

A MAPPING RESEARCH TRENDS IN GREEN FINANCIAL INSTRUMENTS: A GLOBAL AND INDIAN PERSPECTIVE

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Abstract

Through a bibliometric analysis of 244 Scopus-indexed articles (2015–2025) and a systematic review of 20 India-focused studies, this study investigates both Indian and global research on green financial instruments. The results indicate that green finance research is expanding quickly, with China producing the most and India exhibiting robust international cooperation. Green bonds, ESG disclosure, greenwashing, climate finance, renewable energy, and fintech-driven sustainability are important thematic clusters. The Indian review notes enduring problems like low investor awareness, inconsistent disclosure, and greenwashing risks, but it also highlights growing interest in ESG metrics and green bonds. The study calls for more rigorous, technology-integrated, and policy-relevant research to strengthen national and international green finance ecosystems. Overall, it shows significant progress in the field while pointing out methodological gaps and a lack of use of sophisticated analytical tools.

Keywords: Green financial instruments; Bibliometric Analysis; Scopus; Green finance; India

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INTRODUCTION

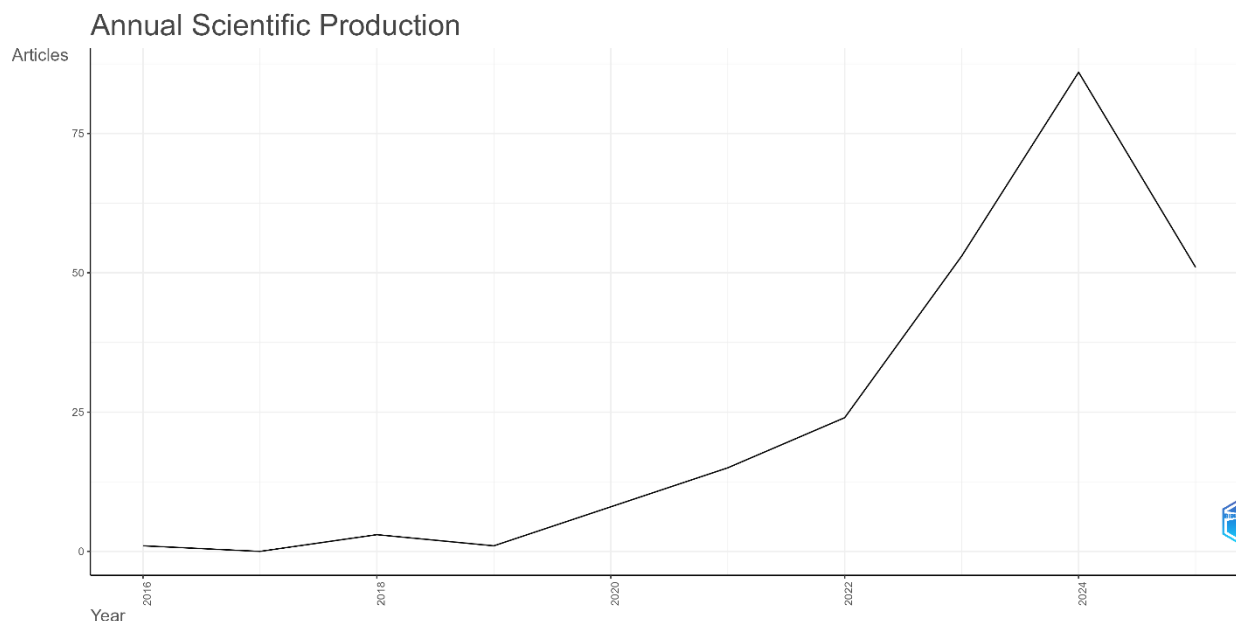
The global financial system is increasingly recognized as a powerful enabler in addressing climate change. Through mechanisms that reduce environmental risks and mobilize capital for sustainable development, the financial industry plays a crucial role in climate mitigation and

adaptation strategies (Green Finance, 2020). A landmark step in this direction was the adoption of the Paris Agreement in 2015, which catalyzed global consensus on limiting global temperature rise and accelerating climate-resilient investment (Long et al., 2022).

Over the past two decades, scholarly attention toward sustainable finance has intensified, particularly in identifying the risks and capital gaps that obstruct progress toward the 2030 Sustainable Development Goals (SDGs). Among the most prominent tools facilitating this transition are green financial instruments, such as green bonds, green loans, and carbon credits, which channel funds toward environmentally beneficial projects (Zhang et al., 2019; Tang & Zhang, 2020; Ren, Shao & Zhong, 2020). These instruments are designed to finance activities like renewable energy adoption, sustainable urban development, clean transportation, and carbon reduction. As (Liu et al., 2023) note, climate finance further underscores the interaction between climate-related risks and financial uncertainties at both macroeconomic and microeconomic levels.

Among these instruments, green bonds have emerged as a leading mechanism, specifically structured to fund projects with measurable environmental benefits. Unlike conventional debt, green bonds are earmarked for initiatives that contribute directly to emissions reduction, energy efficiency, and ecological restoration (Kumar & Kundalia, 2023). By establishing the Business Responsibility and Sustainability Reporting (BRSR) framework, the Securities and Exchange Board of India (SEBI) has taken the initiative to address disclosures pertaining to sustainability in the Indian context. A study of BRSR practices in a few chosen financial firms reveals a growing dedication to ESG transparency, with some companies adopting the framework voluntarily before it became required in FY 2022–2023 (Mishra & Sharma, 2023). Despite their rising adoption, concerns persist about transparency and credibility in sustainability claims, with “greenwashing” becoming a growing challenge (Y. Sun et al., 2020; De Jong et al., 2019; Bingaman et al., 2022).

A bibliometric analysis is necessary to map the research landscape, highlight significant contributors, and identify emerging themes in light of the growing significance of green financial instruments and the explosion of related academic literature. Few studies have systematically examined the intellectual structure of this field, despite the fact that previous research has examined investor behaviour, policy frameworks, and financial performance. Notably, there is little comparative understanding between research conducted globally and in India, especially when it comes to topics like investor awareness and the implementation of green bonds. Through a systematic bibliometric analysis, this study fills in these gaps and provides insights into the development of scholarly discourse and potential avenues for future green finance research.



There has been a noticeable increase in the yearly scientific output on green financial instruments, especially since 2020, and it peaked sharply in 2023. Interest started to gradually increase in 2020, presumably due to a greater global focus on climate policy and sustainable finance initiatives, even though publication output was still quite low between 2016 and 2019. The increase in 2023 suggests that academics are becoming more aware of problems like greenwashing and ESG integration. A modest drop in 2024 and 2025 might be the result of normalisation after a peak year or incomplete data. Because it reflects the changing research landscape during a time of rapid scholarly engagement, this trend emphasises how timely it is to perform a bibliometric analysis.

OBJECTIVE OF THE STUDY

Major objective of the study is to map and analyze research trends on green financial instruments in India and around the world in order to find important themes, collaborations, and gaps in research related to sustainable financial instruments.

RESEARCH METHODOLOGY

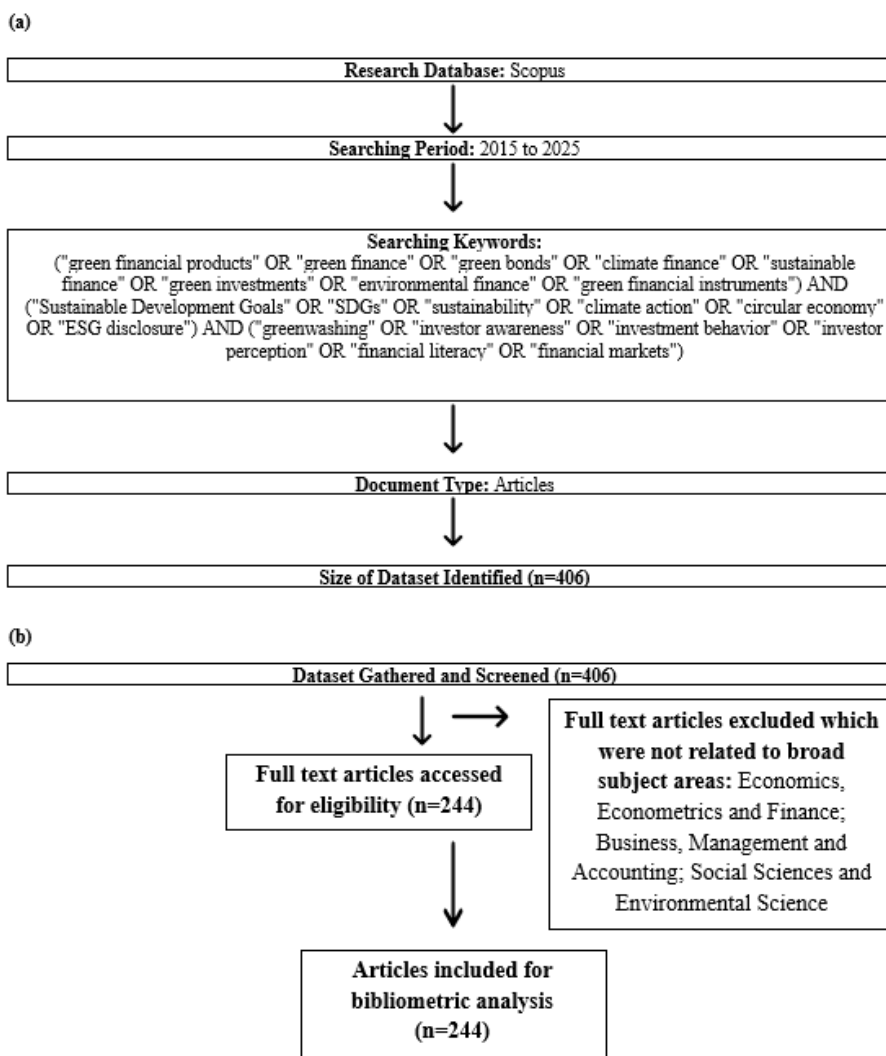
In order to map scientific knowledge structures and identify thematic trends in academic literature, this study uses bibliometric analysis, a quantitative technique first presented by Pritchard in 1969. Because of its extensive coverage of peer-reviewed literature across disciplines, the Scopus database served as the source for the bibliographic data (Elsevier, 2023). The dataset was refined to only include documents classified as "Articles," and it was restricted to journal articles published in English between 2015 and 2025.

The following string was used in an advanced Boolean keyword search to guarantee thorough and pertinent coverage:

("green financial products" OR "green finance" OR "green bonds" OR "climate finance" OR "sustainable finance" OR "green investments" OR "environmental finance" OR "green financial instruments") AND ("Sustainable Development Goals" OR "SDGs" OR "sustainability" OR "climate action" OR "circular economy" OR "ESG disclosure") AND ("greenwashing" OR "investor awareness" OR "investment behavior" OR "investor perception" OR "financial literacy" OR "financial markets")

244 articles in all were kept for analysis following manual screening and duplicate removal. For use with the Bibliometrix R package (Aria & Cuccurullo, 2017) and VOSviewer (Van Eck & Waltman, 2010), the data were exported in BibTeX and CSV formats. Three-field plots, thematic mapping, co-authorship networks, influential authors and journals, keyword co-occurrence, and annual scientific production were all included in the analysis. In order to evaluate national research contributions and thematic gaps in the literature on green financial instruments, a sub-analysis concentrating on publications from India is also carried out.

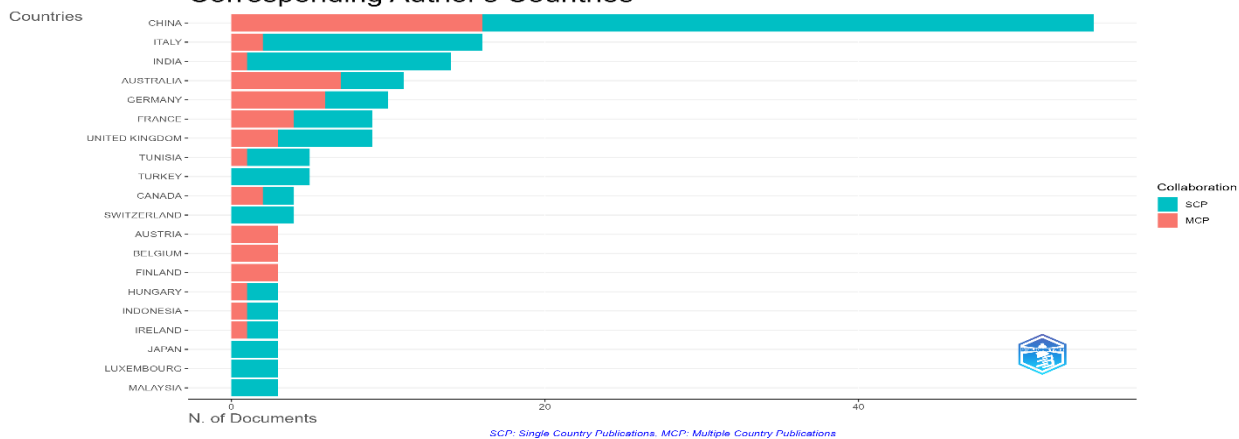
To complement the bibliometric results, a thorough analysis of 20 studies with an emphasis on India (2015–2025) was carried out. Green bonds, ESG performance, investor awareness, and regulatory development were the four main focusses of this review. The chosen studies shed more light on India's changing place in the global green finance scene and demonstrate the growing scholarly interest in green financial instruments, especially after 2018.



(a) Summary of data source and selection; (b) Data cleaning process

KEY RESULTS

4.1 Most Relevant Countries in Green Finance Research Corresponding Author's Countries



As evidenced by the large number of single-country publications, China is a leader in green finance research with a strong national focus. Italy and India, on the other hand, exhibit more international cooperation, suggesting a deeper level of integration into the global sustainability conversation. While the UK and Canada show high rates of collaboration despite lower output, countries such as Australia, Germany, and France contribute moderately. This demonstrates the spread of green finance globally as well as the emergence of new regional research centres.

Rank	Country	Total Documents	SCP*	MCP**	% MCP (Collaboration)
1	China	50	36	14	28%
2	Italy	22	13	9	41%
3	India	20	7	13	65%
4	Australia	17	10	7	41%
5	Germany	15	9	6	40%
6	France	13	8	5	38%
7	United Kingdom	11	4	7	64%
8	Tunisia	6	1	5	83%
9	Turkey	6	2	4	67%
10	Canada	5	1	4	80%
11	Switzerland	4	0	4	100%
12	Austria	3	1	2	67%
13	Belgium	3	1	2	67%
14	Finland	2	0	2	100%
15	Hungary	2	1	1	50%
16	Indonesia	2	1	1	50%
17	Ireland	2	1	1	50%
18	Japan	2	1	1	50%
19	Luxembourg	2	1	1	50%
20	Malaysia	2	1	1	50%

4.2 Country Co-authorship Map

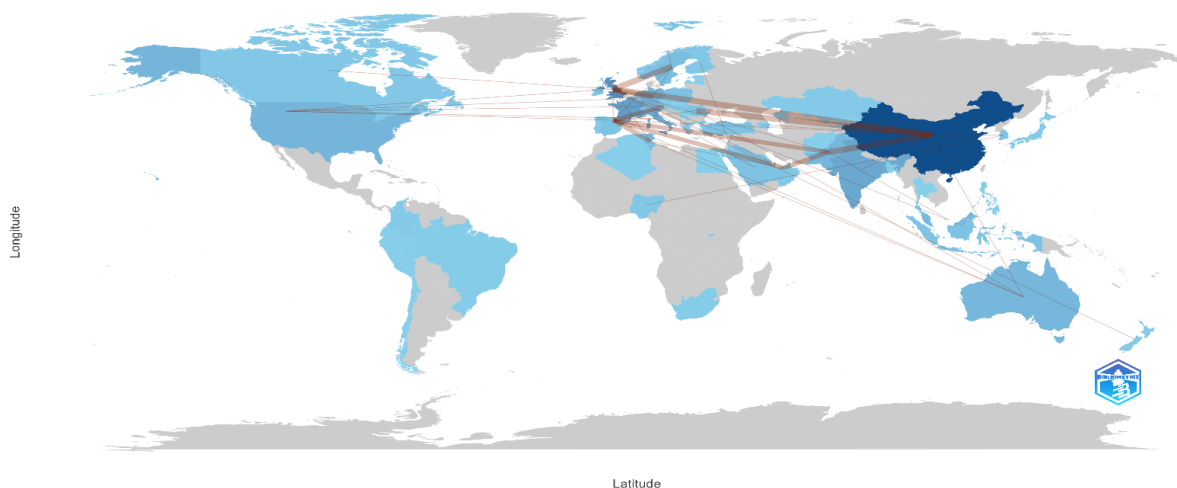


The United Kingdom and China are identified as major contributors in the co-authorship network; the UK has the strongest collaboration ties (33 link strength) and the highest average impact (32.2 citations), while China leads in publications (60) and citations (1,645). Despite having fewer publications, nations like Norway, the United Arab Emirates, and Pakistan have high citation averages, a sign of influential research. The global involvement in green finance research is highlighted by the distinct regional clusters of South Asia, Europe, and East Asia, which show strong intra-regional ties and expanding cross-regional collaboration.

Cluster Color	Key Countries	Central Node	Notable Connections	Citation Weight
Red	China, France, Ireland, Spain	China	Vietnam, UK, Australia, Malaysia	High (China: 1,645)
Green	India, Australia, UAE, Tunisia	India	Pakistan, UAE, Australia	Moderate (India: 244)
Blue	Germany, Italy, Switzerland, USA	Germany	UK, Italy, Sweden	High (Italy: 469, USA: 444)
Yellow	Pakistan, Malaysia, Turkey, Indonesia	Pakistan	India, UAE, Tunisia	High (Pakistan: 526)
Purple	UK, Sweden, Norway	United Kingdom	Germany, China, Italy	High (UK: 965)
Teal	Romania, Saudi Arabia	Romania	UAE, India	Low-Moderate (Romania: 61)

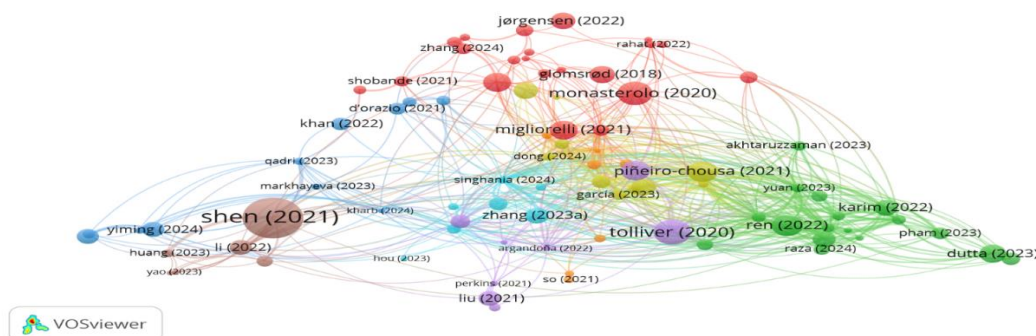
4.3 Country Collaboration Map

Country Collaboration Map

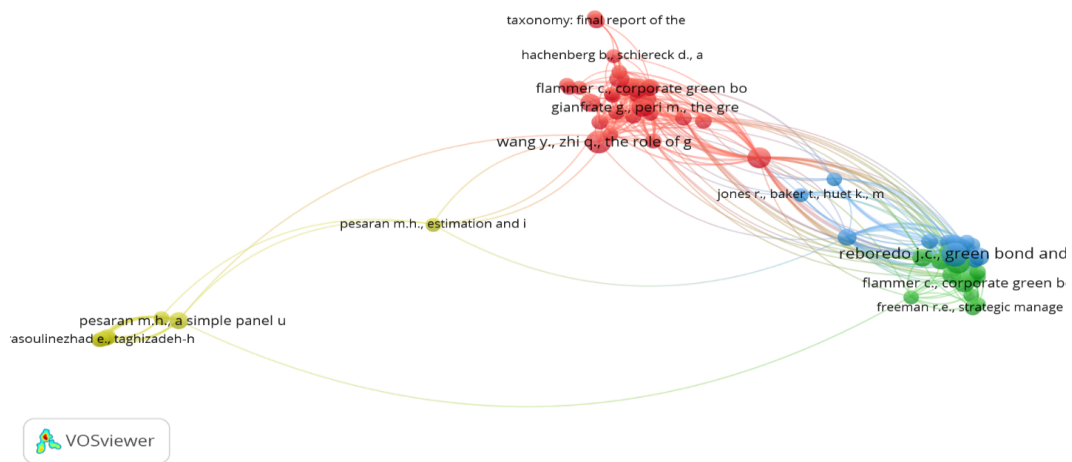


According to the country collaboration map, China is the main location for global collaborations in green finance research, with close connections to both Europe and Asia. Despite its modest output, India is a significant partner, especially with China and a number of European nations. Dense interconnectivity is seen in European countries such as France, Germany, and Italy, indicating established and continuous academic networks. Future prospects for greater international cooperation are indicated by the low level of participation from regions such as Africa and Latin America.

4.4 Bibliographic Coupling Map of Documents



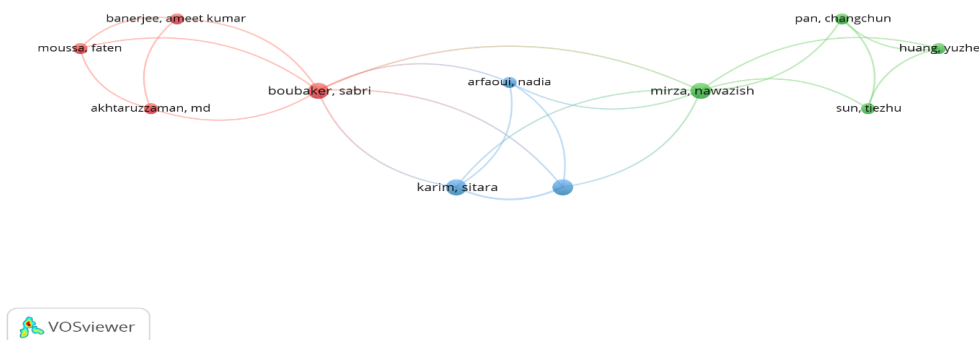
4.6 Co-citation of Cited References



In green finance research, co-citation analysis identifies four major thematic clusters: market performance and investor behaviour (e.g., Reboredo, 2018), risk and volatility under shocks like COVID-19, green bond pricing and policy (e.g., Hachenberg & Schiereck, 2018), and methodological foundations in econometrics (e.g., Pesaran, 2007). These clusters, which integrate financial theory, policy, and quantitative methods, demonstrate the interdisciplinary nature of the field.

Cluster	Color	Central Theme	Representative References	Citation Weight
1	Red	Green bond pricing & policy frameworks	Hachenberg & Schiereck (2018), Gianfrate & Peri (2019), TCFD (2017)	11–12
2	Green	Performance & investor behavior	Reboredo (2018), Flammer (2021), Zerbib (2019)	12
3	Blue	Risk, volatility & market spillovers	Pham (2016), Liu et al. (2021), Saeed et al. (2020)	12
4	Yellow	Econometric & methodological foundations	Pesaran (2007, 2008), Westerlund (2007)	7

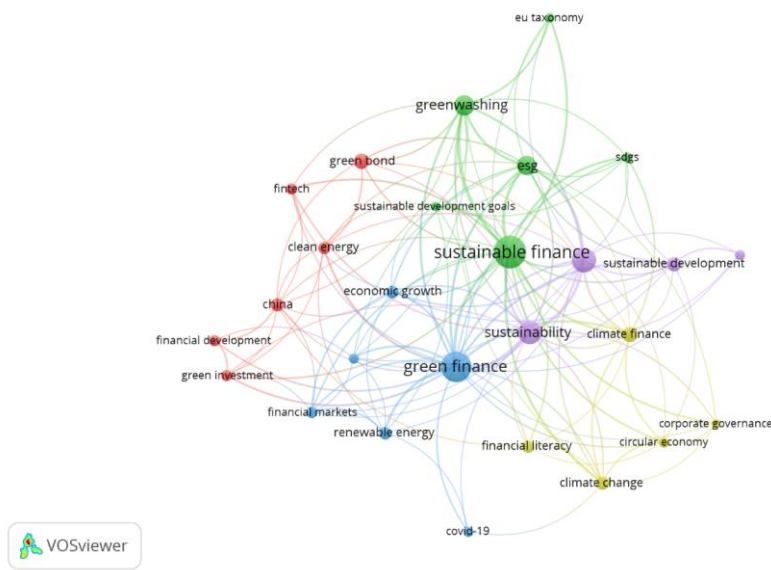
4.7 Authors Collaboration Network Chart



Three separate clusters in the study of green financial instruments are revealed by the author collaboration network. Low-volume but highly cited authors like Md. Akhtaruzzaman and Ameet Kumar Banerjee are part of Cluster 1, which is headed by Sabri Boubaker. Boubaker has 119 citations. Although it has a moderate impact on citations, Cluster 2, which is focused on Nawazish Mirza, demonstrates regional collaborations, especially with Chinese scholars. Cluster 3, led by Sitara Karim, Nadia Arfaoui, and Muhammad Abubakr Naem, exhibits the highest citation averages, reflecting strong conceptual contributions. While Indian scholars continue to be under-represented, suggesting room for greater domestic engagement, the network is moderately connected, with Boubaker and Mirza acting as important bridges.

Cluster	Color	Central Author	Collaborative Authors	Citation Weight (Central Author)
1	Blue	Sitara Karim	Muhammad Abubakr Naem, Nadia Arfaoui	High
2	Red	Sabri Boubaker	Md Akhtaruzzaman, Ameet Kumar Banerjee, Faten Moussa	Medium
3	Green	Nawazish Mirza	Pan Changchun, Huang Yuzhe, Sun Tiezhu	Low

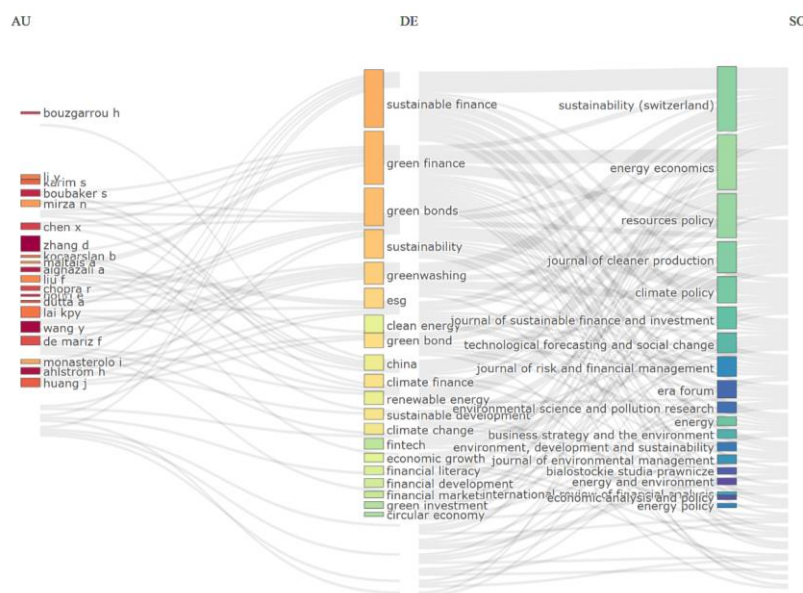
4.8 Keyword Cluster Map



Five thematic clusters are revealed by the keyword co-occurrence analysis, with green finance, sustainable finance, and green bonds being the main focus areas. Cluster 1 focusses on country-level research related to fintech and green investment, particularly in China. Cluster 2 focusses on ESG and regulatory matters, emphasising concepts such as EU taxonomy and greenwashing. Themes of SDG alignment, renewable energy, and climate finance are reflected in other clusters. The most popular keywords highlight the increasing scholarly interest in the financial drivers of sustainability: green finance (51), sustainable finance (58), and green bonds (33).

Cluster Color	Central Keyword	Connected Keywords	Citation Weight
Red	China	green bond, clean energy, fintech, green investment, financial development	104.57
Blue	Green Finance	renewable energy, covid-19, economic growth, environmental sustainability	40.00
Purple	Sustainability	sustainable finance, green bonds, sustainable development, SDGs	30.45
Yellow	Climate Finance	climate change, financial literacy, circular economy, corporate governance	27.83
Green	Greenwashing	ESG, EU taxonomy, SDGs, sustainable development goals	25.90

4.9 Three-Field Plot



Prolific authors (AU), dominant thematic keywords (DE), and frequently used publication sources (SO) interact in the green finance literature, as shown by the Three-Field Plot. Keywords like "sustainable finance," "green bonds," and "greenwashing" are closely associated

with authors like Bouzgarrou H., Boubaker S., and Mirza N., indicating their significant contributions to the central conversation. In terms of theme, "green finance" and "sustainable finance" stand out as key terms that connect a variety of academic publications. The interdisciplinary nature of the field is highlighted by the prominent publication of these studies in journals such as Sustainability (Switzerland), Energy Economics, and Journal of Cleaner Production. All things considered, the plot shows a good fit between top researchers, sustainability-related subjects, and respectable publication channels.

4.10 Systematic Review of Literature on Indian Markets

Table 1 Summary of literature reviews on Green Financial Instruments

S. No.	Title and Author	Year	Methodology	Key Findings
1	An Overview of Green, Social, Sustainability, and Sustainability-linked Bonds in the Indian Context / Swayam Prava Mishra, Rajnish Kumar & Jashasya Rout	2023	Descriptive literature review of existing regulatory frameworks and market data	The paper examines India's regulatory framework for green, social, and sustainability-linked bonds, highlighting SEBI's evolving guidelines and alignment with ICMA principles. It identifies key challenges such as regulatory gaps, low investor awareness, and greenwashing, and recommends standardized taxonomy, clearer disclosures, and stronger impact assessments to enhance the credibility of India's ESG bond market.
2	Are Oil Price Shocks Driving India's Sustainable Sector? / Neenu Chalissery, T Mohamed Nishad & P. Milinth	2025	Wavelet Coherence and Asymmetric TVP-VAR on BSE GREENEX, CARBONEX, and ESG 100 indices (2019–2023) to assess oil price uncertainty impacts.	Green investments are vulnerable to oil price shocks, especially during crises, with asymmetric spillover effects that undermine market stability and SDG progress.
3	A Review of Innovative Bond Instruments for Sustainable Development in Asia / Nisha Prakash & Madhvi Sethi	2022	Qualitative review of journal articles, reports, and policy documents from global institutions (UN, World Bank, IMF, etc.) and think tanks, focusing on sustainable finance mechanisms in Asia.	SDG investments in Asia remain severely underfunded. Financial markets have yet to fully leverage global interest in sustainable investing. The study recommends improving information availability, addressing regulatory barriers, and using blended public-private financing to attract private capital for SDGs.
4	Awareness of Investors Toward Green Finance Initiatives / Rohith N. & Hema Patil	2023	One-sample t-test based on survey data from 463 investors to evaluate awareness and perceptions of green finance initiatives.	Investors strongly believe green finance promotes sustainability and SDGs through clean energy and eco-friendly practices. Green instruments are viewed as essential for climate responsibility, and investors see integrating sustainability into portfolios as both a financial opportunity and a way to achieve long-term environmental goals.
5	Debt as catalyst: Empowering renewable energy in developing countries / Deepak Kushawaha & Manisha Jain	2024	Panel data analysis of 12 developing countries (2000–2020) to assess the impact of debt financing on renewable energy (RE) capacity.	The study finds a U-shaped relationship: initial debt financing can hinder RE deployment, but beyond a threshold, it significantly promotes RE growth. Favorable financial market conditions help offset early negative effects, guiding strategies for leveraging debt to boost RE adoption.
6	Does green improve portfolio optimisation? / Md Akhtaruzzaman, Ameet Kumar Banerjee, Sabri Boubaker & Faten Moussa	2023	Used GARCH-EVT-Copula model with four portfolio strategies (equal weighting, minimum variance, GMV, CET) and backtesting.	The GMV portfolio delivered the best risk-adjusted performance. Portfolios including green assets outperformed benchmarks in the short term, highlighting their diversification

				benefits and support for sustainable investment strategies.
7	Emerging Research Trends in Green Finance: A Bibliometric Overview / Sagarika Mohanty, Sudhansu Sekhar Nanda, Tushar Soubhari, Vishnu N S, Sthitipragyan Biswal & Shalini Patnaik	2023	Bibliometric analysis of 1,748 SCOPUS-indexed articles using VOSviewer to map research questions, publication trends, co-authorship, journals, and keyword co-occurrence.	Identified major themes, influential articles, and evolving research trends in green finance. Keyword clustering revealed emerging topics, while gaps in collaboration and coverage highlighted areas for future research.
8	Environmental Sustainability in Financial Markets: Wavelet Coherence Analysis of ESG Indices and Global Risk Factors / Mahak Manzoor, Saif Siddiqui, Habibur Rahman Laskar, Datar Singh & Taufeeque Ahmad Siddiqui	2025	Wavelet Coherence analysis applied to ESG indices (Nifty100 ESG and S&P 500 ESG) and global uncertainty indices (EPU, GPR, WUI) from 2012–2024.	Co-movement between ESG markets and uncertainty indices intensifies during crises (e.g., COVID-19, Russia-Ukraine war). S&P 500 ESG shows stronger linkages with GPR and WUI, while Nifty100 ESG leads EPU and GPR, indicating ESG markets' growing vulnerability to global shocks.
9	Factors influencing green bond yield: Evidence from Asia and Latin American Countries / Abhilash Abhilash, Sandeep S. Shenoy & Dasharathraj K. Shetty	2024	Panel regression using the Generalized Least Squares (GLS) method on green bond data from Bloomberg and FRED for Asian and Latin American countries (2017–2022).	Asian green bonds offer higher yields with lower risk; coupon rate is the only significant factor affecting yield. In Latin America, coupon rate, maturity, bond rating, ESG disclosure, and interest rate positively influence yield, while issue size and GDP growth reduce it. ESG disclosure also helps mitigate greenwashing and improve yields.
10	Green Finance and AI in India: A Synergistic Approach to Sustainable Development and Climate Resilience/ Naveen Siriman, Mohd Shahid Ali, Taufeeque Ahmad Siddiqui, Gaddam Rohin, Balaji Vejju & Naveen Cherupelly	2025	Qualitative policy analysis using secondary data, focusing on India's green finance initiatives, government policies (e.g., NAPCC), and the role of emerging technologies like AI and blockchain.	India's green finance is growing via policies and green bonds but faces funding gaps, weak private participation, greenwashing risks, and lack of standards. The study calls for innovative tools, stronger governance, and tech-driven inclusive growth.
11	Green financing of eco-innovations: is the gender inclusivity taken care of? / Tanaya Saha, Avik Sinha & Shujaat Abbas	2022	Dynamic elasticity modeling using panel data from OECD countries to assess how gender inequality moderates the impact of green financing on eco-innovation.	Gender inequality reduces the effectiveness of green finance in driving eco-innovation and weakens institutional support for innovation. The study calls for SDG-oriented policies that promote gender inclusivity to maximize green finance outcomes.
12	Green Finance Barriers and Solution Strategies for Emerging Economies: The Case of India / Pratibha Wasan, Ashwani Kumar & Sunil Luthra	2024	Two-phase approach: (1) Literature review and three-round modified Delphi method to identify barriers and strategies for green finance in India; (2) Best Worst Method (BWM) to rank barriers and strategies using weighted analysis.	Top barriers are policy, economic, and knowledge gaps. Recommended strategies include clear green policies, risk assessment frameworks, credit enhancement, low-cost refinancing, and blending public-private finance with technology to close India's green financing gap.
13	Investigating the nexus between green economy, sustainability, bitcoin and oil prices: Contextual evidence from the United States/ Gagan Deep Sharma, Muhammad Shahbaz, Sanjeet Singh, Ritika Chopra & Javier Cifuentes-Faura e	2023	Quantile-on-Quantile Regression (QQR) and Quantile Granger Causality applied to daily data (Aug 2016–Aug 2021) for the U.S. to analyze relationships among green economy, sustainability,	Green economy and sustainability investments are highly sensitive to economic shocks, oil price fluctuations, and market volatility. Sustainability shows a negative relationship with oil prices and stock markets. The study recommends green bonds as a stable alternative for investors seeking to support sustainable development.

			Bitcoin, oil prices, and stock markets.	
14	Modelling the barriers of green financing in achieving environmental sustainability: an analysis using TISM/ Ravita Kharb, Charu Shri, Pragati Singh, Shabani Bhatia & Neha Saini	2024	Identified 11 barriers through literature review and expert interviews; used TISM and MICMAC analysis to map their relationships and impact.	Global-level barriers, political constraints, weak legislative structures, uncertain economic conditions, and lack of knowledge have the highest driving power. Greenwashing risk emerged as the most critical performance-level barrier. The study emphasizes the need for standardized definitions, strong regulatory enforcement, and monitoring to reduce greenwashing and strengthen green finance adoption.
15	Past, present, and future of blockchain in finance Gagan Deep Sharma, Aviral Kumar Tiwari, Ritika Chopra & Dhairya Dev	2024	Systematic literature review using a Boolean search in Scopus (149 records) followed by bibliometric analysis with the Bibliometrix package in R to identify key themes.	Six major research themes emerged: financial inclusion, sustainable finance, blockchain technology, cryptocurrencies, artificial intelligence, and financial innovation. The study proposes a conceptual framework linking digital financial transformation with sustainable business development and calls for stronger methodological and theoretical foundations in future research.
16	Performance Evaluation and Scientific Mapping in Sustainability-Focused Green Finance and Literacy / Manpreet Kaur & Babli Dhiman	2025	PRISMA + Bibliometric analysis	Publications on green investment and financial literacy surged post-2020, driven by COVID-19 and the Paris Agreement. The study stresses linking green finance, financial literacy, and sustainability in policy and investment decisions.
17	Retail Investors' Perception Towards Green Bonds in Advancing Sustainability: Evidence from India / Farhat Aziz Lone, Shalini Aggarwal & Sanjeev Jain	2024	Used Exploratory Factor Analysis (EFA) to identify factors influencing investor perception and PLS-SEM for path and mediation analysis among retail investors in India.	Social factors most strongly influence investor perceptions toward green bonds, followed by personal and environmental factors, while financial gains rank fourth and investment risk is least prioritized. Perceptions toward green bonds play a mediating role in advancing sustainability objectives.
18	Sustainable finance research: Review and agenda/ Monica Singhanian, Gurmani Chadha & Renuka Prasad	2024	Comprehensive bibliometric analysis of sustainable finance literature, examining publication trends, subject categories, co-authorship networks, keyword clusters, countries, institutions, and journal co-citation.	Highlights the need for greater global author collaboration and identifies future research areas including carbon trading, financial inclusion, preventing greenwashing, climate finance impacts, green bond mobilization, and the role of technologies like blockchain and AI in sustainable finance.
19	The Role of Environmental, Social, and Governance (ESG) Metrics in Investment Decisions / Dr. P. Subramanyam, Dr.G.Ramanjaneyulu , Dr V .P. Thirulogasundaram, Dr. Pavankumar G Kulkarni, Dr B Muthukrishnan & Nagabhushan N	2025	Collected ESG ratings and financial indicators and conducted interviews with fund managers, analysts, and sustainability officers of Indian listed companies to assess ESG's impact on investments.	Higher ESG performance leads to stronger long-term financial results, better risk management, and improved investor trust. Challenges remain around inconsistent reporting, greenwashing, and low investor awareness. The study recommends stronger ESG disclosure and integration into financial models to drive responsible investing.
20	Unveiling Greenwashing: Analyzing the Interaction of Factors Discouraging ESG Greenwashing through TISM and MICMAC /	2025	Developed a framework using Total Interpretive Structural Modeling (TISM) and MICMAC analysis based on	Artificial intelligence, digital transformation, green finance, and strong monitoring mechanisms are key drivers in combating greenwashing, while environmental

	Shikha Daga, Kiran Yadav, Dharmendra Singh, Dragan Pramucar & Vladimir Simic	literature review and expert input to identify factors mitigating ESG greenwashing.	awareness has minimal impact. The framework helps enhance corporate transparency and accountability in sustainability practices.
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In order to provide more in-depth understanding of the domestic environment, this systematic review exclusively examined scholarly works from India, building on the first bibliometric analysis of the international literature on green financial instruments. The review looked at a wide range of research using both quantitative and qualitative approaches, from investor surveys and policy analyses to bibliometric mapping and econometric modeling. While some studies examined structural obstacles, investor perceptions, and regulatory developments, others focused on particular instruments like green bonds (Mishra et al., 2023; Lone et al., 2024), ESG indices (Manzoor et al., 2025), and AI-enabled sustainable finance frameworks (Siriman et al., 2025).

The study uses scientometric tools, content analysis, and comprehensive visualisations to review and map the vast body of scientific research on sustainable finance. This two-pronged approach allowed for a nuanced interpretation of India's scholarly output in this field in addition to providing a macro-level understanding of global research patterns. The summary of results shows that although there has been a lot of advancement in the study of investor behavior, green instrument design, and regulatory frameworks, there are still some gaps in the current corpus of research.

These studies show significant methodological limitations, despite the fact that they significantly improve our understanding of India's green finance ecosystem. The majority of analyses rely on secondary sources or descriptive frameworks and are restricted to particular instruments, datasets, or industries. Long-term impact assessments, empirical validations, and interdisciplinary approaches are noticeably lacking. Additionally, there is still a lack of research in areas like behavioral finance, gender inclusivity, and regional policy variations. Therefore, to better inform India's transition towards a sustainable financial future, future research should fill in these gaps by combining strong data-driven methodologies, wider thematic coverage, and stronger policy relevance.

FINDINGS

Research on green financial instruments has been steadily increasing, reaching a peak in 2023, according to a bibliometric analysis of 244 articles published between 2015 and 2025. India and Italy have the highest rates of international collaboration, while China leads the world in publication volume. India is increasingly collaborating with China and European nations, and strong regional collaboration clusters are emerging throughout Europe, East Asia, and South Asia. Green finance and fintech, ESG disclosure and greenwashing, SDG-oriented climate finance, renewable energy and green bonds, and market risk–investor behavior are the five main research clusters identified by thematic mapping. Technological Forecasting and Social Change, Journal of Cleaner Production, and Energy Economics are important journals.

A targeted analysis of 20 studies pertaining to India shows advancements in regulatory initiatives (SEBI, RBI), increasing interest in green bonds and ESG metrics, and a consistent increase in scholarly interest following 2018. Nonetheless, structural problems still exist, including inconsistent disclosures, gaps in investor awareness, risks associated with greenwashing, and low private sector involvement.

IMPLICATIONS

The results point to a number of useful ramifications for bolstering green financial markets. To improve credibility and lessen greenwashing, policymakers should give priority to standardized taxonomies, uniform disclosure frameworks, and robust monitoring systems. By creating cutting-edge financial products and increasing private involvement, financial institutions can capitalize on the growing interest around the world, especially in social sectors and climate adaptation where investment is still scarce.

To increase participation and lessen vulnerability to deceptive sustainability claims, investor-focused interventions—such as awareness campaigns, incentives, and advice on assessing ESG data—are crucial.

Green financial instrument transparency, traceability, and verification can be greatly improved by emerging technologies like blockchain, artificial intelligence, and big-data analytics. Lastly, the study highlights the necessity of interdisciplinary academic approaches that incorporate technology, policy, finance, and the environment in order to address the quickly changing challenges of green finance.

CONCLUSION

This study combines bibliometric methods with a focused systematic review to offer a thorough mapping of international and Indian research on green financial instruments. It draws attention to the growing significance of emerging markets like India as well as an expanding research landscape with growing thematic diversity and international collaboration. Even though there has been progress, there are still gaps in the form of uneven reporting standards, difficulties with investor literacy, and a lack of integration of technology-driven transparency tools. In order to better align green finance with global sustainability goals, the study emphasizes the need for more extensive empirical research, more robust interdisciplinary models, and context-specific analyses. The study lays the groundwork for future research and useful changes in the green finance ecosystem by identifying these trends and research gaps.

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