

# Navigating the Ecosystem of Sustainable Finance Research: A Dynamic Bibliometric Analysis

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## Abstract

*This methodology outlines the mapping of global sustainable finance research over three decades, utilizing Scopus database data up to 2023. Employing bibliometric methods and visualization tools, the study explores research trends, co-authorship, and co-occurrence. Notable trends include a peak in paper publications in 2022, and strong research output from the US, UK, and India. Co-citation and co-word analyses provide insights into theme associations. Notably, the United States led the list in terms of research output, followed closely by the United Kingdom and India. The increasing attention to the subject globally is illustrated through the steady rise in article output over the years. The conceptual structure analysis sheds light on the interconnectedness and relationships among scholarly documents. Co-citation and co-word analysis offered insights into the associations and the relationships among various themes and concepts discussed in the research.*

**Keywords:** Sustainable Finance, Bibliometric Analysis, Co-citation analysis, Co-word analysis, Theme associations.

## Introduction

Over the past several decades, there has been a significant increase in interest between financial intermediaries and institutional investors regarding sustainable finance. They are now actively seeking investment strategies that take into account various metrics related to environmental sustainability, social responsibility, and the governance mechanisms of the companies they invest in (Mashari et al., 2023; Pompella & Costantino, 2023) which requires sustainable financial policy arrangements from the government and the private sector as an instrument to support nationally determined contributions under the Paris Agreement. However, only a few review articles look into the specific combination of green finance (also

known as sustainable financing. "The 17 Sustainable Development Goals (SDGs), adopted by all United Nations Member States in 2015 as part of the 2030 Agenda for Sustainable Development, serve as a global call to action." Their aim is to "eradicate poverty, safeguard the planet, and enhance the well-being and opportunities for people worldwide." These goals are set to be achieved by 2030 (United Nations, 2020).

According to (Whiteman et al., 2013), the idea of sustainable finance has developed alongside the broader concept of business sustainability in recent decades. The foundation for this discussion is based on the typology for business sustainability crafted by (Dyllick & Muff, 2016). The evolution of sustainable finance is characterized by a

shift in classification from focusing solely on 'economic' considerations to encompassing 'economic, societal, and environmental' considerations (Schoenmaker, 2017).

The idea of sustainable finance is remarkably extensive, covering a wide range of dimensions related to achieving the financial and the investment objectives through sustainable means. According to the European Commission (2021), "sustainable finance involves an ongoing process of taking into account environmental, social, and governance (ESG) factors when making financial and investment decisions." However, this definition, solely focused on ESG factors, is quite limited, necessitating a more comprehensive and inclusive approach that addresses sustainability on a broader scale. In light of this, we propose that sustainable finance should encompass all activities and factors that contribute to making finance sustainable and supporting overall sustainability (Kumar et al., 2022).

This proposed definition aligns with the diverse objectives of various stakeholders, including the European Commission's emphasis on ESG factors and the United Nations' Sustainable Development Goals (SDGs). By adopting such a comprehensive perspective, sustainable finance can better serve as a driving force towards a more sustainable future (Liang & Renneboog, 2020).

Global climate change is significantly influenced by global warming, and in order to avoid the most disastrous consequences, it is imperative to reduce greenhouse gas (GHG) emissions. To tackle this problem, the United Nations Framework Convention on Climate Change (UNFCCC) convened the COP-21 meeting and adopted the Paris Agreement, in which officials from across the globe collectively committed to restricting the rise in the average global temperature to 1.5 degrees Celsius above pre-industrial levels.

Recently, the financial dimension has gained significant prominence, especially following the COP-27 conference. During this conference, there was a strong emphasis on the need for a considerable increase in financial resources to facilitate the execution of initiatives laid out in the nationally determined contributions (NDCs) and long-term strategies (Mikes & New, 2023; Motorniuk et al., 2023; Narayanan et al., 2023). Promisingly, there has been observable advancement within the financial industry, as investment portfolios are being modified to support the shift towards a "net-zero economy." Nevertheless, there is an urgent requirement to take further action in order to generate the substantial funds needed for the realization of environmentally friendly, low-carbon development routes (Han et al., 2023; Mashari et al., 2023; Nguyen & Nguyen, 2023; Savoia et al., 2023). Now, all parties involved are genuinely concerned

about reducing greenhouse gas emissions through financial incentives, which makes the situation all the more captivating (Baines & Hager, 2023; Fu et al., 2023). The acknowledgment of the difficulties posed by climate preservation has prompted the introduction of legal and preventative actions aimed at promoting an economy resilient to climate change (Azudin et al., 2023; Ben Belgacem et al., 2023; Bužinskė & Stankevičienė, 2023; Narayanan et al., 2023). Moreover, investors have reacted to environmental concerns by integrating environmental, social, and governance (ESG) factors into their decision-making procedures (Battisti, 2023; Pompella & Costantino, 2023).

The inception of sustainable finance has marked a significant milestone in the realm of financial systems, setting the stage for the emergence and growth of green finance (H. Chen et al., 2023; Mashari et al., 2023) commercial credit has partially replaced the role of formal finance and facilitated the development of the private economy and even the country, thus making commercial credit an important entry point for understanding and promoting sustainable economic development. Taking the Hangzhou Bay Greater Bay Area as a case study, based on the City Business Credit Environment Index (CEI). This transformative journey is characterized by a concerted effort to integrate environmental, social, and governance (ESG) considerations into financial decision-making processes (M. Chen et al., 2023; Junjie et al., 2023). As the foundations of sustainable finance take root, the trajectory naturally extends towards the realm of green finance, a pivotal subset that focuses specifically on mobilizing capital for environmentally responsible projects and initiatives (Bužinskė & Stankevičienė, 2023; Martin, 2023; Tang et al., 2023). This evolution underscores a paradigm shift in the financial landscape, where considerations of sustainability and environmental impact are not only recognized but actively incorporated into the fabric of financial strategies and investments (Yu et al., 2023; J. Zhang et al., 2023; Zhu et al., 2023) this paper applies a spatial econometric model to analyze the non-linear impacts of digital finance on GTFP and its spatial spillovers. Furthermore, it utilizes mediation models to study their transmission mechanisms. The results show that digital finance first inhibits and then promotes GTFP, with spatial spillovers in four dimensions: geography, information, technology, and human capital. Its mediating mechanisms are innovation effects, structural effects, and scale effects. The statistical significance of the U-shaped relationship is regionally heterogeneous, according to different levels of human capital, informatization, urbanization, and financial marketization. Based on digital finance's U-shaped and heterogeneous impacts on GTFP, policy recommendations are to adopt differentiated

development strategies according to specific levels of digital finance and underlying conditions in smart cities. Stimulating the innovation and structural effects and suppressing the scale effects will help digital finance breakthrough inflection points, and will positively promote GTFP. It is also necessary to encourage inter-regional cooperation among smart cities to fully release spatial spillover dividends through technology sharing, information transfer, and talent exchange to promote the linked improvement of GTFP." "container-title": "Sustainability", "DOI": "10.3390/su15129260", "ISSN": "2071-1050", "issue": "12", "journalAbbreviation": "Sustainability", "language": "en", "page": "9260", "source": "DOI.org (Crossref). In this narrative, we delve into the progression from sustainable finance to green finance, exploring the catalysts, principles, and implications that define this journey of financial transformation (Y. Zhang, 2023).

The primary objective of this paper is to conduct a literature review that explores the potential impact of sustainable finance. The primary aim of this review is to pinpoint any gaps in the available data related to sustainable finance. The article will tackle the following research inquiries:

- (a) What are the patterns in the quantity of publications pertaining to this research domain?
- (b) Which entities, countries, subject areas, publications, and authors are at the forefront of the current research domain?
- (c) What are the primary research directions currently being pursued in this domain?
- (d) The study has identified trends in past and ongoing research subjects and drawn attention to emerging areas of interest.

The paper's organization is as follows: after the introduction, the second section provides a step-by-step description of the process used for conducting bibliometric analysis. The third section details the systematic literature review (SLR) methodology, including the configuration of keyword search filters and the analysis of performance and extensive mapping. Next, in the fourth section, we explore the search results and present the network analysis conducted with VOS Viewer. This section also sheds light on the countries, keywords, and methodologies featured in the chosen articles.

### Research Methodology

This research offers an overview of global research in the field of sustainable finance spanning the last 30 years. The research data was retrieved from the Scopus database

using document search services in July 2023. The study utilized bibliometric techniques and conducted data analysis and visualization using Scopus' 'analyze search results' feature and the VOS Viewer application (Perianes-Rodriguez et al., 2016).

Data collection was upto 2023, to provide a comprehensive view of the study's status for the entire year from January to December. The question directive used for data mining in Scopus was "(TITLE-ABS-KEY ("finance" and "sustainable" or "sustainability") AND SUBAREA ("Social science"; "business, management and accounting"; "economics, econometrics and finance") AND DOCTYPE (article) AND LANGUAGE (English))."

For analysis of co-authorship, the study utilized authors as analytical units and applied the full counting method to obtain the author's collaboration network using VOS Viewer. Similarly, for the analysis of co-occurrence, keywords were used, and the full calculation method was employed with VOS Viewer to generate the network of keywords (Van Eck & Waltman, 2010).

Once the manuscripts meeting the inclusion criteria were chosen, they were exported in CSV format. Afterward, the data underwent conversion for use in both the VOS Viewer software and an R package data frame. This conversion process was facilitated by the open-source R package BIBLIOSHINY to guarantee the precision and accuracy of the results.

### Results and Discussion

The main findings of the collected data from the Scopus database from year 1993 to 2023 are shown in Table 1.

**Table 1**

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1993:2023
Sources (Journals, Books, etc)	783
Documents	2306
Annual Growth Rate %	21.3
Document Average Age	3.74
Average citations per doc	14.49
References	127063
DOCUMENT CONTENTS	
Keywords Plus (ID)	4181
Author's Keywords (DE)	6808
AUTHORS	

Authors	6138
Authors of single-authored docs	393
AUTHORS COLLABORATION	
Single-authored docs	415
Co-Authors per Doc	3.06
International co-authorships %	29.62
DOCUMENT TYPES	
Article	2138
Conference Paper	46
Review	122

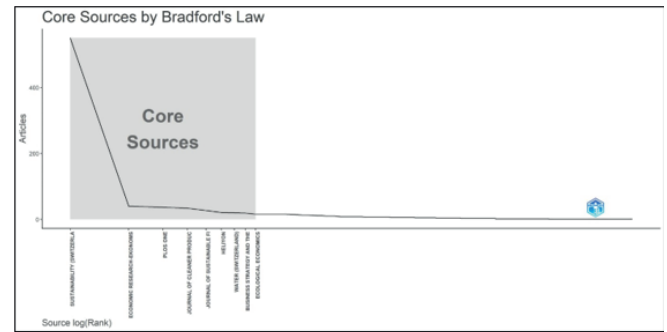


Figure 2

Table 1 provides a concise Summary of the yearly research production related to the subject. The publications exhibited an annual percentage growth rate of 21.3%. Notably, in 2022, there was a significant spike in paper publications across various journals, marking the most notable summit in the data. This pattern indicates that since 2012, the annual count of paper publications has been steadily and substantially increasing.

For a more detailed analysis of the contributions from authors worldwide, please refer to Figure 2 below. The figure illustrates that from 1993 to 2023, scholars have shown increasing attention to the subject, resulting in a steady rise in article output, reaching 328 articles in 2023. This trend signifies a growing interest among researchers in the field, with annual manuscript contributions showing encouraging results on a global scale.

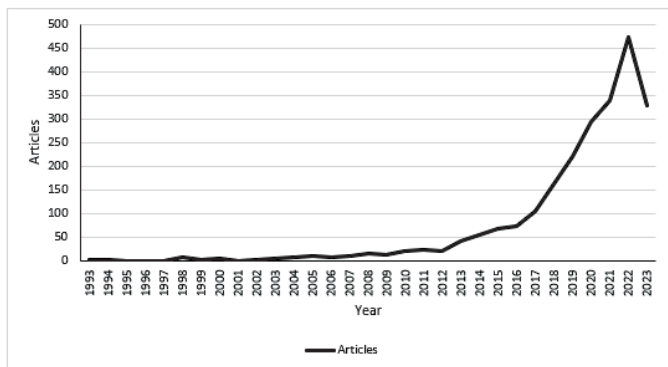


Figure 1

Bradford’s Law of Scattering outlines three distinct zones, which follow a geometric series pattern represented as 1:n:n<sup>2</sup>. The divisions of the nucleus are summarized in figure 2.

Table 2 above presents the ranking of the top 9 journals along with their corresponding frequencies and cumulative frequencies, all of which are categorized under Zone 1.

SO	Rank	Freq	cumFreq	Zone
SUSTAINABILITY (SWITZERLAND)	1	551	551	Zone 1
ECONOMIC RESEARCH-EKONOMSKA ISTRAZIVANJA	2	40	591	Zone 1
PLOS ONE	3	37	628	Zone 1
JOURNAL OF CLEANER PRODUCTION	4	34	662	Zone 1
JOURNAL OF SUSTAINABLE FINANCE AND INVESTMENT	5	27	689	Zone 1
HELIYON	6	21	710	Zone 1
WATER (SWITZERLAND)	7	20	730	Zone 1
BUSINESS STRATEGY AND THE ENVIRONMENT	8	19	749	Zone 1
ECOLOGICAL ECONOMICS	9	16	765	Zone 1

Figure 3 depicts the document examination published per year based on source type. Notably, the “Sustainability”, “Journal of Cleaner Production”, “Plos One”, and Journal of sustainable finance and investment” stand out as eminent journals in the field of Sustainable Finance.

Figure 4 illustrates the count of publications by authors who have received an “h-index”, where some authors have achieved an h-index or more citations, whereas other publications have not exceeded h citations each. The h-index is a defined as a measure of an individual scientist’s impact rather than that of a journal.

Figure 5 presents a country-wise distribution of the paper’s publications. The United States (USA) tops the

list with the largest number of publications by authors, totaling 4,468. Coming in a close second, authors from the United Kingdom have contributed 4,269 articles, while Indian researchers have published 332 articles.

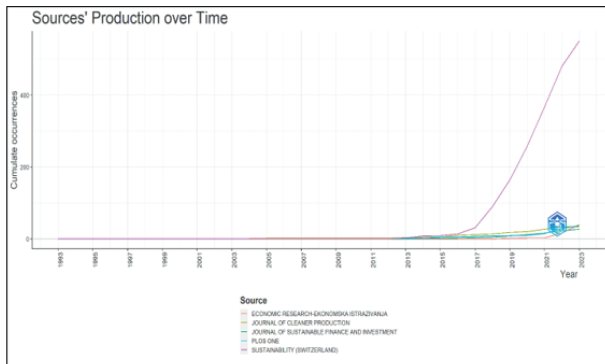


Figure 3

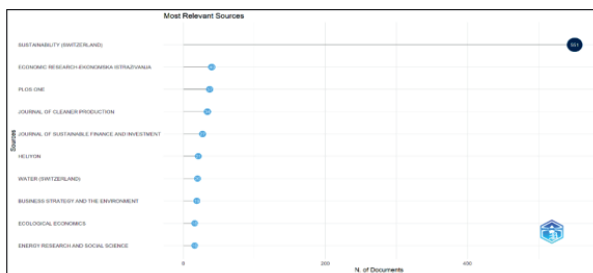


Figure 4

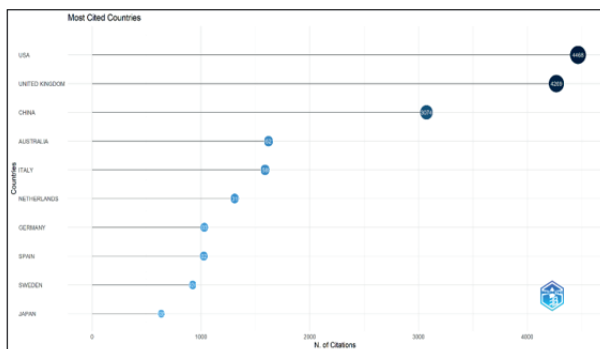


Figure 5

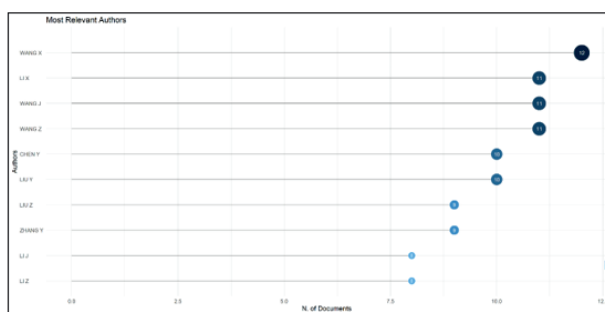


Figure 6

### Author's Impact

Figure 6 displays the authors with the highest global citations, with Wang X. ranking first, followed by Li X. Wang J. Table 2 provides a list of authors along with the fractional values of their published articles.

Table 2

Authors	Articles	Articles Fractionalized
WANG X	12	3.06
LI X	11	4.12
WANG J	11	2.27
WANG Z	11	2.85
CHEN Y	10	3.28
LIU Y	10	2.58
LIU Z	9	3.09
ZHANG Y	9	2.70
LI J	8	1.91
LI Z	8	3.25

### Social-Structure: Collaborative Analysis

The collaborative examination provides Exact understanding of how authors from different countries engage in knowledge exchange within a specific domain of research. Figure 7 displays a network depicting author collaboration, where co-authors are organized into clusters to visualize the landscape. To be included in the network, a country must have a minimum of 5 documents, resulting in 76 out of 168 countries meeting this criterion.

In Figure 7, each author must be associated with a minimum of 2 documents, and the document with the highest number of authors comprises a total of 5 contributors. This representation assumes that every author possesses at least two citations. This visual aid assists in identifying clusters of research scholars and noteworthy authors. The network diagram employs linkages, fonts, and color sizes to depict strong relationships between authors and countries.

Co-authorship analysis involves the collaboration of two authors, regardless of whether they come from different countries or the same one, in producing a paper. This analysis employs VOSviewer software for group mapping. Figure 7 showcases a global illustration of authors collaborating on a specific topic.

From the dataset, out of the 168 countries participating in collaborative research on sustainable finance through co-authorship, a minimum of 3 articles per country were taken into account. Consequently, a threshold of

76 countries was established. The figure highlights the countries with the highest cumulative link strength. The normalization technique used is modularity.

A co-author network can be conceptualized as a graph where authors are nodes, and edges connect two authors if they have jointly authored a paper. The co-authorship connection isn't solely based on the number of documents co-authored but also on the total number of authors for each co-authored article.

In the context of fractional counting, when an author collaborates on a document with n other authors, each of the n co-authorship links is given a weight of 1/n. In Figure 8, out of a total of 2,270 authors, the maximum number of authors per document is limited to 5. To set a criterion, authors were expected to have a minimum of 2 papers and 2 citations. Fractionalization normalization was employed in the analysis. Co-authors published in 2022 are depicted in yellow, those from 2014 in purple, and co-authors from other years are shown in varying colors.

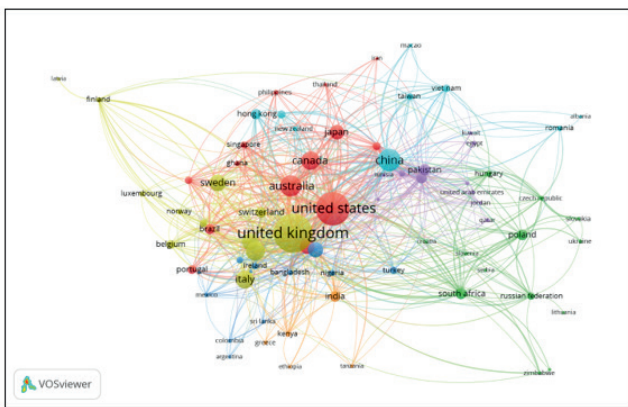


Figure 7

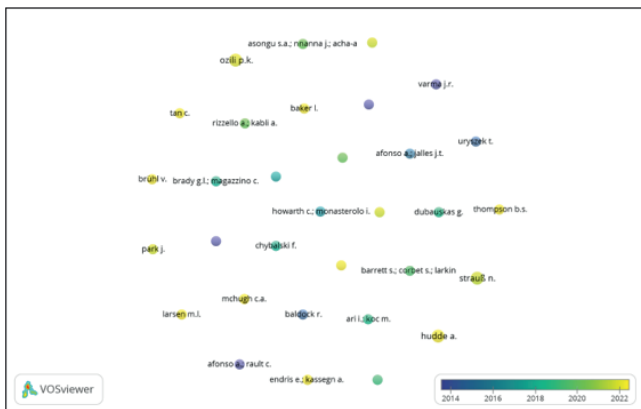


Figure 8

### Renowned Authors Output Overtime

The following visualization illustrates how renowned authors have evolved over time. The size of each bubble represents the number of papers they have authored. Within each bubble, you can see the cumulative total of citations and the number of publications for that specific year. The author's timeline is portrayed through the connecting line.

Figure 9 portrays the author's output concerning the quantity of publications across time. The size of the bubbles above each point on the timeline is proportionate to the number of papers published in that specific year. Furthermore, the intensity of color in the bubbles correlates with the total citations received per year (for more details, refer to Table 3).

Figure 10 exhibits the diagram of Lotka's Law, which unveils the productivity of authors within a defined timeframe, aiming to assess the extent of authors' productivity. In this diagram, "X" signifies the overall number of contributions, "Y" represents the count of authors, and "C" denotes a constant. The equation of Lotka's law,  $X^n = C$ , is employed with the value of n being 2.

Table 4 offers a summary of the top ten countries with the most citations credited to their authors. Based on this information, it becomes evident that authors from the United States make a substantial contribution to various articles, amassing a total of 4,468 citations.

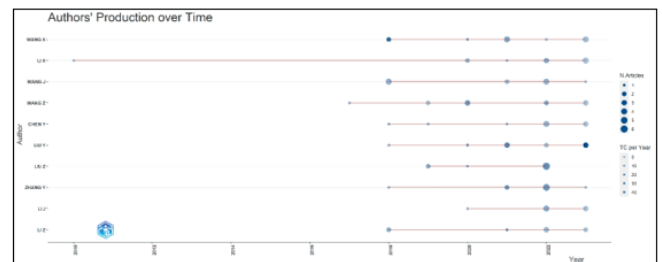


Figure 8

Table 3

Documents written	N. of Authors	Proportion of Authors
1	5558	0.906
2	415	0.068
3	95	0.015
4	33	0.005
5	11	0.002
6	11	0.002

7	4	0.001
8	3	0
9	2	0
10	2	0

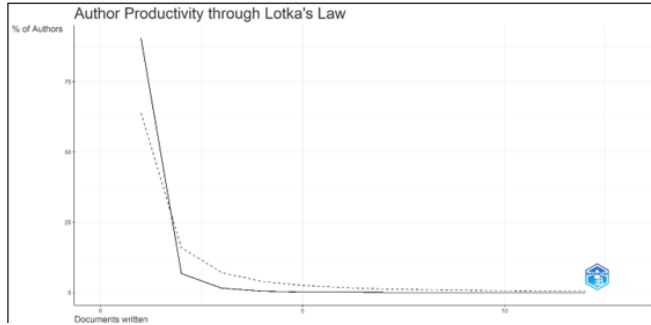


Figure 9

Table 4

Country	TC	Average Article Citations
USA	4468	37.50
United Kingdom	4269	18.90
China	3074	11.00
Australia	1621	28.40
Italy	1589	17.10
Netherlands	1310	24.70
Germany	1032	12.60
Spain	1027	11.00
Sweden	924	25.00
Japan	635	33.40

**Conceptual Structure**

The conceptual framework entails a repository of bibliographic records, creating a meticulously structured digital compilation encompassing published scientific literature, such as journal papers, conference reports, patents, and books.

Figure 11 exhibits the bibliographic linkage between countries within this repository. It visually represents the interconnections and associations among the included journal articles, conference proceedings, patents, and books.

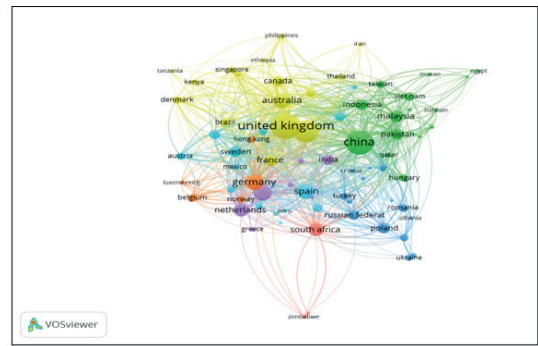


Figure 10

The networks expose the connections between keywords and the concepts and subjects discussed in the documents. Each node in these networks symbolizes a distinct keyword. Consequently, the interconnections become more apparent, and the links between different components acquire heightened importance.

This method of analysis aids in achieving a more lucid comprehension of the scholarly goals of the research, assists in detecting significant gaps or discoveries, and offers valuable direction for subsequent investigations.

**Co-Citation Analysis**

In the field of bibliometrics, co-citation is a measure used to assess the similarity or relatedness of two authors or documents based on their co-cited references. When two authors (or documents) are frequently cited together by other works, it suggests a strong association or connection between their research contributions.

In the context of bibliometric, which is a package in the R programming language for bibliometric analysis, co-citation analysis focuses on analyzing patterns of co-citations among authors. The co-citation network is constructed by considering all the references cited in a collection of scholarly documents (such as journal articles or conference papers). Figure 13 shows the co-citation analysis of authors with parameters of minimum 2 citations.

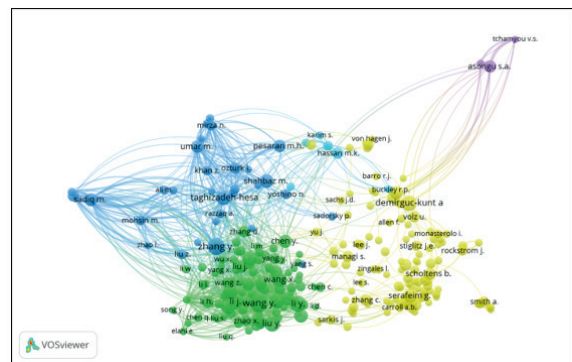


Figure 13

In Figure 14, we can observe a compilation of the most relevant authors from various countries who have contributed to the subject domain. This encompasses articles published in both publications limited to a single country and those involving multiple countries. Notably, China, the United Kingdom, and the USA emerge as the foremost countries with the most articles produced on this topic.

Upon scrutinizing the visual depiction, it becomes clear that the rate of productivity growth for publications originating from single-country publications surpasses that of publications involving multiple countries, as outlined in Table 5.

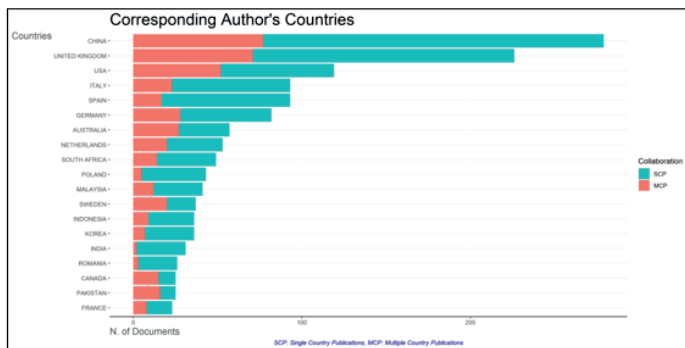


Figure 14

Table 5

Country	Articles	SCP	MCP	Freq	MCP_Ratio
	441	349	92	0.191	0.209
CHINA	279	202	77	0.121	0.276
UNITED KINGDOM	226	155	71	0.098	0.314
USA	119	67	52	0.052	0.437
ITALY	93	70	23	0.04	0.247
SPAIN	93	76	17	0.04	0.183
GERMANY	82	54	28	0.036	0.341
AUSTRALIA	57	30	27	0.025	0.474
NETHERLANDS	53	33	20	0.023	0.377
SOUTH AFRICA	49	35	14	0.021	0.286

Co-word Analysis

Co-word analysis is depicted through the co-occurrence of researchers' keywords in Figure 15. This network analysis establishes relationships among keywords discovered in published articles, offering insights into the conceptual framework of connections between various ideas. Figure 15 illustrates the simultaneous appearance of particular keywords within research

papers, a technique known as co-word analysis. This approach utilizes text-based information from the publications to explore historical, current, and potential associations between themes within a research domain. It's important to emphasize that the chosen keywords are generated from titles using software tools, not the authors' own language.

The diagram depicted in Figure 15 unveils two primary clusters, represented by distinct colors, which emphasize the patterns of co-occurrence from the pool of 768 analyzed articles. Researchers can extract valuable insights from this analysis to further enrich their papers for more comprehensive investigations. The analysis includes a total of 284 words, grouped into 13 clusters, and normalized using the association strength method.

Based on the information presented in the diagram, we can observe that the keyword "Sustainable Finance" is frequently associated with "sustainability" and "climate finance," indicating their strong linkages. On the other hand, less attention has been given to topics like "corporate social responsibility," "sustainable development goals," and the "social finance." Scholars may find it fruitful to conduct empirical studies on these lesser-explored subjects.

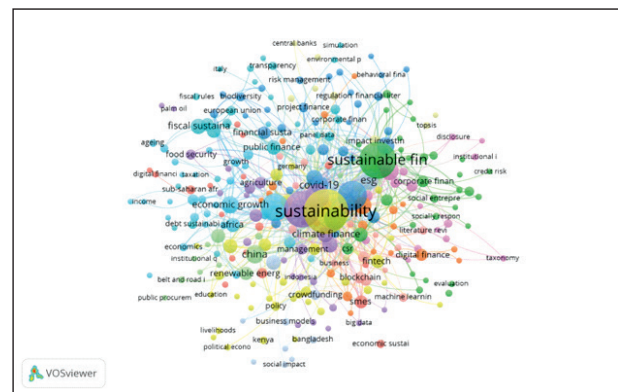


Figure 15

Trend Topic

The contents labeled as "Emerging Themes" are presented in Table 6, illustrating the frequency of authors' utilization of keywords and emphasizing a transient surge in popularity when compared to a prior investigation.

By referring to Table 6, we can discern the keywords most frequently employed within the social network during the specified timeframe. It provides insights into the topics that authors discussed in their work for that year. In years 2020-2022, the hot topics included green finance, sustainable development, climate change, economic development, and sustainability.



In Figure 16, the bubbles below represent the annual frequency of keyword usage in the articles within the given timeframe. This visualization helps to grasp how frequently specific keywords were utilized over the years.

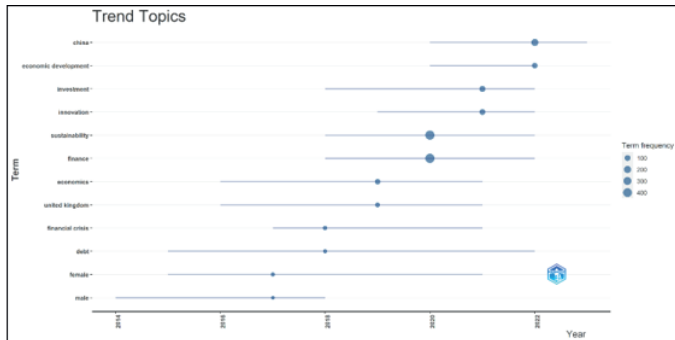


Figure 16  
Table 6

Items	Frequency
Sustainable finance	178
Green finance	109
Sustainable development	171
Climate change	77
Sustainability	255
Finance	99
Financial sustainability	21
Governance	27
Fiscal sustainability	31
Poverty	16
Microfinance	14
Fiscal policy	25
Debt	11

**Discussion and Findings**

This research offers a global overview of studies conducted in the realm of sustainable finance spanning the last thirty years. Data for this study was obtained from the Scopus database through document search services in July 2023. Utilizing bibliometric techniques, we conducted data analysis and visualization using the ‘analyze search results’ feature within Scopus and the VOS Viewer application.

The data collection encompasses the entirety of 2023, providing a comprehensive overview for the entire year from January to December. The query command for data extraction from Scopus was structured as

(TITLE-ABS-KEY (“finance” and “sustainable” or “sustainability”) AND SUBAREA (“Social science”; “business, management and accounting”; “economics, econometrics and finance”) AND DOCTYPE (article) AND LANGUAGE (English)). For the co-authorship analysis, authors were treated as the primary units of analysis, and the author collaboration network was constructed using VOS Viewer. Likewise, co-occurrence analysis involved keywords, and a keyword network was generated using VOS Viewer. Once the pertinent manuscripts that met the inclusion criteria were identified, they were exported in CSV format. Subsequently, the data was converted into formats compatible with both VOS Viewer software and an R package data frame. This conversion process was executed using the open-source R package BIBLIOSHINY to ensure the accuracy of the results. Table 1 offers a succinct summary of the annual research output in the field. The data showcases an annual growth rate of 21.3%. Notably, 2022 saw a significant surge in paper publications across diverse journals, marking a prominent peak in the dataset. This trend underscores the consistent and substantial growth in annual paper contributions since 2012. To gain a more comprehensive view of authors’ global contributions, refer to Figure 2. The figure visually depicts the increasing attention paid by scholars to the subject, leading to a steady rise in article output, reaching 328 articles in 2023. This upward trajectory signifies growing interest among researchers on a global scale.

Bradford’s Law of Scattering defines three distinct zones, which follow a geometric series pattern represented as 1:n:n<sup>2</sup>. The divisions of the nucleus are summarized in Figure 2. Table 2 presents the ranking of the top nine journals along with their corresponding frequencies and cumulative frequencies, all falling under Zone 1. Figure 3 visually represents the distribution of publications by document type over the years. Notably, journals such as Sustainability, Journal of Cleaner Production, Plos One, and Journal of Sustainable Finance and Investment emerge as prominent sources in the field of Sustainable Finance.

Figure 4 offers insight into the frequency of publications by authors who have received an h-index. Some authors have achieved an h-index or more citations, while other publications have not exceeded h citations each. The h-index, reflecting an individual scientist’s impact rather than that of a journal, informs this analysis. Country-wise distribution of paper publications is depicted in Figure 5. The United States leads the list with the highest number of author contributions (n = 4468). The United Kingdom closely follows with authors contributing (n = 4269) articles, while Indian researchers have published (n = 332) articles. Figure 6 reveals the most cited authors on

a global scale. Wang X. holds the top position, followed by Li X and Wang J. These authors have played a pivotal role in shaping the discourse within the field.

Figure 7 delves into collaborative analysis, offering insights into how authors from different countries engage in knowledge exchange within the field. A network illustrates author collaboration, where co-authors are clustered to visualize the landscape. To be part of the network, a country must have a minimum of 5 documents, resulting in 76 out of 168 countries meeting this criterion. In Figure 7, it is stipulated that authors must have a minimum of 2 documents, and each document can have a maximum of 5 authors. This assumption is based on the idea that each author is associated with at least two citations. This visual representation assists in pinpointing groups of research scholars and notable authors, where connections, fonts, and the sizes of colored elements in the network diagram signify robust associations between authors and countries. The paper's primary aim is to conduct a comprehensive literature review to explore the potential impact of sustainable finance. To address this, the research questions are formulated: a) What is the trajectory of publications in this research field? b) Which countries, organizations, publications, subject areas, and authors are dominant in this field? c) What are the primary research directions in this domain? d) What trends can be observed in past and present research topics, and what emerging areas are gaining traction?

To achieve these objectives, a rigorous methodology was employed, utilizing bibliometric analysis, systematic literature review, and comprehensive mapping analysis. The results offer a nuanced understanding of the field's development, trends, and areas of interest. The study's significance lies in its capacity to guide future research, address existing gaps, and inform scholars, policymakers, and stakeholders about the evolving landscape of sustainable finance. The analysis of author collaborations, co-citations, and co-occurrence of keywords enriches the understanding of the network of ideas, researchers, and concepts shaping the field. This comprehensive review contributes to the broader goal of advancing sustainable finance as a driving force toward a more sustainable future.

## **Conclusion**

For 29 years, this study has been examining and presenting the global scientific contributions related to sustainable finance over nations. The primary goal has been to conduct a comprehensive assessment of the existing research in the literature. However, it's important to acknowledge certain limitations in this study. Firstly, all the included articles are primarily

in English and originate from developed countries. Secondly, the study's timeframe spans from 1993 to 2022, excluding more recent articles from 2023. The study's data is sourced exclusively from "SCOPUS," neglecting other reputable journal databases like WOS, Google Scholar, and Elsevier. A more comprehensive analysis across various sources could potentially yield more robust outcomes.

The research highlights that researchers from the China, United Kingdom, USA and Italy and have garnered substantial attention within this domain. The study's findings can benefit both novice and established researchers by guiding them toward new research focal points, pertinent sources, and collaboration prospects, facilitating well-informed decisions. Through an exploratory bibliometric analysis, this study delved into publications concerning sustainable finance. In 2021 and 2022, topics of "sustainability" and "climate finance" were discussed, though most articles were not extensively explored to maintain the review's length, which stands as a limitation.

The study also unveiled a correlation between international scientific partnerships and the efficacy of sustainable finance research. Collaborative research with other countries exhibited greater citation impact compared to individual scientific output. This insight informs prospective researchers about emerging themes, contexts, and collaborative opportunities in these domains. The study sheds light on prevalent issues within the field, guiding the way toward potential research areas. As a result, this research holds valuable insights for the formulation of financial education and literacy policies.

## **Future Scope and Limitation**

- 1. Energize the Green Bonds Market:** Pioneering the expansion of the green bonds market is paramount. These bonds serve as a vital tool for financially underpinning eco-friendly development. They effectively tackle the notable requirements for funding green and low-carbon projects driven by the ongoing shifts in the tangible economy. Subsequent investigations into green bonds should thoroughly explore the complex interrelationships between green bonds and interconnected markets like the financial sector, carbon market, renewable energy market, and environmentally-focused stock market. Furthermore, it's imperative to gauge the interrelationship between the green bond market and macroeconomic stability across diverse countries, scrutinizing this correlation through both temporal and frequency dimensions. Scholars seeking guidance on measuring this relationship can

glean insights from the pertinent research conducted by (Boukhatem et al., 2021).

2. **Promote ESG Green Finance with Vigor:** The vigorous propagation of ESG (Environmental, Social, and Governance) green finance is of paramount importance. Subsequent research regarding ESG investment funds must deeply explore the intricate interplay between SRI (Socially Responsible Investment) funds and ESG ratings. This exploration should center on multifaceted aspects such as assessing ESG risks, enhancing ESG information disclosure practices, refining methodologies for ESG evaluation and rating, establishing criteria for evaluating ESG funds, and understanding the preferences of ESG investors. Simultaneously, just as the efficacy of international harmonization in corporate social responsibility information remains a subject of scrutiny, future ESG information disclosure efforts should strive to address the effectiveness of international harmonization.
3. **Foster Green Finance at the Corporate Level:** A decisive effort should be made to drive the evolution of green finance at the corporate level. Green finance acts as a conduit for channeling social capital into eco-friendly projects through avenues like loans, bonds, investments, and stock issuance. These ecologically conscious endeavors are increasingly being initiated and executed by specific companies. While green innovation offers the opportunity to improve resource efficiency, strengthen a company's reputation, and boost financial results, it's important to recognize that a company's commitment to sustainability and environmental decisions is greatly shaped by its corporate governance structures. Therefore, researchers are encouraged to delve deeper into uncovering the complex ways in which corporate governance influences the direction of green finance. Additionally, gaining insights into the responsibilities and strategies employed by financial institutions operating within corporate conglomerates to promote green finance represents a promising avenue for further investigation.
4. **Foundation for a "Green Recovery" Strategy through Green Finance:** In the aftermath of the COVID-19 pandemic, nations worldwide are confronted not only with the economic downturn instigated by the crisis but also with the pressing imperative of transitioning toward a low-carbon trajectory. While governments have responded with economic stimulus packages to counteract the socio-economic repercussions of the pandemic, these initiatives have often exhibited a misalignment with

environmental concerns. The "Greenness of Stimulus Index," a research project carried out by think tanks Vivid Economics and Finance for Biodiversity, highlights that just 12% of the COVID-19 stimulus plans in the world's top 30 economies were focused on reducing greenhouse gas emissions or supporting nature and biodiversity. Conversely, nearly 33% of these funds were directed toward industries with high carbon emissions. It's worth noting that Europe and the EU have shown their commitment to a sustainable post-COVID-19 recovery by allocating 25% of their EUR 750 billion recovery package to initiatives like energy-efficient infrastructure and investments in renewable and clean technologies. However, the escalation of the Russian-Ukrainian conflict, combined with rising inflation, has raised concerns about the global economic outlook and could potentially hinder the green recovery efforts of nations worldwide, particularly the European Union's ambitious green recovery goals.

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