

Sustainable Finance: Exploring the Frontiers of Current Research

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ABSTRACT

This study explored the frontiers of current sustainable finance (SF) research by identifying research traits, important in shaping its future research direction. It combined analytical techniques covering bibliometrics, citation, social networks, and the content analysis of 690 papers published in the Scopus database between 1979 and 2021 (43 years). The analytical results suggested that SF has grown into a cross-disciplinary research area where past literature had concentrated mainly on business-related and environmental science domains. The three primary areas of focus in sustainable finance that have received considerable attention from scholars over the past few years include microfinance, green finance, and green banking. The publishing trend was first fragmented but ramped up post-2005 and further spiked post-2015, primarily due to the United Nations' establishment and propagation of Sustainable Development Goals (SDGs), which systematically caused the literature to proliferate, covering more strategic research issues. The paper contributes to SF's existing body of knowledge by highlighting critical research properties and suggesting ten promising areas important for early and/or matured researchers in framing their future research trajectory involving SF.

Keywords: Sustainable Finance, Bibliometric Analysis, Citation Network

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INTRODUCTION

Sustainability is no longer an eccentric term in many realms, particularly business and the environment. The call for individuals and groups within the social and business contexts to behave and operate more sustainably had become louder, at least post-millennium, with conversations on the issue had evolved dramatically, the climax of which could be seen in the development and propagation of SDGs by the United Nations in 2015 through its General Assembly the outcomes of which are expected to be materialised fifteen years later (by 2030). Introduced to succeed in the Millennium Development Goals, which ended in 2015, the SDGs primarily consist of seventeen connected goals. It serves as a framework to develop and produce a more sustainable future for all humanity (see, e.g., Miralles-Quirós & Miralles-Quirós, 2021; Rodrigo-González et al., 2021). Table 1 presents relevant elements under the sustainable domain being part of the seventeen SDGs.

Table 1: Elements in the Sustainable Domain

Environmental	Social	Governance
<ul style="list-style-type: none"> ● Climate change mitigation and adaptation ● Preservation of biodiversity ● Pollution prevention ● The circular economy 	<ul style="list-style-type: none"> ● Labour relations ● Inequality ● Inclusiveness ● Human rights issues ● Investment in human capital and communities 	Public and private institution governance in ensuring the inclusion of social and environmental considerations in decision-making processes covering: <ol style="list-style-type: none"> a) Management structures b) Relationships between employees c) Compensation for senior executives

(Source: European Commission. Available at https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en)

In the acute business context, the boundaries of intellectual discourse on sustainability have gradually transcended beyond environmental issues to cover the firm’s entire business practices (Baker et al., 2020). The term ‘sustainable’ was paired with the critical business element of finance; the primary purpose being to raise capital to support the running and expansion of business operations. The literature provides a somewhat codified definition of ‘sustainable finance’, which conceptually refers to myriads of financing services provided in consideration of factors transcending beyond

financial returns objectives by integrating relevant, sustainable criteria of environmental, social, and governance (ESG) into the financing decisions to generate unwavering benefits for stakeholders including but not limited to the financing clients and society at large (Haigh, 2012; OECD, 2020). Under the umbrella of such definition, financial services firms systematically mould their investment decisions to support and ensure relevant mitigation and adaptation practices that attend to sustainable development outcomes, including adapting to efficient natural resources usage, mitigating pollution, and other adverse effects of climate change (Akomea-Frimpong et al., 2021; Sarma & Roy, 2021; Urban & Wójcik, 2019). Furthermore, there are emerging efforts to combine legislative and regulatory solutions to accomplish comparable aims using terminologies like ‘financial inclusion’, ‘access to credit, and ‘sustainable finance’ (Schwarcz & Leonhardt, 2021).

As the targeted year of materialising SDGs is fast approaching, it is practically and academically imperative for the academic literature to look back at the frontier of empirical knowledge on SF being a vital part of the SDGs, thereby providing the necessary reflections on what had been done so far and what more could be done in shaping the trajectory of practical and empirical SF knowledge. Accordingly, this study attempted to explore the frontiers of SF research repertoire by delineating critical research attributes under the general theme of SF, which are arguably important in guiding future SF research. 690 SF-related publications were selected and analysed using the widely used scientific analytical technique of bibliometric analysis. These SF research collections were published between 1979 to 2021 in various Scopus-indexed publishing outlets. The scientific-analytical bibliometric analysis generates comprehensive results suggesting that SF built itself as a multidisciplinary research area. Prior literature has concentrated mainly on business-related and environmental science domains. Trend analysis indicates that SF research was initially fragmented during embryonic stages (earlier years, pre-2000). However, publications in the area had ramped up post-2005. They increased exponentially after 2015, mainly driven by the introduction and propagation of SDGs by the United Nations. The literature had further increased to cover more strategic and practical research issues covering varying areas under the practice of ‘finance’.

This study highlights the most critical aspects of SF and the current state of affairs in this field. It also makes recommendations for further research. A bibliometric study can assess this field's publication trends and intellectual structure. Six research questions are listed below (RQs):

RQ1: What is the current trend in sustainable finance?

RQ2: Which sustainable finance papers are the most important?

RQ3: Which sustainable finance authors are the most influential?

RQ4: What are the most popular sustainable finance themes for academic studies?

RQ5: What is the current intellectual framework for sustainable finance research?

RQ6: What kinds of impediments in sustainable finance research?

RQ7: Which aspects of sustainable finance need further research?

The contributions of this paper are at least two-fold. First, it highlights critical research properties crucial for early and/or mature researchers in framing their future research trajectory involving SF. As the analyses identify gaps and futile future research areas are subsequently offered, researchers are presented with readily available empirical and literature gaps for their considerations. Secondly, the present research endeavour, despite having minor similarities with recently published works on SF-related literature studies (e.g., Akomea-Frimpong et al., 2021; Sarma & Roy, 2021), however, signifies the first bibliometric analysis on SF using the established publication database over a more extended period horizon of over four decades. Hence, the study offers novel contributions to the existing literature in terms of comprehensively providing evidence of the current practices in sustainable finance.

The paper proceeds as follows. The following section briefly introduces SF, followed by a section that explains the strategy used to identify the data on past publications related to SF, including the appropriate analytical methods employed. The results section, which presents the functional analysis, is presented next. The final section discusses the implications of findings translated into suggestions on ten promising areas and concludes the paper.

SUSTAINABLE FINANCE: OVERVIEW

The concept of sustainability is historically derived from the awareness movement towards global warming and its impact on the environment and humanity. As the movement was formally institutionalised through various introduced environmental policies (including protocol and convention) at the global stage through the United Nations, the concept of sustainability was later expanded to cover various business-related practices, including that of finance.

SF refers to a variety of financing services provided in consideration of factors transcending financial return objectives by integrating relevant, sustainable ESG criteria into financing decisions to generate unwavering benefits for stakeholders, including but not limited to financing clients and society at large (Haigh, 2012; OECD, 2020; Nirino et al., 2021). SF is more coherently referred to as “finance for sustainability” which encompasses all the activities and factors that promote financial sustainability and contribute to achieving sustainability objectives (Kumar et al., 2022; Migliorelli, 2021).

The literature further indicates that SF is directly connected to what is commonly known today as ‘Environmental Finance’ in which similar other concepts include ‘green’, ‘climate’, ‘social’, ‘micro’ and ‘ethical’, which are all fall under the sustainability domain (Akomea–Frimpong et al., 2021; Muganyi et al., 2021; Sarma & Roy, 2021). Similar to environmentalism efforts in general, the global movement promoting and championing environmental finance was essentially driven by many governments’ ineffective management of economic crises globally (Linnenluecke et al., 2016).

Interchangeably used as SF in the literature, environmental finance primarily refers to ‘myriads of financing and investing-related activities that utilise specific environmental policy instruments to improve financing and investment strategies’ environmental and ecological impact (Linnenluecke et al., 2016). It is directly connected to the ‘green finance’ concept, which aims to support economic growth while reducing relevant environmental pressures, minimising greenhouse gas emissions (hence, pollution) as well as reducing waste, and improving efficiency in natural resources usage (Akomea–Frimpong et al., 2021; Muganyi et al., 2021;

Sarma & Roy, 2021). SF has also been extended to cover auxiliary transparency and governance business concepts. It propagates awareness for stakeholders to demand transparency regarding applicable risks potentially impacting the financial system's sustainability and the influential role of stakeholders in mitigating those risks through appropriate governance instruments (Naciti & Cesaroniand Pulejo, 2021). Taken collectively, SF aims to rationalise the available business resources obtained through financing and investing, improving the sustainability of financing and investment activities while simultaneously regressing the negative impacts of environmental degradation, particularly climate change.

METHODOLOGY

Identification of Sources

The bibliometric method

The scientific-analytical approach of bibliometric analysis uses appropriate statistical methods to analyse various published reading materials covering books, articles, and other publications. Frequently applied in the field of library and information science, its specific analytical tool of 'Citation Analysis' represents part of the bibliometric approach based on citation graph construction which effectively refers to a network or graph representation of the citations between documents (Linnenluecke et al., 2016; Schaer, 2013). This phase enables impact assessment exercises towards various elements, including the selected research field, the set of researchers, the published material, and the assessment exercise of identifying the most influential papers within a specific field of research (Donthu et al., 2021; Ellegaard & Wallin, 2015; Mustikarini & Adhariani, 2022).

Figure 1 depicts the same direction prior bibliometric investigations have pursued (e.g., Mansour et al., 2021). Past publications on SF were drawn from the Scopus collection on 8th September 2021. It represents a comprehensive and interdisciplinary bibliographic database covering articles referenced from various publications, including journals, books, and conference proceedings. The data search was based on the article title related to SF, i.e., 'sustainable finance' OR 'sustainable financing' OR

‘environmental finance’ OR ‘social finance’ OR ‘green finance’ OR ‘ESG financing’ OR ‘ESG Finance’ OR ‘green financing’ OR ‘micro finance’ OR ‘Islamic social finance’ OR ‘Islamic micro finance’ OR ‘green banking’ OR ‘environmental financing’ OR ‘micro financing’ OR ‘Islamic social financing’ OR ‘Islamic micro-financing. Six hundred ninety documents are obtained from the query. The output is used to conduct bibliometric analysis. The citation analysis is conducted using ‘Harzing Publish or Perish’ to obtain the citation metrics and other frequencies. Besides that, other frequencies are also calculated, and the graph and chart are designed using Excel. In exploring the research frontiers in SF, the analyses were conducted using the relevant data covering the year of publication, authors’ publication, subject area, type of documents, source title, type of source, keyword used by the author, affiliation of the author, publication according to country, and language used in the publication.

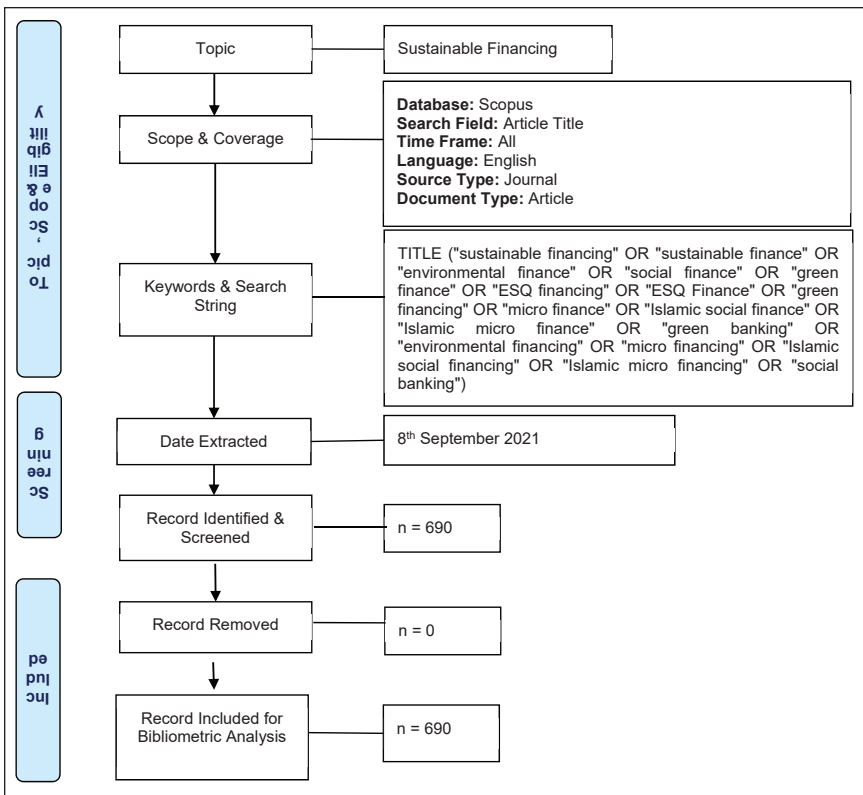


Figure 1: Flow Diagram of the Search Strategy

Data Analysis

Citation analysis and bibliometric network analysis tools, such as VOSviewer and Harzing’s Publish or Perish tools were employed to explore the intellectual, social, and conceptual structures of the literature.

RESULTS AND DISCUSSION

Documents Profiles

Table 2 presents the profiles of all 690 documents covering document type (Panel 1), source type (Panel 2), subject area (Panel 3) and the most active source title (Panel 4). The statistics indicated that the concentration of SF publications was among paper articles (451: 65.36%), with journal type being the source documents (513: 74.35%), published in 20 subject areas, with the top three areas coming from Economics, Econometrics, and Finance (271: 39.28%), followed by Business, Management, and Accounting (227: 32.90%) and Environmental Science (169: 24.49%). Published SF papers were also noted to have been concentrated in four source titles with at least ten publications in each title. More than twenty were in Sustainability Switzerland (28 papers) and the Journal of Sustainable Finance and Investment (22 papers).

Table 2: Document Profiles

Panel 1: Document Type		Total	%	Panel 2: Source Type		Total	%
Article		451	65.36%	Journal		513	74.35%
Book Chapter		80	11.59%	Book		90	13.04%
Conference Paper		76	11.01%	Conference Proceeding		67	9.71%
Review		38	5.51%	Book Series		18	2.61%
Book		17	2.46%	Trade Journal		2	0.29%
Others		28	4.05%				
Panel 3: Subject Area		Total	%	Panel 4: Most Active Source Title		Total	%
Economics, Econometrics and Finance		271	39.28%	Sustainability Switzerland		28	4.06%

Business, Management and Accounting	227	32.90%	Journal Of Sustainable Finance and Investment	22	3.19%
Environmental Science	169	24.49%	E3s Web of Conferences	13	1.88%
			Routledge Handbook of Social and Sustainable Finance	10	1.45%

Minimum 10

Research Trends in Sustainable Finance

This section addresses the answer to the first RQ1 (*What is the current trend in sustainable finance?*). The trends of SF publications are presented in Figure 2 below. The first publication on SF appeared in 1979, which dealt with environmental financing litigation (Minturn, 1979). There were only 22 publications related to SF within the span of 20 years (1979 to 1999), corroborating the claim by Cooper (2019) that the growth of capital markets helped governance improvement during the period leading to the 1990s, but both environmental and social issues were not the focus. However, the publication trend accelerated after 2005, when many global financial institutions recognised the potential benefits of socially responsible investment (SRI) during the 2008 financial crisis, owing to the growing need for institutional investors to diversify away from traditional investments in hard assets and commodities.

Furthermore, another surge occurred in 2015, mainly due to the United Nations' development and dissemination of the SDGs, after which the literature expanded to encompass more strategic and practical research topics. Consistent with the publication growth, total citations also increased significantly, especially in 2019, with 462 citations being the highest during the period under review. This increase might be attributed to the 2017 World Summit on Sustainable Development (WSSD), which was hosted in New York City under the theme of 'transformative partnership' to work together to achieve sustainable development goals via collaborative cooperation. In addition, the United Nations General Assembly established the 'Sustainable Development Agenda' in the same year. In terms of geographical distributions (Figure 3), the People's Republic of China contributed the most to SF publications (104: 15.07%), followed by both India and United Kingdom (each 74: 10.72%), United States (68: 9.86%),

Malaysia (44:6.38%) and Australia (36:5.22%). The most active regions producing SF publications were the Asian region and Oceania (Australia) combined, contributing 37.39%.

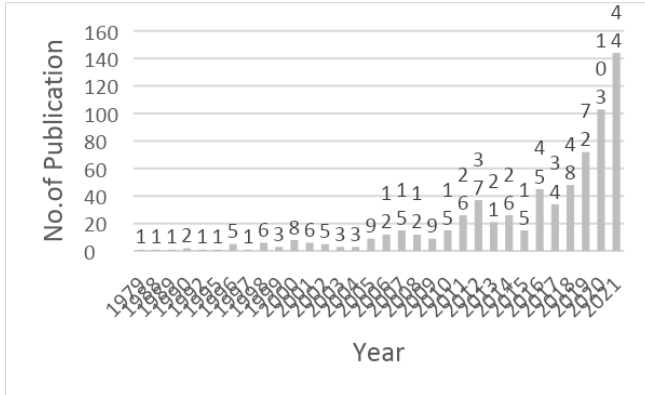


Figure 2: Publication Trend

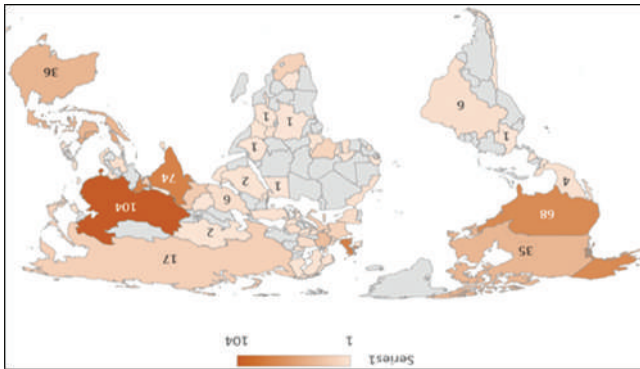


Figure 3: Geographical Distributions of Publications

Most Influential Documents and Researchers

This research utilised the citation analysis to answer the second RQ2 (*Which sustainable finance papers are the most important?*) and RQ3 (*Which sustainable finance authors are the most influential?*). Citation analysis is an effective tool for determining SF papers’ influence based on their number of citations (Baker et al., 2020). The citation metrics are shown in Table 3 (panel 1) below, in which statistics and their corresponding analyses were obtained using VOSviewer and Harzing’s Publish or Perish tools. Based

on the 690 documents retrieved, the citations are reported as 4,529, with an average of a cited publication standing at 7. Panel 2 of the same table further discloses the top 5 most cited documents based on the number of citations, with the paper by Burgess and Pande (2005) marked as the most highly cited article with 406 citations, an average citation per year of 25.38, and an average citation per author of the article stood at 203.

Table 3: Citations Analyses

Panel 1: Citation Metrics					
Metrics	Data	Metrics	Data		
Papers Covered	690	Cites/Paper	6.56		
Citations Received	4,529	Cites/Author	2,837		
h-index	30	Authors/Paper	2.33		

Panel 2: Top 5 Highly Cited Document					
No.	Authors	Title	Cites	Cite/Year	Cite/Author
1	Burgess and Pande (2005)	Do rural banks matter? Evidence from the Indian social banking experiment	406	25.38	203
2	Mayoux (2001)	Tackling the downside: Social capital, women's empowerment and micro-finance in Cameroon	267	13.35	267
3	Pitt et al. (2006)	Empowering women with microfinance: Evidence from Bangladesh	191	12.73	64
4	Rogaly (1996)	Micro-finance evangelism, 'destitute women,' and the hard selling of a new anti-poverty formula	138	5.52	138
5	Mayoux (1999)	Questioning virtuous spirals: Micro-finance and women's empowerment in Africa	135	6.14	135

Visualising the citation analyses could be represented with the visualisation map as per Figure 4 (panel 1: by document and panel 2: by country). Setting the requirement to only a minimum of 1 citation showed the link between the critical author of the article/document published and how their publication was related to the other article/document published by the other author. With each colour representing a specific cluster, Figure 4 suggests that authors in the same cluster strategically cited each other's research works. It also indicated seventeen (17) clusters with four hundred nineteen (419) thresholds.

Panel 2 in Figure 4 illustrates a network visualisation map of citations by country, with one set as the minimum number of documents and one set as the minimum number of citations for each author. These requirements resulted in 75 countries reaching the thresholds, indicating the number of citations each country had produced and published. The mapping shown in Figure 4 is consistent with the results reported in Figure 3. The most prominent circles are China, India, the United Kingdom, the United States, and Malaysia. The tenacity of Malaysian researchers is unsurprising (“As of November 1, 2021, the Malaysiakini stated on its website that Malaysia’s carbon emissions per capita are greater than those of the world’s worst emitter, China”). The People’s Republic of China, the Asian giant with the highest population globally, remains the leader in carbon emissions based on the latest report by the Rhodium Group study, which states that China produced twenty-seven per cent (27%) of the world’s greenhouse emissions in 2019. The overall emissions exceeded that of all industrialised countries combined.

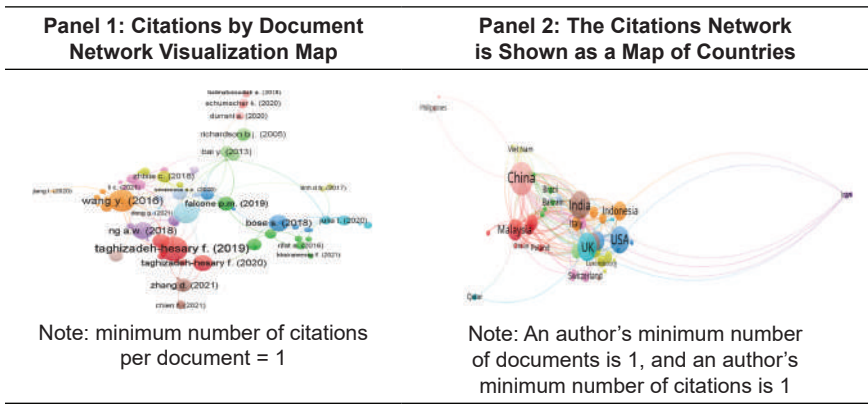


Figure 4: Network Visualisation Map on Citations

Most Popular Sustainable Finance Themes

This section highlights the answer to RQ4 (*What are the most popular sustainable finance themes for academic studies?*). Another critical component of the bibliometric analysis is the analysis of themes related to SF in previously published research. Utilising the VOSViewer software to see the map of keywords’ co-occurrence in the abstract and co-occurrences on title exclusively, the results will indicate keywords co-occurrence in

Table 4: Top Keywords

Keywords	Total	%	Keywords	Total	%
Green Finance	92	13.33%	Green Economy	27	3.91%
Microfinance	83	12.03%	Social Finance	27	3.91%
Finance	81	11.74%	Financial System	24	3.48%
Sustainable Development	74	10.72%	Climate Change	23	3.33%
Sustainability	65	9.42%	Environmental Economics	23	3.33%
Green Banking	36	5.22%	Environmental Protection	22	3.19%
Sustainable Finance	36	5.22%	Micro-finance	22	3.19%
Economics	34	4.93%	Poverty Alleviation	22	3.19%
Investments	29	4.20%	Banking	21	3.04%

Figure 5 (panel 2) illustrates a word co-occurrence network based on the title and abstract fields. Binary counting is used in this mapping, with five (5) being the smallest occurrence of the term. 751 terms met the threshold; 60% were selected as relevant items (by default). This configuration resulted in five (5) clusters (themes) mapped using VOSViewer based on the title and abstract fields. The clusters were ‘microfinance’ (green coloured), ‘green finance’ (yellow coloured), ‘green banking’ (blue coloured), and finally, ‘social finance’ (red coloured). The same colour network within the cluster showed that the term always occurred when the theme was used in the publication.

Current Intellectual Framework for Sustainable Finance Research

Co-citation analysis

In bibliometric network analysis, co-citation analysis is the number of times two articles are cited together (Small, 1973). It could indicate intellectual organisation (Rossetto et al., 2018), revealing the study domain’s structure, directions, and advances (Liu et al., 2015). Our fifth RQ (*What is the intellectual framework of contemporary sustainable finance research?*) focussed on the intellectual structure of sustainable finance research using co-citation and content analysis. When two articles, represented by nodes, co-occur in any research publication, co-citation analysis is used to connect

them. We consider two items comparable when referenced together since they are likely to be about the same topic (Hjørland, 2013).

Content analysis

The co-citation network analysis revealed three research clusters. This section examined the content of each cluster. To identify a similar subject within each cluster, we examine the most recent top ten publications, as is customary in bibliometric studies (Baker et al., 2020; Xu et al., 2018). Figure 6 represents the network visualisation map on co-citation.

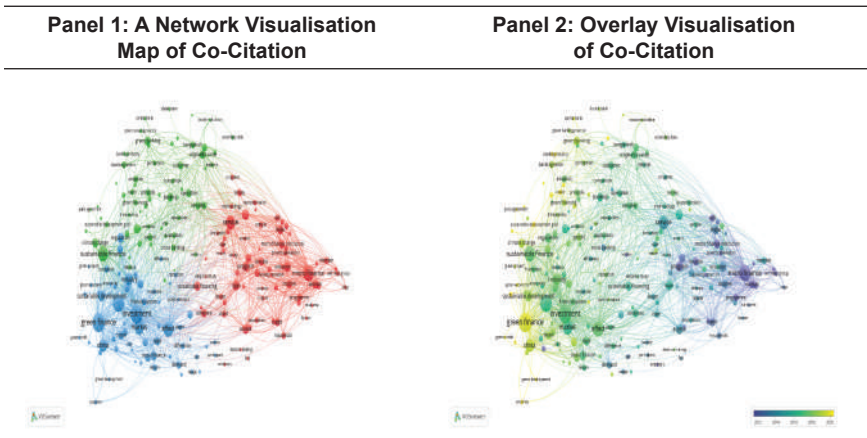


Figure 6: Network Visualisation Map on Co-Citation

Cluster 1 (red): SF in the context of income, success, women, and poverty alleviation

Microfinance programs were dominated by the ‘financial self-sustainability paradigm,’ in which women’s group participation was marketed as a vital means of enhancing financial sustainability while also being presumed to empower them automatically. Most past literature studies the relationship between sustainable finance and its effect on women’s empowerment (see, e.g., Piff, 2006; Mayoux, 2001). Consequently, the impact of the success of micro-financing programs is positive on the income of poor people. The conventional and Islamic SF has increased household income and alleviated poverty. Hadisumarto et al. (2010) suggested that implementing Islamic microfinancing effectively develops microenterprises and increases household income. However, while microcredit has improved the profitability of rural poor women-run microenterprises, there appears

to be no long-term effect as assessed by gains in household assets (Ssendi & Anderson, 2009).

Cluster 2 (green): SF in the context of green financial services in response to climate change

With increased worldwide action to combat climate change, green finance has received much attention in recent literature. It is, nevertheless, conceptually ambiguous, with no agreement reached among researchers on its definition (Zhang et al., 2019). Green finance has paved the way for the government to respond to climate change issues by increasing the role of public financial institutions and non-banking financial institutions in long-term green investments (Taghizadeh-Hesary & Yoshino, 2020). Major players in green energy projects face challenges. However, there are practical solutions to that issue, such as using the spillover tax to increase the rate of return on green projects, developing green credit guarantee schemes to reduce credit risk, establishing community-based trust funds, and addressing green investment risks through financing. The current concentration on maximising shareholder value has unintended consequences driving many corporations to externalise their social and environmental costs. As a result, a paradigm shift is required to ensure green finance’s long-term viability and development. Initiatives have been launched to analyse the influence of regulatory standards and other factors on green banking disclosures to ensure the long-term viability of green financial services in response to climate change (Bose et al., 2018).

Cluster 3 (blue): SF in the context of investment, green finance, sustainable development, regulation, and efficiency

Green finance is a new financial pattern that combines environmental protection with economic rewards by emphasizing the words “green” and “finance,” both of which are contentious subjects (Wang & Zhi, 2016). It is, nevertheless, conceptually ambiguous, with no agreement reached among researchers on its definition. Green finance and investment risk are intricately intertwined, particularly in emerging and developing nations. Most of the top articles in this cluster examined investment challenges in developing green energy projects, such as the lack of long-term financing, diverse risks, lack of market players’ capabilities, and poor rate of return.

Impediments in Sustainable Finance Research

This section will respond to RQ6 (*What types of constraints exist in SF research?*), which practically deals with various obstacles and dilemmas which constitute a common stumbling block in SF research.

1. Challenges in data sourcing

Most of the past SF research was conducted using the qualitative method. During fieldwork with microfinance programme participants in non-western settings, researchers found challenges in acquiring access, negotiating positionality, using the predefined technique, and assuring ethics (Chowdhury, 2021). Furthermore, researchers faced ethical quandaries when conducting qualitative microfinance research when gathering morally sensitive data or dealing with disadvantaged people (Bahn & Weatherill, 2013). For example, when assessing the attitudes of borrowers or non-compliance with loan repayment, the concrete conclusion is hard to generalise as it deals with the culture of people that become the sample of the observation. For instance, Nawai and Shariff (2013) discovered previously unknown elements contributing to Malaysia's low microfinance loan payback performance, whereby the attitudes of borrowers regarding their loans, the quantity of money they get, company experience, and family background all have a part in bad payback.

On the other hand, using questionnaires in SF, combined with the fact that the respondents were from rural areas, jeopardises the confidentiality and integrity of the input, putting the research findings in jeopardy. Most questionnaire respondents will be illiterate if the research targets illiteracy, which impedes reliable data. A framework within which questionnaires should be developed will provide helpful information that can be turned into effective SF programs.

Another impediment is an issue with a specific segment of sustainable Islamic microfinance. In particular, regarding geographical location, particularly those of under-developed countries, the concept of Islamic economics is still in its infancy stage of development and cannot be distinguished from conventional economics because they deal with the same issues. According to Masrifah (2022), even in Muslim-majority

countries, there are few experts/scholars on any aspect of Islamic microfinance. The above significantly limits qualitative studies that require a certain number of expert interviews. Additionally, there is also a shortage of regular quantitative data from numerous financial organisations to begin quantitative investigations.

2. **Impact Assessments: Extreme (outliers) Observations**

Primarily, research based on observations of extremely successful entrepreneurs or heavily indebted borrowers makes it impossible to forecast how SF would influence the ordinary borrower, let alone the average family. Because SF users are not typical of the overall population, establishing a link between SF access and poverty alleviation is difficult. As a result of this practice, it is impossible to compare the socioeconomic status of clients to that of non-clients. Aside from that, SF organisations are usually concentrated in a single village or township. Because of challenges like these, assessing the effectiveness and efficiency of microcredit, which previously lacked reliable evidence to support its use and efficacy, becomes more difficult (Banerjee et al., 2013). However, all of the disadvantages and problems allow future researchers to investigate specific SF research areas more in-depth. The section that follows will highlight prospective research avenues in SF.

Promising Areas for Future Research

This section discusses the final RQ (*Which aspects of SF need further research?*). Analysing the formed clusters further enabled this study to realise that some critical elements related to SF have not received the required attention in the literature. Therefore, future research should ideally explore these aspects.

1. **Governance issues:** Future research should address critical governance issues (e.g., structures and ownership) and their potential impacts on SF practices, including reporting. This new inclusion enhances the comprehensiveness of SF literature to link relevant elements of governance into the sustainability domain within a firm's sustainable financing and investing practices.

2. **Green bond or climate bond:** The evolution of the green bond or climate bond has become a potential instrument for sustainable financing, which is vital to help bridge investment gaps in green, climate-friendly initiatives. Nonetheless, due to inconsistent standards and unsuitable government engagement, the green bond market's enormous development potential is noticeable and has not been fully realised (Chen and Zhao, 2021). Consistent standards are technically crucial because they enhance transparency and create more objective standards for stakeholders in the green bond market (Sartzetakis, 2021).
3. **Embedding sustainability into investment models:** Future research should also investigate the possibilities of incorporating sustainability issues into investing models, particularly at the individual investor level. Creating sustainable investment models that integrate sustainability issues might be beneficial in encouraging long-term thinking and ethical investing. Additionally, incorporating sustainability considerations into individual decision-making might enhance policy efficacy by promoting the development of evidence-based tools for private investment.
4. **Greenwashing:** The issue of greenwashing whereby SF lacks public awareness is particularly alarming, especially given current market trends, which heighten the possibility of 'greenwashing' (Riding, 2019). As a result, promoting ostensibly 'green' financial products to an uneducated audience poses significant investment risks.
5. **Role of politics:** To study the potential of SF in handling climate change and its associated issues, it is also crucial to look at the role of politics. For instance, there have been widespread calls for more government oversight over the financial industry, demonstrating the sector's inability to self-regulate (Strauß, 2021).
6. **Financial market linkages:** Identifying strategies to link the expansion of financial markets with the development of policies based on reliable data. The financial industry significantly affects sustainable finance, but little is known about contributing to evidence-based policy. Furthermore, supporting the creation of tools meant to promote SF

may increase market and policy efficacy. This exertion is particularly essential since there are only a few options for governments and private investors to attain high levels of environmental quality (such as biodiversity preservation) via private investments (with implications for social welfare).

7. **Impact on economic growth:** Investigating individual investors' views toward sustainability would potentially influence retirement results and, more generally, economic growth at the household level.
8. **Cultural diversity:** The keywords analysis and geographical dispersions indicate a need for future research to address the novel aspect of cultural diversity and its interplay with SF strategy formulation and practical decisions. Prior studies were notably sporadically spread across different continents having diverse cultural values. This discovery also calls for SF scholars, particularly those in fewer research-intensity countries based on the visualisation map (e.g., Indonesia and the Middle East), to engage more in SF studies. The imperative is even more critical as these countries possess high population density, rich biodiversity, and unique economic development, systematically creating rich issues related to the elements within the sustainability domain for them to exploit.
9. **Assessment of corporate players:** Future SF research should also respond swiftly to the urgent call to assess corporate players, whether in the financial services industry or otherwise, in supporting and achieving SDGs within the acute context of SF practices. An important future research question would be whether those corporate players have done enough to achieve SDGs wherever applicable. This understanding helps relevant country regulators formulate the necessary public policy for guidance and subsequent adherence by market players, corporate or otherwise.
10. **Carbon taxes:** Exploring the efficacy of carbon taxes to mitigate climate change. This effort is particularly relevant since some countries have pushed to eliminate these tariffs because they are perceived as ineffective or too expensive, despite their well-documented benefits in reducing climate change and tackling high-polluting industries.

Overall, as environmentalism increases due to the inevitable climate change and the subsequent observable environmental degradations, the relevant concepts of sustainability and social and economic inclusion will continue to gain research relevance. Based on these considerations and consistent with the discussions on the reported findings above, it is believed that the future SF research trajectory seems promising and is likely to represent assuring growth in the future.

CONCLUSION

The development of SF literature was primarily driven by the growing environmental awareness that was later formalised and institutionalised globally. With less than ten years to the finishing line, the race for materialising SDGs has practically induced the imperative for academic literature to examine the frontier of empirical knowledge on SF being an essential part of the SDGs, thereby providing the necessary reality check on what had been discussed and deliberated and more importantly, what is left for future studies to work on, hence, advancing the frontier of SF knowledge. Accordingly, this study examined SF published research repertoire through a bibliometric approach, thereby delineating critical research attributes under SF's general theme, which are arguably important in guiding aspiring scholars in undertaking future intellectual discourses surrounding SF research.

The analysis results suggest several points worthy of discussion and attention. First, results on trend analysis indicate that SF research was initially fragmented during its embryonic stage (earlier years, pre-2000). However, publications in the area increased exponentially after post-SDGs' introduction and propagation. The literature had further increased to cover more strategic and focused research issues covering varying areas under financing and investing activities related to sustainability objectives. Such research evolution is commendable as it primarily indicates a swift measured response to the introduced public policy, the correct research path academic research should follow. Second, it reflects that prior SF studies had progressively developed into a multidisciplinary research area, albeit prior literature has also concentrated mainly on business-related and environmental science domains. The analysis identified mainstreams and

sub-streams of sustainable finance, where three core areas of sustainable finance were highlighted. Microfinance was found to be a well-established field within the literature on sustainable finance, with numerous studies exploring the impact of microfinance programmes on poverty alleviation, women's empowerment, and household income. Green finance has also seen rapid growth in recent years, with an increasing number of studies examining the adoption of green finance practices to ensure the long-term viability of green financial services in response to climate change. Another dominant theme in the SF area is the implementation and effectiveness of green banking practices as an effective means of financing environmentally sustainable projects and promoting sustainable development. Green banking was found to be a relatively new but rapidly emerging field within the literature on sustainable finance.

The paper highlighted critical SF research properties imperative for early and/or matured scholars in shaping their future research trajectory in SF. As the area has been identified as multidisciplinary, theorising variables involved in past SF research covering all the identified clusters is inevitably open-ended and arguably liberal. Scholars should appreciate and hence make full use of the interconnected elements within the sustainable domain (e.g., environmental, social, and governance) and the availability of diverse theories, particularly in management and finance areas, which could explain and predict empirical phenomena in SF studies. The argument on the different theories applicable in SF also allows for more exploration (e.g., Gollier, 2017; Cheba and Bak, 2020; Lvova et al., 2019; Fullwiler, 2016). Furthermore, policymakers should consider various perspectives when developing a national framework for mobilising public and private resources to achieve sustainability objectives (Liyanage & Netswera, 2021). Additionally, the readily available diverse theories would practically facilitate future SF research in providing empirical support to constructive suggestions for regulators to formulate necessary public policy and documents relevant to SF practices. Since theoretically informed research works in the area would systematically provide credible empirical support to public policies on SF, this would practically ensure the betterment of social well-being.

Despite its apparent valuable contribution in elucidating the frontier of SF research presented in this paper, some limitations are unavoidable.

Noticeably, the prior SF research repertoire limit is those indexed solely in the Scopus database, arguably containing the most comprehensive academic research collections. Thus, other outlets outside Scopus were not covered despite their potential relevance to the analysis. Additionally, the analysis was purely based on the scientific methodology of bibliometrics only. However, these shortcomings present promising avenues and strategies for future research in the same area. Besides, the restriction of the search to “sustainable finance” keyword variation may result in the omission of a substantial number of publications that are intrinsically pertinent to our investigation. With the introduction of the Boolean operator “OR” on the other hand seeks to increase the scope of the literature coverage over the period of study, i.e., 1979–2021. This step produces 690 articles as a primary sample. Overall, the paper provides important contributions to SF’s body of knowledge by exploring its intellectual structure and hence systematically providing relevant guidance on the potential future research trajectory in the field.

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