Socially Responsible Investment Literature (1990-2022): Key Concepts and Future Research Agenda

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Abstract

Socially responsible investment (SRI) has recently been a top research area in business finance, economics, and environmental management sciences since 1990. Using 1988 research articles from 105 journals from 1990 to 2022 provides the conceptual structure of SRI. The study identifies four research streams by deploying co-occurrence network analysis. These research streams include environmental economics, security and policies, green energy finance, green investment opportunities, green finance risk, and sustainability challenges. Moreover, the study uses thematic map analysis to find the centre of attention themes and anticipated future green finance streams.

Keywords: Green Finance; Socially Responsible Investment; Green Economics; Climate Finance; Social Behaviour; Corporate Social Responsibility; Bibliometric Analysis; Sustainability

Introduction

The increasing global warming has pressured organizations to adopt green practices (Adeel et al., 2022; Cai et al., 2022). The international and local communities are also actively working to implement green culture, particularly after the Paris Agreement 2015, where all countries unanimously agreed to promote low-carbon energy projects and establish socially responsible financial policies (Khan et al., 2022; Zhang & Chen 2021). A socially responsible investment (SRI) can accelerate economic growth and create a link between innovation and corporate social responsibility (CSR) activities (Khan & Nasir, 2023). It gears up the economy to explore untapped opportunities for sustainable

economic growth by following environmental protection laws. Liu et al. (2020) consider the green finance system as a tool to fulfil CSR.

Although environment-friendly projects are less risky than conventional financial projects, they lack private sector involvement (Cui et al., 2018). Private investors do not consider them attractive for investment because returns on such projects are relatively low (Taghizadeh-Hesary & Yoshino, 2020). This system can sometimes not be implemented due to inconsistent government policy, lack of interest in the financial sector, limited technical knowledge, focus on short-term investment plans, etc. (Falcone & Sica, 2019). Financial institutions are also restricted from fully implementing the SRI system, highlighting the need to modify the country's macroeconomic policies (Durrani et al., 2020). The solution is that the government should develop a comprehensive policy to benefit from all regulatory authorities and concerned actors (financial institutions, economists, environmentalists, etc.) through SRI (Yoshino et al., 2020).

Financial institutions, in collaboration public sector, introduce green credit guarantee schemes that increase green finance and investment transparency and stimulate the private sector to participate in such projects (Zafar et al., 2021). The global and local community's role is also essential in promoting ethical investment (Khan et al., 2021). Recently, the government has also been involved in environment-friendly projects to promote fossil fuels in the transition of the economy (Gangi et al., 2022). Zhou et al. (2019) believe global warming has highlighted the importance of socially responsible and ethical financing. Recent studies address the pressure on Asian countries to attain sustainable economic growth rates and the challenges of climate change (Zhang & Kong, 2022). Countries like Japan, China, and South Korea have advanced technology and unique green innovation in recycling waste and using renewable energies. Therefore, these countries can achieve sustainable development through green innovation and finance.

Gabriel (2019) suggested that regulatory authorities promote green financial facilities for the high productivity of low-carbon projects in China to maintain stable green finance and green energy coordination. Qin et al. (2018) believe financial institutions should provide low-interest credit to socially responsible organizations. They also offered green financing and a cost-sharing framework to deal with capital constraints. Liu et al. (2020) stated that organizations using green finance to fulfil their CSR toward an eco-friendly environment is a step toward attaining a sustainable green economy that is only possible if SRI is promoted at the country level. He et al. (2019) discuss government and financial intuitions' significant involvement in defining policies and procedures for SRI projects. Zhou and Cui (2019) have introduced green bonds to increase the company's profitability. Green bonds enhance stock prices, attract new investors, improve operational performance, and are used to fulfil a firm's CSR requirement.

This paper aims to address the issue and provide a general overview of the research conducted on SRI. It undertakes the previous financial management, economics, and environmental sciences literature from 1990 to 2022 by following the bibliometric approach from the Scopus database. The keywords and citation analysis are conducted to highlight the frequency of searching and citing significant topics on SRI. Further, thematic and cluster analysis is performed to develop the model, identify the major trends and themes that provide additional insight into the current research interests, and suggest future studies' potential directions.

The current study makes several contributions to SRI research. Firstly, it presents one of the most extensive and meaningful reviews of top concepts on this contemporary topic in the literature. Secondly, influential and conceptual structures make a unique contribution to the methodology. Thirdly, it helps identify the barriers in the implementation process and suggests possible solutions that have implications for financial managers, economists, environmentalists, and policymakers. The current study emphasizes that SRI policies cannot be implemented successfully without collaborating with stakeholders such as the financial sector, economists, environmentalists, and government and private sector firms. Finally, it identifies various themes and streams that will help narrow down the broad topic of SRI and direct future research with emerging and developing themes.

Methods and Materials

The data for bibliometric analysis was collected through the Scopus database from the field of social sciences. We applied filters to restrict our research query and get more objective results. In May 29, 2022, we had started searching the relevant information related to the topic with the following stings: TITLE ("CSR Invest*" OR "Responsible Invest*" OR "Social Invest*" OR "Socially Conscious Invest*" OR "Socially Aware Invest*" OR "Ethical Invest*" OR "sustainable invest*" OR "green invest*" OR "invest* in green bonds" OR "green bonds invest*" OR "ESG invest*") OR KEY ("CSR Invest*" OR "Responsible Invest*" OR "Social Invest*" OR "Socially Conscious Invest*" OR "Socially Aware Invest*" OR "Ethical Invest*" OR "Sustainable Invest*" OR "Green Invest*" OR "Invest* in Green Bonds" OR "Green Bonds Invest*" OR "ESG Invest*") AND (Limit-To (Doctype, "AR")) AND (Limit-To (Language, "English")) AND (Limit-To (Srctype, "J")) AND (Exclude (Pubyear, 1989) OR Exclude (Pubyear, 1988) OR Exclude (Pubyear, 1987) OR Exclude (Pubyear, 1986) OR Exclude (Pubyear, 1985) OR Exclude (Pubyear, 1984) OR Exclude (Pubyear, 1983) OR Exclude (Pubyear, 1982) OR Exclude (Pubyear, 1981) OR Exclude (Pubyear, 1980) OR Exclude (Pubyear, 1979) OR Exclude (Pubyear, 1977) OR Exclude (Pubyear, 1976) OR Exclude (Pubyear, 1975) OR Exclude (Pubyear, 1974) OR Exclude (Pubyear, 1972) OR Exclude (Pubyear, 1966) OR Exclude (Pubyear, 1965) OR Exclude (Pubyear, 1964) OR Exclude (Pubyear, 1960) OR Exclude (Pubyear, 1956) OR

Exclude (Pubyear, 1946) OR Exclude (Pubyear , 1936) OR Exclude (Pubyear, 1931) OR Exclude (Pubyear, 1929) OR Exclude (Pubyear, 1927) OR Exclude (Pubyear , 1913)).

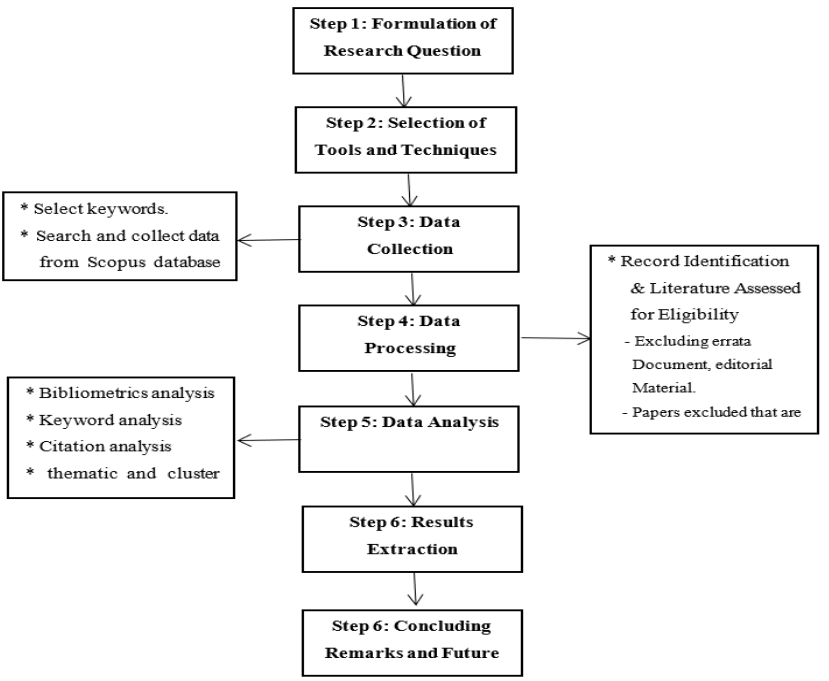

Figure 1. Study Workflow of Bibliometrics Analysis

The workflow of recent research is presented in Figure 1. The final data only retrieved documents in the English language after in-depth readings of titles and abstracts (Nasir et al., 2021a). The current study employs VOS viewer software to conduct a co-occurrence analysis for exploring the critical concepts among the keywords of the selected studies. Furthermore, the study deploys biblioshiny of bibliometrix 3.0 package of R-programming to analyze the thematic map for segmentation of various research themes of green finance. These packages are the most comprehensive and widely used for analyzing the conceptual structure of the selected studies.

Results and Discussion

Brief Overview of Selected Studies

The study extracted almost all the data related to SRI using the title, abstract, authors, and keyword plus analysis through the tools of 'biblioshiny' and 'bibliometrix 3.0'. Table 1 presents information about data characteristics. The final extracted documents were 1988 from 797 sources (journals, books, etc.) from

January 1, 1990, to May 29, 2022. Citation counts also sorted the documents in descending order; the average citation per document was 20.54. Single-authored records were 501, and authors of single-authored and multi-authored papers were 425 and 3506, respectively. Total author appearance was 5061, manuscript per author was 0.506, while author per document was 1.98. There were 2.55 co-authors per document, and the collaboration index was 2.36.

Table 1. Description of Selected Studies

Descriptions	**Results**
Documents	1988
Sources (Journals, Books, etc.)	797
Keywords Plus (ID)	3520
Author's Keywords (DE)	4678
Time Span	1990 - 2022
Average citations per document	20.54
Authors	3931
Author Appearances	5061
Authors of single-authored documents	425
Authors of multi-authored documents	3506
Single-authored documents	501
Documents per Author	0.506
Authors per Document	1.98
Co-Authors per Documents	2.55
Collaboration Index	2.36
Document Types	**Details**
Article	1988

Figure 2 presents the annual scientific production of SRI-related articles from 1990 to 2022. The number of articles is significantly increasing over the period. Especially after COVID-19, scholars, managers and policymakers' attention are diverted towards the SRI concept. The increasing trend from 2020 to 2022 is evidenced by 694 articles related to the topic being published, accounting for 35% of total publications.

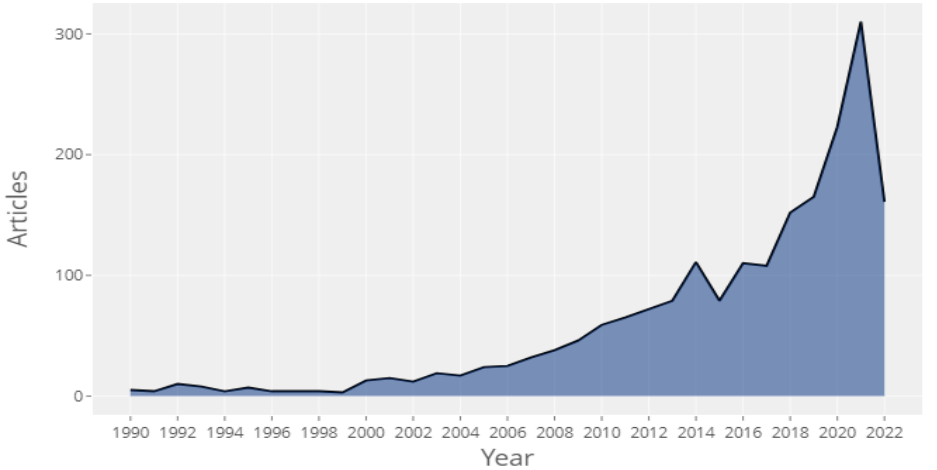

Figure 2. Annual Scientific Production

Influential Analysis

The publications' influential aspects (key authors, journals, institutions, country, year, citations, corresponding authors) are discussed in the bibliometric analysis. The r package envisages the possibility of performing the analysis and explaining the results in a presentable form Khan et al., (2022). Table 2 presents the top ten authors' information on SRI literature. This information is arranged in the order of h-index, g-index, m-index, Total number of publications (TP), total citations (TC), and starting year of publications (PY_start). Although the h-index does not accurately assess the quality of the published work, as many publications can affect its evaluation criteria (Ding et al., 2020), the same is the case with the g-index and m-index. It gives a general idea about the quality of the research as perceived by the scholars in the field, then the results found with the impact factor (Merigó & Yang, 2017). In Table 2, Scholtens (2005) seems to be the most prominent and contributing author in SRI literature from 2005 to 2018. He has published thirteen articles, having TC=975. His indexing is quite impressive (h-index=12; g-index=13; m=index=0.67).

Most of his publications focused on socially responsible saving and investment challenges organizations face in dealing with financial constraints (Scholtens, 2005) and evaluating SRI funds' performance (Chen & Scholtens, 2018). He stated that the legal origin of the country, fund size and ownership are the main determinants of the SRI (Sievänen et al., 2013). Special tax arrangements help increase socially responsible savings and investment growth in the Netherlands, allowing organizations to access finance for socially responsible environmental projects. Otherwise, it has become difficult for firms to approach such projects due to financial constraints. Investors earn abnormal returns on controversial stock than on SRI, but they often have to bear the opportunity cost of negative screening

(Trinks & Scholtens, 2017). They stated a higher return on SRI funds than conventional funds due to tax advantages. However, the risk level in both projects ts is the same.

Table 2. Top Ten Authors' Impact on SRI Literature

Author	h_index	g_index	m_index	TC	NP	PY_start
Scholtens B	12	13	0.67	975	13	2005
Busemeyer MR	7	11	1.17	200	11	2017
Weber O	6	10	0.33	185	10	2005
Arenas Parra M	8	9	0.73	282	9	2012
Bilbao Terol A	8	9	0.73	207	9	2012
Viviers S	7	9	0.47	142	9	2008
Caal Fernndez V	7	8	0.64	199	8	2012
Cortez MC	6	8	0.43	259	8	2009
Dorfleitner G	6	8	0.55	265	8	2012
Garritzmann JL	5	8	0.83	161	8	2017

Note: h-index: "measuring productivity and citation impact of publication"; g-index: "including highly cited papers in the dataset"; m-index: "reflecting the ratio of h-index to the number of years the researchers has been actively publishing their research work."

Busemeyer takes second place after publishing 11 articles. His research mainly focuses on the issues related to SRI, like policy reforms at the state level (Garritzmann et al., 2021), labour union members' attitudes towards social investment (Bledow & Busemeyer, 2021), and budgetary constraints to promote SRI (Busemeyer & Neimanns, 2017). He explained the need for increasing demand for social responsibility policies, particularly in the era of environmental violations by companies (Busemeyer & Garritzmann, 2017). He stressed promoting social investment through education and device policies to meet budgetary constraints. He further believes that political conflicts should be resolved to encourage social investment in the state (Busemeyer & Neimanns, 2017). Weber has contributed to ten research articles from 2005 to 2022 and is tenth among the top ten authors. He analyzed the market efficiency of SRI and suggested that the prices of SRI indices are predictable (Ang & Weber, 2018). Investors can earn abnormal returns by predicting future price movements based on historical analysis.

Bilbao Terol and Arenas Parra have the same (h-index=8; g-index=9; m=index=0.73). They are notable authors with the same number of publications (TP=9) but different citations (Bilbao Terol =282; Arenas Parra=207). They helped to develop the portfolio optimization models for SRI and conventional mutual funds to optimize the returns (Bilbao-Terol et al., 2012a). Their focus is on the ethical dimension of financial products by fulfilling environmental responsibilities and optimizing financial returns (Bilbao-Terol et al., 2012b). Dorfleitner introduced stochastic sustainability returns into safety first models for

portfolio choice that help to evaluate the cost of investing in case of lower returns in SRI funds (Dorfleitner & Utz, 2012).

Cortez has the third-highest citations (TC=259). He found the neutral performance of a socially responsible and conventional mutual fund (Cortez et al., 2009). He also exposed that performance estimates are slightly higher when funds are evaluated concerning socially responsible indices. The socially responsible funds are more exposed to conventional indices than socially responsible indices. Viviers proposes an ethical framework to position the responsible investment that facilitates the investors to understand the concept of SRI (Viviers et al., 2008). SRI combines investment strategies, including investment analysis and decision-making, by integrating financial, social, ethical, environmental and corporate governance activities. The findings state that socially responsible investors give more importance to ethical investing that supports the universal principles of ethical reasoning. Weber analyzed the extent to which financial sectors integrate sustainability in their policies, processes, strategies, products and services (Weber, 2005).

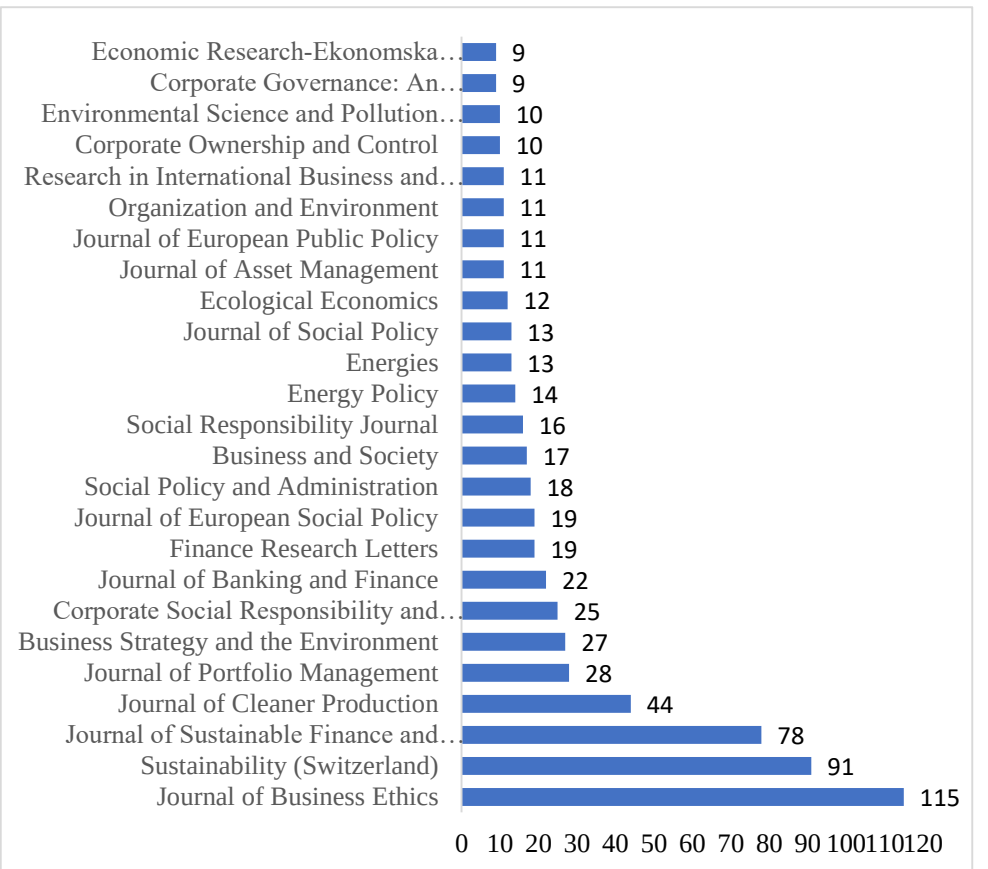

Figure 3. List of Journals

Figure 3 shows the list of journals; the Economic Research-Ekonomska Istrazivanja journal has the lowest nine publications. In contrast, the Journal of Business Ethics has the highest number of 115 publications in our selected studies. Figure 4 shows the country-level publications and citations among our selected studies. We observed the highest contributions from the USA and the UK, with 521 (8217 citations) and 358 (6332 citations) publications, respectively. The Netherlands maintains the third-highest total citations (TC=3025) but third last place in total production (TP=165). It is essential to note that no other country possesses the same position in their respective lists except for the top two countries: the USA and the UK.

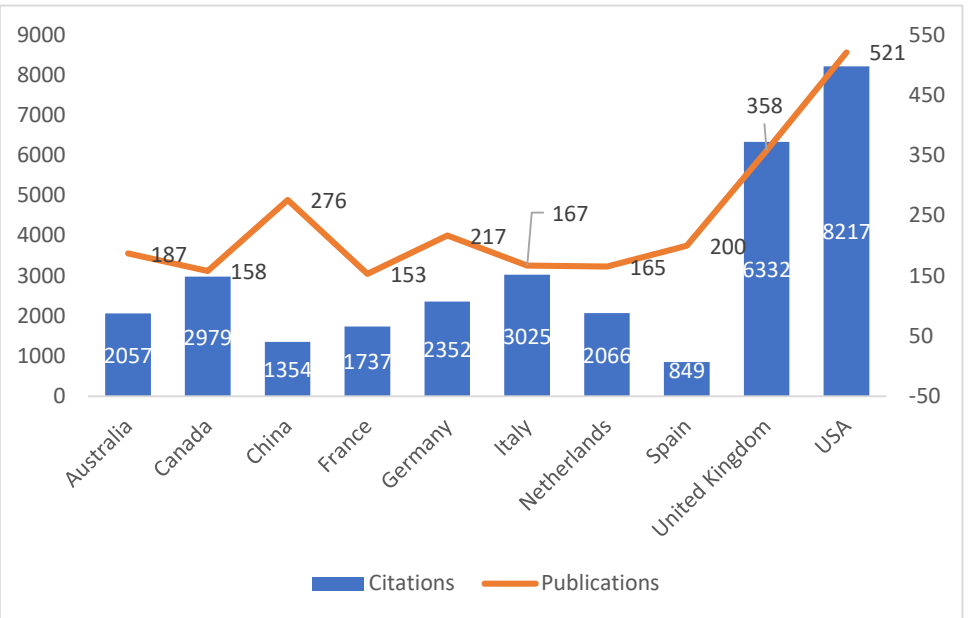

Figure 4. Country Level Contributions

Table 3. Corresponding Author's Country

Country	Articles	Freq	SCP	MCP	MCP Ratio
USA	246	0.14	205	41	0.167
United Kingdom	174	0.10	116	58	0.333
Germany	116	0.07	93	23	0.198
China	109	0.06	77	32	0.294
Spain	103	0.06	79	24	0.233
Canada	85	0.05	67	18	0.212
Australia	84	0.05	66	18	0.214

Netherlands	65	0.04	36	29	0.446
Italy	63	0.04	52	11	0.175
South Africa	55	0.03	48	7	0.127

Note: SCP: "single country publications"; MCP: "multiple country publications."

In Table 3, information is arranged according to the top ten countries of the corresponding authors, and it is reflected that the USA stands at the top position with 246 publications (22%). The number of articles published in single or multiple countries is 205 or 41, respectively. Here multiple country publication means at least one paper co-author belongs to a foreign country. United Kingdom is the second most important country, with 174 publications (SCP:116; MCP:58). It has the highest MCP ratio. Germany places in the third position in terms of total article publications (116) and SCP (93), but its MCP ratio (19.8%) is lower than China (29.3%), Spain (23.3%), Canada (21.2%), Australia (21.4%) and the Netherlands (44.6%). The Netherlands reported the third-lowest publications (65). It has the lowest value for SCP (36), but its MCP (29) and MCP ratio (44.6%) are higher than Germany, Spain, Canada, and Australia.

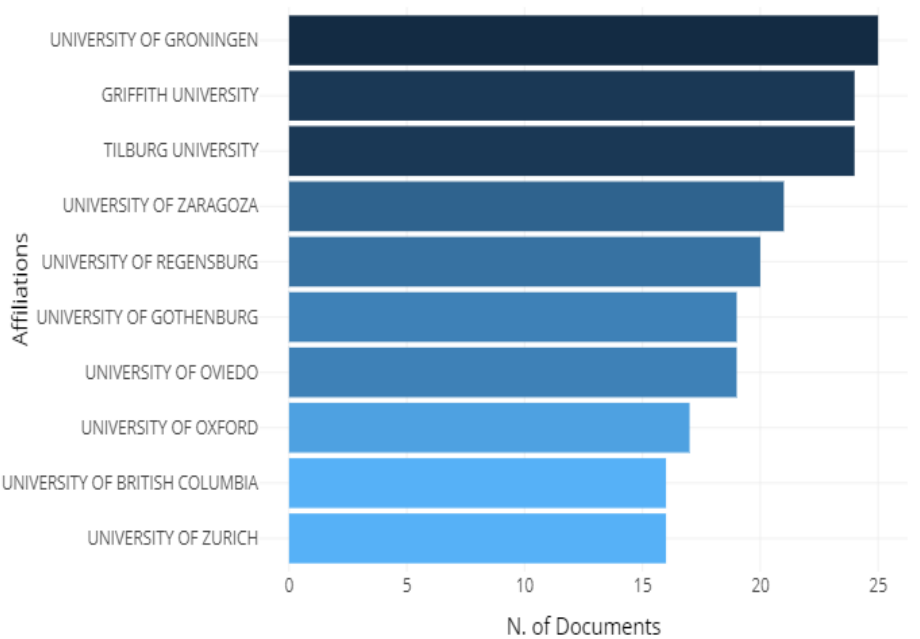

Figure 5. Top Ten Institutional Publications

Figure 5 reported the top ten institutional affiliations that published the most relevant articles related to SRI. The eight universities included in the list are from European countries. Griffith University and the University of British Columbia in Australia and Canada published 24 and 16 research papers, respectively. The two

universities: the University of Groningen and Tilburg University, belong to the Netherlands with 49 publications. The University of Zaragoza and the University of Oviedo, with 40 publications, belong to Spain.

Among the 1988 selected studies, Table 4 reflects the top ten publications and total citations that discuss the subject matter of SRI. Renneboog, Ter Horst, and Zhang (2008a) ranked at the top based on citations (TC=676; TCPY=48.3), focused on the institutional support, investment behaviour and performance of SRI. They argued that the world's attention has diverted towards SRI due to increasing environmental deregulations and economic and financial distress. They emphasized the importance of SRI and motivated the investors to invest in this potential area. Barnett and Salomon (2006) placed in the second position having 653 total citations and 40.8 citations per year. They contributed to the ongoing debate on the relationship between the social-financial performance of mutual funds, also known as SRI. They found that SRI funds bear financial losses due to poor diversification of the portfolios. These losses can be offset by making the right investment choice, as the total returns vary with the social screens employed. Their findings suggest that community social screening increased financial performance compared to environmental and labour screening. Therefore, they should be given preference in portfolio design.

Table 4. Ten Most Productive Scientific Publications with Citations

Article Reference	TC	TCPY
Renneboog, Ter Horst, and Zhang (2008a)	676	48.3
Barnett and Salomon (2006)	653	40.8
Goss and Roberts (2011)	626	56.9
Edmans (2011)	605	55.0
Bauer, Koedijk, and Otten (2005)	508	29.9
Heinkel, Kraus, and Zechner (2001)	379	18.0
Roberts, Wood, and Smith (2005)	349	20.5
Kempf and Osthoff (2007)	329	21.9
Renneboog, Ter Horst, and Zhang (2008b)	325	23.2
Galema, Plantinga, and Scholtens (2008)	310	22.1

Note: TC stands for total citations, and TCPC means total citations per year

Goss and Roberts (2011), ranked in the third position, establish a framework to explain the relationship between CSR and bank debts by emphasizing the crucial role of banks as delegated monitors of firms' activities. They found that lenders are more conscious of the CSR rating if they intend to grant a loan without covenants. Edmans (2011) ranked fourth with 605 global citations, with 55 citations per year. Their research explains the relationship between employee satisfaction and long-term returns. Bauer, Koedijk, and Otten (2005) ranked fifth (TC=508; TCPY=29.9), analyzed the performance and status of 103 ethical mutual funds in

the USA, Germany and the United Kingdom. Their results did not indicate any significant difference in the risk-adjusted returns of ethical and conventional funds. They suggested that these funds are more likely to be growth-oriented than value-oriented and have less variability in their returns. Heinkel, Kraus, and Zechner (2001) stand in the sixth position with total global citations of 379 and 18 citations per year. They also ranked the eighth position based on local citations. Their article discusses the effect of ethical investment on the firm's cost of capital. They stated that the percentage of investors willing to promote SRI impacts the firm's financing cost. They encourage the concept of green financing based on SRI funds.

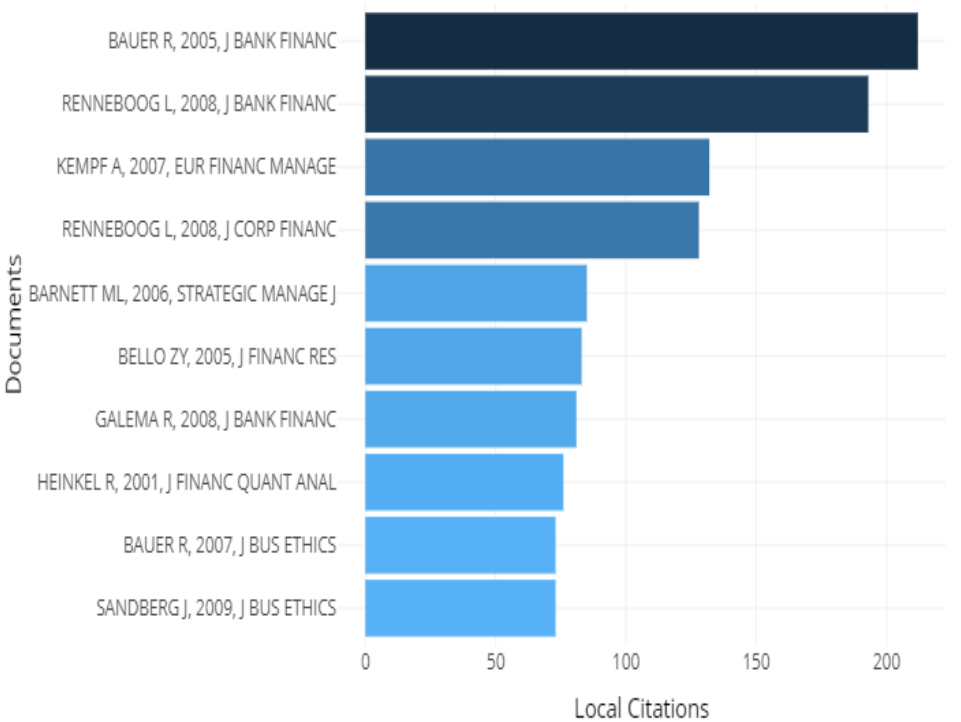

Figure 6. Most Local Cited Documents

Roberts, Wood, and Smith (2005) rank seventh (citations=349). They combine the five-factor theory and social investment theory to explain the personality traits of adulthood and found little support for the five-factor theory and provisional support for social investment theory. Kempf and Osthoff (2007) provided a solution for earning abnormal returns on SRI funds. They emphasized a simple trading strategy of implementing socially responsible ratings where investors buy stocks with high socially responsible and sell with low ratings. Investors will be able to get abnormal returns through this strategy. Renneboog, Ter Horst, and Zhang (2008b) answered an essential question about SRI funds' performance. They believe that the underperformance of SRI funds is because of poor assessment of investors

regarding future returns. It was not due to ethical factors. Investors misjudge the SRI funds and include poorly performed funds in their portfolios. They develop a conceptual model that guides future researchers based on empirical analysis. Galema, Plantinga, and Scholtens (2008) establish a link between portfolio returns, book-to-market ratio, and abnormal or excess returns with SRI funds performance. Their empirical results indicate that SRI influences stock returns by decreasing the book-to-market ratio and generating negative alphas.

Figure 6 reported the local citations of the top ten published documents. The publications by Bauer, Koedijk, and Otten (2005), Renneboog, Ter Horst, and Zhang (2008a), Kempf and Osthoff (2007) and Renneboog, Ter Horst, and Zhang (2008b) ranked first (LC=212), second (LC=193), third (LC=132) and fourth (LC=128) positions, respectively, based on local citations. However, Barnett and Salomon (2006) attained second place in global citations (GL=653) but stood in the fifth position in local citations (LC=85). Three publications are not included in the list of top ten publications based on global citations but are added in local citations.

The publication by Bello (2005) ranked sixth in the list of local citations (LC=83). They compare SRI and conventional mutual funds regarding portfolio diversification, assets held, and specified performance factors. Their findings suggested no significant difference in the classes of funds. The last two authors listed in the top-ten category of local citations observed a similar number of citations, i.e., 73. The research work of Bauer, Derwall, and Otten (2007) focuses on the performance of ethical and conventional mutual funds and found no significant difference in the performance of both investment classes. Sandberg et al. (2009) emphasized the heterogeneity issue of SRI and differentiated its four levels: terminological, definitional, strategic and practical.

3.3. Keyword Analysis

Table 5 presents the top ten most significant concepts or words used in the green finance literature from the selected studies' titles, abstracts, authors' keywords, and keyword plus (e.g., system-generated keywords). A keyword comparison showed consistency in using the concepts in all categories. Therefore, the finding confirms that the selected studies are relevant in focusing on green finance in sustainability literature.

Table 5. Keywords Analysis

Keyword Plus		**Author Keyword**	
Words	**Frq.**	**Words**	**Frq.**
Investment	291	Social Investment	258
Investments	174	Socially Responsible Investment	220
Male	152	Corporate Social Responsibility	164

Sustainable Development	141	Socially Responsible Investing	153
Article	119	Green Investment	93
Sustainability	110	Sustainable Investment	75
Female	109	Sustainability	71
Social Behavior	109	Sustainable Development	70
Human	73	Responsible Investment	68
Animal	71	Ethical Investment	67

Title		**Abstract**	
Words	**Frq.**	**Words**	**Frq.**
Investment	808	Social	3365
Social	664	Investment	3268
Responsible	447	SRI	1331
Socially	342	Investors	1225
Green	244	Financial	1210
Sustainable	240	Study	1206
Investing	220	Funds	1195
Funds	172	Responsible	1178
Investments	169	Green	1105
Performance	169	Performance	1083

The current study is related to economics and economic development that is validated by the keyword "Sustainable Investment," "sustainable development," "green economics," and "sustainability." Interestingly, green finance represents the social concepts depicted through the keywords of "social investment", "socially responsible investment", "corporate social responsibility", "socially responsible investing", and "green investment", which exist in all the categories of the keywords. It also reflects the social behaviour of individuals and investors; that is why the "human", "male", and "female" are part of the analysis. The keywords used in the abstract and title are more in a generic form like "green," "investment," "financial," "performance," "social," "sustainable", etc.

Figure 7.1. Author Keywords

Figure 7.2. Title Keywords

Figure 7.3. Keywords Plus

Figure 7.4. Abstract Keywords

Figure 7. Word Clouds of Keywords

Figures 7.1-7.4 presented the word cloud of the selected studies' top 50 most important words. Specifically, Figure 7.1 shows the word cloud of authors' keywords. The five most powerful words in this category are social investment, green investment, socially responsible investing, sustainable investment, and ethical or responsible investment. In Figure 7.2 (keywords from studies articles),

social investment, green approach, sustainable impact, financial, and energy are the most popular concepts. Figure 7.3 on keywords plus category presents investment, environmental economies, decision-making, social policy, and sustainable development as the most dominant words. While Figure 7.4 focuses on keywords from the `article's abstract, the most prominent keywords in this category are green, financial, investment, social, environmental and ethical.

3.3 Conceptual Aspects of Socially Responsible Investment

Co-occurrence analysis indicates that the frequency of keywords occurs together in the articles (Nasir et al., 2021b). The VOS viewers software uses author keywords and keyword plus to depict the co-occurrence network. Figure 8 shows four significant clusters based on a co-occurrence network of keywords. These clusters represent potential research streams in the field of green finance. For better understanding and discussion, we have listed the most frequent keywords from the co-occurrence network in Table 6. The first research stream represents a red cluster, and it is related to the relevance of green finance with environmental economics, development, and policies. Zhang, (2021) uses ecological and economic efficiency to measure green total factor productivity. They contributed to the body of knowledge by indicating that green total factor productivity significantly provides innovation efficiency for cleaner firms.

Furthermore, it is less for other firms in the red cluster, Zou et al. (2020) analysis of green finance's impact on environmental quality and economic development. They suggested that green finance positively impacts ecological improvement but is subject to various economic growth levels. Finally, they concluded that green finance significantly contributes to environmental and economic development. The topics related to ecological economics, security, and policies are highly researched in China. Wang et al. (2021) described the increasing labour cost in China with the market environment and green technological innovation. The penetration of green technological innovation can justify the increased labour cost by developing the market environment. Feng et al. (2022) predict green finance as the future of financial management. Their study deploys the deep learning mechanism to establish the green intellectual and financial system paradigm. Green finance's role is becoming the financial community's core consideration.

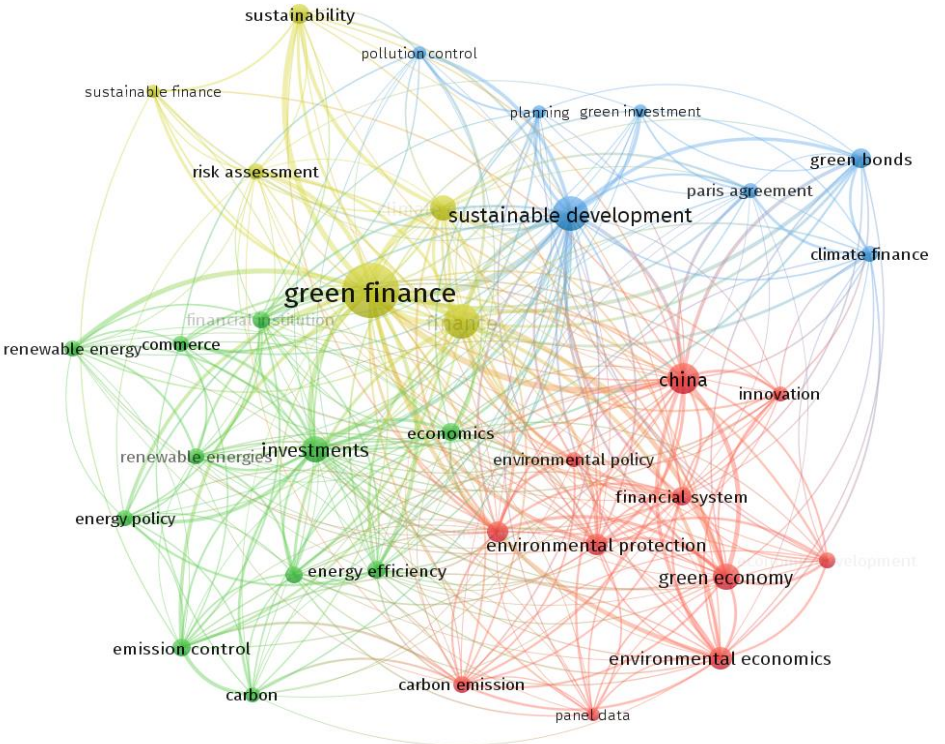

Figure 8. Co-occurrence Network of SRI

The green energy finance stream represents green finance contribution to energy efficiency through emission control and energy policy formation. Furthermore, these streams deal with integrating financial institutions with business commerce to develop financial operations in green finance. Dawkins (2018) studied the impact of green finance in developing and adopting clean energy in Yunnan province. Zhang et al. (2020) looked at the challenges and barriers to access to green finance at the operational and systemic levels in China. Majeed & Luni (2020) questioned various income groups and found that industrialization and urbanization significantly affected carbon emissions. Their study showed that environmental pollution is aggravated by urbanization and industrialization, whereas financial development, economic growth, and energy consumption had heterogenous relevancy depending on the country's development stage. Furthermore, Vo et al. (2019) studied the intermediation of green financial development with efficient renewable energy investment through bank short and long-term loans. The significance of the effect is observed for short-term loans, and the study suggested that the government develop a green financial system through regulations and policies.

Table 6. Co-occurrence keywords and Research Streams

Clusters	Keywords	Research Stream
Red	China, green economy, environmental economies, environmental protection, investment, financial system, carbon emission, economic development, environmental policy, innovation	**Ecological economics, security, and policies**
Green	Investments, economics, emission control, energy efficiency, financial development, financial institutions, commerce, energy policy, renewable energies	**Green energy finance**
Blue	Sustainable development, green bonds, climate finance, Paris Agreement, green investment, planning, pollution control	**Green Investment opportunities**
yellow	Green finance, climate change, sustainability, risk assessment, sustainable green finance	**Green finance risk and sustainability challenges**

The blue cluster represents the studies related to eco-friendly and sustainable green finance practices concerning investment options under climate control. Humphrey et al. (2016) studied international climate finance, the subpart of green finance, and its investment in mitigating climate change activities. It supports investment in developing nations concerning financial instruments with low-carbon solutions. It requires innovations in the shape of contemporary green technology and policy innovation. Dongyang Zhang (2021) saw blockchain technology as the implementation tool for climate change laws. They discuss the challenges and opportunities related to blockchain technology in terms of international regulations and environment-friendly investment. Tran et al. (2020) identified key factors that affect sustainable business development and green investments. Among these factors are awareness of green investment, accessing green capital, green finance mobilization, and government role are the core factors that affect the implementation of green investment procedures. Hafner et al. (2020) discussed the contemporary issue that significant investments in low-carbon energy are not taken urgently. They proposed that financial system uncertainty and short-termism are the main barriers to green investment.

The yellow research stream cluster exhibits the risk factors associated with the sustainability of green finance. Walter (2020) argued that ecological finance theories, based on the financial system within the environment and social constraints, align with sustainable development goals. It represents the paradigm shift from morphology or randomness associated with financial risk modelling. A

small proportion of long-term investment opportunities, underlying risks, and low return rates post challenges for developing green energy projects. Taghizadeh-Hesary & Yoshino (2020) identified gaps that impede green project development and suggested solutions such as guarantee schemes of green credits to curb credit risk, establishing trust funds, and financial policies risk assessment to address green investment opportunities. D'Orazio & Popoyan (2019) signify financial regulators and central banks' role in smoothening the low carbon economy. They addressed the issues related to bank-decarbonized financial statements and finance alignment with sustainable growth and objectives. The risk and slow growth of green projects are discussed by Ngan et al. (2019).

4.2. Thematic Map

The thematic map divides themes into centrality (topics with high frequency) and density (topics with high importance). The above section (Figure 8 and Table 6) highlights the main research streams in green finance. The thematic map narrows down further by dividing the themes into four constructive quadrants, as mentioned in Figure 9. Centrality is on the x-axis, and density is on the y-axis dividing Figure 9 into four main quadrants. Quadrant, I possess themes with low density and low centrality. These themes may drop or may emerge as the potential body of knowledge. We can consider these themes as the future direction of research. Quadrant II represents themes with high centrality and low density. These are primary themes in the field as they are not essential but positively used themes in literature. Quadrant III represents themes that are highly developed but isolated. We can extract future directions from these themes as these themes are remote but developed, so much work can be done on these themes. The themes in quadrant IV are motor themes. These are highly advanced themes with high density but not isolated; significant work has been done as these themes have high centrality. We have further divided the quadrants into two segments, centre of attention themes and anticipated future green finance streams. The former represent themes in quadrants II and IV, and later, those that come under quadrants I and III with low centrality.

4.2.1. Center of Attention Themes

The main centre of attention themes is the core themes with high density and centrality. These themes are in quadrant IV of the thematic map (Figure 9). The main centre of attention is the blue bubble with the highest density and centrality. These research studies are related to the green economy and environmental protection, and most of the origin of these studies is China, the core country. Zou et al. (2020) analyze the impact of green finance on environmental quality and economic development and found a positive significant coefficient indicating that green finance improves China's ecological quality and ultimately leads to economic growth. Liu et al. (2020) analyze the coupling coordination between green finance and the green economy and found a gradual increasing trend in China. Further to a

green economy and environmental protection, a significant contribution has been made by prior research (Budsaratragoon & Jitmaneeroj, 2021; Feng et al., 2022; Vo et al., 2019; Yang et al., 2020; Zhu et al., 2021).

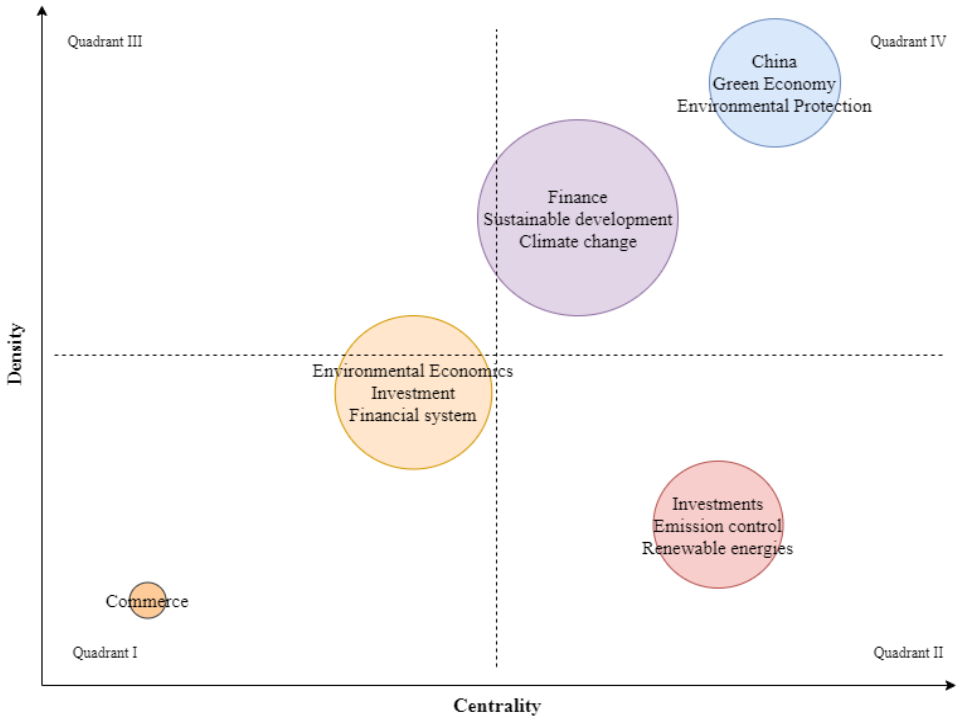

Figure 9. Thematic Map

The second motor theme shifted from a developed and isolated quadrant to highly developed and centralized themes. Trippel (2020) worked on the importance of sustainable development and climate change and reported the European Union's (EU) sustainable financial policies from 2015 to 2019. He indicated EU concerns about environmental and climate crises and accelerated optimal green finance policies to address these crises. Globalization is rising, and international financial instruments are growing over time. Voituriez et al. (2019) reviewed the Chinese international investments' compliance with 2°C of the Paris Agreement on climate and environmental protection. They indicated that green policies are more stringent for local Chinese investments than global investment portfolios. The authors recommended more strict sustainable guidelines for international investments. D'Orazio and Popoyan (2019) addressed issues regarding banks' decarbonization and tools to tackle climate-related uncertainties. There are significant contributions to sustainable development in climate change by Tolliver et al. (2019), who studied the structure of green bonds and aligned them with sustainable development goals. Further elaboration of these themes is reported by prior studies (Ahmed et al., 2023; Bhutta et al., 2022; Lukšić et al., 2022). Highly centralized themes of

quadrant II that are related to investments concerning emission control and renewable energies are discussed and analyzed by Pegels (2010), Sen and Ganguly (2017) and Yan et al. (2022).

4.2.2. Anticipated future streams

The study identifies four main streams with the help of keyword co-occurrence analysis. These themes represent broad sub-fields of SRI literature. The first research stream concerns green finance penetration in environmental economics, securities, and policies. The second research stream focuses on green energy finance. The studies in this stream provide remedies to improve energy efficiency with green finance. Assurance and application of emission control, investments in renewable energies, and building firm energy policy based on green finance practices. The third stream identifies green finance investment opportunities related to concepts. This stream contains studies analyzing and recommending green finance integration with the Paris Agreement on emission mitigation, adaptation, and financial practices. Furthermore, this stream identifies various investment options such as green bonds, climate finance, green credit, and other financial instruments for pollution control. Finally, the last research stream covers green finance risk and sustainability challenges. This research stream addresses climate change risks and provides various risk assessment tools to sustain green finance practices.

There is no clear theme in the isolated and developed quadrant, but two themes are in the thematic map's emerging or dropping quadrant. There is a big cluster of topics related to environmental economics research, green investments, and the financial system's development according to green policies. These clusters of themes are ready to enter in motor or basic quadrants in the near future. Relevant work is done by Hafner et al. (2020), who discussed the green finance gap in decarbonizing the energy sector. Their study's future recommendations are to develop a sustainable vehicle of green investment and prepare green policy for long-term implementations. Cai et al. (2022) considered bank credit and raised issues regarding green finance contribution to renewable energy investment efficiency. Renewable energy investment improvement and policies post future research requirements. Future research agenda should also be set to promote green finance as CSR. Zhou and Cui (2019) analyzed the impact of green finance announcements on companies' performance. They suggested that a green finance announcement create value for the company and promote CSR.

There is a theme with the lowest centrality and density. This cluster's topics are either emerging and get into motor themes in the future, or these research topics are dropping, and soon, these topics will become irrelevant in green finance. This cluster is related to green finance and commerce. To improve market-oriented investment and reduce vigorous pollution development in green finance, cleaner investment is needed, and future research challenges (Liu et al., 2020). In

commerce and industry, there is a significant rule of renewable energy. It is imperative to develop green finance and research for growth (Yan et al., 2022).

5. Discussion

The emergent SRI topic remains a hot topic for discussion for financial managers, economists, environmentalists, and policymakers over the years. Many significant publications have been documented in social sciences that highlight the importance of the topic. The current study has conducted a bibliometric, thematic, and cluster analysis to highlight this field's key concepts and themes. The following influential factors are found through bibliometrics, keywords, and thematic analysis. The most frequent words or concepts used in the article's main body, i.e., title, abstract, authors, and keyword plus, are SRI, green finance, social investment, CSR, ethical investment, green economics, green bonds, climate finance, climate change, and green growth.

The study identifies four main streams with the help of keyword co-occurrence analysis. These themes represent broad sub-fields of green finance literature. The first research stream concerns green finance penetration in environmental economics, securities, and policies. The second research stream focuses on green energy finance. The studies in this stream provide remedies to improve energy efficiency with green finance. Assurance and application of emission control, investments in renewable energies, and building firm energy policy based on green finance practices. The third stream identifies green finance investment opportunities-related concepts. This stream contains studies analyzing and recommending green finance integration with the Paris Agreement on emission mitigation, adaptation, and financial practices. Furthermore, this stream identifies various investment options such as green bonds, climate finance, green credit, and other financial instruments for pollution control. Finally, the last research stream covers green finance risk and sustainability challenges. This research stream addresses climate change risks and provides various risk assessment tools to sustain green finance practices.

In addition to finding research streams, this study highlighted divides all the research streams into four quadrants with the thematic map. The authors identify central attention themes and anticipated future streams with these quadrants. Centre of attention themes represents positively produced literature in green finance. These studies are related to green economies, environmental protection, sustainable development, climate change, emission control and mitigation investment, and renewable energies. Finally, the study identifies fewer research areas of green finance that provide relevant future directions in literature. These themes are anticipated future research streams and contain topics related to the green financial system, environmental economics, and commerce. This study will help research policymakers, agencies, and other stakeholders identify green finance's vital influential aspects. It helps them know where to look when curious about green

practices and highlights various topics and themes that can help them identify gaps, compare multiple issues, and explore the dynamics of green finance.

5.1 Implications of the Study

The study highlights the core aspects and contemporary literature on sustainably responsible investment. The study provides significant implications for sustainable development goals (SDG). Considerable research direction is suggested in SDG 9 and 10 as SRI fosters industrial innovation and offers resilient infrastructure. Furthermore, SRI contributes to a sustainable global economy by providing key themes and research streams to policymakers, regulators and investors to support the resilient, innovative and sustainable industry.

5.2 Conclusion

The advent of SRI enhances global economic sustainability by accommodating corporate social responsibility and innovation. The literature on SRI has rapidly evolved with geometric growth in financial management, economics, and environmental management sciences. This study aims to find the core and conceptual aspects of SRI literature and use extensive bibliometric analysis to achieve the stated objective. Key influential elements focus on the importance of the topic, its assessment criteria, barriers to adopting the process, relationship with environmental and economic matters, and future challenges. The study deploys the Scopus database to extract 1988 documents from 105 sources for bibliometric analysis from 1990 to 2022. The papers are primarily published in the top three journals: Journal of Business Ethics, Sustainability, and Journal of Sustainable Finance and Investment. The highly cited publications focused on the top ten SRI concepts, corporate social responsibility, green economics, green bonds, climate finance, social investment, sustainable development, financial system, green growth, social behaviour, and ethical and social investment. The USA, the United Kingdom and China are significant places of origin. Eight of the top ten institutions focusing on SRI publications belong to European countries. In addition to influential critical aspects, this study provides the conceptual structure of SRI. The study deploys a co-occurrence network to classify the literature into four clusters. Each cluster offers dynamic SRI literature. The central cluster with high centrality is regarded as red and includes literature related to ecological economics, policies and securities. Green energy finance literature is highlighted as the green cluster. Furthermore, green investment opportunities, risk management, and sustainable challenges provide insightful literature under blue and yellow clusters. The study uses the thematic map to identify future research streams by evaluating the literature using four thematic perspectives. These thematic perspectives are divided into four thematic quadrants, i.e. emerging, basic, developed and motor. Emerging or dropping themes are the most dynamic and provide future directions as these

themes provide new aspects of literature. Articles related to environmental economics, financial system, investment and commerce come under this quadrant. Highly centralized themes include renewable energies and emission control investment. Environmental protection, green economics, climate change and sustainable development and finance are the themes that are highly developed, and there is considerable research as well. The thematic analysis not only provides foundations for future research but also provides implications for a sustainable global economy and contributes to the agenda of SDGs.

5.3 Limitations and Future Directions

The current study reported certain limitations that open new avenues for further research. The main constraint is the research query that is applied at one point in time, and topics are identified and inspected according to that data. The query application may provide different results, and analysis may change accordingly from 1990-2022. Further, going through the underlying themes, streams, and literature, the current study proposes future directions to fill the existing research gaps. First, it emphasized increasing awerance of the SRI concept, particularly in developing countries, where large numbers of people are usually unable to make informed decisions due to a lack of knowledge (Cai et al., 2022). Second, it highlighted the significance of developing a green finance system for decarbonization and renewable energy development in commerce and industry.

Third, the sub-elements of green finance, such as green bonds and credit, should have exact comparisons and policy research. Such type of financial instruments helps to promote SRI among investors and create a positive image of the firm's CSR activities. That is why research is required for decarbonization and emission control in developing countries, and an international green financial instrument should be introduced to achieve this objective. Fourth, the current study concluded that the government's role is essential in devising and implementing policy (Khan et al., 2022). Therefore, policymakers should consider the future of SRI in implementing green finance regulation. Fifth, there should be future research regarding Islamic practices in green finance and investment. But it remains the less explored area in the field. Therefore, more attention is paid to linking SRI with ethical values. There is a gap between green insurance or takaful and green bonds and Sukuk in the body of knowledge (Bauer et al., 2005, 2006). It would be an underpinning area in Islamic finance for the researchers. Sixth, research and development in fintech models are needed for SRI improvement and implementation. Finally, there is minimal research on green entrepreneurship practices. So, that area requires more attention in the future.

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