

Climate Finance and Macroeconomic Sustainability: A Systematic and Bibliometric Review

SAKSHI JAIN

JSAKSHI5700@GMAIL.COM

Manav Rachna International Institute of Research and Studies <https://orcid.org/0009-0006-0189-0297>

DR, ANANDAJIT GOSWAMI

Manav Rachna Educational Institutions <https://orcid.org/0009-0005-1689-9107>

Systematic Review

Keywords: Climate Finance, Macroeconomic Sustainability, Sustainable Development, Bibliometric Analysis, Systematic Literature Review, Emerging Economies

Posted Date: July 16th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10361235/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: The authors declare no competing interests.

Abstract

Climate finance has become a critical component of sustainable development and macroeconomic resilience; however, research examining its macroeconomic implications remains fragmented across environmental, financial, and economic disciplines. This study provides a systematic review and bibliometric analysis of the climate finance literature to examine its intellectual development, identify dominant research themes, and highlight emerging directions from a macroeconomic sustainability perspective. Using the Scopus database, 395 publications were initially identified, of which 89 peer-reviewed studies were selected through a PRISMA-guided screening process. Bibliometric mapping was conducted using VOSviewer and complemented by thematic synthesis to analyze the evolution and structure of the literature. The findings indicate a clear transition from environmentally oriented research towards broader issues of sustainable finance, macroeconomic sustainability, and economic resilience. Six interconnected thematic areas emerge from the review, namely economic growth, fiscal sustainability, inflation and macroeconomic stability, employment and just transition, external sector performance, and financial system development. Despite the rapid expansion of the literature, evidence on the long-run macroeconomic effects of climate finance remains limited, particularly for emerging economies, indicating important priorities for future empirical research and policy evaluation. The fragmented evidence provided by combining bibliometric analysis with systematic literature synthesis, is converted into comprehensive macroeconomic perspective on climate finance in this review by identifying key knowledge gaps and developing a future research agenda. This study also provides insights related to policy that can support climate finance strategies design which aimed at promoting sustainable development and macroeconomic resilience especially in emerging economies like India.

JEL Classification: Q54, Q56, O44, G28, E60

1. INTRODUCTION

Climate finance has become the center of global sustainability and macroeconomic policy discussions because of the climate change and the increasing transition towards low carbon development. Throughout the past decade, governments, international organizations, and financial institutions have focused that there is a need for large scale financial mobilization to support climate mitigation, adaptation and sustainable development pathways. To facilitate the climate transition strategies some financial tools like green bonds, sustainable investment funds, carbon markets, renewable energy financing and ESG oriented financial system have emerged as important instruments (Tiwari et al., 2022; Sreelakshmi and Greeshma, 2023; Raman et al., 2024; Talwar et al., 2025). Because of this, climate finance is no longer known solely as environmental policy mechanism but also as an instrument which influences the economic transformation, financial resilience and long term macroeconomic sustainability (de Aguiar et al., 2024; Tekin et al., 2025; Tyson and Weiss, 2025).

Existing literature have examined themes which includes renewable energy finance, climate risk disclosure, green investment, sustainable banking systems, ESG governance and carbon emission

mitigation (Bhatnagar and Sharma, 2022; Jung and Song, 2023; Khurshid and Islam, 2025; Ahuja and Rani, 2025; Rani et al., 2025). Scholarly discussion in the recent time have shifted towards understanding the broader macroeconomic implications of climate finance, particularly in area related to economic growth, employment generation, financial stability, fiscal sustainability and external sector resilience (Jin and Kim, 2017; Hsu, 2023; Zhao et al., 2025; Sun et al., 2025; Tekin et al., 2025). This transition shows implication of climate finance not only on environmental sustainability but also on the functioning of financial systems and macroeconomic policy frameworks.

Though there is a rapid growth of climate finance research but still the existing literature is fragmented across multiple thematic and disciplinary domains. Many studies focus on environmental finance, renewable energy financing, ESG oriented financial systems or green investment (Bhatnagar and Sharma, 2022; Joshipura et al., 2024; Dar et al., 2024), but fewer studies focused on broader macroeconomic sustainability implication of climate finance (Hsu, 2023; Zhang et al., 2025; Gong et al., 2025). Existing findings remain scattered across sustainable finance, environmental economics, financial market analysis, development studies and climate policy research (Sisodia and Maheshwari, 2023; de Aguiar et al., 2024; Kumar et al., 2024), therefore limiting the understanding of how climate finance can impact macroeconomic sustainability and long term economic resilience (Zhang et al., 2024; Lessmann and Kalkuhl, 2024; Wang et al., 2024).

In developing economies like India, climate vulnerability, rapid economic development, infrastructure requirements and sustainability interact simultaneously, because of which climate finance has become important. There are certain challenges faced by India related with climate induced economic risks, energy transition pressures, environmental degradation and increasing demand for sustainable infrastructure investment (Naik et al., 2014; Umamaheswaran et al., 2024; Malode and Singh, 2025; Katoch and Peer, 2025). At the same time, India requires substantial financial mobilization for renewable energy expansion, climate resilient infrastructure, sustainable development objectives and green industrial transformation. As a result, climate finance in India has emerged as a critical policy mechanism which balances the environmental sustainability with economic growth and macroeconomic stability (Umamaheswaran et al., 2024; Sachan and SenGupta, 2025; Katoch and Peer, 2025).

Earlier research offers limited evidence on how climate finance influences short run macroeconomic effects and long run development outcomes. Existing studies are often based on descriptive, sector specific or policy oriented approaches, whereas less attention was given to ARDL and DSGE frameworks which are capable of examining the long run transmission mechanisms, policy transition dynamics and macroeconomic interactions related to climate finance (Lessmann and Kalkuhl, 2024; Braga et al., 2025; Wang et al., 2025). Furthermore, there is need of systematic synthesis which is capable of identifying the thematic evolution, and emerging macroeconomic research directions within the field due to the increasing complexity of climate finance.

This study examines the evolving relationship between climate finance and macroeconomic sustainability through an integrated bibliometric and systematic literature review approach. Available

literature mainly examines environmental finance mechanism and sustainable investment frameworks, however this study focuses on broader macroeconomic viewpoint of including economic growth, financial development, external sector dynamics and financial stability. This study also intends to map the collaboration patterns, conceptual evolution and emerging research frontiers within the climate finance literature.

This study is important for climate finance literature because of integrated bibliometric and systematic literature review approach which includes thematic evolution and emerging research related to climate finance, especially in emerging economies like India. In methodological terms, this study combines the bibliometric analysis with ARDL and DSGE frameworks which will examine the long run dynamics, policy transmission and sustainability outcomes. The study also focuses on policy relevant insights for climate resilient macroeconomic planning, long term economic sustainability and sustainable financial system in emerging economies.

The rest of the paper is structured as follows. The research methodology is presented in section 2. Section 3 discusses the bibliometric findings, thematic synthesis and emerging research gaps for the climate finance literature. Finally, section 4 concludes the study which shows the major findings, policy implication, limitations and future research directions.

2. Research Methodology

This study has a mixture of method which include bibliometric analysis and systematic literature review (SLR) to examine the growing relationship between climate finance and macroeconomic sustainability. The bibliometric analysis enables the mapping of the thematic evolution, emerging research frontiers (Jain and Tripathi, 2023; Pacelli et al., 2025; Ray et al., 2025), whereas on the other hand systematic literature review facilitates in depth thematic synthesis and identification of conceptual, methodological and policy oriented research gaps (de Aguiar et al., 2024; Kumar et al., 2024). The methodological approach gives us both quantitative and qualitative understanding into the macroeconomic transmission mechanisms related to climate finance within the emerging economies like India.

2.1 Data Source and Search Strategy

Primary source of literature was Scopus database due its coverage in various interdisciplinary, strong peer reviewed studies related to climate finance, macroeconomics, sustainable finance and economic sustainability (Jain and Tripathi, 2023; Pacelli et al., 2025; Yadav, 2025; Joshipura et al., 2024). Scopus provide high impacts journals and greater compatibility with VOSviewer tool for bibliometric analysis.

The search for the study focused on publication between 2015-2025 to capture the increase of climate finance research with Paris agreement and the increasing global importance of sustainable financial transition and green economic development.

The search was developed by using the combination of climate finance keywords like ‘climate finance’, ‘green finance’, ‘sustainable finance’, ‘green bond’, ‘carbon market’, ‘renewable energy finance’, ‘adaptation finance’, and ‘mitigation finance’ with macroeconomic sustainability related keywords like ‘economic growth’, ‘GDP’, ‘investment’, ‘inflation’, ‘employment’, ‘financial stability’, ‘fiscal deficit’, and ‘balance of payment’.

2.2 PRISMA-Based Screening Process

The Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA 2020) framework was used to make sure of transparency, consistency, and reproductability in the literature selection process.

After the initial database selection of 395 publications from Scopus, firstly the duplicates were removed and the remaining literatures were screened through titles, abstracts, and keywords. Studies which are not related to climate finance, macroeconomic sustainability or sustainable financial system were removed. The final dataset of 89 studies is used for bibliometric analysis and systematic literature review.

2.3 Inclusion and Exclusion Criteria

To enhance the relevance and quality of the review process, inclusion and exclusion criteria was used during the screening stage.

Criteria	Inclusion	Exclusion
Language	English-language publications	Non-English publications
Publication Type	Peer-reviewed journal articles	Editorials, notes, conference abstracts, book reviews
Subject Focus	Climate finance and macroeconomic sustainability	Pure engineering or unrelated environmental studies
Time Period	2015–2025	Publications before 2015
Database	Scopus-indexed studies	Non-indexed publications

Table 1: Inclusion and Exclusion Crteria

2.4 Bibliometric Analysis Techniques

Bibliometric analysis was administrated using VOSviewer, to inspect the intellectual and conceptual pattern of climate finance research. VOSviewer was used because it helps in constructing and visualizing bibliometric networks like keyword co-occurrence, citation network and co-authorship patterns (Bhatnagar and Sharma, 2022; Jain and Tripathi, 2023; Khurshid and Islam, 2025).

This framework also incorporates macroeconomic modeling related to climate finance transmission mechanisms and sustainability analysis.

2.5 Thematic Synthesis and Analytical Framework

The selected studies were further categorized into major macroeconomic and sustainability themes which are linked to conceptual similarity, relevance of macroeconomic sustainability and frequency of occurrence. The themes which were used are economic growth, investment, inflation, fiscal sustainability, employment, financial stability, external sector dynamics and human capital formation.

The review also incorporates ARDL and DSGE frameworks to strengthen the analytical part of the study. ARDL framework examines the short run and long run dynamics between climate finance and macroeconomic sustainability within the emerging economies linked to structural transitions and evolving financial systems. Whereas, DSGE framework focused on understanding the dynamic policy transmission mechanisms, macroeconomic adjustments, productivity effects and long term sustainability transition for climate finance.

3. RESULTS AND DISCUSSION

3.1 Publication Trends and Research Growth

The publication patterns suggest that there is a sharp increase in climate finance research after 2015 due to the adoption of the Paris Agreement and increased policy attention on climate finance. The climate finance, green investment, ESG integration, sustainability and macroeconomic frameworks have shown an increasing publication trends (de Aguiar et al., 2024; Talwar et al., 2025; Tyson and Weiss, 2025). The publications had been increased after 2020, show the growing academic attention towards climate financial risks, transition finance and challenges related to macroeconomic sustainability due to climate change (Gourdel and Sydow, 2023; Hoffart et al., 2024; Kroll and Kühne, 2024; Yang and Geng, 2025).

This trend also reflects the growing institutional and academic identification of climate financial risks as an economic concern instead of solely an environmental issue (Bhatnagar and Sharma, 2022; Zhang et al., 2024; Hanafy et al., 2025).

3.2 Conceptual Structure of Climate Finance Research

The climate finance conceptual structure was inspected using keyword co-occurrence analysis with the help of VOSviewer. The networks show various interconnected thematic clusters which represents main conceptual foundation of this field (Hachaichi, 2022; Afjal, 2023; Tekin et al., 2025).

The green cluster focuses on sustainable finance, green bonds, ESG financial system and green economic transformation. These keywords increase the scholarly focus on sustainable investment and climate oriented financial market development.

The red cluster main contain climate policy, environmental economics, investment dynamics and financial stability dimension which are related to climate risks.

The yellow and blue clusters show the integration of climate finance with economic growth, carbon emissions, eco friendly progress and carbon emissions. These keywords suggest that there is more focus on the relationship between sustainability transitions and broader macroeconomic development outcomes within the emerging economies (Carfora and Scandurra, 2019; Hsu, 2023; Liu and Paan, 2024).

Overall, the conceptual structure reflects the transition of climate finance from environmental finance to macroeconomic sustainability and financial frameworks. It also demonstrates the multidimensional nature of climate finance and its relevance for economic growth, financial development and macroeconomic resilience (Ameli et al., 2020; Alessi et al., 2024; Talwar et al., 2025).

3.3 Co-citation Analysis of Climate Finance Literature

The co-citation analysis helps in identifying influential studies and foundational knowledge streams shaping the field. The co-citation network reveals interconnected intellectual clusters reflecting the interdisciplinary evolution of climate finance literature.

One major intellectual cluster centers on ESG-oriented finance and sustainable investment discussions, highlighting the increasing importance of environmental, social, and governance frameworks within climate-finance research (Ameli et al., 2020; Dev et al., 2025; Lalhunthara et al., 2025; Aggarwal et al., 2025).

A second cluster focuses on green bonds and sustainable financial instruments, reflecting growing scholarly attention toward green capital markets and transition-finance mechanisms (Abhilash et al., 2022; Tiwari et al., 2022; Sreelakshmi and Greeshma, 2023; Wang et al., 2025).

Additional co-citation linkages emphasize climate-finance publication streams and broader sustainability-oriented macroeconomic discussions (Joshi et al., 2024; Kumar et al., 2024; Ray et al., 2025). This further indicates that climate finance research remains strongly anchored in sustainable finance and ESG-oriented frameworks.

Overall, the co-citation network demonstrates the transition of climate finance research from traditional environmental-finance (Jain and Tripathi, 2023; de Aguiar et al., 2024; Wang et al., 2024; Rani et al., 2025) discussions toward broader macroeconomic sustainability, financial-market resilience, and climate-transition policy frameworks.

3.4 Social Structure and Country Co-authorship Networks

The social structure of climate finance research was analyzed through country collaboration networks. The collaboration network demonstrates the international nature of climate finance research, with

increasing interaction between developed and emerging economies.

The country collaboration network identifies India as an increasingly significant research node within climate finance and macroeconomic sustainability discussions (ÓhAiseadha et al., 2020; Masud et al., 2023; Gulati et al., 2025). Strong collaborative linkages are observed between India and developed economies such as France, Germany, the United Kingdom, and the United States, reflecting the globalized nature of climate-finance policy research.

The growing internationalization of collaboration networks reflects the increasing policy relevance of climate finance and the recognition of climate-related financial risks as a global economic challenge (Bhatnagar and Sharma, 2022; Sisodia and Maheshwari, 2023; Joshipura et al., 2024).

3.5 Thematic Evolution of Climate Finance Literature

The thematic evolution shows an important transformation of climate finance research over time. Early studies (Ghosh et al., 2002; Hultman et al., 2011; Narain et al., 2011; Ranjan, 2025;) is more focused on environmental finance and renewable energy investment, carbon emission mitigation strategies and climate financing mechanisms. But the literature has shifted towards green finance, sustainable investment, ESG integration and green financial instruments after Paris Agreement and sustainable finance initiatives.

More recent research (Kroll and Kühne, 2024; Hoffart et al., 2024; Alessi et al., 2024; Lessmann and Kalkuhl, 2024) is focusing on relationship between climate finance and macroeconomic stability, financial market resilience, transition risk and sustainable economic development. These developments over the years highlight the importance of macroeconomic frameworks like ARDL and DSGE models (Lessmann and Kalkuhl, 2024; Braga et al., 2025; Wang et al., 2025).

3.6 Thematic Synthesis

The thematic syntheses have some major themes which is related to climate finance and macroeconomic and financial system dynamics.

3.6.1 Climate Finance and Economic Growth

With the help of renewable energy transition, green investment mechanisms and sustainable finance, literature can examine the relationship between climate finance and economic growth. Existing studies (Carfora and Scandurra, 2019; Han and Jun, 2023; Liu and Paan, 2024; Tekin et al., 2025) suggest that climatic financial flows can contribute to long term economic growth by investing in low carbon development and sustainable investment pathways. But the literature (Halimanjaya, 2015; Narita et al., 2022; Doku, 2022; Njangang et al., 2024) also mentioned about financial constraints, uneven distribution across emerging economies and institutional limitations.

3.6.2 Climate Finance and Macroeconomic Stability

Macroeconomic stability is one of the major determinants of climate finance. Existing literature studies the interaction of climate finance with inflation, labour market adjustments, transition risks and fiscal sustainability. The findings from the literature (Jin and Kim, 2017; Huang et al., 2022; Braga et al., 2025; Gronwald and Wadud, 2025) tell that financial policies related to climate change may generate both transitional macroeconomic pressures and stabilization benefits which will be depended upon institutional capacity and policy design (Kumar et al., 2012; Kuiti et al., 2020; Gronwald and Wadud, 2025).

3.6.3 Climate Finance and External-Sector Dynamics

External sector dynamics mainly focuses on the relationship between climate finance and capital flows, exchange rate movements and sustainable investment patterns. Previous studies (Wang et al., 2024; Abakah et al., 2025; Hanafy et al., 2025) have observed that climate finance affects external sector stability through sustainable climate inflows and climate finance instruments especially in developing economies. Literature (Tiwari et al., 2022; Wang et al., 2025; Azad and Tulasi Devi, 2025; Sachan and SenGupta, 2025) also suggest that climate financial cooperation and sustainable capital inflows contributes to stability in balance of payment and diversification in international investment. But at the same time for emerging economies there is vulnerability in evolving financial systems and structural development constraints due to exposure of climate transition risks and external financing dependencies (Sachan and SenGupta, 2025; Abakah et al., 2025; Gong et al., 2025).

3.6.4 Climate Finance and Financial Stability

The interaction between climate finance and financial stability is another important research area. The literature (Bressan and Romagnoli, 2021; Kedward et al., 2023; Kroll and Kühne, 2024; Gulati et al., 2025) focuses on financial risk, transition risk related to climate finance, ESG investment strategies and green financial instruments. Existing studies (Kroll and Kühne, 2024; Hoffart et al., 2024; Yang and Geng, 2025) also recognizes the increasing importance of climate risk into financial sector governance and resilience frameworks. Recent discussions states that macro financial stability is strengthened because of the growing role of central banks, sustainable banking systems and climate risk disclosure mechanisms (Tiwari et al., 2022; Sreelakshmi and Greeshma, 2023; Reepu, 2024; Raman et al., 2024). This suggests that financial regulatory and risk management frameworks are being integrated into climate finance across globe.

3.6.5 DSGE Perspectives and Long-Run Sustainability

Interaction between climate finance, human capital formation, productivity and long term sustainability transitions is being examined from the DSGE point of view. This approach helps to understand that how macroeconomic adjustment process, and long run development trajectories is being influenced by climate oriented policies and financial mechanisms (Lessmann and Kalkuhl, 2024; Braga et al., 2025; Zhang et al., 2025). Overview of the transmission of climate related shocks, intertemporal sustainability dynamics and policy coordination mechanism can be studies through DSGE model. Incorporating

climate finance variables into DSGE framework will help in seeing the increasing recognition of climate change as systematic financial and macroeconomic challenge with long term implication on growth, economic resilience and investment (Mungai et al., 2022; Zhao et al., 2025; Zhang et al., 2025).

4. Research Gaps and Future Directions

Despite the significant growth of climate finance literature, many important gaps remain. Previous research primarily focuses on sustainable finance, environmental policy dimensions and ESG integration (Joshipura et al., 2024; Khurshid and Islam, 2025; Aggarwal et al., 2025), whereas very less focus was given to long run economic impacts and sustainable growth patterns (Umamaheswaran et al., 2024; Katoch and Peer, 2025; Tekin et al., 2025). The literature also talks about limited interaction of climate finance and broader macroeconomic indicators like economic growth, external sector resilience, financial stability and fiscal sustainability in developing economies like India (Hsu, 2023; Zhang et al., 2025; Gong et al., 2025).

Available empirical findings are limited to developed economies, whereas little macroeconomic evidence is there for emerging economies shaped by policy limitations, evolving sustainability frameworks and financial sector imbalances (Bhatnagar and Sharma, 2022; Zhang et al., 2024; de Aguiar et al., 2024).

The literature also shows that there is very limited interaction between climate finance and sector specific macroeconomic areas like industrial transition, labour productivity, renewable energy financing, and human capital development (ÓhAiseadha et al., 2020; Kotchen, 2020; Tekin et al., 2025).

Previous research also shows that data availability is very limited related to climate finance measurement standards, sustainability related financial indicators (Lessmann and Kalkuhl, 2024; Braga et al., 2025; Wang et al., 2025). Differences in reporting standards ESG reporting norms also create challenges for empirical reliability and long term macroeconomic analysis (Narita et al., 2022; Hachaichi, 2022; Mungai et al., 2022).

At the methodological level, fewer studies includes dynamic macroeconomic framework which examines both short run and long run interactions of sustainability with climate finance (Hsu, 2023; Braga et al., 2025; Wang et al., 2025). In this respect, ARDL and DSGE models gives important opportunities for improving future research concerning policy impact channels, short run economic adjustments and sustainability related to economic transitions. (Afjal, 2023; Wang et al., 2025; Hanafy et al., 2025)

5. CONCLUSION

5.1 Summary of Findings

This study comprehensively reviewed the changing landscape of climate finance research with the help of bibliometric analysis and systematic literature review approach especially in relation to

macroeconomic sustainability within the emerging economies like India. The findings tell that climate finance has increased over the past decade, especially after adoption of the Paris Agreement and increased policy attention on climate finance (Peake and Ekins, 2017; Alessi et al., 2024; Talwar et al., 2025; Tyson and Weiss, 2025).

The bibliometric findings highlights that there is a evolution of climate finance from limited environmental investment literature toward wider macroeconomic analysis which include ESG integration, financial stability, green finance, transition risk management and macroeconomic stability (Bhatnagar and Sharma, 2022; Hoffart et al., 2024; Kroll and Kühne, 2024; Yang and Geng, 2025).

The co-citation analysis reveals that the field continuous to focus on sustainable finance and ESG research where as on the other hand thematic evolution demonstrates a growing attention towards macroeconomic and financial sector analysis (Kumar et al., 2024; Khurshid and Islam, 2025; Aggarwal et al., 2025).

The thematic synthesis reveal that climate finance affects financial stability, external sector dynamics, economic growth and fiscal systems (Wang et al., 2024; Zhang et al., 2025; Lessmann and Kalkuhl, 2024). Although, the findings also highlights that literature remains scattered in relation to macroeconomic transmission mechanisms, sustainability outcomes related to climate finance in the developing economies like India (Naik et al., 2014; Umamaheswaran et al., 2024; Malode and Singh, 2025; Katoch and Peer, 2025).

5.2 Policy Implications

The study strengthens the existing literature by linking climate finance with macroeconomic sustainability and climate transition financing. The findings indicated that climate finance is not only an environmental financial mechanism but also a macroeconomic policy instrument which influences the long term growth, sustainable development transitions and financial stability. The finding reinforce the importance of associating climate finance objectives in national development strategies, long term macroeconomic planning and financial sector governance (de Aguiar et al., 2024; Talwar et al., 2025; Tekin et al., 2025; Tyson and Weiss, 2025).

From the policy point of view, the findings demonstrates the importance of strengthening climate related financial system, sustainable investment strategies, and development of green capital market to improve macroeconomic stability, and low carbon economic transition (Gourdel and Sydow, 2023; Kroll and Kühne, 2024; Hoffart et al., 2024).

These findings are important for the emerging economies like India. Improving climate finance frameworks and sustainable investment mechanisms may support climate resilient economic development. In developing economies, increasing institutional capacity, financial governance and sustainable capital allocation plays an important role in supporting stable and balanced economic transitions (Chirambo, 2017; Hourcade et al., 2021; Bazbauers, 2022; Bazbauers, 2025).

5.3 Limitations of the Study

Although the study offers useful findings into the growth of climate finance research but still there are several limitations. First, the review is limited to Scopus indexed English literature, because of which there can be exclusion of relevant studies in different databases or in publications in other languages. Second, bibliometric analysis is based on citation patterns and database indexing which can influence the formation of network and thematic clustering. Third, the study focuses mainly on macroeconomic sustainability dimensions and therefore does not examine the technical engineering or sector specific applications related to climate finance.

Declarations

Conflict of Interest

The authors declare that they have no competing interests.

Ethics Approval

Not applicable. This study is based exclusively on published literature and bibliographic data obtained from the Scopus database and did not involve human participants or animals.

Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Funding

The authors received no specific funding for this work.

Availability of Data and Materials

The datasets analysed during the current study were obtained from the Scopus database using the search strategy described in the methodology section. The bibliographic data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to the licensing terms of Scopus.

References

1. Abakah, E. J. A., Tiwari, A. K., Oliyide, J. A., and Appiah, K. O. (2025), "Analyzing the static and dynamic dependence among green investments, carbon markets, financial markets and commodity markets", *International Journal of Managerial Finance*, Vol. 21 No. 1, pp. 286-327, <https://doi.org/10.1108/IJMF-09-2021-0428>.
2. Abhilash, A., Shenoy, S., and Shetty, D. (2022), "A state-of-the-art overview of green bond markets: Evidence from technology empowered systematic literature review", *Cogent Economics and Finance*, Vol. 10 No. 1, p. 2135834, <https://doi.org/10.1080/23322039.2022.2135834>.
3. Afjal, M. (2023), "The tapestry of green economics: Mapping the nexus of CO2 emissions, economic growth, and renewable energy", *International Journal of Sustainable Energy*, Vol. 42 No. 1, pp. 1364-1390, <https://doi.org/10.1080/14786451.2023.2268853>.
4. Aggarwal, S., Dsouza, S., Joshi, M., Antoun, R., and Phan, D. H. T. (2025), "Environmental, social and governance investing: Systematic literature review using ADO model", *Journal of Accounting Literature*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1108/JAL-11-2024-0319>.
5. Ahuja, K., and Rani, E. (2025), "A bibliometric analysis of ESG literature: Key themes, influential authors and future research directions", *Journal of Asia Business Studies*, Vol. 19 No. 2, pp. 429-448, <https://doi.org/10.1108/JABS-01-2024-0043>.
6. Alessi, L., Battiston, S., and Kvedaras, V. (2024), "Over with carbon? Investors' reaction to the Paris Agreement and the US withdrawal", *Journal of Financial Stability*, Vol. 71, p. 101232, <https://doi.org/10.1016/j.jfs.2024.101232>.
7. Ameli, N., Drummond, P., Bisaro, A., Grubb, M., and Chenet, H. (2020), "Climate finance and disclosure for institutional investors: Why transparency is not enough", *Climatic Change*, Vol. 160 No. 4, pp. 565-589, <https://doi.org/10.1007/s10584-019-02542-2>.
8. Azad, S., and Tulasi Devi, S. L. T. (2025), "Sustainable development and investor confidence: The safe-haven appeal of green-bond issuing firms", *Sustainable Development*, Vol. 33 No. 1, pp. 1249-1268, <https://doi.org/10.1002/sd.3172>.
9. Bazbauers, A. R. (2022), "Sustainable, green, and climate-resilient cities: An analysis of multilateral development banks", *Climate and Development*, Vol. 14 No. 8, pp. 689-704, <https://doi.org/10.1080/17565529.2021.1974331>.
10. Bazbauers, A. R. (2025), "The multilateral development banks and rural climate finance: Adaptation, mitigation, and resilience", *Journal of Environment and Development*, Vol. 34 No. 2, pp. 437-466, <https://doi.org/10.1177/10704965241305842>.
11. Bhatnagar, S., and Sharma, D. (2022), "Evolution of green finance and its enablers: A bibliometric analysis", *Renewable and Sustainable Energy Reviews*, Vol. 162, p. 112405, <https://doi.org/10.1016/j.rser.2022.112405>.
12. Braga, J. P., Chen, P., and Semmler, W. (2025), "Central banks, climate risks, and energy transition: A dynamic macro model and econometric evidence", *Macroeconomic Dynamics*, Vol. 29, p. e69,

<https://doi.org/10.1017/S1365100525000069>.

13. Bressan, G. M., and Romagnoli, S. (2021), "Climate risks and weather derivatives: A copula-based pricing model", *Journal of Financial Stability*, Vol. 54, p. 100877, <https://doi.org/10.1016/j.jfs.2021.100877>.
14. Carfora, A., and Scandurra, G. (2019), "The impact of climate funds on economic growth and their role in substituting fossil energy sources", *Energy Policy*, Vol. 129, pp. 182-192, <https://doi.org/10.1016/j.enpol.2019.02.023>.
15. Chirambo, D. (2017), "Enhancing climate change resilience through microfinance: Redefining the climate finance paradigm to promote inclusive growth in Africa", *Journal of Developing Societies*, Vol. 33 No. 1, pp. 150-173, <https://doi.org/10.1177/0169796X17692474>.
16. Chirambo, D. (2024), "Strategies for promoting climate change transparency and inclusive growth through south-south climate change cooperation", *Environment, Development and Sustainability*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1007/s10668-024-05198-w>.
17. Dar, B. I., Badwan, N., and Kumar, J. (2024), "Investigating the role of fintech innovations and green finance toward sustainable economic development: A bibliometric analysis", *International Journal of Islamic and Middle Eastern Finance and Management*, Vol. 17 No. 6, pp. 1175-1195, <https://doi.org/10.1108/IMEFM-01-2024-0018>.
18. de Aguiar, T. R. S., Haque, S., and McCann, L. (2024), "Mapping accounting literature on climate finance: Identifying research gaps and reflections on future research", *Accounting Research Journal*, Vol. 37 No. 3, pp. 249-269, <https://doi.org/10.1108/ARJ-06-2023-0162>.
19. Dev, D., Sharma, G. D., Gupta, M., and Tiwari, A. K. (2025), "Sustainable finance in action: A comprehensive framework for policy and practice integration", *International Review of Economics and Finance*, Vol. 103, p. 104511, <https://doi.org/10.1016/j.iref.2025.104511>.
20. Doku, I. (2022), "Are developing countries using climate funds for poverty alleviation? Evidence from Sub-Saharan Africa", *European Journal of Development Research*, Vol. 34 No. 6, pp. 3026-3049, <https://doi.org/10.1057/s41287-022-00509-1>.
21. Doku, I., Ncwadi, R., and Phiri, A. (2021), "Examining the role of climate finance in the environmental Kuznets curve for Sub-Sahara African countries", *Cogent Economics and Finance*, Vol. 9 No. 1, p. 1965357, <https://doi.org/10.1080/23322039.2021.1965357>.
22. Gao, J., Hua, G., and Huo, B. (2025), "Green climate finance development and environmental air quality improvement: Unveiling the role of green technological progress and industrial symbiotic agglomeration", *Business Strategy and the Environment*, Vol. 34 No. 2, pp. 1669-1690, <https://doi.org/10.1002/bse.4060>.
23. Ghosh, D., Shukla, P. R., Garg, A., and Ramana, P. V. (2002), "Renewable energy technologies for the Indian power sector: Mitigation potential and operational strategies", *Renewable and Sustainable Energy Reviews*, Vol. 6 No. 6, pp. 481-512, [https://doi.org/10.1016/S1364-0321\(02\)00015-1](https://doi.org/10.1016/S1364-0321(02)00015-1).
24. Gong, X., Borojo, D. G., and Jiang, J. (2025), "The heterogeneous impacts of climate finance on environmental sustainability and social welfare in developing countries", *Kybernetes*, Vol. 54 No. 3,

- pp. 1904-1937, <https://doi.org/10.1108/K-05-2023-0839>.
25. Gourdel, R., and Sydow, M. (2023), "Non-banks contagion and the uneven mitigation of climate risk", *International Review of Financial Analysis*, Vol. 89, p. 102739, <https://doi.org/10.1016/j.irfa.2023.102739>.
 26. Gronwald, M., and Wadud, S. (2025), "'My name is bond. Green Bond.'" *Informational Efficiency of Climate Finance Markets. Journal of Environmental Management*, Vol. 373, p. 123697, <https://doi.org/10.1016/j.jenvman.2024.123697>.
 27. Gulati, R., Rahut, D. B., and Kumar, S. (2025), "Banking for climate change: South Asia initiatives", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 16 No. 5, p. e70021, <https://doi.org/10.1002/wcc.70021>.
 28. Hachaichi, M. (2022), "Cities: Allocating climate change responsibilities at planetary scale", *Urban Climate*, Vol. 46, p. 101329, <https://doi.org/10.1016/j.uclim.2022.101329>.
 29. Halimanjaya, A. (2015), "Climate mitigation finance across developing countries: What are the major determinants?", *Climate Policy*, Vol. 15 No. 2, pp. 223-252, <https://doi.org/10.1080/14693062.2014.912978>.
 30. Han, S., and Jun, H. (2023), "Growth, emissions, and climate finance nexus for sustainable development: Revisiting the environmental Kuznets curve", *Sustainable Development*, Vol. 31 No. 1, pp. 510-527, <https://doi.org/10.1002/sd.2406>.
 31. Hanafy, S. A., Abouelenein, M. F., Roushdy, N., Ibrahim, D. M., Addai, G., Sethi, N., Esily, R. R., and Samah, R. (2025), "Key factors in environmental quality: Green finance, energy and trade", *Energy Strategy Reviews*, Vol. 60, p. 101800, <https://doi.org/10.1016/j.esr.2025.101800>.
 32. Hannam, P. M., Liao, Z., Davis, S. J., and Oppenheimer, M. (2015), "Developing country finance in a post-2020 global climate agreement", *Nature Climate Change*, Vol. 5 No. 11, pp. 983-987, <https://doi.org/10.1038/nclimate2731>.
 33. Hoffart, F. M., D'Orazio, P., Holz, F., and Kemfert, C. (2024), "Exploring the interdependence of climate, finance, energy, and geopolitics: A conceptual framework for systemic risks amidst multiple crises", *Applied Energy*, Vol. 361, p. 122885, <https://doi.org/10.1016/j.apenergy.2024.122885>.
 34. Hourcade, J.-C., Dasgupta, D., and Gherzi, F. (2021), "Accelerating the speed and scale of climate finance in the post-pandemic context", *Climate Policy*, Vol. 21 No. 10, pp. 1383-1397, <https://doi.org/10.1080/14693062.2021.1977599>.
 35. Hsu, C.-C. (2023), "Influence of climate finance and natural resource consumption on the mitigation of climate change in developed countries in the pre-COP26 era", *Resources Policy*, Vol. 83, p. 103714, <https://doi.org/10.1016/j.resourpol.2023.103714>.
 36. Huang, Z., Dong, H., and Jia, S. (2022), "Equilibrium pricing for carbon emission in response to the target of carbon emission peaking", *Energy Economics*, Vol. 112, p. 106160, <https://doi.org/10.1016/j.eneco.2022.106160>.
 37. Hultman, N. E., Pulver, S., Pacca, S., Saran, S., Powell, L., Romeiro, V., and Benney, T. (2011), "Carbon markets and low-carbon investment in emerging economies: A synthesis of parallel workshops in

- Brazil and India", *Energy Policy*, Vol. 39 No. 10, pp. 6698-6700, <https://doi.org/10.1016/j.enpol.2011.08.006>.
38. Jain, K., and Tripathi, P. S. (2023), "Mapping the environmental, social and governance literature: A bibliometric and content analysis", *Journal of Strategy and Management*, Vol. 16 No. 3, pp. 397-428, <https://doi.org/10.1108/JSMA-05-2022-0092>.
 39. Jakob, M., Steckel, J. C., Flachslund, C., and Baumstark, L. (2015), "Climate finance for developing country mitigation: Blessing or curse?", *Climate and Development*, Vol. 7 No. 1, pp. 1-15, <https://doi.org/10.1080/17565529.2014.934768>.
 40. Jin, I., and Kim, Y. (2017), "Analysis of the impact of achieving NDC on public climate finance", *Journal of Sustainable Finance and Investment*, Vol. 7 No. 4, pp. 309-334, <https://doi.org/10.1080/20430795.2016.1275934>.
 41. Joshipura, M., Mathur, S., and Kedia, N. (2024), "Sustainable investing and financing for sustainable development: A hybrid review", *Sustainable Development*, Vol. 32 No. 5, pp. 4469-4485, <https://doi.org/10.1002/sd.2912>.
 42. Jung, H., and Song, C.-K. (2023), "Managerial perspectives on climate change and stock price crash risk", *Finance Research Letters*, Vol. 51, p. 103410, <https://doi.org/10.1016/j.frl.2022.103410>.
 43. Katoch, R., and Peer, U. A. A. (2025), "Navigating market risks in green investments in India: An evaluation of interest rate, equity, commodity, and forex market influences", *Computational Economics*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1007/s10614-025-11009-9>.
 44. Kedward, K., Ryan-Collins, J., and Chenet, H. (2023), "Biodiversity loss and climate change interactions: Financial stability implications for central banks and financial supervisors", *Climate Policy*, Vol. 23 No. 6, pp. 763-781, <https://doi.org/10.1080/14693062.2022.2107475>.
 45. Khurshid, R., and Islam, A. U. (2025), "ESG literature mapping: Insights from bibliometric analysis", *International Journal of Disclosure and Governance*, Vol. 22 No. 2, pp. 476-503, <https://doi.org/10.1057/s41310-024-00244-5>.
 46. Kotchen, M. J. (2020), "On the scope of climate finance to facilitate international agreement on climate change", *Economics Letters*, Vol. 190, p. 109070, <https://doi.org/10.1016/j.econlet.2020.109070>.
 47. Kroll, M., and Kühne, K. (2024), "'Climate bailout': A new tool for central banks to limit the financial risk resulting from climate change", *International Environmental Agreements: Politics, Law and Economics*, 24(1), 217–232, <https://doi.org/10.1007/s10784-024-09630-4>.
 48. Kuiti, M. R., Ghosh, D., Basu, P., and Bisi, A. (2020), "Do cap-and-trade policies drive environmental and social goals in supply chains: Strategic decisions, collaboration, and contract choices", *International Journal of Production Economics*, Vol. 223, p. 107537, <https://doi.org/10.1016/j.ijpe.2019.107537>.
 49. Kumar, S., Managi, S., and Matsuda, A. (2012), "Stock prices of clean energy firms, oil and carbon markets: A vector autoregressive analysis", *Energy Economics*, Vol. 34 No. 1, pp. 215-226, <https://doi.org/10.1016/j.eneco.2011.03.002>.

50. Kumar, S., Sharma, D., Rao, S., Lim, W. M., and Mangla, S. K. (2022), "Past, present, and future of sustainable finance: Insights from big data analytics through machine learning of scholarly research", *Annals of Operations Research*, Vol. 332, pp. 1199-1205, <https://doi.org/10.1007/s10479-022-04535-4>.
51. Lalhunthara, Ali, S. M. S., Deivanai, P., Chowdary, V. G. R., Deshmukh, P. N., and Sharma, D. J. (2025), "Impact of ESG (environmental, social, and governance) criteria on investment decisions", *International Journal of Accounting and Economics Studies*, Vol. 12 No. 5, pp. 137-144, <https://doi.org/10.14419/30e63f52>.
52. Lessmann, K., and Kalkuhl, M. (2024), "Climate finance intermediation: Interest spread effects in a climate policy model", *Journal of the Association of Environmental and Resource Economists*, Vol. 11 No. 1, pp. 213-251, <https://doi.org/10.1086/725920>.
53. Liu, Z., and Paan, C. (2024), "New evidence across the world on how climate financing helps in ensuring a greener future", *Heliyon*, Vol. 10 No. 14, p. e34779, <https://doi.org/10.1016/j.heliyon.2024.e34779>.
54. Malode, S. N., and Singh, A. (2025), "Navigating India's emission trading system: An analysis of policy evolution, implementation imperatives, and critical review for energy sustainability pathway", *Energy for Sustainable Development*, Vol. 88, p. 101822, <https://doi.org/10.1016/j.esd.2025.101822>.
55. Masud, M. A. K., Sahara, J., and Kabir, M. H. (2023), "A relationship between climate finance and climate risk: Evidence from the South Asian region", *Climate*, Vol. 11 No. 6, p. 119, <https://doi.org/10.3390/cli11060119>.
56. Michaelowa, A., and Michaelowa, K. (2015), "Do rapidly developing countries take up new responsibilities for climate change mitigation?", *Climatic Change*, Vol. 133 No. 3, pp. 499-510, <https://doi.org/10.1007/s10584-015-1528-6>.
57. Mishra, A., Alsamhi, M. H., Bajaher, M., and Alahdal, W. M. (2025), "ESG research unveiled: Publication patterns, dominant themes, and future avenues – a bibliometric approach", *Cogent Business and Management*, Vol. 12 No. 1, p. 2538711, <https://doi.org/10.1080/23311975.2025.2538711>.
58. Mondal, S., Rakshit, D., Jee, K., and Tiwari, S. C. (2025), "Navigating the evolution: A comprehensive review of sustainable finance in mergers and acquisitions", *F1000Research*, Vol. 14, p. 150207, <https://doi.org/10.12688/f1000research.150207.1>.
59. Mungai, E. M., Ndiritu, S. W., and Da Silva, I. (2022), "Unlocking climate finance potential and policy barriers – A case of renewable energy and energy efficiency in Sub-Saharan Africa", *Resources, Environment and Sustainability*, 7, 100043, <https://doi.org/10.1016/j.resenv.2021.100043>.
60. Naik, M., Singh, A., Unnikrishnan, S., and Naik, N. (2014), "Role of the clean development mechanism (CDM) in the development of national energy industries", *Energy and Environment*, Vol. 25 No. 2, pp. 325-342, <https://doi.org/10.1260/0958-305X.25.2.325>.
61. Narain, U., Margulis, S., and Essam, T. (2011), "Estimating costs of adaptation to climate change", *Climate Policy*, Vol. 11 No. 3, pp. 1001-1019, <https://doi.org/10.1080/14693062.2011.582387>.

62. Narita, D., Sato, I., Ogawada, D., and Matsumura, A. (2022), "Evaluating the robustness of project performance under deep uncertainty of climate change: A case study of irrigation development in Kenya", *Climate Risk Management*, Vol. 36, p. 100426, <https://doi.org/10.1016/j.crm.2022.100426>.
63. Njangang, H., Padhan, H., and Tiwari, A. K. (2024), "From aid to resilience: Assessing the impact of climate finance on energy vulnerability in developing countries", *Energy Economics*, Vol. 134, p. 107595, <https://doi.org/10.1016/j.eneco.2024.107595>.
64. ÓhAiseadha, C., Quinn, G., Connolly, R., Connolly, M., and Soon, W. (2020), "Energy and climate policy – An evaluation of global climate change expenditure 2011–2018", *Energies*, Vol. 13 No. 18, p. 4839, <https://doi.org/10.3390/en13184839>.
65. Pacelli, V., Foglia, M., and Mariano, D. (2025), "The link between climate and systemic risk: A bibliometric and systematic literature review", *Research in International Business and Finance*, Vol. 79, p. 103072, <https://doi.org/10.1016/j.ribaf.2025.103072>.
66. Pauw, W. P., Castro, P., Pickering, J., and Bhasin, S. (2020), "Conditional nationally determined contributions in the Paris Agreement: Foothold for equity or Achilles heel?", *Climate Policy*, Vol. 20 No. 4, pp. 468-484, <https://doi.org/10.1080/14693062.2019.1635874>.
67. Peake, S., and Ekins, P. (2017), "Exploring the financial and investment implications of the Paris Agreement", *Climate Policy*, Vol. 17 No. 7, pp. 832-852, <https://doi.org/10.1080/14693062.2016.1258633>.
68. Raman, R., Ray, S., Das, D., and Nedungadi, P. (2024), "Innovations and barriers in sustainable and green finance for advancing sustainable development goals", *Frontiers in Environmental Science*, Vol. 12, p. 1513204, <https://doi.org/10.3389/fenvs.2024.1513204>.
69. Rani, R., Vasishta, P., Singla, A., and Tanwar, N. (2025), "Mapping ESG and CSR literature: A bibliometric study of research trends and emerging themes", *International Journal of Law and Management*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1108/IJLMA-09-2024-0301>.
70. Ranjan, R. (2025a), "Forest carbon buffers and sustainability-linked price premiums: Advancing climate resilience in Uttarakhand's Himalayan forests", *Land Use Policy*, Vol. 158, p. 107761, <https://doi.org/10.1016/j.landusepol.2025.107761>.
71. Ranjan, R. (2025b), "Leveraging green bonds to mitigate cascading flooding and fire risks in Uttarakhand's Himalayan forests", *Journal of Sustainable Forestry*, Vol. 44 No. 9, pp. 851-876, <https://doi.org/10.1080/10549811.2025.2553201>.
72. Ray, S., Pan, A., Shukla, A., and Rastogi, S. K. (2025), "Mapping and decoding green finance research: Themes and topic interconnections using a multi-method approach", *International Journal of Productivity and Performance Management*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1108/IJPPM-08-2024-0557>.
73. Reepu, R. (2024), "Climate bonds: The green advantage", *Proceedings on Engineering Sciences*, Vol. 6 No. 1, pp. 63-68, <https://doi.org/10.24874/PES06.01.008>.
74. Sachan, A., and SenGupta, S. (2025), "Climate financing and FDI impacts on renewable energy consumption for sustainable development in BRICS+", *Sustainable Development*, Vol. ahead-of-print

No. ahead-of-print, <https://doi.org/10.1002/sd.70214>.

75. Sisodia, A., and Maheshwari, G. C. (2023), "Exploring sustainable finance: A review and future research agenda", *Vision*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1177/09722629231209177>.
76. Sreelakshmi, P., and Greeshma, R. J. (2023), "Green bonds: A propitious financial instrument of climate finance", *Vision*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1177/09722629221138679>.
77. Sun, Y., Chen, X., and Wang, Z. (2025), "Climate finance: Employment opportunity or alternative crisis – Evidence from Chinese listed companies", *Australian Economic Papers*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1111/1467-8454.70005>.
78. Talwar, S., Alshaghdali, N. O., Gupta, B., and Battisti, E. (2025), "Climate finance for sustainable development: Substantive agendas and future directions", *Sustainable Development*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1002/sd.70276>.
79. Tekin, B., Dirir, S. A., and Aden, K. (2025), "Integrating sustainable finance into energy policies: A comprehensive study on the influence of green investments on energy performance in OECD nations", *International Journal of Finance and Economics*, Vol. 30 No. 3, pp. 2883-2911, <https://doi.org/10.1002/ijfe.3048>.
80. Tiwari, A. K., Abakah, E. J. A., Gabauer, D., and Dwumfour, R. A. (2022), "Dynamic spillover effects among green bond, renewable energy stocks and carbon markets during COVID-19 pandemic: Implications for hedging and investments strategies", *Global Finance Journal*, Vol. 51, p. 100692, <https://doi.org/10.1016/j.gfj.2021.100692>.
81. Tyson, L. D., and Weiss, D. (2025), "Climate finance: Progress, challenges, and opportunities on the path to a sustainable planet", *California Management Review*, Vol. 67 No. 2, pp. 5-39, <https://doi.org/10.1177/00081256241296902>.
82. Umamaheswaran, S., Dar, V., Prince, J. B., and Viswanathan, V. (2024), "Risk perception as a barrier to renewable energy finance – A study of debt investors in the Indian context", *International Journal of Energy Sector Management*, Vol. 18 No. 6, pp. 1511-1530, <https://doi.org/10.1108/IJESM-07-2023-0020>.
83. Wang, J., Mishra, S., Sharif, A., and Chen, H. (2024), "Dynamic spillover connectedness among green finance and policy uncertainty: Evidence from QVAR network approach", *Energy Economics*, Vol. 131, p. 107330, <https://doi.org/10.1016/j.eneco.2024.107330>.
84. Wang, Y., Wang, R., and Mason, T. A. (2025), "Exploring the impact of green bonds on sustainable development and financial markets: An ARDL-based causality approach", *Finance Research Letters*, Vol. 85, p. 107943, <https://doi.org/10.1016/j.frl.2025.107943>.
85. Yadav, A. (2025), "Financial distress, ESG practices and firm valuation: Comparing pre- and post-Paris Agreement periods", *Management Decision*, Vol. ahead-of-print No. ahead-of-print, <https://doi.org/10.1108/MD-05-2024-1159>.

86. Yang, J., and Geng, J.-B. (2025), "Dissecting the financial impact of climate risk", *Energy Economics*, Vol. 143, p. 108295, <https://doi.org/10.1016/j.eneco.2025.108295>.

87. Zhang, J., Li, Y., Du, R., and Hua, X. (2025), "Importing innovation or indigenous innovation: Evaluating the effect of climate finance on promoting environmental sustainability in developing countries", *Energy Economics*, Vol. 149, p. 108726, <https://doi.org/10.1016/j.eneco.2025.108726>.

88. Zhang, K.-C., Safi, A., Kchouri, B., Banerjee, A., and Wang, L. (2024), "The three greens: Innovation, finance, and taxes – Performance analysis and future implications", *Journal of Innovation and Knowledge*, Vol. 9 No. 4, p. 100627, <https://doi.org/10.1016/j.jik.2024.100627>.

89. Zhao, J., Li, X., and Hou, C. (2025), "Can climate finance bridge the gender gap in labor markets? Evidence from developing countries", *Climatic Change*, Vol. 178 No. 4, p. e3921, <https://doi.org/10.1007/s10584-025-03921-8>.

Figures

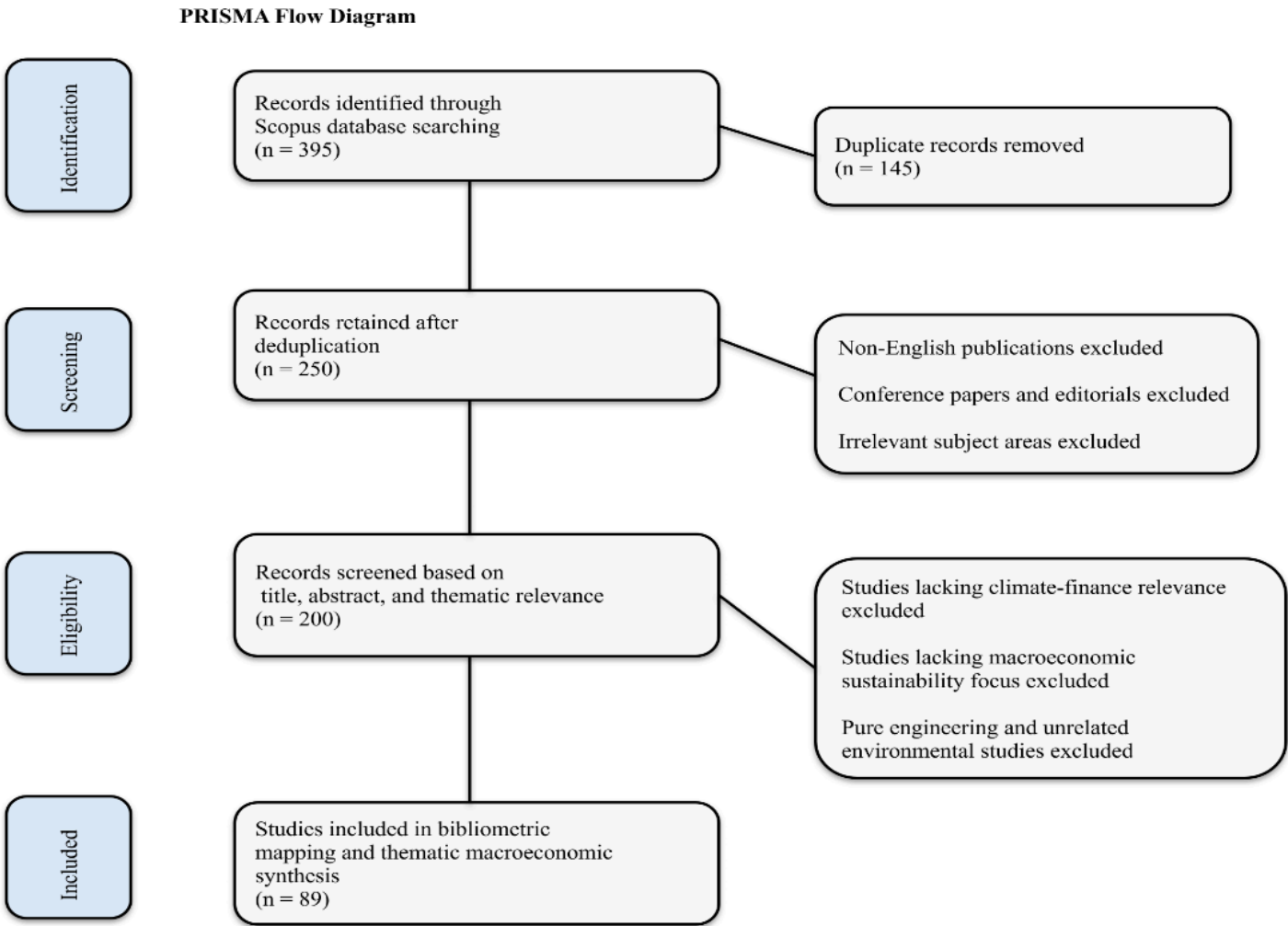


Figure 1

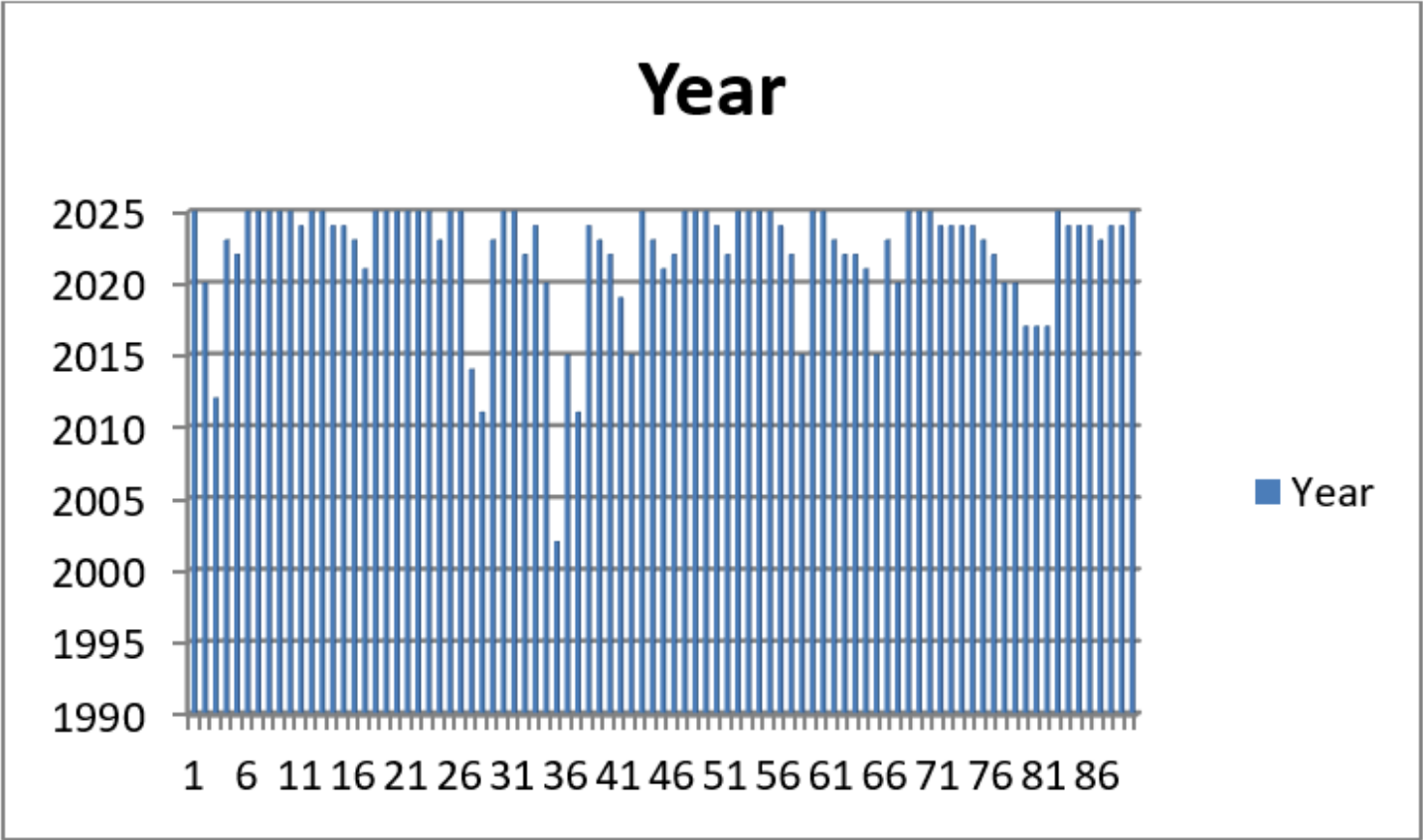
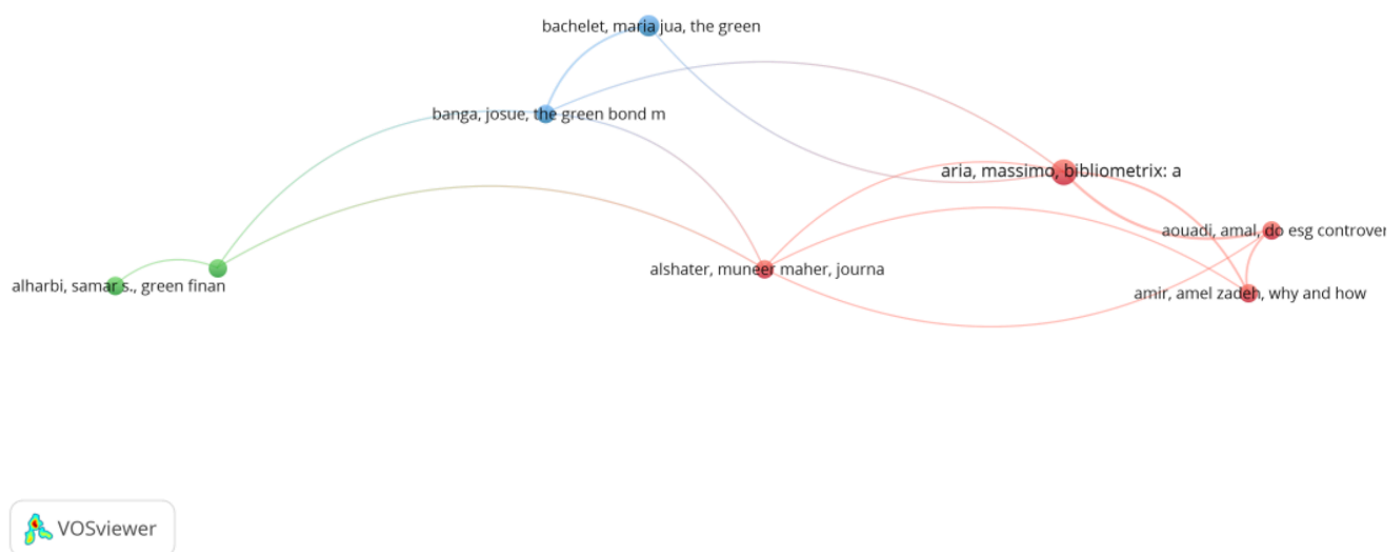
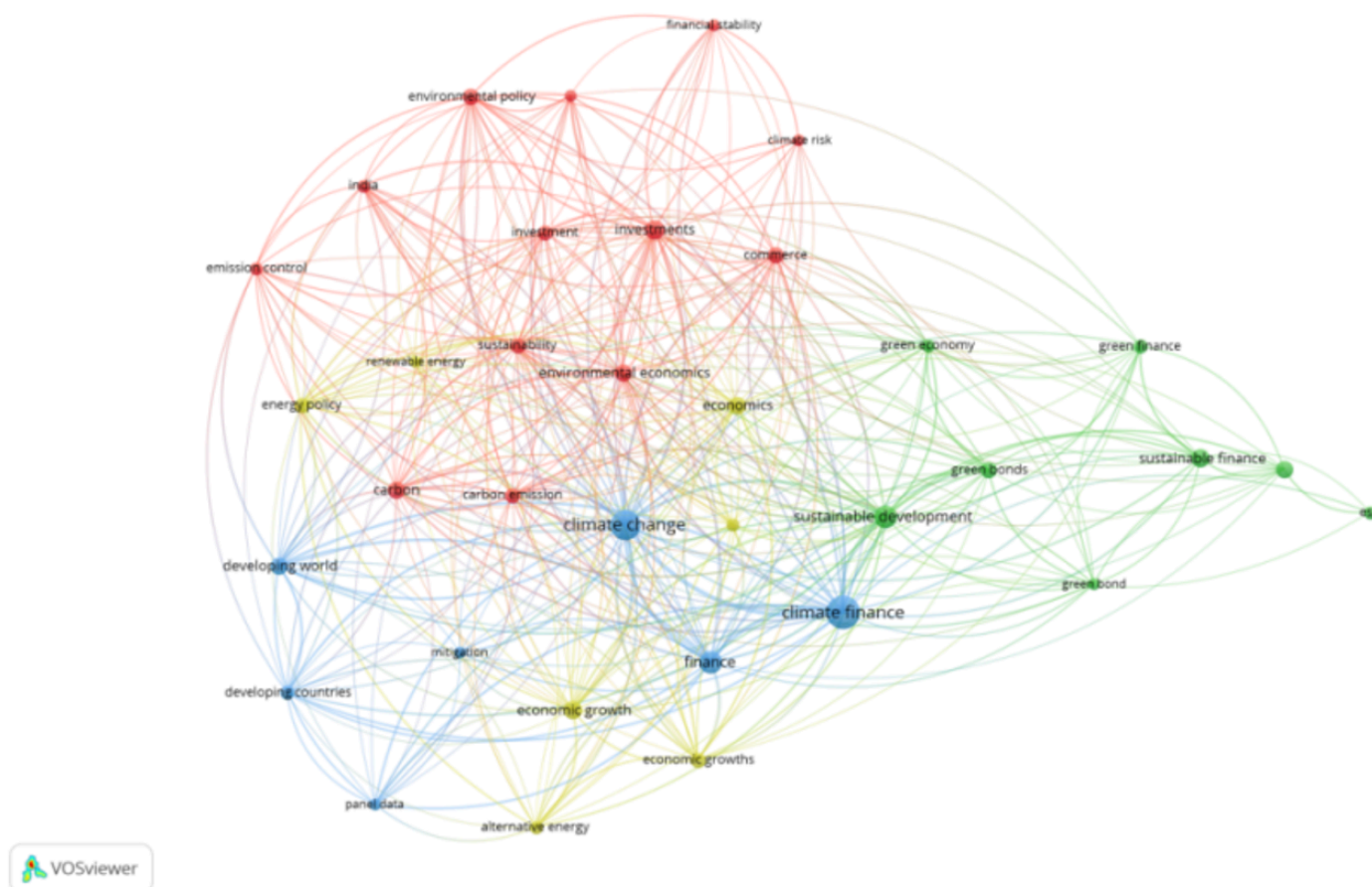


Figure 2

Year wise Publication Analysis



Co-citation Analysis

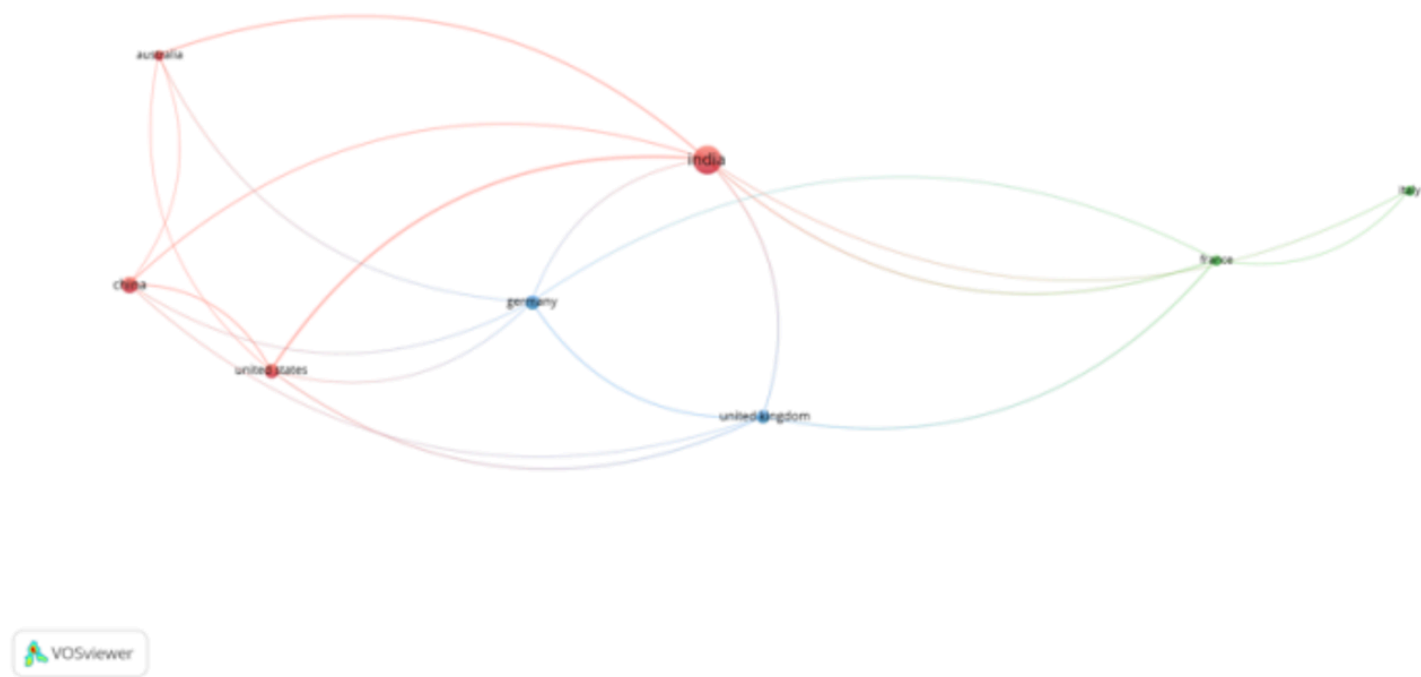


Figure 5

Country co-authorship network in climate finance research.

