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Mapping the Research on Sustainable Finance: Bibliometric Insights from Web of Science and Scopus

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ABSTRACT

This study presents a bibliometric analysis of sustainable finance research using data exclusively from the WoS and Scopus database and visualization via VOSviewer. The aim is to map the intellectual landscape, identify thematic clusters, and explore global collaboration patterns within this rapidly evolving field. Keyword co-occurrence analysis highlights "sustainable finance" as the central theme, surrounded by related concepts such as ESG, green finance, green bonds, and sustainable development goals. Temporal and density visualizations reveal a shift in focus from traditional sustainability issues to emerging topics like greenwashing, decentralized finance, and fintech. Author and country collaboration maps uncover influential scholars and strong regional networks, particularly among institutions in the United Kingdom, India, Germany, and Italy. While the field shows high growth and thematic diversity, it also displays gaps in methodological variety, geographic inclusion, and institutional integration. The findings contribute to a comprehensive understanding of sustainable finance research trends and provide directions for future interdisciplinary inquiry.

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1. INTRODUCTION

Sustainable finance has emerged as a critical field in response to the growing concerns over climate change, social equity, and corporate governance. Financial markets and institutions are increasingly integrating environmental, social, and governance (ESG) factors into investment decision-making processes [1]. The concept of sustainable finance encompasses a wide range of financial activities, including green bonds, impact investing, socially responsible investing (SRI), and corporate sustainability reporting [2]. As governments and international organizations push for sustainable development, financial systems play a pivotal role in channeling capital toward sustainable projects and initiatives [3]. The evolution of sustainable finance has been significantly influenced by policy frameworks, market mechanisms, and shifting investor preferences.

Research on sustainable finance has expanded significantly over the past two decades, reflecting its growing relevance in both academic and policy discussions. The early literature focused primarily on ethical investment practices and the exclusion of controversial sectors such as tobacco and weapons from investment portfolios [4].

However, as global challenges such as climate change and resource depletion intensified, research has shifted towards understanding the role of finance in addressing sustainability goals [5]. Sustainable finance now encompasses a broad spectrum of topics, including green finance, ESG integration, financial innovation, and the role of financial institutions in promoting sustainability [6].

The role of bibliometric analysis in mapping the intellectual landscape of sustainable finance research is becoming increasingly relevant. Bibliometric techniques, including citation analysis, co-occurrence analysis, and keyword clustering, provide valuable insights into research trends, influential authors, and emerging themes in the field [7]. By leveraging databases such as Web of Science (WoS) and Scopus, scholars can systematically examine the evolution of sustainable finance research and identify gaps that require further exploration [8]. Such analyses not only enhance our understanding of the field's development but also provide direction for future research.

Despite the growing body of literature on sustainable finance, there remains a lack of comprehensive mapping of the research landscape through bibliometric analysis. Previous studies have examined specific aspects of sustainable finance, such as ESG performance and green bonds, but few have provided a holistic overview of the research domain [9]. Given the interdisciplinary nature of sustainable finance, it is crucial to explore how different research streams intersect and contribute to a broader understanding of sustainability in financial markets. A bibliometric analysis can help uncover the intellectual structure of the field, highlight key research clusters, and identify influential publications and scholars.

The increasing policy emphasis on sustainability, coupled with investor demand for ESG-aligned financial products, underscores the need for a systematic assessment of sustainable finance research. Governments, regulatory bodies, and financial institutions are implementing policies that promote sustainability, such as the European Union's Sustainable Finance Disclosure Regulation (SFDR) and the Task Force on Climate-related Financial Disclosures (TCFD). Understanding the trajectory of research in this field is essential for policymakers, practitioners, and academics seeking to navigate the evolving landscape of sustainable finance. A bibliometric analysis of WoS and Scopus can provide critical insights into the dominant themes, research trends, and future directions of the field.

Although sustainable finance has attracted considerable scholarly attention, the field remains fragmented, with diverse theoretical perspectives, methodological approaches, and disciplinary orientations. The lack of a unified research framework poses challenges for both academics and practitioners in understanding the scope and impact of sustainable finance. Existing literature reviews have largely focused on specific topics within sustainable finance, such as green investment or ESG integration, without providing a comprehensive overview of the research landscape. Additionally, the rapid growth of publications in this field necessitates a systematic approach to identifying influential works, key research themes, and emerging trends. Without such an analysis, scholars and policymakers may struggle to navigate the extensive body of literature and derive meaningful insights for future research and policy development. This study aims to map the intellectual structure of the field, identify key research themes, and highlight influential publications and scholars. Specifically, the study seeks to (1) analyze the growth trajectory of sustainable finance research over time, (2) examine the co-citation and co-authorship networks to identify leading researchers and institutions, and (3) uncover emerging research themes and gaps that warrant further investigation.

The Evolution of Sustainable Finance Research

Sustainable finance has evolved over several decades, driven by growing awareness of environmental and social issues

in financial decision-making. The early literature on sustainable finance primarily focused on ethical investing, which sought to align financial returns with moral values [10]. Ethical investing laid the foundation for socially responsible investing (SRI), which expanded the scope of investment considerations to include social and environmental criteria [11]. Over time, sustainable finance has progressed beyond ethical investing to encompass broader concepts such as environmental, social, and governance (ESG) integration, green finance, and impact investing [12]. The development of ESG criteria has played a pivotal role in shaping sustainable finance. ESG investing integrates environmental sustainability, social responsibility, and corporate governance into investment decisions, reflecting a shift from purely profit-driven models to more holistic value-based approaches [13]. Numerous studies have explored the financial performance of ESG investments, with mixed findings. Some researchers argue that ESG factors enhance financial returns by mitigating risk and improving corporate reputation [14], while others suggest that ESG considerations may introduce constraints that limit investment opportunities [13].

Green Finance and Climate-Related Investments

Green finance has gained prominence as a subset of sustainable finance, emphasizing investments that support environmental sustainability and climate change mitigation. The issuance of green bonds has emerged as a crucial mechanism for mobilizing capital toward sustainable projects [15]. Green bonds, which are specifically designed to finance environmental initiatives such as renewable energy and climate adaptation, have witnessed significant growth, driven by regulatory incentives and investor demand [16]. Despite the rapid expansion of green finance, challenges remain in ensuring transparency and credibility in green investments. Greenwashing, or the misrepresentation of sustainability credentials, is a growing concern, as some companies and financial institutions exaggerate their environmental commitments to attract capital [17]. Regulatory frameworks such as the EU Taxonomy for Sustainable Activities have been introduced to standardize definitions and enhance accountability in green finance.

The Role of Financial Institutions in Sustainable Finance

Financial institutions, including banks, asset managers, and insurance companies, play a critical role in advancing sustainable finance. Banks have increasingly integrated sustainability considerations into their lending practices, offering green loans and sustainability-linked financing products [18]. Asset managers have incorporated ESG factors into portfolio management strategies, reflecting a growing recognition of the financial materiality of sustainability issues [19].

2. METHODS

This study employs a bibliometric analysis to map the research landscape of sustainable finance using data from Web of Science (WoS) and Scopus. Bibliometric analysis involves quantitative techniques to analyze publication trends, citation networks, and thematic structures within a research domain. The data collection process involves retrieving peer-reviewed articles and conference papers related to sustainable finance published between 2000 and 2024. Keywords such as “sustainable finance,” “ESG investing,” “green finance,” and “socially responsible investing” are used to extract relevant publications. The analysis includes citation analysis, co-occurrence network mapping, and thematic clustering using VOSviewer.

3. RESULTS AND DISCUSSION

3.1 Keyword Co-Occurrence Network Visualization

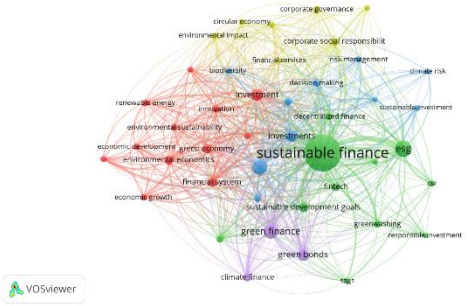

Figure 1. Network Visualization
Source: Data Analysis, 2025

This keyword co-occurrence visualization reveals the thematic structure of sustainable finance research based on Scopus data. The central and most frequently occurring term is "sustainable finance," depicted as the largest node, indicating its foundational role across various research themes. Closely related keywords such as ESG, green finance, green bonds, and sustainable development goals (SDGs) cluster around it, forming a robust core. These relationships reflect how sustainable finance serves as a unifying concept, encompassing environmental responsibility, investment practices, and development agendas. The visualization reveals how diverse areas—such as innovation, policy, financial products, and social governance—are increasingly interwoven into the sustainable finance discourse.

The green cluster is prominently composed of terms like ESG, CSR, green finance, green bonds, climate finance, and responsible investment. This group clearly represents the environmental and ethical dimensions of finance, where sustainability goals are embedded in investment and corporate strategies. The strong interconnections indicate that these concepts are often addressed jointly in the literature, reflecting a growing alignment between financial performance and sustainability criteria. Discussions in this cluster often emphasize transparency, corporate accountability, climate-related disclosure, and market instruments aimed at driving sustainability transitions.

To the left side of the map, the red cluster is formed around topics such as renewable energy, economic growth, innovation, environmental sustainability, and green economy. These keywords point to research that links finance with broader economic and ecological goals. This cluster is often policy-oriented, focusing on how financial tools can promote sustainable development, foster innovation in clean technologies, and stimulate economic growth while mitigating environmental degradation. Its presence signifies the increasing relevance of environmental economics and sustainable development strategies in the financial literature.

The blue and yellow clusters introduce additional dimensions. The blue cluster includes keywords such as climate risk, risk management, decision making, and sustainable investment, suggesting a focus on risk assessment and financial strategy in the face of climate uncertainty. This area likely encompasses studies that quantify climate-related risks, evaluate investment resilience, and model sustainability performance. Meanwhile, the yellow cluster features terms like corporate governance, corporate social responsibility, and financial services, highlighting institutional and managerial factors within sustainable finance. These themes explore how governance practices and corporate behavior influence sustainability performance and stakeholder trust. Several emerging and interdisciplinary terms appear at the periphery—such as fintech, decentralized finance, greenwashing, and circular economy. Their presence, though less central, points to novel areas of inquiry within sustainable finance. Topics like greenwashing address the credibility and integrity of sustainability claims, while fintech and decentralized finance reflect technological innovations that could reshape sustainable investment models.

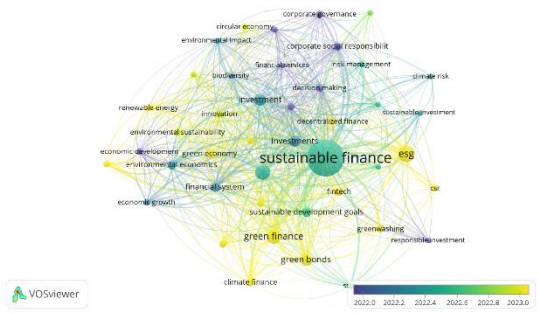

Figure 2. Overlay Visualization
Source: Data Analysis, 2025

This overlay visualization provides a temporal analysis of the sustainable finance research landscape based on average publication year, using data from Scopus. The color gradient—from dark blue (older topics) to bright yellow (more recent)—indicates the evolving interest and focus within the field. At the center is the term "sustainable finance," shown in a teal hue, suggesting that it has been a consistently prominent term throughout the 2022–2023 period. Closely linked keywords like ESG, green finance, green bonds, and sustainable development goals appear in brighter yellow, showing their increasing relevance and frequency in the most recent literature, particularly in late 2022 and into 2023.

The left side of the map, with clusters including terms such as renewable energy, environmental sustainability, environmental economics, and economic development, appears in a more yellowish shade as well. This shift in color suggests a resurgence or ongoing interest in environmental and developmental aspects of sustainable finance. These areas may be driven by global climate policy initiatives and increasing investor attention on long-term sustainable growth. Meanwhile, older discussions (indicated in darker blue tones) around financial services, corporate governance, decision making, and risk management are still relevant but have likely plateaued in terms of new research contributions, pointing to a matured area of study.

The visualization also highlights the emergence of newer or intensifying topics such as greenwashing, CSR, decentralized finance, and fintech, which appear in yellow, suggesting their increasing attention in 2023. These newer focal points indicate a diversification of the research agenda toward transparency in sustainability claims, technological innovation in financial services, and the ethical behavior of corporations. The temporal trend displayed in this map illustrates not only a broadening of the sustainable finance domain but also a dynamic shift toward more innovative, socially driven, and digitally enabled aspects of financial sustainability research.

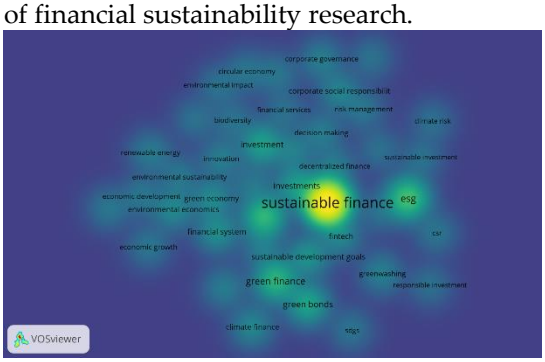

Figure 3. Density Visualization
Source: Data Analysis, 2025

This VOSviewer heatmap presents the density visualization of keyword occurrences within the sustainable finance research domain. The brightest yellow area, centered around "sustainable finance", represents the highest density of keyword usage, indicating that this concept is the focal point of scholarly discussions in the field. Closely associated and frequently co-occurring terms such as ESG, investments, and green finance also appear in relatively bright green hues, suggesting their strong relevance and centrality in the academic discourse. The clustering of these high-density terms demonstrates the integrated nature of sustainability-oriented investment practices and their importance in the broader financial landscape.

Surrounding this core are moderately dense regions, shown in lighter green, encompassing topics like green bonds, sustainable development goals, corporate social responsibility, fintech, climate risk, and greenwashing. These terms represent growing areas of interest that are well-established but not as dominant as the core cluster. The peripheral regions, depicted in

dark blue, include emerging or niche topics such as biodiversity, circular economy, decentralized finance, and economic growth. While these topics currently show lower publication densities, their presence suggests an expanding scope of sustainable finance research, embracing broader economic, environmental, and technological themes.

3.2 Co-Authorship Network Visualization

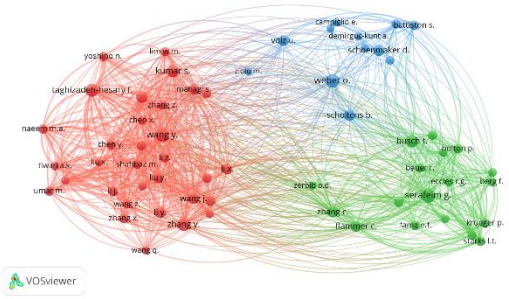

Figure 4. Author Visualization
Source: Data Analysis, 2025

This author collaboration network visualizes the intellectual structure of the sustainable finance research community, grouping authors into clusters based on co-authorship and citation relationships. The map reveals three major clusters: the red cluster on the left, consisting largely of authors such as Zhang Z., Wang Y., and Taghizadeh-Hesary F., which appears to represent a strong Asia-focused or emerging market scholarly network; the green cluster on the right, anchored by influential Western scholars such as Serafeim G., Eccles R.G., and Flammer C., who are well-known for ESG and corporate sustainability research; and the smaller blue cluster at the top, featuring authors like Weber O. and Schoenmaker D., who are likely engaged in policy-oriented or institutional research on sustainable finance.

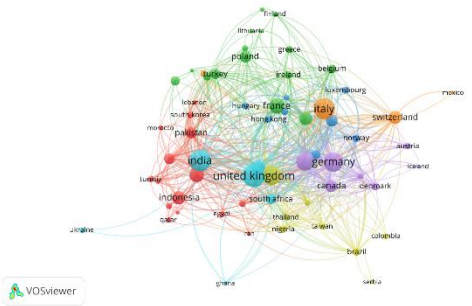

Figure 5. Country Visualization
Source: Data Analysis, 2025

This country collaboration map illustrates the global network of co-authorships in sustainable finance research. The United Kingdom, India, Germany, and Italy emerge as central nodes, reflecting their significant contribution and connectivity within the international scholarly community. Each colored cluster represents a group of countries with strong mutual research ties, such as the red cluster centered on India and surrounding South Asian countries, and the green cluster comprising several European nations including Poland, Greece, and Finland. The visualization highlights not only robust North-South collaboration (e.g., between the UK and developing economies like Indonesia, Nigeria, and South Africa) but also strong intra-European partnerships. Countries like Switzerland, Brazil, and Mexico, while present, appear more peripheral, suggesting less frequent collaboration or a more regionally focused research output.

DISCUSSION

This study set out to map the intellectual structure and research dynamics of sustainable finance through a bibliometric analysis using Scopus data and VOSviewer visualization. The results reveal several key insights regarding thematic trends, influential authors, global collaboration patterns, and the temporal evolution of scholarly focus. As sustainable finance continues to gain traction in academic, policy, and professional domains, understanding its knowledge architecture is critical for guiding future research and fostering global discourse. The keyword co-occurrence analysis demonstrates that "sustainable finance" is the central term around which the scholarly literature is organized. Closely linked terms such as “green finance,” “ESG,” “green bonds,” “sustainable development goals,” and “responsible investment” form dense clusters, indicating that the research field is multifaceted and increasingly interdisciplinary. The dominance of environmental themes—particularly green finance and ESG integration—reflects the strong alignment of academic work with

climate action and global sustainability agendas such as the Paris Agreement and the United Nations SDGs. The tight linkages among these terms also imply that researchers are not studying sustainability in isolation but rather as a core element of financial decision-making, corporate strategy, and policy design.

Overlay visualizations further enrich this insight by indicating how the focus of sustainable finance research has evolved over time. The use of temporal color gradients reveals that while core topics such as "sustainable finance" and "ESG" have maintained consistent importance, newer keywords like "greenwashing," "decentralized finance," "fintech," and "CSR" are appearing more frequently in recent years, particularly in 2022 and 2023. This indicates a shift in scholarly interest towards more contemporary and sometimes critical issues. For example, the emergence of "greenwashing" reflects growing concern over the authenticity of sustainability claims made by corporations and financial institutions. Similarly, the increasing appearance of "fintech" and "decentralized finance" suggests the integration of digital innovation into sustainable finance solutions, such as blockchain-enabled green bonds or algorithm-driven ESG scoring.

The density visualization corroborates these findings, showing that the highest concentration of scholarly attention is on terms like "sustainable finance," "ESG," and "green finance." Moderately dense areas highlight ongoing but less saturated themes like "corporate governance," "climate risk," and "financial system," while peripheral areas such as "biodiversity," "circular economy," and "climate finance" indicate emerging areas that are gaining momentum but remain underexplored. This gradient of attention suggests a maturing field that is both consolidating its core while simultaneously expanding into new, interdisciplinary domains.

The co-authorship and co-citation analysis unveils the structure of scholarly communities contributing to sustainable finance. The visualization of author networks reveals three dominant clusters. The red cluster features predominantly Asian authors such as Zhang Z., Wang Y., and Taghizadeh-Hesary F., who appear to focus on sustainable development and financial inclusion in emerging markets. The green cluster, anchored by Western scholars like Eccles R.G., Serafeim G., and Flammer C., appears to emphasize ESG performance, corporate sustainability, and investor behavior. Meanwhile, the blue cluster, including authors such as Weber O. and Schoenmaker D., seems more policy- and institution-oriented, exploring governance and regulatory aspects of sustainability. The dense intra-cluster links indicate strong collaboration within regions or thematic focus areas, while the inter-cluster connections reveal an emerging global scholarly dialogue that transcends geographical and disciplinary boundaries.

The country collaboration map offers another layer of understanding by showing how nations collaborate on sustainable finance research. The United Kingdom, India, Germany, and Italy emerge as central hubs, not only producing a high volume of research but also engaging in extensive international co-authorship. India's central role, particularly in the red cluster, highlights its rising prominence in global sustainability discourse, possibly driven by domestic policy shifts and its active role in climate negotiations. The map also indicates robust North-South collaboration, such as between the UK and countries like Indonesia, Nigeria, and South Africa. While countries like Switzerland, Brazil, and Mexico appear more peripheral, their connections suggest potential for deeper integration into the global research community.

Despite these strong collaborative patterns, the analysis also highlights notable gaps and underrepresented areas. For instance, Global South countries are less visible in the author network and keyword prominence, suggesting a need for more inclusive research agendas that capture region-specific sustainability challenges.

There is also a methodological gap in the literature: much of the current research remains quantitatively driven, with a heavy focus on modeling ESG performance, carbon pricing, or green bond issuance. Qualitative insights into institutional behavior, policy implementation, stakeholder perceptions, and ethical dilemmas remain limited. A balanced mix of methods—including case studies, interviews, and ethnographic approaches—could provide a more holistic view of how sustainable finance is practiced and experienced.

Moreover, the analysis indicates that institutional collaboration—between academia, government bodies, financial institutions, and civil society—is an underexplored dimension. While author and country networks show promising signs of scholarly partnership, institutional networks could further enhance the practical impact of research. Collaborative projects involving central banks, stock exchanges, or sustainability standard-setting bodies could bridge the gap between theory and application, ensuring that research informs real-world decision-making. Another critical observation is the increasing intersection of technology with sustainable finance. The growing presence of terms like "fintech," "decentralized finance," and "blockchain" suggests that digital innovation is reshaping how sustainable finance is conceptualized and operationalized. However, these themes are still emerging and would benefit from more rigorous empirical studies. How do digital platforms enhance access to green finance? Can decentralized finance democratize ESG investing, or does it introduce new risks? These are the kinds of questions that future research could explore in greater depth. Additionally, the emergence of critical terms like "greenwashing" and "CSR" reflects a growing scrutiny of corporate claims and the ethical dimensions of sustainability. This suggests that the field is maturing beyond promotion to include accountability and critique. Future research should delve into mechanisms for verifying sustainability performance, the role of regulation in curbing misleading claims, and the ethical implications of ESG scoring systems.

4. CONCLUSION

This bibliometric analysis paints a comprehensive picture of the sustainable finance research landscape. The field is robust, dynamic, and increasingly interdisciplinary, encompassing themes from financial modeling and ESG integration to ethics, innovation, and global collaboration. While the literature has developed strong thematic cores and collaborative networks, there remain significant opportunities to broaden its scope geographically, methodologically, and institutionally. By addressing these gaps, the field can better contribute to shaping a financial system that is not only profitable but also inclusive, ethical, and environmentally responsible.

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