

Bibliometric Review on Sustainable Finance

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Abstract: Unlike conventional finance, sustainable finance seeks to integrate social, environmental, and climate change considerations into financial institutions' business strategies. The financial system's ability to positively respond to sustainability transition demands is contingent upon a directional transformation that involves regulatory, political, structural, theoretical, and relational shifts. Accordingly, this paper performs a quali-quantitative analysis that combines both a bibliometric method with a content analysis process to investigate the trend of sustainable finance literature in the Scopus database and provide directions for potential future research. Our bibliometric performance analysis of 723 publications reveals that the UK, China, the US, Switzerland, and Japan are the major centers of research excellence in sustainable finance. They are the most productive countries and hold the most relevant institutions. Moreover, the prevalence of transdisciplinary journals over mainstream finance and economics sources is obvious. Our network map analysis, on the other hand, shows the substantial relevancy of sustainable/green banks' involvement in sustainable development. Nonetheless, its relatively low density underlines the existence of relevant research gaps. Therefore, we undertake a content analysis of that particular topic's literature to derive its conceptual structure and truly understand banks' important role in sustainability transition. Key research themes in this respect include sustainability performance and banks' profitability associations; sustainable banks' risk profile; determinants of banks' willingness to introduce sustainability criteria into their business strategy; depositors'/customers' responsiveness to banks' sustainability performance; and relevant macroprudential regulations, monetary policies, and supervisory guidelines to sustainability transition.

Keywords: sustainable finance; sustainable banking; ESG; sustainable development; sustainability transition



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1. Introduction

There is a clear call for financial institutions to consistently leverage their financial flows and expertise in accordance with low-carbon economy criteria and climate-resilient development indicators set out by the COP-UNFCCC, and the comprehensive global-development framework set by the United Nations under the 2030 sustainability agenda requires financial institutions to develop applicable standards and practices that integrate sustainability criteria into their business strategies [1]. Sustainable finance is, therefore, finance that seeks to deploy financial capital to economic sectors or activities that are more likely to generate and/or reinforce positive economic, environmental, and/or social impacts [2].

Recent estimates show that green investments that aim to decarbonise the economic system and mitigate the current and predictable climate and environmental risks lack the necessary financial resources [3–6]. The yearly incremental investment in this respect ranges from USD 1 to 2.6 trillion or around 2% of global GDP on average [5]. Currently, private and institutional investors cannot fill the sustainable development funding gap due to institutional, financial, investors' perceptions, and sector-specific constraints. Unstable international and local climate change and environmental regulatory frameworks, policy uncertainty, inconsistent financial macroprudential regulations and monetary policies, lack

of appropriate financial vehicles, technology risks, high upfront capital investment, and negative investors' perceptions about financial returns on sustainable and climate-resilient investments are key impediments to meeting the financial requirements for low-carbon transition [4,6,7]. In other words, the present financial system architecture is intrinsically "carbon biased" and prevents consistent and integrative financial system's alignment with the green structural transformation [1,4,5]. To illustrate, some experts claim that Basel III liquidity requirements, for instance, favor short-term "brown" investments to the detriment of more long-term, climate and environmentally sustainable investments [4,5].

Therefore, a comprehensive framework that helps set the directional transformation of the financial system's intermediaries, markets, and infrastructures and ascertains their alignment with sustainability transition demands is an imperative [1]. The financial system's response to sustainable structural change starts with the (1) reappraisal of the financial intermediaries, markets, and infrastructures' primary purpose in the economic system (relational and multidimensional perspective) [1,8]; (2) the reassessment of financial intermediaries and markets' behaviour and incentives to reinforce their involvement in sustainability transition (political and regulatory perspectives) [1,9,10]; (3) the synchronisation of local and international financial system structures to ensure diversity, financial innovation—which overcomes debt biasness issues—, equitable access to finance, the consideration and incorporation of specific cultural influences, and the advancement of financial institutions' positive sustainability impacts simultaneously with the mitigation of their negative social and environmental implications (structural perspective) [1,11]; (4) the transformation of investment managers and shareholders' mindsets "to shift away from short-termism of investment allocations and financialisation" (financial system qualities' perspective) [1,4,12]; and (5) the integration of novel theoretical foundations into the finance theory to equip future generations with models and methodologies that intrinsically embed the environmental, climate, and social objectives into their epistemological assumptions (theoretical perspective) [1].

Accordingly, this paper reviews the literature on sustainable finance (SF), identifies their thematic evolution, and then provides directions for potential future research within this problematic area.

To consistently proceed with this review, we apply a quali-quantitative approach that combines both a bibliometric analysis method and a content analysis process [13]. The contribution of this paper matters because there is a need to understand the topic trends, its intellectual and conceptual structures, and critically evaluate the current level of contribution.

Recently, several studies undertook a bibliometric method to investigate the SF literature. Regardless of their common trend from the descriptive perspective (most important research constituents: top influential countries, institutions, journals, authors . . .), they pay attention to various issues in SF. While Gao et al. [14] describe the impact of ESG disclosure on corporate governance (CG) structures, investment practices, investors' behaviour, companies' capital structure, environmental risk management (commensurate with [15]), and product innovation, Bhatnagar and Sharma [16] focus more on the identification of a systematic set of sustainable/green finance enablers. They claim that a conducive macroeconomic environment, political stability, comprehensive and relevant regulatory frameworks, policies, and structures (in line with [17]), technology development, diversification of financial instruments, significant institutional commitment, and effective capital markets may contribute to the development of green and SF. To explore global evolution and identify potential future directions of research in SF, Luo et al. [18] and Naeem et al. [19] use the co-citation analysis method. They determine key research streams in this particular field (responsible investment, green credit policy, green bonds, green finance, sustainable or impactful business models, climate finance . . .), discuss their dimensions, and set relevant recommendations to develop this sector. It is noteworthy to highlight that [18] used the structural variation analysis method to assess the transformative potentials of recent SF publications and, therefore, avoid the biasness of citations' metrics for which they are more

likely to neglect new publications in their analysis. In other words, this strategy helps researchers better examine or scrutinise new SF literature that is more able to transform or rather set the directions for further development. In a more specific context, green bonds were also subject to more scrutiny as it is the major sustainable investment instrument, and the potential of its market growth is relatively substantial. The establishment of green bond certifications schemes (e.g., Green Bond Principle (GBP), Climate Bond Initiative (CBI), Centre for International Climate and Environmental Research Oslo (CICERO) second opinion, and Moody's Green Bond Assessment) for which they seek to boost green investors' confidence, mobilise additional global capital to climate-resilient investments [20], support issuers in their process to raise capital and invest in environmentally-sustainable projects [21], and set a conducive ecosystem for better eco-friendly enhancement services has led to significant market expansion (Climate Bond Initiative expects the issuance across several sustainability bonds labels to reach USD 5 trillion by 2025 [22]). These notable prospects of market growth coupled with the continuous involvement and commitment of countries, investors, and corporations to green investment have also drawn the researchers' interests. Khamis and Aysan [23] conduct a bibliometric analysis of the green bonds literature and report an exponential growth of green bonds' publications in the last five years. On the other hand, Cortellini and Panetta [24] undertake a systematic review to investigate in particular the empirical studies on green bonds and derive a "taxonomy of green bonds research". The authors' thematic analysis shows the existence of five key categories or research streams in this regard, namely green bond premium or "Greenium", the price or rather the volatility dependence between the green bonds market and other financial markets, the green bonds and stock market reactions, green bonds' issuers characteristics, and the performance analysis of green bond markets.

Banks' fundamental role as intermediaries [they create money and decide on whether to allocate credits to the economy], advisors, and investors underline their great importance in sustainability transition. As a result, several bibliometric studies and systematic reviews sought to define the construct itself, i.e., "sustainable or green or ethical bank*" and the scope of measurement of banks' sustainability impact [25], identify the determinants and impediments to effective integration of sustainability criteria into banks' business strategies [25,26], highlight the key parameters and issues banks should observe to reinforce their social impact [27], and thematically describe the evolution of research topics in this particular field across time and pinpoint the potentially transformative/emergent themes [28].

Keeping that in mind, our analysis complements previous bibliometric and systematic reviews and contributes to the literature in several ways. First, it highlights the importance of regulators and supervisors' commitment to calibrate green macroprudential regulations and monetary policies to mitigate systemic risks that may originate from climate and environmental risks. Our review explains how macroprudential regulations introduced by [16] as a major enabler of green finance can address the issue of "carbon biasness" in the financial system, reduce the green and sustainable finance gap, help transform the financial system architecture to comply with sustainability demands, and achieve financial stability.

Second, to the best of our knowledge, this is the first bibliometric analysis that explores and reports on depositors' responsiveness to banks' sustainability performance and the determinants of depositors' choice of conventional or sustainable banks. Moreover, in our recommendations for future studies, we put forward the idea to assess whether depositors can exercise their power to discipline banks (market discipline) should they allocate credits to investments that may threaten climate and environmental systems.

Third, we synthesise the empirical results on the potential impact of institutional factors, i.e., regulatory guidelines and normative pressures, CG structures, and digitalisation on banks' sustainability performance. This is a notable contribution in comparison with previous bibliometric reviews.

The paper consists of five sections in addition to the introductory one. Section 2 describes the study's methodology and the sample construction of the review. Section 3

underlines the most important research constituents in sustainable finance. Section 4 outlines the intellectual, social, and conceptual structures of sustainable finance literature. Section 5 provides an in-depth discussion of the key results embedded in the relevant research streams derived from network and content analysis processes. Finally, Section 6 concludes the study and provides recommendations for future research.

2. Methodology

Our bibliometric study undertakes a systematic process that involves three stages:

- 1 Set the search process to:
 - (i) Identify the bibliographic database and incorporate the relevant keywords into a logical search statement;
 - (ii) Introduce the relevant inclusion and exclusion criteria to narrow down the scope of literature coverage and derive the final dataset for our review.
- 2 Conduct the bibliometric analysis:
 - (i) Carry out a bibliometric performance analysis (BPA) to determine the most important research constituents of sustainable finance literature. To do so, we use the citation analysis method available on VOSviewer;
 - (ii) Perform a bibliometric network analysis (BNA) to figure out the intellectual, social, and conceptual structures of sustainable finance literature.
- 3 Apply a content analysis process to our dataset to identify and investigate the key research themes in the literature on sustainable finance.

Figure 1 below outlines our methodological process.

2.1. Set the Search Process

To generate our bibliometric data, we set a systematic process to first select the database and then find out, specify, and incorporate the most relevant keywords to sustainable finance into a logical search statement. Scopus constitutes a trustworthy source for our bibliometric data as it is “the largest curated abstract and citation database, with a wide global and regional coverage of scientific journals”, in particular [29] (p. 377). Moreover, the introduction of publications into the database is subject to rigorous content selection and consistent re-assessment processes [29].

The breadth of coverage in bibliometric studies is contingent upon the logical integration of pertinent keywords into relevant search statements. The wide spectrum of relevant keywords that may outline the role finance could play to better monitor the sustainability transition from a multidimensional perspective impels us to set our search statement as follows: “sustainable finance” OR “green finance” OR “sustainable banking” OR “green banking” OR “sustainable and responsible investment” OR “climate finance” OR “carbon finance” (Commensurate with [16–19,30]). The limitation of the search statement to “sustainable finance” keyword variations may miss out a significant collection of publications that are intrinsically relevant to our investigation, i.e., finance-sustainable growth dynamics (such as “climate change”, “low-carbon economy”, and “energy and financial markets”). 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., 2001–2021. This step produces 1738 articles as a primary sample.

To determine the scope and validity of our bibliometric review results, we introduce a set of relevant inclusion and exclusion criteria into our “raw data” [31]. We first exclude scientific disciplines irrelevant to our research background and introduce other subjects relevant to sustainability transition (environmental sciences and energy). We then strictly limit our analysis to articles that we exclusively retrieve from journals. Finally, to implicitly embed a multi-perspective comparability across publications, we limit our review to English-language articles only. Accordingly, our final sample of bibliometric data consists of 723 publications.

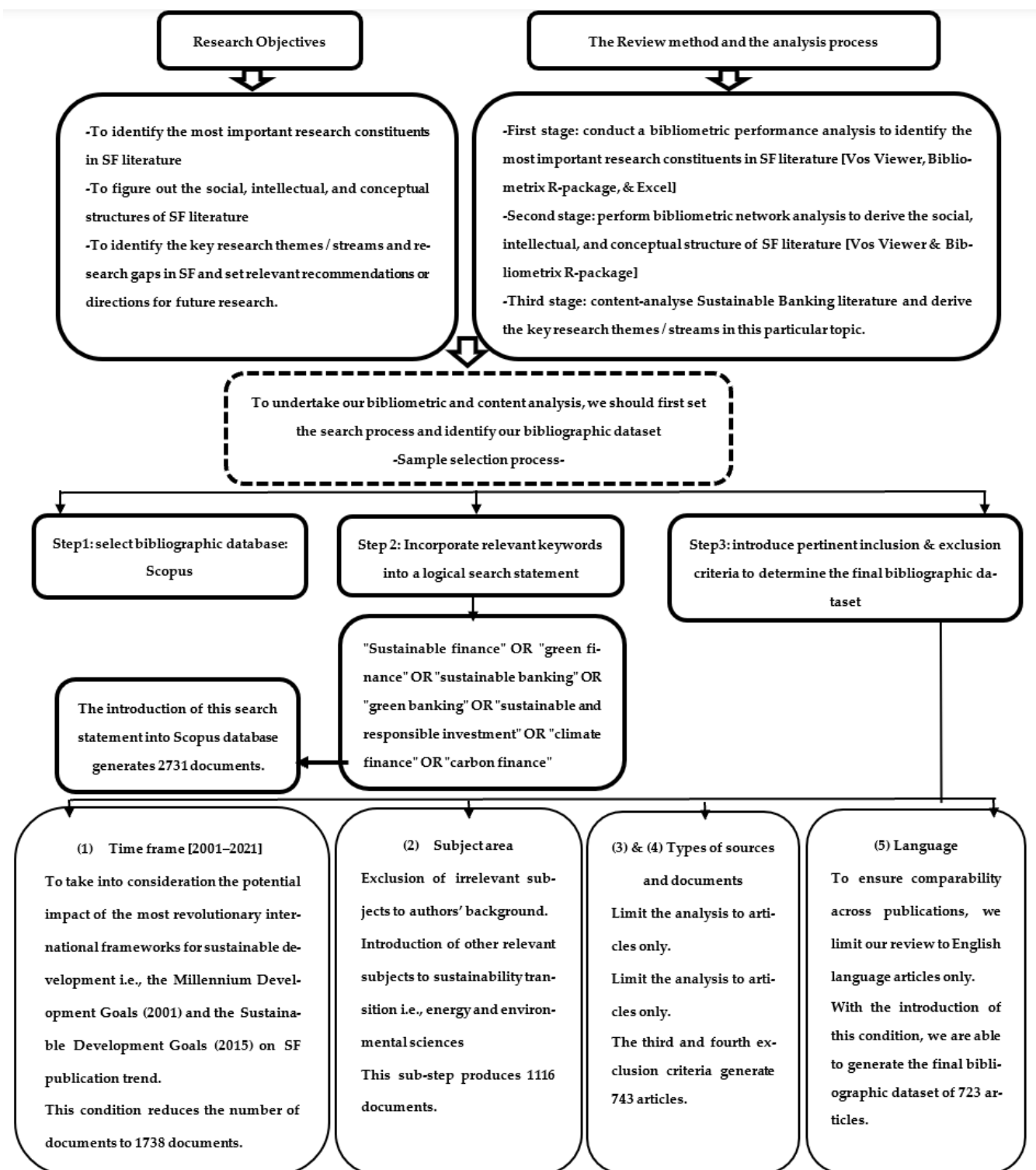


Figure 1. Methodological process.

2.2. Bibliometric Analysis

Bibliometric analysis is a consistent “quantitative” method that helps researchers explore and examine considerable sources of scientific data. It has “the potential to introduce a systematic, transparent, and reproducible review process based on the statistical measurement of science, scientists, or scientific activity” [32] (p. 959). It consists of specific techniques that seek to scrutinise and determine the social, intellectual, and conceptual

structures of a particular field of study in the extant literature, highlight the most important research constituents, acquire an effective overview of the research topic, identify relevant research gaps, develop innovative research ideas for exploration, and position researchers' contributions to their respective research disciplines [33].

The major bibliometric analysis techniques are objective in nature (number of publications, number of citations, occurrences of keywords . . .) [32], despite the fact that interpretations may usually involve subjective assessments due to the introduction of certain qualitative methods such as thematic analysis.

Our bibliometric analysis, therefore, consists of bibliometric performance analysis or bibliometric descriptive analysis and bibliometric network analysis [32]. While the former seeks to identify the most important research constituents of sustainable finance literature, i.e., top countries, institutions, journals, authors, and articles, the latter enables us to figure out the intellectual structure (e.g., co-citation analysis) [34], the social structure or the network of research collaborations (e.g., co-authorship analysis) [34], and the conceptual structure (e.g., thematic map analysis and title and abstract map analysis) [34–36] of the sustainable finance literature.

To perform our bibliometric review, we employ three bibliometric analysis tools: VOSviewer [34], Bibliometrix R-package, and Microsoft Excel. VOSviewer and Bibliometrix R-package provide the necessary functions/options to conduct BNA as they both help construct, visualise, and examine the various bibliometric network maps. As for BPA, we use Microsoft Excel and Bibliometrix R-package.

2.3. Content Analysis

In the third stage, we perform a content analysis to appraise, examine, and synthesise our bibliographic dataset. Owing to the “generic nature”, the wide range of concepts, and the variety of topic categories that fall under “sustainable finance”, “green finance”, and “climate finance” keywords, we focus our content analysis on publications that address banks' commitment to sustainable growth. On top of that, the literature on ethical banks' ability, as intermediaries in the economic system, to enhance the finance-sustainability dynamics usually involves or introduces those concepts in their analysis (e.g., [9,10,37]).

The combination of the quantitative bibliometric method with the qualitative content analysis approach aims to triangulate the study's results, i.e., enhance the paper's credibility and trustworthiness. In other words, the integrative thematic analysis' results may reinforce the descriptive and systematic nature of the bibliometric review. It is noteworthy to highlight that this phase leverages the network map analysis conducted in the second stage.

3. Bibliometric Performance Analysis (BPA)

3.1. Most Influential Countries and Institutions

Sustainable finance seeks to allocate or rather re-allocate financial capital to the economic system in order to promote economic prosperity, environmental protection, and social welfare [2]. Countries and institutions are, therefore, bound to set and introduce inclusive and directional transformation processes to help financial and non-financial institutions integrate sustainability criteria into their business strategies. Accordingly, we identify the most influential countries and institutions to explore and derive the centers of excellence in sustainable finance research.

Figure 2 displays the top ten most influential countries in sustainable finance research from the number of publications and the number of citations perspectives. It is remarkable that the UK, China, the USA, Germany, and Australia keep their positions in the top 5 countries from both perspectives.

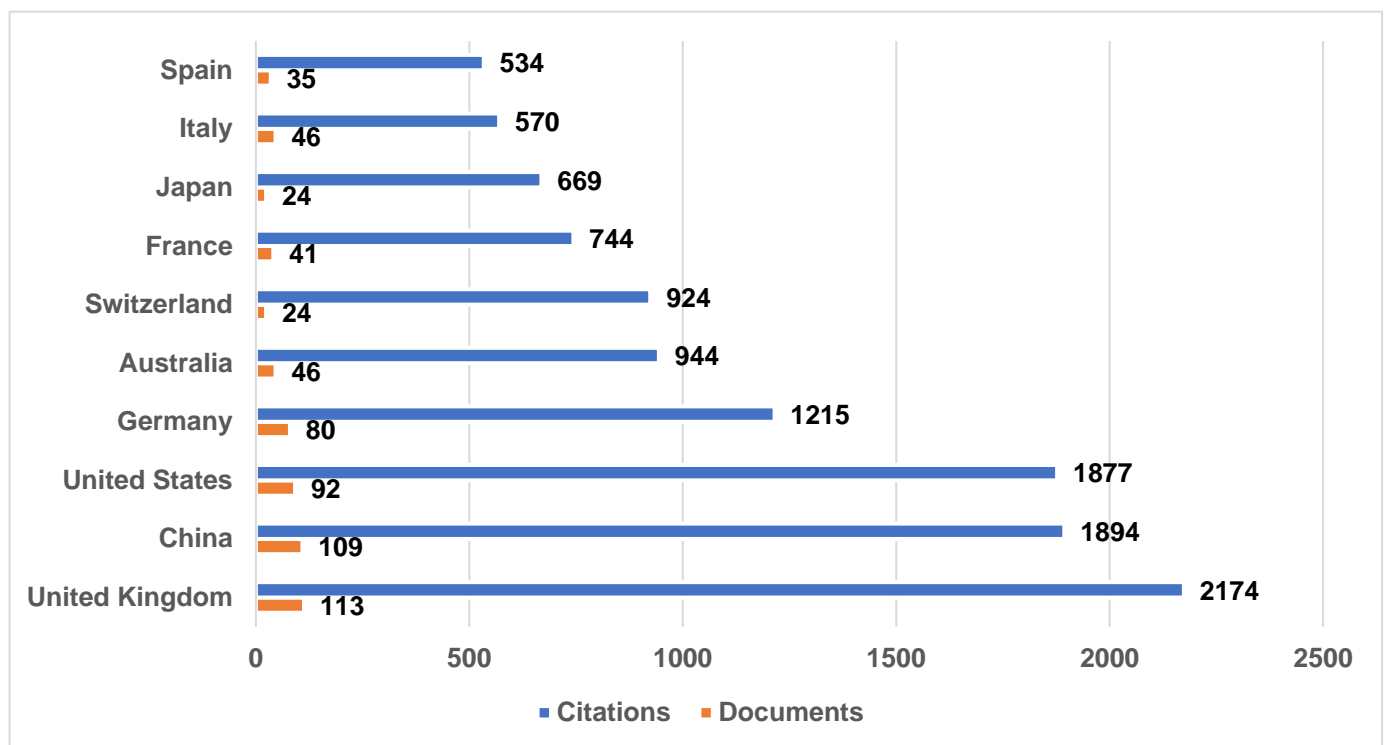


Figure 2. Most influential countries from the number of publications and the number of citations' perspectives.

Nonetheless, the definition of the average citation score as the underlying indicator for countries' classification may completely change the countries' positions and definitely provide more insights about the publications' impact. Figure 3 below approves this presumption.

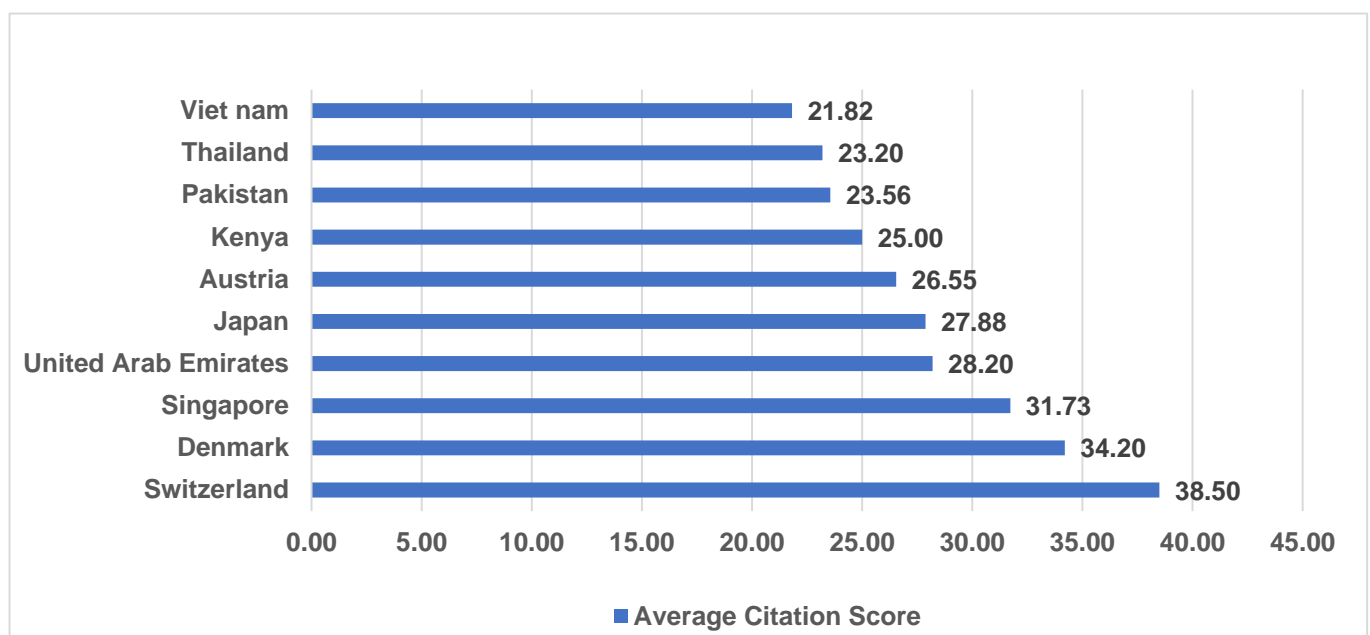


Figure 3. Most influential countries from the average citation score's perspective. Note: average citation score is the ratio of country's total citations over its total number of publications.

To illustrate, only Switzerland and Japan keep their positions in the top ten most influential countries from the average citation score's perspective.

It is noticeable from Figure 4, on the other hand, that five out of ten most influential institutions from both citations and average citations' perspectives are from China. The introduction of the "Green Credit Policy" in 2007 and "Green Credit Guidelines" in 2012 as isomorphic institutional pressures have put financial institutions in China under legal obligations to develop more sustainable and responsible behaviour. Moreover, the People's Bank of China (2014) [38] clearly underlined that it will closely monitor financial institutions' credit allocation policies (window guidance) to limit the flow of financial resources into the overcapacity and environmentally destructive industries. Moreover, it highlighted that it would establish a "green credit mechanism" to promote and develop better financial structures and steer additional funds to eco-friendly businesses. Accordingly, financial institutions in China are bound under this regulatory ecosystem to integrate sustainability practices into their business strategies, operational systems, and credit allocation policies, and hence, develop and provide institutions with access to additional or rather unprecedented data, which has fueled research in sustainable finance from different perspectives (e.g., risk management, credit allocation behaviour, macroprudential regulations, monetary policies, etc.).

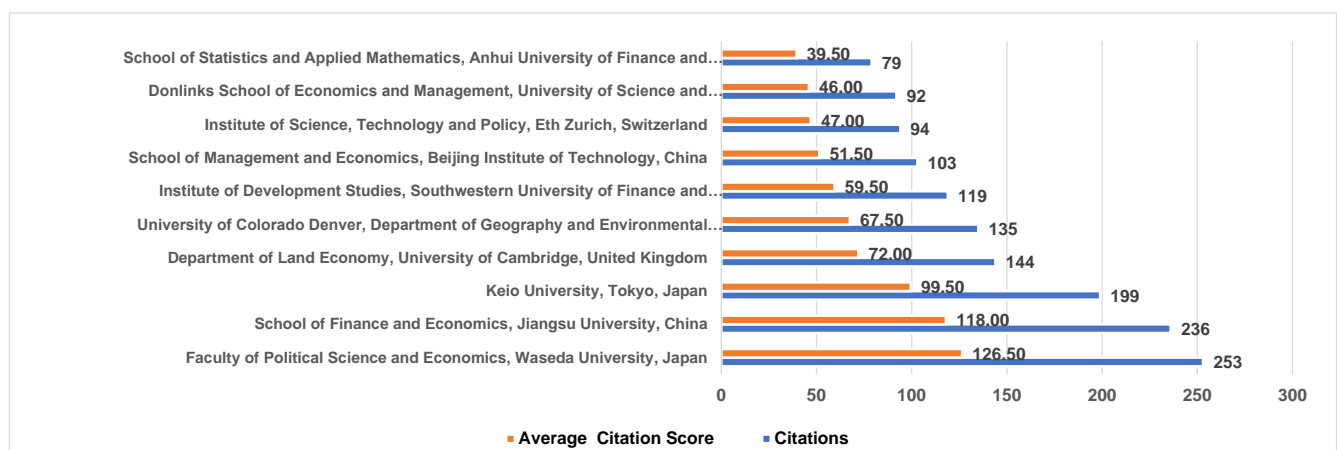


Figure 4. Most influential institutions from the number of citations and the average citation score's perspectives. Note: it is noteworthy to point out that 69 out of 1560 institutions met the threshold of 2 publications at least. The Stockholm Environment Institute (Sweden) is by far the most influential institution from the number of publications perspective with 7 articles. Six institutions, on the other hand, were able to publish 3 articles while the rest produced 2 publications only.

Therefore, Figures 2 and 4 highlight that China, the UK, the USA, Switzerland, and Japan are the major centers of research excellence in sustainable finance.

3.2. Most Influential Journals and Authors

The identification of the most influential journals and the most productive and impactful authors is useful to different stakeholders involved in sustainable finance, such as policymakers, regulators, academic institutions, financial organisations, and researchers, to name a few. They help understand and/or expect prospective authors' collaboration networks and target the most relevant and impactful journals for potential future publications.

Of the 292 sources, 25 journals meet the threshold of 5 publications at least set by the authors. Altogether, they account for 365 out of 727 articles. Moreover, Figure 5 below or Bradford's Law [39] underlines that the core sources for publication in sustainable finance consist of nine journals (they hold about 39% of the entire collection of publications or 282 articles) (see Table 1).

Table 1. Most relevant journals.

Rank ^a	Source	Documents	Citations	Aver Cit
1	Sustainability (Switzerland)	113	1082	9.58
2	Journal of Sustainable Finance and Investment	51	453	8.88
3	Energy Policy	19	719	37.84
4	Ecological Economics	16	717	44.81
5	Climate and Development	15	190	12.67
6	International Environmental Agreements: Politics, Law and Economics	15	257	17.13
7	International Journal of Green Economics	13	66	5.08
8	World Development	11	348	31.64
9	Energy for Sustainable Development	9	188	20.89
10	Environmental Science and Pollution Research	9	243	27.00
Rank ^b	Sources	Documents	Citations	Aver Cit
1	Sustainability (Switzerland)	113	1082	9.58
2	Energy Policy	19	719	37.84
3	Ecological Economics	16	717	44.81
4	Finance Research Letters	7	492	70.29
5	Journal of Sustainable Finance and Investment	51	453	8.88
6	World Development	11	348	31.64
7	Nature Climate Change	6	310	51.67
8	Global Environmental Change	9	301	33.44
9	International Environmental Agreements: Politics, Law and Economics	15	257	17.13
10	Environmental Science and Pollution Research	9	243	27.00
Rank ^c	Sources	Documents	Citations	Aver Cit
1	Finance Research Letters	7	492	70.29
2	Nature Climate Change	6	310	51.67
3	Ecological Economics	16	717	44.81
4	Energy Policy	19	719	37.84
5	Global Environmental Change	9	301	33.44
6	Global Finance Journal	5	162	32.40
7	World Development	11	348	31.64
8	Environmental Science and Policy	8	232	29.00
9	Environmental Science and Pollution Research	9	243	27.00
10	Energy for Sustainable Development	9	188	20.89

Note: the journals' positions are sorted based on three different criteria: number of publications (rank^a), number of citations (rank^b), and average citation score (rank^c).

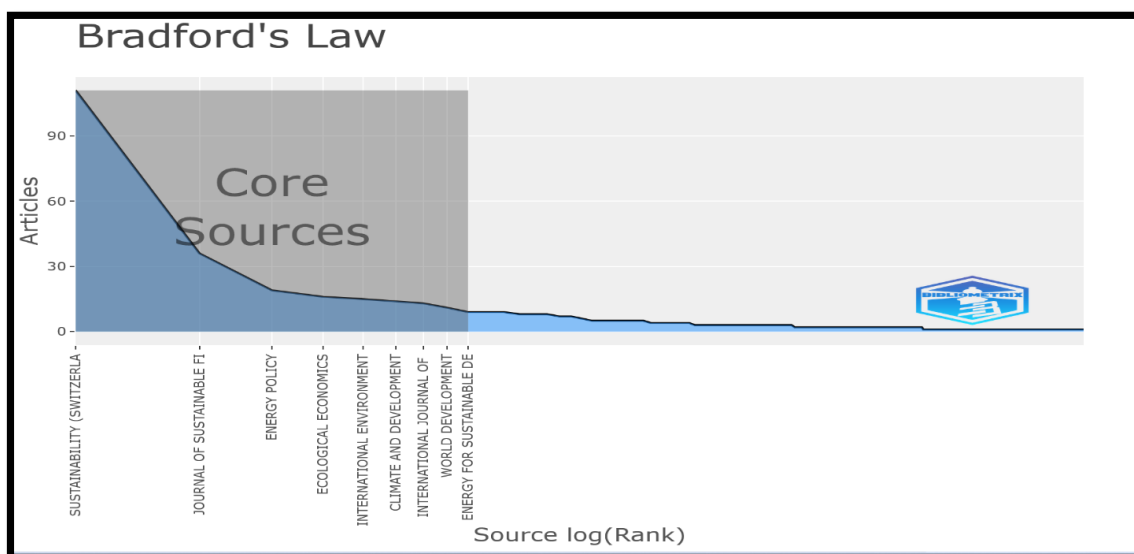


Figure 5. Bradford's law.

Sustainability transition requires a fundamental shift in stakeholders' perceptions of appropriate economic order and a multidimensional development model that seeks to improve economic growth (profit) and reinforce people's social stability (people), but without transgressing the planetary physical boundaries (planet). Such a shift in the theoretical and epistemological foundations may have implications on the nature of research collaborations (interdisciplinary teamwork) and the scope of journals' coverage (multidisciplinary journals) in sustainable finance. Accordingly, and as per Table 1, approximately 50% of journals are multidisciplinary.

Finance and economics journals, on the other hand, do not exceed six sources (qualitative research in financial markets, International Journal of Green Economics, Finance Research Letters, Business Strategy and the Environment, Journal of Sustainable Finance and Investment, and Global Finance Journal), despite the introduction of finance as a critical element into our search statement, e.g., "sustainable finance", "green finance", "climate finance", and "carbon finance". Moreover, the prevalence of journals that focus primarily on the environment, climate change, energy, and ecology is obvious. A total of 15 out of 25 journals address these topics.

Table 1 displays that apart from Finance Research Letters, Nature Climate Change, and Global Environmental Change, the other sources hold their positions in the top ten most influential journals from the number of publications (rank^a) and the number of citations' perspectives (rank^b). Nevertheless, Finance Research Letters and Nature Climate Change with average citation scores of 70.29 and 51.67, respectively, are relatively the most impactful sources in spite of their low number of publications, i.e., seven and six, respectively (rank^c). Ecological Economics and Energy Policy are exceptions in this respect as they were able to rank within the top five across all perspectives.

Finance and economics journals must improve their contributions to sustainable finance literature and reduce the gap with other sources in both criteria to increase their visibility. To illustrate, two out of the six finance and economics journals, i.e., "Journal of Sustainable Finance and Investment" and "International Journal of Green Economics" are in the top ten in relation to the output. As for impact, one journal only, i.e., Finance Research letters, ranks among the top ten.

Figures 6 and 7, on the other hand, show the top ten most influential authors in sustainable finance literature. It is obvious that Taghizadeh-Hesary is the most impactful author from both metrics, namely total citations and h-index.

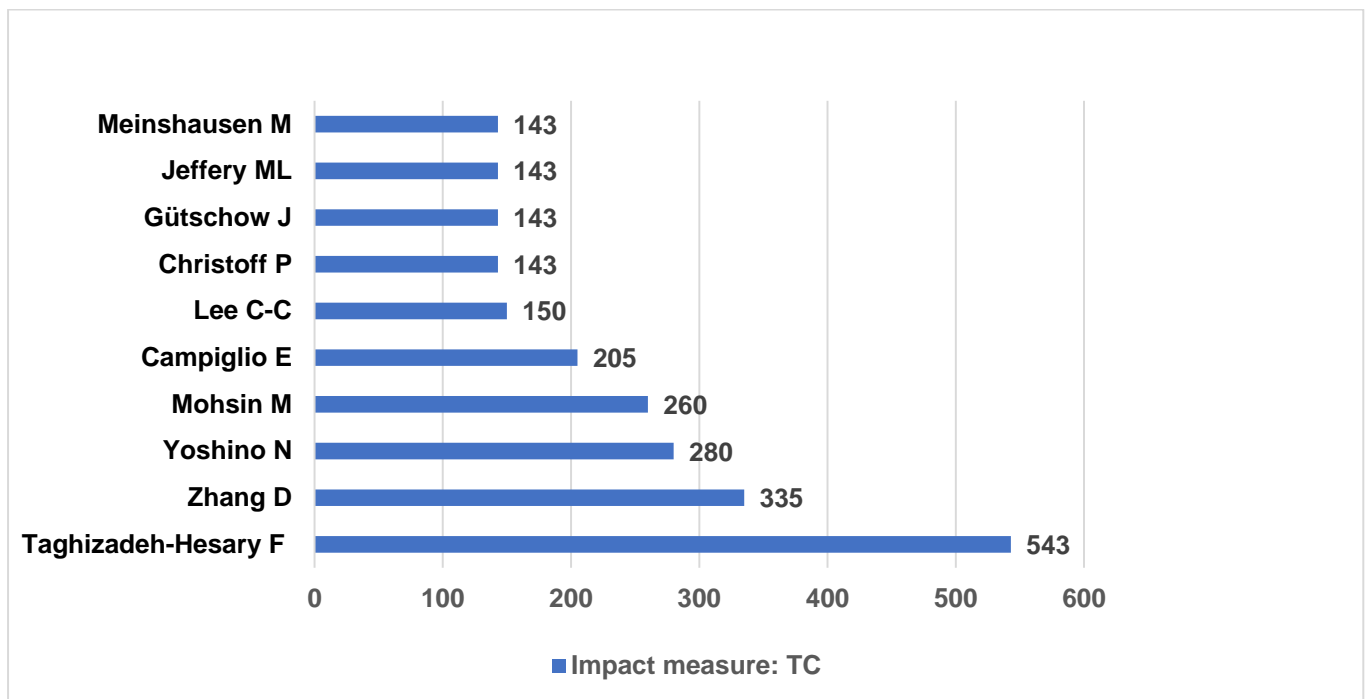


Figure 6. Most impactful authors by total citation index.

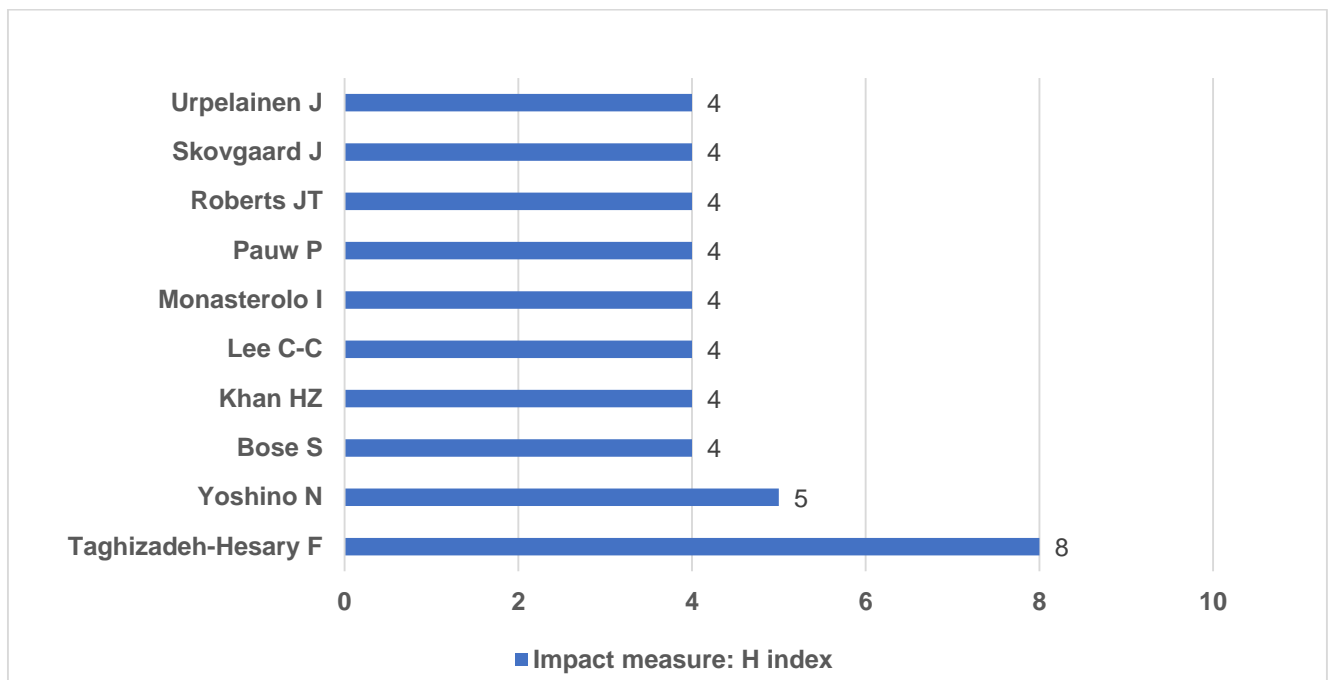


Figure 7. Most impactful authors by H index.

3.3. Most Influential Articles

The effective review of top influential publications may help researchers establish a consistent perception about the emergence, development, direction, and scope of research coverage in the literature for any scientific discipline. Table 2 depicts the top ten most influential publications in sustainable finance through citation analysis.

Table 2. Most relevant publications.

	Author (s) and Year	Title and Journal	Cit
1	Campiglio E. (2016) [5]	Beyond carbon pricing: The role of banking and monetary policy in financing the transition to a low-carbon economy", Ecological Economics	202
2	Taghizadeh-Hesary and Yoshino (2019) [40]	The way to induce private participation in green finance and investment, "Finance Research Letter"	190
3	Robiou Du Pont et al., (2017) [41]	Equitable mitigation to achieve the Paris Agreement goals, "Nature Climate Change"	143
4	Ziegler et al., (2012) [42]	Carbon outcomes of major land-cover transitions in SE Asia: Great uncertainties and REDD+ policy implications, "Global Change Biology	141
5	Zhang D et al., (2021) [43]	Public spending and green economic growth in BRI region: mediating role of green finance, "Energy Policy"	140
6	Zhang D et al., (2019) [17]	A bibliometric analysis on green finance: Current status, development, and future directions, Finance Research Letter	125
7	Capelle-Blancard and Monjon, (2014) [44]	The Performance of Socially Responsible Funds: Does the Screening Process Matter?", European Financial Management"	104
8	Lewis J.I. (2010) [45]	The evolving role of carbon finance in promoting renewable energy development in China", "Energy Policy"	104
9	Mohsin et al., (2021) [46]	Developing Low Carbon Finance Index: Evidence from Developed and Developing Economies, "Finance Research Letters"	96
10	Aizawa and Yang. (2010) [47]	Green credit, green stimulus, green revolution? China's mobilization of banks for environmental cleanup, "Journal of Environment and Development",	91

Note: The minimum number of citations of an article set by the authors is 50.

The major research objectives of the most relevant articles are to (1) bring the green growth discussions closer to the one on macroprudential regulations and monetary macroeconomic dynamics to avoid market failure and mitigate the transition costs towards a low-carbon economy [5], (2) put forward appropriate mechanisms that may help reduce the risks associated with green energy projects [40], (3) assess the role green finance may play as a mediator on the impact of public spending on R&D on green economic growth [43], (4) examine whether the financial performance of socially responsible investment (SRI) mutual funds are related to the features of the screening process [44], (5) examine the role the Clean Development Mechanism has played in promoting renewable energy development in China to assess how international carbon finance can best be used to help promote emissions mitigation in the developing world in the light of Kyoto Protocol greenhouse gas emissions reduction targets [45], and (6) develop a low-carbon finance index to help attract foreign and private investments in the low-carbon energy sector [46].

4. Bibliometric Network Map Analysis (BNA)

The considerable market expansion of sustainable finance in response to multiple global initiatives, task force or special networks' guidelines, and countries' institutional frameworks has triggered an exponential growth of sustainable finance literature over the last decade (see Figure 8 below). Therefore, it is fundamental to explore the intellectual structure, the network of research collaborations, and the conceptual structure or rather examine the "structures of knowledge" of sustainable finance research.

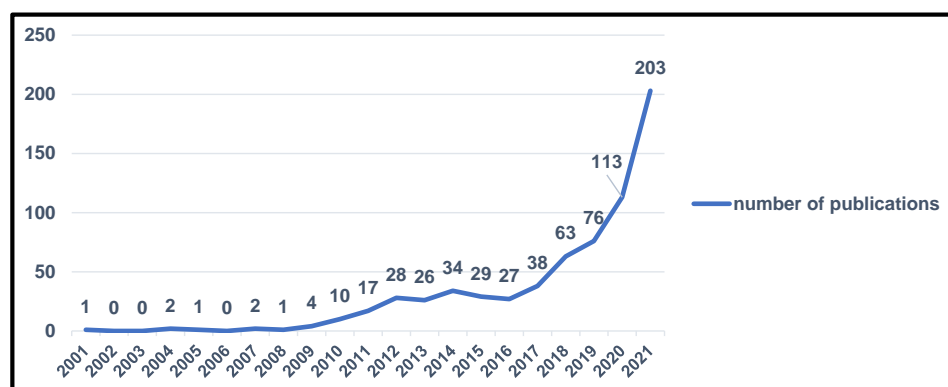


Figure 8. The growth and the number of publications by year.

4.1. Intellectual Structure (Co-Citation Analysis)

Co-Citation of Sources

Co-citation of sources considers representative journals as the units of analysis. Its major purpose is to examine the journal–journal interrelatedness so as to assess the importation and exportation of citations across all given pairs of journals [48]. In other words, it is set to determine the most co-cited journals and their links [49].

The rule of thumb in this respect is that the closer the journals' positions to each other, the more substantial/significant their relatedness or rather their co-citation links [34]. Moreover, lines that connect journals with each other provide an additional indicator about the strength of the co-citation links. The closeness of the five clusters overall, as shown in Figure 9, indicates that journals that meet the threshold of 50 citations at least tend to cite (share) related/common references, and accordingly, their co-citation links are relatively strong.

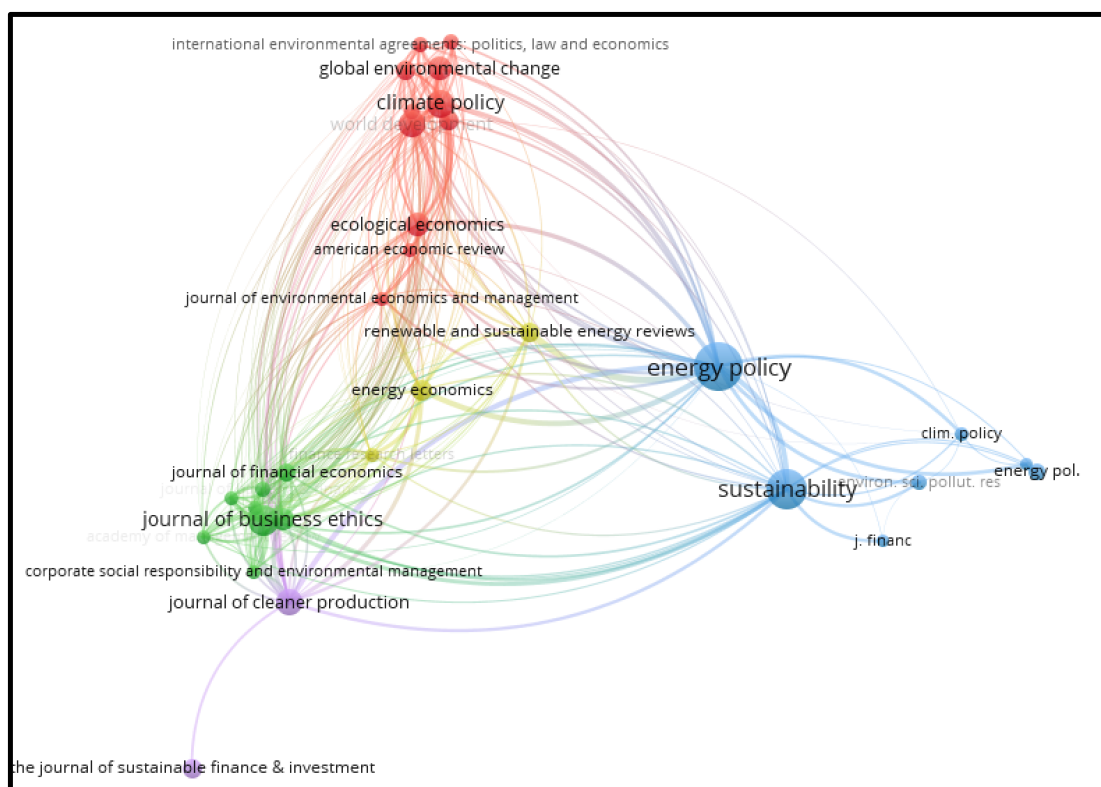


Figure 9. Co-citation of sources. Note: Minimum number of citations of a source is set to 50; of the 17,815 sources, 48 meet the threshold.

Consistent with our analysis on most influential journals, we can clearly see that the co-citation links of transdisciplinary journals (energy policy, sustainability, climate policy, ecological economics, etc.) are relatively stronger than the mainstream finance and economics journal counterparts (the journal of sustainable finance and investment, journal of finance).

4.2. Social Structure (Co-Authorship Analysis)

A co-authorship analysis provides a systematic documentation of the social and professional networks of authors [50]. It helps explore their features and derive the level of cohesiveness or research collaboration within the knowledge community in that particular topic [51]. Moreover, it is a relatively reliable proxy to identify the most productive or impactful groups of authors in that network.

For the purpose of our review, we perform a co-authorship analysis of authors and set the threshold of authors' inclusion to one publication only in order to comprehensively examine the authors' networks in sustainable finance.

The social network in Figure 10 consists of 95 authors divided into five clusters. This author's network together with the analysis of the most relevant publications indicates that 4 out of 10 most influential authors, namely Taghizadeh-Hesary, Yoshino, Mohsin, and Zhang D, form the most impactful team of authors. To illustrate, their collaborations generate 3 out of 10 most cited documents in sustainable finance.

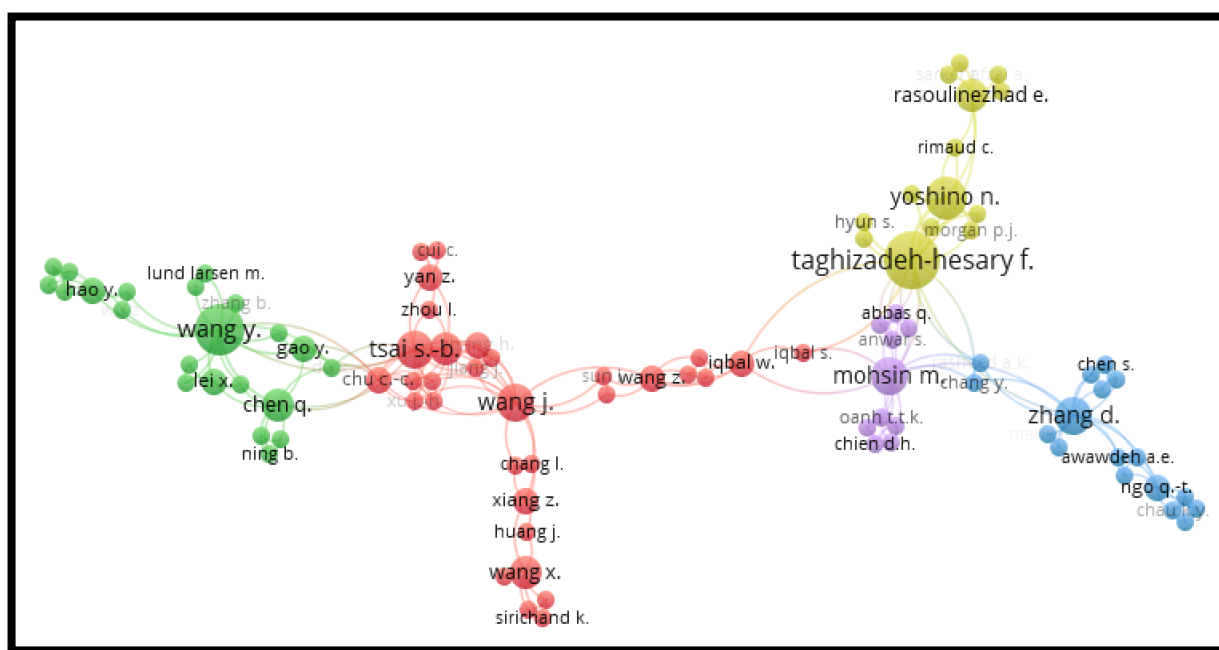


Figure 10. Social network of research collaboration.

4.3. Conceptual Structure of Sustainable Finance Literature

4.3.1. Bibliographic Coupling

Bibliographic coupling (BC) (Figure 11 and Appendix A) measures the relatedness of publications in accordance with the number of references they share [52]. It provides an indicator that those publications are most likely investigating a related topic [53]. Generalising this principle across a collection of publications may produce consistent research clusters that may probably shape the thematic or the conceptual structure of that particular topic.

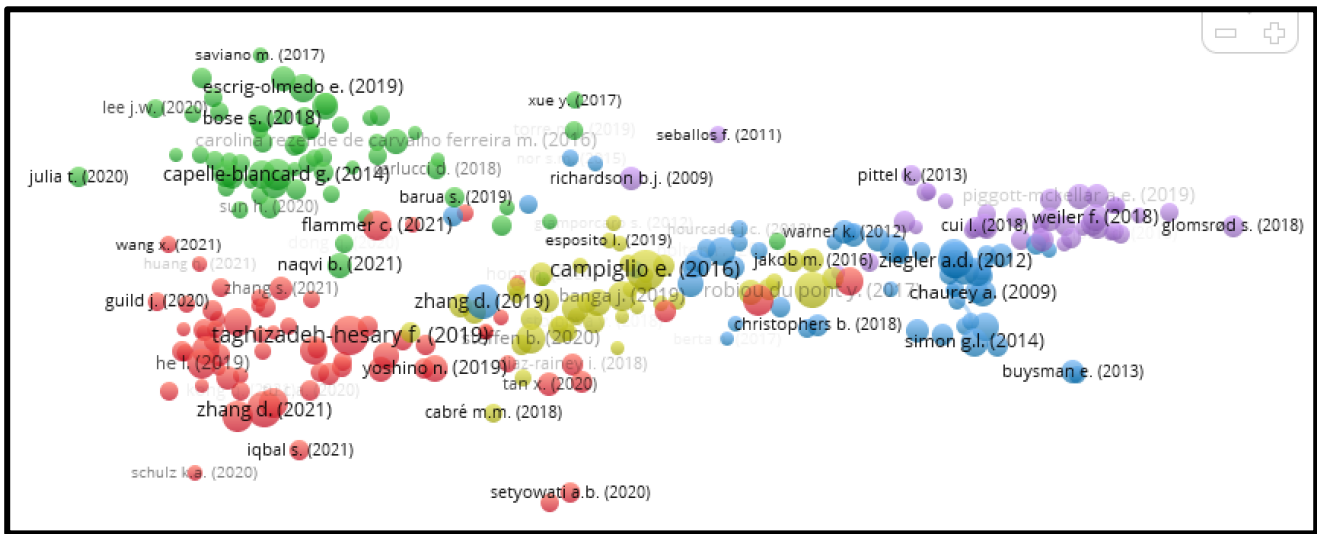


Figure 11. Bibliographic coupling network. Note: (1) we select “document” as a unit of analysis and “fractional count” as a method of analysis. (2) The idea of the fractional count method of analysis is to minimise the influence of publications with many authors [34]. (3) We set the minimum number of citations for a document to 10, and we also determined the minimum cluster size to be 30. Accordingly, 268 out of 762 documents meet the criteria.

4.3.2. Title and Abstract Map Analysis

The textual data that emanate from publications' titles and abstracts help create keywords co-occurrence maps. The keywords networks in this respect may support researchers in their way to identify the relevant variables to their research interest. Furthermore, the clusters of keywords shown in the network map (see Figure 12 and Table 3) may improve the authors' perception of possible keywords' combinations to develop appropriate research topics.

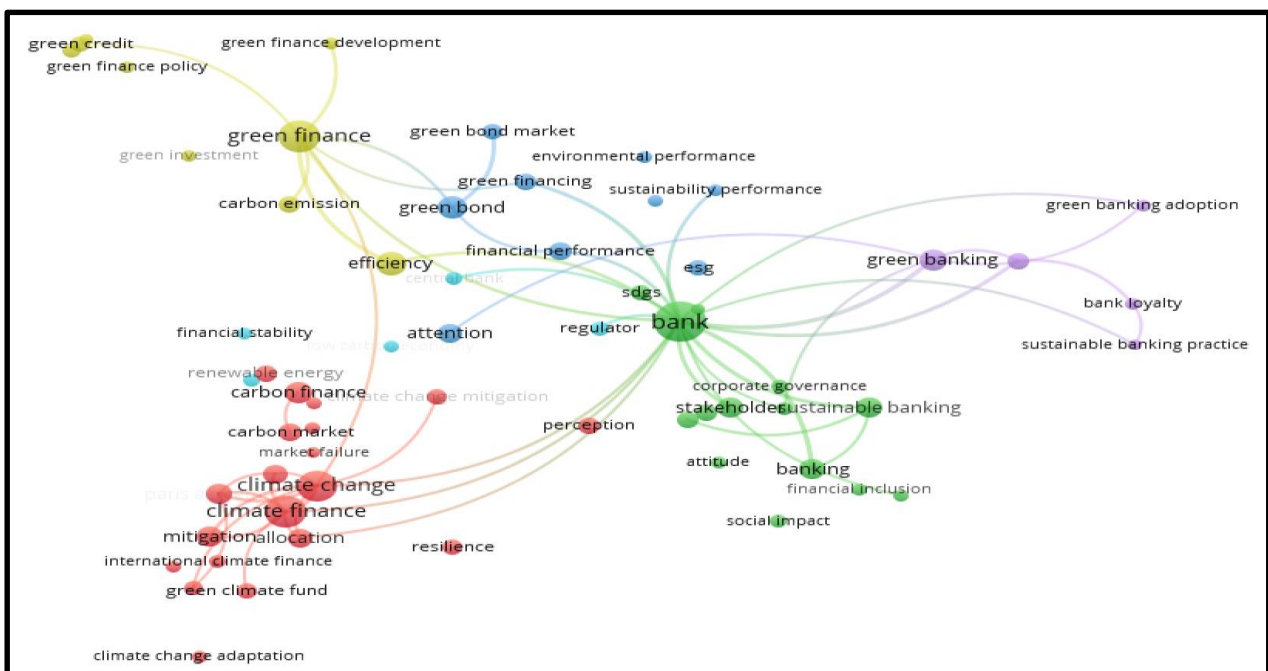


Figure 12. Title and abstract map. Note: we set the minimum number of occurrences of a term to the default value, i.e., 10 times, and we opt for the complete count method of analysis [34]. Our set parameters generate 539 out of 15,584 terms, meeting the threshold.

Table 3. Title and abstract map analysis.

Cluster	Most Relevant Keywords	Occurrences	Relevance Score	Links	Total Link Strength
1	Adaptation Finance	25	1.2041	17	142
1	Carbon Finance	74	1.0697	19	168
1	Carbon Market	45	1.8425	16	95
1	Climate Change	240	0.7599	52	855
1	Climate Finance	265	0.9649	37	673
1	Climate Policy	54	1.027	28	222
1	Low Carbon Investment	13	0.7498	12	37
1	Market Failure	11	0.8437	13	47
1	Paris Agreement	64	1.1244	26	326
1	Renewable Energy	35	0.5956	23	156
2	Bank	474	0.4842	58	1857
2	Corporate Governance	19	0.8771	11	37
2	Driver	35	0.4606	32	203
2	Environmental Sustainability	12	0.6101	21	81
2	Ethical Bank	14	0.8813	8	82
2	Financial Inclusion	16	0.821	15	39
2	SDGs	34	0.3067	22	119
2	Social Impact	18	1.088	9	35
2	Stakeholder	69	0.2868	41	334
2	Sustainable Banking	67	0.8563	20	330
3	Attention	56	0.1939	43	259
3	Environmental Performance	15	0.6392	16	87
3	ESG	34	0.7791	24	101
3	Financial Performance	43	0.5814	25	274
3	Green bond	97	1.3954	32	401
3	Green Bond Market	30	2.176	15	167
3	Green Financing	40	0.3639	22	277
3	Sustainability Performance	15	0.6915	15	155
3	Sustainable Investment	14	0.6033	17	79
4	Green Credit	31	2.6416	11	141
4	Green Credit Policy	11	1.6294	10	60
4	Green Economy	27	2.4084	15	124
4	Green Finance	261	0.8868	41	692
4	Green Finance Policy	15	1.5796	11	48
4	Green Investment	14	0.9176	20	57
5	Bank Loyalty	15	3.4198	5	114
5	Green Banking	73	0.888	22	462
5	Green Banking Adoption	15	1.3012	6	88
5	Green Banking Practice	42	1.5331	20	317
5	Sustainable Banking Practice	11	2.4922	8	107

Table 3. Cont.

Cluster	Most Relevant Keywords	Occurrences	Relevance Score	Links	Total Link Strength
6	Climate Risk	22	0.9197	19	73
6	Central Bank	18	0.4981	20	113
6	Financial Stability	17	0.766	17	67
6	Regulator	24	0.5108	30	150

4.3.3. Thematic Map Analysis

A thematic or strategic map analysis, on the other hand, helps explore and describe the progress and dynamics of research clusters through the development of strategic networks derived from keywords co-occurrence analysis [54]. It is an indicator of the concentration of research, in particular themes or categories in accordance with their levels of centrality and density. As such, thematic map abstracts the literature on a particular field of study into four distinct typologies as shown in Figure 13.

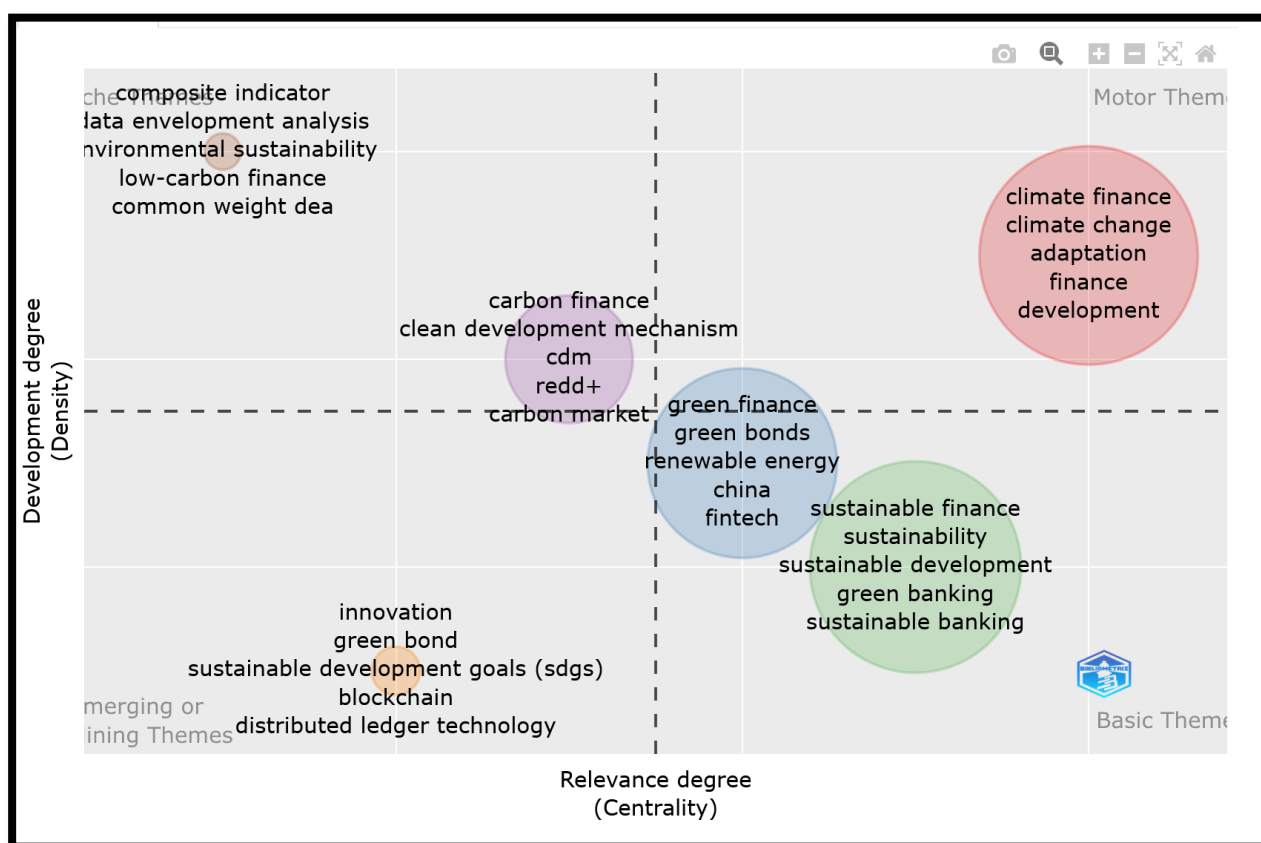


Figure 13. Thematic map analysis of sustainable finance literature.

To narrow down the scope of analysis and better understand the conceptual structure of the SF literature, we select the most relevant keywords from the network. This process results in 62 keywords structured in 6 clusters with 662 links and a total link strength of 6480.

It is remarkable to see from Table 3 and Figure 12 that the clusters of keywords revolve around primary themes, which may help figure out the conceptual structure of sustainable finance publications.

Keywords in Clusters 2 and 5, and part of keywords in Cluster 3 (specifically: attention, financial performance, sustainability performance, and environmental performance) in Table 3 pertain to the papers that examine different topics related to banks' involvement

in sustainability transition. This includes the drivers of banks' adoption of sustainability practices, the determinants of banks' sustainability performance (e.g., corporate governance mechanisms), the impact of sustainability performance on banks' financial performance, the influence of banks' environmental performance on depositors' and customers' behavior, and the nexus between banks' sustainability performance and bank loyalty, to name a few. The BC network (Figure 11) reinforces this thematic direction or relevancy. Several publications from Cluster 2 (green color) address in particular the abovementioned relationships/topics (see Appendix A). The thematic map (Figure 13), on the other hand, moves the analysis a step forward and introduces sustainable and green banking together with sustainability/sustainable development and underlines their substantial relevance to sustainable finance research (high relevance degree/centrality). Their interrelatedness (i.e., sustainable banks and sustainable development) points to the researchers' perception of banks' impact on sustainable development and sustainability transition. Banks' intermediary role and their capacity to create money and allocate credit to the entire economic system provide banks' boards with the ability to deploy the necessary financial resources towards sustainable and green industries in one hand and influence firms' managers to introduce sustainability indicators into their business strategies on the other. In other words, in addition to their direct financial contribution, banks that integrate ESG factors into their credit allocation policies and risk assessment methods are able to exercise their power to shift companies' core strategies towards more sustainable and responsible investments and, hence, help realise sustainable development Goals (SDGs is also visible in Cluster 2 of Table 3). Nonetheless, the sustainable and green banks' low density (i.e., lower development degree) highlights the significant opportunity for further development in the future, i.e., obvious research gaps.

The most relevant publication in sustainable finance, i.e., [5] (202 citations) belongs to Cluster 4 (yellow color) of the BC network (see Appendix A). This paper highlights the importance of calibrating and introducing relevant macroprudential regulations and monetary policies to help banks avoid additional market failure and mitigate the risk of disorderly transitions towards a low-carbon economy. A further analysis of this cluster documents the existence of other relevant studies in this respect [4,55–57].

The noticeable point in the thematic map is the significant centrality and the great development degree of “climate change” and “climate finance”. Furthermore, they top the list of keywords' occurrences (240 and 265, respectively), as shown in Table 3 (Cluster 1). The introduction of the Paris Climate Agreement by the parties to the UNFCCC in 2015 to fight against climate change and spur different stakeholders' involvement in green and climate-resilient investments has had a positive impact on research publications in climate and adaptation finance. Moreover, the recognition of climate change as a major source of systemic risks that may have negative implications on financial stability (both climate risks and financial stability belong to Cluster 6 in Table 3) [58–61], and as a planetary boundary of which the transgression may disturb or rather destabilise earth systems and create existential risks to modern societies [62] have urged countries, regions, and institutions to look for solutions to mitigate such risks. Publications in climate finance are also clearly visible in the BC network (Cluster 5) (see Appendix A).

As for publications in Clusters 1 and 3 in the BC network, they are more relevant to different categories of energy finance namely, energy and financial markets, energy corporate finance, green finance, green investment, and energy risk management [63] (see Appendix A). It is noteworthy to highlight that 3 out of 10 most influential publications in sustainable finance fall under this theme [40,43,46].

Finally, other keywords in Clusters 1, 4, and 6 in Table 3, such as climate policy, green credit policy, green finance policy, central bank, and regulator point to the important role institutional frameworks may play in reinforcing stakeholders' commitment and involvement in sustainable growth. In other words, unlike standard finance, sustainable finance is a policy-driven research topic [17] that seeks, among other things, to “de-risk” [37]

green, climate-resilient, and responsible investments in order to increase the financial flows towards green projects.

The next section (content analysis) will further extend the discussion about sustainable and green banks' involvement in sustainable development and provide a contextual analysis within a set of consistent research streams.

5. Content Analysis

5.1. Determinants of Banks' Adoption of Sustainability Practices

Banks' integration of sustainability practices into their operational systems is subject to several internal and external drivers. Regulatory policies and guidelines [9,10,64–66], professional networks or normative pressures (e.g., the banks' membership in international or local sustainable finance initiatives) [9,10], commitment of senior management to sustainability practices [9,64], board characteristics and corporate governance structures [9,10], banks' digital transformation [65], employee awareness [9,64], and pressures from civil society groups [64] are the key drivers for banks to introduce sustainability indicators into their core strategies and business models. It is noteworthy to highlight that authors drawn on several theoretical frameworks to develop their hypotheses.

Apart from banks' digitalisation, which requires further investigation in future research, the publications' results overall document a significantly positive impact of the abovementioned variables on banks' involvement in sustainability practices.

5.2. Risk Profile of Sustainable Banks

The introduction of regulatory policies may definitely have implications for banks' risk management processes. Cui et al. [37] kept that in mind and investigated whether the green credit policy introduced in China in 2012 may enhance banks' credit risk profile. Banks are bound to comply with this policy framework to ensure their regulatory compliance and hold their legitimacy. The authors claim that banks' integration of "environmental risks" into their "risk assessment methods" may mitigate their "credit risk". The paper's results support the researchers' hypothesis, i.e., banks that allocate higher ratios of green credit tend to manage lower ratios of NPL (consistent with [67]). The institutional theory helps figure out the paper's policy implications. The green credit guidelines, the control of the People's Bank of China over banks' credit allocation policy, and China's environmental economic policies may help banks manage their credit risk. In other words, the regulatory ecosystem that ascertains the prevalence of climate-resilient investments, sets green credit guidelines, and "integrates environmental protection into the fiscal system reform" ([47] (p. 123)) provides a conducive environment for sustainable industries to evolve and at the same time reduce their counterparty risk. This in turn may help banks better manage their credit risk.

From the risk management perspective, companies with significant environmental risks may carry higher liquidity, profitability, and solvency risks due to the regulatory obligations to internalise environmental costs. On top of that, they are subject to higher interest rates [68,69], and this may reduce their accessibility to banks' credit and, therefore, reduce their activity or efficiency and solvency ratios and, hence, increase their likelihood to default.

5.3. Sustainability Performance—Banks' Profitability Associations

Similar to risk management, publications in the Scopus database address the dynamics of sustainability performance-financial performance associations in specific regulatory frameworks (China, Malaysia, and Bangladesh). Moreover, their analysis is subject to several theories that provide an interpretative framework for the nature of associations. Usually, researchers determine first the direction of causality and then identify the impact of the relationship. Consistent with stakeholders and good management theories, all papers [70–74] report a significantly positive impact of sustainability performance on banks' financial performance. Yin et al. [72] on the other hand, and in line with slack

resource theory, also document a positive and significant impact of banks' profitability on sustainability performance.

Institutional and market structure theories reinforce the researchers' results. First, regulatory ecosystems that include green guidelines/standards, monetary policies, and macroprudential regulations force banks to scrutinise sustainable industries and identify "value customers". Second, the green finance market and sustainable industries across jurisdictions are not yet at the maturity level, and companies are still subject to public support. Accordingly, banks' ability to identify creditworthy borrowers/applicants is relatively easy.

Noteworthy, Torre Olmo et al. [74] ascertain that sustainable banks are more profitable than conventional banks. Moreover, they proclaim that sustainable banks do not charge higher interest rates in instances of greater market power to drive their profitability up. Rather, they enhance their financial performance via goodwill improvement, business culture differentiation, and good management of their various stakeholders' interests. On top of that, despite the additional costs sustainable banks may incur to integrate ESG factors into their operating system, the authors report a significantly positive impact of cost scale efficiency on banks' financial performance for both bank types. The authors claim that banks' effective integration of sustainability control systems may boost their reputation and lower their cost of capital. Furthermore, sustainable banks may trigger normative pressures and mimetic processes within the industry, and this may cause the competitors' costs to go up.

5.4. Macroprudential Regulations, Supervisory Guidelines, and Monetary Policies

The researchers' motives to look into this topic are (1) to trigger a balanced interplay of financial stability and sustainable economic growth, (2) to overcome the additional credit market failures that may hamper the effectiveness of carbon price policies, (3) to introduce climate and environmental risks into the macroprudential regulations and monetary policies to eliminate their "carbon bias" and cater for the financial requirements of green investments, and (4) to "green" the banks' balance sheets and align the financial system architecture with sustainable development.

D'Orazio and Popoyan [4], Campiglio [5], Dafermos et al. [55], Raberto et al. [56], Esposito et al. [57] and Esposito et al. [75] ascertain that climate change and ecological imbalance are potential key drivers of systemic risks. Accordingly, they call for the establishment of green monetary policies and macroprudential regulations that may spur banks to channel additional financial flows towards green investments and, therefore, address the expected negative implications of climate change and ecological imbalance on financial stability and economic systems. Moreover, they may help resolve the additional credit market failures that arise from incompatible banks' private interests and societies' development aspirations. However, Carney [58] argues that the green structural change of the economic and financial systems may create systemic risks to the financial sector due to higher market volatility and disruptions in capital flows. Hence, the authors recommend a gradual introduction of green monetary policies and macroprudential regulations to mitigate such adverse implications.

5.5. Depositors'/Customers' Behaviour in Response to Banks' Sustainability Practices

Depositors' choice of a bank according to previous studies is subject to economic benefits, convenience, service quality, depositors'/customers' characteristics, and reputation [76]. Today's socially and environmentally conscious societies may definitely set new determinants of depositors'/customers' choice of a bank. Depositors' funds are the primary source of banks' financial resources and, therefore, depositors' sensitiveness to banks' risk strategies may increase, and their power to discipline banks may in turn rise if they integrate sustainability indicators into their banks' risk assessment. Bearing that in mind, several papers sought to (1) investigate whether banks' environmental performance may determine the depositors' choice of a bank [77], (2) identify and examine the determinants that justify

the customers' choice of conventional or sustainable banks [76], (3) assess the influence of green image, banks trust, corporate reputation, and other variables [as moderators or mediators] on banks' sustainability practices and bank loyalty relationship [78–81], and (4) explore or grasp the antecedents of customers' behavioral intentions to use or engage in banks' green services [82,83].

Inconsistent with their research hypothesis, Galletta et al. [77] report a significantly negative impact of banks' environmental disclosure on customers' deposits. Moreover, they document that banks' environmental performance is negatively related to interest rates paid on deposits. On the same note, Bayer et al. [76] argue that the common negative perception about ethical banks' financial returns is a key factor that inhibits depositors' intentions to choose or switch to a sustainable bank. Other elements include the lack of pressure from the social context and the weak moral intensity. However, the good reputation of sustainable banks, their ethical consciousness, and their customers' interest and involvement with sustainability issues reveal a positive customers'/depositors' attitude towards sustainable banks.

Other studies namely, Ibe-enwo et al. [78], Igbudu et al. [79], Sun et al. [80] and Aramburu and Pescador [81] assert that green image, corporate reputation, and co-creation are positive mediators of banks' sustainability practices-bank loyalty association.

6. Conclusions

The growth of the total global institutional assets of signatories to the United Nations' principles for responsible investment shows the financial markets and institutions' commitment to incorporate sustainability criteria into their investment decisions and credit allocation policies. Nonetheless, due to institutional, financial, perceptual, and sector-specific impediments, a widespread shift of private and institutional investors towards the integration of sustainability criteria into their investment decisions remain rather slow [1,84]. The key resolution to this conundrum is to figure out first the essence of the sustainability transition and set a framework of indicative expectations that embeds climate change, environmental, and social issues into the core of the financial system [1]. Otherwise, government, financial regulators, and supervisors will have to control for unmanageable systemic and endogenous risks associated with ecological imbalance, climate change, and disorderly transitions towards a low-carbon and climate-resilient economy [58,60,85,86].

Accordingly, this paper combines bibliometric and content analysis processes to investigate the sustainable finance literature and explore the researchers' perspectives, responses, and contributions to solve this structure (financial system architecture)-objective (sustainable growth and sustainable transition demands) mismatch.. Bibliometric analysis helps derive the most important research constituents (performance analysis) and identify the conceptual and social structures of the sustainable finance literature (network map analysis). Content analysis on the other hand seeks to systematically examine the specific research themes of our dataset and integrate their results into the mainstream discourse of financial systems' alignment with sustainability transition demands. Our performance analysis reveals that the UK is the most influential country from the number of publications' perspective and Switzerland is the most impactful country.

The People's Bank of China's involvement in the control of financial markets and the comprehensive regulatory and supervisory guidelines it set to better manage the country's transition towards a low-carbon economy create a conducive environment for the growth of sustainable finance market (more data is accessible) and, therefore, expand the opportunity to examine the dynamics of sustainable finance–sustainable growth associations. To illustrate, China ranks second in the most influential countries from the number of publications' perspective and holds 50% of the most relevant institutions in sustainable finance.

The vulnerability of the ecological order and financial systems to climate and environmental shocks and the worldwide acknowledgement of both as potential sources for systemic risks have triggered a particular course of research that integrates the planetary physical boundaries with financial systems and economic stability. This is clearly visible in

the most relevant journals and the most impactful publications in sustainable finance. In total, 60% (15 out of 25) of the most influential journals focus primarily on climate change, environmental, and ecological issues. The researchers introduced finance to underline the important role it could play to achieve sustainable growth. As for the most relevant publications, 6 out of 10 fall under energy finance which consists of five primary categories or subtopics namely, energy and financial markets, energy corporate finance, green finance, green investment, and energy risk management [63], all of which address several issues (monetary policies, macroprudential regulations, relevant structures to reduce technology and operational risks of green investments, etc.) from different perspectives.

Banks' ability to create and allocate credit to the economy and their capacity to exercise institutional pressures over companies to introduce sustainability criteria into their business models justifies our choice to limit the content analysis process to the sustainable and green banking literature. Moreover, "sustainable finance", "climate finance", and "carbon finance" are "inclusive" keywords that usually involve banks as a key provider of consistent financial resources for the low-carbon economy and climate-resilient investments.

Our bibliometric network and content analysis processes generate five key research themes/clusters, namely determinants of banks' adoption of sustainability practices, depositors'/customers' behaviour in response to banks' sustainability practices, sustainability performance/banks' profitability associations, the risk profile of sustainable banks, and the macroprudential regulations, monetary policies, and central bank mandates to reinforce the sustainability transition and uphold the financial system's stability.

Despite the relatively wide spectrum of themes' inclusion in our content analysis, we can still identify significant research gaps. Galletta et al. [77] investigate whether Banks' internal environmental policy that seeks to reduce banks' carbon emissions may influence or rather identify depositors' choices of banks. Banks' negative environmental impact is not significant and, therefore, it is better to introduce materiality in the analysis and examine whether banks' intermediary role may determine the depositors' choice of banks. In other words, researchers may explore whether banks' ratio of financial allocation to environmentally-friendly investments and businesses affect the depositors' choices of banks. Moreover, in today's environmentally-conscious societies, depositors can easily access banks' fundamentals, financials, and annual reports and they can assess banks' intermediary performance from sustainability perspectives. Accordingly, they are more able to discipline banks. Authors may use relevant data in this respect and assess whether depositors exercise their power to discipline banks in the event they allocate credit to pollution-intensive industries for instance.

The recent introduction of green credit guidelines and sustainable finance roadmaps in several countries and the rise of banks' memberships in international sustainable finance initiatives provide further incentives to test whether institutional theory percepts (regulative isomorphism and normative processes) still hold positive impacts and whether past studies' results are still applicable to new regulatory contexts. On top that, those regulatory frameworks may also trigger a course of research that seeks to investigate their influence on credit risk profile and banks' financial performance, for instance.

Last but not least, the accessibility to material and relevant data to banks' specific business model will strengthen the current studies' results on banks' sustainability performance-financial performance relationships and, thus, reduce the inconclusive nature of the results in this respect. Moreover, researchers will be better able to investigate banks' risk profile in relation to their sustainable intermediary role in the economy and ultimately help generalise the results.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Bibliographic Coupling.

Authors	Title	Source Title
Cluster 1 (Green finance–Energy finance), 69 publications		
Taghizadeh-Hesary and Yoshino, 2019 [40]	The way to induce private participation in green finance and investment	Finance Research Letters
Zhang D et al., 2021 [43]	Public spending and green economic growth in BRI region: Mediating role of green finance	Energy Policy
He et al., 2019 [87]	Can green financial development promote renewable energy investment efficiency? A consideration of bank credit	Renewable Energy
Song et al., 2021 [88]	Impact of green credit on high-efficiency utilization of energy in China considering environmental constraints	Energy Policy
Yoshino et al., 2019 [89]	Modelling the social funding and spill-over tax for addressing the green energy financing gap	Economic Modelling
Tan et al., 2020 [90]	How connected is the carbon market to energy and financial markets? A systematic analysis of spillovers and dynamics	Energy Economics
Azhgaliyeva et al., 2020 [91]	Green bonds for financing renewable energy and energy efficiency in South-East Asia: a review of policies	Journal of Sustainable Finance and Investment
Setyowati, 2020 [92]	Mitigating energy poverty: Mobilizing climate finance to manage the energy trilemma in Indonesia	Sustainability (Switzerland)
Jin et al., 2021 [93]	The financing efficiency of listed energy conservation and environmental protection firms: Evidence and implications for green finance in China	Energy Policy
Setyowati, 2021 [94]	Mitigating inequality with emissions? Exploring energy justice and financing transitions to low-carbon energy in Indonesia	Energy Research and Social Science
Bourcet and Bovari, 2020 [95]	Exploring citizens' decision to crowdfund renewable energy projects: Quantitative evidence from France	Energy Economics
Li et al., 2021 [96]	Renewable energy resources investment and green finance: Evidence from China	Resources Policy
Wang F et al., 2021 [97]	The impact of environmental pollution and green finance on the high-quality development of energy based on spatial Dubin model	Resources Policy
Cluster 2 (Sustainable and Green Banking), 63 publications		
Cui et al., 2018 [37]	The impact of green lending on credit risk in China	Sustainability (Switzerland)
Bose et al., 2018 [10]	What drives green banking disclosure? An institutional and corporate governance perspective	Asia Pacific Journal of Management
Sun et al., 2020 [80]	CSR, co-creation, and green consumer loyalty: Are green banking initiatives important? A moderated mediation approach from an emerging economy	Sustainability (Switzerland)
Bose et al., 2021 [98]	Does green banking performance pay off? Evidence from a unique regulatory setting in Bangladesh	Corporate Governance: An International Review
Khan H.Z et al., 2021 [99]	"Green washing" or "authentic effort"? An empirical investigation of the quality of sustainability reporting by banks	Accounting, Auditing, and Accountability Journal

Table A1. Cont.

Authors	Title	Source Title
Contreras et al., 2019 [100]	Self-regulation in sustainable finance: The adoption of the Equator Principles	World Development
Igbudu et al., 2018 [79]	Enhancing bank loyalty through sustainable banking practices: The mediating effect of corporate image	Sustainability (Switzerland)
Ibe-enwo et al., 2019 [78]	Assessing the relevance of green banking practice on bank loyalty: The mediating effect of green image and bank trust	Sustainability (Switzerland)
Rehman et al., 2021 [101]	Adoption of green banking practices and environmental performance in Pakistan: a demonstration of structural equation modelling	Environment, Development and Sustainability
Amidjaya and Widagdo, 2020 [65]	Sustainability reporting in Indonesian listed banks: Do corporate governance, ownership structure, and digital banking matter?	Journal of Applied Accounting Research
Tan et al., 2017 [64]	A holistic perspective on sustainable banking operating system drivers: A case study of the Maybank group	Qualitative Research in Financial Markets
Taneja and Ali 2021 [83]	Determinants of customers' intentions towards environmentally sustainable banking: Testing the structural model	Journal of Retailing and Consumer Services
Bryson et al., 2016 [82]	Antecedents of Intention to Use Green Banking Services in India	Strategic Change
Khan H.Z et al., 2021 [102]	Green banking disclosure, firm, and the moderating role of a contextual factor: Evidence from a distinctive regulatory setting	Business Strategy and the Environment
Cluster 3 (Green finance = Carbon finance = Energy finance), 59 publications		
Bolton and Foxon, 2015 [103]	A socio-technical perspective on low carbon investment challenges—Insights for UK energy policy	Environmental Innovation and Societal Transitions
Chaurey and Kandpal, 2009 [104]	Carbon abatement potential of solar home systems in India and their cost reduction due to carbon finance	Energy Policy
Lambe et al., 2015 [105]	Can carbon finance transform household energy markets? A review of cookstove projects and programs in Kenya	Energy Research and Social Science
Maltais and Nykvist, 2021 [106]	Understanding the role of green bonds in advancing sustainability	Journal of Sustainable Finance and Investment
Nakhooda, 2011 [107]	Asia, the Multilateral Development Banks and Energy Governance	Global Policy
Zhang B., Wang Y, 2021 [108]	The Effect of Green Finance on Energy Sustainable Development: A Case Study in China	Emerging Markets Finance and Trade
Zhang M et al., 2020 [109]	Unlocking green financing for building energy retrofit: A survey in the western China	Energy Strategy Reviews
Aglietta et al., 2015 [110]	Financing transition in an adverse context: climate finance beyond carbon finance	International Environmental Agreements: Politics, Law, and Economics
Chevallier et al., 2021 [111]	Green finance and the restructuring of the oil-gas-coal business model under carbon asset stranding constraints	Energy Policy
Cluster 4 (Central bank mandates, relevant macroprudential regulations, and monetary policies for energy finance), 43 publications		
Campiglio, 2016 [5]	Beyond carbon pricing: The role of banking and monetary policy in financing the transition to a low-carbon economy	Ecological Economics
Banga, 2019 [112]	The green bond market: a potential source of climate finance for developing countries	Journal of Sustainable Finance and Investment
D'Orazio and Popoyan, 2019 [4]	Fostering green investments and tackling climate-related financial risks: Which role for macroprudential policies?	Ecological Economics
Dikau and Volz, 2021 [113]	Central bank mandates, sustainability objectives, and the promotion of green finance	Ecological Economics
Raberto et al., 2019 [56]	From financial instability to green finance: the role of banking and credit market regulation in the Eurace model	Journal of Evolutionary Economics
Cabré et al., 2018 [114]	Renewable Energy: The Trillion Dollar Opportunity for Chinese Overseas Investment	China and World Economy

Table A1. Cont.

Authors	Title	Source Title
Durrani et al., 2020 [115]	The role of central banks in scaling up sustainable finance—what do monetary authorities in the Asia-Pacific region think?	Journal of Sustainable Finance and Investment
Roncoroni et al., 2021 [116]	Climate risk and financial stability in the network of banks and investment funds	Journal of Financial Stability
Chenet et al., 2021 [117]	Finance, climate-change, and radical uncertainty: Towards a precautionary approach to financial policy	Ecological Economics
Monasterolo et al., 2018 [118]	Climate Transition Risk and Development Finance: A Carbon Risk Assessment of China's Overseas Energy Portfolios	China and World Economy
Corrocher and Cappa, 2020 [119]	The role of public interventions in inducing private climate finance: An empirical analysis of the solar energy sector	Energy Policy
Esposito et al., 2019 [57]	Environment–risk-weighted assets: allowing banking supervision and green economy to meet for good	Journal of Sustainable Finance and Investment
Matthäus and Mehling, 2020 [120]	De-risking Renewable Energy Investments in Developing Countries: A Multilateral Guarantee Mechanism	Joule
Gunningham, 2020 [12]	A quiet revolution: Central banks, financial regulators, and climate finance	Sustainability (Switzerland)
Cluster 5 (Climate finance), 42 publications		
Weiler et al., 2018 [121]	Vulnerability, good governance, or donor interests? The allocation of aid for climate change adaptation	World Development
Betzold and Weiler, 2017 [122]	Allocation of aid for adaptation to climate change: Do vulnerable countries receive more support?	International Environmental Agreements: Politics, Law, and Economics
Cui and Huang Y, 2018 [123]	Exploring the Schemes for Green Climate Fund Financing: International Lessons	World Development
Roberts and Weikmans, 2017 [124]	Postface: fragmentation, failing trust, and enduring tensions over what counts as climate finance	International Environmental Agreements: Politics, Law, and Economics
Pickering et al., 2015 [125]	Acting on climate finance pledges: Inter-agency dynamics and relationships with aid in contributor states	World Development
Remling and Persson, 2015 [126]	Who is adaptation for? Vulnerability and adaptation benefits in proposals approved by the UNFCCC Adaptation Fund	Climate and Development
Stadelmann et al., 2011 [127]	New and additional to what? Assessing options for baselines to assess climate finance pledges	Climate and Development
Gampfer et al., 2014 [128]	Obtaining public support for North–South climate funding: Evidence from conjoint experiments in donor countries	Global Environmental Change
Glomsrød and Wei, 2018 [129]	Business as unusual: The implications of fossil divestment and green bonds for financial flows, economic growth, and energy market	Energy for Sustainable Development
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