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Article

Evolution of Green Finance and Banking Research: A Bibliometric Analysis

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Abstract: This paper presents a comprehensive bibliometric review of research on green finance and the banking sector with special emphasis on public sector banks. The study synthesizes 800 Scopus-indexed journal articles published between 2000 and 2024 and employs Biblioshiny for performance analysis, science mapping, and thematic evolution. Key findings reveal rapid growth in scholarly output after 2015, with dominant themes including ESG integration, green credit, fintech-enabled green finance, and climate-risk regulation. China, the United Kingdom, and India are central contributors, while regions such as Africa and Latin America remain underrepresented. The study identifies five major gaps: limited attention to public sector banks, geographic imbalance, scarcity of longitudinal studies, thematic isolation of green fintech, and limited use of behavioural frameworks. Based on these results, the paper proposes a future research agenda and policy recommendations to strengthen the institutional, methodological, and geographic breadth of green finance scholarship.

Keywords: Green Finance; Sustainable Banking; Public Sector Banks; Bibliometric Analysis; ESG; Climate Finance; Thematic Evolution

1. Introduction

Green finance has become a core mechanism for aligning financial intermediation with global sustainability objectives. Banks, by virtue of their role in credit allocation, deposit mobilization, and financial intermediation, are pivotal actors in channeling funds towards low-carbon and climate-resilient projects. Over the last two decades, the field has shifted from voluntarist corporate social responsibility frameworks to regulatory-driven strategies, as witnessed after the 2015 Paris Agreement. Public sector banks (PSBs) play a unique role in emerging economies because of their developmental mandates, policy alignment, and capacity to de-risk green projects. However, academic knowledge remains fragmented across sub-fields such as green bonds, ESG disclosure, climate finance, and fintech-enabled green instruments. This paper synthesizes the intellectual structure and thematic evolution of green finance research in the banking sector using systematic bibliometric methods drawing on a Scopus-derived dataset of 800 articles (2000–2024).[1]

The G20 Green Finance Study Group (2016) defines green finance as financial investment that supports environmentally sustainable development by reducing pollution, lowering greenhouse gas emissions, improving energy efficiency, promoting the sustainable use of natural resources, and facilitating climate change mitigation and adaptation.

The present paper aims to provide a review on GF through bibliometric analysis of the selected literature. It further attempts to identify the enablers for increasing green financing activities and scope for further research. The study will add to the literature of GF for further theoretical and

empirical analysis. In future researches, the identified list of enablers can be analysed with the help of quantitative and qualitative techniques. Focusing on GF and its enablers, the paper aims to map and discuss the following research questions:

RQ1. How has research on green finance and banking evolved in terms of scientific production and citation impact during the study period?

RQ3. What intellectual structures and collaboration patterns characterise the existing literature on green finance and banking?

RQ3. What are the important enablers of GF discussed in the literature and what is the possible scope for future research in GF?

The present study contributes to the existing literature by providing a comprehensive bibliometric overview of green finance and banking research based on Scopus-indexed publications. It systematically examines the field's intellectual structure, collaboration patterns, and thematic developments using advanced bibliometric techniques. Furthermore, the study identifies emerging research trends and potential avenues for future investigation while offering valuable insights for researchers, policymakers, financial institutions, and regulators to support informed decision-making and the advancement of sustainable finance.

Objectives of the Study

This paper aims to provide a comprehensive bibliometric review of research on green finance in the banking sector, with particular emphasis on thematic evolution and the role of public sector banks. The specific objectives are:

1. To analyse publication trends, growth patterns, and citation impact of research on green finance and banking from 2000 to 2024.
2. To identify the most influential authors, journals, institutions, and countries contributing to the field.
3. To map the thematic evolution of green finance research using co-occurrence and cluster analysis.
4. To assess how public sector banks are represented and discussed within the green finance literature.
5. To suggest future research directions and policy priorities based on bibliometric insights.

2. Materials and Methods

Research Design:

This study adopts a bibliometric research design to examine the evolution, intellectual structure, and emerging thematic trends in the field of green finance and banking. Bibliometric analysis is a quantitative approach that enables researchers to evaluate the development of a research field by analyzing publication patterns, citation structures, collaboration networks, and thematic relationships within the existing literature. Compared with traditional narrative reviews, bibliometric methods provide a more systematic, objective, and reproducible assessment of scientific knowledge.[2]

The study combines a systematic literature search with bibliometric techniques to identify influential publications, leading authors, productive institutions, major contributing countries, and evolving research themes. The systematic search process was conducted in accordance with the principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020), ensuring that the identification and selection of publications followed a transparent and reproducible procedure. Although PRISMA was originally developed for systematic reviews, its screening framework has increasingly been adopted in bibliometric studies to document the article selection process in a structured manner.

The bibliometric analysis was carried out using the Bibliometrix package[3] (Biblioshiny interface) in R, which provides comprehensive tools for descriptive performance analysis and science mapping. In addition, VOSviewer was used to generate and validate network visualization's,

including keyword co-occurrence, co-authorship, and co-citation networks. The combined use of these software packages enabled both quantitative assessment and graphical representation of the intellectual structure of green finance and banking research.

Data Source:

The Scopus database was selected as the sole source of bibliographic data for this study. Scopus is one of the world's largest multidisciplinary abstract and citation databases and offers extensive coverage of high-quality peer-reviewed journals across the fields of business, economics, finance, environmental science, and sustainability. Its comprehensive metadata, standardized indexing system, and compatibility with bibliometric software make it a preferred database for conducting bibliometric analyses.

The literature search was performed using the Scopus Advanced Search interface. To ensure the relevance and quality of the retrieved publications, the search was restricted to journal articles published in English between 2000 and 2024. Conference papers, book chapters, editorials, notes, and non-English publications were excluded from the dataset. The search strategy focused on publications related to green finance, sustainable finance, green banking, climate finance, and ESG finance within the banking sector.

The search initially retrieved **1,557** records. Following the application of predefined screening criteria, **800** journal articles were retained for the final bibliometric analysis. The bibliographic information exported from Scopus included article titles, author names, affiliations, abstracts, author keywords, indexed keywords, publication year, source titles, citation counts, Digital Object Identifiers (DOIs), and reference lists. These metadata served as the basis for subsequent performance analysis and science mapping.

Table 1. Summary of the Data Collection Strategy

ITEMS	DESCRIPTION
Database	Scopus
Search Interface	Scopus advanced search
Search Period	2000-2024
Document Type	Journal Articles
Language	English
Search Field	Title-Abs-Key
Initial Records Retrieved	1,557
Final Records Included	800
Software Used	Bibliometrix (Biblioshiny) and VOSviewer
Metadata Exported	Title, Authors, Affiliations, Abstract, Keywords, Source, References, DOI, Citation Information

Source: Compiled by the authors.

Search Strategy

A comprehensive search strategy was developed to identify publications related to green finance and banking. The search query was formulated after reviewing commonly used terminology in previous studies and considering frequently occurring keywords within the field. Boolean operators (AND, OR), phrase searching, and wildcard operators (*) were used to maximize the retrieval of relevant publications while reducing irrelevant records.

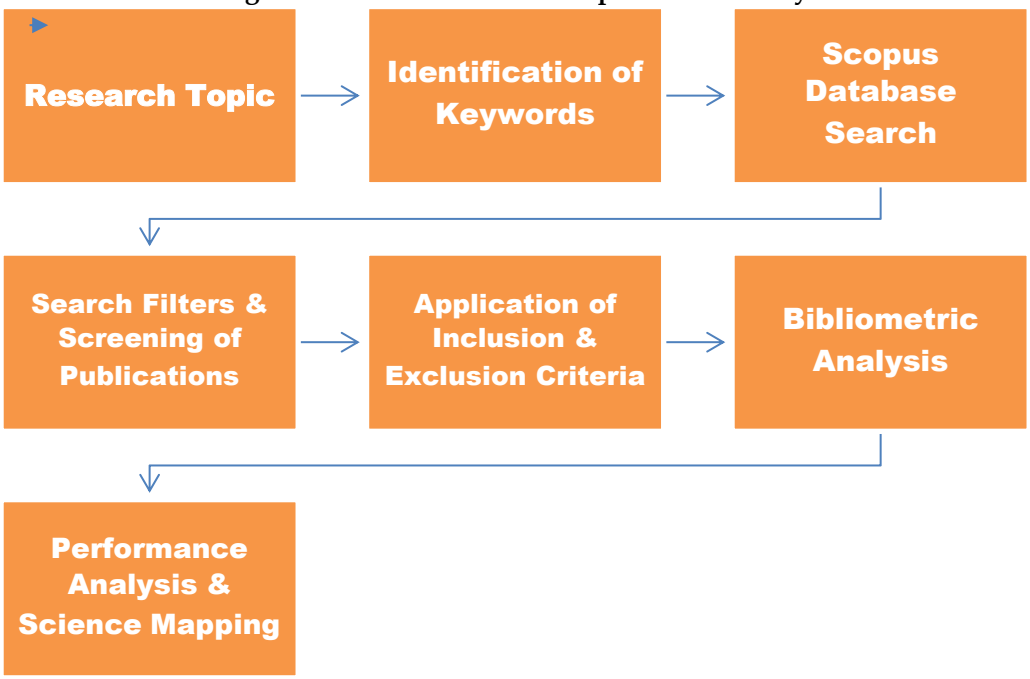
The search was restricted to the TITLE-ABS-KEY field to ensure that the retrieved publications explicitly addressed the research topic within their titles, abstracts, or author keywords.

Research Process

The overall research process consisted of six sequential stages. Initially, the research topic and objectives were defined, followed by the identification of appropriate keywords based on previous

literature. Subsequently, bibliographic records were retrieved from the Scopus database using the predefined search strategy. The retrieved publications were then screened using predefined inclusion and exclusion criteria to ensure the relevance and quality of the dataset. Finally, the selected publications were analysed using Bibliometrix (Biblioshiny) and VOSviewer to generate bibliometric indicators and science mapping visualisations.

Figure 1. Research Process Adopted in the Study:



Source: Compiled by Authors

Inclusion and Exclusion Criteria:

To ensure the reliability and relevance of the dataset, predefined inclusion and exclusion criteria were applied during the screening process. The study included only English-language, peer-reviewed journal articles published between 2000 and 2024 that focused on green finance and banking. Publications that were unrelated to the research scope, published in other languages, or classified as conference papers, book chapters, editorials, notes, and errata were excluded. The selection criteria adopted for this study are presented in Table 2.

Inclusion Criteria	Exclusion Criteria
Scopus-indexed journal articles	Conference papers
English-language publications	Non-English-language publications
Publication period: 2000–2024	Publication before 2000
Studies related to green finance and banking	Studies outside the research scope
Complete bibliographic information	Incomplete bibliographic records
Peer-reviewed research articles	Editorials, notes, book chapters.

Source: Compiled by Authors

3. Results and Discussion

Section Three: Practical and Applied Side Descriptive Bibliometric Overview

Annual scientific production demonstrates exponential growth from 2018 onward, peaking in 2024. Average citations per year rose substantially post-2017, with a citation peak in 2021 due to earlier foundational works accruing references. Top globally cited documents include empirical and review articles addressing energy policy, renewable energy finance,

and green credit systems.[4]

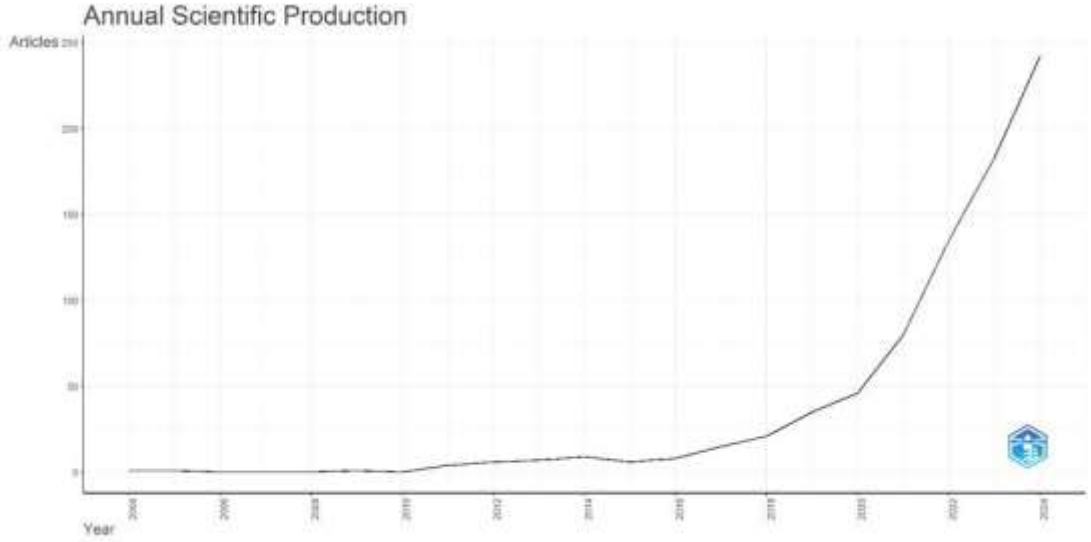


Figure 1. Annual Scientific Production

Most Relevant Journals and Sources

Top sources by article count: Sustainability (Switzerland), Environmental Science and Pollution Research, Climate Policy, Journal of Cleaner Production, and Journal of Sustainable Finance and Investment. While Sustainability leads in volume, journals like Climate Policy and Journal of Cleaner Production exhibit higher citation impact per article.

Table 2. Most Relevant Sources

Sources	Articles
SUSTAINABILITY (SWITZERLAND)	58
ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	27
CLIMATE POLICY	19
JOURNAL OF CLEANER PRODUCTION	17
JOURNAL OF SUSTAINABLE FINANCE AND INVESTMENT	17
ENVIRONMENT, DEVELOPMENT AND SUSTAINABILITY	13
ENERGIES	10

Performance Analysis of Contributors 4.4 Average Citations per year Most prolific authors include Wang Y, Siddik AB, and Zhang D. High-impact contributors in citation terms feature authors whose works advanced green credit policy analysis and green bond market studies. Institutional hubs include Chinese universities (Southwestern University of Finance and Economics), University Sains Malaysia, and Western institutions such as the University of Oxford.

Average Citations per year

The Average Citations per Year plot reveals a nonlinear but meaningful pattern of academic impact.

1. From 2000 to 2010, the citation impact was relatively flat.
2. However, a distinct rise begins in 2017, peaking dramatically in 2021 with an average of over 11 citations per article.
3. Interestingly, a slight decline is seen in 2023 and 2024.

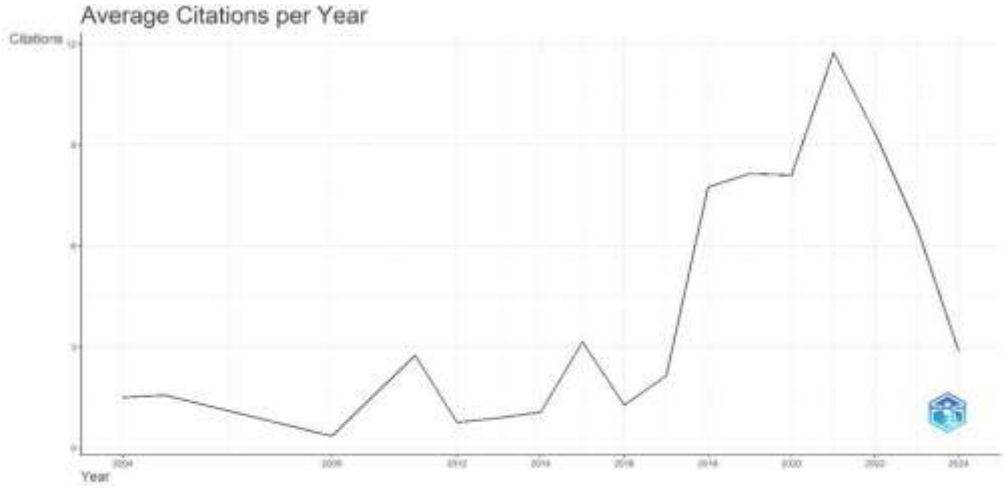
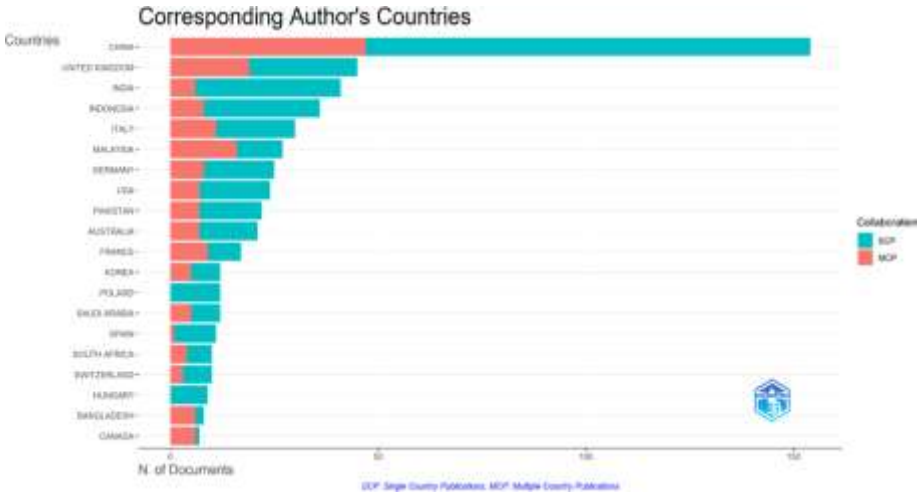


Figure 2. Average Citation Per Year

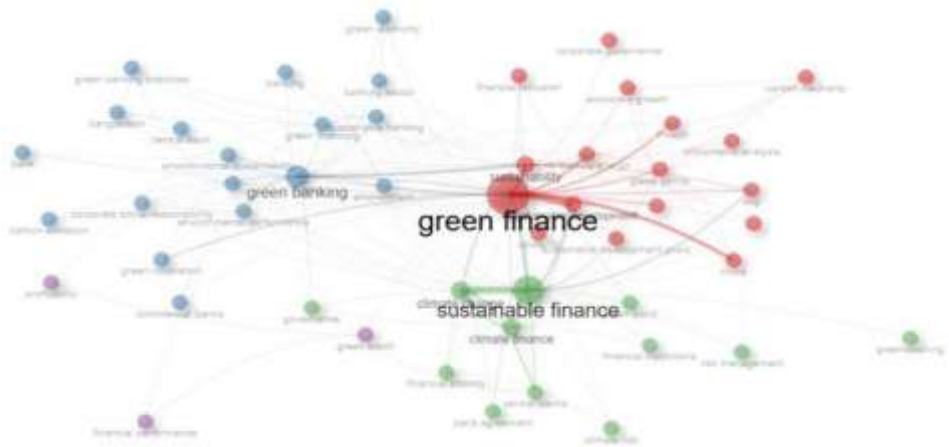
Country-Level Contributions and Collaborations

China is the leading contributor in volume and collaboration, followed by the UK and India. Collaboration maps show strong China–Southeast Asia links, UK–EU/Commonwealth ties, and India–South Asia/UK collaborations. Regions like Africa and Latin America are underrepresented relative to climate vulnerability and green finance needs.[5][6][7]

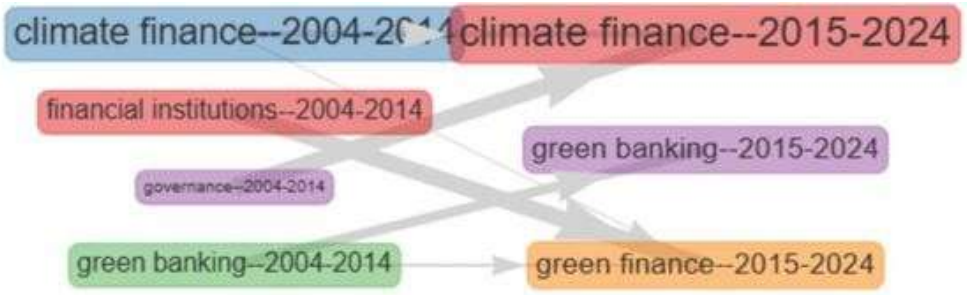


Keyword Co-Occurrence and Thematic Evolution

Keyword co-occurrence reveals four major thematic clusters: (1) Sustainability, ESG and green bonds; (2) Climate finance and central banking; (3) Green banking practices and CSR; and (4) Financial performance and green innovation. Thematic evolution from 2004–2014 to 2015–2024 shows a shift from broad 'climate finance' to specialized themes like green credit, fintech, greenwashing, and climate risk.[8][9]



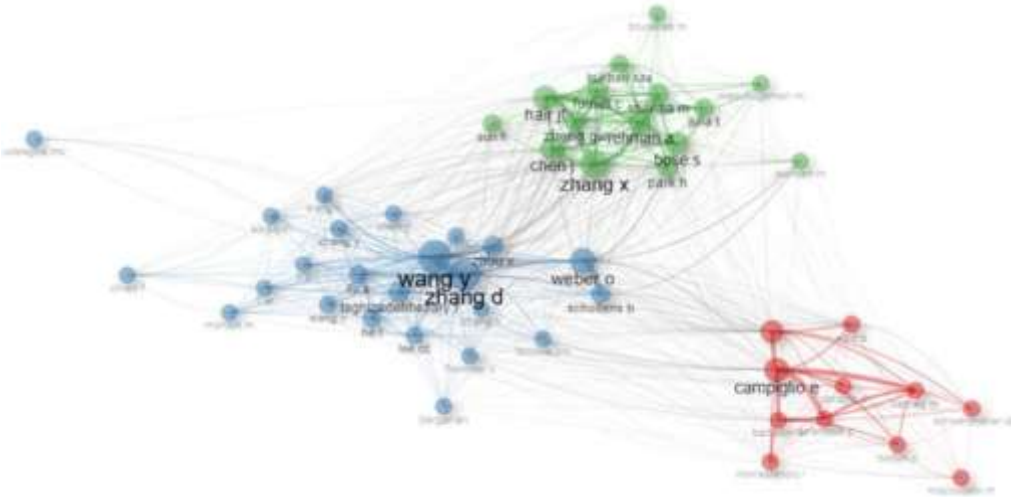
Thematic Map



Author Co-Citation and Conceptual Structure

Author co-citation networks delineate three intellectual schools: ESG-centric policy research, methodological behavioural models (PLS-SEM, CFA), and macro-financial analyses linking monetary policy to low-carbon transitions. Conceptual structure via

MCA positions green finance at the core, with peripheral yet significant themes like greenwashing and renewable energy transitions.[10][11]



Key Findings

- Rapid growth in publications post-2015 with a notable peak in 2024.[12]
- Dominance of China, UK, and India in research output; underrepresentation of several Global South regions.
- Core thematic clusters around ESG, green credit, fintech, and climate-risk regulation.[13]
- Limited empirical focus specifically isolating public sector banks compared to private/commercial banks.[14]
- Methodological expansion but persistent reliance on cross-sectional studies; call for longitudinal designs.

Discussion, Implications, and Future Research Agenda

The bibliometric patterns suggest that policy-driven scholarship and regulatory integration are central in shaping green finance research. The study recommends three policy actions:[15][16]

1. Development of standardized green taxonomies in emerging markets;
2. Capacity building for PSBs to implement climate risk frameworks; and
3. Incentivizing green fintech deployment for traceability and ESG performance monitoring.[17]

Research Gaps and Future Directions

1. Underrepresentation of Public Sector Banks — targeted empirical studies differentiating PSBs from private banks.
2. Geographic Imbalance — encourage research collaborations and open-data initiatives for Africa, Latin America.
3. Methodological Depth — promote longitudinal, mixed-methods, and quasi-experimental designs.
4. Thematic Integration — integrate green fintech with climate-risk stress testing and governance studies.
5. Behavioural Insights — include retail/institutional investor behaviour analyses.

This bibliometric review consolidates 25 years (2000–2024) of research on green finance and banking, offering a synthesized map of intellectual development, thematic clusters, and research frontiers. While green finance has matured into a policy-relevant field, considerable opportunities remain to broaden geographic representation, refine theoretical frameworks, and deepen empirical rigor—especially regarding public sector banks.

Limitations

Limitations include reliance on Scopus (excluding regional databases and non-English literature), bibliometric focus on metadata rather than full-text policy impacts, and potential recency effects for 2023–2024 publications which have limited citation accumulation.

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