



RESEARCH ARTICLE

A Bibliometric Review of Sustainable Finance and Investment

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ARTICLE INFO	ABSTRACT
Received: Oct 17, 2024	Abstract. This bibliometric review surveys the current state of research on sustainable finance and investment, utilizing academic literature to discern key themes, trends, and gaps in the field. Focused on the period from 2015 to 2023 and drawing from the Web of Science database, the analysis conducted through Rstudio and Biblioshiny tools highlights the evolution of research, offering insights into volume, trends, and characteristics of literature on sustainable finance. The study showcases a substantial increase in published articles and a growing emphasis on interdisciplinary collaboration, indicating the field's expansion and maturity. It emphasizes the continued necessity for research to address challenges in implementing sustainable finance and investment practices, underscoring the significance of ongoing scholarly exploration in this domain.
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INTRODUCTION

The concept of sustainable finance has garnered increasing attention in recent years, with financial institutions, investors, and governments striving to align their activities with sustainable development goals. In this context, the Western Balkans presents a distinctive and significant case for exploring the advancement and implementation of sustainable finance and investment.

Sustainable finance and investment represent a progressively vital research area, driven by heightened environmental concerns and the imperative for sustainable economic growth. This concept encompasses a variety of practices and strategies designed to incorporate environmental, social, and governance (ESG) factors into financial decision-making processes. It encompasses the creation of novel financial instruments, the formulation of sustainable investment strategies, and the incorporation of ESG criteria into conventional financial analysis and risk management practices (Eduardsen & Marinova, 2020)

Given the escalating significance of sustainable finance and investment, comprehending the evolution and progression of research in this field is imperative. Bibliometrics is a valuable tool for scrutinizing scientific literature, offering insights into the quantity, trends, and attributes of literature within a specific domain (Khan & Jain, 2020; Nasir et al., 2020). This bibliometric review seeks to scrutinize research in the realm of sustainable finance and investment by employing data retrieved from the Web of Science database spanning the years 2015 to 2023. The analysis will be executed

utilizing the Rstudio and Biblioshiny tools to deliver a comprehensive understanding of research productivity distribution and collaboration among authors, institutions, and nations.

Bibliometric review of sustainable finance and investment will furnish an extensive overview of the prevailing state of research in the field, including recent advancements, trends, key contributors, and the research landscape (Yadav, 2023). It will be a valuable resource for scholars, policymakers, and practitioners aiming to deepen their comprehension of sustainable finance and investment on a global scale.

The findings from this study will yield vital insights into the progression of sustainable finance and investment research, underscoring the ongoing necessity for further exploration in this domain to confront the challenges of implementing sustainable finance and investment practices.

2. LITERATURE REVIEW

2.1. Literature for Sustainable finance and investment

The literature pertaining to sustainable finance and investment has witnessed substantial growth in recent years, reflecting a heightened global consciousness regarding the significance of environmental and social responsibility in financial decision-making. The concept of sustainable finance and investment involves the incorporation of environmental, social, and governance (ESG) considerations into the analysis and decision-making processes within the financial sector (European Banking Authority, 2020). This encompasses the inception of novel financial instruments, the formulation of sustainable investment strategies, and the assimilation of ESG criteria into conventional financial analysis and risk management practices (Global Sustainable Investment Alliance (GSIA), 2018).

One of the central themes emphasized in the literature on sustainable finance and investment is the pivotal role of ESG factors in investment decision-making. Multiple studies have demonstrated that companies exhibiting superior ESG performance face reduced financial distress risk (Brent & Howat, 2019; Capriotti *et al.*, 2020; Li *et al.*, 2021). An investigation conducted by Li *et al.* (2021) scrutinized the proliferation of sustainable investment products, such as green bonds and socially responsible investment funds, and their potential to support the transition toward a more sustainable financial system (Vardari *et al.*, 2025). Furthermore, a burgeoning body of research indicates a positive correlation between ESG performance and financial performance, suggesting that companies embracing sustainable practices may gain a competitive edge (Boue *et al.*, 2018; Brent & Howat, 2019; Jam *et al.*, 2011).

Another salient theme in the literature centers on the development of sustainable investment strategies. Numerous authors have proposed investment approaches that factor in ESG considerations to simultaneously pursue financial and sustainability objectives (Xu *et al.*, 2022; Smith & Stokes, 2021). For instance, introduced a sustainability-oriented investment strategy that incorporates ESG factors both in asset selection and weighting. Similarly, Deng *et al.* (2021) presented a sustainable investment strategy that considers the carbon footprint of investments.

A third notable theme underscores the integration of ESG factors into conventional financial analysis and risk management practices. Several studies have advocated frameworks for embedding ESG factors into financial analysis, including the incorporation of ESG scores into financial models (Alfatah *et al.*, 2019). A study by Desvousges *et al.* (2019) discerned that companies demonstrating robust ESG performance tend to experience lower capital costs and superior stock performance in comparison to companies with weaker ESG performance. Additionally, certain authors have advanced frameworks for assimilating ESG factors into risk management practices, encompassing the integration of ESG risks into enterprise risk management (ERM) frameworks (Alfatah, 2019; KPMG, 2018; Helaudho *et al.*, 2024).

Sustainable finance and investment practices encompass financial activities that factor in environmental, social, and governance (ESG) elements to promote sustainability and contribute to a more sustainable future. These practices have gained prominence as society increasingly acknowledges the necessity of addressing environmental and social issues, and as investors endeavor to align their financial objectives with their values.

There exist various sustainable finance and investment practices aimed at fostering sustainability. Common practices include (Brown, 2020; Garnett, 2021; Kim *et al.*, 2022; Smith & Stokes, 2021):

Green bonds: These bonds are issued specifically to fund environmental projects, such as renewable energy, energy efficiency, and sustainable transportation. Their popularity is on the rise as they offer investors a means to align investments with their environmental values.

Impact investing: This entails investing in companies, organizations, and funds with the aim of generating positive social and environmental impact alongside financial returns. This form of investing has gained traction as investors seek alignment with their values and a contribution to a more sustainable future.

ESG integration: ESG integration involves the inclusion of ESG factors in financial decision-making. This can be achieved by considering ESG factors when evaluating potential investments or by integrating ESG data into financial analysis and reporting. It is becoming increasingly prevalent as investors seek to comprehend the ESG risks and opportunities associated with their investments.

Sustainable funds: These investment funds concentrate explicitly on sustainability, directing investments toward companies and projects that champion environmental and social responsibility. They have surged in popularity as investors strive to align their investments with their values and advance a more sustainable future.

In essence, sustainable finance and investment practices serve as a pivotal tool for advancing sustainability and contributing to a more sustainable future. By factoring in ESG elements in financial decision-making and by investing in sustainable endeavors and companies, investors can play a role in promoting a more sustainable future while achieving their financial aspirations (Smith & Stokes; 2021).

In addition to the themes, the literature on sustainable finance and investment has also addressed the role of governments and regulators in promoting sustainability within the financial sector. For example, numerous studies have explored the influence of government policies and regulations in advancing sustainable finance and investment (Deng & Song, 2021; Gürkan *et al.*, 2022). These policies and regulations may encompass tax incentives, grants, financial support mechanisms, as well as regulations and guidelines for incorporating ESG factors into financial decision-making.

Another pivotal facet of the literature on sustainable finance and investment revolves around the role of stakeholders, including investors, in propelling sustainability. For instance, various studies have examined the role of institutional investors, such as pension funds, in promoting sustainability through their investment choices (Liu & Chen, 2021; Smith & Stokes, 2021). These investigations have revealed that institutional investors are increasingly factoring in ESG factors when making investment decisions and are becoming more actively engaged with the companies they invest in regarding ESG matters.

Furthermore, there is a burgeoning corpus of literature exploring the impact of sustainable finance and investment on the real economy. Multiple studies have delved into the relationship between sustainable finance and investment and economic growth (Kim & Lee, 2022; Kim *et al.*, 2021). These studies have demonstrated that sustainable finance and investment can positively influence economic growth, particularly through stimulating investments in environmentally and socially responsible projects.

The literature on sustainable finance and investment has burgeoned rapidly in recent years, paralleling the increased global recognition of the importance of integrating environmental and social responsibility into financial decision-making (Lee & Kim, 2022). This literature underscores the significance of considering ESG factors in investment choices, the formulation of sustainable investment strategies, and the integration of ESG considerations into conventional financial analysis and risk management practices. As the world continues to heighten its awareness of sustainability's importance, it is likely that this body of literature will expand and deepen further, providing valuable insights into how the financial sector can advance sustainability and contribute to a more sustainable future (Lee & Kim, 2022; Vardari *et al.*, 2020).

3. RESEARCH METHODOLOGY

The research methodology for this bibliometric review of Sustainable finance and investment will entail gathering data from the Web of Science database, covering the period from 2015 to 2023 (Jansen *et al.*, 2007). The collected data will then undergo analysis using two widely recognized and robust tools for bibliometric analysis, namely Rstudio and Biblioshiny.

The initial phase of the analysis will focus on data cleaning and pre-processing. This entails the elimination of duplicates and the standardization of data to ensure uniformity. Irrelevant fields will be removed, and the data will be transformed into a consistent and analyzable format. After data pre-processing, the following step will involve conducting a comprehensive bibliometric analysis. This will encompass the computation of various metrics, including publication counts, citation counts, and the calculation of the h-index, which measures the impact of specific authors or journals within a particular field. Additionally, the data will be visually represented through graphs and charts, such as bar graphs, line graphs, and scatter plots, aiding in the identification of underlying patterns and emerging trends.

Beyond traditional bibliometric analysis, the data will also undergo scrutiny through text mining and network analysis techniques. Text mining will be employed to pinpoint frequently used keywords and phrases in the literature, while network analysis will facilitate the visualization of relationships between authors, journals, and institutions within the realm of Sustainable finance and investment.

The collected data will be standardized using the Rstudio program, removing duplicates and extracting pertinent variables like authors, institutions, publication year, and journal. The data will then be structured into a data frame to facilitate further analysis.

Typically, bibliometric research employs descriptive statistics and fundamental tools, with VOSviewer serving as a prominent software for scientometric mapping (Merediz-Sola & Bariviera, 2019; Bamel *et al.*, 2020; Dwekat *et al.*, 2020; Marchiori *et al.*, 2020; Eduardsen & Marinova, 2020; Orăștean & Mărginean, 2023; Perannagari & Chakrabarti, 2020; Xu *et al.*, 2022).

The bibliometric analysis will be executed utilizing various packages within Rstudio, such as the "bibliometrix" and "visNetwork" packages (Aria and Cuccurullo, 2017; Aria *et al.*, 2020). This analysis will encompass co-citation analysis, co-word analysis, and visualization tools like citation networks and histograms. The overarching goal of the analysis is to discern key research domains, influential authors, significant keywords and sources, and trends within sustainable finance and investment research.

The results derived from the bibliometric analysis will be contextualized within the current landscape of research in the domain of Sustainable finance and investment. This will entail identifying trends and patterns within the data, as well as highlighting areas of strength and areas that require further exploration.

The utilization of Rstudio and Biblioshiny in this bibliometrics review of Sustainable finance and investment promises a comprehensive and in-depth analysis of the data, offering valuable insights

into the research landscape in this field (Li & Rousseau, 2021; Biblioshiny, 2019). These findings will prove beneficial to researchers, policymakers, and practitioners engaged in Sustainable finance and investment, contributing to the advancement of more effective and sustainable financial practices.

It's worth noting that while the Web of Science database may not encompass all relevant literature on sustainable finance and investment in the Western Balkans, and the findings may be subject to inherent biases and limitations of the database, the bibliometric literature review conducted through RStudio will still provide valuable insights into the state of the field and directions for future research.

3.1. ANALYSIS AND INTERPRETATION OF RESULTS

We conducted data mining in the Web of Science database to gather published research papers related to sustainable finance and investment in the Western Balkans. Table 1, which presents citation statistics, provides insights into the influence and significance of various papers in the domain of sustainable finance and investment. These findings underscore the dynamic and evolving nature of this research field, with numerous papers gaining significant recognition within the academic community.

Table 1. Citation statistics

Paper	Total Citations	TC per Year	Normalized TC
Taghizadeh-Hesary F, 2019, Financ Res Lett	220	44.00	6.09
Clark R, 2018, Land Use Policy	64	10.67	1.71
Kumar S, Na, Ann Oper Res	36		4.36
Schumacher K, 2020, J Sustain Financ Inv	28	7.00	2.20
Urban Ma, 2019, Sustainability-Basel	25	5.00	0.69
Ning Yy, Na, Environ Sci Pollut R	20		2.42
Zhan Jx, 2021, J Int Bus Policy	17	5.67	3.58
Sievanen R, 2017, Bus Strateg Environ	14	2.00	2.00
Havemann T, 2020, Agr Hum Values	12	3.00	0.94
Gonzalez-Ruiz Jd, 2019, Eng Constr Archit Ma	12	2.40	0.33

Source: Author's Contribution.

Among the papers discussed, "TAGHIZADEH-HESARY F, 2019, FINANC RES LETT" stands out as a significant contributor, amassing a substantial total of 220 citations, reflecting its enduring relevance and influence over the years. Several papers, such as "CLARK R, 2018, LAND USE POLICY" and "ZHAN JX, 2021, J INT BUS POLICY," have achieved noteworthy citation rates, underlining their impact and relevance within the field. Moreover, the presence of papers with varying publication years, from 2017 to 2021, underscores the continuous growth and development of research in sustainable finance and investment. This diversity in publication years suggests an ongoing interest and engagement with the subject matter. The citation data provides valuable insights into the vitality of research in sustainable finance and investment, showcasing both established and emerging contributions that shape the discourse in this important field.

Table 2. Main information about the data collection report

Main information about data - Recent Analysis 2015-2023	
Documents	50
Sources	32
Keywords plus (ID)	148
Author's keywords (DE)	196
Average citations per documents	11.38
Authors	130
Author appearances	130

Authors of single-authored documents	7
International Co-Authorship	46%
Single-authored documents	8
Co-Authors per documents	2.8

Source: Author's Contribution.

Table 2 furnishes crucial details regarding data collection for the bibliometric review titled "A Bibliometric Review of Sustainable Finance and Investment." The dataset encompasses 50 documents pertaining to sustainable finance and investment. These 50 documents originate from 32 distinct sources, indicative of a wide array of publications contributing to the research. In total, there are 148 unique keywords, identified by their corresponding ID numbers, underscoring the broad spectrum of topics encompassed within sustainable finance and investment. Additionally, there are 196 distinct author-provided keywords (identified as DE), signifying the extensive range of specific research areas within the field.

Each document in the dataset has garnered an average of approximately 11.38 citations, suggesting a notable level of influence and recognition within the academic community. The dataset features contributions from 130 different authors, showcasing diverse perspectives and contributors to the research. Remarkably, these 130 authors have collectively made 130 appearances within the dataset, illustrating a one-to-one author-document ratio.

Among the 130 authors, 7 have authored single-authored documents, indicating a blend of single-authored and collaborative research efforts. Notably, international collaboration holds significance, as 46% of the documents result from co-authorship involving authors from various countries, exemplifying a global outlook in the research.

Furthermore, the dataset comprises a total of 8 single-authored documents, spotlighting individual contributions to the field. On average, each document in the dataset boasts approximately 2.8 co-authors, underscoring the collaborative nature of research within sustainable finance and investment. This data furnishes valuable insights into the composition and attributes of the research dataset, underscoring the collaborative ethos of the field, the diversity in keywords and sources, and the impact of the documents, as gauged by their average citation count.

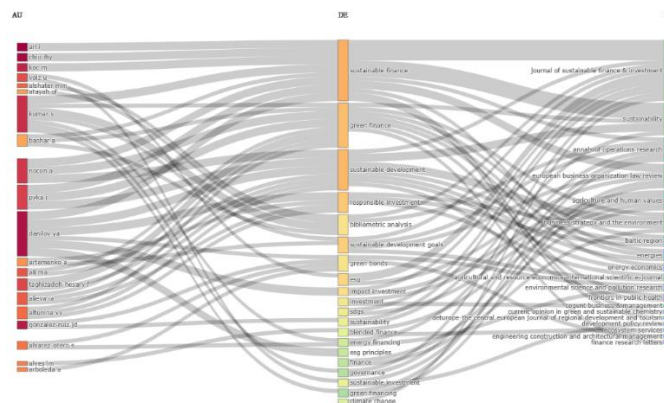


Figure 1. Illustration of the Three-Fields Plot: Authors, Keywords, and Sources

The Three-fields Plot serves as a graphical representation facilitating the visualization of interrelationships between authors, their designated keywords, and the pertinent sources. This plot not only elucidates the specific conceptual domains explored through keywords but also highlights the predominant publication venues favored by these authors. The diagram employs a spectrum of colors and varying sizes of rectangles, where the dimensions of each rectangle correspond proportionally to the quantity of connections attributed to a particular element.

Figure 1 unequivocally portrays the presence of five distinct authors (Danilov, Kumar, Pyka, Nocon, and Bashar) and an equivalent number of sources (Journal of Sustainable Finance & Investment, Sustainability, Annals of Operation Research, European Business Organization Law Review, and Agriculture and Human Values), each displaying robust affiliations with the principal research themes, which encompass "sustainable finance," "green finance," "sustainable development," "responsible investment," and "sustainable development goals."

Table 3. The 12 Most Influential Sources Based on Source Impact

Element	h_index	g_index	m_index	TC	NP	PY_start
Sustainability	5	7	0.833	59	8	2018
Journal of Sustainable Finance & Investment	3	6		47	8	
European Business Organization Law Review	2	3	0.4	15	4	2019
Agricultural and Resource Economics-International Scientific E-Journal	1	1	0.25	3	1	2020
Agriculture and Human Values	1	1	0.25	12	1	2020
Annals Of Operations Research	1	1		36	1	
Baltic Region	1	1	0.333	4	1	2021
Business Strategy and The Environment	1	2	0.143	14	2	2017
Current Opinion in Green and Sustainable Chemistry	1	1	0.5	1	1	2022
Development Policy Review	1	1	0.5	1	1	2022



Figure 2. Core sources by Bradford's Law

In this section, we identify the most pertinent journals based on the number of articles, highlight the top 12 sources based on source impact, and establish core sources utilizing Bradford's Law within a collection comprising 32 sources and 50 documents.

Table 3 employs various impact metrics, including the h-index (indicating the number of a source's published articles cited in other journals at least h times), g-index (measuring global citation performance improvement over the h-index), m-index (calculated as h-index divided by the number of years since the journal's first published paper), total citations (TC), net production (NP), and production year start (PY start), to rank the top 12 sources (Aria and Cuccurullo, 2017).

Leading the ranks in impact indexes is "Sustainability," securing the top position, trailed by "Journal of Sustainable Finance & Investment," "European Business Organization Law Review," and "Agricultural and Resource Economics-International Scientific E-Journal."

To pinpoint the core sources, we apply Bradford's Law, which posits that when journals are arranged in descending order of article count, consecutive zones of periodicals containing the same number of articles follow a simple geometric progression, as denoted by 1:nS:n2S:n3S (Biblioshiny 2019).

Employing this principle, we classify the sources into three zones, each containing 50 articles as shown in Figure 2.

Consequently, the core sources consist of three journals among the total 32 sources, contributing to approximately 16.0% of the entire collection encompassing 50 articles. It's noteworthy that this outcome was achieved by incorporating associate journals to ensure each zone comprised 50 articles.

To pinpoint influential authors with the potential to shape future research, this section introduces the authors who have contributed significantly to the field. It covers the authors with the highest number of published documents, tracks the production trends of the top 10 authors over time, assesses author impact, examines the countries of corresponding authors, analyzes country-wise scientific production, and identifies the countries with the most citations.

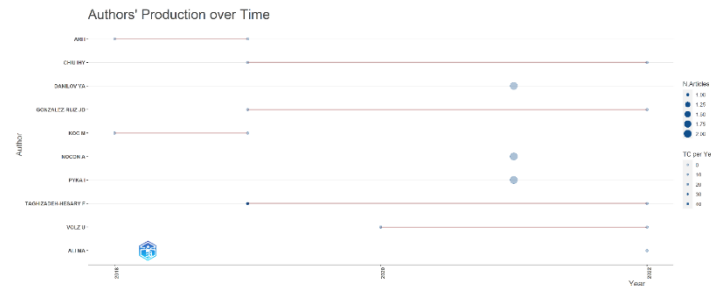


Figure 3. Illustrates the production of the top 10 authors over time. (The size of each circle corresponds to the number of articles published by the author in that year. Additionally, the shading of the circle indicates the number of citations per year acquired by the author, with darker circles representing higher citation rates.)

Figure 3 illustrates a rising interest in global research during and following the global crisis. The lines in the figure depict the timelines of the authors, with Na N. having the lengthiest timeline from 2016 to 2022. The intensity of color in the figure corresponds to the total number of citations per year, and the size of the bubbles corresponds to the number of documents. The most noteworthy authors in this context include Danilova Ya., Koc M., and Nocon A.

Table 4. Top 10 cited article by global citation

Paper	Total Citations
TAGHIZADEH-HESARY F, 2019, FINANC RES LETT	220
CLARK R, 2018, LAND USE POLICY	64
KUMAR S, NA, ANN OPER RES	36
SCHUMACHER K, 2020, J SUSTAIN FINANC INV	28
URBAN MA, 2019, SUSTAINABILITY-BASEL	25
NING YY, NA, ENVIRON SCI POLLUT R	20
ZHAN JX, 2021, J INT BUS POLICY	17
SIEVANEN R, 2017, BUS STRATEG ENVIRON	14
HAVEMANN T, 2020, AGR HUM VALUES	12
GONZALEZ-RUIZ JD, 2019, ENG CONSTR ARCHIT MA	12

Table 4 presents a ranking of the ten most referenced papers, providing information about the total number of citations they have received from documents in the comprehensive WoS and Scopus databases, which are referred to as "global citations." In contrast, the number of citations from documents within the analyzed collection, referred to as "local citations," is comparatively lower. "TAGHIZADEH-HESARY F, 2019, FINANC RES LETT" is the most cited paper in the list with 220 total citations, indicating its high impact and influence in the field of study. "CLARK R, 2018, LAND USE POLICY" is the second most cited paper with 64 citations, suggesting a significant contribution to

research in land use policy. "KUMAR S, NA, ANN OPER RES" follows with 36 citations, reflecting its relevance in operations research and related fields. "SCHUMACHER K, 2020, J SUSTAIN FINANC INV" has 28 citations, indicating its importance in the context of sustainable finance and investments. "URBAN MA, 2019, SUSTAINABILITY-BASEL" is another paper with 25 citations, highlighting its role in the field of sustainability research. "NING YY, NA, ENVIRON SCI POLLUT R" has 20 citations, indicating its significance in the study of environmental science and pollution research. "ZHAN JX, 2021, J INT BUS POLICY" is cited 17 times, suggesting its relevance in international business policy. "SIEVANEN R, 2017, BUS STRATEG ENVIRON" is the eighth most cited paper with 14 citations, signifying its importance in the field of business strategy and environmental considerations. "HAVEMANN T, 2020, AGR HUM VALUES" and "GONZALEZ-RUIZ JD, 2019, ENG CONSTR ARCHIT MA" both have 12 citations each, indicating their contribution to the respective fields of agricultural human values and engineering construction and architecture management.



Figure 4. A Word Cloud representing the most prominent authors' keywords. Source: Generated by the authors using Biblioshiny.

In an alternative visual depiction of textual data in the form of a Word Cloud, Figure 4 showcases the keywords that are used most frequently. These commonly employed keywords include Sustainable Finance, sustainable development, responsible investment, green finance, SDG (Sustainable Development Goals), and impact investment. The visual parameters in this representation are determined by the selection of authors' keywords and the frequency of their occurrence.

Top authors' keywords (30 with 7 minimum occurrences) are represented by a Tree Map in Figure 5. Sustainable Finance is the most common keyword with 20 occurrences (15%) followed by Sustainable Development with 12 occurrences (15%) and green finance with a total of 10 occurrences (8%).



Figure 5. A Tree Map representing the most prominent authors' keywords. Source: Generated by the authors using Biblioshiny.

Figure 6 illustrates the changing utilization of authors' keywords over time. This depiction encompasses yearly occurrences and publication years, revealing the outcome of a Loess regression analysis aimed at examining the progression in the usage of keywords.

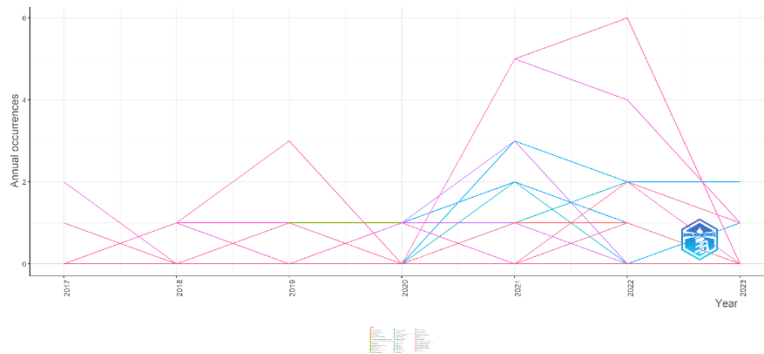


Figure 6. Word dynamics in authors' keywords in 2015–2023. Source: Authors' elaboration using Biblioshiny.

The analysis of renminbi bibliometrics and science mapping involved three key structures (Aria and Cuccurullo, 2017):

A. Conceptual Structure: This aspect aimed to uncover the primary themes and trends in the research field. Co-word analysis and mapping were utilized to highlight the conceptual structure of the field. Various reduction techniques, such as Correspondence Analysis (CA), Multiple Correspondence Analysis (MCA), or Metric Multidimensional Scaling (MDS), along with clustering algorithms, were employed to create a conceptual structure map. Multiple Correspondence Analysis, chosen for its exploratory nature without restrictive assumptions, was used to examine the interdependence among categorical variables and identify latent variables. The Bibliometrix R-package facilitated the application of MCA to explore the relationship between authors' keywords, leading to the formation of a conceptual structure and the use of clustering algorithms to identify paper clusters addressing similar issues (Cuccurullo et al., 2016).

B. Intellectual Structure: This dimension focused on understanding how an author's article influences the scientific community.

C. Social Structure: This aspect aimed to observe interactions among authors, institutions, and countries.

The Conceptual Structure analysis employed Multiple Correspondence Analysis, an exploratory data analysis method without restrictive assumptions, to identify new latent variables based on the interdependence of categorical variables.

Network Approach (Co-word Analysis):

Co-occurrence network visualization.

Thematic map representation.

Exploration of thematic evolution.

The co-occurrence matrix, created using Multiple Correspondence Analysis, generated a network graph representing term co-occurrence (Aria et al. 2020). The resulting visualization showcased the knowledge base and explored various themes in the research field. Figure 7 illustrated the co-occurrence network, revealing three distinct clusters: blue (centered on Sustainable Finance), green (centered on Sustainable Development and Green Finance), and red (centered on SDGs investment). The clustering algorithm on the authors' keywords network further highlighted different themes in

the research field, with centrality indicating theme importance and density measuring theme evolution.

Figure 8 presented the thematic map of the literature, where each bubble represented a network cluster with size proportional to cluster word occurrences. Basic themes (e.g., Sustainable Development, Green Finance, and responsible investment), Motor themes (e.g., Sustainable Finance, Sustainable Development Goals, and Bibliometric Analysis), Niche themes (e.g., Sustainable Financing, Public Investments, and Sustainable Economics), and Emerging or Declining themes (e.g., Values and Pension Funds) were identified in different quadrants, providing a comprehensive overview of the diverse themes in the research field.

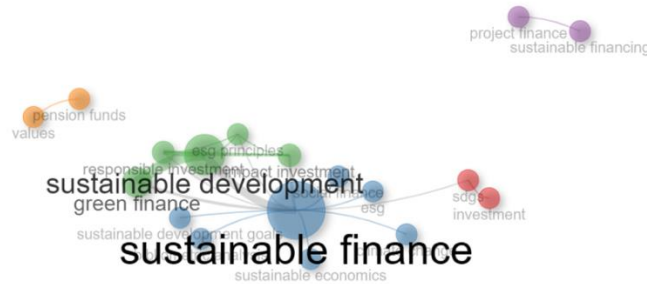


Figure 7. Top authors’ keywords as a Word Cloud. Source: Authors’ elaboration using Biblioshiny

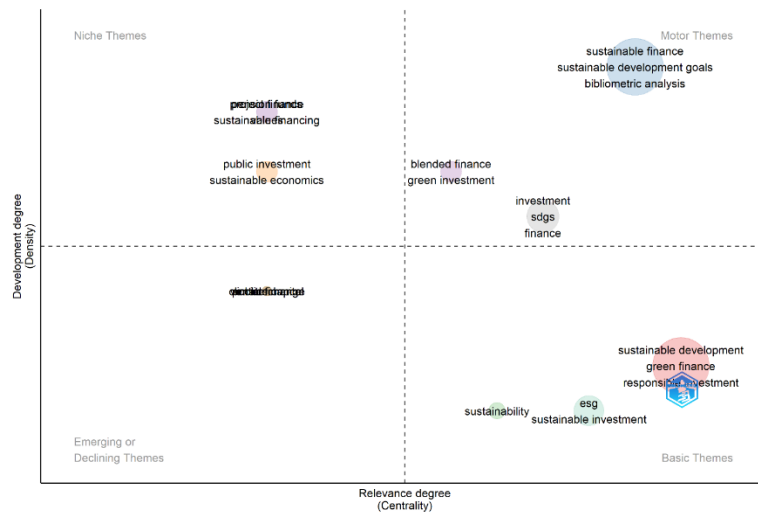


Figure 8. Thematic map of the renminbi literature. Source: Authors’ elaboration using Biblioshiny

Figure 9 illustrates the thematic evolution of renminbi literature, providing a historical perspective divided into three periods. The division is based on authors' keywords, with two cutting points in 2015 and 2020, and an inclusion index weighted by the words Green Finance, Sustainable Finance, and Pension Funds:

The period from 2021 to 2022 (pre-global crisis) is characterized by an inclusion index weighted by words like Sustainable Finance, Sustainable Development, and Public Finance. During this time, Western Balkans and renminbi prominently feature.

The period from 2023 to 2022 (post-renminbi inclusion in Green Finance) shifts the focus to renminbi and its internationalization.

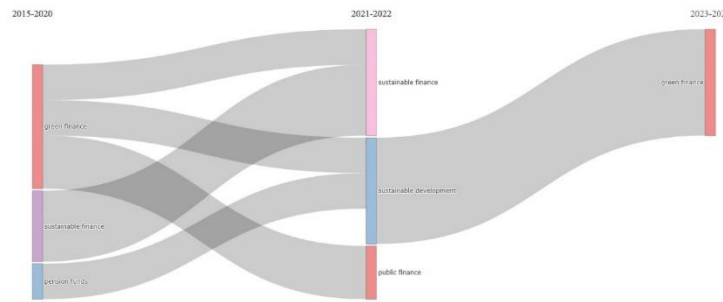


Figure 9. Thematic evolution of renminbi literature. Source: Authors' elaboration using Biblioshiny

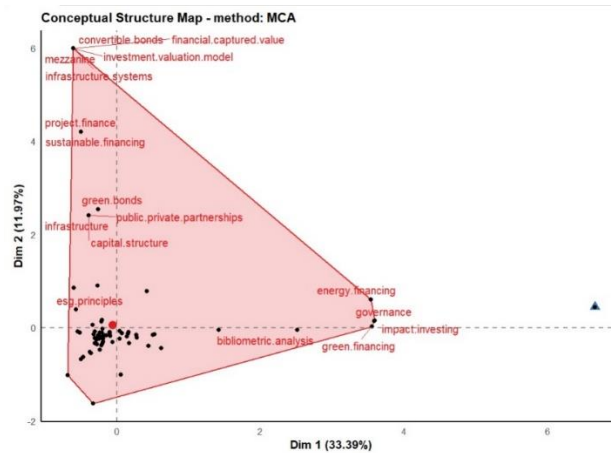


Figure 10. Conceptual map and authors' keywords clusters. Source: Authors' elaboration using Biblioshiny.

To explore subfields within the research area, we opted to create a conceptual map of authors' keywords using Multiple Correspondence Analysis (MCA) and selecting 17 terms. This involved plotting the authors' keywords on a two-dimensional map, providing a more detailed representation for words with a similar distribution, as outlined by Cuccurullo et al. in 2016. The outcome, as depicted in Figure 10, reveals two distinct clusters (1—red and 2—blue), representing two topics—renminbi Green Finance and ESG principles—along with the distribution of authors' keywords.

The map's origin, situated at the center of the research field, symbolizes the average across all articles. Notably, the keywords "ESG principles" and "Bibliometric Analysis" are positioned closest to the center, indicating that these topics are extensively covered in many articles.

The map's two dimensions can be elucidated as follows: the horizontal dimension distinguishes keywords related to Green Finance and impact investing (on the left) from those examining aspects such as financial crises, determinants of international currency, and renminbi internationalization (on the right). Simultaneously, the vertical dimension separates keywords addressing green bonds and project finance (at the top) from those concentrating on the infrastructure system and capital structure.

CONCLUSION

Sustainable finance and investment is an increasingly important area of research and practice, as the financial sector plays a critical role in addressing ESG issues and promoting sustainable development.

This literature review highlights the key concepts, challenges, and best practices in this field, underscoring the importance of integrating ESG considerations into financial decision-making, improving data availability and transparency, and promoting collaboration between financial institutions and investors. Further research is needed to better understand the long-term impacts of sustainable finance and investment and to develop best practices for integrating ESG considerations into financial decision-making.

Growing societal concerns about sustainability and sustainable development have prompted a focus on issues within the realm of sustainable finance (Yadav *et al.*, 2023). Over the past few decades, there has been a noticeable surge in the publication of manuscripts related to sustainable finance, signifying the emergence of this as a burgeoning area of research. Conducting a bibliometric analysis and delving into discussions about the sustainability of finance reveals numerous research opportunities for both regulatory institutions and researchers.

Despite the increasing attention, it is evident that there remains a substantial research gap in the field of sustainable finance. This gap not only poses challenges but also presents a valuable opportunity for further exploration and investigation within the broader domain of sustainability and finance. The bibliometric analysis conducted in this study unveils a noteworthy aspect: the literature on sustainable finance extends beyond traditional finance domains. It is characterized by diversity and assimilation of interdisciplinary areas, such as environmental engineering, sustainable development, and economic growth. However, the analysis also underscores a limitation—the exclusive research focused explicitly on sustainable finance has resulted in relatively constrained intellectual contributions.

These findings collectively underscore the potential for expanded exploration, collaboration, and dedicated research efforts within the intersection of sustainability and finance. The interdisciplinary nature of sustainable finance suggests a rich landscape for future studies that could contribute meaningfully to both the theoretical foundations and practical applications of this evolving field.

This research enhances the existing body of literature by providing a comprehensive review of papers concerning Sustainable Finance, transcending conventional boundaries within the finance domain. However, it is crucial to acknowledge certain limitations associated with the study, particularly concerning the process of dataset cleaning. To conduct a more in-depth analysis, there is a need for a refined approach to data cleaning, ensuring greater accuracy in the research findings.

Limitations of the Study

While this research significantly enriches the existing literature on Sustainable Finance, acknowledging its interdisciplinary nature, certain limitations should be considered. The study acknowledges a potential constraint in the exclusive focus on sustainable finance, which may have resulted in relatively constrained intellectual contributions. Furthermore, the dataset cleaning process, while comprehensive, may benefit from a more refined approach to enhance the accuracy of research findings. Considering these limitations, future research endeavors should aim for a more holistic approach, exploring diverse facets of sustainability and finance while ensuring meticulous data cleaning processes to bolster the reliability of findings.

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