

Chapter 1

How Many Shades Are There in Sustainable Finance? A Bibliometric Review

Rabia Fatima

University of Cagliari, Italy

Iustina Alina Boitan

Bucharest University of Economic Studies, Romania

Rosella Carè

University of Cagliari, Italy

ABSTRACT

In the last years, sustainable finance emerged as one of the most popular research topics all over the world. Inspired by the need to reconsider the role and contribution of finance for a more sustainable development and capitalism, sustainable finance encompasses a very broad set of terms and investment approaches that lead to a blurring of its boundaries and core elements. This chapter explores research on the field of sustainable finance by using a bibliometric approach and mapping its conceptual landscape and the related sub-themes. The chapter provides a better understanding of sustainable finance to researchers, organizations, and the society by clarifying the origin, concept, and boundaries of sustainable finance, and delineating comprehensive knowledge of the tools, approaches, and instruments useful for sustainable development in the financial world.

INTRODUCTION

Many studies have suggested that the subprime crisis highlighted a crisis of ethics and values that raised the demand for long-term approaches to creating sustainable development in the finance world. In this perspective, several works emphasized that traditional finance has not been able to fulfill its social purpose (Sandberg, 2018).

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The concept of sustainable finance emerged from sustainability or sustainable development defined as “the provision of financial capital and risk management products and services in ways that promote or do not harm economic prosperity, the ecology and community well-being” (Strandberg, 2005, p. 6). According to academic literature, sustainable development has considered economic, environment, and social constraints on the same level rather than preference for just monetary goals (Lagoarde-Segot & Paranque, 2017). Thus, sustainable development not only reflects all the issues related to the environment, society, and governance (ESG), but also creates sustainability by balancing these three main factors (Vifell & Sonery, 2012).

Salzmann (2013) describes how environment, social justice, and corporate governance can be considered the three main central aspects of concern in assessing the sustainability of an investment. More recently, academic contributions on sustainable finance are increasingly focusing on the role of sustainable finance in achieving Sustainable Development Goals (Ziolo et al., 2021), on the challenges and opportunities emerging after the COVID-19 crisis (Caldecott, 2020; Quatrini, 2021), and on the role of regulatory policy to encourage the development of sustainable finance (Klettner et al., 2019; Ahlström & Monciardini, 2021; Okonjo, 2021). The exploration of the following themes further enriches the current debate around sustainable finance: Environmental, Social, and Governance (ESG) (Ramadhani, 2019; Kew & Krosinsky, 2020; Weston & Nnadi, 2021), Sustainable Responsible Investments and Socially Responsible Financial Markets (Jednak, & Jednak, 2019), Impact Investing (Park, 2018), Green Bonds (Park, 2018; Carè et al., 2018; Maltais & Nykvist, 2020; Birindelli et al., 2020), and Green and Climate Finance (Dörny & Schulz, 2018; Liang & Renneboog, 2020; Migliorelli, 2021).

Although there have been many reviews before, most of them are more inclined to specific sub-themes. These reviews are often unable to summarize the development and knowledge structure of the whole field. Sustainable finance encompasses an extensive set of terms and investment approaches without a clear understanding of its boundaries and core elements. Based on this consideration, this chapter explores the stance of previous studies on sustainable finance by (i) identifying their origins and roots; and (ii) by mapping its conceptual landscape and the related sub-themes.

The structure of a scientific field can be analyzed by its research and publication activity (Ronda-Pupo, 2017). This chapter uses bibliometric tools (Castriotta, Loi, Marku, & Naitana, 2019) that, combined with a co-word analysis approach, can show the structure and central themes of a research area (Tunger & Eulerich, 2018). More in detail, a bibliometric analysis enables the identification of current trends and future research avenues (Fahimnia et al., 2015; Li, Wu, & Wu, 2017; Xu et al., 2018).

Finally, this study provides a better understanding of sustainable finance to researchers, organizations, and society by clarifying the origin, concept, and boundaries, and delineating comprehensive knowledge of the tools, approaches, and instruments useful for sustainable development in the financial world.

SCOPE AND RESEARCH METHODOLOGY

The aim of this chapter is to conduct a systematic and objective bibliometric analysis on sustainable finance to determine the theoretical structure of this emerging field and the future research directions. To accomplish the aim, a bibliometric approach was used to describe the evolution of this research field quantitatively. This methodological approach supports researchers in understanding the knowledge structure of a research field and capturing both research gaps and future research directions. Bibliometric analyses are conducted by using an objective, replicable, and quantitative approach. One of the main

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Table 1. Search protocol

| Database | Fields | Document types | Keyword | Number of articles | Search key |
|----------------------|------------|----------------|-----------------------|--------------------|--|
| SCOPUS | All fields | Articles | "sustainable finance" | 1909 | ALL ("sustainable finance") AND (LIMIT-TO (DOCTYPE, "ar")) |
| ISI Web of Knowledge | All fields | Articles | "sustainable finance" | 348 | ALL FIELDS: ("sustainable finance") Refined by: DOCUMENT TYPES: (ARTICLE) Timespan: 1990–2021. Indexes: SSCI, A&HCI, CPCI-S, SCI-EXPANDED, CPCI-SSH, BKCI-SSH, BKCI-S, ESCI, CCR-EXPANDED, IC. |

Source: Authors' elaboration

significant results emerging from this methodological approach is the “scientific knowledge map” in which visual graphics depict the structure, development process, core content, and frontier of a research field (Shiffrin & Börner, 2004).

The authors applied a systematic literature review and co-word analysis for this work. According to Gough et al. (2012), a systematic review is based on a set of processes namely, defining the research questions, choosing the inclusion and exclusion criteria, defining the keyword-based search terms, analysis of the literature, and synthesis. Further, an analysis of keywords co-occurrence was used to systematically evaluate the existing sub-themes, determine their evolution over time, and identify the future research pathways.

The analysis of keywords co-occurrence is an effective method for exploring research topics and identifying new research trends because the terms used by authors as keywords can provide a concise overview of the important contents and key points of a body of articles (Li et al., 2016). The VOSviewer 1.6.17 tool calculates the frequency of keywords and creates a keywords co-occurrence matrix used to analyze keywords co-occurrence. Sections below describe the methodological approach adopted for the systematic literature review and then the preliminary standardization procedures adopted for the keyword co-occurrence analysis.

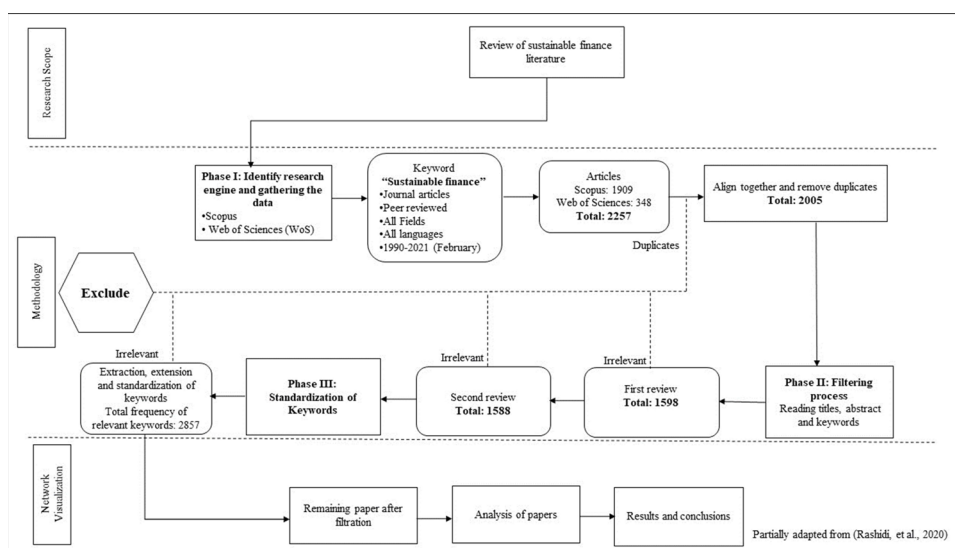
Data Sampling, Collection, and Cleaning

Two primary databases - ISI Web of Science (WoS) and SCOPUS—have been used to search for scientific publications as they are considered the most used platforms in social sciences to collect data for bibliometric analysis (Zupic & Čater, 2015; Röhm, 2018; Fabregat-Aibar et al., 2019; Maia et al., 2019; Rashidi et al., 2020). The only keyword used to collect the data from both search engines was “sustainable finance.” The fixed time frame for each database was from 1990 to February 16, 2021. The data collected were limited to scientific articles. As an outcome of the initial search, “348” articles from Web of Sciences and “1909” articles from SCOPUS related to sustainable finance were obtained by following the search protocol summarized in Table 1. Afterward, retrieved data was downloaded in Excel format.

After merging the result and forming the standardized Excel sheet, a total of 2257 articles were found. The researchers then manually corrected minor errors related to the authors' names and article titles within the sample file before excluding the repeated and irrelevant articles (Baker et al., 2020). All duplicate papers were eliminated using the “duplicate value” function in Excel as many items appeared

in both databases (Fabregat-Aibar et al., 2019; Rashidi et al., 2020). At the end of this process, only 2005 papers remained. The data were reviewed twice by two researchers independently, a process that entailed analysis of all article titles, abstracts, author keywords, and index keywords (Fabregat-Aibar et al., 2019; Nájera-Sánchez, 2020; Rashidi et al., 2020). The rationale behind eliminating irrelevant papers during the complete review process was based entirely on failure to address the sustainable finance concept adequately (Röhm, 2018; Rashidi et al., 2020). Therefore, only those papers that are precisely related to sustainable finance were selected. After removing the irrelevant articles, a total of 1588 articles were left for further analysis. Figure 1 provides an overview of the process used for data gathering and filtration in this study.

Figure 1. Methodology workflow
 Source: Authors' elaboration



Data Standardization

During this phase, the author’s keywords were extracted and standardized within the selected articles. Before the standardization process, the researchers manually selected and added the important keywords to 181 authors’ articles without keywords from index keywords or by reading the title and abstract or full text—three keywords maximum were extracted from each research article (Statman, 2000; Ding et al., 2001; Bauer et al., 2005; Barnett et al., 2006; Renneboog et al., 2008; Dehdarirad et al., 2014; Topalli & Ivanaj, 2016). Thus, the sample of 1588 articles yielded 8143 different keywords. As discussed by Choi (2011), it is important to standardize the keywords before network analysis (p. 373). Table 2 summarizes the standardization process applied (Choi et al., 2011; Nájera-Sánchez, 2020; Aracil et al., 2021). This process normalized the data for further analysis and reduced the number of keywords to 2857. Appendix 1 provides an overview of the final standardized terms.

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Table 2. Keywords extraction, extension, and standardization

| Standardization procedure | Screened keywords |
|--|-------------------|
| Selected and added important keywords to 181 missing authors' keyword articles (Statman, 2000; Bauer et al., 2005; Barnett et al., 2006; Renneboog et al., 2008). | 533 |
| To build uniformity within the data file, the first alphabet of each keyword was turned into uppercase (Ding et al., 2001; Castriotta et al., 2021). | 8143 |
| Corrected and unified spelling errors within the data set (Ding et al., 2001; Dehdarirad et al., 2014; Murgado-Armenteros et al., 2015; Castriotta et al., 2021). | 8143 |
| Hyphen removed if the meaning was not affected (Choi et al., 2011). | 8143 |
| Unified keywords or Abbreviations, for example for mostly used terms, if keyword and its abbreviation were used together, it was converted into complete word and also for other terms, if the somewhere complete term mentioned to explain Acronym they were also consolidated by complete word (Palshikar, 2007; Choi et al., 2011; Castriotta et al., 2021). For instance, "Corporate social responsibility" and "CSR" became "Corporate social responsibility," "Environmental, Social, and Governance", "Environment Social Governance (ESG)," "Environmental social governance," "Environment, social, governance (ESG)," "Environmental Social and Governance," "social and governance (ESG)," "Social and corporate governance (ESG)," and "ESG" became "Environmental, social, and governance," "Microfinance Institutions" and "MFI" became "Microfinance institutions," "Sustainable Development Goals," "Sustainable Development Goals (SDGs)," "SDG" and "SDGs" became "Sustainable development goals." | 8113 |
| Standardized singular and plural terms (Choi et al., 2011; Dehdarirad et al., 2014; Castriotta et al., 2021). For instance "Sustainable development goal" and "Sustainable development goals" were merged into "Sustainable development goals," "social impact bond," and "social impact bonds" were merged into "social impact bonds." | 8113 |
| Separated multiple terms combined as a single keyword. If two separate terms were used together in the keyword, they were separated and considered as individual keywords (Choi et al., 2011). | 8118 |
| Unified synonyms merged closely related terms, or converted them into a more general term (Choi et al., 2011). For instance, "poverty alleviation" and "poverty reduction" were merged into "poverty alleviation," "clustering analysis" and "cluster analysis" were merged into "cluster analysis," "Reputation risk" and "reputational risk" were merged into "reputational risk." | 8118 |
| Removed irrelevant terms or keywords that are not related to sustainable finance (words with general meanings) (Ding et al., 2001; Dehdarirad et al., 2014; Murgado-Armenteros et al., 2015; Castriotta et al., 2021). For instance countries names like China, Africa, Malaysia, Indonesia, Bangladesh, European Union, Sub-Saharan Africa, India, Pakistan, Canada, Turkey, Ghana, Latin America, South Africa, Australia, Egypt, France, United Kingdom, United states, Germany, Nigeria, Kenya, Northern Uganda, Asia-Pacific, and many more, target samples like education sector, students, technology, etc., statistical tests and data types like structural equation modeling, fuzzy cognitive map, data envelopment analysis, event study, panel data, content analysis, or JEL Classification Codes e.g., G11, G12, G13, G22, G33, C15, G10, Q430, G20, G110, G130, G150, Q56, G14, Q43, Q56, G01, G32, C5, etc. and some very general terms like glass ceiling, big data, Performance, Developing countries, Investment. | 2857 |

Source: Authors' elaboration

REVIEW RESULTS AND DISCUSSION

In this section, the formal characteristics of the collected papers are analyzed and assessed. Information related to the research articles across the various journals, publication dates, and authors are evaluated. In the first part, a comprehensive view of all papers is provided to understand the development of the research field by considering the research growth trends and elucidate the analysis of keywords co-occurrence. This will not only reveal the influential authors or journals but also depict the visual network of the main clusters (themes) within this emerging field of finance, which ultimately shows the most relevant topics or themes of sustainable finance (Ye et al., 2020). In the second part, bibliometric cluster analysis is applied to understand the relationship within/among these main clusters. Keyword

cluster analysis is the most effective way of learning and understanding the relationships between keywords because it categorizes the data into sensible clusters (Rashidi et al., 2020). Each cluster would help understand the most common features and similarities within well-connected themes (keywords) and compare and/or link them to other themes (keywords) of other clusters (Rashidi et al., 2020). The cluster analysis in this study selects keywords based on highest occurrences and total link strength, by applying the association strength method to normalize the link strength between keywords (Van Eck & Waltman, 2009). The results show 47 keywords (nodes), 291 links (edges), and total link strength of 742 between the keywords related to sustainable finance. These findings indicate that the number of edges between nodes is high because the keywords (nodes) are linked within or/and among the clusters of the selected dataset. Thus, the study reveals the specific trends and patterns of sustainable finance by establishing appropriate clusters and mapping the network within/among the clusters to provide the researchers, organizations, and the society with an in-depth understanding of the conceptual structure of sustainable finance (Olawumi & Chan, 2018).

For the purpose of this work, the software VOSviewer 1.6.17 was used to calculate the keywords frequency and to create a keywords co-occurrence matrix. The software allows the representation of a network of items with the total number of links and the link strengths. In the visualization map, the size of each circle is proportionate to the relevance of the term it represents. To obtain a full picture of different clusters, only keywords with a minimum of ten occurrences have been selected.

Number of Published Articles and Publication Output

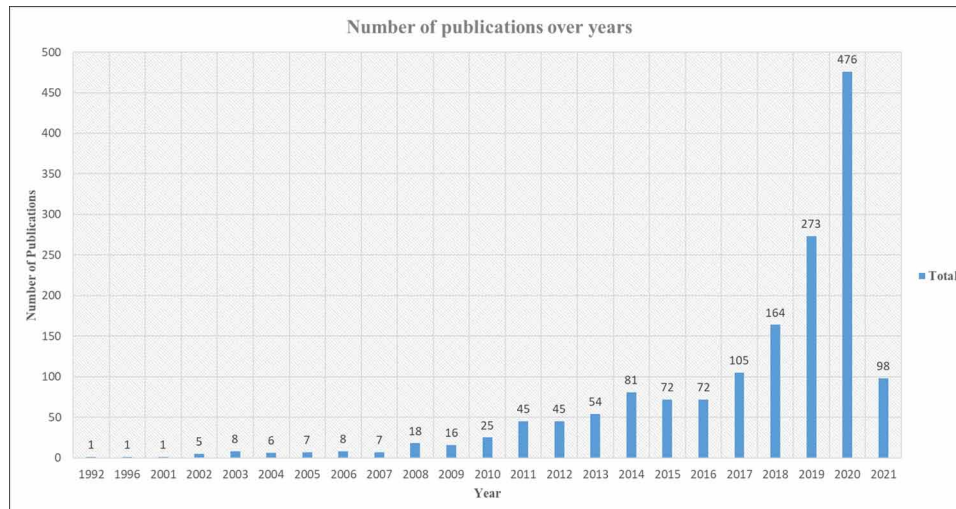
The publication trend over the years (1990 to 2021) is summarized in Figure 2. The graph represents the number of publications on the y-axis and the year on the x-axis. According to the collected data, the first paper on sustainable finance was published in 1992. After the 2007/2008 crisis, an upward trend is observed from 2009 to 2014 and 2017 to 2020. The highest number of publications (476 articles) was recorded in 2020. The growth in publications seems to be relatively flat in 2015 and 2016; it does not indicate a significant decline. Moreover, the percentage analysis from 2009 to 2021 showed that little more than 96 percent of articles were published after the global financial crisis. Thus, this upward trend indicates that there has been increasing attention on the study of sustainable finance by researchers after the financial crisis.

Table 3 reports the top ten journals with the highest number of publications—both total and per year number of publications—of the collected dataset. The percentage analysis indicates that these top 10 journals published 35.83% of the total articles from the selected dataset. The highest number of publications came from the *Journal of Sustainable Finance and Investment* (210), followed by *Sustainability* (171), *Journal of Cleaner Production* (43), *Business Strategy and the Environment* (29), and *Journal of Business Ethics* (24). Table 3 also provides the data of publications per year. For instance, the year with the highest number of publications was 2020 for the *Journal of Sustainable Finance and Investment*, *Sustainability*, *Business Strategy and the Environment*, *Corporate Social Responsibility and Environmental Management*, *World Development*, and *Journal of Cleaner Production*. Whereas, it was 2019 for the *Journal of Organization and Environment*, *Technological Forecasting and Social Change*, and *Ecological Economics*; and 2021 for the *Journal of Business Ethics*. All publications were related to sustainable finance.

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Figure 2. Number of publications over years

Source: Authors' elaboration



Most Contributing Authors

This section shows the researchers with the highest number of publications in this emerging field of research. Table 4 summarizes the author's information—country, affiliation, and focused research area—regarding the maximum number of article publications in this field. In the selected dataset, Weber was the most productive author with 23 publications, followed by Richardson with 12, and Polzin with 10 publications. However, it should be noted that in the selected dataset, Weber worked as the author in 14 articles and as co-author in other nine articles, while Richardson appears as the author in all the 12 published articles. Moreover, Weber's areas of focused research are diversified as his publications are on social (Social finance, socially responsible investing*, CSR, microfinance) or/and environmental factors (Environmental finance, Green finance) of sustainability (Sustainable development, Impact investing*, Sustainable finance, Sustainable banking). Richardson's researches on the other hand, focused on socially responsible investing, Sustainable development, social investing, and ethical investing, and Polzin's research focuses on innovation finance, Crowdfunding, and Entrepreneurial finance. Additionally, Table 4 shows that the University of Waterloo and the University of British Columbia, both of which are in Canada, are the most active institutions with a total of 35 publications. The table also shows that Canada is the main contributing country in this field of research based on the number of publications by the countries' authors. Canada has a total of 35 publications (authors: Weber and Richardson), followed by Greece with a total of 17 publications (authors: Nikolaou and Tsalis), Netherland with total 16 (authors: Polzin and Scholtens) and France with total 12 publications (authors: Paulet and Louche).

Research Hotspots and Emerging Topics: Results from the Keyword Co-Occurrence Analysis

This section presents the findings of a co-occurrence analysis of keywords that was conducted to systematically identify the linkages among different sub-topics. In general terms, the co-word analysis

Table 3. Ranked Journals with highest publications for the year 1990–2021

| Journal name | Number of publications per year | | | | | | | | | | | | | | | | | | | | Total | |
|--|---------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | | 2021 |
| Journal of Sustainable Finance and Investment | | | | | | | | | | | 17 | 18 | 16 | 22 | 13 | 13 | 13 | 16 | 18 | 55 | 9 | 210 |
| Sustainability (Switzerland) | | | | | | | | | | | | | | | | 5 | 7 | 20 | 51 | 74 | 14 | 171 |
| Journal of Cleaner Production | | | | | | | | | | | | | 1 | | | 5 | 4 | 7 | 9 | 9 | 8 | 43 |
| Business Strategy and the Environment | | | | 1 | | | | 1 | | | | | | 1 | 1 | | 2 | | 6 | 10 | 6 | 29 |
| Journal of Business Ethics | | | 1 | | | | | 1 | 1 | | | | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 3 | 5 | 24 |
| Corporate Social Responsibility and Environmental Management | | | | 1 | | | | | | | | | | | 2 | | 1 | | 5 | 7 | 4 | 20 |
| Journal of Banking & Finance | | | | | | | | 1 | | | | | 11 | 2 | 2 | 1 | | | 4 | 1 | | 20 |
| World Development | 1 | | 1 | | | | 1 | | | | 1 | 1 | 1 | 1 | 2 | | | 1 | 1 | 4 | 1 | 15 |
| Organization and Environment | | | | | | | | | | | | | 1 | | | | | 1 | 7 | 4 | | 13 |
| Technological Forecasting and Social Change | | | | | | | | | | | | | | | | 1 | | | 2 | 4 | 3 | 12 |
| Ecological Economics | 1 | | | | | | | | | | 1 | | | | | | | 2 | 5 | 1 | 1 | 12 |

Source: Authors' elaboration

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Table 4. Ranked authors with highest publications for the year 1990–2021

| # | Authors | Total number of articles | Country | Affiliation | Research area |
|-----|------------------|--------------------------|----------------|---|---|
| 1. | Weber, O. | 23 | Canada | University of Waterloo | Green finance, Impact investing*, Social banking, Social finance, Green economy, Microfinance, Socially responsible investing*, Sustainable finance, Environmental finance, Sustainable banking, Corporate social responsibility, Sustainable development/ Sustainability |
| 2. | Richardson, B.J. | 12 | Canada | University of British Columbia | Socially responsible investing*, Sustainable development/ Sustainability, Social investing*, Ethical investing* |
| 3. | Polzin, F. | 10 | Netherlands | Utrecht University School of Economics (U.S.E.) | Innovation finance, Crowdfunding, Entrepreneurial finance |
| 4. | Nikolaou, I. E. | 09 | Greece | Democritus University of Thrace | Environmental finance, Sustainable development, Water finance, Climate change finance |
| 5. | Caldecott, B. | 08 | United Kingdom | University of Oxford | Environmental, social, and governance, sustainable finance, Transition Finance, Public finance, Decarbonization |
| 6. | Tsalis, T. A. | 08 | Greece | Democritus University of Thrace | Global Reporting Initiative, Corporate sustainability, Climate change finance, Environmental finance, Sustainable development |
| 7. | Hoepner, A.G.F. | 07 | Ireland | Smurfit Graduate Business School, University College Dublin | Environmental finance, Green venture capital, Socially responsible investing*, Corporate social irresponsibility, Climate finance |
| 8. | Scholtens, B. | 06 | Netherlands | University of Groningen | Sustainability/Sustainable development, Financial crisis, Environmental, social, and governance, Sovereign bonds, Sustainable finance, Responsible investment* |
| 9. | Paulet, E. | 06 | France | ICN Business School | Financial crisis, Corporate social responsibility, Ethical banks, Greenwashing |
| 10. | Louche, C. | 06 | France | Audencia Business School | Impact investing*, Social entrepreneurship, Social finance, Sustainable banking, Microfinance |

*investing or investment

Source: Authors' elaboration

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Table 5. Keywords clusters with frequency

| Cluster no. | No. of Keywords within cluster | Keywords | Keywords frequency | Color |
|-------------|--------------------------------|---|---|--------|
| 1. | 12 | Corporate governance Corporate social performance Corporate social responsibility Environmental performance Environmental, social, and governance Environmental, social, and governance criteria Green banking Responsible investment* Social performance Social responsibility Socially responsible investing* Shareholder theory | 82 10 143 23 96 28 10 26 14 19 95 10 | Red |
| 2. | 10 | Carbon emissions Climate change Climate finance Energy transition Financial development Green bonds Green finance Paris Agreement Renewable energy Sustainable finance | 10 79 22 12 10 52 34 10 28 109 | Green |
| 3. | 09 | Crowdfunding Impact investing* Social banking Social enterprise Social entrepreneurship Social finance Social impact Social impact bonds Social impact investment* | 19 49 15 17 16 21 14 14 13 | Blue |
| 4. | 09 | Corporate sustainability Covid-19 Financial crisis Financial institutions Green credit Sustainability reporting Sustainable banking Sustainable development Sustainable Development Goals | 31 10 16 14 10 16 21 103 51 | Yellow |
| 5. | 07 | Financial inclusion Microcredit Microfinance Microfinance Intuitions Poverty alleviation Social capital Sustainable investing* | 21 37 141 37 60 12 25 | Purple |

*investing or investment

Source: Authors' elaboration

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Figure 3. Network of keywords

Source: Authors' elaboration

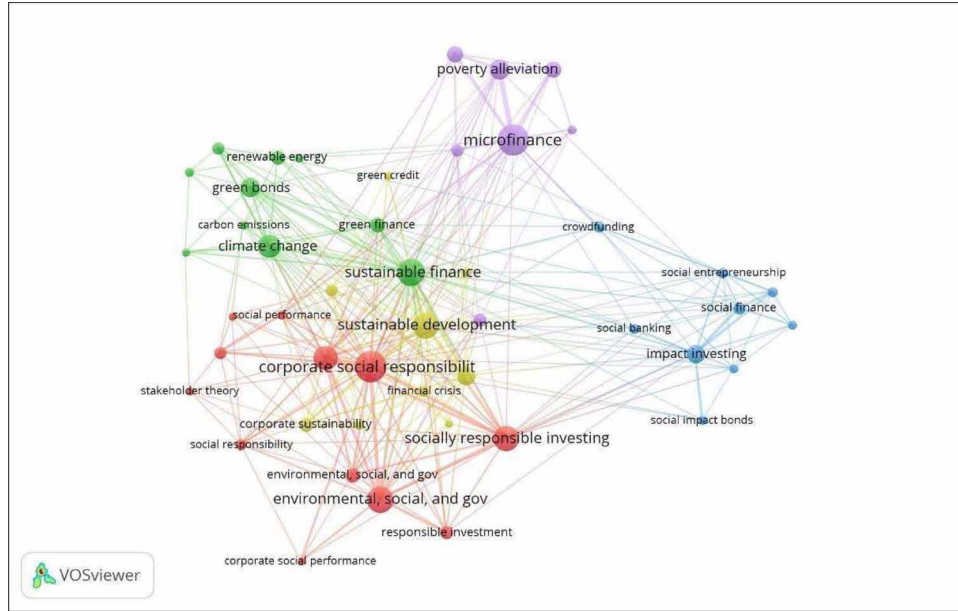
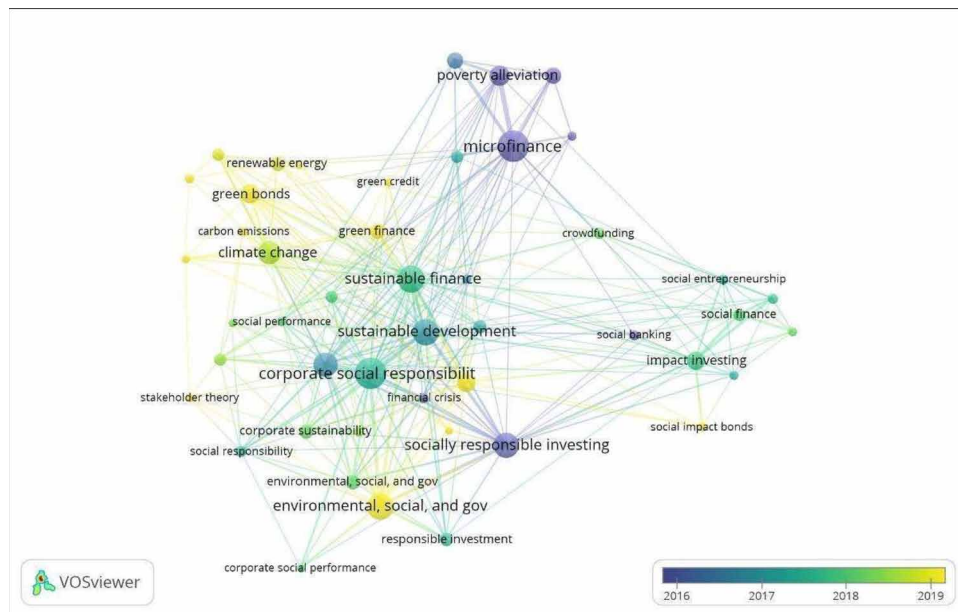


Figure 4. Keyword time map (overlay visualization)

Source: Authors' elaboration



supports identifying research hotspots in a particular field of study (Gao et al., 2020). Keywords with high frequencies indicate the research hotspots (Dai & Zhang, 2020). Before conducting the analysis, the keywords list was cleaned as summarized in Table 2. In the end, 2641 out of 2857 keywords were retained for the analysis. Table 5 shows the frequency of the keywords and how they are allocated to each cluster.

After excluding the keywords with a co-occurrence frequency below ten (for a clearer visualization), the co-occurrence network of keywords is shown in Figure 3.

In Figure 3, the bigger circles represent keywords with higher frequencies. The size of nodes can reflect the frequency of keywords: the higher the frequency of a keyword, the larger the size of the node. The thickness of each line is proportional to the closeness between two keywords.

Finally, in the overlay visualization (Figure 4) different colors correspond to the year in which the keyword appears (average publication year of the articles in which a keyword occurs).

Cluster Analysis

The data clustering revealed five main areas of research described in the sections below.

Cluster 1: Corporate Social Responsibility and the Environmental, Social, and Governance (ESG) Research Landscape

The cluster groups ethical investment practices (*responsible investment, socially responsible investing*), principles (*governance*), and outcomes (*corporate social performance, environmental performance, environmental (ESG), social and governance performance, and social performance*) within the broader *CSR* and *ESG* spectrums—that are used by managers within financial institutions to maximize the value of organizations. Over the last few years, *CSR* has attracted social sciences researchers' attention (Auld et al., 2008; Jaysawal & Saha, 2015; Nguyen et al., 2020) and has become one of the most significant aspects of the business industry (Amran et al., 2017; Bing & Li, 2019). The concept takes into consideration the interests of all stakeholders (Diez-Cañamero et al., 2020). In this vein, *CSR* activities benefit not only investing stakeholders but also non-investing stakeholders (Buchanan et al., 2018). Corporate social responsibility also includes corporate governance (Dell'Atti et al., 2017)—such that in the cluster, the governance is much closer to *CSR* and connected with the highest link strength (16). Corporate governance is defined as “the rules under which firms are operating, with the rules coming from such sources as the legal system, the judicial system, financial markets, and factor (labor) markets” (Claessens, 2006, p.93). The investment practices shown by this cluster are socially responsible investing (*SRI*) and responsible investment (Bing & Li, 2019). Although in recent researches, the broad relevance of the term “social” was questioned in *SRI* and had been frequently replaced with “sustainable investing” or “responsible investing,” the count of socially responsible investment articles was higher than that of responsible investment (Daugaard, 2020). This cluster even showed that *SRI* is the most evolved investment practice. The Social Investment Forum (2006) - defines *SRI* as an investment approach that is mainly based on social screening (i.e., the consideration of social factors to either avoid or seek out specific investments), community investing, and shareholder advocacy. These actions show a positive impact on society and the world (Daugaard, 2020, 1501). Whereas responsible investment is defined as “an investment that considers *ESG* criteria to generate long-term competitive financial returns and positive societal impact” (US SIF 2017, as cited in, Yamahaki, 2019, p. 162). Within the wider spectrum of sustainable development and sustainable finance, many non-financial factors, especially *ESG* have

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transformed the conventional finance paradigm into a sustainable one. ESG factors are considered as the three main pillars of financial development—that inclusion in the decision-making processes of financial institutions built a more sustainable financial system (Ziolo et al., 2019). Moreover, the relationship between two resilient concepts of this cluster - CSR and ESG is described by Clarke (2007) as, “the same forces that are impressing corporations toward taking a greater regard of CSR issues are guiding investments institutions to address ESG issues in their investment policies and practices” (p.92). Thus, Crifo et al. (2016) further define the relationship between these two concepts by clarifying that “it is becoming conventional wisdom today to define CSR through the lenses of three main dimensions: ESG factors)” (p.6).

Cluster 2: The Green Soul of Sustainable Finance

The cluster groups keywords like *climate change*, *climate finance*, *green finance*, and *green bonds* under the wider spectrum of *sustainable finance*. More precisely, this cluster elucidates the main driver (*carbon emission*) and policies (*Paris Agreement*) of climate change by defining tools (*green bonds*) and practices (*energy transition*, *renewable energy*) that are developed within the sustainable finance spectrum (*green finance*, *climate finance*). This cluster shows that the link between climate change and financial activities has markedly intensified during the recent years. The United Nations Framework Convention on Climate Change (UNFCCC), defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (1992, p.7). On the relationship between climate change and carbon emission, the European Commission (2016) in their climate action plan assert that human activities, especially industrial development, are the primary reason behind greenhouse gases emissions. The Paris Agreement is considered to be one of the most applicable agreements within the United Nations Framework Convention on Climate Change (UNFCCC) that states the issues related to climate change (UNFCCC 2015; Tolliver et al., 2020). Moreover, to reduce carbon emissions and/or enhance climate resilience in line with the Paris Agreement objectives it is important to integrate sustainable practices into the financial business model (Migliorelli, 2021). The green bond is the most important and developed innovation in the field of sustainable finance. According to Ehlers & Packer, “green bonds are fixed income securities which finance investments with environmental or climate-related benefits” and are considered as the “integral component of green finance” (2017, p.89) because they make considerable contribution to the achievement of the Paris Agreement objectives and the Sustainable Developments Goals (Tolliver, Keeley, & Managi 2019; Ferrer et al., 2021). Regarding the relationship between green bonds and climate finance—green bonds are considered “the best vehicle to finance low-carbon infrastructure” (Sartzetakis, 2020, p.1). In the cluster, the keyword sustainable finance is at the center of the map. There is however still no standard or universal definition of sustainable finance. According to Strandberg, “sustainable finance is the provision of financial capital and risk management products and services in ways that promote or do not harm economic prosperity, the ecology and community well-being” (2005, p. 6). Whereas according to the critical realist view by Lagoarde-Segot, “sustainable finance entails deep qualitative changes in the practice of finance that would rather require adopting an open-system view in which human agency is embedded in an organic social context” (2019, p.8). In general, sustainable finance is defined as “finance for sustainability” (Migliorelli, 2021, p.1). The cluster overlapping the visualization map shows that green finance and climate finance are recently evolved fields within the wider spectrum of sustainable finance, so can be considered as the

main components of sustainable finance (Migliorelli, 2021, p.5). Thus, this cluster focuses on the fact that the green dimension is the predominant component of sustainable finance.

Cluster 3: The Social Dimension of Sustainable Finance

The main focus of this cluster is on impact investment and its relationship with social finance and social enterprises. More precisely, this cluster is focused on the socially-oriented business and investment practices (*impact investing, social impact investment, social banking, social entrepreneurship, crowdfunding*) and instruments (*social impact bonds*).

Recent studies summarized that social finance lies between two extremes (Rexhepi, 2016)—profit and philanthropy—and consider it as “an umbrella term for financial products and services that strive to achieve a positive social, environmental or sustainability impact” (Weber, 2012, p.3). Social finance incorporates many socially-oriented financial activities (Rexhepi, 2016; 15), for instance, impact investing, social banking, and crowdfunding. Impact investing is the main theme of this cluster and is strongly linked to social finance—with the highest link strength (11). According to La Torre et al., “Impacting investing and social impact bonds represent an interesting field of research in innovative business models for sustainable finance” (2019, p.1). In general terms, social impact bonds are defined as an “instrument/tool for funding projects where a fixed amount of money is paid if performance results are achieved” (Rexhepi, 2016, p.40). The relationship between social finance and social impact bonds is, according to Carè et al., “social impact bonds have emerged as one of the most innovative instrument of social finance that is designed to support the social service sector in the delivery of innovative social programs” (2020, p.1). In conclusion, this cluster majorly focuses on the social aspects of the newly emerged field of sustainable finance.

Cluster 4: Sustainable Development at the Driving Force of Sustainable Finance

The core focus of this cluster is on *sustainable development*. The 2007/2008 global financial crisis was a crisis of unsustainability (Yip & Bocken, 2018)—that brought dramatic consequences for economies and societies (Herzig & Moon, 2013, p.1870). After the financial crisis “it has become apparent that the expansion of the financial sector, the phenomenal sophistication of financial products, and the unprecedented velocity of financial transactions have together profoundly altered the relationship between finance, the economy, and society” (Lagoarde-Segot, 2017, p.113). “The crises led business industry and research groups around the world to rethink and debate on assumptions of modern finance, the impact of finance on society and the sustainability of financial system” (Sun et al., 2011, p.3) and therefore raised the demand for long-term sustainable approaches for sustainable development in the financial world.

The network visualization map shows the crucial role of sustainable development, as this term is addressed in 103 articles. It is the prominent theme in this cluster and is present almost at the center of the cluster—between sustainable finance and CSR. Sustainable development describes the pathways (processes) to achieve sustainability (Beland Lindahl et al., 2016; UNESCO, 2015).

As the global crises enforced to rethink about the unsustainable business models adopted by banks (Yip & Bocken, 2018)—most financial institutions are modifying their traditional approaches by redesigning their products and services to meet the need for a green economy (Lundgren & Catasús, 2000, as cited in Galletta et al., 2021). According to the Collevocchio Declaration endorsed by civil society organizations, “financial institutions - banks and asset managers—must expand their missions from ones

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that prioritize profit maximization to a vision of social and environmental sustainability” (2003, p.3). Sustainable banking is an evolved and dynamic concept that internalizes ESG systems and ethical conduct policies to promote sustainable development (Mendez & Houghton, 2020, p.973).

Cluster 5: Poverty Alleviation at the Core of Sustainable Finance

The main themes of this cluster are *microfinance* and *poverty alleviation*. Furthermore, this cluster shows the relationship between sustainable investment and financial inclusion. According to Beck, “financial inclusion refers to the access by enterprises and households to reasonably priced and appropriate formal financial services that meet the needs of enterprises and households” (Beck, 2015, p.3). Poverty alleviation is one of the most important Millennium Development Goals by the United Nations (United Nations General Assembly, 2000), and also SDGs for the society (United Nations General Assembly, 2015). The basic aim of the goal “no poverty” is to “ensure that everyone around the world - particularly the poor and the vulnerable—have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services—microfinance or microcredit” (United Nations General Assembly, 2015, p.15). Many microfinance institutions worldwide contribute to poverty reduction and improve quality of life (Schoenmaker & Schramade, 2018). Microfinance institutions provide banking services to lower-income group individuals and micro-enterprises (Mersland & Øystein Strøm, 2009; Schoenmaker & Schramade, 2018; Tang et al., 2020), but their institutional and operational frameworks are totally different from those of commercial banks (Quayes, 2012). The major goals of microfinance institutions are to provide low-income group individuals with different ways to manage their finances, spending, and savings (van Rooyen et al., 2012). Microfinance is the most prominent theme of this cluster, as it is addressed in 141 documents.

DISCUSSION OF RESULTS, LIMITATIONS OF THIS STUDY, IMPLICATIONS FOR RESEARCH, AND DIRECTIONS FOR FUTURE STUDIES

Through exploring the stance of previous studies on sustainable finance and mapping its conceptual landscape and the related sub-themes, the study conducted in this chapter has manifold and practical implications for researchers, the society, and decision makers.

By providing a comprehensive and relevant snapshot of existing research on sustainable finance, published in prestigious journals indexed in WoS and SCOPUS, researchers benefit from uncovering the scientific knowledge generated so far in the field of sustainable finance and from identifying current research gaps that create opportunities for exploring new research assumptions. Despite the noticeable upward trend in the number of published papers gravitating around the sustainable finance concept, there are still underexplored areas to which researchers should channel their attention—as suggested also by the analysis of the co-occurrence of keywords. Thus, the findings of the bibliometric analysis performed in this chapter complemented with the identification of research hotspots may serve as a starting point for novel and original research topics and approaches that will further advance knowledge in this continuously evolving field.

Although this study reveals interesting results regarding sustainable finance, it has several limitations related to bibliometric analysis. First, data collected are limited to scientific articles only, while excluding

books, news items, editorial material, and proceeding papers. Even though journal articles are the most widely accepted and frequently used for bibliometric analysis, there may be publications related to the subject matter that this study has not contemplated. An interesting direction for future research would be to consider the use of other scientific sources of knowledge (e.g., book chapters, position papers) in order to obtain a more comprehensive perspective of the evolution of the fields. Following the identified limitations of this research, future research may complement this study using different bibliometric methodologies (e.g., co-citation analysis).

From the standpoint of society, in terms of civil society organizations and individuals, the results obtained are primarily meant at raising awareness on the multifaceted acceptations of sustainable finance that could be incorporated into their saving or investment behavior (e.g., sustainable banking products and services; savings placed at ethical banks; investments in social impact bonds, green bonds, and sustainable stock market indices; crowdfunding). A direct consequence of increased social awareness and involvement in applying for sustainable or green financial products and relying on financial institutions that incorporate the principles of ethics and social responsibility will be represented by a shift in the business strategies of conventional financial institutions. The institutions will have to adapt the traditional offer of financial products and services in resonance with the ethical values requested by their customers. Thus, the adaptation will create prospects for generating not only economic added value, but also social and/or environmental added value. Additionally, if society becomes an active promoter of ethics and sustainability in the financial system, it will indirectly contribute to alleviating the needs of local communities and enhancing social and financial inclusion.

Interestingly, the dynamics recorded by public debates at the global level, by the European Commission's communications, policy papers, or regulations in the field of sustainability are mirrored by the temporal dimension of the published papers. As the time map for the keywords shows, there is a continuous evolution of research hotspots from microfinance in 2016, to CSR and sustainable finance in 2016, to ESG and climate change-related issues in 2019, and ongoing. Climate risk management and climate change impacts on economic development and economic fundamentals, public finances (such as government debt, budget deficit), and the financial system (banking system, capital market, insurance market, private pensions, investment funds) is key topic for the agendas of the current day policymakers and international authorities. In this respect, the recent EU Taxonomy of environmentally sustainable activities which entered into force in July 2020 can be mentioned to provide milestones for those economic activities that can be considered environmentally sustainable and help companies to become more climate-friendly. This guideline regulation would be further developed based on regular input and advice provided by an independent body of the European Commission called Platform on Sustainable Finance, whose members include various stakeholders such as the corporate and public sector, financial system, academia, and civil society. Therefore, the joint, pivotal role to be played by representative stakeholders, including researchers and academia, in generating new knowledge on sustainable finance issues, is officially recognized.

We expect emerging research in this area of sustainable finance aimed at substantiating both qualitatively and empirically the strength of climate change impact, countries' vulnerability to climate risks as well as their readiness to mitigate them. Additionally, future studies should design climate risk management frameworks to be used by decision makers as starting points for official policies and strategies. The frameworks may indicate whether a one-size-fits-all regulatory approach at European (international) level is suitable for addressing climate change challenges and risks, or if it is preferable to identify peer

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countries and design tailor-made regulations in order to enhance the catching-up process toward climate resilience/neutrality.

CONCLUSION

The chapter is aimed at identifying the various sustainable finance concepts in a comprehensive manner and reveals several co-existing dimensions, such as the following: i) CSR and the ESG practices; ii) the field of green finance that focuses on fulfilling ecological (environmental protection, climate change) goals; iii) the social finance field that aims at stimulating social inclusion, quality of life and employability (through social impact investment, social banking, social entrepreneurship, and crowdfunding); and iv) microfinance, with the stated goal of poverty alleviation and financial inclusion. Further, the density and time map of the keywords show the frequency of occurrence of these concepts in published papers, to enable understanding of which of them have been most studied by researchers and what the trends are.

Research findings published to date, irrespective of their statistical or conceptual nature may be seen as guidelines and triggers of best practice to be used as starting points for practitioners and decision makers in designing policies, frameworks, or management tools. In this regard it can be noticed that in order to facilitate connection of the financial system and corporate sector to the objectives of sustainable development, series of action plans, standards, and principles have been developed at the international level, to which financial institutions and businesses can voluntarily adhere, by implementing them in their current activity.

There has been continuous development of international voluntary frameworks that financial institutions and businesses may adhere to; the most representative (in chronological ordering) being: The United Nations Environment Program Finance Initiative (UNEP-FI) launched in 1991, the London Principles launched in 2002, the Equator Principles launched in 2003, the Principles of Sustainable Banking Activity and the Global Alliance for Banking on Values (both launched in 2009), the UNEP-FI Principles for Sustainable Insurance Initiative launched in June 2012, the RE100 initiative (renewable energy 100%) emerged in 2014, the Paris Climate Agreement and the United Nations 2030 Agenda for sustainable development (both launched in 2015), the Principles for Positive Impact Finance and the Network for Greening the Financial System (both launched in 2017), the Action plan on Sustainable Finance belonging to the EC launched in 2018, and the United Nations Principles for Responsible Banking launched in 2019.

The ongoing evolution and adaptation of complementary and voluntary sustainability frameworks mirrors the intensification of public debates related to the imperative need of the financial industry's robust and transparent commitment into the process for progress toward sustainable development. Against this background, new challenges arise in the context of the COVID-19 global pandemic. Some reports emphasize that the pandemic occurrence acts "as a wake-up call for sustainable finance" (Deutsche Bank, 2020), while the UN Global Compact (2021) perceives it as "an opportunity to refocus on sustainability and responsible investment." A World Bank study (Klein, 2020), argues that the global response to the COVID-19 outbreak should include the joint efforts of investors, businesses, and financial institutions in leading the way to a new, more sustainable and climate-friendly economic model. In a similar fashion, the UNEP report (2020) discusses the potential implications of the pandemic for sustainable finance markets and proposes a framework for strengthening the role of the financial system in supporting transition to a low-carbon economy.

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APPENDIX 1

Table 6. Standardized Keywords

| Original terms | Conceptually similar terms | Standardized terms |
|--|---|--|
| Corporate governance | Governance | Corporate governance |
| Corporate social responsibility, CSR, Corporate social responsibility (CSR) | | Corporate social responsibility |
| Environmental, Social, and Governance, Environment Social Governance (ESG), Environmental social governance, Environment, social, governance (ESG), Environmental Social and Governance, social and governance (ESG), Social and corporate governance (ESG), ESG | | Environmental, social, and governance |
| Environmental, Social, and Governance criteria, Social and governance (ESG) criteria, ESG criteria | Environmental, Social, and Governance performance, Social and governance (ESG) performance, ESG performance | Environmental, social, and governance criteria |
| Responsible investment, Responsible investments, Responsible investing | | Responsible investment* |
| Socially Responsible Investing, Socially Responsible Investment, Socially Responsible Investments, SRI | Social, and governance investments (SRI), Sustainable and responsible investment | Socially responsible investing* |
| Microfinance Institutions, MFI | | Microfinance institutions |
| Sustainable development goal, Sustainable Development Goals, Sustainable Development Goals (SDGs), SDG, SDGs | | Sustainable development goals |
| Carbon emissions, Carbon emission | | Carbon emissions |
| Green bond, Green bonds | | Green bonds |
| Social impact bond, Social impact bonds | | Social impact bonds |
| Renewable Energy, Renewable Energies | | Renewable Energy |
| Social enterprises, Social enterprise | | Social enterprise |
| Impact investing, Impact investment | | Impact investing |
| Social impact investments, Social impact investment, Social impact investing | | Social impact investment* |
| Microcredits, Microcredit | | Microcredit |
| Micro-finance, Microfinance | | Microfinance |
| Poverty alleviation | Poverty reduction | Poverty alleviation |
| Sustainable investments, Sustainable investment, Sustainable investing | | Sustainable investing* |

*investing and investment

Source: Author's elaboration