

Research Patterns and Trends in Field of Sustainable Finance: A Bibliometric Study

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ABSTRACT

Sustainable finance is a rapidly evolving field of finance which has gained prominence for emphasizing investments that guarantee goals for sustainable development. Sustainable finance has become one of the most influential sectors in the world due to its growing modern developments in the financial industry. Although sustainable finance is a popular topic in the literature on sustainability, there is a dearth of systematic bibliometric analysis that offers a thorough evaluation of the area, clarifies the state-of-the-art, analyses new prospects, and offers potential guidelines for additional research. With this view, the study aims to comprehensively examine the sustainable finance as a research field over past twenty years by conducting a bibliometric analysis of 640 publications between 2003-2023 from the SCOPUS database. In order to identify the most significant authors, universities, countries, journals, reference papers, and prominent keywords and to learn about the research topics that researchers have been working on recently, the study intends to highlight collaborations between authors, universities, and countries in the field.

Keywords: *Bibliometric Study, Green Finance, Sustainable Finance, VOS Viewer.*

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INTRODUCTION

Globally, one of the most significant common goals is sustainable development. Sustainability is still a key idea in many fields and sectors of the economy. Expectations are rising that sustainable investing (SI), or investing that considers information related to environmental, social, and governance (ESG) would help society accomplish its objectives.

Incorporation of term sustainable finance stems from the validity of shareholder wealth maximization approach for creation of sustainable wealth. Fatemi et al. (2013) in their work suggests implementing a structure that formally acknowledges all incidental, incremental, and project-related costs and benefits, including those that have been externalized up to this point. They assert that the marketplace's shifting dynamics have made this paradigm transition necessary, and companies that don't implement the sustainable value creation model will fall behind their industry and see a slow decline in their market values.

The term "sustainable finance" describes any type of financial services integration that incorporating environmental, social, and governance (ESG) considerations into investment or company decisions is beneficial for customers as well as society overall. A new financial paradigm and evolving idea is sustainable finance. In the literature, it is precisely defined. According to Schoenmaker (2017), sustainable finance is defined broadly as finance that considers environmental, social, and governance (ESG) considerations while making financial decisions. Major environmental degradation and inequality that are included in the definitions of sub-disciplines of sustainable finance are referred to as subcategories of sustainable finance.

Sustainable finance is basically the application of financial capital to various activities of economy in such a manner that it generates positive impact on economy, environment and society. Sustainable finance is a fast-growing area of finance that has become well-known for prioritizing investments that support sustainable development objectives. As the globe grapples with pressing environmental and social issues, sustainable finance has grown in order to generate long-term financial returns to minimize adverse environmental and social ripple effects. To create a feasible impact on society and the environment, the businesses that practise sustainable finance are encouraged to raise funds.

Researchers have recently shifted their attention to the study of sustainable finance and have published numerous pertinent studies. By identifying pertinent intellectual limits, a literature review seeks to identify, clarify, organise, and assess the pertinent current literature in an objective, repeatable, and systematic manner (Tranfield et al. 2003). Nevertheless, with thousands of papers to sort through, there is a significant danger of missing fundamental issues and areas in need of further research improvement sectors. Who are the well-known academics conducting research on sustainable finance? Which organisations and nations collaborated closely? What changes may be seen in the research themes and development trends? All the issues require in-depth analysis. A thorough and in-depth analysis, as well as clearly defined contextual connections, are provided by a systematic review, which handles a large variation in the literature (Raghuram et al. 2010). To fix these problems, bibliometric analysis is required. Bibliometrics may provide us a comprehensive view on how knowledge is developing and where it is headed in a certain sector.

This study aims to do a bibliometric analysis of the literature on sustainable finance. The main objective of study is to identify the publication trend in the field and to know scholars involved in the research. To identify the institutions and countries which have close cooperations. To know the evolution of research themes and identify the development trends. To pinpoint the crucial subject areas, authors, and organisations, the study specifically examines the publications, citations, and co-authorship networks of sustainable finance research. It also look at how sustainable finance research has changed over time, pointing out any gaps and new developments.



LITERATURE REVIEW

The word "SF" is propose to be understood by (Jaeggi et al.,2018) as a "collective notion that covers sustainable finance techniques" in their study. Such tactics are intended to reduce the risks and take advantage of the possibilities that arise from the interaction between financial concerns and sustainability issues. (Soppe 2009) in their study highlighted the term Sustainable corporate finance (SCF) as an integrated approach to business financing that ensures social, environmental, and financial concerns (termed as the "triple bottom line," or TBL) are interrelated and incorporated into a system that is explicitly created between the present and future generations. For instance,

(Huerga and Rodriguez-Monroy, 2019) asserted that a SCF system aids in the development of balanced economies that are not adversely affected by the usage of surplus debt. Due to enterprises' internal finance advantages in marketplaces with sustainability drivers incorporated. While creating and putting into place successful policies that target economic development, policymakers should not ignore the repercussions on the environment or society. One must not undervalue the role of financial capital, one of the most significant drivers of all economies, if one is to attain prosperity in a society via more strong, egalitarian, and sustainable economic growth.

According to (Scholtens, 2006), finance is oil to the economy. As a result, it may also have an impact on the company's economy and social responsibility. The financial system must adjust by embracing continuous improvement and principles and incorporating them into all its internal operations (as the primary provider of financial capital). In course of reality, while allocating their resources to investment opportunities, all participants in an economy, including financial institutions, must take the environment, society, and government into consideration.

- (Sertsios, 2020) offered organisational structures that are directly related to early SCF choices and aid in the creation of sustainable long-term cash flows. It is crucial for businesses to maintain an equilibrium between TBL and sustainability. According to Chomsky's research from 2007, unethical behaviour might result in societal externalised costs while privatising further gains. Moreover, (Sharma and Starik, 2002) suggested sustainability hurdles to enterprises implementing these activities into their operations since they impede economic development and social welfare improvements.

Work of Muneer M Alshater (2021) uses bibliometric indicators to analyse publications and citations in addition to bibliographic coupling, keyword analysis and content analysis. Network analysis shows that the popularity of 'Sustainable finance' and 'ESG' topics has increased, while that of 'Corporate governance' and 'Socially responsible investment' has declined. Bibliographic coupling analysis shows that the major themes published in JSFI involve four main clusters: 'Corporate social responsibility and sustainable development'; 'Sustainable finance and green bonds'; 'Corporate governance and ESG'; and 'Responsible investment and pension funds'.

(Purnomo A et al., 2021). identified most productive countries, individual researchers, research institutions. The study identifies key themes as BCFSP (Bank, Country, Finance, Sustainable and Policy). (Luo Wenbing et al., 2022) studied global evolution research on sustainable finance and identified key search topics at different time and how research topics have evolved over time.

The present study complements the previous bibliometric studies and contributes to the literature. The present research focuses on trend of publications, co-authorship, keyword clusters and emerging keywords. The relevance of this research resides in its potential to impact investment strategies, lead regulatory choices, and stimulate innovation in sustainable finance. The promotion of sustainable development and addressing urgent global issues like climate change, social injustice, and environmental degradation can then be addressed by this.

After introduction and literature review the paper describes the methodology about database, keywords search terms and inclusion, exclusion criteria in section 2. Section 3 describes the bibliometric performance analysis and finally Section 4 highlights the findings and conclusion of the study.



METHODOLOGY

Database, Keywords & Inclusion

The data for the study was acquired from the SCOPUS Database on April 3, 2023. The study period for extracting articles spans for 20 years from 2003 until April 2023. The data was obtained in order to compile the pertinent information for the study. The relevant publications were thus searched using a series of acceptable search terms (TITLE-ABS-KEY ("SUSTAIN*" AND "FINANC*" AND "DEVELOP*" OR "GREEN")). The keywords for search statement initially represented 902 results. Inclusion and exclusion criteria were applied to raw data to filter out the search results. First of all, the disciplines which were not relevant for the search were not relevant for the search were excluded and publications were limited to English language articles only. Further, publications were limited to journal articles and conference proceeding articles only. After inspecting articles on the basis of reading abstracts, the final sample consists of 640 papers which were analyzed bibliometrically through VOS Viewer software.

BIBLIOMETRIC PERFORMANCE ANALYSIS

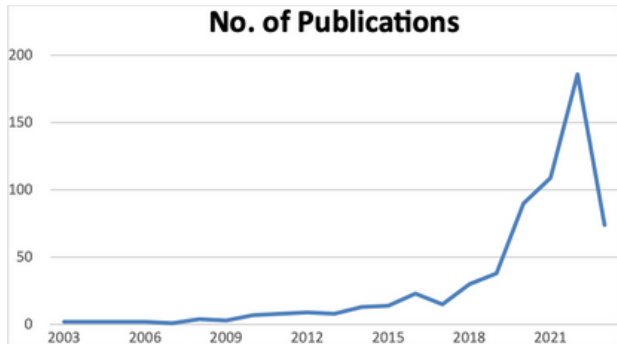


Figure 1 Total Number of Publications (Author's Own)

Figure 1 illustrates the growing number of publications published in the field of sustainable finance with each passing year. In order to support consistent, equitable, and sustainable economic growth, the SDGs were made more actionable after July 6, 2017. Growth that had not been seen in the previous 10 years was seen after 2017 due to a change in the pattern. Therefore, the primary focus of current research is on the sustainability and applicability of sustainable finance for sustainable development. This pattern indicates that it will be the subject of future study.

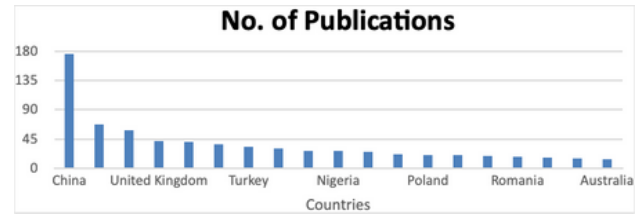


Figure 2 Number of Publications (CountryWise) (Autjor's Own)

The 640 publications under study originates from around 57 countries out of which top 20 countries are shown in Figure 2. China holds a remarkable position with around 180 publications and tops the list. Even pakistan has good academic research contribution followed by Russian Federation, UK and US. India is at 6th position showcasing way for further scope of research in the domain. Countries like Taiwan, Bangladesh and Australia appears to have made a meagre contribution.

Table 1 : Co-Authorship (Authors)

Author	Documents	Citations	Total Link Strength
Kirikaleli D.	6	551	3
Adebayo T.S.	8	427	7
Zakari A.	3	238	3
Haas C.T.	3	203	9
Knight M.A.	3	203	9
Rehan R.	3	203	9
Unger A.J.A.	3	203	9
Khan M.K.	4	172	4
Wang X.	4	141	1
Ionescu L.	4	140	0
Rjoub H.	3	131	4
Ozturk I.	3	127	1
Venturelli A.	3	122	0
Odugbesan J.A.	3	115	3
Khan I.	3	109	2
Irfan M.	4	106	5
Wang Y.	8	103	0

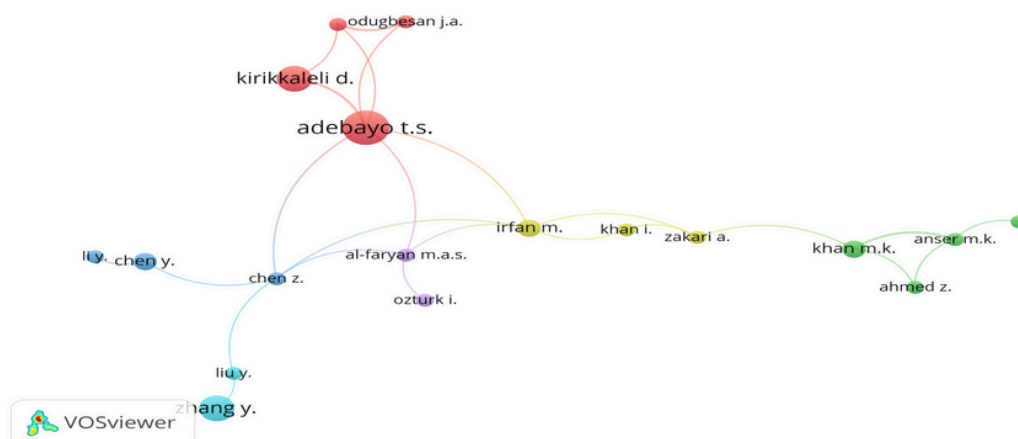


Figure 3: Network visualization map of the co-authorship (Authors) (Autjor's Own)

Notes: Unit of analysis = Authors

Counting method: Full counting

Minimum number of documents of an author = 3

Minimum number of citations of an author = 10

As depicted in Figure 3, the network visualisation map of co-authorship demonstrates the most prolific authors and their collaborations with each other. Out of 1792 authors, only 41 fulfil the minimal requirement of three documents with a minimum of 10 citations and of those, only 18 are linked. This demonstrates lack of co-authorship in this specific area of study. Although significant co-authorship ties have been discovered in organisations and nations. The network demonstrates various clusters of authors as well who are working who are working on

similar topics. With six documents cited, author Kirikkaleli D. has the highest number of citations, however the links do not appear to be sufficient. Adebayo T.S. has eight documents, which is greater, but has fewer citations. Considering this, Kirikkaleli D.'s work is more relevant. Despite less citation, link strength is good for the studies of Haas C.T., Knight M.A., Rehan R. and Unger A.J.A highlighting the relevance of their work for others.

Table 2 Co- Authorship (Organizations)

Organization	Documents	Citations	Total Link Strength
School Of Management and Economics, Beijing Institute Of Technology, Beijing, 100081, China	4	190	1
Spiru Haret University, Bucharest, Romania	4	140	0
Department Of Business Administration, Ilma University, Karachi, Pakistan	4	128	4
Riphah School Of Business and Management, Riphah International University, Lahore, Pakistan	3	53	3
School Of Management and Economics, Beijing Institute Of Technology, Beijing, China	3	50	4
Center For Energy and Environmental Policy Research, Beijing Institute Of Technology, Beijing, China	3	48	4
Department Of Psychology, Plekhanov Russian University Of Economics, Moscow, 115093, Russian Federation	3	10	0

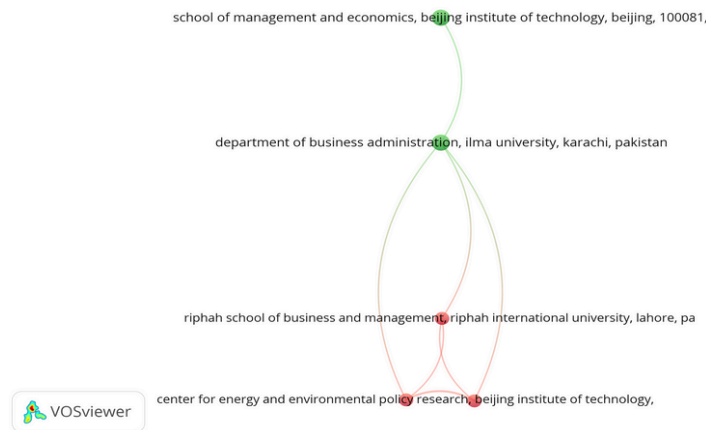


Figure 4: Network visualization map of the Co- Authorship (Organizations) (Autor’s Own)

Notes: Unit of analysis = Organisations

Counting method: Full counting

Minimum number of documents of an organisation = 3

Minimum number of citations of an organisation = 10

Figure 4 network visualisation map of co-authorship illustrates that only seven of the 1586 organisations fulfil the requirement of three documents with a minimum of 10 citations, and of those, only five are related. The 3 organisations with 4 documents have the maximum citation of 190,140 and 128.

This demonstrates the degree to which organisations collaborate in this specific area of study. This represents China and Pakistan are major centers of research excellence in domain of sustainable finance and also opens the doors of research for India.

Table . 3 Co-Authorship (Countries)

Country	Documents	Citations	Total Link Strength
China	176	2397	134
Pakistan	67	1177	100
Turkey	33	1143	60
United states	42	800	46
United Kingdom	42	712	51
Spain	31	662	21
India	37	543	30
Nigeria	26	511	27
Italy	25	501	14
Canada	14	462	20
Taiwan	16	414	20
Australia	14	386	19
France	13	328	18
Vietnam	13	315	11
Switzerland	5	311	5
Malaysia	22	292	23
Hong Kong	11	272	8
Russian federation	59	248	28
South Africa	19	217	16
Japan	6	216	4

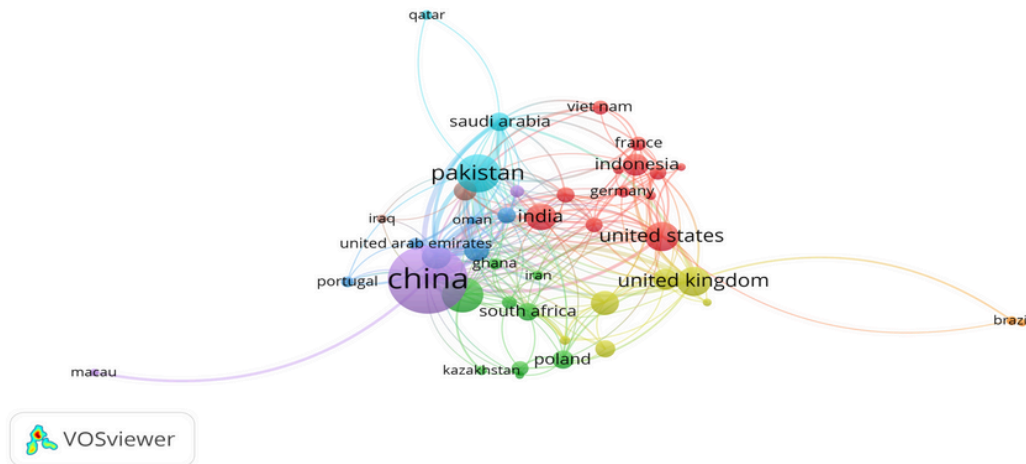


Figure 5: Network visualization map of the Co-Authorship (Countries) (Autjor’s Own)

Notes: Unit of analysis = Countries

Counting method: Full Counting

Minimum number of documents of a Country = 5

Minimum number of citations of a Country = 10

Table. 4 Co-Occurrence (Author Keywords)

Keyword	Occurrences	Total Link Strength
Sustainable Development	153	166
Financial Development	80	135
Green Finance	59	84
Sustainability	50	76
Financial Inclusion	35	59
Environmental Sustainability	32	69
Economic Growth	29	71
Sustainable Development Goals	28	38
Financial Performance	26	31
Corporate Social Responsibility	23	35
Renewable Energy	21	39
China	20	32
Climate Change	19	35
Sustainable Finance	19	26
SDGs	15	24
Co2 Emissions	14	31
Developing Countries	11	14
Energy Consumption	10	22
Energy Efficiency	10	17
Financial Sustainability	10	4
Natural Resources	10	21
Sustainable Economic Development	10	14

Figure 5's network visualisation map of co-authorship demonstrates that out of 100 countries only 43 meets the minimum threshold of 3 documents with minimum 10 citations. This reveals the weak co-authorship among countries in this particular field of research. This demonstrates how inadequately different nations collaborate on this specific area of study. Inconsequential co-authorship ties have also been discovered in organisations and nations. India ranks seventh in this domain yet the majority of publications, citations and connections are from China, Pakistan and Turkey.

Numerous papers from the Russian Federation support this assertion, however the citation is rather weak. The number of papers from Russian Federation are in top 3 as per numbers but citation is very weak symbolising weak co-authorship and less relevance of work for cross cultural issues. Countries like Germany, Netherlands and Bangladesh seem to have made a meagre contribution.

Over the years, a plethora of minor keywords arose. Among the buzzwords in the centre are "financial development" and "sustainable development." In terms of frequency, these were the search terms that were already at the top of the rankings. Recent trends include research on COVID 19, financial development, and economic growth. Using keyword co-occurrences, new themes and subjects with a wider reach are found. Analyses that are connected to other media have started to appear. The new trends discovered include research interests in developing subjects such as green finance, which is being discussed in the majority of articles.



FINDINGS

Based on SCOPUS database, a total of 902 records related to sustainable finance research in some specific fields between 2003 and April 2023 are studied. The study utilizes a bibliometric approach to analyze the trend of publications, co-authorship among authors, organizations and countries, keyword clusters and emerging keywords. In order to help scholars and practitioners identify the research interests and emerging themes in sustainable finance and thus improve their comprehension and assessment of the field, this paper conducts a thorough search of the literature on sustainable finance. It also uses the bibliometric analysis method to visualise the knowledge structures and developments within sustainable finance research. The exponential growth in literature can be witnessed in last decade in response to various initiatives taken globally in context of sustainable finance. In recent years, academia has witnessed growing attention towards research in the domain of sustainable finance specially after 2017. This study adds to the growing body of literature on sustainable finance. This research assists in improvement the transition to a more sustainable future by illuminating the major trends, obstacles, and possibilities in sustainable finance.

Co-authorship networks helps in investigating research collaborations and provides opportunities to investigate its structure. Collaboration in research is a crucial process that connects disparate information and competences to generate new ideas and research directions. Lack of co-authorship among authors is witnessed in this specific area of study which highlights the scope of further cross border studies to be conducted in the domain of sustainability. Understanding co-authorship networks from an interdisciplinary standpoint is crucial. Co-authorship for organizations and countries witness a good link between China and Pakistan. China and Pakistan are major centers of research excellence in domain of

The study identifies the top search terms from 2000 to 2021, including renewable energy, carbon credits, green financing, climate change, and socially conscious investing; The hottest research topics from 2016 to 2021 included responsible investing, green bonds, low-carbon transition, vulnerable countries, low-carbon investment, business models, financial development, supply chains, conventional investment conundrum, sustainable financing, environmental investment and green credit policy; Between 2000 and 2021, research papers on socially responsible investment served as a valuable source of knowledge for sustainable financial research. Among the research topics with the greatest transformative potential between 2016 and 2021 were socially responsible mutual funds, green finance, green bonds, ESG investor preferences, and the COVID-19 effect.



CONCLUSION

The UN SDGs and sustainability have garnered more attention, and this has led to a corresponding focus on financial inclusion—bringing money to all facets of society in order to maximize benefits. Ensuring that everyone benefits from sustainable balanced development is the main goal of financial inclusion.

Emerging keywords include financial inclusion, sustainable development, green finance, financial development and energy efficiency and there is further scope of research for the same. These major keywords identify that sustainable development is majorly linked with financial development, sustainable finance, financial inclusion and green finance. This keyword identification highlights the importance of sustainable finance in achieving sustainable development goals. This is also supported by the work of Ziolo M. et al. (2021), their study looks at the relationship between sustainable financing and the SDGs and elaborates on the need of the sustainable financing model is essential to the implementation of the Sustainable Development Goals. The study's findings indicate that in the group of nations under analysis, better SDG attainment occurs when the funding model is more sustainable. According to reports from the World Bank and International Monetary Fund, increasing development money is necessary to meet the 17 Sustainable Development Goals (SDGs). The importance of accelerating financial innovation to achieve the SDGs was emphasized in the report Scaling Finance for the Sustainable Development Goals. It is undeniable that finance plays a crucial part in accomplishing the SDGs.

The study makes a fresh contribution to the body of literature by offering a thorough explanation of the practices sustainable finance as they exist now. Simultaneously, noteworthy consequences for the potential viewership enhance the research's significance. Policymakers, regulatory agencies, aspiring academics, environmentalists, and investors should take note of the study's conclusions because they offer a useful framework for implementing sustainable practices, weighing the pros and cons of business ventures against environmental risks, and generating value from environmentally friendly research and practice.

As identified in the study, we can focus on financial issues like financial inclusion for the

purpose of achieving Sustainable Development Goals and emerging concepts of Green Finance and Green Bonds can also be studied in detail in context of sustainability.

The relevance of this research resides in its potential to impact investment strategies, lead regulatory choices, and stimulate innovation in sustainable finance. The promotion of sustainable development and addressing urgent global issues like climate change, social injustice, and environmental degradation can then be addressed. The field is rapidly changing, creating new opportunities for future study.

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