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GREEN FINANCE FOR SUSTAINABLE DEVELOPMENT: A BIBLIOMETRIC ANALYSIS

SÜRDÜRÜLEBİLİR BİR KALKINMA İÇİN YEŞİL FİNANS: BİBLİYOMETRİK BİR ANALİZ

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ABSTRACT

Sustainability is an investment plan that must be implemented in order to reduce the future concerns of economic units. Green finance refers to investment decisions to be made in the financial resources of the future for sustainable development. At the same time, green finance enables economic units to direct their attention to sustainable financial resources in terms of protecting the environment and reducing climate change. Climate change is one of the factors that prevent long-term planning that must be solved worldwide. Economies are making more efforts to reduce environmental greenhouse gas emissions and transfer financial resources to sustainable investments, as well as the efficient use of resources. This article has presented an overview of green finance for sustainable development, foregrounding the bibliometric analysis of selected literature. The bibliometric review was conducted to quantitatively examine 495 publications verified by Web of Science. Academic literature covers the periods 2017 to 2024. The intellectual structure and bibliometric analysis of the articles included in the research were made using R programming and R-studio software. Our study shows that the number of academic studies on green finance has increased, especially after the pandemic period that started in 2020, when production decreased and consumption increased significantly.

Keywords: *Green Finance, Sustainability, Bibliometric Analysis*

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ÖZ

Sürdürülebilirlik, ekonomik birimlerin gelecek kaygılarının azaltılması adına uygulanması zorunlu olan bir yatırım planıdır. Yeşil finans, sürdürülebilir bir kalkınma için geleceğin finansal kaynaklarına yapılacak yatırım kararlarını ifade etmektedir. Aynı zamanda yeşil finans, çevrenin korunması, iklim değişikliğinin azaltılması noktasında ekonomik birimlerin dikkatini sürdürülebilir finansal kaynaklara yönlendirilmesini sağlamaktadır. İklim değişikliği dünya genelinde çözülmesi zorunlu olan uzun vadeli planlamaları engelleyici faktörlerden biridir. Ekonomiler, kaynakların etkin kullanımının yanı sıra çevresel sera gazı emisyonlarının azaltılması ve mali kaynakların sürdürülebilir yatırımlara aktarılması konusunda daha fazla gayret göstermektedirler. Bu makale, seçilen literatürün bibliyometrik analizini ön planda tutarak, sürdürülebilir kalkınma için yeşil finansa genel bir bakış açısı sunmuştur. Bibliyometrik inceleme, Web of Science ile doğrulanan 495 yayını niceliksel olarak incelemek için yapılmıştır. Akademik literatür 2017 ile 2024 Dönemlerini kapsamaktadır. Araştırmaya dahil edilen makalelerin fikri yapısı ve bibliyometrik analizi R programlama ile R-stüdyo yazılımını kullanarak yapılmıştır. Çalışmamız yeşil finans konusunda yapılan akademik çalışmaların sayısının özellikle üretimin azaldığı, tüketimin ise önemli oranda yükseldiği, 2020 yılında başlayan pandemi döneminden sonra arttığını göstermektedir.

Anahtar Kelimeler: *Yeşil Finans, Sürdürülebilirlik, Bibliyometrik Analiz*

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Genişletilmiş Özet

Yeşil finans, sürdürülebilir kalkınmanın sağlanması ve iklim değişikliği ile ilgili çevresel bozulmaların önlenmesi adına kilit rol oynamaktadır. Kaynakların etkin kullanımına imkân sağlamasının yanında özellikle finansal enstrümanların çevreyi koruyacak yatırım türlerine aktarılmasında da aracılık hizmeti görmektedir. Dolayısıyla yeşil finans, finans sektörünün, çevre korunmasının ve ekonomik büyümenin kesişiminde yer almaktadır (Andreeva ve diğ., 2018). İklim değişikliği çevresel bozulmalara neden olduğu gibi ülkelerin finansal sistemleri için zorluklar ve zorunluluklar ortaya çıkarmaktadır. Yeşil finans, ekonomik, çevresel ve sosyal açıdan sürdürülebilir kalkınmanın önünü açan uygulanması zorunlu politikaların başında gelmektedir. Hem özel hem de kamu sektörü tarafından daha fazla kaynak yaratılması, daha düşük karbonlu ve daha dayanıklı ekonomilere geçişi hızlandıracaktır. G20 yeşil finansman çalışması, yeşil finansmanı, çevresel açıdan sürdürülebilir kalkınmanın sağlanmasına yönelik daha geniş bağlamda çevresel faydalar sağlamayı amaçlayan finansal yatırımlar olarak tanımlamıştır (Long ve Blok, 2021). Çevresel faydanın artırılması yönünde çevreyi direkt etkileyebilecek projelerin finansmanında birçok yeni finansal ürün ve yöntem ortaya çıkmıştır. Bu finansal ürünler ve yöntemler, yeşil tahviller, yeşil kredi, iklim finansmanı, karbon finansmanı, sürdürülebilir finans, yeşil bankalardır (Desalegn ve Tangl, 2022).

Sürdürülebilirlik kavramı "dayanıklı" ve "kalıcı" anlamına gelerek kalıcı kalkınmayı ifade etmektedir (Pearce ve diğ., 1994). Bu kavram çevresel sorunlar ve çevre yönetimi ile ilgili politikaların geliştirilmesi ile ilgili yapılan bilimsel araştırmalarda büyük önem kazanmıştır (Rugerio, 2021). Sürdürülebilir kalkınma, 1987 yılında Brundtland Raporunda ortaya çıkmasından bu yana çevreyle ilgili bilimsel araştırmalar için bir referans haline gelmiş ve kalkınma için bir paradigma niteliği kazanmıştır (Alvarado-Herrera ve diğ., 2017). Brundtland Raporunda, sürdürülebilirliğin sosyal, ekonomik ve çevresel boyutları arasındaki bağımlılık vurgulanmıştır (Silvestre ve Tirca, 2019). Bu kapsamda Elkington (1997), "üçlü sonuç" olarak adlandırılan yöntemi kullanarak, iş ve politika kararları alınırken finansal, çevresel ve sosyal boyutların eşit derecede dikkate alınması gerektiğini öne sürmüştür.

Bu çalışma sürdürülebilir kalkınma için yeşil finans'ın önemini aktaran çalışmalardan biridir. Çalışmada belirlenen araştırma başlıkları akademisyenlerin, uygulayıcıların ve politika belirleyicilerin sürdürülebilir kalkınmanın sağlanması adına yeşil finans'ın geliştirilmesi gerekliliğinin anlaşılmasına yardımcı olacaktır. Bununla birlikte izah edilmek istenen konu hakkında doğru bir anlayış oluşturmak, gelecekteki araştırmalara fayda sağlamak adına literatüre rehber bir çalışma sağlanması arzu edilmektedir.

Bu çalışmada, bibliyometrik bir inceleme yaparak sürdürülebilir kalkınma ve yeşil finans kavramlarını geliştiren, ilgili literatüre katkı sağlayan çalışmaların tespit edilmesi amaçlanmıştır. Bibliyometrik tarama ilk olarak, Web of Science'da 2017 -2024 yılları arasında makalelerin başlığında yer alan "sürdürülebilir kalkınma" ve "yeşil finans" kriterleri kullanılarak gerçekleştirildi. Günümüzde Web of Science mevcut akademik literatürün büyük bir yüzdesine sahip olan bir veri tabanıdır (Mongeon ve Paul-Hus, 2016). İkinci olarak makaleler, genişletilmiş bilim atıf indeksi (SCIE), sosyal bilimler atıf indeksi (SSCI), sanat ve beşerî bilimler atıf indeksi (A&HCI) ve yükselen kaynak atıf indeksi (ESCI) gibi indekslerin birinde indekslenme şartı ile taranmıştır. Analiz, sıkı ve sistematik dahil etme ve hariç tutma kriterlerinden sonra toplanan yayınlanmış makalelere ilişkin veri kümesine dayalı olarak gerçekleştirilmiştir. Bibliometric R-Studio yazılımı, bibliyometrik haritaların yorumlanması ve incelenmesi için sağlam bir arayüze sahip olduğundan, veri setinin daha kolay yorumlanması için grafiksel olarak temsil edilmesine yardımcı olur (Komiyama ve Yamada, 2018). Analiz, sıkı ve sistematik dahil etme ve hariç tutma kriterleri sağlandıktan sonra seçilen 495 yayınlanmış makalenin veri setine dayanmaktadır.

R programlama ile R-stüdyo yazılımını kullanarak Bibliometrix ve Biblioshiny paketi kullanarak elde edilen veriler Tablo 1'de gösterilmektedir. Veriler incelendiğinde Web of Science veri tabanında sürdürülebilir kalkınma için yeşil finansman ile ilgili yayınların başladığı 2017 yılından itibaren 1096 yazar tarafından 166 farklı dergide 495 farklı makale yayımlandığı görülmektedir. Tabloda makale başına düşen ortalama atıf 17, belge ortalama yaşı 1,62, yayınların yıllık büyüme oranı %50,2 ve toplam referans sayısı ise 22.016 olarak gösterilmektedir. Yayınlarda kullanılan toplam anahtar kelime sayısı 660, tek yazarlı yayın sayısı 56, doküman başına ortak yazar sayısı 3,04 olarak hesaplanmıştır. Yayın sayıları dikkate alındığında en fazla çalışmanın 13 yayınla Taghizadeh-Hesary ve Wang Y, ve 11 yayınla Wang X ve Zhang J tarafından yapıldığı görülmektedir.

Yeşil finans, çevrenin korunması, iklim değişikliğinin azaltılması ve uyum ile ilgili tüm finansal unsurları ve faaliyetleri içermektedir (Bhatnagar ve Sharma, 2022). Bulgulara dayanılarak, gelecek nesillere aktarılabilecek kalkınma imkanları için yeşil finansmana ilişkin mevcut literatürün geliştirilmesi ve politika yapıcılara daha geniş bakış açısı sağlanabilmesi adına niceliksel yaklaşımlar kullanılarak ekonomik ve finansal açıdan daha ileri çalışmaların yapılması önerilmektedir.

Introduction

Green finance plays a key role in ensuring sustainable development and preventing environmental degradation related to climate change.In addition to enabling the effective use of resources, it also serves as an intermediary in the transfer of financial instruments to investment types that will protect the environment.Therefore, green finance is located at the intersection of the financial sector, environmental protection and economic growth (Andreeva et al., 2018).Climate change not only causes environmental degradation, but also poses challenges and obligations for the financial systems of countries.Studies show that a high proportion of fossil fuels leads to a dangerous scenario. In this case, the action to be taken is to reduce global warming by 2 ºC by keeping economies at a low carbon level.Low carbon mitigation brings with it a new challenge that involves reducing carbon emissions through the adoption of sustainable renewable energies and greater conservation of energy (Elie et al., 2021).

Green finance is one of the mandatory policies that pave the way for sustainable development in economic, environmental and social terms.Greater resource creation by both the private and public sectors will accelerate the transition to lower-carbon and more resilient economies.The G20 green finance study defined green finance as financial investments aimed at providing environmental benefits in the broader context of achieving environmentally sustainable development (Long and Blok, 2021).Many new financial products and methods have emerged in the financing of projects that can directly affect the environment in order to increase environmental benefits.These financial products and methods are green bonds, green credit, climate finance, carbon finance, sustainable finance and green banks (Desalegn and Tangl, 2022).

Green finance aims to promote a green economy, where financed industries are expected to greatly reduce emissions.Thus, the green economy has three advantages.First, customers' improved quality of life creates greater potential for corporate growth than traditional operations.Second, the green economy promotes environmental awareness and enables the market to protect the environment by adopting green energy and using low-carbon products.The third is a social impact, in which communities surrounding production zones enjoy the benefits of corporate social responsibility provided by the green finance fund, including the availability of clean water and air (Al-Sheryani and Nobanee, 2020).In short, green finance can be considered a superset of the self-sustaining financial system approach to overcoming the challenges arising from climate change and the transition to a low-carbon society (Malhotra and Thakur, 2020).

The concept of sustainability means "durable" and "permanent" and indicates permanent development (Pearce et al., 1994).This concept has gained great importance in scientific research on environmental problems and the development of policies regarding environmental management (Rugerio, 2021).Sustainable development has become a reference for environmental scientific research and a paradigm for development since its emergence in the Brundland Report in 1987 (Alvarado-Herrera et al., 2017).In the Brundtland Report, the dependence between the social, economic and environmental dimensions of sustainability was emphasized (Silvestre and Tirca, 2019).In this context, Elkington (1997), using the so-called "triple bottom line" method, suggested that financial, environmental and social dimensions should be taken equally into account when making business and policy decisions.Sustainable development goals were first introduced in 2015 to ensure a more sustainable future for everyone and to follow the path of sustainability until 2030.These goals are a set of interconnected measurable targets designed to address interrelated challenges and achieve global sustainable development (Mio et al., 2020).

One of the main problems that countries have faced recently is the financing of climate-friendly projects.Low carbon financing is an existing financial policy designed to finance a low-carbon economy (Jiguang and Zhiqun, 2011).Green financing is an important factor in supporting sustainable development by providing the necessary financial support to projects that support environmental sustainability (World Bank, 2018).Additionally, green financing promotes more sustainable economic

development while promoting new skills and tools that have the potential to reduce greenhouse gas emissions (European Investment Bank, 2019).

This study is one of the studies that convey the importance of green finance for sustainable development.The research topics determined in the study will help academicians, practitioners and policy makers understand the necessity of developing green finance in order to ensure sustainable development.In addition, it is desired to provide a guide to the literature in order to create a correct understanding of the subject to be explained and to benefit future research.

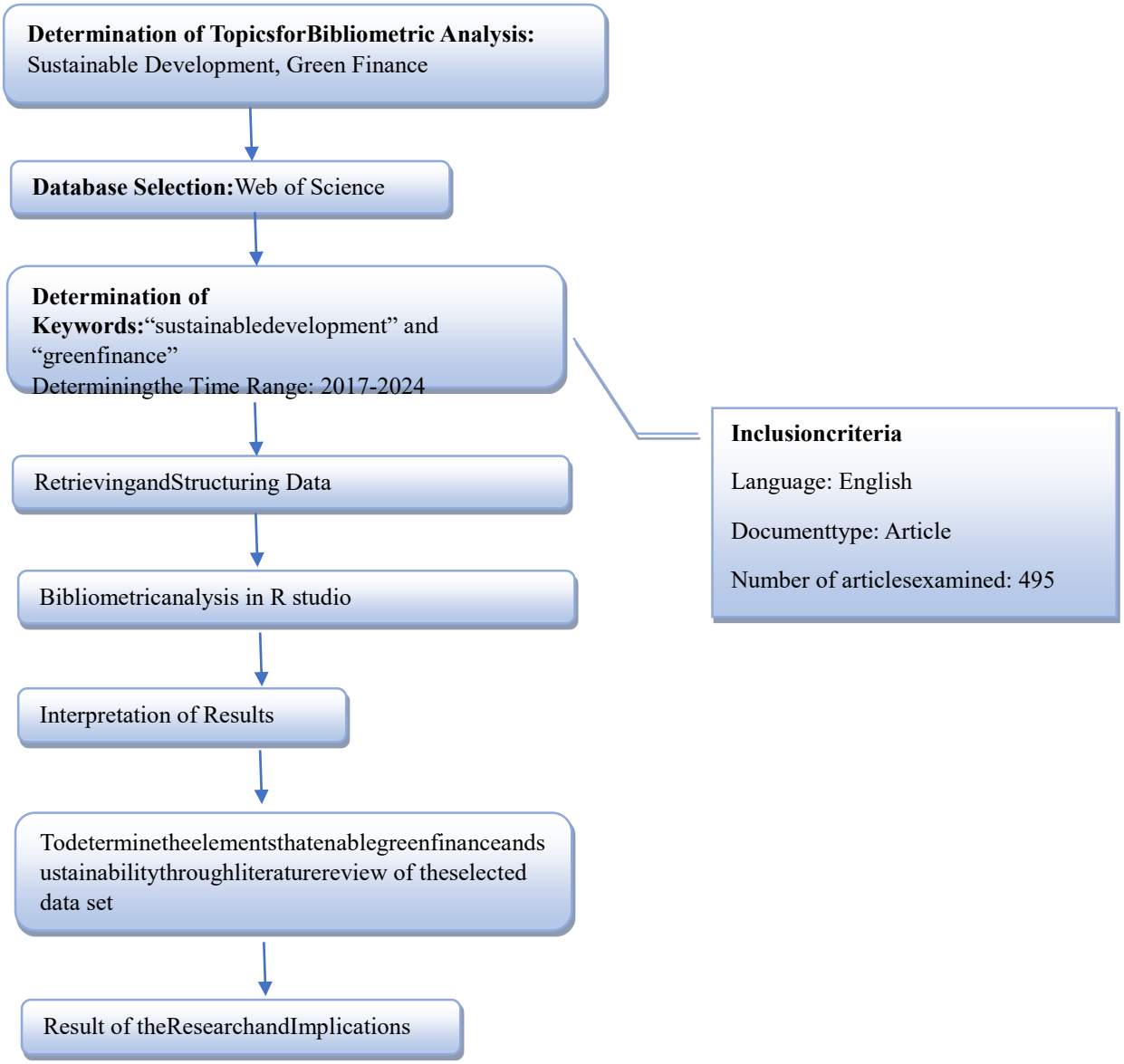
1.Research Methodology

Bibliometric analysis was first used by Pritchard (1969) and has gained wide popularity to aid quantitative analysis in understanding the literature (Zhang et al., 2019).Bibliometric analysis involves analyzing and researching selected literature using mathematical and statistical methods (Gutiérrez-Salcedo et al., 2018).Bibliometric method includes; quantitative indicators measuring productivity, qualitative indicators assessing impact, structural indicators measuring connections and interactions between scientific actors (Durieux and Gevenois, 2010).

In this study, it is aimed to identify studies that develop the concepts of sustainable development and green finance and contribute to the relevant literature by conducting a bibliometric analysis.Bibliometric scanning was first carried out using the "sustainable development" and "green finance" criteria in the titles of the articles in Web of Science between 2017 and 2024.Today, Web of Science is a database that contains a large percentage of the existing academic literature (Mongeon and Paul-Hus, 2016).Secondly, the articles were scanned with the condition of being indexed in one of the indexes such as extended science citation index (SCIE), social sciences citation index (SSCI), arts and humanities citation index (A&HCI) and emerging source citation index (ESCI).

Data cleaning, formatting and analysis were performed using R Studio.The analysis was performed based on a dataset of published articles collected after strict and systematic inclusion and exclusion criteria.Since Bibliometric R-Studio software has a robust interface for interpreting and examining bibliometric maps, it helps in graphically representing the dataset for easier interpretation (Komiyama and Yamada, 2018).The analysis is based on a dataset of 495 published articles selected after strict and systematic inclusion and exclusion criteria were met.

Figure 1: *Research Process Adopted in the Study*



2. Findings and Results

The analysis performed on a dataset of 495 records is concerned with organizing past research to understand the evolution of the literature, identify research trends, and suggest future research avenues.Therefore, the following section provides information on publication trends, relevant sources, subject areas, authors' data, and the thematic structuring of the data.

2.1. Main Information

The data obtained using R programming and R-studio software using the Bibliometrix and Biblioshiny packages are shown in Table 1.When the data is examined, it is seen that 495 different articles have been published in 166 different journals by 1096 authors since 2017, when publications on green financing for sustainable development began in the Web of Science database.The table shows the average citation per article as 17, the average age of the document as 1.62, the annual growth rate of publications as 50.2%, and the total number of references as 22.016.The total number of keywords used in publications was calculated as 660, the number of publications with a single author was 56, and the number of joint authors per document was 3.04.

Table 1: *General Information About Publications*

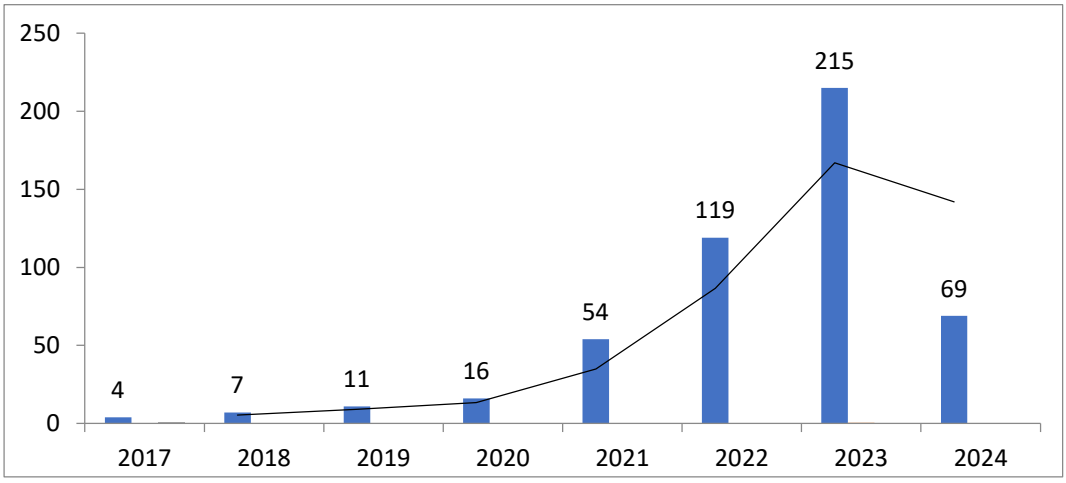
Main Information About Data	
Time range	2017:2024
Resources	166
Articles	495
Annual growth rate %	50.2
Document average age	1.62
Average citation per document	17
References	22016
Document content	
Keywords	660
Keywords used by authors	1345
Authors	
Author view counts	1096
Number of authors of single-author publications	56
Author collaboration	
Number of single author publications	62
Co-authors per document	3.04
International co-authorship rate %	33.94

Source: *Biblioshiny, based on WoS dataset*

2.2. Publication Trend

Figure 2 shows the time distribution of articles over the observed period, covering the years from 2017 to 2024.The observed period is divided into two depending on the volume and variability of the number of publications.While the first period covers the years from 2017 to 2021, the number of publications analyzed in this period is 92 and this number represents 18.5% of the total number of articles.The second period covers the years 2022 and 2024.During this period, 403 articles were published, which is 81.5% of the total articles.Especially in 2023, the publication peak was reached with 215 articles.It can be said that the pandemic period, which affected the whole world in 2020, caused people to be more inclined towards sustainability and green finance issues, especially from 2021 onwards.

Figure 2: *Distribution of Articles by Time*



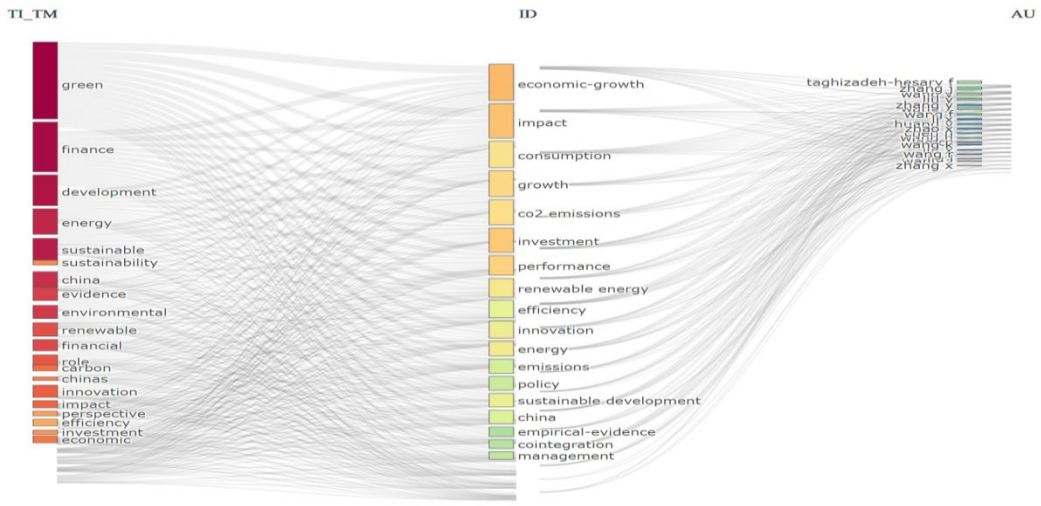
Source: *Biblioshiny, based on WoS dataset*

2.3. Three Fields Analysis of Green Financing for Sustainable Development

Figure 3 shows the titles on the left, the most cited authors on the right, and the keywords in the middle. The three-field chart helps visualize academic literature based on three selected fields.

Diagrams help locate important contribution to the flow system. The width of the flow band is proportional to the contribution of the element of that specific area (Bhatnagar and Sharma, 2022). As seen in Figure 3, the titles of publications on green finance in sustainable development mostly include the expressions green, finance, development and energy. The connection between authors and keywords shows that most authors publish literature related to economic growth, impact and investment.

Figure 3: *Three Areas Analysis of Green Financing in Sustainable Development*

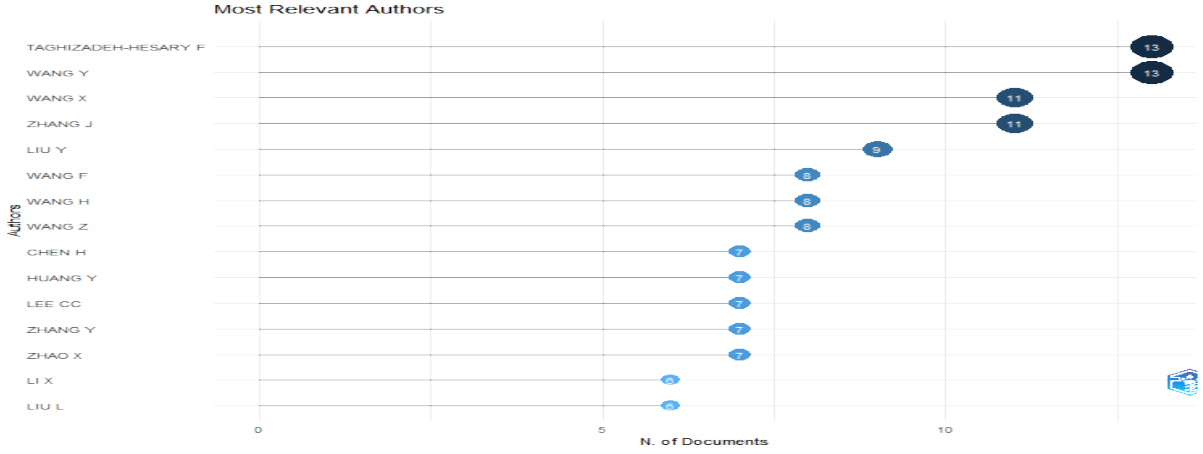


Source: *Biblioshiny, based on WoS dataset*

2.4. Most Productive Author

Prolific authors are those who contribute the most to the discipline of study, and this analysis helps gain insight into the authors' overall work based on a set of articles, co-authorships, and citations received (Kumar et al., 2021).Figure 4 shows the publication numbers of authors working on the research topic.Considering the number of publications, it can be seen that the most studies were done by Taghizadeh-Hesary and Wang Y with 13 publications, and Wang X and Zhang J with 11 publications.

Figure 4: *Publication Numbers of Authors*

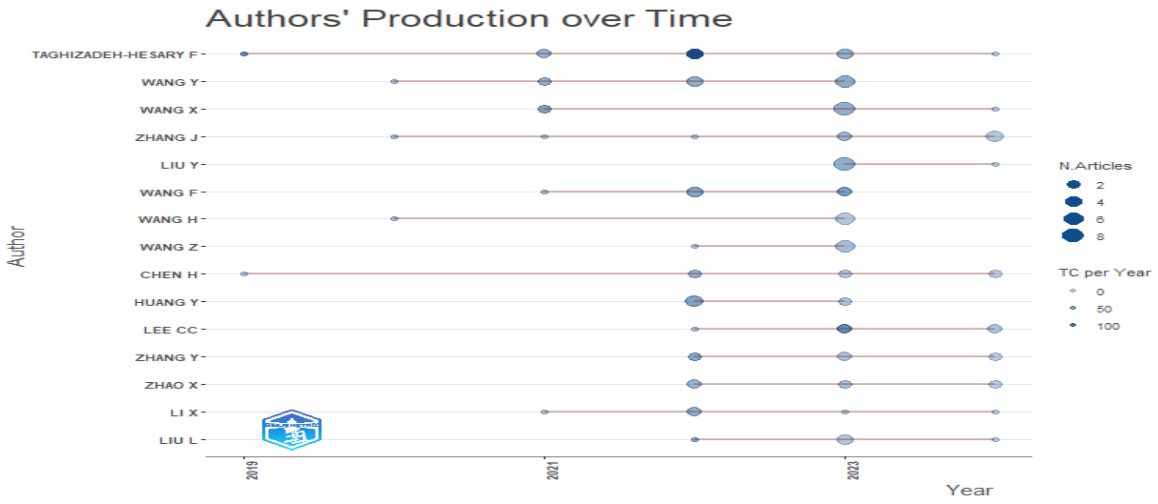


Source: *Biblioshiny, based on WoS dataset*

Figure 5 shows the most active authors in the field of green finance in sustainable development by number of publications.It seems that the authors who contributed to the subject under consideration are consistent in terms of publications, especially after 2021.As with the number of publications,

author Taghizadeh-Hesary contributed to most of the articles and was an active contributor throughout the period.Wang Y. and Zhang J. are other authors who regularly contribute to the development of studies in this field.

Figure 5: *Most Active Authors*



Source: *Biblioshiny, based on WoS dataset*

2.5. Most Relevant Countries

Memberships reveal the countries' contribution to overall scientific production. Table 2 shows the top 20 countries contributing to green finance in sustainable development.China, India and Pakistan are the most influential countries. The table also includes measurements based on single country and multiple country construction. The cuntries with the highest single country production are also listed in the table as having the highest multiple collaborations. China, India and Russia rank first in single country production.

Table 2: *The 20 Most Influential Countries in Green Finance in Sustainable Development*

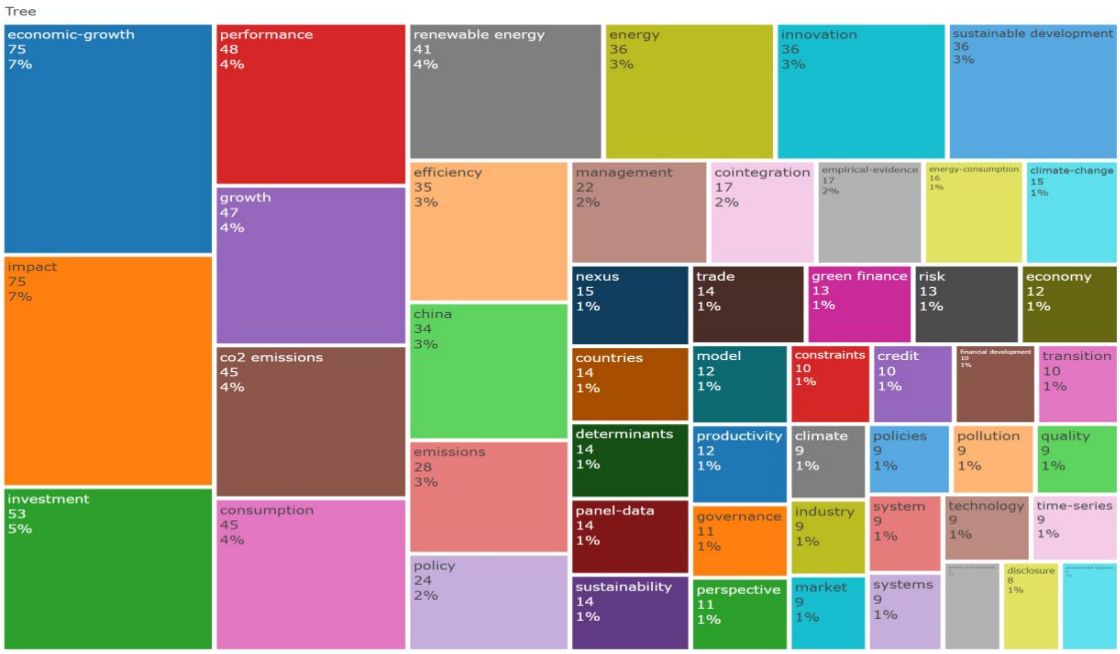
Country	Articles	SCP	MCP
China	296	226	70
India	17	11	6
Pakistan	14	6	8
Russia	12	10	2
United Kingdom	11	5	6
Malaysia	10	2	8
Japan	8	2	6
Spain	7	5	2
Vietnam	7	5	2
Australia	6	1	5
Bangladesh	6	1	5
Poland	6	5	1
Denmark	5	3	2
Ukraine	5	5	0
Usa	5	3	2
France	4	1	3
South Africa	4	1	3
Turkey	4	2	2
Canada	3	0	3

Source: *Biblioshiny, based on WoS dataset*

2.6. Keyword Analysis

Ensuring the co-occurrence of keywords is a useful tool for defining the research composition.This method involves using correlation measurements to reveal the appearance of relationships between words (Desalegn and Tangl, 2022).The co-occurrence network draws a network map by highlighting the relationship between keywords. To research keywords related to green financing in sustainable development, the best keywords according to the number of associations and the intensity level of associations are shown in Figure 6.

Figure 6: *Keyword Creation and Analysis*



Source: *Biblioshiny, based on WoS dataset*

The result of the keyword analysis shows that among the articles used in this study, the terms economic growth and impact (75), investment (53) and performance, growth, emissions, consumption and renewable energy (44) are mostly used.As can be seen among the more specifically determined keywords, China is different from other keywords.The fact that the majority of studies on green finance for sustainable development originate from China causes authors to use China as a keyword.Data show that the term green finance is mostly used to examine issues such as climate change, sustainable development, renewable energy, which are carried out in China (Desalegn and Tangl, 2022). Figure 7 shows that in the word cloud analysis, words such as economic growth, impact, investment, performance, consumption, energy are frequently used by the authors.

Figure 7 : *Word Cloud*

Source: *Biblioshiny, based on WoS dataset*

3. Most Productive Resources

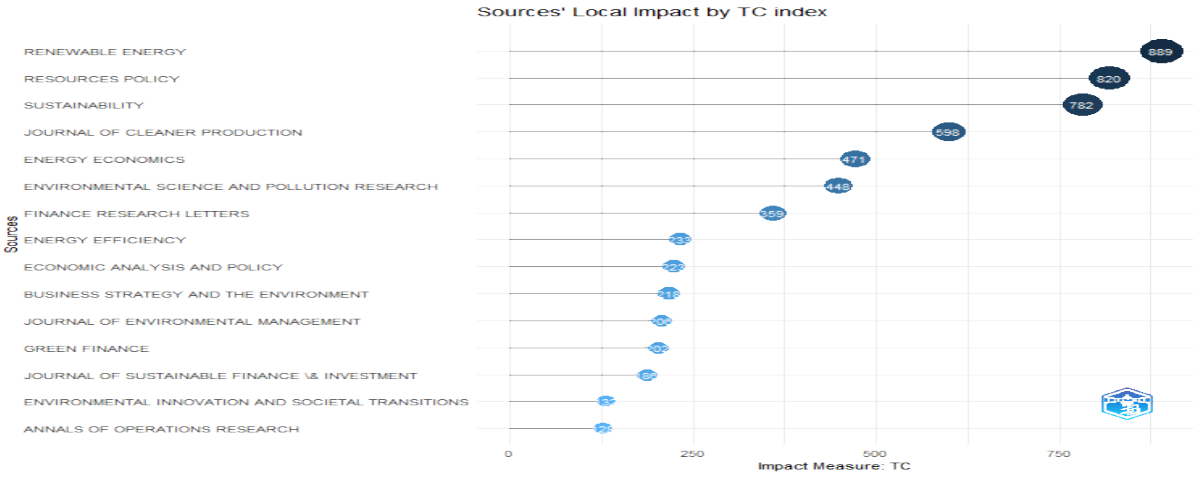
Table 3 shows a list of important sources with h-index > 3, arranged in descending order by h-index.This shows that there are 21 journals with an h-index above 3.The highest h-index value is Renewable Energy with 16, Resource Policy with 15, and Sustainability with 13.While the journal with the highest number of citations in total (889) is the Renewable Energy journal, Resource Policy with 820 citations and Sustainability journals with 782 citations are at the top.

Table 3. *Most Important Resources*

Source	h_index	g_index	m_index	TC	NP	PY_start
Renewable Energy	16	28	5,3	889	28	2022
Resources Policy	15	28	3,7	820	35	2021
Sustainability	13	27	2,6	782	54	2020
Green Finance	10	13	1,6	202	26	2019
Journal Of Cleaner Production	10	14	2,5	598	14	2021
Environmental Science And Pollution Research	9	20	2,2	448	40	2021
Energy Economics	7	14	2,3	471	14	2022
Economic Analysis And Policy	6	9	1,5	223	9	2021
Frontiers In Environmental Science	6	10	2	107	16	2022
Business Strategy And The Environment	5	8	0,8	218	8	2019
Journal Of Environmental Management	5	6	1,2	206	6	2021
Environment Development And Sustainability	4	6	1	37	6	2021
International Journal Of Environmental Research And Public Health	4	4	1	65	4	2021
Journal Of Sustainable Finance \&Investment	4	5	0,8	186	5	2020
Corporate Social Responsibility And Environmental Management	3	6	0,4	48	7	2018
Economic Research-Ekonomska Istrazivanja	3	3	1	116	3	2022
Emerging Markets Finance And Trade	3	4	0,7	107	4	2021
Energies	3	4	0,7	80	4	2021
Frontiers In Energy Research	3	4	0,7	38	4	2021
Mirovaya Ekonomika I Mezhdunarodnye Otnosheniya	3	3	0,3	26	3	2017
Sustainable Development	3	5	1,5	29	8	2023
Technological Forecasting And Social Change	3	3	1	110	3	2022

Source: *Biblioshiny, based on WoS dataset*

Figure 8: *Total Number of Citations of Publications*

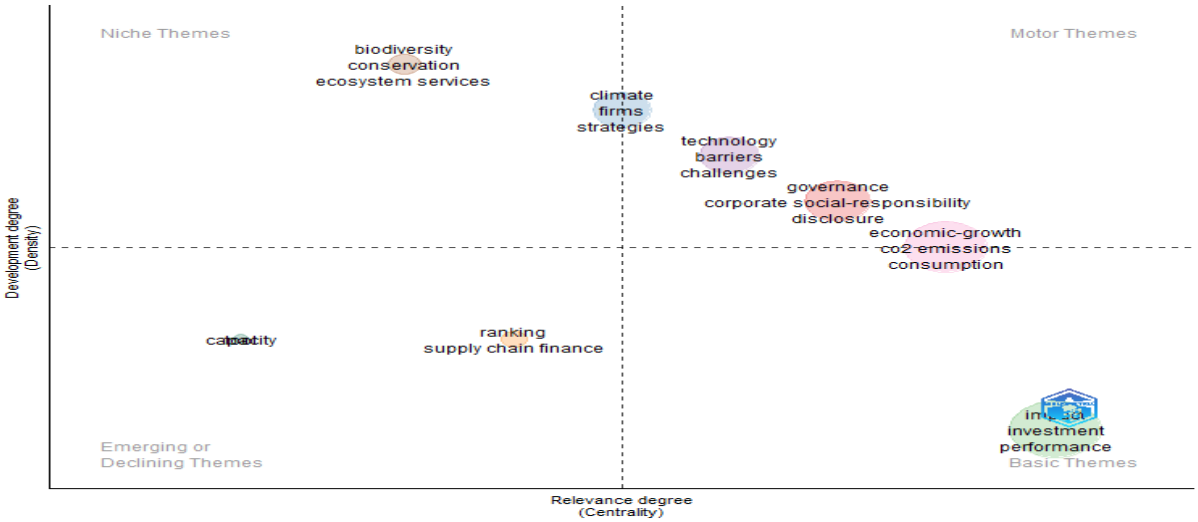


Source: *Biblioshiny, based on WoS dataset*

4. Thematic Development of Research Areas

The thematic development of research areas data set is divided into a single time period covering the period from 2017 to 2024.In Figure 9, the Y-axis measures the degree of research development for a given cluster, which is calculated as the weighted average of the number of articles in the field, their impact, and their citations.The x-axis measures the relevance of articles in a cluster, which allows us to know how much any cluster impacts the field and how credible colleagues find the research (Manogna and Anand, 2023).The axis controls how relevant the work in any given cluster is to our primary research topic. In the period under consideration, the focus is on climate, technology, governance and economic growth.

Figure 9.*Thematic Development Graph (2017-2024)*



Source: *Biblioshiny, based on WoS dataset*

Table 4 shows that researchers address issues such as biodiversity, climate and technology, along with the impact of green finance on sustainable development.

Table 4: *Popular Themes from 2017 to 2024*

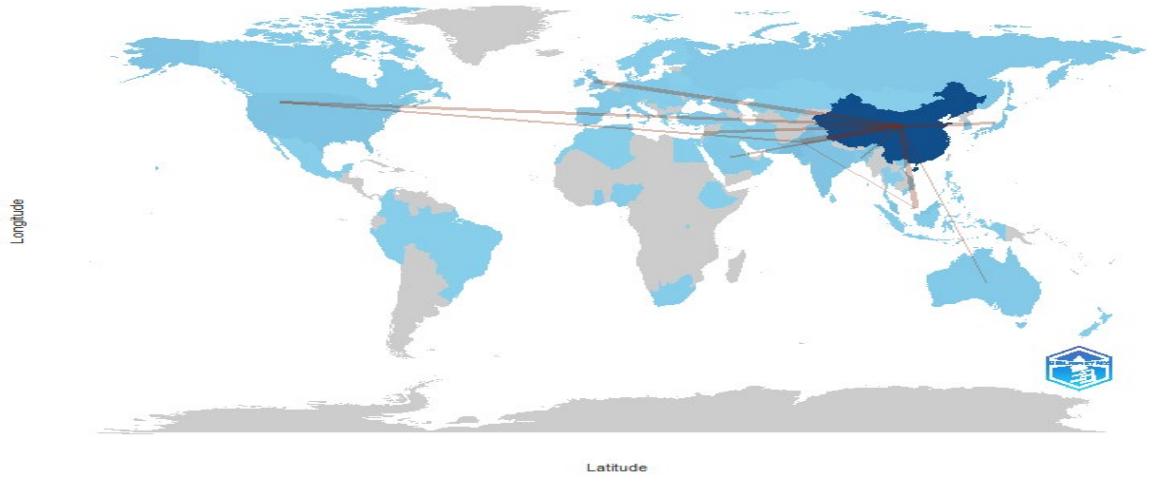
Cluster	CallonCentrality	CallonDensity	RankCentrality
Impact	17,5	48,1	9
Economic-growth	6,7	52,3	8
Governance	5,5	65,7	7
Technology	3,8	69,1	6
Climate	2,2	69,6	5
Ranking	0,4	50	4
Biodiversity	0,2	87,5	3
Capacity	0	50	1,5

Source: *Biblioshiny, based on WoS dataset*

5. Social Structure

Considering the institutions to which the authors are affiliated, it can be seen that there is a high level of interaction between China and Pakistan, Malaysia, England, Japan, Lebanon and the United States on the basis of authors.While this cooperation rate is represented by lines in Figure 10, it is observed that the darker the country color, the more productive that country is.However, it can be said that there is a deficiency in the participation of authors in the countries of the European region, which are considered developed.

Figure 10: *Social Structure*



Source: *Biblioshiny, based on WoS dataset*

6. Conclusion

In this study, green finance literature for sustainable development was reviewed within the scope of 495 publications obtained from Web of Science database between 2017 and 2024. The main aim of the study is to fill a literature gap by presenting a comprehensive bibliometric analysis that will help researchers expand their knowledge about the link between sustainable development and green finance. The articles included in the research were analyzed with a bibliometric technique. It has been revealed that there has been an increasing trend in the publication of studies in the relevant field since 2017. A significant and regular increase is observed in the studies carried out especially after the pandemic that emerged in 2020. Most of the scientific research has been published in renewable energy, resource policy, development and green finance journals, but it seems that not enough research has been conducted in journals related to environmental management. Major topics of current interest to scientists include economic growth, impact, governance, technology, climate and biodiversity.

Green finance includes all financial elements and activities related to environmental protection, climate change mitigation and adaptation (Bhatnagar and Sharma, 2022). Based on the findings, it is recommended to conduct further economic and financial studies using quantitative approaches in order to improve the existing literature on green finance and provide a broader perspective to policy makers for development opportunities that can be transferred to future generations.

Considering the number of publications, it can be said that the academic participation of developing countries is higher than that of developed countries. Among the developing countries, China, India and Pakistan are among the top three countries in terms of the number of publications. On the other hand, England, which is described as a developed country, is ranked fifth and Spain is ranked eighth. The number of publications, as the most concrete data regarding the analysis, shows researchers that the demographic characteristics of countries such as population, economic development, and income distribution increase the need for green finance. Especially when evaluated in terms of China, India and Pakistan, it can be said that the population has a significant impact on the use of resources in sustainable development. Therefore, this study also recommends more international research collaborations between developed country economies. These research collaborations should be integrated with the policies of underdeveloped or developing countries and efficiency should be increased in the use of already scarce economic resources in these countries. In particular, the importance of green finance should be emphasized by transferring the studies carried out in this field to the new generation. In future studies, the scanning infrastructure should be expanded and other databases should be included in the analysis.

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Ethical Responsibilities of Authors (Yazarın Etik Sorumlulukları): This study was prepared in accordance with the rules of the required ethical approval

Conflicts of Interest (Çıkar Çatışması): There is no conflict of interest with any institution related to the study.

Plagiarism Checking (İntihal Denetimi): This study has been checked for plagiarism using a plagiarism scanning programme.

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