation and sustainability transition (3) Green finance, Energy transition and carbon emission reduction (4) Green bonds and sustainable capital markets (5) Green finance, economic growth and environmental protection and (6) Green finance as a catalyst for sustainable development and innovation. The themes communally depicts that green finance has evolved from a policy based concept into a inclusive financial ecosystem merging ESG considerations, fintech innovation, and sustainable capital market instruments.

The study contributes theoretical by uniting fragmented green finance literature into comprehensible thematic framework grounded in ecological modernization theory, institutional theory and sustainable financial perspectives. These findings provides valuable vision for Regulators , financial institutions, policy makers and investors by giving importance to the robust regulatory frameworks, transparent green financial instruments and comprehensive financial instruments to accelerate carbon reduction transitions and adopting eco-friendly behaviour practices through synthesizing previous studies and finding emerging themes, this study demonstrate scholarly understanding of green finance and offers a solid foundation for future studies and policy invention aiming at attaining sustainable and climate resilient economic development.

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