A Bibliometric Evaluation of Green Finance and Green Innovation: Research Trends and Future Directions

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Abstract

Green finance innovation is of essential importance in relation to the development of financial execution ingrained with constructive environmental influences. The change in climate is evidently a major issue which is being faced for foreseeability of the future. Many research articles emphasize emerging trends in association with publishing work attributed to innovations in green finance. This research article scrutinizes thorough evaluation using bibliometric analysis to shed light on the existing landscape and emerging trends in sustainable and green finance. Scopus database is used to collect data on the literature on green innovative finance and green innovation. To analyze the data, this study employed various software programs such as MS Excel and VOS-viewer. The findings of this investigation indicate that the finance literature has grown substantially. However, this growth is mainly concentrated in China due to favorable conditions for research in this area. Based on the top 10 journals categorized as A/A by ABDC, there was a noticeable increase in publications appertaining to green finance innovation in China and the UK. Professor Zhang Dongyang of the Capital University of Economics & Business Beijing, China, is the leading author with 181 publications based on the top 10 journals categorized as A/A* by ABDC. This study presents the latest information on the present state of green finance and innovation globally.*

Keywords: Bibliometric, Green Finance, Green Innovation, Bibliometric Analysis.

Introduction

People around the globe have become increasingly concerned about environmental issues in recent years. The escalating focus on climate change and global warming among policymakers, governments, and regulatory bodies has led to a thorough examination of present practices in innovative finance. International agreements and regulations have been established to ensure that industries are accountable for their environmental impact. The abstraction of this enlarged in a timely manner in line with the aspirations of the economies which notable authors who are making significant contributions to this field. Many countries have made efforts to decrease the number of greenhouse gases released into the atmosphere and to increase investments in environmentally friendly and sustainable projects. The growth of the environmentally friendly economy has

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received distinct assistance from green financing. The discipline of green finance is a developing field and, therefore, requires greater awareness globally.

Consequently, it helps the industry in shaping its policies. The entire intent of this article scrutinizes the most recent developments in the field of green financial development. It supplies knowledge about the prestigious publications, countries, organizations and authors in the concerned field and all publishing material in high-ranked journals, which are classified as A/A* by ABCD. This article also identifies the specific areas and keywords that attract the utmost attention in green finance. In addition, it addresses the issues and difficulties associated with this topic.

The foremost target of this area of study is to add value to the structure of knowledge concerning green innovation. We plan to do this by conducting an in-depth exploration of scholarly articles and research findings within this particular domain.

Only a few bibliometric evaluations of green financial and green innovation literature have been done. These investigations have concentrated on different areas separately, such as green financial innovations.

The development of green financial structures is currently the most dynamic area of financial innovation, so actively encouraging this area of research is crucial for the financial system's participation in economic restructuring and the expansion of the financial industry's capabilities (Cheng, 2014). The study of Jiang et al. (2022) investigated the influence of green financial development on the companies' green technology innovation because, in light of the carbon neutrality plan, an understanding of the impacts of green finance on green technology innovation is beneficial to advancing the green transformation of the economy. It was discovered that green financing greatly increased the firm's adoption of green technology despite enough incentives for quantity and only somewhat adequate motivation for quality. Although the significance of green finance has been extensively discussed, there needs to be more proof of how it influences environmentally beneficial business operations. The results of the study demonstrate that green finance has a considerable beneficial impact on business environmental innovation (Zhou et al., 2023).

Additionally, an increasing number of consumers have important considerations for ecofriendly options. As a result, industries are now exerting considerable effort to discover environmentally favorable practices. In the modern world, every country seeking to lower carbon emissions and have a robust economy must first create green technologies. It is a path toward creating less carbon while balancing what is still generated. By employing a technique known as "fixed-effect panel regression" to clarify this link, one crucial component is pushing companies to develop creative green solutions.

The findings of this investigation could offer some insightful information. For instance, it might provide insight into enhancing business operations, which could spur the development of more environmentally friendly products. This may result in more vital, sustainable growth for firms and the economy (Hu & Wang, 2022). Only recently, the academic community paid much attention to how organizations can contribute to environmental protection.

Changes in the global climate have far-reaching consequences for people everywhere and will do so for decades to come. It's a problem we've never seen before, and it points to a major flaw in the way the world economy has been operating for a long time (Adom & Amoani, 2021).

The uninterrupted hike in human actions brought about by extensive computerization and the immense usage of fossil fuels has accelerated the emission of greenhouse gases (Ngwenya & Simatele, 2020).

Even though experts have tried many times to understand and explain the idea of green innovation (GI), there still needs to be more clarity about its most basic parts, such as how to define the types of innovation and how to measure them. Due to this lack of clarity, there exists a lot more working papers, meeting sessions, and workshops about GI around the world. Now, GI is also the subject of special issues in academic books and magazines. While the variety of studies adds to the richness and vitality of GI research, it also makes it hard to understand what the idea means and how it can be used. Because of this, the field of GI is beginning to split into different areas of study as researchers start to look into different things (Schiederig et al., 2012).

For the purpose of generating environmentally friendly innovations, supporting environmentally responsible economic transformations and combating climate change, it has become necessary to build efficient usage of inclusive green financing (Irfan et al., 2022). Green financing is a strategic tool that has the potential to boost economic fertility and minimize issues related to the atmosphere. Financial organizations have begun implementing novel strategies to increase investor trust. They are keeping an eye on public interest in money related to green investments, investments with social impact, and investments with a conscience. These tactics are spreading and rising in acceptance (Morano et al., 2020).

In 2010, 194 countries came together to make the Green Climate Fund (GCF). The main goal of this fund was to help countries that worked hard to cut their greenhouse gas pollution by giving them money. Since then, the idea of "green finance" has become more popular and is now used by many foreign organizations (Zhang et al., 2019).

At the peak of their list of priorities after the declaration of the UN 2030 plan in 2015, Sustainable Development Goals (SDGs) were being set by member countries. To reach these goals, a lot of money is needed. The SDGs cover 17 important areas, and green finance is a key part of making them happen (Pizzi et al., 2021). The aim of green financing covers the era to achieve the financial industry involved in making the shift to low-carbon economies that are also economically prosperous and help stop climate change (Soundarrajan & Vivek, 2016). To attain distinctive development goals, exclusive green financing is an important way because it looks at all three parts of sustainability: environmental, social and financial (Naz et al., 2020).

The study also looked at how the effects and kinds of geographical spillover happen in different parts of China, like the eastern, middle, and western states. The researchers made a framework to help decide which types of green funding should be given to these areas to encourage green growth. They did this by making the study bigger and adding the ideas and views of financial geography (Zhang et al., 2019).

The field of finance has to work together to develop new financial technology and find ways to distribute resources more effectively if the goal is to be achieved. China must undergo fundamental changes in economics, energy, and the environment to accomplish its green environment goals. To do this, it is essential to use environmentally friendly technologies, such as financial technology, to move toward a greener environment (Awais et al., 2023; Lee et al., 2023).

Since environmental concerns and the need for sustainable development have grown, scholars and politicians have focused on energy transition (ET) policies. Unlike past ET studies, this study examines how green financing (GF) affects China's ET by incorporating climate risk from 2011 to 2020. Results show that GF development accelerates ET and has heterogeneous effects, suggesting that GF is more likely to drive ET in regions with better socioeconomic conditions and sustainable development environments (Lee, 2024).

According to the Sustainable Development Goals (SDGs), the most significant dangers to human well-being include two types of energy sources: non-renewable and renewable. Additionally, there

is a growing environmental deficit, which is in line with the objectives of SDG-7 and SDG-13. Through the use of environmental technology, financial growth, and energy consumption, this study investigates the ways in which these factors impact the ecological footprint and green growth in the top ten nations with the largest ecological footprint from 1990 to 2019. Environmental innovations, green growth, and renewable energy all contribute to an improvement in the environment. On the other hand, it has been demonstrated that financial expansion and the utilization of energy sources that do not replenish themselves are harmful to the environment. Green development is hampered by factors such as financial expansion, ecological damage, and the use of non-renewable energy. Environmental innovation and the use of renewable energy sources have a cumulative influence on green growth (Saqib, 2024). In light of the fact that an increasing number of stakeholders are paying greater attention to environmental issues, the significance of green entrepreneurial orientation and green innovation has expanded, as has their implementation.

This study's major objective is to use the bibliometrics method to examine significant publications in the area of green financing and green innovations (GI). This study seeks to comprehend the past, present, and upcoming eras of this field of study by examining the effects of publications on the scientific community. The study looks at how the field has changed through time to understand its history. The study identifies the key issues and discussions that have shaped this subject by examining the most commonly cited studies.

Additionally, by examining the most recent papers in the field, this analysis can offer insightful advice on how to fill in research gaps. By pointing them in the direction of pertinent literature for future study, it can assist researchers in comprehending the idea of GI. This study can also be used as a starting point and introduction guide for new researchers who wish to familiarize themselves with the literature and developments in the field of GI.

The study also examines the research themes and trends in green financing and green innovations and elaborates on the imputations of our experiments for the upcoming timely research and practice. This analysis will provide proper intuitions in the development and evolution of this field of study. These specifications consist of the document (article) and the publication in English language. This current analysis suggests rates of quotation to evaluate the impact factors of journals, which symbolize quantitative objectives and indicators directly associated with issued scientific research.

The current study investigates these research questions:

1. What is a complete overview of the research on green finance and green innovation through bibliometric analysis?
2. What are the influential publications and papers in the field of green financing and green innovative research, specifically those categorized as A/A* by ABCD?
3. Which organizations, countries, and authors actively participate in and make the most contributions to the area of green financing and green innovations?
4. Elaboration of the main topics and pivotal words that researchers concentrate on when researching green financing and green innovations.
5. What are the latest issues and challenges encountered in the field of green financing and green innovations?
6. What kind of specific areas of green financing research are anticipated and investigated in the upcoming era?

Green finance connects financial and green innovation environmental sectors (Ngo et al. 2022). It divulges the flow of capital in assisting with optimizing industrial models. To foster sustainability,

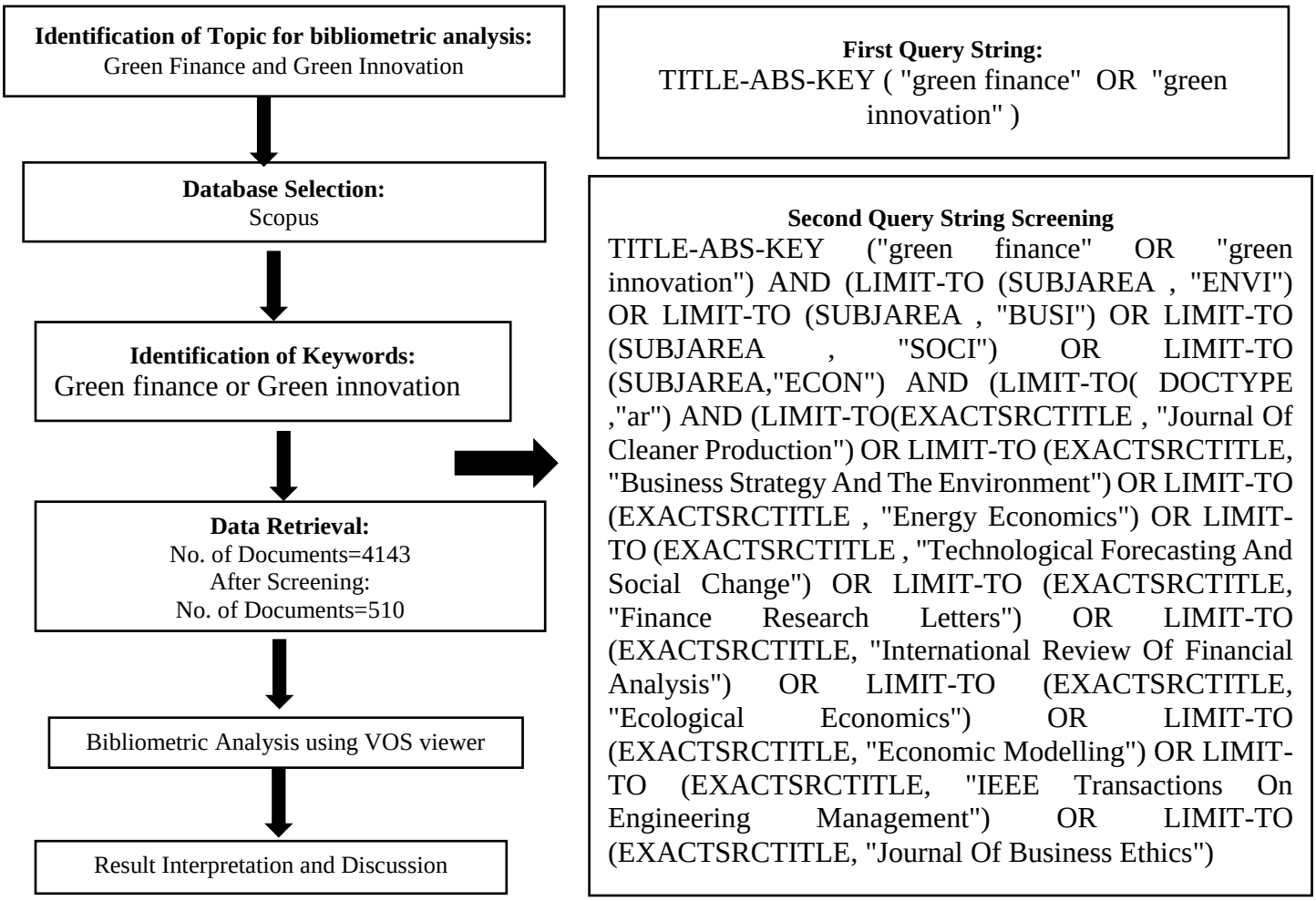
green financial products have been developed (Salazar, 1998). These products are financial services that include investing in new projects, evaluating risks and activity in favor of the protection of the environment, prompting feasible developments and energy conservation (Salazar, 1998).

Methodology

Bibliometrics are being used in the development and publication patterns in the subject of literature related to green finance and green innovation. The study uses the Scopus database to conduct a bibliometric analysis of excellent academic papers on green finance innovations. Bibliometric analysis (quantitative method) is being used to investigate and rank publications. It involves collecting and analyzing various bibliographic data, such as the author, journal, publication year, and citations, to identify patterns and trends in the publication of research in a particular field.

This study analyzed data using bibliometric tools and techniques (citation and co-citation analysis and bibliographic coupling) to examine patterns in publication of research in accordance with the field. In July 2023, concealment process is being conducted for detailed and comprehensive research on green finance innovations.

Figure 1: Summary of the research process adopted



Articles proceedings review and book chapters were the primary sources for this research. In table 1(a), it depicts that the targeted data were examined by using search ambiguities in the Scopus main search box and found 4143 scientific contributions. Table 1(b) shows that after executing the query mentioned, the following Scopus subject category included topics such as Econometrics, Finance, Economics, Business Management Administration, Social Sciences and Accounting subject area and found 3452 documents. The selection criteria included articles only written in English, resulting in 2987 documents. This article was published in a high 10 rank journal designated as A/A* by [ABCD] resulting in 510 documents. To ensure the reliability of the outcomes, this selection process was repeated. This study employed various software programs such as VOS-viewer and Excel to analyze the data. This process is summarized in Table 1(a)

Table 1 a

Scopus	**"All fields"**	**Explored Outcome (Documents Number)**
Appellative Word	Green finance or green innovation	4143
Subject	Econometrics, Finance Business Management Social Sciences Economics and Accounting	3452
Document type	Article	2987
Source title	Top ten journals categorized as A/A* by ABDC	510

Table 1 (b)

Concentrated Search Stages	Concept	Explored For?	Query String (Searched)	Explored (Documents Number)
Stage 1	Central	"Green Finance"	TITLE-ABS-KEY ("green finance" OR "green innovation")	4143
Stage 2	Subject Area	Subject Area ,Econometrics Economics Finance, Business Management Accounting, Environmental Science Social Sciences	TITLE-ABS-KEY ("green finance" OR "green innovation") AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON"))	3452
Stage 3	Document type	Document type ‘Article”	TITLE-ABS-KEY ("green finance" OR "green innovation") AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON")) AND (LIMIT-TO (DOCTYPE , "ar"))	2987
Stage 4	Source title	Top 10 ABDC Journal A/A* categorized journals	TITLE-ABS-KEY ("green finance" OR "green innovation") AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON") AND LIMIT-TO (DOCTYPE , "ar") AND (LIMIT-TO (EXACTSRCTITLE, "Journal Of Cleaner Production") OR LIMIT-TO (EXACTSRCTITLE , "Business Strategy And The Environment") OR LIMIT-TO (EXACTSRCTITLE , "Energy Economics") OR LIMIT-TO (EXACTSRCTITLE , "Technological Forecasting And Social Change") OR LIMIT-TO (EXACTSRCTITLE , "Finance Research Letters") OR LIMIT-TO (EXACTSRCTITLE, "International Review Of Financial Analysis") OR LIMIT-TO (EXACTSRCTITLE , "Ecological Economics") OR LIMIT-TO (EXACTSRCTITLE , "Economic Modelling") OR LIMIT-TO (EXACTSRCTITLE, "IEEE Transactions On Engineering Management") OR LIMIT-TO (EXACTSRCTITLE, "Journal Of Business Ethics")	510

Results

Green Finance Innovation Publishing Trends

Number of publications on green finance and green innovation has increased considerably. One of the possible reasons for this trend is the supportive environment promoted by the Government of China and research institutions, which has resulted in numerous publications by the universities of China. Figure-1 exhibits that the most cited articles on green finance innovations mostly were published between 2021 and 2022, indicating that the field is developing. With the passage of time, the extensive literature in green finance innovations has confirmed the nourishment of the study in the modern era. Figure-1portrayed the publication trend in the different years categorized as A/A* by ABCD.

Figure 1

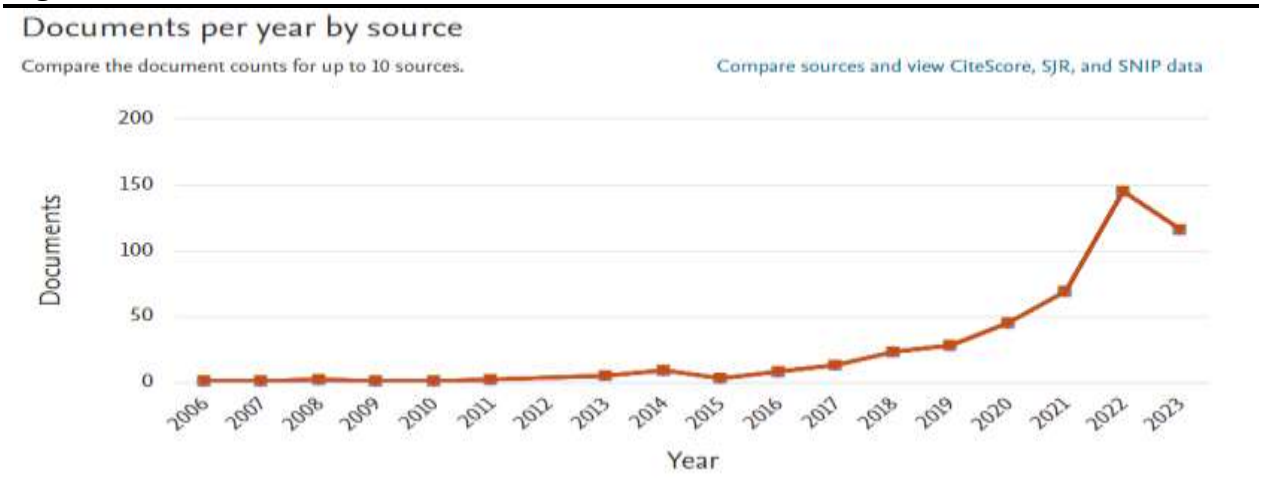
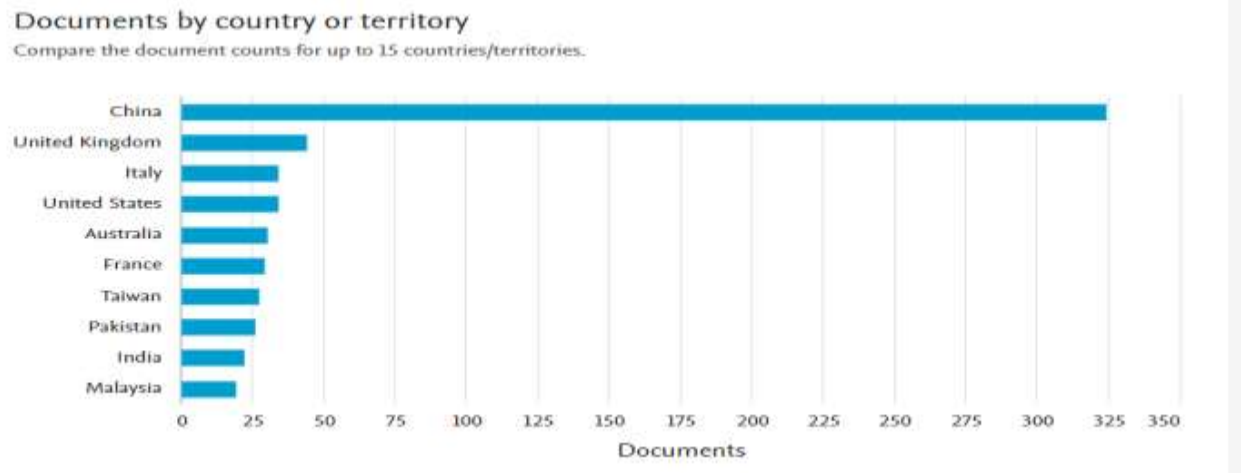


Figure 2 shows the documents up to 15 countries. China is the leading country in green finance and innovation publications. China has made significant investments in renewable energy, electric vehicles, and green technology, positioning the country at the forefront of green financing and innovation worldwide.

The United Kingdom is at the second number. The United Kingdom (UK) has actively encouraged investment in sustainable projects through initiatives such as the Green Finance Strategy and Institute.

Italy lies at the third number. In recent modern times, Italy has emerged as a marked contributor to the field of green finance innovations. All these contributions align with global efforts to tackle environmental concerns, mitigate change in climate and shift towards an unceasing and green economical innovations. The United States is a leader in sustainable technology research and development thanks to its thriving venture capital industry and plenty of renewable energy firms. Further, Australia, France, Taiwan, Pakistan, India and Malaysia, respectively.

Figure 2



Journals With the Most Articles Published on Green Innovations

This article inquires in effectiveness of the publishing scholarly articles which academic journals are related to green finance innovations. The under observations course study accurately depicts that the literature on green finance innovations has experienced significant growth. However, this growth is mainly concentrated in China due to favorable conditions for research in this area. According to table 2, the most prominent journal among the top 10 categorized as A/A* by ABCD is the journal of cleaner production.

The percentages show how many relevant articles there are in each journal. The Journal of Cleaner Production is the most important in this field because 38.82% of the relevant articles are published in it. This shows that the Journal of Cleaner Production has been the primary position where researchers have shared their work on green finance innovations.

To examine closely is business strategy and environment, which accounts for 18.62% of the relevant publications. This indicates the significance of this journal as a prominent outlet for research on the topic. Energy Economics accounts 13.13% and Technological Forecasting and Social Change share of 10.78% highlighting the accomplishment related to green finance and innovation.

Remaining 18.63% represents the collective percentage of relevant publications in other journal as mentioned in the table. This implies that research in this field is distributed across various journals, indicating the interdisciplinary nature of the topic and the broad interest it has garnered among scholars. It is of consideration that all the well reputed eight journals were published through Elsevier out of ten. As mentioned earlier only **A*** and A category journals were sought in this regard.

In summary, table 2 provides valuable insights into the top journals where relevant articles on green finance innovations are being issued. Researchers related to this field can refer to these journals to explore further studies, stay updated with the latest developments, and engage with the diverse range of perspectives and research contributions in this important area.

Table 2: Summary of high ranked 10 journals categorized as A or A* by ABDC with total publication and cite score

Sr. No	Name of Journal	ABDC Category	Numerals of Publications	Cite Score 2022 %	Publisher Name
1	Journal Of Cleaner Production	A	198	38.82	Elsevier
2	Business Strategy and The Environment	A	95	18.62	Wiley-Blackwell Publishing
3	Energy Economics	A*	67	13.13	Elsevier
4	Technological Forecasting And Social Change	A	55	10.78	Elsevier
5	Finance Research Letters	A	30	5.88	Elsevier
6	International Review Of Financial Analysis	A	14	2.75	Elsevier
7	IEEE Transactions On Engineering Management	A	14	2.75	Institute of Electrical and Electronics Engineers
8	Journal Of Business Ethics	A	13	2.55	Springer International Publishing
9	Ecological Economics	A	12	2.35	Elsevier
10	Economic Modeling	A	12	2.35	Elsevier

Most Creative Authors

This prescribed research also aimed to determine which prominent authors in green finance and green innovation have made distinct contributions to field, as classified by the top 10 journals and ranked as A/A* publications by ABCD. Table 3 shows that Professor Zhang, Dongyang (Capital University of Economics and Business) was the most prolific author. His 59 publications were cited 1499 times, making him the most cited author. Chang Chunping from Shih Chien University, Taipei, Taiwanis close behind. Six out of the top ten writers belongs to China, while other put in writing such articles are from to Taiwan, Denmark, Japan and Pakistan.

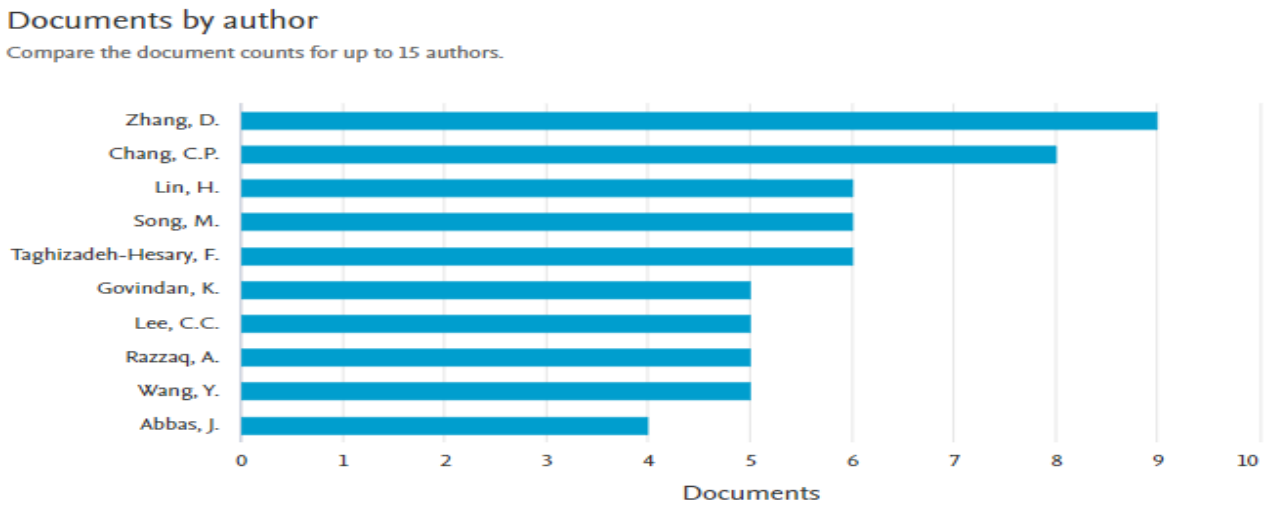
Table 3: Top 10 authors and affiliations

Sr. No	Author	Scopus author ID	1st publication Year	Total publication	Doc. h-index	Total citation	Current affiliation	Country
1	Zhang, Dongyang	57194417399	2017	59	22	1499	Capital University of Economics & Business Beijing, China	China
2	Chang, Chunping	7407036338	2005	188	39	5670	Shih Chien University,	Taiwan

							Taipei, Taiwan	
3	Lin, Han	55841418200	2002	64	23	1806	Nanjing Audit University Nanjing, China	China
4	Song, Malin	26422516400	2008	337	62	12833	Anhui university of finance and economics Bengbu	China
5	Taghizadeh-Hesary, Farhad	67017386400	2013	238	45	6515	Tokai University, Tokyo, Japan	Japan
6	Govindan, Kannan	54986334000	2006	394	100	33935	Syddansk Universities, Odense, Denmark	Denmark
7	Lee, Chien-Chiang	8601620600	2005	394	63	14827	Nanchang University, Nanchang, China	China
8	Razzaq, Asif	57219122851	2020	95	36	4003	CAREC Institute, Urumqi, China	China
9	Wang, Yu	57217058566	2011	20	6	420	Nanjing University of Finance and EcoNomics, Nanjing, China	China
10	Abbas, Jawad	57206897602	2014	34	18	1306	University of Central Punjab, Lahore, Pakistan	Pakistan

In figure-3 proper analysis of leading green finance is being compelled by authors to the area of green finance innovations as categorized by A/A* top 10 Journals. Zhang, Dongyang, stands in first position , Chang, Chunping, are at second position, Lin, followed by Han, Song, Malin, Taghizadeh-Hesary, Farhad, Govindan, Kannan, Lee, Chien-Chiang, Razzaq, Asif Wang, Yu, Abbas, Jawad.

Figure 3



Productive Top Journals With Most Cited Article

Table 4 accurately represents top 10 green finance innovations journals escorted most cited article. These journals remarkably contributed to research in green finance innovations. Journal of clean production led with 198 which is 39% of total publication. From a literature review, which reveals the frame work for distinctive supply management of its most cited article, cited 3832 time. The Journal of Business Strategy and the environment produced 95 articles, followed by the Journal of Energy Economics with 67 publications. This shows that high-impact journals are cited more than low-impact ones.

Table 4: Top 10 journals with most cited article

Sr. No	Journal Name	Total Citation 2022	Total Publication%	The most cited article	Time cited
1	Journal Of Cleaner Production	18.5	198/510 (39%)	from a Literature Review to a Conceptual, framework for Sustainable supply chain management	3832
2	Business strategy & the environment	17.8	95/510 (19%)	Beyond the business case for corporate sustainability	2076
3	Energy Economics	14.7	67/510 (13%)	Oil price shocks and stock market activity	1152
4	Technological Forecasting And Social Change	17.2	55/510 (11%)	The Future of employment; How susceptible are jobs computerization.	2294
5	Finance Research Letters	10.8	30/510 (6%)	financial markets under global pandemic of COVID-19	1159

6	International Review Of Financial Analysis	9.1	14/510 (2.75%)	COVID-19 geopolitical risk, pandemic, stock market, policy uncertainty nexus, and oil prices in the US economy; Fresh evidence from the wavelet based approach.	761
7	IEEE Transactions On Engineering Management	7.6	14/510 (2.75%)	Innovation characteristics and innovations adoption implementation; A meta-analysis of findings.	2057
8	Journal Of Business Ethics	12	13/510 (2.5%)	Corporate social responsibility theories: Mapping the territory	2100
9	Ecological Economics	11	12/510 (2.35%)	update on the Environmental and Economic costs associated with alien invasive species in the United States;	3400
10	Economic Modelling	6.6	12/510 (2.35%)	Testing for granger non causality in Heterogeneous Panels.	2426

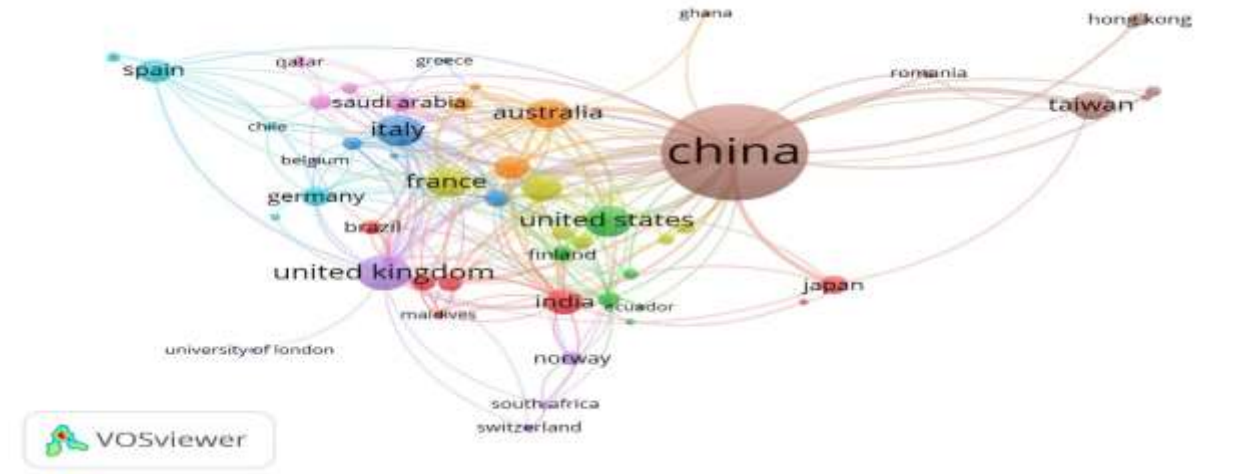
Figure 4 and table 4 briefly depicts leading journals and their research trends in green finance innovations. Figure 4 shows that these journals have made the most important contributions to the area of green finance innovations as categorized by A/A* top 10 journals. In journal Of cleaner production, 39% from a literature review to a conceptual, framework for sustainable finance innovations with total 18.5 citations have been found. The trend for the business case for corporate sustainability related to financial publications has tremendously increased in business strategy & the environment. A massive hike in citations of finance in energy economics can be easily observed. Researchers in technological forecasting and social change have concentrated on the future of employment; how susceptible are jobs computerization regarding this field. 11% of citations have been analyzed. The investment in financial markets under global pandemic of COVID-19 attracted the attention of researchers and 6% of the citations are being scrutinized. In a similar manner many journals extended their publications regarding this field whose trend can be observed in table and figure 4.

Figure 4

Analysis of Geographical Origin

The presented figure 5 provides evidence of country collaboration and highlights the active collaborative networks and high production poles around the world, particularly in countries China, Taiwan, Denmark, Japan, Italy and Pakistan. The analysis in figure 5 represents another perspective for comprehension the country wise behavior in finance. The research trends regarding the financial innovations can be further categorized into digitalization, fiancé inclusion and in numerous aspects, which are presented by different countries. There has been a substantial rise in study and interest in green finance and green innovation over the past few years.

Figure 5

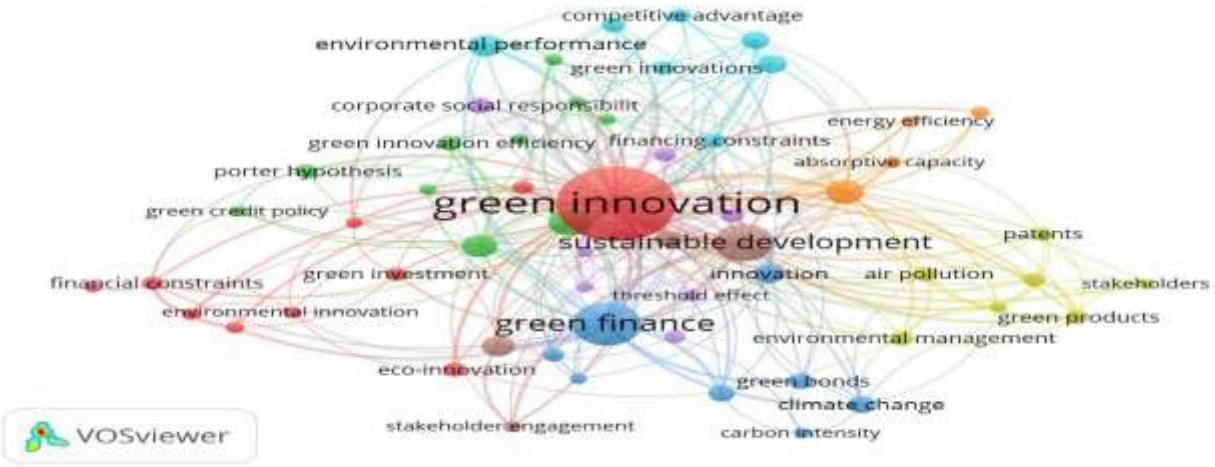


Concurrence Analysis of Keywords

Figure 6 presents a concurrence analysis of pivotal words in green finance innovations articles, comprised on author-provided keywords at the time of publication. The circle size surrounding each keyword reflects its frequency of use, with green finance innovations are being most

commonly used keyword. There have been 41 occurrences of green finance, green innovation, and the total link strength occurrences is 39.

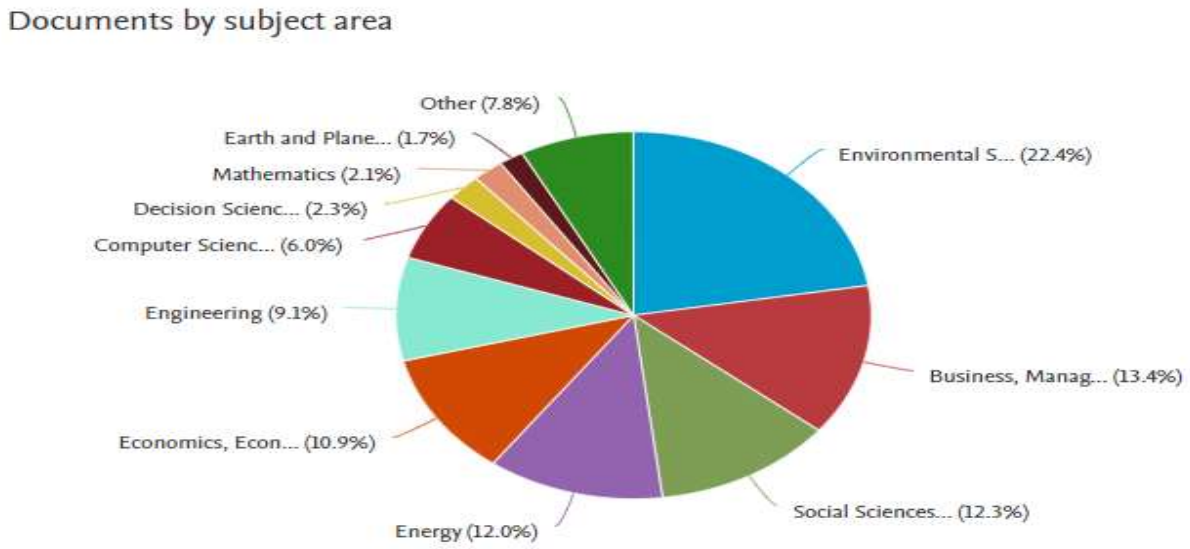
Figure 6



Documents by Subject Area

Figure 7 shown below shows the distribution of documents subject area. Notably, Environmental Sciences account for 22.4% of the total, followed by Business Management at 13.4%, Social Sciences at 12.3%, Energy at 12%, Economics at 10.9%, Engineering at 9.1%, and Computer Sciences at 6%. The area of green finance and green innovation encompasses various disciplines, with Decision Sciences, Mathematics, Earth and Planet, and others constituting 2.3%, 2.1%, 1.7%, and 7.8% of all documents, respectively.

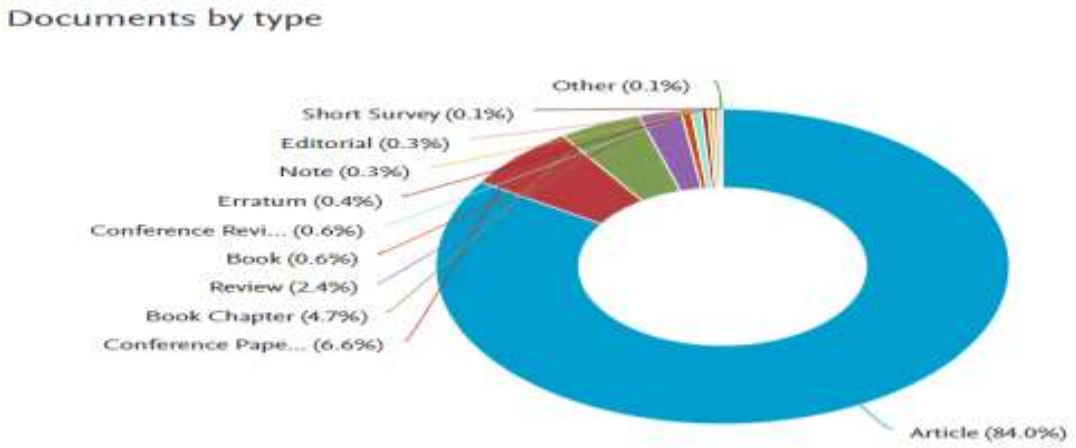
Figure 7



Documents by Type

Figure 8 shown below shows the distribution of documents by type. Particularly, article account for 84% of the total, followed by subscription of other type including conference article 6.6%, book chapter 4.7%, review 2.4% and other type have nominal contributions.

Figure 8



Discussions

This study bibliometrically investigates the published works on green finance and green innovations in journals indexed by Scopus over 16 years. Several exciting things emerge from the analysis. To begin, a lot more has been written about green finance and green innovation in the last five years (2018-2022) (Harande, 2008). There may be a correlation between the rise in the number of journals providing venues for such publishing and the dramatic increase in the volume of literature. Currently, the paper with the title "Encouraging Private Involvement in Green Finance and Investment" is the most well-liked. With 218 articles, it holds the record for the most publications in a single journal. It was issued in the Journal of Finance Research Letter and Sustainability in Switzerland.

In the area of green finance, Jiangsu University in China is at the front of the pack. It is the country that has made the most important efforts, with the numerous publications, the best cooperations and the most knowledge on the subject. Writer is a crucial part when it comes to expressing the urge for the research and figuring out how an academic problem changes over time (Baber & Fanea-Ivanovici, 2022).

The writer's cooperation was evaluated, and it was found that the topic could be used for more research all over in the field of green finance and green innovations.

An immense number of studies are being executed on the sustainability of finance and examined conclusions in accordance with VOS viewers. Limited research has been conducted, however, on topics including "green innovative performances," "green insurance, "green credit rating ", "green bank," green financial gaps," and " green financial products" Scientists have an excellent chance of making progress in the near future if they investigate these topics. Evidence from the past reveals that when it comes to green financing, countries from all over the world have similar problems and obstacles. The flaws in evaluating loan applications, policy frameworks, and legal compliance are only a few examples of the issues plaguing the field of green financing and green

innovations. This encompasses areas like economics, business administration, accounting, and finance.

Most of the articles mentioned in the field of green financing and green innovations were published in the period of the past few years. This suggests that the field is truly starting to pick up speed. The one exception was a study from way back in 1987. Everyone involved in this growing discipline must keep this momentum going. This goes to show how Green financing and green innovations are becoming broadly accepted in all academic circles (Ali & AlQuradaghi, 2019).

Limitations

- A potential limitation of this research is its reliance on a single database, such as Scopus, for the purpose of gathering data. Although Scopus is widely utilized and considered a thorough database, it is important to note that it might only encompass some relevant articles related to the domain of green finance innovation. Alternative databases or sources of information might have yielded differing outcomes.
- There is another limitation of the subject area. The subject areas included in this article are Econometrics, Economics Finance, Business Management, Accounting, Environmental Science, and Social Sciences.
- Another constraint is the inclusion of solely English-language documents in the study. The exclusion of documents published in languages other than English may result in overlooks of valuable research and perspectives originating from linguistically diverse countries. This has the potential to restrict the depth and accuracy of the findings.
- Furthermore, the domain of green finance innovation is now vibrant and growing. The dynamic mixture of new research, shifting trends, and policy changes can rapidly shape the current landscape. This study's findings may have limitations in terms of its temporal scope, thus failing to depict the current state of the field accurately.

Future Directions

- For the purpose of acquiring a deeper understanding of the direction and evolution of research within the domain of green finance innovation, it is recommended to conduct a longitudinal study. This research methodology would facilitate the investigation of patterns and changes in the discipline over an extended period. The study possesses the capacity to reveal emerging patterns, shifting areas of emphasis in academic research, and the effects of evolving governmental measures throughout time.
- Improve the investigation by including a comprehensive analysis that involves a comparative evaluation of different geographical regions, countries, or even continents in terms of their contributions to research and collaborative efforts in the field of sustainable finance. This technique has the potential to reveal regional variations, identify outstanding strategies, and foster global collaboration in this crucial domain.
- Improve the investigation by including a comprehensive analysis that involves a comparative evaluation of different geographical regions, countries, or even continents in terms of their contributions to research and collaborative efforts in the field of sustainable finance. This technique has the potential to reveal regional variations, identify outstanding strategies, and foster global collaboration in this crucial domain.
- Consider the involvement and perspectives of different groups of stakeholders, including financial institutions, governments, NGOs and local communities, in advancing innovation

within the realm of green finance; assess the barriers to and facilitators of collaboration; and identify strategies for fostering joint action in the face of environmental challenges.

Conclusion

This study provides the most recent information on the topic of green financing and green innovations across the globe at present. Consequently, it aids the green financing and green innovations industry in shaping its policies. It is important to note that there were only a few publications; hence, this paper primarily covers the period from 2006 onwards, which is the most significant period of coverage. The study's findings will help the green finance and green innovation sector because they provide important information for shaping policy. Furthermore, the study underscores the importance of the industry's support for this type of research. Additionally, the study findings can be utilized as a source of guidance for training and educational institutions related to green finance innovations**.** The discipline of green financing and green innovations is a developing field and, therefore, requires greater awareness globally.

This study reveals important information on the current state of the articles on green financing and green innovations, including publishing trends, prominent countries, authors, journals, and prevalent keywords in green financing and green innovative studies. In accordance with findings, the structure of the literature on green financing and green innovations has undergone distinctive expansion. The contribution of the government and the participation of the academic sector will be essential to the success of this endeavor.

References

- Adom, P. K. & Amoani, S. (2021). The role of climate adaptation readiness in economic growth and climate change relationship: An analysis of the output/income and productivity/institution channels. *Journal of Environmental Management, 293,* 112923. https://doi.org/10.1016/j.jenvman.2021.112923
- Asad, M., Aledeinat, M., Majali, T. E., Almajali, D. A., & Shrafat, F. D. (2024). Mediating role of green innovation and moderating role of resource acquisition with firm age between green entrepreneurial orientation and performance of entrepreneurial firms. *Cogent Business & Management*, *11*(1), 2291850.
- Awais, M., Afzal, A., Firdousi, S., & Hasnaoui, A. (2023). Is fintech the new path to sustainable resource utilisation and economic development? *Resources Policy*, *81*, 103309. https://doi.org/10.1016/j.resourpol.2023.103309
- Baber, H. & Fanea-Ivanovici, M. (2022). Fifteen years of crowdfunding–a bibliometric analysis. Pp: 1-15, Technology Analysis & Strategic Management, (2022). https://doi.org/10.1080/09537325.2022.2089548
- Chami, R.T., Cosimano, F., & Fullenkamp, C. (2002). Managing ethical risk: How investing in ethics adds value. *Journal of Banking & Finance, 26*(9), 1697-1718. https://doi.org/10.1016/S0378-4266(02)00188-7
- Chen, Y., Chang, C. and Wu, F. (2012). Origins of green innovations: the differences between proactive and reactive green innovations. *Management Decision, 50*(3), pp. 368-398. https://doi.org/10.1108/00251741211216197
- Cheng, F. H. (2014). On Green Finance Innovation Mode under the Path of Low-carbon Economy. *Value Engineering*, (2014).
- Ding, L. W., Huang., X. Q. (2022). Does Innovation Climate Help to Effectiveness of Green Finance Product R&D Team? The Mediating Role of Knowledge Sharing and Moderating Effect of Knowledge Heterogeneity. *Sustainability*, *14*(7), 3926. https://doi.org/10.3390/su14073926

- Hu, J. & Wang, D. (2022). Study on the impact of finance leasing on corporate green innovation. *Information Systems and Economics*, *3*(5), 6-9. https://doi.org/10.23977/infse.2022.030502.
- Irfan, M., Razzaq, A., Sharif, A., Yang, X. (2022). Influence mechanism between green finance and green innovation: exploring regional policy intervention effects in China. *Technological Forecasting and Social Change*, *182*, 121882.
- Jiang, S., Liu, X., Liu, Z., Shi, H., & Xu. (2022). Does green finance promote enterprises' green technology innovation in China? *Frontiers in Environmental Science*, *10*, 981013. 10.3389/fenvs.2022.981013.
- Lee, C. C., Wang, F., & Chang, Y. F. (2023). Does green finance promote renewable energy? Evidence from China. *Resources Policy*, *82*, 103439. https://doi.org/10.1016/j.resourpol.2023.103439.
- Lee, C. C., Song, H., & An, J. (2024). The impact of green finance on energy transition: Does climate risk matter?. *Energy Economics*, *129*, 107258. https://doi.org/10.1016/j.eneco.2023.107258
- Morano, P., Tajani, T. & Anelli, D. (2020). A decision support model for investment through the social impact bonds. The case of the city of Bari (Italy) (24), Valori e Valutazioni.
- Naz, F. J., Oláh, D., Vasile, & Magda, R. (2020). Green purchase behavior of university students in Hungary: An empirical study. Sustainability, 12(23). 10077. https://doi.org/10.3390/su122310077
- Ngo, Q. T., Tran, A. H. & Tran, H. T. T. (2022). The impact of green finance and Covid-19 on economic development: capital formation and educational expenditure of ASEAN economies. *China Finance Review International*, *12*(2), pp 261-279. https://doi.org/10.1108/CFRI-05-2021-0087
- Ngwenya, N., Simatele, M. D. (2020). Unbundling of the green bond market in the economic hubs of Africa: Case study of Kenya, Nigeria and South Africa. *Development Southern Africa*, *37*(6), pp 888-903. https://doi.org/10.1080/0376835X.2020.1725446
- Pizzi, S., Rosati, F., & Venturelli, A. (2021). The determinants of business contribution to the 2030 Agenda: Introducing the SDG Reporting Score. *Business Strategy and the Environment*, *30*(1), 404-421. https://doi.org/10.1002/bse.2628
- Salazar, J. (1998). Environmental finance: linking two world. 1, pp. 2-18. In a Workshop on financial innovations for biodiversity Bratislava, Open journal of sciences, 1998.
- Saqib, N., Usman, M., Ozturk, I., & Sharif, A. (2024). Harnessing the synergistic impacts of environmental innovations, financial development, green growth, and ecological footprint through the lens of SDGs policies for countries exhibiting high ecological footprints. *Energy Policy*, *184*, 113863. https://doi.org/10.1016/j.enpol.2023.113863
- Soundarrajan, P. & Vivek, N. (2016). Green finance for sustainable green economic growth in India. *Agricultural Economics*, *62*(1), pp : 35-44. https://doi.org/10.17221/174/2014-AGRICECON
- Zhang, D., Zhang, Z. & Managi, S. (2019). A bibliometric analysis on green finance: Current status,development and future directions. Finance Research Letters, 29, 425-430(2019). https://doi.org/10.1016/j.frl.2019.02.003
- Zhou, K. Y., Tao, S., Wang. H. L. (2023). Does Green Finance Drive Environmental Innovation in China? pp: 1-20. *Emerging Markets Finance and Trade*, https://doi.org/10.23977/infse.2022.030502.