RESPONSIBLE INVESTMENT REGULATION

COMPREHENSIVE BIBLIOMETRIC ANALYSIS

Responsible investment regulation: comprehensive bibliometric analysis

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INTRODUCTION

Responsible investing, also known as sustainable investing, is gaining momentum as investors increasingly recognize the importance of involving environmental, social and governance (ESG) factors in decision-making processes and sustainable business operations. As a result, the need for effective regulation and policy instruments that promote responsible investment practices and ensure the long-term stability of financial markets increases.

Implementing the United Nations Sustainable Development Goal(s) as global vectors of human development requires accumulating a significant amount of investment resources on a responsible basis. Global climate cataclysms, the energy crisis, Covid-19, military-political instability and the large-scale invasion of Ukraine deepen significant investment gaps in achieving the Sustainable Development Goals and nullify the progress achieved.

It concerns not only the Goals that shape the contours of global food (Marinova et al., 2022, Plastun et al., 2021, Vo, 2020) or energy security (Naumenkova et al., 2022, Shevchenko et al., 2021, Makarenko et al., 2023) but also ecologically (Nassar et al., 2023, Štreimikienė et al., 2022, Vorontsova et al., 2022, Naomi & Akbar, 2021) and socially oriented Sustainable Development Goals (Tjahjanto et al., 2023, Makarenko et al., 2021, Situm et al., 2021).

National financial regulators and international institutions develop mechanisms and tools for accelerating sustainable finance (Streimikiene et al., 2023) and responsible investment in projects that will contribute to restoring progress in the Sustainable Development Goals. These entities recognize the urgent need to align financial systems with broader societal and environmental objectives.

In this context, Corporate Social Responsibility (CSR) serves as a crucial bridge between financial institutions, businesses, and the broader community (Zaburanna et al., 2020). CSR initiatives complement sustainable finance and responsible investment by emphasizing a company's commitment to ethical conduct, social well-being, and environmental stewardship, that are often seen as attractive investment opportunities for ESG-conscious investors (Cayón & Gutierrez, 2021, Myšková & Hájek, 2019). As companies engage in CSR activities, they go beyond financial considerations and actively contribute to the achievement of the Sustainable Development Goals (SDGs).

According to the PRI, the number of regulatory instruments in responsible investment has increased by 96% since 2000. The world's 50 largest economies have made more than 730 changes to regulatory documents related to investors considering ESG factors when making investments over the past decade. Finally, 221 new regulatory instruments were adopted in 2021, and now the list of such instruments includes 868 sources of various groups and areas at the global level.

Road maps and strategies for responsible investment, as the highest level of such investment promotion, are key normative sources for promoting the ideology of responsible investment. Policies and frameworks describe the main actions in the strategic–level documents. Specific rules and requirements for responsible investment market participants are stipulated in standards, codes, stewardships and taxonomies, laws, and national regulations (legislation). The specified requirements are usually mandatory or concluded by the regulators according to the "comply or explain" principle. Guidelines (guideline, guide, principle, recommendation or instruction) provide methodical and organizational support for responsible investment development. These guidelines are mostly

voluntary. Benchmarks (ratings, rankings, index) is a separate category in the regulatory landscape of responsible investment.

The monograph structure is built in such a way as to consider the fundamental approaches mentioned above to the structuring of the most widely distributed regulatory sources in responsible investing. Responsible investments are considered broadly, including responsible, sustainable (sustainability), impact, and ESG investments within this monograph.

Legal tools for regulating responsible investment were investigated using the extensive methodology of bibliometric meta-analysis. Academic papers in responsible investment, published over the past five years (2017-2022) in recognized peer-reviewed journals and indexed in the Scopus, Web of Science and Google Scholar databases, are the basis of writing the monograph.

A range of existing methodologies and software products were used to perform bibliometric analysis, such as in-built Scopus and Web of Science instruments SciVal by Elsevier, VosViewer, Publish or Perish software, Google Trends, Google Books Ngram Viewer and Infranodus like AI-based instrument.

The monograph was conducted as part of a research theme, "*Fractal model of Ukraine's stock market transformation: Socially responsible investing to achieve the Sustainable Development Goals"* (reg. n. 0121U100473), funded by the grant from the Ministry of Education and Science of Ukraine and prepared by a team of authors:

– PhD in Economics, Senior Lecturer *Anna Vorontsova* (Chapter 2);

– Doctor of Economics, Professor *Inna Makarenko* (Introduction, Chapter 1);

– Doctor of Economics, Professor *Alex Plastun* (Chapter 3).

THE LIST OF CONDITIONAL ABBREVIATIONS

SDG – Sustainable Development Goals;
WoS – Web of Science;
PoP – Publish or Perish.

CHAPTER 1 ROAD MAP AND POLICY FOR RESPONSIBLE INVESTMENT REGULATION: RESEARCH GAP

1.1 Road map and policy for responsible investment regulation in Academia: Scopus and SciVal tools

The growing interest of governments and politicians in sustainable financing and responsible investment has been a significant trend in recent years. It indicates the global recognition of the importance of environmental, social and governance factors (ESG) in investment decision-making. In particular, the most significant regulatory changes have been observed in ESG and sustainable financing in recent years, according to the KPMG Regulatory Barometer (2023).

It led to the formation of national and regional regulatory norms regarding responsible investment regulation, resulting in a fragmented regulatory landscape. It is due to differences in socioeconomic status, political priorities, legal systems, cultural context, etc. (Daugaard & Ding, 2022, Singhania & Saini, 2022).

According to the PRI (UNPRI, n.d.), the world's 50 largest economies have made more than 730 changes of varying degrees to regulatory documents related to investors' consideration of ESG factors and the consideration of risks associated with sustainable development over the past decade. Following this, road maps, regulatory frameworks and policies for responsible investment regulation are being formed and agreed upon.

Conducting a qualitative bibliometric analysis is a critical initial stage of the research, which will allow us to form basic ideas about the trends, problems and prospects of responsible investment regulation based on a detailed study of the existing

scientific work using individual bibliometric metrics. We will form appropriate search queries corresponding to the basic syntax rules in scientometric databases, particularly in Scopus and SciVal (Table 1.1). The research period is 2017-2022.

Table 1.1. Search queries formation for bibliometric research in Scopus and SciVal

Group name	Detailed search query
Road maps for responsible investment	(“road map” OR roadmap OR strategy) AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment
Policies for responsible investment	(policy OR framework) AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment

Source: elaborated by authors.

This subsection proposes focusing specifically on roadmaps and policies as two dimensions that serve different purposes in the context of responsible investment regulation. Roadmaps define the direction and sequence of actions needed to develop and implement policies, regulatory frameworks and market interventions promoting responsible investment practices. The policy describes specific steps, guidelines and standards that financial institutions, investors and other stakeholders should follow in responsible investing.

The research based on static analysis (Table 1.2) indicates a high level of significance and development of road maps and policies for responsible investment regulation. In particular, the citation level is high (the FWCI is more than one, and therefore the citation level is higher than the average global indicator for similar publications), international collaboration is also developed, and there are many topics and thematic clusters on this issue.

Table 1.2. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: static analysis

Research area	Field-Weighted Citation Impact	Field-Weighted International Collaboration	Topics	Topics cluster
Road maps for responsible investment	1.34	4386	3359	804
Policies for responsible investment	1.53	8315	4527	750

Source: elaborated by authors (SciVal tools).

A positive trend towards the scientific growth of publications on using road maps and policies for responsible investment regulation in the Scopus database and the wide dissemination of findings can be traced based on the dynamic analysis. Detailed results are given in Table 1.3. The total number of papers on the analyzed issues was more than 30,000, and the number of citations was more than 360,000.

Table 1.3. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: dynamic analysis

	Overal	2017	2018	2019	2020	2021	2022
Road maps for responsible investment							
Output	9858	1119	1270	1441	1752	1974	2302
Citations	113584	683	3198	7891	14630	24707	37986
Policies for responsible investment							
Output	20541	2342	2622	3030	3653	4050	4844
Citations	248916	1514	6823	15449	29347	52482	85388

Source: elaborated by authors (Scopus and SciVal tools).

The distribution of scientific publications on road map and policy for responsible investment regulation by subject area is given in Table 1.4 within the framework of structural analysis. Most scientific research is concentrated in Social,

Environmental and Economic Sciences, and Engineering and Energy Sciences; they are among the top five. Findings are natural because all the given subject areas include separate investigations related to sustainable development.

Table 1.4. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: structural analysis by subject area

№	Road maps for responsible investment		Policies for responsible investment	
	Area	%	Area	%
1	Social Sciences	26.4	Social Sciences	33.4
2	Environmental Science	25.6	Environmental Science	29.9
3	Business, Management and Accounting	22.2	Economics, Econometrics and Finance	23.9
4	Engineering	21.7	Energy	18.7
5	Energy	17.2	Engineering	17.8

Source: elaborated by authors (Scopus and SciVal tools).

Most publications related to the road map and policy for responsible investment regulation belong to the USA, China, the United Kingdom, and Australia. Among the EU countries, the leading positions are occupied by Italy and Germany (details and a broader list of countries are given in Table 1.5). Scientists from the world's leading institutions of higher education, such as the Chinese Academy of Sciences (China), the University of Oxford (United Kingdom), Harvard University (USA), University College London (Harvard University), etc., are quite active in this field. Among public organizations, the French public organization Center national de la recherche scientifique (The French National Centre for Scientific Research) (CNRS)) and the World Health Organization are active in publishing activities regarding responsible investment regulation.

Table 1.5. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: top countries and institutions

№	Road maps for responsible investment		Policies for responsible investment	
	Country	Institution	Country	Institution
1	USA	Chinese Academy of Sciences	China	Chinese Academy of Sciences
2	China	CNRS	USA	University of Oxford
3	UK	University of Oxford	UK	University College London
4	Australia	Harvard University	Australia	Harvard University
5	Italy	World Health Organization	India	CNRS
6	India	University of Melbourne	Italy	Tsinghua University
7	Canada	Wageningen University & Research	Germany	Johns Hopkins University
8	Germany	University College London	Canada	University of Sydney

Source: elaborated by authors (Scopus and SciVal tools).

Additionally, it is advisable to consider the map where the 100 most active institutions engaged in responsible investment regulation research through the prism of road maps and policies are marked (Figure 1.1). Europe, the USA, China and Australia are active enough in this scientific discourse. Despite the high urgency and relevance of responsible investment and its implementation in countries' normative and regulatory landscape, the low activity of certain regions, particularly in Africa, South America and most of Asia is noted.

Figure 1.1. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: top 100 institutions

Source: elaborated by authors (SciVal tools).

Sustainability, Journal of Cleaner Production Environmental Science and Pollution Research, etc. (see Table 1.6) are among the most popular journals in the Scopus database, in which research was published during the analyzed period on the use of road maps and policies for responsible investment regulation. The topics of these journals are closely related to sustainable development, cleaner production and consumption, environmental and energy issues, etc.

We will list the most productive authors on this topic in Appendix A, Table A.1. According to the number of publications among them, Dinçer, H., Yüksel, S. (Istanbul Medipol University), Sarkar, B. (Yonsei University), Lin, B. (Xiamen University), Bekun, F. V. (Lebanese American University), Murshed, M. (North South University) etc. should be singled out.

Table 1.6. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: top Scopus journals

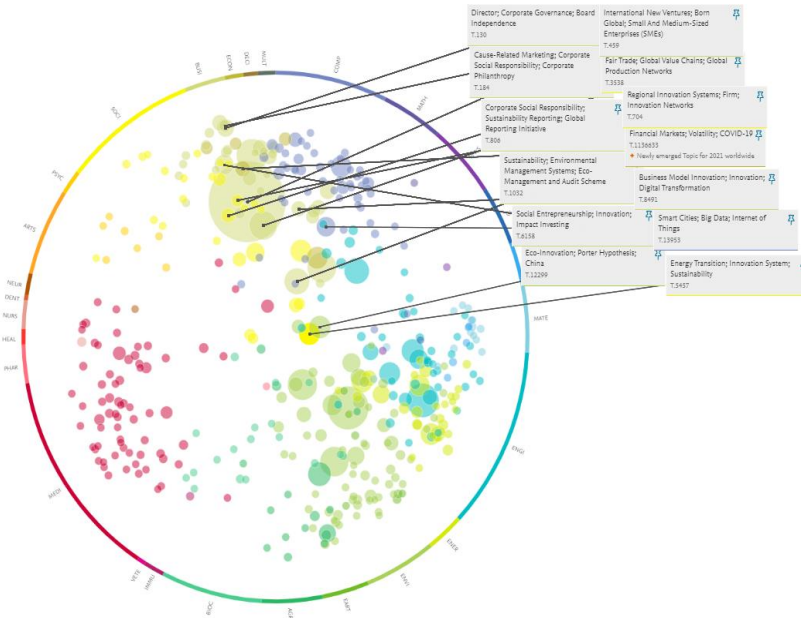
№	Road maps for responsible investment		Policies for responsible investment	
	Journal	Output	Journal	Output
1	Sustainability	617	Sustainability	1187
2	Journal of Cleaner Production	245	Environmental Science and Pollution Research	483
3	Energies	140	Journal of Cleaner Production	477
4	Environmental Science and Pollution Research	109	Energies	295
5	IOP Conference Series: Earth and Environmental Science	108	Energy Policy	279

Source: elaborated by authors (Scopus and SciVal tools).

The thematic topics mentioned above reflect the main research areas of scientists; we will display the top 1% of them by prominence with the socio-economic vector of research in Figure 1.2.

It can be stated that the identified research topics are aimed at corporate social responsibility and its implementation in the activities of companies, the norms of its regulation at the state level, the issue of innovativeness of business models, the performance of digitalization and technology achievements, at financial markets and their volatility, the impact of Covid-19, as well as other issues of sustainable development.

To prove it, we present the results of keyphrase analysis, which were formed based on 50 phrases from titles, abstracts and author keywords of the documents regarding road maps and policies for responsible investment regulation. Details are in Figure 2.3.



Note COMP Computer Science; MATH Mathematics; PHYS Physics and Astronomy; CHEM Chemistry; CENG Chemical Engineering; MATE Materials Science; ENGI Engineering; ENER Energy; ENVI Environmental Science; EART Earth and Planetary Sciences; AGRI Agricultural and Biological Sciences; BIOC Biochemistry, Genetics and Molecular Biology; IMMU Immunology and Microbiology; VETE Veterinary; MEDI Medicine; PHAR Pharmacology, Toxicology and Pharmaceutics; HEAL Health Professions; NURS Nursing; DENT Dentistry; NEUR Neuroscience; ARTS Arts and Humanities; PSYC Psychology; SOCI Social Sciences; BUSI; Business, Management and Accounting ECON Economics, Econometrics and Finance; DECI Decision Sciences; MULT Multidisciplinary.

Figure 1.2. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: top 1% topics by prominence

Source: elaborated by authors (SciVal tools).

Clouds obtained from the analysis contain keywords such as investments and FDI, investment strategies, corporate social responsibility, sustainable development, sustainability and SDG, economic growth, innovation, carbon emission policy, etc.

Figure 1.3. Road map and policy for responsible investment regulation in SciVal: keyphrase analysis

Source: elaborated by authors (SciVal tools).

The issues related to Covid-19 and its impact on the financial and social sectors, the cryptocurrency industry formation, the development of artificial intelligence and robotics, the transition to distance learning, etc., are the most relevant topics in formed clusters that arose and began to develop after 2021 (see Figure 1.4).

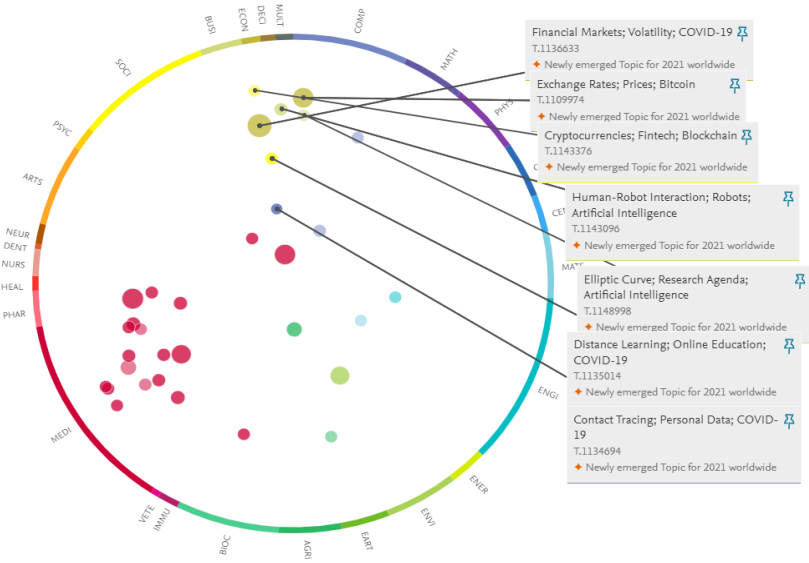


Figure 1.4. Newly emerged topics for road map and policy for responsible investment regulation in 2021

Source: elaborated by authors (SciVal tools).

Topic clusters for a road map and policy for responsible investment regulation by prominence percentile, formed from numerous studies with similar scientific interests, are listed in Table 1.7. As a result, it was revealed that at the time of the analysis, the following were the most significant Electricity, Energy, Economics, Corporate Social Responsibility and Monetary Policy, Economic Growth, Exports.

We will list the most significant papers on using road maps and policies for responsible investment regulation. We will present them in Table A.2, Appendix A, based on the above quantitative and qualitative analysis of scientific publications in Scopus and SciVal databases.

Table 1.7. Road map and policy for responsible investment regulation in SciVal over the period 2017-2022: the most relevant topic clusters and their prominence percentile (%)

Road maps for responsible investment		Policies for responsible investment	
Cluster	%	Cluster	%
Electricity; Energy; Economics	99.67	Electricity; Energy; Economics	99.67
Corporate Social Responsibility; Corporate Governance; Firms	98.26	Monetary Policy; Economic Growth; Exports	95.92
Industry; Innovation; Entrepreneurship	99.19	Corporate Social Responsibility; Corporate Governance; Firms	98.26
Models; Risks; Finance	95.99	Industry; Innovation; Entrepreneurship	99.19
Electric Power Transmission Networks; Wind Power; Electric Power Distribution	99.47	Models; Risks; Finance	95.99

Source: elaborated by authors (SciVal tools).

Most analyzed scientific studies have a micro-level view of strategies and policies at the level of individual firms and economic entities. Thus, Diener & Habisch (2022) examine the impact of socially responsible investment on investors, including their subsequent investment policies and strategies.

Research by Folqué, Escrig-Olmedo & Corzo Santamaría (2021) focuses on integrating ESG risks of Sustainable Investment funds into sustainable investment strategies or their combinations. It also explores the role of the financial system in promoting sustainable development and addresses the challenges and opportunities associated with incorporating ESG factors into investment decision-making.

Ielasi, Ceccherini & Zito discuss integrating ESG analysis into smart beta strategies and how it can enhance risk-adjusted

returns and align investment strategies with sustainable and responsible investment objectives.

Research by Uden & Kumaresan (2021) aims to study the features of Smart City development, which currently needs to be revised outside the concept of sustainable development. In this regard, they offer an approach to developing a sustainable framework as a smart city business model considering ESG factors.

The following studies have a more macroeconomic perspective on using road maps and policies for responsible investment regulation. In particular, Widyawati (2020) conducts a systematic literature review of socially responsible investment (SRI) and ESG metrics, proving the need for more reliability and convergence in the market.

Shaikh (2022) explores the connection between policy uncertainty and sustainable investing (through the prism of ESG-based sustainability indices) and how it impacts the decision-making of investors and firms. Overall, the article highlights the importance of reducing policy uncertainty to promote sustainable investing and suggests that investors and firms may be more likely to adopt sustainable investing strategies in a more stable political environment.

A group of authors led by Plastun (2022) examine the role of public investment policy and responsible investment in financing sustainable development. The authors provide policy implications and recommendations for governments, policymakers, and investors to improve public investment strategies, enhance responsible investment practices, and create enabling environments for financing sustainable development.

The article by Chen et al. (2022) discusses the environmental regulatory framework in China and its implications for the ESG performance of SMEs. It also

emphasizes the prospects of screening strategies in engaging SMEs in sustainability transition.

1.2 Road map and policy for responsible investment regulation in Academia: in-built WoS tools

Research on responsible investment regulation through the prism of road maps and policies is widely presented in the WoS database, the world's second most widespread bibliographic database (Zhu et al., 2020). The number of scientific publications on two topics exceeds 30,000, with more than 500,000 citations. It should be considered that many papers can be duplicated with the Scopus database because journals may have dual affiliations. However, this duplication is not critical to research in-built WoS tools for conducting bibliometric analysis.

A dynamic analysis of scientific papers on using road maps and policies for responsible investment regulation from 2017 to 2022 is given in Table 1.8. Its results indicate the growing positive dynamics of publications and significant dissemination of scientific developments as an increase in the number of citations of these papers.

Table 1.8. Road map and policy for responsible investment regulation in WoS over the period 2017-2022: dynamic analysis

	Overall	2017	2018	2019	2020	2021	2022
Road maps for responsible investment							
Output	10590	1128	1208	1544	1752	2063	2090
Citations	120429	712	3297	8629	16703	29746	41353
Policies for responsible investment							
Output	22566	873	1064	1405	1707	2040	2506
Citations	384632	628	3296	8118	17381	34150	54285

Source: elaborated by authors (WoS tools).

Most scientific papers belong to Business Economics and Environmental Sciences, Engineering, Technological and Energy Sciences; they are among the top 5 subject areas. A more detailed structural analysis of publications by subject area is given in Table 1.9.

Table 1.9. Road map and policy for responsible investment regulation in WoS over the period 2017-2022: structural analysis by subject area

№	Road maps for responsible investment		Policies for responsible investment	
	Area	%	Area	%
1	Business Economics	34.5	Business Economics	38.8
2	Environmental Sciences Ecology	20.3	Environmental Sciences Ecology	24.8
3	Engineering	14.8	Science Technology Topics	12.1
4	Science Technology Topics	11.5	Engineering	10.7
5	Energy Fuels	7.1	Energy Fuels	9.1

Source: elaborated by authors (WoS tools).

The research subject area can also be determined using WoS categories; we will analyze their specifics in Table 1.10. According to these results, research is mainly concentrated in Environmental, Economic, Management and Energy Sciences.

Table 1.10. Road map and policy for responsible investment regulation in WoS over the period 2017-2022: structural analysis by WoS categories

№	Road maps for responsible investment		Policies for responsible investment	
	Area	%	Area	%
1	Environmental Sciences	14.2	Economics	24.1
2	Management	13.4	Environmental Sciences	17.3
3	Economics	13.2	Environmental Studies	14.1
4	Business	11.4	Green Sustainable Science Technology	10.3
5	Environmental Studies	10.2	Energy Fuels	9.1

Source: elaborated by authors (WoS tools).

The vast majority of research presented in the WoS database is concentrated in the USA, China and England (Table 1.11) and is affiliated with the N8 Research Partnership as a powerful collaboration of universities in Northern England, the University of London and the University of California System. Scientists from Australia, Italy, and Canada also conduct active scientific and research work. It should be noted that among the most active institutions, in addition to institutions of higher education (for example, State University System of Florida, Chinese Academy of Sciences, Harvard University), there is also the international organization Consortium of International Agricultural Research Centers (CGIAR), which specializes mainly in food security and related topics.

Table 1.11. Road map and policy for responsible investment regulation in WoS over the period 2017-2022: top countries and institutions

№	Road maps for responsible investment		Policies for responsible investment	
	Country	Institution	Country	Institution
1	USA	N8 Research Partnership	USA	University of London
2	China	University of London	China	N8 Research Partnership
3	England	University of California System	England	University of California System
4	Australia	CGIAR	Australia	CGIAR
5	Italy	State University System of Florida	Italy	Chinese Academy of Sciences
6	Canada	Chinese Academy of Sciences	Germany	White Rose University Consortium
7	Germany	Harvard University	Canada	Harvard University
8	Spain	Udice French Research Universities	India	University of Oxford

Source: elaborated by authors (WoS tools).

These scientific developments are primarily published in journals related to sustainable development, sustainable consumption or clean production, and environmental and energy issues (for example, Sustainability, Journal of Cleaner Production, Energies and Energy Policy, etc.). Details are given in Table 1.12.

Table 1.12. Road map and policy for responsible investment regulation over the period 2017-2022: top WoS journals

№	Road maps for responsible investment		Policies for responsible investment	
	Journal	Output	Journal	Output
1	Sustainability	710	Sustainability	1,452
2	Journal of Cleaner Production	343	Journal of Cleaner Production	703
3	Energies	159	Energy Policy	669
4	Energy Policy	135	Environmental Science and Pollution Research	635
5	Environmental Science and Pollution Research	129	Energies	359

Source: elaborated by authors (WoS tools).

Most research is concentrated in major international academic publishers such as Elsevier, Springer Nature, Wiley and Taylor & Francis (Table 1.13).

Table 1.13. Road map and policy for responsible investment regulation in WoS over the period 2017-2022: top publishers

№	Road maps for responsible investment		Policies for responsible investment	
	Publisher	%	Publisher	%
1	Elsevier	24.2	Elsevier	27.5
2	Springer Nature	10.3	Springer Nature	10.7
3	Wiley	7.7	Taylor & Francis	7.8

Source: elaborated by authors (WoS tools).

The above analysis singles out the most relevant papers on using road maps and policies for responsible investment regulation in WoS, which we list in Table 1.14. Since individual papers overlap with the Scopus database, we will select papers not previously mentioned.

Table 1.14. Road map and policy for responsible investment regulation in WoS: the most relevant papers

№	Authors (Year)	Bibliometric	Cite
1	Hauff, C. J., & Nilsson, J. (2022)	Is ESG mutual fund quality in the eye of the beholder? An experimental study of investor responses to ESG fund strategies. Business Strategy and the Environment, Advance online publication.	6
2	Aldowaish, A., Kokuryo, J., Almazyad, O., & Goi, H. C. (2022)	Environmental, Social, and Governance Integration into the Business Model: Literature Review and Research Agenda. Sustainability, 14(5), 2959.	15
3	Beisenbina, M., Fabregat-Aibar, L., Barberà-Mariné, M.-G., Sorrosal-Forradellas, M.-T. (2023)	The burgeoning field of sustainable investment: Past, present and future. Sustainable Development, 31(2), 649-667.	116
4	Gangi, F., Daniele, L. M., Varrone, N., Vicentini, F., & Coscia, M. (2021)	Equity mutual funds' interest in the environmental, social and governance policies of target firms: Does gender diversity in management teams matter? Corporate Social Responsibility and Environmental Management, 28(3), 1018-1031.	6
5	Daugaard, D., & Ding, A. (2022)	Global Drivers for ESG Performance: The Body of Knowledge. Sustainability, 14(4), 2322.	11
6	Bengo, I., Boni, L., & Sancino, A. (2022)	EU financial regulations and social impact measurement practices: A comprehensive framework on finance for sustainable development. Corporate Social Responsibility and Environmental Management, Advance online publication.	6

Source: elaborated by authors (WoS tools).

Selected papers are more focused on studying tomorrow's strategies of firms regarding implementing responsible investment. In particular, Hauff & Nilsson (2022) investigate the impact of different ESG strategies on retail investors' perception of mutual fund quality.

The study of Aldowaish et al. (2022) focuses on integrating ESG factors into firms' internal operations from the sustainable development perspective. Based on their analysis, the authors found that firms often adopt ESG integration as a response to pressure from financial markets rather than as a genuine effort to incorporate sustainability into their core operations.

Beisenbina et al. (2023) provide an extensive and up-to-date overview of research on sustainable investment and discuss the evolution of different strategies within socially responsible investment over time. These strategies can be considered approaches or frameworks guiding investment decisions with a sustainability focus.

The main focus of the Gangi et al. (2021) research is to examine the interest of equity mutual funds in the ESG policies of target firms and investigate whether gender diversity within the management teams of these firms plays a role in this interest. The authors conducted a study to analyze the relationship between equity mutual funds' investment decisions, the ESG policies of target firms, and the gender diversity within those firms' management teams.

The work of Daugaard & Ding (2022) is much broader; it addresses the disparities in ESG performance across different regions of the world and highlights the fragmented nature of the literature on the drivers of ESG performance. Stakeholder theory is highlighted to identify which ESG outcomes can be delivered by businesses and which require involvement from other actors such as government and non-profit organizations.

The study acknowledges a predominant focus on corporate management and strategy within the literature.

The study of Bengo, Boni & Sancino (2022) has a vector on the regulatory field of Europe, which is considered the most predictive in ESG principles implementation. The article contributes to understanding the SFDR's (Sustainable Finance Disclosure Regulation as one of the responsible investment standards) implications for financial actors. It proposes a framework that helps guide them in adopting sustainable practices. By integrating social impact measurement practices, financial institutions can work towards a more sustainable finance model that aligns with sustainable development goals and creates blended value for stakeholders.

1.3 Road map and policy for responsible investment regulation in Academia: with Biblioshiny

The Biblioshiny tool (Aria & Cuccurullo, 2017) is a sufficiently thorough tool for conducting comprehensive scientific mapping analysis. We will use modified data arrays from Scopus to carry out such an analysis, which allows us to reduce the large volume of publications to the optimal number of 2000 (Figure 1.5).

Descriptive information on metadata for each block is presented in Table 1.15. It shows individual quantitative indicators (number of sources, documents, references, authors), their dynamics and structure (annual growth rate, document average age, average citations per document), content (author's keywords), etc.

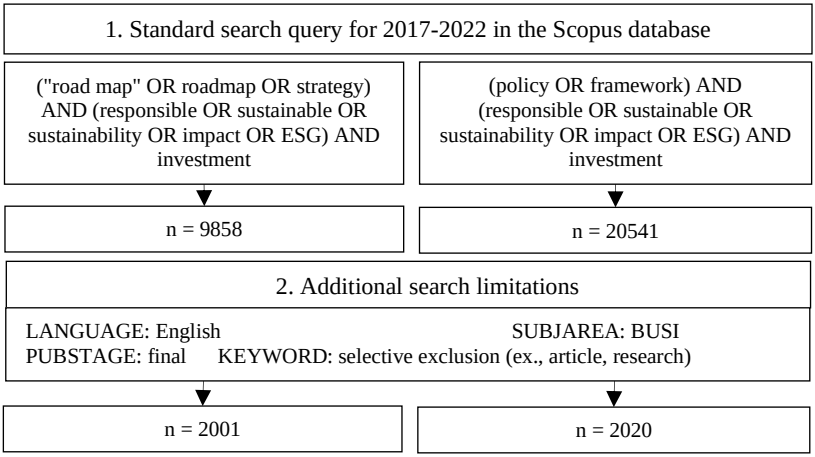


Figure 1.5. Formation of a data array for bibliometric analysis with Biblioshiny

Source: elaborated by authors.

Table 1.15. Road map and policy for responsible investment regulation in Academia over the period 2017-2022: descriptive information

Form	Road maps for responsible investment	Policies for responsible investment
Timespan	2017-2022	
Sources	850	779
Documents	2000	2000
References	109027	110482
Annual Growth Rate	8.1%	7.6%
Document Average Age	3.2	3.3
Average citations per document	12.3	6.7
Authors	5033	4559
Authors of single-authored documents	321	506
International Co-Authorship	28.1 %	23.9%
Co-Authors per Doc	2.9	2.5
Author’s keywords	6183	5189

Source: elaborated by authors (Biblioshiny tools).

The descriptive statistics presented above indicate the similarity of two analyzed vectors of regulatory influence on responsible investment. They also indicate the relevance of this topic and its growth, the dissemination of findings and established collaboration between scientists.

In the first step, we will analyze the ***Conceptual Structure*** of the aggregated data, which characterizes the main topics and trends (Aria & Cuccurullo, 2017), which are discussed in scientific circles in the framework of using road maps and policies for responsible investment regulation.

First, we will analyze the keywords used in scientific publications. The resulting word cloud in Figure 1.6 shows that the scientific contribution of researchers is based on keywords such as investment(s), foreign direct investments, sustainable development, economic and social effects and impact, decision-making, etc.

a) Road maps for responsible investment regulation

b) Policies for responsible investment regulation

Figure 1.6. Road map and policy for responsible investment regulation in Academia: word cloud of keywords

Source: elaborated by authors (Biblioshiny tools).

A reasonably clear distribution of keywords into clusters can be seen using keywords co-occurrence (Figure 1.7), which is presented in the data array for policies for responsible investment regulation. The blue cluster is represented by publications related to sustainability investment, making decisions about responsible investing based on economic, environmental and social effects analysis, etc. The green cluster includes publications focused on policy-making in different regions of the world, studying the implementation of responsible investment principles in financial systems and possible spillover effects. The red cluster provides research on the role of responsible investment in economic policy, particularly in the stock market.

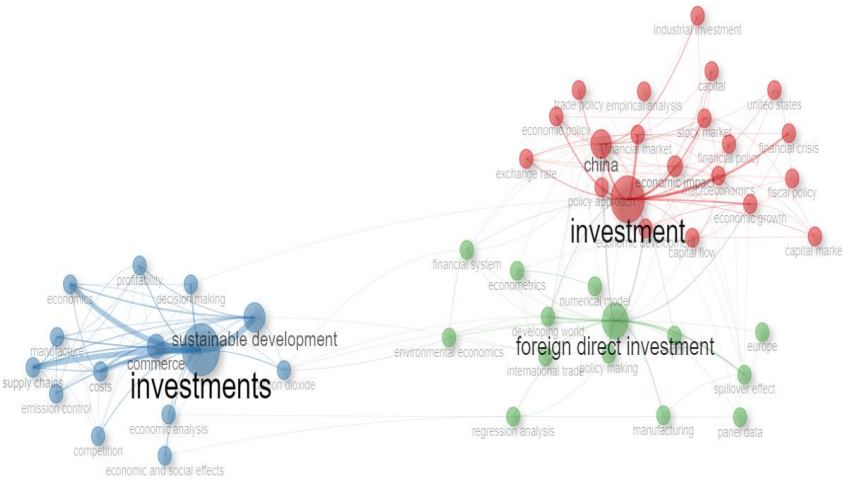


Figure 1.7. Policy for responsible investment regulation: co-occurrence network

Source: elaborated by authors (Biblioshiny tools).

Biblioshiny also provides an opportunity to analyze the main subject areas of using road maps and policies for responsible investment regulation (Figure 1.8), which have different meanings depending on the level of development and significance. In particular, corporate social responsibility and sustainable development are classified as niche and basic topics, respectively, and the issue of supply chains and emission control is included in motor themes. Innovation in environmental economics and industrial performance are Emerging or Declining themes.

The evolution of thematic clusters over the analyzed period is shown in Figure 1.9. The graph is built based on the Sankey diagram principles, allowing us to see the flow of terms for the years 2017-2022.

At the beginning of 2017, investments were one of the keywords most often found in scientific publications in the

context of the firm's strategic approaches to financial data processing, planning, at the stages of life cycle formation, mergers and acquisitions, etc. After that, the focus shifted to risk assessment and control systems, innovation issues in sustainable development, etc. The last formed cluster contains generalized keywords related to sustainability, investments, supply chains, finance, etc.

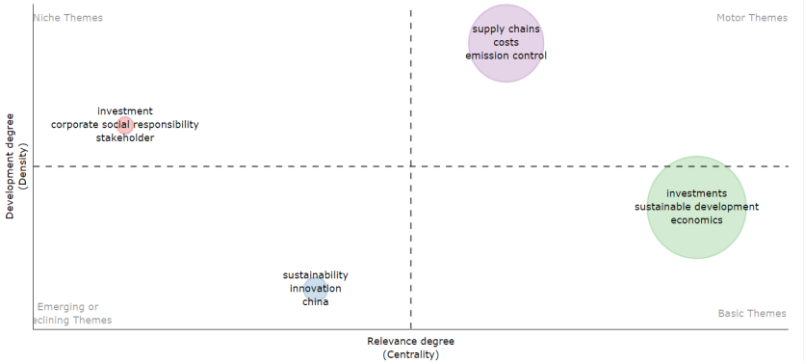


Figure 1.8. Road map and policy for responsible investment regulation in Academia: thematic map

Source: elaborated by authors (Biblioshiny tools).

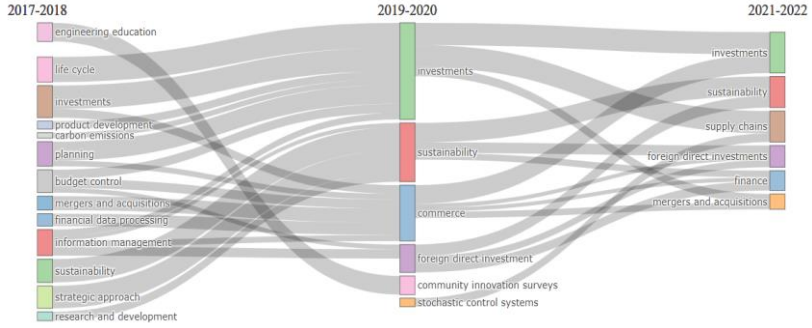
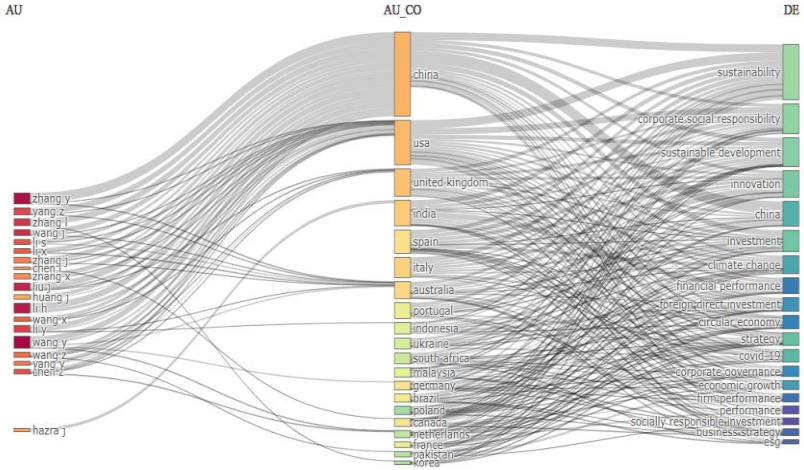


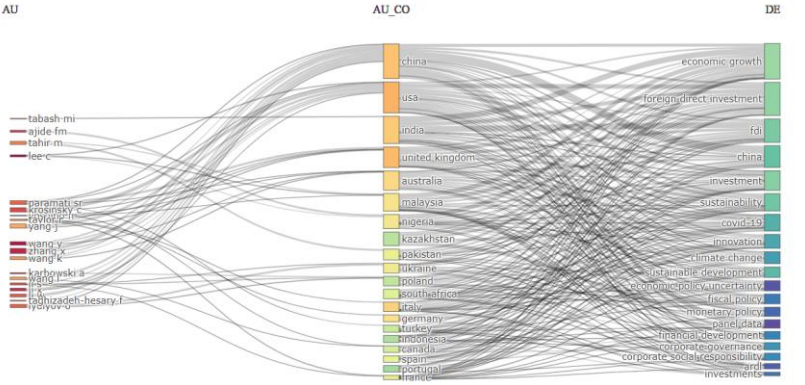
Figure 1.9. Road map and policy for responsible investment regulation: thematic evolution

Source: elaborated by authors (Biblioshiny tools).

Biblioshiny also makes it possible to establish the connection between scientists, countries and the subject of their research (through the prism of keywords from their study) using a three-field plot (Figure 1.10).



a) Road map for responsible investment regulation



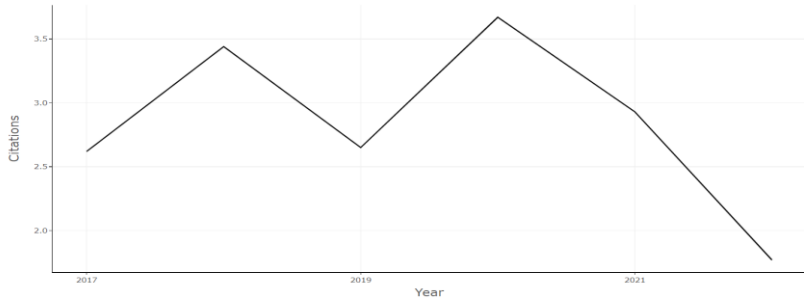
b) Policy for responsible investment regulation

Figure 1.10. Road map and policy for responsible investment regulation in Academia: three-fields plot among authors(AU), countries (AU_CO) and keywords (DE)

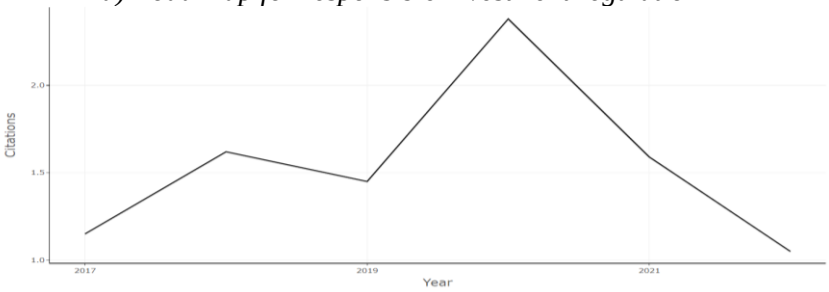
Source: elaborated by authors (Biblioshiny tools).

Most top scientists come from China, the USA, the United Kingdom and Australia, whose research is closely related to ESG investments and sustainable development, corporate social responsibility and management, climate change, investment strategies, policy uncertainty and economic growth, etc.

We will focus on ***Intellectual Structure*** in the second step, which shows the influence of research appearing in the form of citations. The average rate of citations per year has a downward tendency for both the road map and policy for responsible investment regulation (Figure 1.11); the highest rate was recorded as of 2018.



a) Road map for responsible investment regulation



b) Policy for responsible investment regulation

Figure 1.11. Road map and policy for responsible investment regulation: average citations per year

Source: elaborated by authors (Biblioshiny tools).

Co-citation network shows the existence of two clusters in which scientists from different countries of the world work (Figure 1.12). It indicates a high level of closeness of conducted research within the scope of responsible investment regulation.

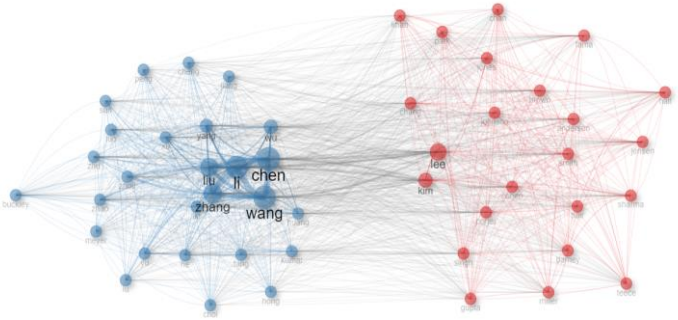


Figure 1.12. Road map and policy for responsible investment regulation: co-citation network
Source: elaborated by authors (Biblioshiny tools).

The authors' productivity is additionally determined using Lotka's Law; we give an example of road maps for responsible investment regulation in Figure 1.13. It shows that most authors (91.5%) have only one publication on this topic, and approximately 6% have two publications.

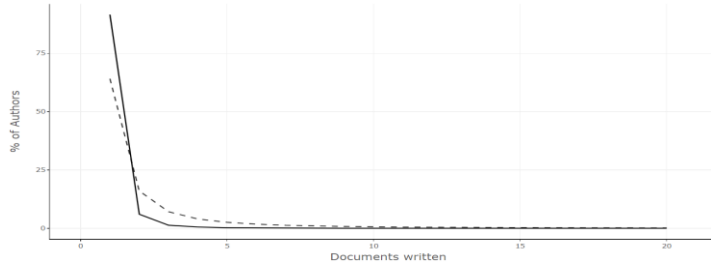


Figure 1.13. Road map for responsible investment regulation: author productivity through Lotka's Law
Source: elaborated by authors (Biblioshiny tools).

We will focus on ***Social structure*** in the last step, which shows the areas of interaction between authors, institutions or countries. Forms of collaboration between individual authors are shown in Figure 1.14. They indicate the diversity of scientific clusters that have prospects for cooperation deepening in the form of scientific schools or research groups. We see such authors as Wang Y., Zhang Y., Liu H., Liu J., etc. among the leaders of these clusters.

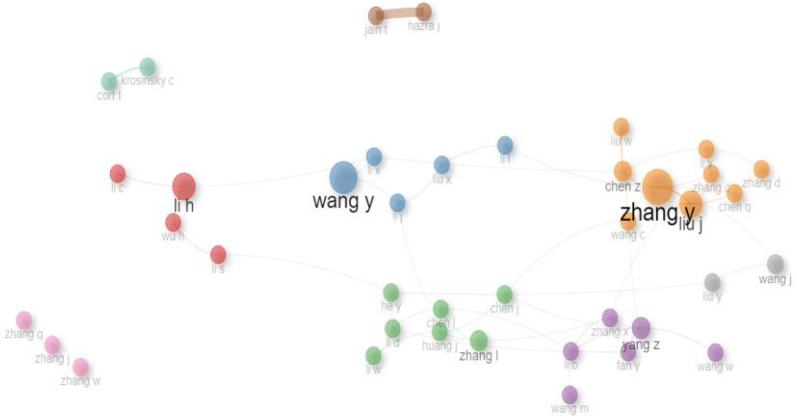


Figure 1.14. Road map and policy for responsible investment regulation: authors collaboration network

Source: elaborated by authors (Biblioshiny tools).

Six clusters show different forms of collaboration at the institutional level (Figure 1.15). In particular, close cooperation between Asian institutions is indicated, for example, within the red cluster Shanghai University of Finance and Economics, Hong Kong Polytechnic University, and Nanjing University of Finance and Economics. International collaboration between the University of Oxford, Iowa State University, Tsinghua University and the University of Pretoria is noted at the level of the purple cluster.

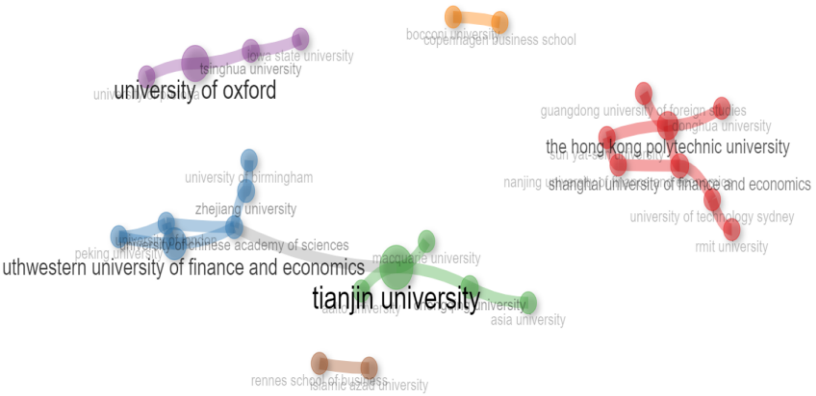


Figure 1.15. Road map and policy for responsible investment regulation: institutions collaboration network
Source: elaborated by authors (Biblioshiny tools).

We will additionally analyze the areas of collaboration at the level of the world's countries (Figure 1.16). The color intensity on the map indicates the contribution to the country's scientific output; the line thickness is the force of interaction.

The lines on the map indicate numerous international forms of collaboration at the level of countries worldwide, confirming the previous conclusions. The most connections were found for China, USA, UK, Australia, Canada, etc. Numerous connections are noted among the countries of Europe and South America

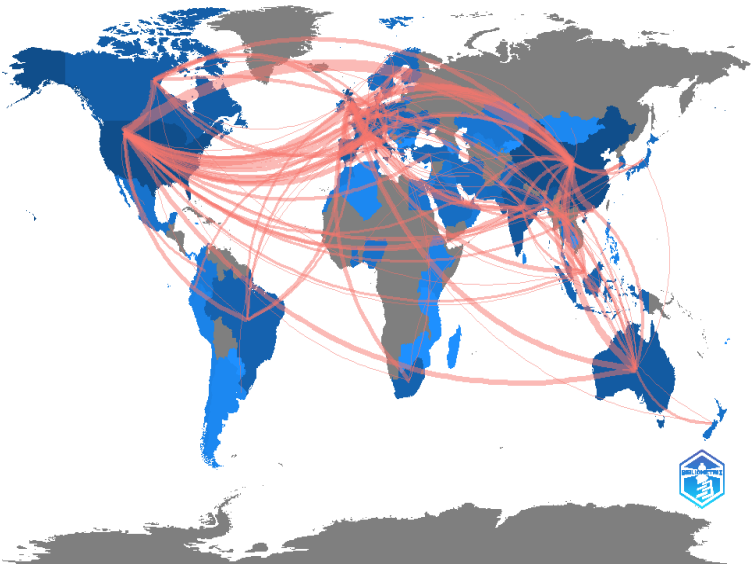


Figure 1.16. Road map and policy for responsible investment regulation: countries collaboration network
Source: elaborated by authors (Biblioshiny tools).

1.4 Road map and policy for responsible investment regulation in Academia: VosViewer keywords co-occurrence and co-authorship analysis

Another essential tool for bibliometric analysis is VosViewer software, which allows us to build clusters or bibliometric maps for in-depth keyword co-occurrence and co-authorship analysis. Using the data obtained from the WoS database, we will form the most optimal data array for analysis. We will show the main stages of array formation in Figure 1.17.

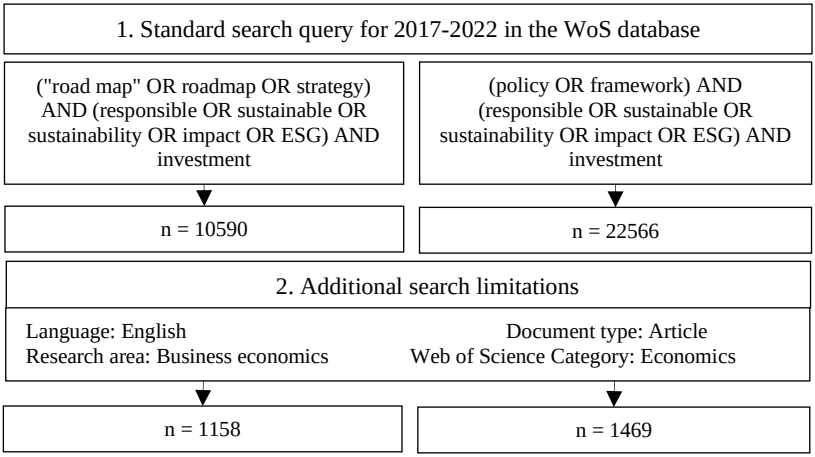
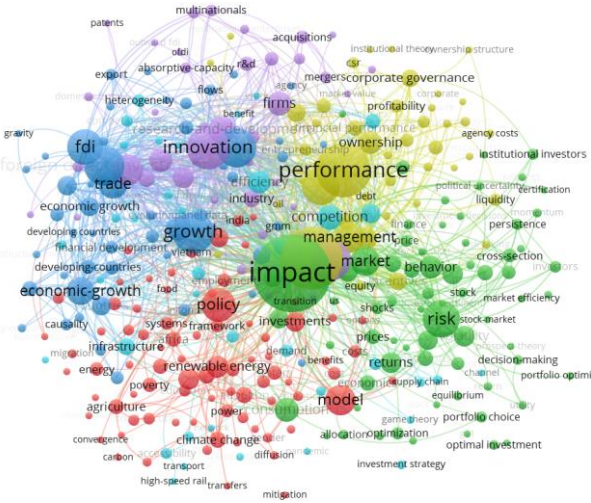


Figure 1.17. Forming a data array for bibliometric analysis with VosViewer

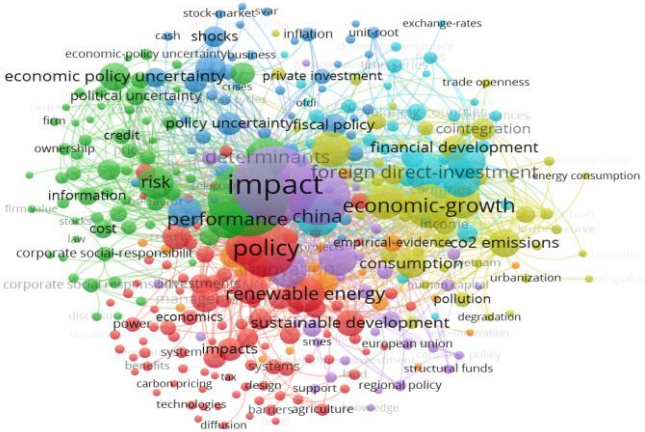
Source: elaborated by authors.

As a result, the following bibliometric maps for keywords co-occurrence in road maps and policies for responsible investment regulation were obtained (Figure 1.18).

A detailed analysis of the resulting clusters is given in Table 1.16. The high similarity of the obtained clusters and their topics should be noted. In particular, it is possible to distinguish a cluster of scientific studies devoted to the focus of policy or a road map for responsible investment regulation, which is related to the main Sustainable Development Goals, and more economic clusters, which are related to regulatory instruments and decision-making both at the level of the state and the firm. A cluster related to innovations and progressive technologies was also singled out.



a) Road maps for responsible investment regulation
6 clusters 330 items 7958 links



b) Policies for responsible investment regulation
7 clusters 354 items 9872 links

Figure 2.18. Road map and policy for responsible investment regulation: bibliometric map by keywords co-occurrence

Source: elaborated by authors (VosViewer tools).

Table 1.16. Road map and policy for responsible investment regulation: clusters analyses by keywords co-occurrence

Parameters	Road maps for responsible investment	Policies for responsible investment
Cluster 1 Red	Policy and framework focus, renewable energy, climate change, agriculture and energy issues, income inequality, sustainable development	Policy and framework focus, sustainable development, agriculture and agglomeration, renewable energy, food security, climate change, energy efficiency, security
Cluster 2 Green	Impact determinants, decision-making, optimization, equilibrium, risks and shoks, prices and returns, market efficiency	Economic policy and political uncertainty, corporate governance and management, CSR, firm performance, sustainable finance
Cluster 3 Blue	Economic and financial development, international trade and FDI, globalization and liberalization	Business cycles, fiscal and monetary policy, stock market, inflation, crises, public debt, shocks, volatility
Cluster 4 Yellow	Performance indicators, corporate governance and management, CSR, liquidity and profitability	Economic policy and growth, financial development, international trade and FDI, energy consumption, institutional quality
Cluster 5 Purple	Innovations, research and development, competititve advantage, human capital, technology, patents	Impact determinants, development investments, innovations, R&D, human capital, education
Cluster 6 Sky-blue	Investment strategies, environmental regulation, competitiveness, coordination	Foreign direct investments, export and import, macroeconomic policy, trade liberalization
Cluster 7 Orange	X	Competitiveness, eco-innovation, environmental policies, green finance, technological innovations

Source: elaborated by authors (VosViewer tools).

The topics related to the determinants of influence, particularly in achieving Sustainable Development Goals, political and economic instability and market shocks, the interaction between economic, social and managerial factors, etc., were considered the most relevant and significant in recent years. Details are given in Figure 1.19.

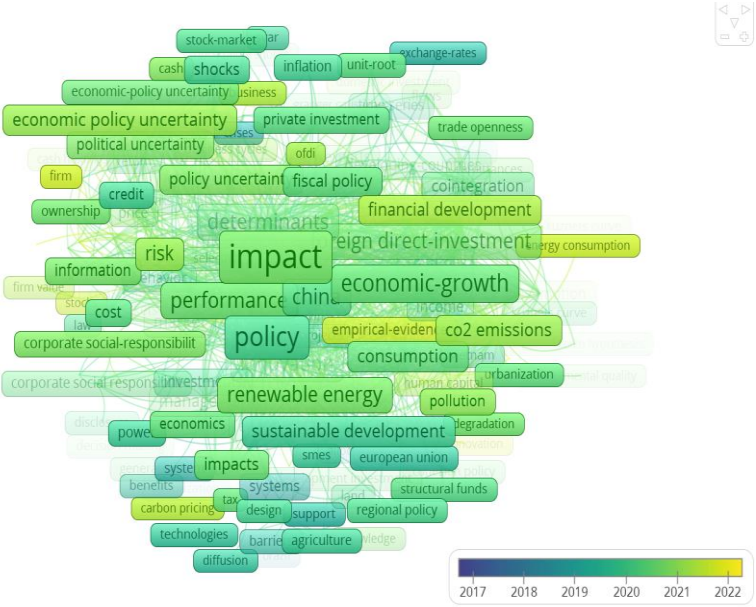
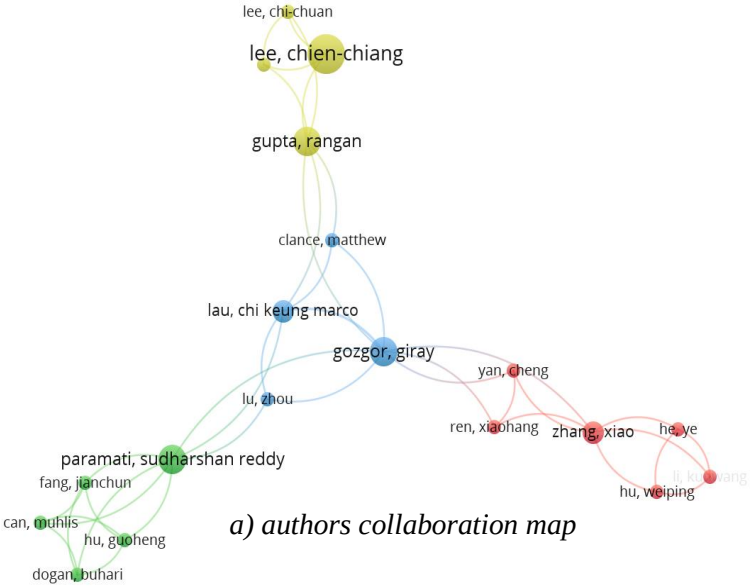


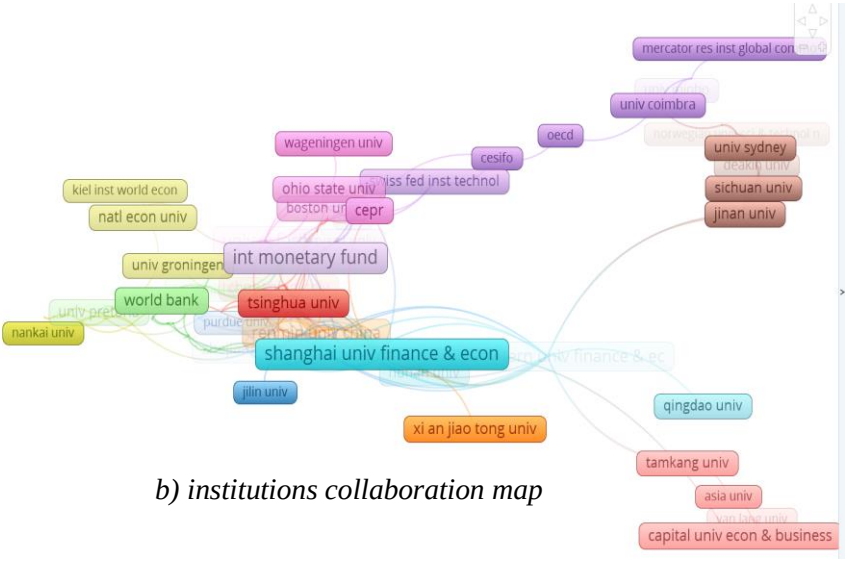
Figure 1.19. Road map and policy for responsible investment regulation: keywords co-occurrence by time dimension

Source: elaborated by authors (VosViewer tools).

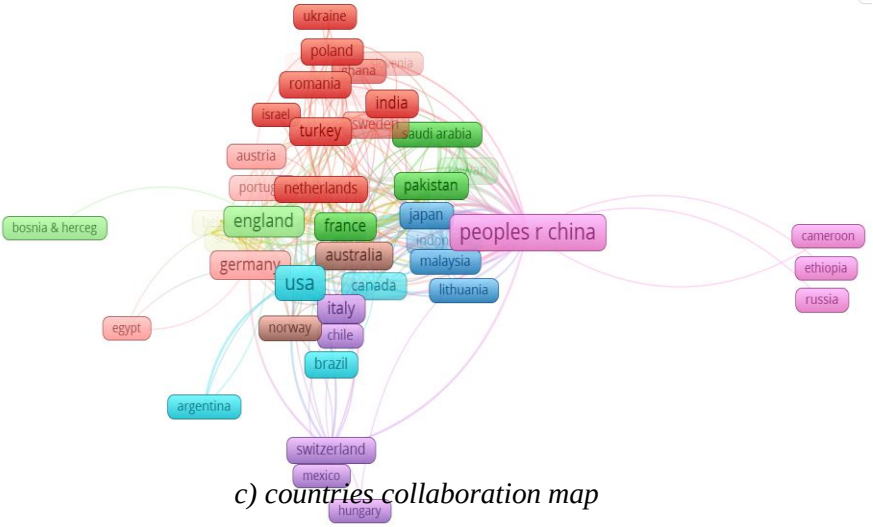
You can also build collaboration maps between authors, institutions, and countries with the help of VosViewer tools; the results are shown in Figure 1.20.



a) authors collaboration map



b) institutions collaboration map



c) countries collaboration map

Figure 1.20. Road map and policy for responsible investment regulation: collaboration maps by co-authorship

Source: elaborated by authors (VosViewer tools).

The authors' collaboration map presented above contains 4 clusters and 19 authors, which indicates an average level of collaboration between authors in the context of this topic. 15 clusters have been formed at the level of institutions, including cross-national collaboration forms. In particular, Shanghai University (China), Tsinghua University (China), International Monetary Fund, World Bank, etc., can be the most significant. 11 clusters have been identified at the level of countries, which indicates sufficiently numerous ways of international collaboration. The leaders were China, the USA, England and the EU, which formed the largest cluster.

1.5 Road map and policy for responsible investment regulation in Academia: Publish or Perish tools

The study of bibliometric information in the Google Scholar database, which includes the number of publications and citations on the use of road maps and policies for responsible investment regulation, is possible with the help of Publish or Perish software, which allows not only to identify quantitative indicators such as academic citations and publication but also to assess the level of their significance and influence. We present the static analysis results among the 1000 most cited studies in Table 1.17. The analysis searched for title words and keywords covering a broader range of effects for more accurate results.

Table 1.17. Road map and policy for responsible investment regulation over the period 2017-2022: static analysis (among most cited 1000 studies)

№	Metrics	Road maps for responsible investment		Policies for responsible investment	
		Title words	Keywords	Title words	Keywords
1	Papers	124	988	411	1000
2	Citation	452	≈327 th.	1806	≈315 th.
3	Cites per year	75.33	54649.8	301.0	52624.2
4	Cites per paper	3.7	328.6	4.4	315.8
5	Author per paper	2.3	2.9	2.2	2.9
6	h-index	11	301	19	330
7	g-index	19	527	33	513

Source: elaborated by authors (PoP tools).

Scientific studies devoted to policies for responsible investment regulation are more popular among Google Scholar documents, which is shown in many papers, citations and h-index and g-index. At the same time, searching within keywords shows approximately the same results for both search queries. The conclusions reached are confirmed by the dynamic analysis of publications for road maps and policies for responsible investment regulation, which is visually presented in Figure 1.21. The topic of policies for responsible investment regulation has more papers and the trend has a positive tendency. In contrast, publications related to road maps have a downward tendency.

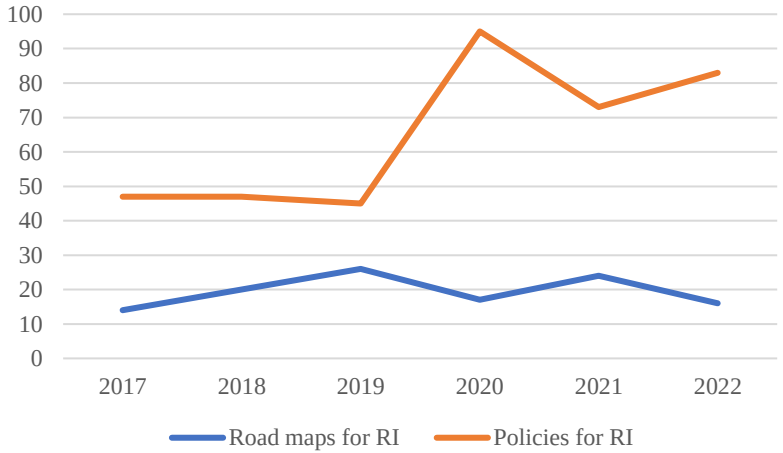


Figure 1.21. Road map and policy for responsible investment regulation over the period 2017-2022: dynamic analysis (among most cited 1000 studies)
Source: elaborated by authors (Google Scholar tools).

We systematize the most cited papers on using road maps and policies for responsible investment regulation based on the Publish or Perish analysis in Table 1.18.

Table 1.18. Road map and policy for responsible investment regulation over the period 2017-2022: the most cited papers

№	Cites	Cites per year	Authors (Year)	Bibliometric
A	1	2	3	4
1	33	8.25	Ivanisevic Hernaus, A. (2019)	Exploring the strategic variety of socially responsible investment: Financial performance insights about SRI strategy portfolios. Sustainability Accounting, Management and Policy Journal, 10(3), 545-569.
2	24	8	Stern, N. H., Unsworth, S., Valero, A., Zenghelis, D., Rydge, J., & Keng, C. (2020)	Strategy, investment and policy for a strong and sustainable recovery: An action plan.
3	70	23.3	Liu, R., He, L., Liang, X., Yang, X., & Xia, Y. (2020)	Is there any difference in the impact of economic policy uncertainty on the investment of traditional and renewable energy enterprises? – A comparative study based on regulatory effects. Journal of Cleaner Production, 255, 120102.
4	59	11.8	Calderini, M., Chiodo, V., & Michelucci, F. V. (2018)	The social impact investment race: Toward an interpretative framework. European Business Review, 95(1), 58-72.
5	42	21.0	Zahan, I., & Chuanmin, S. (2021)	Towards a green economic policy framework in China: role of green investment in fostering clean energy consumption and environmental sustainability. Environmental Science and Pollution Research, 28, 43618-43628.
6	39	9.8	Dufour, B. (2019)	Social impact measurement: What can impact investment practices and the policy evaluation paradigm learn from each other? Research in International Business and Finance, 47, 18-30.

Source: elaborated by authors (PoP tools).

Ivanisevic Hernaus (2019) aims to segment and profile socially responsible investment funds based on their investment strategies. This study explores applying different socially responsible investment strategies and their relationship with fund-level characteristics to identify dominant combinations in socially responsible investment practice.

Separate studies aim to develop an action plan for their own countries regarding the development of responsible investment regulation. In particular, the paper of Stern et al. (2020) highlights the need for intense and timely action to address the immense disruption caused by Covid-19 and prevent a prolonged global depression. Institutional reform, capacity building, and investment in vital assets such as physical and human, knowledge, natural, and social capital are essential. Zahan & Chuanmin (2021) investigate the impact of green investment on clean energy consumption and CO_2 emissions in China. The study identifies that green investment plays a role in encouraging consumers and producers to adopt clean energy, leading to improved environmental quality. Furthermore, the analysis reveals that environmental tax and financial development contribute to reducing CO_2 emissions.

The study of Liu et al. (2020) examines the impact of economic policy uncertainty on investment in different types of energy enterprises in China. The findings reveal that monetary policy uncertainty inhibits investment in traditional energy enterprises but does not affect significantly renewable energy enterprises. The study also explores the regulatory effects of factors, including growth opportunities, financing constraints, external demand, and ownership concentration, on the relationship between economic policy uncertainty and investment. Overall, the results provide valuable insights for policymakers and industry stakeholders to understand better

the differential effects of monetary policy uncertainty on investment decisions in the energy sector.

Calderini, Chiodo, & Michelucci (2018) develop an interpretative framework for understanding the evolution of social impact investment (SII) across different countries. They distinguish between “roadrunners” and “chasers” regarding the institutionalization and systematization of social impact investment activities.

Dufour (2019) focuses on the comparison and potential knowledge exchange between impact investment practices and the policy evaluation paradigm in the context of social impact measurement. The paper examines the similarities and differences between these two approaches and explores how they can learn from each other to enhance social impact measurement. The aim is to identify best practices and improve the effectiveness of social impact measurement in both domains.

1.6 Road map and policy for responsible investment regulation in Academia: with Google tools

The Google Trends tool reveals a broad audience’s interest in road maps and policy for responsible investment based on entered search queries. It provides insights into how frequently a keyword or topic has been searched for on Google and presents the data visually.

Such dynamics for 2017-2022 are shown in Figure 1.22 compared to road maps and policies for responsible investment regulation. The results showed that there were significantly more search queries related to policies for responsible investment regulation in the Google Search system. However, in retrospect, they have similar trends and peaks characterized by gradual growth.

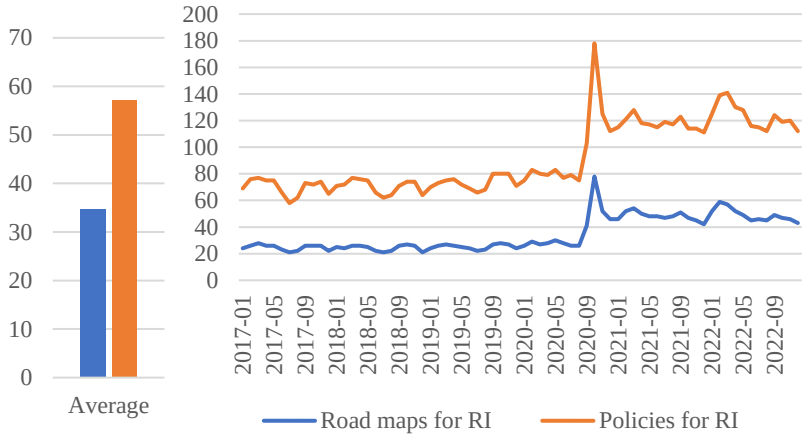


Figure 1.22. Internet queries concerning road map and policy for responsible investment regulation in 2017-2022
Source: elaborated by authors (Google Trends tools).

For comparison, let us analyze the same search queries in business and industrial, which indicates a more narrow and expert topic (Figure 1.23). The results show that the level of searches in this area for both categories is higher and is again characterized by similar fluctuations and an upward tendency.

Google Trends also analyzes the geography of the analyzed search queries. According to findings of 2017-2022, information about the road map in responsible investment regulation was most actively searched in France, Brazil, and Chile, and information about policy in Tanzania, Uganda, and India. Details and a more extensive list of countries are given in Table 1.19.

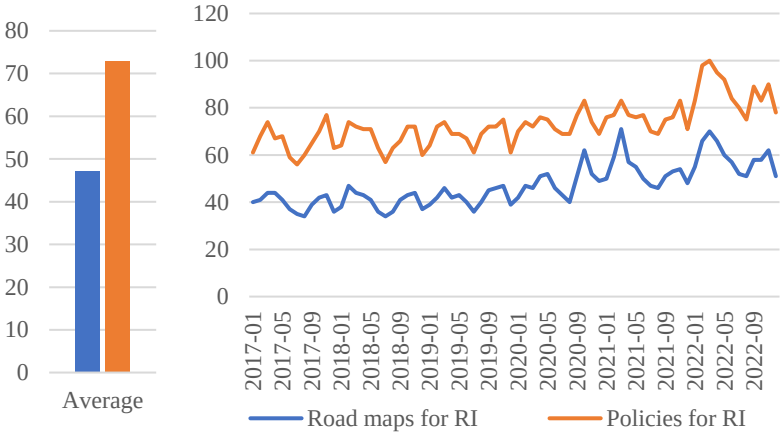


Figure 1.23. Internet queries concerning road map and policy for responsible investment regulation in 2017-2022: business and industrial area

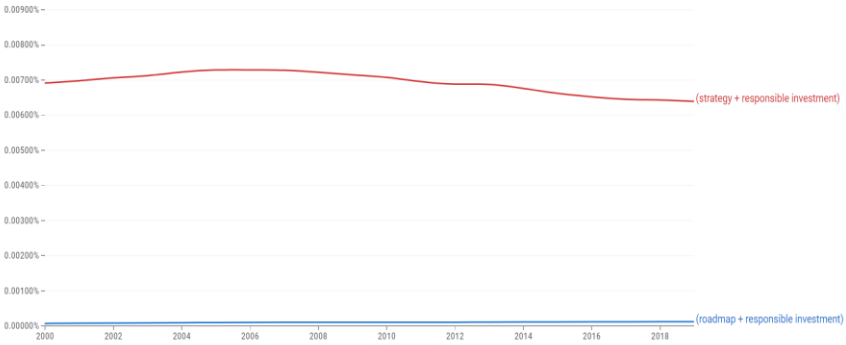
Source: elaborated by authors (Google Trends tools).

Table 1.19. Internet queries concerning road map and policy for responsible investment regulation in 2017-2022: top countries

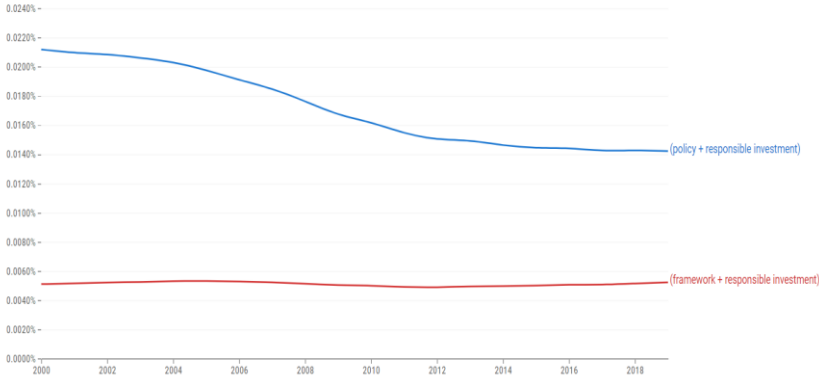
№	Road maps for responsible investment		Policies for responsible investment	
	Country	%	Country	%
1	France	50	Tanzania	67
2	Brazil	50	Uganda	67
3	Chile	49	India	67
4	Portugal	48	Nepal	65
5	Romania	47	Zimbabwe	63
6	Denmark	47	Kenya	63
7	Indonesia	47	Pakistan	63
8	Finland	47	United States	63
9	Germany	47	Bangladesh	63
10	Iran	47	Saudi Arabia	63

Source: elaborated by authors (Google Trends tools).

Google Ngram deserves special attention among Google tools that track the main trends in road maps and policies for responsible investment regulation in the Google Books Library database. The results of such searches are shown in Figure 1.24.



a) Road maps for for responsible investment regulation



b) Policies for responsible investment regulation

Figure 1.24. Ngram concerning road map and policy for responsible investment regulation in 2000-2019

Source: elaborated by authors (Google Books Ngram tools).

Individual phrases (presented in the form of 2 ngrams on the graph) related to road map and policy for responsible

investment regulation were investigated due to the limitation of the search query length and for clarity within each block. The results show that responsible investment strategies and policies are often found in Google Books. At the same time, all the analyzed requests had a slight downward tendency.

Let us analyze the most relevant papers concerning road map and policy for responsible investment regulation in the Google Books database in Table 1.20.

Table 1.20. Road map and policy for responsible investment regulation: the most relevant books

№	Authors / Editors (Year)	Bibliometric
1	UNESCO (2020)	Education for Sustainable Development: A Roadmap. UNESCO Publishing.
2	De Morais Sarmento E., Herman R. P. (2020)	Global Handbook of Impact Investing: Solving Global Problems Via Smarter Capital Markets Towards a More Sustainable Society. United Kingdom. Wiley.
3	Schramade, W., Schoenmaker, D. (2019)	Principles of Sustainable Finance. United Kingdom: Oxford University Press.
4	Pedersen, L. J. T., Jørgensen, S. (2018)	RESTART Sustainable Business Model Innovation. Germany: Springer International Publishing.
5	Rouch, D. (2020)	The Social Licence for Financial Markets: Reaching for the End and Why It Counts. Germany: Springer International Publishing.
6	Melissen F., Moratis L., Idowu S. O. (2018)	Sustainable Business Models: Principles, Promise, and Practice. Germany: Springer International Publishing.

Source: elaborated by authors (based on Google Books data).

The book of UNESCO (2020) focuses on the concept of Education for Sustainable Development (ESD), an approach to learning that integrates environmental, social, and economic dimensions of sustainability. The roadmap outlined in the book provides a framework for policymakers, educators, and other stakeholders to integrate ESD into education systems and

practices at all levels, from early childhood to higher education. It offers guidance on curriculum development, teacher training, learning methodologies, assessment approaches, and community engagement.

The De Morais Sarmento & Herman (2020) handbook offers insights into the principles, practices, and strategies of impact investing, highlighting the role of capital markets in driving positive change. It explores how impact investors can align their investments with sustainable development goals and create lasting social and environmental value.

The paper of Schramade & Schoenmaker (2019) focuses on the principles and practices of sustainable finance, examining how financial systems can contribute to achieving sustainability goals. It also explores the emergence of sustainable finance standards, disclosure requirements, and guidelines for financial institutions to integrate sustainability considerations into their operations.

Pedersen & Jørgensen (2018) focus on sustainable business model innovation and explore how organizations can adapt and thrive in a rapidly changing, sustainable-focused business environment. It presents the RESTART framework and roadmap for better development and implementation in sustainable business models. In this aspect, studies were also carried out in the paper of Melissen, Moratis, Idowu (2018), which explore the principles, potential, and practical aspects of existing and new approaches towards sustainable business models.

Rouch (2020) discusses the concept of the social license for financial markets and its significance in the context of sustainable and responsible finance. He offers some strategies and recommendations for financial institutions to obtain and maintain social license. He describes potential regulatory

developments, emerging trends, and evolving societal expectations that can shape the industry in the coming years.

1.7 Road map and policy for responsible investment regulation in Academia: with InfraNodus

The study of academic papers from the Google Scholar database in subsection 1.5 contains general descriptive characteristics that allow conclusions within the static and dynamic analysis of publications regarding the road map, strategy, and policy framework in responsible investing.

The specified analysis should be supplemented with bibliometric maps and network analysis. The functionality of Biblioshiny, VOS Viewer, Publish or Perish as additional software for visualization of bibliometric analysis results does not allow the direct import of scientific papers from Google Scholar.

The software InfraNodus helps create a text network visualization tool that empowers users to construct graphs and depicts textual content as interconnected networks. It is also connected to artificial intelligence algorithms and provides opportunities for structural gap identification and AI-based ideation.

Thus, data on the 1000 most cited academic publications based on the Publish or Perish search query for 2017-2022 were loaded into the InfraNodus program to create mind maps. Publication titles, keywords, and abstracts were used as filtering criteria.

The constructed mind map regarding the road map and policy for responsible investment regulation is presented in Figure 1.25.

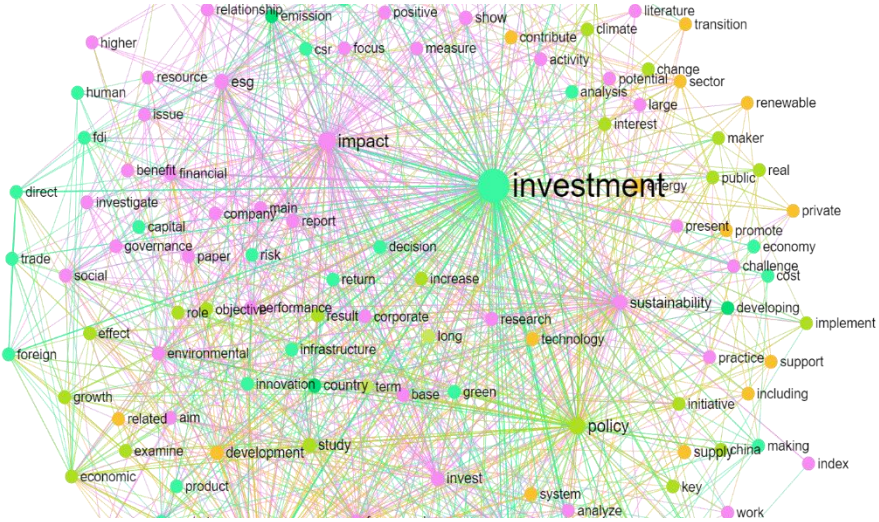


Figure 1.25. Road map and policy for responsible investment regulation: qualitative analysis of abstract and keywords on the mind map

Source: elaborated by authors (InfraNodus tools).

The most significant nodes (in descending order of importance) are those dedicated to investment, impact, sustainability (sustainable) and policy.

The node associated with the road map is directly related to the principal investment node but is not as significant as the policy node (Figure 1.26).

Findings of the search for nodes related to the responsible investment road map confirm the results of the dynamic analysis conducted in subsection 1.5 using the Publish or Perish software regarding the downward tendency in the dynamics of scientific publications on the subject of the road map for responsible investment regulation.

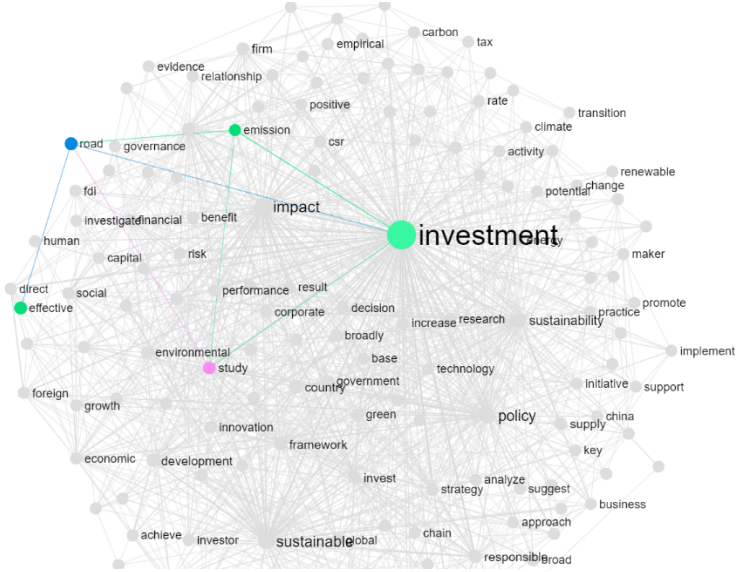


Figure 1.26. Road map for responsible investment regulation: focus on types of regulation

Source: elaborated by authors (InfraNodus tools).

Regulatory framework for responsible investment and strategy are not widely used in research papers. It is also confirmed by the results of the cluster analysis (Table 1.21), according to which the investment cluster (the most significant) is directly related to the policy cluster (the least significant).

The analysis of structural gaps shows the largest clusters between policy and sustainability.

The structural gap in this graph reveals the presence of two distinct communities or clusters of words. Despite their significance, these communities exhibit limited interconnections. However, this characteristic holds immense promise, as it is precisely within these less connected clusters that novel potential and innovative ideas may reside (Figure 1.27).

Table 1.21. Road map and policy for responsible investment regulation: the most relevant topic cluster, nodes, categories and keywords

Topical Cluster	Influ-ence,%	Total Nodes	Percen tage of Entries ,%	Cate-gory	Keywords
1	60	37	41	Invest ment	investment, responsible, portfolio, economy, driver, cost, international, encourage, fdi, direct, foreign, fund, return, green, decision, product, csr, process, capital, investor, strategy, risk, innovation, socially,
2	20	54	31	Impact	impact, esg, sustainability, framework, invest, social, index, negative, relationship, activity, health, resource,
3	12	24	15	Sustai nable	sustainable, development, supply, energy, renewable, support, transition, asset, private, promote, sdg, contribute, chain, goal, technology, system, implementation, sector
4	8	27	11	Policy	policy, initiative, government, tax, maker, result, objective, rate, climate, growth, real, business, economic, effect, role, public

Source: elaborated by authors (InfraNodus tools).

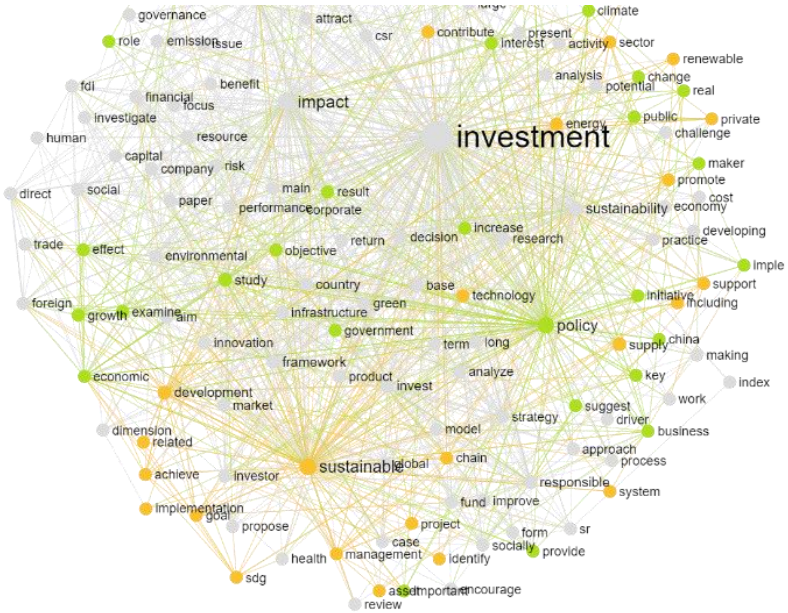


Figure 1.27. Structural gap between policy and sustainability clusters

Source: elaborated by authors (InfraNodus tools).

This structural gap indicates the need to intensify research on sustainability investment policies in the current study context.

The evolutionary aspect of the road map for responsible investment regulation is essential to the key nodes analysis in researched papers by InfraNodus (Figure 1.28). The y-axis represents the number of occurrences per text segment; the x-axis represents the text segments by the most widely represented thematic clusters.

Figure 1.28. Evolution of key words in road map and policy for responsible investment regulation

Source: elaborated by authors (InfraNodus tools).

The importance of keywords in four researched clusters, especially for the responsible investment cluster, has increased by more than 264 occurrences per text segment, as shown in Figure 1.28.

Thus, the topic of the road map and policy for responsible investment regulation is emerged and characterized by a large structural gap between policy and sustainability clusters.

Appendices
Appendix A

Table A.1. Road map and policy for responsible investment regulation: top researches

№	Author	Affiliation	Output	FWCI	Citation Count
A	B	C	1	2	3
Road maps for responsible investment					
1	Dinçer, H.	Istanbul Medipol University	16	7.31	515
2	Yüksel, S.	Istanbul Medipol University	14	8.25	496
3	Sarkar, B.	Yonsei University	11	6.38	422
4	Balsalobre-Lorente, D.	University of Castilla-La Mancha	8	7.79	71
5	Bekun, F. V.	Lebanese American University	8	17.55	265
6	Göransson, L.	Chalmers University of Technology	8	1.46	151
7	Martek, I.	Deakin University	8	2.34	107
8	Pereira, L. F.	University Institute of Lisbon	8	1.51	62
9	Shah, N. G.	Imperial College London	8	1.46	95
10	Tabash, M. I.	Al Ain University of Science and Technology	8	1.05	43
11	Xiang, Y.	Sichuan University	8	0.86	59
12	Xu, Ch.	Beijing Forestry University	8	0.6	38
13	Zhu, J.	Nankai University	8	0.6	38
14	Farooq, U.	Xi'an Jiaotong University	7	1.59	41
15	García-Sánchez, I. M.	Universidad de Salamanca	7	4.78	257
Policies for responsible investment					
1	Lin, B.	Xiamen University	36	2.49	1,194
2	Bekun, F. V.	Lebanese American University	32	9.87	877
3	Dinçer, H.	Istanbul Medipol University	31	6.04	750
4	Yüksel, S.	Istanbul Medipol University	30	6.19	731
5	Murshed, M.	North South University	29	9.22	1,406

Continuation of Table A.1

A	B	C	1	2	3
6	Kirikkaleli, D.	European University of Lefke	28	8.21	738
7	Taghizadeh-Hesary, F.	Tokai University	24	5.91	941
8	Tabash, M. I.	Al Ain University of Science and Technology	23	1.52	83
9	Udemba, E.N.	Istanbul Gelisim University	23	7.25	555
10	Balsalobre-Lorente, D.	University of Castilla-La Mancha	22	7.81	988
11	Farooq, U.	Xi'an Jiaotong University	21	1.81	79
12	Adebayo, T. S.	Cyprus International University	20	15.4	729
13	Su, Ch.	Qingdao University	20	6.75	470
14	Zaman, Kh.	The University of Haripur	20	2.01	302
15	Al-Faryan, M. A. S.	University of Portsmouth	18	6.85	88

Table A.2. Road map and policy for responsible investment regulation: top papers in Scopus by relevance

№	Title	Authors, year	Source	Citations
A	B	1	2	3
Road maps for responsible investment				
1	Developing an impact-focused typology of socially responsible fund providers	Diener, J., Habisch, A. (2022)	Journal of Risk and Financial Management 15(7), 298	3
2	Sustainable development and financial system: Integrating ESG risks through sustainable investment strategies in a climate change context	Folqué, M., Escrig-Olmedo, E., Corzo Santamaría, T. (2021)	Sustainable Developmen, 29(5), 876-890	31
3	Integrating ESG analysis into smart beta strategies	Ielasi, F., Ceccherini, P., Zito, P.	Sustainability (Switzerland), 12(22),9351, 1-22	5

Continuation of Table A.2

A	B	1	2	3
4	A systematic literature review of socially responsible investment and environmental social governance metrics	Widyawati, L. (2020)	Business Strategy and the Environment 29(2), 619-637	104
5	The influence of sustainable development on stock risk and volatility in Thailand's stock exchange during the Covid-19 pandemic	Laokulrach, M. (2022)	Asian Economic and Financial Review, 12(9), 751-765	0
6	Socially responsible investment strategies for the transition towards sustainable development: the importance of integrating and communicating ESG	Sciarelli, M., Cosimato, S., Landi, G., Iandolo, F. (2021)	TQM Journal, 33(7), 39-56	36
7	Can ESG-responsible investing attract sovereign wealth funds' investments? Evidence from Chinese listed firms	Chen, G., Wei, B., Dai, L. (2022)	Frontiers in Environmental Science, 10,935466	7
8	Long-term sustainable investment for retirement	Owadally, I., Mwizere, J.-R., Kalidas, N., Murugesu, K., Kashif, M. (2021)	Sustainability (Switzerland), 13(9),5000	2
9	A content guide to environmental, social and governance investing for faculty and students	Bell, G.G., Patt, B.S. (2022)	Journal of Business Ethics Education, 19, 169-192	0
10	Values at work: sustainable investing and ESG reporting (book)	Esty, D.C., Cort, T. (2020)	Values at Work: Sustainable Investing and ESG Reporting, 1-239	7
11	Shareholder value and dividend policy: The role of ESG strategies	Niccolo, N., Battisti, E., Papa, A., Miglietta, N. (2020)	2020 IEEE International Conference on Technology Management, Operations and Decisions,, 9380585	2

Continuation of Table A.2

A	B	1	2	3
12	The ultimate owner of environmental, social, and governance investment	Keeley, A.R., Li, C., Takeda, S., Gloria, T., Managi, S. (2022)	Frontiers in Sustainability 3,909239	0
13	R&D investment, ESG performance and green innovation performance: evidence from China	Xu, J., Liu, F., Shang, Y. (2021)	Kybernetes 50(3), 737-756	41
14	Factors affecting esg towards impact on investment: A structural approach	Aich, S., Thakur, A., Nanda, D., Tripathy, S., Kim, H.-C. (2021)	Sustainability (Switzerland) 13(19),10868	4
15	The effect of environmental, social, governance and sustainability initiatives on stock value – examining market response to initiatives undertaken by listed companies	Lo, K.Y., Kwan, C.L. (2017)	Corporate Social Responsibility and Environmental Management 24(6), 606-619	80
Policies for responsible investment				
1	On the relationship between policy uncertainty and sustainable investing	Shaikh, I. (2022)	Journal of Modelling in Management 17(4), 1504-1523	7
2	Sustainable smart city business model framework	Uden, L., Kumaresan, A. (2021)	Proceedings - 2021 5th International Conference on Vision, Image and Signal Processing, 181-187	1
3	The role of public investment policy and responsible investment in sustainable development financing	Plastun, A., Yelnikova, Y., Shelyuk, A., Vorontsova, A., Artemenko, A.	Agricultural and Resource Economics, 6(2), 108-125	4
4	Environmental regulation and ESG of SMEs in China: Porter hypothesis re-tested	Chen, Y.P.V., Zhuo, Z., Huang, Z., Li, W. (2022)	Science of the Total Environment, 850, 157967	9

Continuation of Table A.2

A	B	1	2	3
5	Bringing the user back in the building: An analysis of esg in real estate and a behavioral framework to guide future research	Kempeneer, S., Peeters, M., Compernolle, T. (2021)	Sustainability (Switzerland) 13(6),3239	6
6	Corporate sustainability and institutional shareholders: The pressure of social responsible pension funds on environmental firm practices	Alda, M. (2019)	Business Strategy and the Environment 28(6), 1060-1071	48
7	Does ESG affect the stability of dividend policies in Europe?	Matos, P.V., Barros, V., Sarmento, J.M. (2020)	Sustainability (Switzerland) 12(21),8804, 1-15	19
8	Multidimensional environmental social governance sustainability framework: Integration, using a purchasing, operations, and supply chain management context	Whitelock, V.G. (2019)	Sustainable Development 27(5), 923-931	20
9	Clearing the air: Responsible investment	Dunn, J., Hernandez, M., Palazzolo, C. (2020)	Journal of Portfolio Management 46(3), 36-41	4
10	Sustainable finance: limitations and evolutionary profiles | [La finanza sostenibile: limiti e profili evolutivi]	Conte, F. (2022)	Federalismi.it 2022, (33)	0
11	The global sustainability footprint of sovereign wealth funds	Liang, H., Renneboog, L. (2020)	Oxford Review of Economic Policy 36(2), 380-426	21
12	A quantitative model supporting socially responsible public investment decisions for sustainable tourism	Skrame, A., Ciancio, C., Corvello, V., Musmanno, R. (2020)	International Journal of Financial Studies 8(2),33, 1-9	0
13	An integrated approach to quantitative esg investing	Chen, M., Mussalli, G. (2020)	Journal of Portfolio Management 46(3), 65-74	22

Continuation of Table A.2

A	B	1	2	3
14	Sustainability frameworks and the recovery and resilience plan. Challenges from the Italian context	Pastore, L., Corvo, L., Tricarico, L. (2022)	Lecture Notes in Networks and Systems 482 LNNS, 432-449	0
15	A framework to identify and overcome barriers in launching sustainable energy projects in the Iranian industrial sector	Sirous, R., Lopes, R.B. (2019)	International Journal of Energy Technology and Policy 15(1), 1-30	2

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CHAPTER 2 REGULATORY FRAMEWORK FOR RESPONSIBLE INVESTMENT: RESEARCH GAP

2.1 Regulatory framework for responsible investment in Academia: Scopus and SciVal tools

According to estimates by Bloomberg experts (2021), ESG assets should exceed $53 trillion by 2025, more than a third of total assets under management. The rapid development of the responsible investment concept in recent decades also contributes to the active development of its regulation.

At the same time, if the number of regulatory instruments was relatively small at the beginning of 2000, a positive growing trend was observed after the beginning of the new millennium. 2021 is a seminal year because more than 200 policy instruments developed by international organizations, regional associations or individual countries, business associations and even companies have been recorded, according to UNPRI (2023).

It contributed to creating a sufficiently extensive regulatory framework for responsible investment, which varies depending on the country and the specifics of its legislative field. According to UNPRI (2023), currently, the following types of regulatory instruments can be distinguished according to the updated methodology:

– varieties of ESG disclosure (for example, corporate and investor ESG disclosure) and integration;

– stewardship codes as examples of best practice principles;

– taxonomy systems;

– specific sectoral policies;

– specific measures for some financial products (for example, green bonds, labels, etc.)

– sustainable finance strategies or plans at the national level;

– other instruments that can be in the form of regulations, rules, recommendations, guidelines etc.

Despite the positive aspects of developing a regulatory field in which responsible investments can develop in the future, such an extensive list leads to information asymmetry. In particular, according to the official data of MSCI (2022), 34 regulatory bodies conducted consultations on ESG12 financial markets in 2021.

The lack of a unified approach to the formation of a regulatory framework for responsible investment, in turn, leads to the inhibition of this instrument development and contributes to the formation of low transparency and integrity in the market, which has considerable potential in financing the gap of achieving the Sustainable Development Goals.

Specific role in Sustainable Development Goals progress can be assigned to ESG disclosure rules (Soni, 2023), ESG guidelines (Fakoya and Malatji, 2020), cultural and social factors (Hamdan, Fernandez Calavia and Aminu, 2023).

Consider using various terms related to a sufficiently wide regulatory field of responsible investment for a full-fledged bibliometric analysis. As a result, the authors of this study proposed the following search queries that correspond to the basic syntax rules in scientometric databases, particularly in Scopus and SciVal (Table 2.1).

The generated search queries group terms by blocks regarding Standards and Codes, Laws and Guidelines for responsible investment regulation. The research period is 2017-2022. The data grouping into four blocks is conditional and made for the convenience of further results visualization. The authors clearly understand that individual names of regulatory documents can be found at different levels of the legislative framework, but this does not prevent the achievement of the goals of this study.

Table 2.1. Formation of search queries for bibliometric research in Scopus and SciVal

Group name	Detailed search query
Standards and Codes for responsible investment	(standard OR code OR stewardship OR taxonomy) AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment
Laws for responsible investment	(disclosure OR law OR resolution OR act OR bill OR directive OR bulletin OR regulation OR legislation) AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment
Guidelines for responsible investment	(guideline OR guide OR rule OR principle OR recommendation OR report OR instruction) AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment

Source: elaborated by authors.

Conducting a static analysis state that responsible investment regulation through standards, laws, recommendations, and other tools is widespread and relevant in scientific circles (Table 2.2). It is directly reflected in many papers' citations in this area (in particular, higher than the average global indicator), high levels of international collaboration, and the formation of many topics and thematic clusters.

Table 2.2. Regulatory framework for responsible investment in SciVal over the period 2017-2022: static analysis

Research area	Field-Weighted Citation Impact	Field-Weighted International Collaboration	Topics	Topics cluster
Standards and Codes for responsible investment	1.22	1662	2717	669
Laws for responsible investment	1.36	6038	4914	888
Guidelines for responsible investment	1.29	4931	4972	896

Source: elaborated by authors (SciVal tools).

The dynamic analysis of various dimensions of responsible investment regulation in scientific literature includes studying the total number of scientific papers, the citation index, and the dynamics in 2017-2022. Its results are shown in Table 2.3.

Table 2.3. Regulatory framework for responsible investment in SciVal over the period 2017-2022: dynamic analysis

	Overal	2017	2018	2019	2020	2021	2022
Standards and Codes for responsible investment							
Output	6237	907	189	971	1016	1138	1314
Citations	51727	13295	11486	10226	8892	5410	2418
Laws for responsible investment							
Output	21213	2511	2728	3239	3705	4101	4929
Citations	196666	39452	38656	40720	38902	24584	11352
Guidelines for responsible investment							
Output	16672	1980	2174	2443	2913	3346	3816
Citations	145113	32300	29580	26485	30037	19108	7603

Source: elaborated by authors (Scopus and SciVal tools).

The total number of papers in all blocks is more than 44 thousand and more than 390 thousand citations. Positive dynamics are observed in all groups, indicating the growth of scientific interest in responsible investment regulation. The decrease in the number of citations in 2022 is due to incomplete data processing this year and insufficient filling of the Scopus and SciVal databases at the time of this study.

Investigating the subject area of basic research on Standards and Codes, Laws and Guidelines for responsible investment regulation, the following trends can be traced (Table 2.4).

Table 2.4. Regulatory framework for responsible investment in SciVal over the period 2017-2022: structural analysis by subject area

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Area	%	Area	%	Area	%
1	Social Sciences	25.8	Social Sciences	30.3	Social Sciences	28.3
2	Engineering	20.1	Environmental Science	25.7	Environmental Science	22.2
3	Environmental Science	19.5	Economics, Econometrics and Finance	24.9	Business, Management and Accounting	20.4
4	Business, Management and Accounting	18.9	Business, Management and Accounting	24.0	Engineering	17.2
5	Economics, Econometrics and Finance	18.5	Engineering	17.4	Economics, Econometrics and Finance	17.2

Source: elaborated by authors (Scopus and SciVal tools).

Most publications relate to Social and Environmental sciences, Engineering and Economics (Economics, Finance, Business and Management). Such results are quite natural considering the intrinsic nature of responsible or ESG investments. At the same time, the proportion of economic research in the cumulative summary of its subject areas occupies a leading position.

The most active countries and institutions in the research area are listed in Table 2.5. The leaders of scientific research on responsible investment regulation are the USA, the United Kingdom, and China. The most active institutes include Harvard University, University of Oxford, University College London, etc., and such state organizations as CNRS and the World Health Organization.

Table 2.5. Regulatory framework for responsible investment in SciVal over the period 2017-2022: top countries and institutions

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Country	Institution	Country	Institution	Country	Institution
1	USA	Harvard University	China	CNRS	USA	Harvard University
2	UK	University of Oxford	USA	Chinese Academy of Sciences	China	University College London
3	China	CNRS	UK	University of Oxford	UK	University of Oxford
4	Australia	University of Washington	Australia	Harvard University	Australia	World Health Organization
5	Germany	University of Toronto	India	University College London	India	University of Sydney
6	Italy	Johns Hopkins University	Italy	Tsinghua University	Canada	Johns Hopkins University
7	India	University of New South Wales	Germany	University of Melbourne	Germany	London School of Hygiene and Tropical Medicine
8	Canada	University College London	Canada	Columbia University	Italy	University of New South Wales

Source: elaborated by authors (Scopus and SciVal tools).

We present a map constructed using SciVal tools (Figure 2.1) for a better visual perception of information about the 100 most active institutions in the regulatory framework for responsible investment study. Accordingly, most of them are concentrated in the USA, China, the United Kingdom, Australia, and other European countries, particularly the Netherlands, Belgium, etc.

Figure 2.1. Regulatory framework for responsible investment in SciVal over the period 2017-2022: top 100 institutions

Source: elaborated by authors (SciVal tools).

The study of the most significant scientific journals in the Scopus database, in which researchers are published on the regulatory framework for responsible investment, is given in Table 2.6.

Most scientific papers have been published in such journals as Sustainability, Journal of Cleaner Production, Emerald Emerging Markets Case Studies and Environmental Science and Pollution Research. Their topics closely related to various aspects of sustainable development, sustainable or cleaner production, corporate social responsibility issues, environmental management and audit, etc.

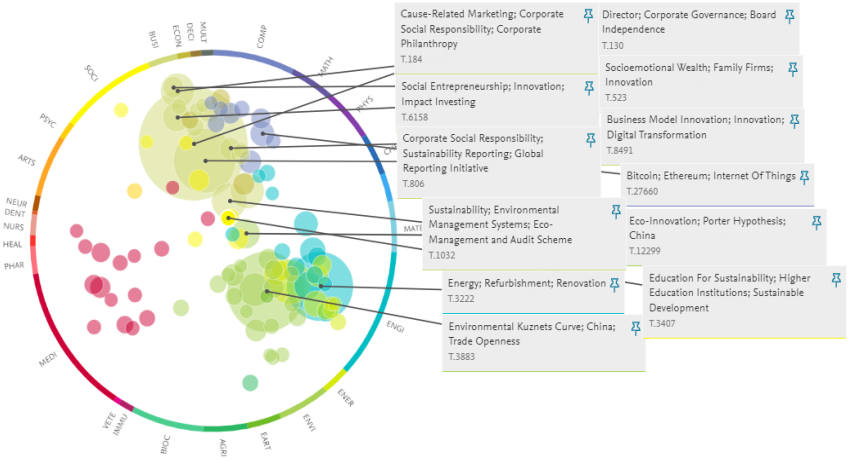
Table 2.6. Regulatory framework for responsible investment in SciVal over the period 2017-2022: top Scopus journals

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Journal	Output	Journal	Output	Journal	Output
1	Sustainability	155	Sustainability	689	Sustainability	514
2	Journal of Cleaner Production	69	Journal of Cleaner Production	340	Journal of Cleaner Production	217
3	Emerald Emerging Markets Case Studies	63	Environmental Science and Pollution Research	331	IOP Conference Series: Earth and Environmental Science	152
4	IOP Conference Series: Earth and Environmental Science	59	IOP Conference Series: Earth and Environmental Science	201	PLoS ONE	152
5	Energies	55	Energies	193	Environmental Science and Pollution Research	113

Source: elaborated by authors (Scopus and SciVal tools).

We list the most productive authors on the topic of regulatory framework for responsible investment in Appendix B, Table B.1; the leaders in terms of the number of publications are Zakari, A. (Beijing Institute of Technology), Azhgaliyeva, D. (Asian Development Bank Philippines), Bekun, F. V. (Lebanese American University), Zaman, K. (The University of Haripur), Dinçer, H. and Yüksel, S. (Istanbul Medipol University), etc.

These researchers form thematic topics on the example of the Standards and Codes for responsible investment block, the top 1% of which by prominence are shown in Figure 2.2.



Note COMP Computer Science; MATH Mathematics; PHYS Physics and Astronomy; CHEM Chemistry; CENG Chemical Engineering; MATE Materials Science; ENGI Engineering; ENER Energy; ENVI Environmental Science; EART Earth and Planetary Sciences; AGRI Agricultural and Biological Sciences; BIOC Biochemistry, Genetics and Molecular Biology; IMMU Immunology and Microbiology; VETE Veterinary; MEDI Medicine; PHAR Pharmacology, Toxicology and Pharmaceutics; HEAL Health Professions; NURS Nursing; DENT Dentistry; NEUR Neuroscience; ARTS Arts and Humanities; PSYC Psychology; SOCI Social Sciences; BUSI; Business, Management and Accounting ECON Economics, Econometrics and Finance; DECI Decision Sciences; MULT Multidisciplinary.

Figure 2.2. Regulatory framework for responsible investment in SciVal over the period 2017-2022: top 1% topics by prominence

Source: elaborated by authors (SciVal tools).

Most topics are multidisciplinary. The most significant economic and social issues include corporate social responsibility and regulation, sustainability reporting, sustainable or ecological management approaches, innovative and digital transformations, education for sustainable development, etc.

Keyphrase analysis, shown in Figure 2.3, also allows us to form an idea about the research subject areas.

Figure 2.3. Regulatory framework for responsible investment in SciVal: keyphrase analysis

Source: elaborated by authors (SciVal tools).

The most common or keyphrases characterizing research on the regulatory framework for responsible investment are investments and investors, corporate social responsibility, sustainable development and Sustainable Development Goals, economic and social growth, sustainable development reporting, stock market, innovation, environmental regulation, information disclosure, etc.

The analysis of newly emerged topics in the Scopus database in 2021, which increase scientific circles' power in the regulatory framework for responsible investment, should highlight the following (Figure 2.4). They are closely related to the economic and environmental consequences of Covid-19 spread, the artificial intelligence development and the phenomenon of robotics, the digitalization economy, the cryptocurrency industry's emergence on the financial market, etc.

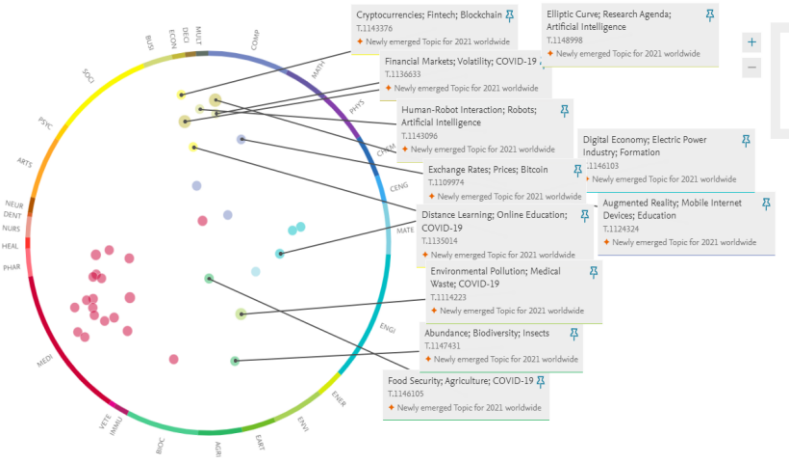


Figure 2.4. Newly emerged topics for regulatory framework for responsible investment in 2021

Source: elaborated by authors (SciVal tools).

Table 2.7 shows the most relevant topic clusters and their prominence percentile from the analyzed topic. One of the priorities are Corporate Social Responsibility, Corporate Governance, Firms and Monetary Policy, Economic Growth and Exports.

Table 2.7. Regulatory framework for responsible investment in SciVal over the period 2017-2022: the most relevant topic clusters and their prominence percentile (%)

Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
Cluster	%	Cluster	%	Cluster	%
Corporate Social Responsibility; Corporate Governance; Firms	97.67	Monetary Policy; Economic Growth; Exports	94.72	Corporate Social Responsibility; Corporate Governance; Firms	97.65
Electricity; Energy; Economics	99.47	Electricity; Energy; Economics	99.47	Electricity; Energy; Economics	99.46
Monetary Policy; Economic Growth; Exports	94.72	Corporate Social Responsibility; Corporate Governance; Firms	97.66	Monetary Policy; Economic Growth; Exports	94.71
Models; Risks; Finance	94.11	Industry; Innovation; Entrepreneurship	98.99	Industry; Innovation; Entrepreneurship	98.99
Industry; Innovation; Entrepreneurship	98.99	Models; Risks; Finance	94.11	Models; Risks; Finance	94.11

Source: elaborated by authors (SciVal tools).

It forms sufficient grounds for analysing the most significant papers on this topic, which are grouped in Appendix B, Table B.2. We will examine some of them below.

Drempetic et al. (2020) argue that responsible investments should be based on an appropriate code of ethics for investors,

and rating assessments define their distribution. The authors confirm the positive correlation between the firm's size and the ESG score in sustainability ratings and note the need to regulate this issue to eliminate the potential bias when making investment decisions.

Kim et al. (2022) investigate the impact of shares of the Korean National Pension Fund (NPF) on ESG and financial indicators of investee companies, which is the basis for further investment strategy formation.

Consolandi et al. (2020) study the connection between ESG criteria and achieving Sustainable Development Goals in the healthcare sector based on the Sustainability Accounting Standard Board (SASB).

The study of Nofsinger & Varma (2022) is devoted to the question of the reaction of sustainable funds in the USA to data on the level of carbon risk, which due to fiduciary and legal bonding, are insensitive to full information disclosure. The authors also note a negative trend towards a decrease in the carbon risk assessment by such funds, not due to renewable sources but due to a reduction in the impact of fuel.

Bose (2020) analyzes the evolution of ESG reporting frameworks, in particular through the prism of the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the Task Force on Climate-related Financial Disclosures (TCFD). He focuses on such problems of ESG reporting as the imperfection of standardized information for creating compelling investment strategies.

Ching (2020) examines the quality of ESG disclosures in integrated reports of companies in the automotive, consumer goods, and healthcare industries. He proved the low quality of ESG information disclosure and the existence of a lack of knowledge or ignoring the need to highlight such issues among the management of the analyzed companies.

Escrig-Olmedo et al. (2019) analyze the changes to the evaluation criteria of ESG rating agencies over the last decade and prove that their contribution to achieving more sustainable development should be revised.

Weston & Nnadi (2021) examine the connection between the companies' corporate social responsibility and financial performance and recommend incorporating ESG principles into investment decisions.

Gatzert & Reichel (2022) focus on analysing sustainable investing practices in the insurance industry in the United States and Europe. The findings indicate a significant increase in the number of firms referring to sustainable investing and a rise in the word count related to sustainable investing.

2.2 Regulatory framework for responsible investment in Academia: in-built WoS tools

The results of the dynamic analysis of scientific papers devoted to Standards and Codes, Laws and Guidelines for responsible investment regulation in the WoS database are shown in Table 2.8. Search queries are those listed in Table 2.1 in the previous subsection, adapted according to the syntax rules of this database.

Findings indicate the annual growth of scientific interest in responsible investment regulation and its dissemination. The total number of publications in all blocks exceeds 30,000, and the number of citations exceeds 500,000.

The structural analysis of publications by subject area is given in Table 2.9. The results showed the same top-5 positions, where only the proportions of papers vary. Many articles belong to Economic and Environmental Sciences, Engineering and Technologies. As you can see, Social Sciences did not enter the top 5 subject areas.

Table 2.8. Regulatory framework for responsible investment in WoS over the period 2017-2022: dynamic analysis

	Overal	2017	2018	2019	2020	2021	2022
Standards and Codes for responsible investment							
Output	6354	480	488	596	625	694	750
Citations	106704	6606	8141	10676	13947	18136	19725
Laws for responsible investment							
Output	12 285	809	937	1195	1356	1657	1789
Citations	199854	428	2111	5680	11570	21040	32283
Guidelines for responsible investment							
Output	15 786	1152	1269	1492	1715	1955	2008
Citations	205789	597	2983	7546	14738	26287	35241

Source: elaborated by authors (WoS tools).

Table 2.9. Regulatory framework for responsible investment in WoS over the period 2017-2022: structural analysis by subject area

№	Area	Standards and Codes for responsible investment	Laws for responsible investment	Guidelines for responsible investment
		%	%	%
1	Business Economics	37.3	39.1	32.3
2	Environmental Sciences Ecology	16.6	23.6	18.0
3	Engineering	13.9	11.5	11.5
4	Science Technology Other Topics	8.63	10.7	9.8
5	Energy Fuels	7.7	8.3	5.7

Source: elaborated by authors (WoS tools).

An additional analysis of WoS categories, formed based on the subject areas of journals in which papers are published, is given in Table 2.10.

Table 2.10. Regulatory framework for responsible investment in WoS over the period 2017-2022: structural analysis by WoS categories

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Area	%	Area	%	Area	%
1	Economics	19.7	Economics	19.3	Economics	14.9
2	Environmental Sciences	11.7	Environmental Sciences	16.3	Environmental Sciences	12.7
3	Business Finance	10.1	Environmental Studies	11.7	Management	9.2
4	Management	8.8	Business Finance	11.7	Environmental Studies	8.9
5	Environmental Studies	8.6	Management	9.2	Business Finance	8.3

Source: elaborated by authors (WoS tools).

Most publications include Economics, Environmental Sciences, Finance, and Management Studies. Their structure is slightly different from the previous analysis by subject area.

Most studies are concentrated in the USA, England and China geographically (Table 2.11). Also, Australia, Germany and Canada are among the top 5 most active countries where research on responsible investment regulation is conducted. We can see both world institutions of higher education (the University of London, the University of California System, Harvard University, Oxford University) and state or international organizations (the World Health Organization, the Ministry of Education Science of Ukraine, CNRS) as the most active institutions.

Table 2.11. Regulatory framework for responsible investment in WoS over the period 2017-2022: top countries and institutions

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Country	Institution	Country	Institution	Country	Institution
1	USA	University of London	USA	University of London	USA	University of London
2	England	University of California System	China	University of California System	China	University of California System
3	China	Harvard University	England	Ministry of Education Science of Ukraine	England	Harvard University
4	Australia	University of Oxford	Australia	Udice French Research Universities	Australia	Ministry of Education Science of Ukraine
5	Germany	University of Texas System	Germany	State University System of Florida	Canada	World Health Organization
6	Canada	Udice French Research Universities	Italy	University of Texas System	Germany	CGIAR
7	Italy	State University System of Florida	Canada	CNRS	Germany	University of Sydney
8	Nether-lands	Pennsylvania Commonwealth System of Higher Education	Spain	University of Oxford	Nether-lands	University of Oxford

Source: elaborated by authors (WoS tools).

The analysis of the most relevant journals in the WoS database, which publish research devoted to responsible investment regulation, is given in Table 2.12.

Table 2.12. Regulatory framework for responsible investment over the period 2017-2022: top WoS journals

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Journal	Output	Journal	Output	Journal	Output
1	Sustainability	142	Sustainability	381	Sustainability	444
2	Journal of Cleaner Production	85	Journal of Cleaner Production	237	Journal of Cleaner Production	201
3	Energy Policy	72	Environmental Science and Pollution Research	195	Plos one	129
4	Energies	58	Energy Policy	141	Environmental Science and Pollution Research	112
5	Environmental Science and Pollution Research	50	Energies	122	Energy Policy	104

Source: elaborated by authors (WoS tools).

We observe that most journals belong to both WoS and Scopus databases. The topics of these studies are closely correlated with issues of sustainable development, sustainable or clean production, environmental and energy issues, etc.
The top 3 Publishers are Elsevier, Springer Nature, and Wiley (Table 2.13).

Table 2.13. Regulatory framework for responsible investment in WoS over the period 2017-2022: top publishers

№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Publisher	%	Publisher	%	Publisher	%
1	Elsevier	22.1	Elsevier	23.9	Elsevier	19.9
2	Springer Nature	9.8	Springer Nature	10.0	Springer Nature	10.7
3	Wiley	7.2	Wiley	7.6	Wiley	7.1

Source: elaborated by authors (WoS tools).

Based on the above analysis, general trends and most publications overlap with the Scopus database. The following list of the most relevant papers was formed based on the documents from the WoS database not analyzed above (Table 2.14).

Table 2.14. Regulatory framework for responsible investment in WoS: the most relevant papers

№	Authors (Year)	Bibliometric	Cite
1	Liang, H., Sun, L., Teo, M. (2022).	Responsible Hedge Funds. *Review of finance*, 26 (6), 1585-1633	10
2	Dumrose, M., Rink, S., Eckert, J. (2022).	Disaggregating confusion? The EU Taxonomy and its relation to ESG rating. *Finance research letters*, 48	2
3	Van Oostrum, C. (2021)	Sustainability Through Transparency and Definitions: A Few Thoughts on Regulation (EU) 2019/2088 and Regulation (EU) 2020/852. *European company law*, 18(1), 15-21	1
4	Rajesh, R., Rajendran, C. (2020)	Relating Environmental, Social, and Governance scores and sustainability performances of firms: An empirical analysis. *Business strategy and the environment*, 29 (3), 1247-1267	51
5	Zhan, J.X., Santos-Paulino, A. (2021)	Investing in the Sustainable Development Goals: Mobilization, channeling, and impact. *Journal of international business policy*, 4 (1),166-183	21
6	Harymawan, I., Nasih, M., Agustia, D., Putra, F.K.G., Djajadikerta, H.G. (2022)	Investment efficiency and environmental, social, and governance reporting: Perspective from corporate integration management. *Corporate social responsibility and environmental management*, 29 (5),1186-1202	34

Source: elaborated by authors (WoS tools).

Liang et al. (2022) analyze the implementation of principles of responsible investment by hedge funds and note the positive impact on the effectiveness of their activities. It

leads to the conclusion that regulation reforms are needed to regulate this sector and stimulate management by hedge funds.

Dumrose et al. (2022) investigate the possibilities of the EU taxonomy to regulate differences in ESG rating and emphasize the importance of solving this problem.

Van Oostrum (2021) studies the potential regulation of responsible investment based on the adopted Regulation (EU) 2019/2088 (Disclosure Regulation) and Regulation (EU) 2020/852 (Taxonomy Regulation). The author notes that despite the positive impact of implementing these acts in the legislative field, there is a need for a more precise formulation of definitions and standards for measuring sustainability, as well as the cooperation of various stakeholders to form a regulatory field.

Rajesh & Rajendran investigate the connection between ESG scores and sustainability performances. They identify the need to disclose ESG information for economic benefit and sustainability in the long term.

Zhan & Santos-Paulino, investigating the problem of overcoming the financing gap in achieving Sustainable Development Goals, propose political measures to solve it. In particular, the authors consider options for stimulating investments in Sustainable Development Goals, using various financial instruments, promoting ESG standards and implementing these principles in reporting, national or international investment policies, etc.

2.3 Regulatory framework for responsible investment in Academia: with Biblioshiny

A more in-depth analysis of the publications was carried out using Biblioshiny. The results obtained in the Scopus database (subsection 2.1) were narrowed down to an estimated

number of 2,000 papers based on the following criteria (Figure 2.5).

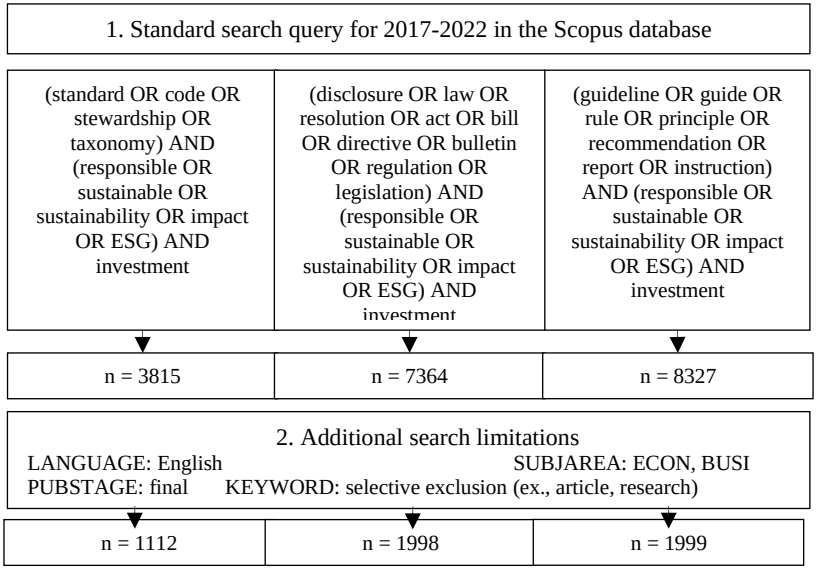


Figure 2.5. Formation of a data array for bibliometric analysis with Biblioshiny

Source: elaborated by authors.

Table 2.15 provides basic descriptive information on metadata in each block Standards and Codes, Laws and Guidelines for responsible investment regulation.

The obtained data indicate a high similarity between the three research areas, which confirms the previous conclusions of the authors. Each array has a similar average age, citations per document, international co-authorship, etc.

Table 2.15. Regulatory framework for responsible investment in Academia over the period 2017-2022: descriptive information

Form	Standards and Codes for responsible investment	Laws for responsible investment	Guidelines for responsible investment
Timespan	2017-2022		
Sources	620	882	920
Documents	1112	2000	2000
References	54495	114807	112056
Annual Growth Rate	8.2%	16.6%	13.7%
Document Average Age	3.3	3.1	3.1
Average citations per document	8.3	9.9	10.3
Authors	2785	5006	5192
Authors of single-authored documents	230	404	395
International Co-Authorship	25.7 %	28.1%	25.5%
Co-Authors per Doc	2.64	2.8	2.8
Author's keywords	3520	6095	6340

Source: elaborated by authors (Biblioshiny tools).

We will use the analysis of keywords that can be presented as a word cloud for Standards and Codes, Laws and Guidelines for responsible investment, shown in Figure 2.6 within the study of the ***Conceptual Structure*** of aggregated data. The resulting clouds are similar because they are built around sustainable development and sustainability keywords, corporate social responsibility, corporate governance, investments and innovations, economic growth, etc.

a) Standards and Codes for responsible investment

b) Laws for responsible investment

c) Guidelines for responsible investment

Figure 2.6. Regulatory framework for responsible investment in Academia: word cloud of keywords

Source: elaborated by authors (Biblioshiny tools).

Clusters were built by keywords co-occurrence in the example of Standards and Codes for responsible investment, which has similar trends with other blocks (Figure 2.7). In summary, 7 clusters are distinguished and represented in different colors on the figure. The red cluster is the largest, which includes general issues related to the regulatory framework for responsible investment, and the green cluster, which has a clearly defined ecological research direction.

The study of the main subject areas of the regulatory framework for responsible investment, carried out thanks to the Thematic Map, is shown in Figure 2.8.

The most promising topics are investments in sustainable development, considering economic and social effects, and research and economic analysis of investments during financial crises for the data on Standards and Codes for responsible investment.

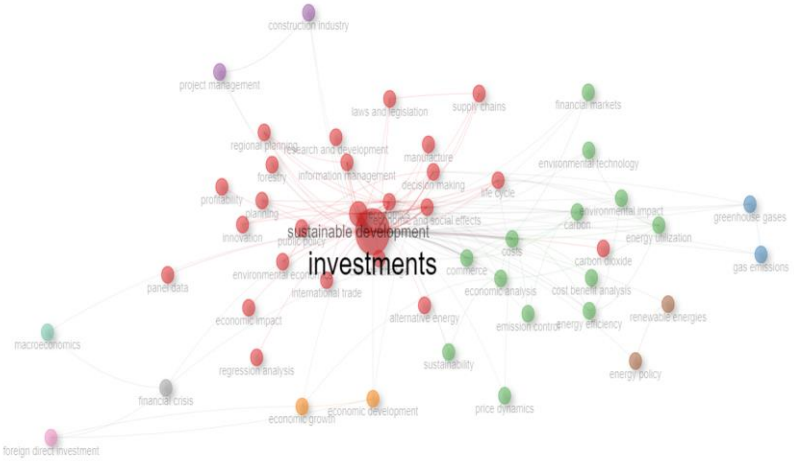
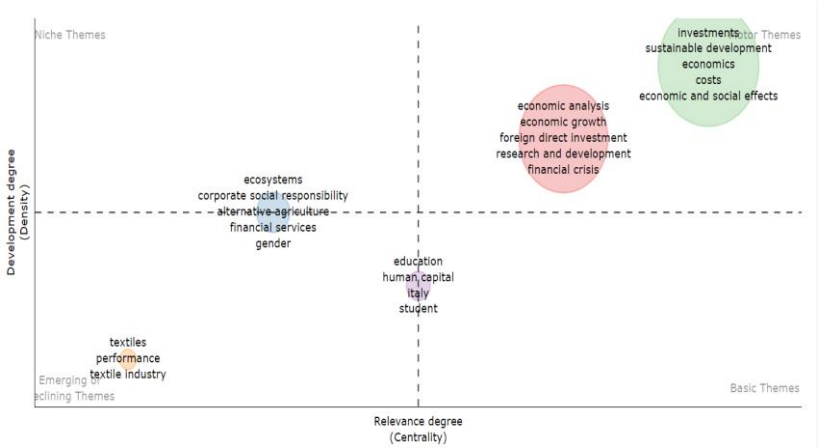
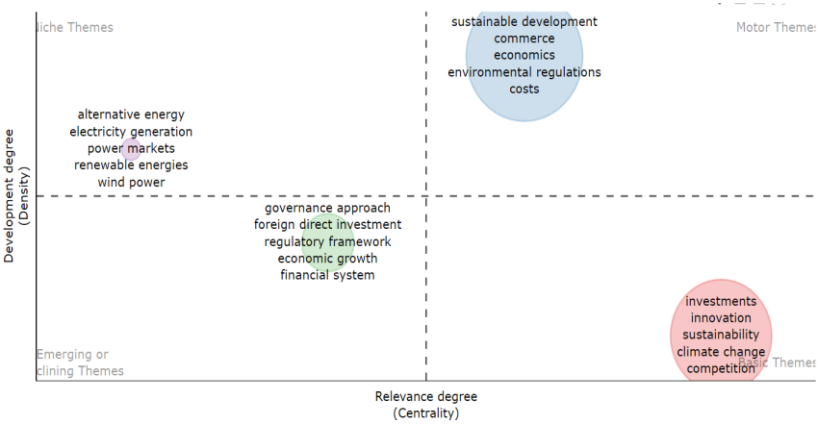


Figure 2.7. Standards and Codes for responsible investment: co-occurrence network

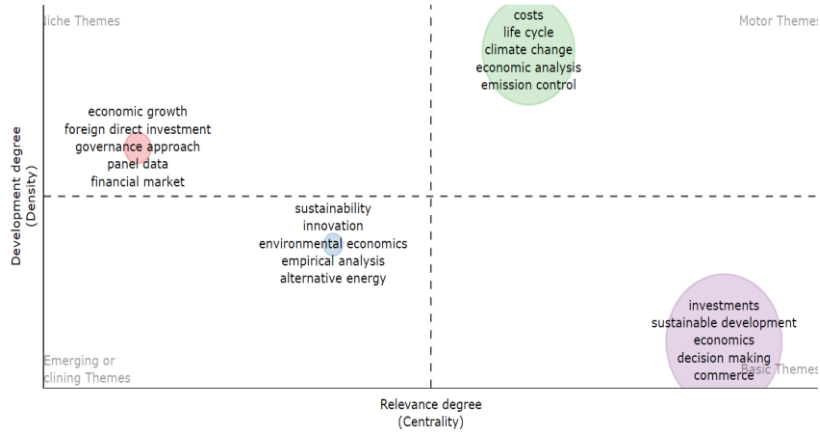
Source: elaborated by authors (Biblioshiny tools).



a) Standards and Codes for responsible investment



b) Laws for responsible investment



c) Guidelines for responsible investment

Figure 2.8. Regulatory framework for responsible investment in Academia: thematic map

Source: elaborated by authors (Biblioshiny tools).

Research on environmental regulation and separate economic issues of responsible investment is most important in the Laws for responsible investment block, climate change, and emission control issues in the Guidelines for responsible

investment block. Issues of regulatory framework and environmental economics belong to Emerging or Declining themes.

Figure 2.9 shows the evolution of thematic clusters for 2017-2022 using Standards and Codes for responsible investment as an example.

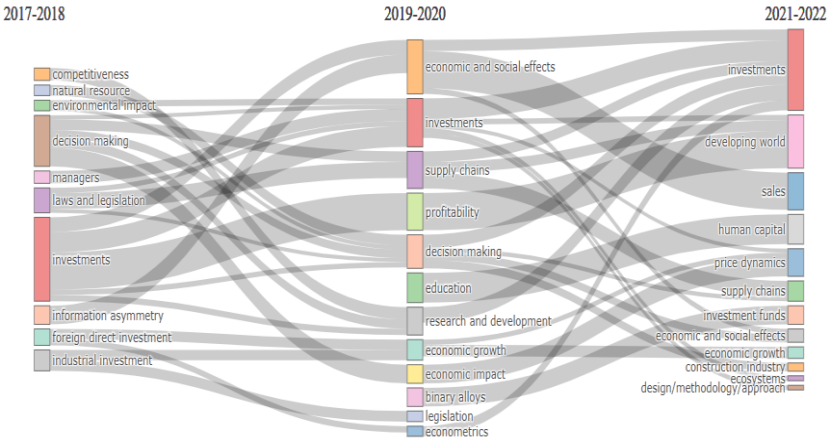
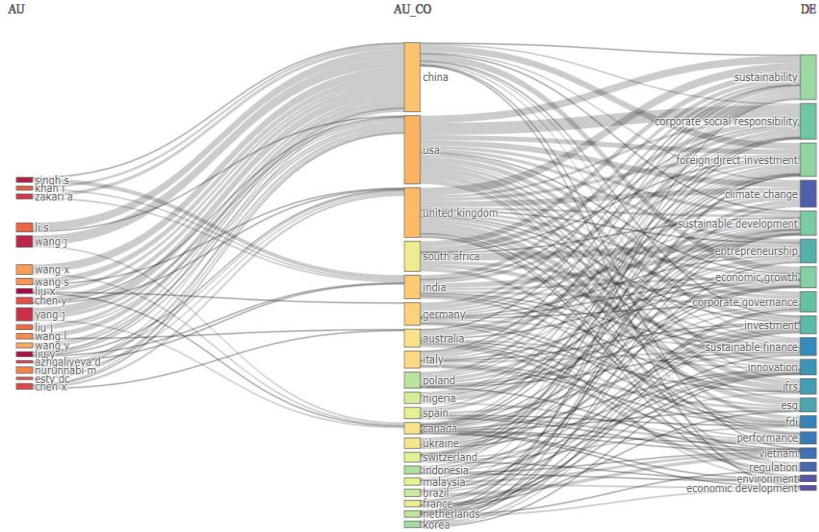


Figure 2.9. Standards and Codes for responsible investment: thematic evolution

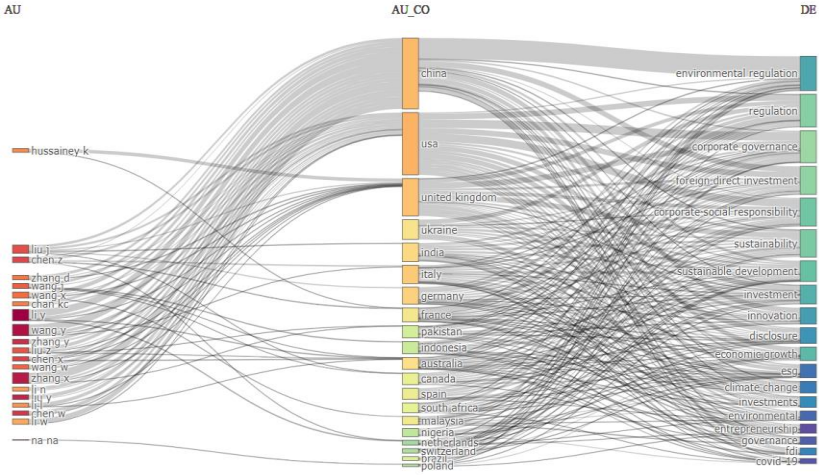
Source: elaborated by authors (Biblioshiny tools).

If, in 2017, issues on competitiveness and investment decisions, responsible investment regulation and environmental impact were discussed at the management level, then in 2019, the economic and social impact of investments, their profitability, and education gained new importance. More global issues of the spreading investments and investment funds globally and in developing countries, sales and price dynamics, human capital development and economic growth have become priority areas in 2022.

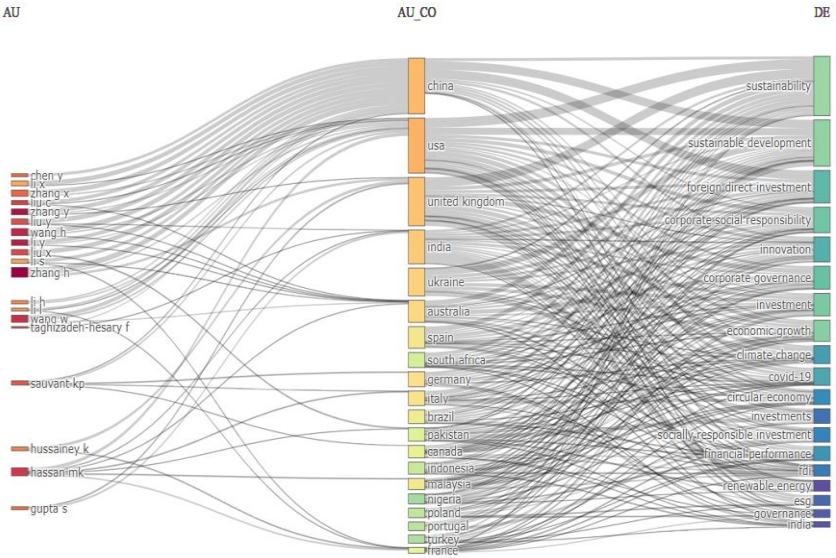
The relationship between authors, their countries of origin and their scientific research (through the prism of keywords from their research) can be traced with the help of a three-field plot (Figure 2.10).



a) Standards and Codes for responsible investment



b) Laws for responsible investment



c) Guidelines for responsible investment

Figure 2.10. Regulatory framework for responsible investment in Academia: three-fields plot among authors (AU), countries (AU_CO) and keywords (DE)

Source: elaborated by authors (Biblioshiny tools).

It becomes clear from the given figure that most authors come from China and the USA. Their research topics are closely related to sustainable development, corporate social responsibility, climate change, environmental regulation and foreign investment.

At the stage of ***Intellectual Structure*** analysis, it should be noted that, on average, the number of citations in the analyzed years had a downward tendency (Figure 2.11), which confirms the data in Table 2.17; the peak came in 2018.

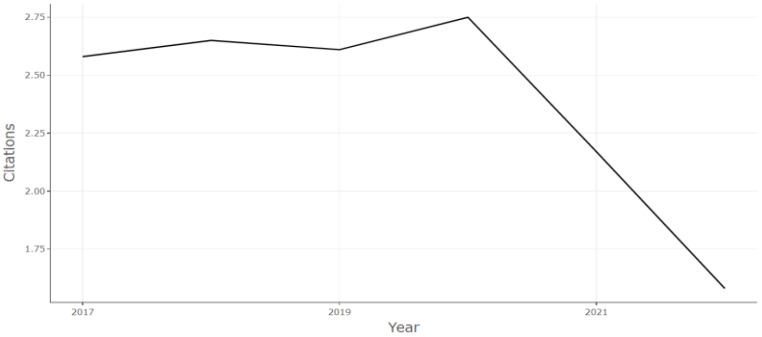


Figure 2.11. Standards and Codes for responsible investment : average citations per year

Source: elaborated by authors (Biblioshiny tools).

A close connection between authors on the subject of research is ensured with the help of the built Co-citation network (Figure 2.12); in particular, three sufficiently branched clusters can be distinguished.

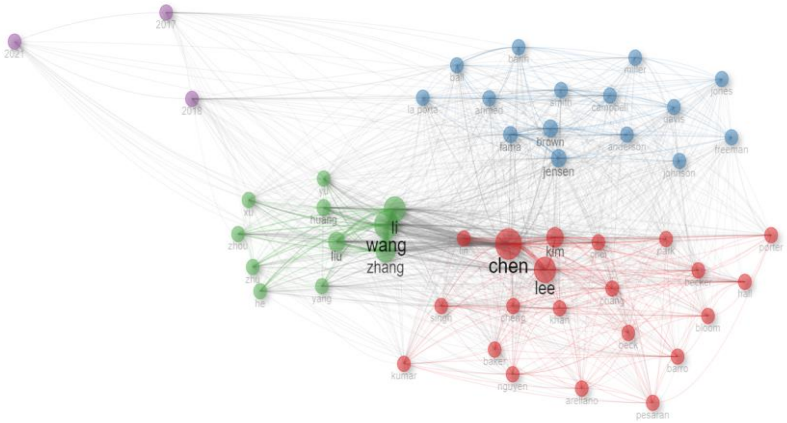


Figure 2.12. Standards and Codes for responsible investment: co-citation network

Source: elaborated by authors (Biblioshiny tools).

Using the example of Standards and Codes for responsible investment, we will examine the authors' productivity through Lotka's Law in Figure 2.13. The constructed graph shows that over 95% of authors have only one publication on this topic; the percentage of authors with two or more publications is relatively small.

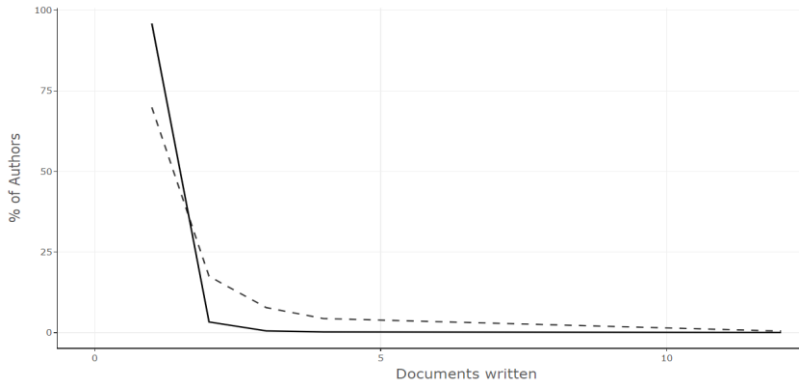


Figure 2.13. Standards and Codes for responsible investment: Author Productivity through Lotka's Law
Source: elaborated by authors (Biblioshiny tools).

Various forms of collaboration are explored within the ***Social structure*** analysis block. Figure 2.14 shows the authors' collaboration, which allows identifying individual scientific schools or research groups that closely cooperate. It included authors with the most significant publications (for example, Liu X., Liu Y., Zakari A., Wang J., Yang J. etc.).

Institutions collaboration is shown in Figure 2.15 and shows the high level of international collaboration between the world's famous universities. In particular, 8 clusters were selected; the largest (blue) included Yale University, the London School of Economics, the University of Cambridge,

the University of North Carolina, the University of Amsterdam, etc.

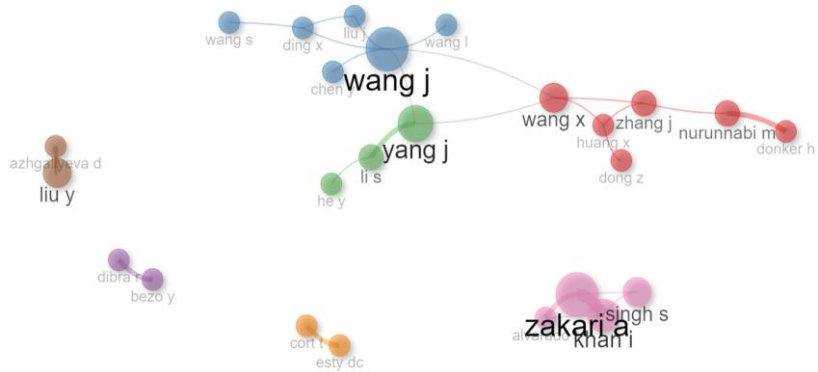


Figure 2.14. Standards and Codes for responsible investment: authors collaboration network

Source: elaborated by authors (Biblioshiny tools).

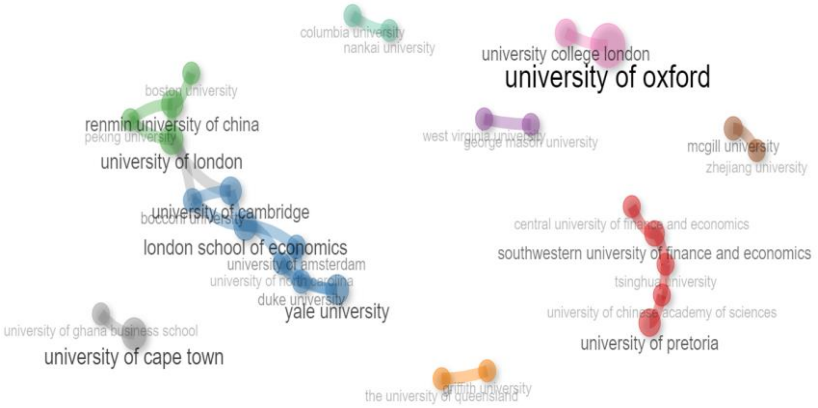


Figure 2.15. Standards and Codes for responsible investment: institutions collaboration network

Source: elaborated by authors (Biblioshiny tools).

The study of areas of countries' collaboration is shown in Figure 2.16.

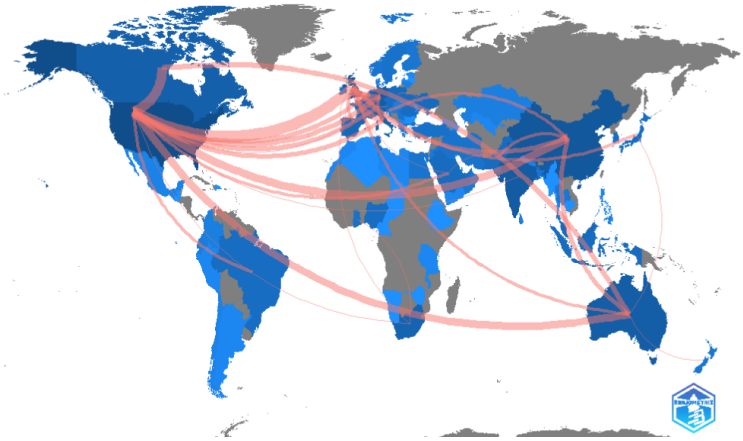


Figure 2.16. Standards and Codes for responsible investment: countries collaboration network
Source: elaborated by authors (Biblioshiny tools).

The interaction scale has a global character because all continents are involved. The results confirm the previous conclusions that the leaders in scientific production are the USA, UK, China, India and Germany. There are many areas of collaboration with the USA because the connection with Europe, China, Canada and Australia can be traced. African countries are active participants in research on the regulatory framework for responsible investment.

2.4 Regulatory framework for responsible investment in Academia: VosViewer keywords co-occurrence and co-authorship analysis

VosViewer software is another tool that builds bibliometric maps for qualitative research using keywords co-occurrence

and co-authorship. The data integrated with the WoS database is used, which is reduced for the capabilities of this analysis; the steps for forming a new array are shown in Figure 2.17.

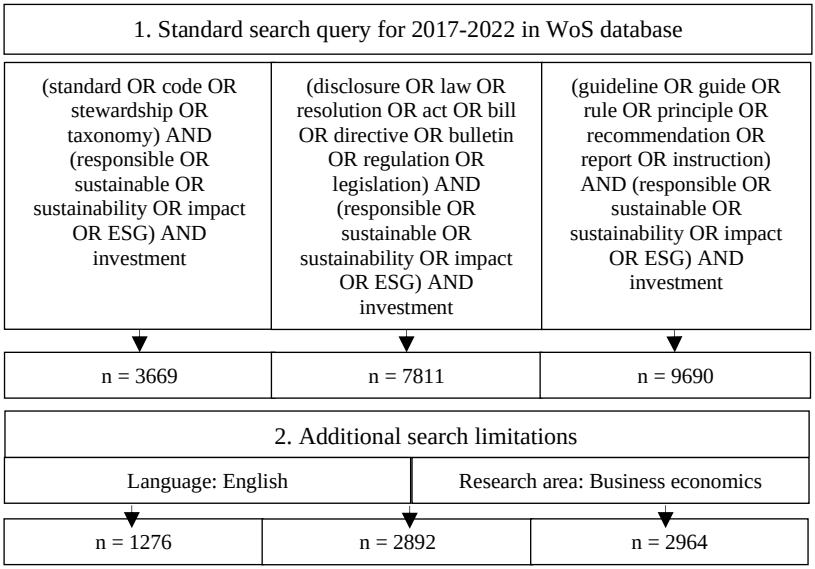
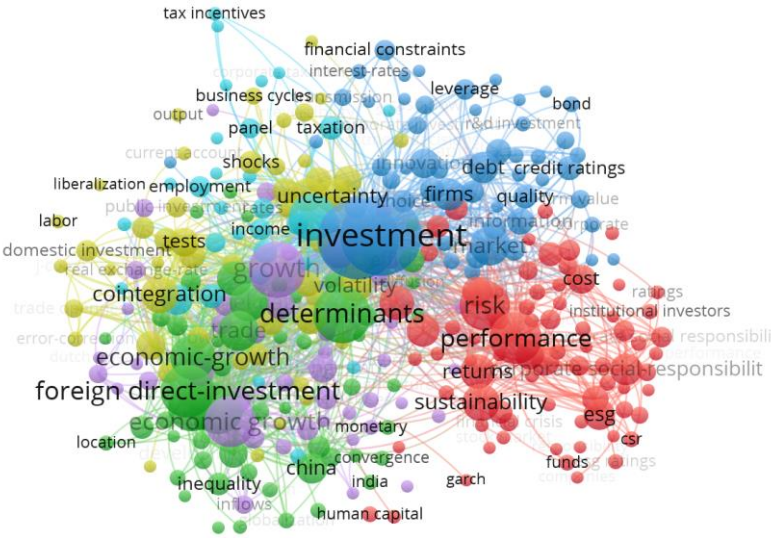


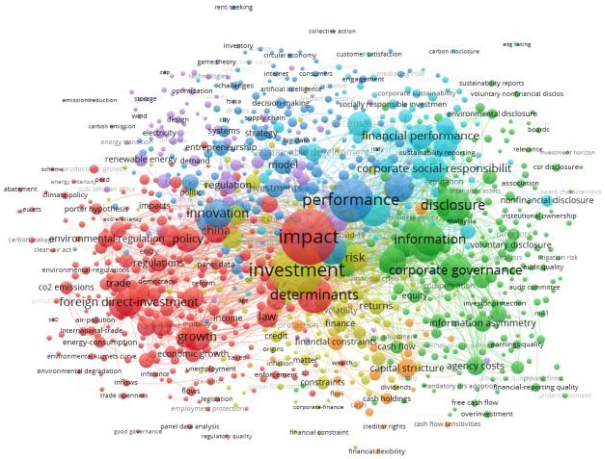
Figure 2.17. Forming a data array for bibliometric analysis with VosViewer

Source: elaborated by authors.

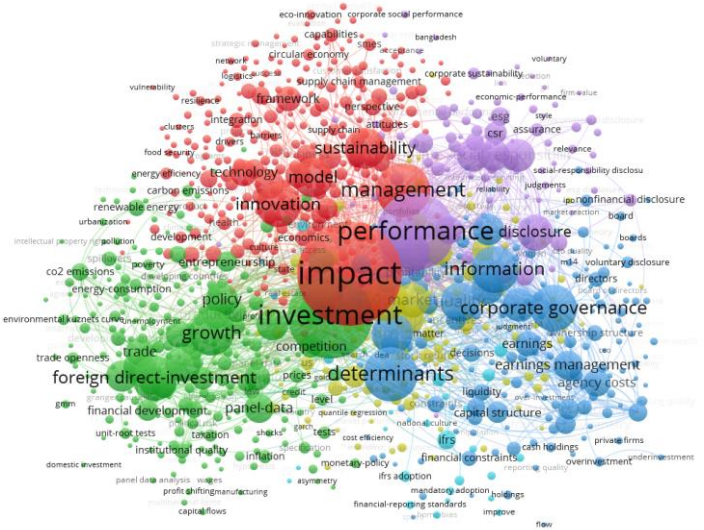
As a result, bibliometric maps for keywords co-occurrence for Standards and Codes, Laws and Guidelines for responsible investment regulation were built based on imported data from the WoS database (Figure 2.18).



a) Standards and Codes for responsible investment regulation
7 clusters 417 items 10914 links



b) Laws and Codes for responsible investment regulation
7 clusters 976 items 40106 links



c) Guidelines and Codes for responsible investment regulation
6 clusters 977 items 36575 links

Figure 2.18. Regulatory framework for responsible investment: bibliometric map by keywords co-occurrence
Source: elaborated by authors (VosViewer tools).

Their parameters are systematized in Table 2.16 for in-depth analysis of map data. They are similar, indicating that they belong to the regulatory framework for responsible investment. Impact, investment, determinants and performance are the most significant terms on each map. In general, it is possible to single out clusters devoted to the issues of drivers and barriers for responsible investment regulation, information asymmetry and reporting standards, features of responsible investment at the firm level and their connection with business models and performance, decision-making processes, etc.

Table 2.16. Regulatory framework for responsible investment: clusters analyses by keywords co-occurrence

Parameters	Standards and Codes for responsible investment	Laws for responsible investment	Guidelines for responsible investment
Cluster 1 Red	Impact determinants, productivity, growth, innovation, openness, convergence, resilience, development, rise in entrepreneurship and employment	Impact determinants, policy and regulations, economic growth and FDI, trade, corruption, eco- and energy efficiency, green finance	Impact determinants, technology, management, sustainability, innovation, drivers and barriers
Cluster 2 Green	Sustainability and SDG, CSR, environmental regulations, green, social, ESG and responsible investments	Information asymmetry, corporate governance, disclosure, accounting and audit quality and standards	Investment policy, capital flows, trade openness, competition, carbon emissions, renewable energy
Cluster 3 Blue	Business cycles, capital structure, fiscal and monetary policy, stock market, volatility and crises	Business models and performance, collaboration, decision-making, innovations, R&D	Corporate governance ownership, earning management, capital structure, acquisitions and mergers
Cluster 4 Yellow	Corporate governance and ownership, acquisitions and mergers, firms performance, stakeholders and stewardship theory	Investment policy, credit risks, returns, volatility, value art risk, profitability, cryptocurrency	Asset allocations. behavioral finance, corporate investments, forecasts,
Cluster 5 Purple	Performance and risks, benefits and barriers, decision-making, portfolio selection and strategies	Environmental issues, energy transition, carbon emissions, renewable energy	CSR, financial and environmental performance, disclosure, ESG, greenwashing
Cluster 6 Sky-blue	Reporting standards, accounting quality and standards, disclosure, financial reporting, information asymmetry, mandatory adoption	CSR, financial and environmental performance, ESG disclosure, greenwashing, sustainable reporting	Accounting and audit quality and standards, financial reporting standards, mandatory adoption, operating perfomance
Cluster 7 Orange	Transparency and trust, politics, governance, laws	Capital structure, corporate finance, financial constraints, political connections	X

Source: elaborated by authors (VosViewer tools).

Among the researched clusters, the most relevant are scientific papers related to Covid-19, green innovations,

sustainable finance, ESG ratings, voluntary disclosure and stewardship. Keywords co-occurrence for Standards and Codes for responsible investment in the time dimension are shown in Figure 2.19.

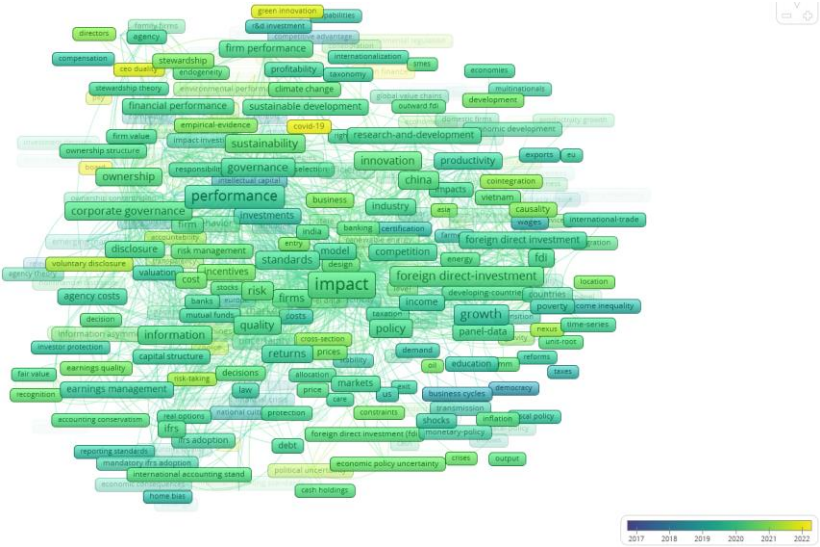
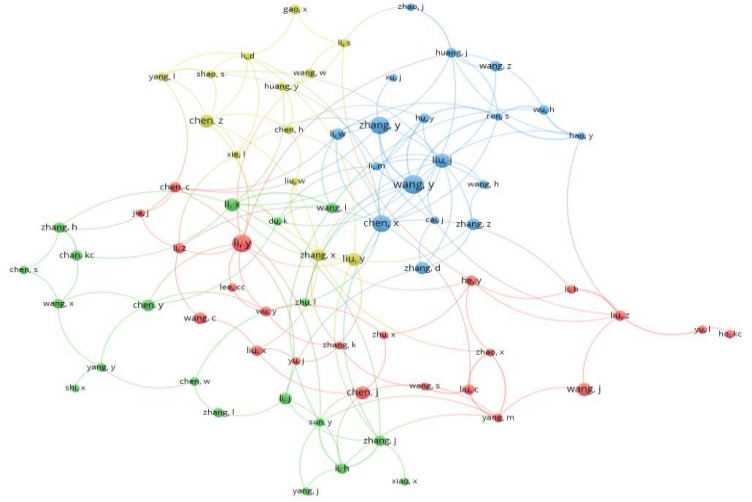


Figure 2.19. Regulatory framework for responsible investment: keywords co-occurrence by time dimension
Source: elaborated by authors (VosViewer tools).

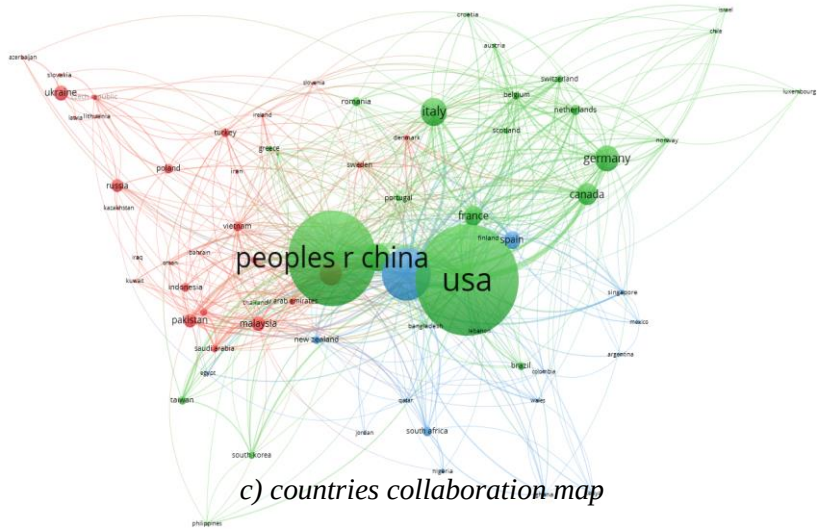
Forms of collaboration between authors, institutions, and countries were revealed (Figure 2.20) in the example of Laws for responsible investment by co-authorship analysis. The presented authors' collaboration map contains 4 clusters and 72 authors, which indicates a high level of collaboration between authors in the context of this topic. It is confirmed by the institutions' collaboration map, which identified 12 clusters out of 269 institutions. The Southwestern University of Finance and Economics (China), Renmin University of China, the

National Bureau of Economic Research (NBER), etc., can be singled out as the most significant.



a) authors collaboration map

b) institutions collaboration map



c) countries collaboration map

Figure 2.20. Regulatory framework for responsible investment: collaboration maps by co-authorship

Source: elaborated by authors (VosViewer tools).

3 clusters have yet to be identified at the level of countries, but they have many ways of international collaboration. The leaders are China, USA and England. A large part of the green cluster is made up of European countries; the red one includes the countries of Eastern Europe and Asia, and the blue cluster is formed by the countries of Africa, Australia, etc.

2.5 Regulatory framework for responsible investment in Academia: Publish or Perish tools

Static analysis of publications in Google Scholar among the most cited 1000 studies was conducted using Publish or Perish software; the results are shown in Table 2.17.

Table 2.17. Regulatory framework for responsible investment over the period 2017-2022: static analysis (among most cited 1000 studies)

№	Metrics	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
		Title words	Key words	Title words	Key words	Title words	Key words
1	Papers	62	580	259	997	115	880
2	Citation	115	≈230 th.	657	≈353 th.	386	≈295 th.
3	Cites per year	9.8	3474.5	109.5	58997.5	64.3	49208.5
4	Cites per paper	2.7	336.8	2.5	355.1	3.4	335.5
5	Author per paper	1.6	2.2	1.6	2.7	2.1	2.8
6	h-index	5	257	13	305	8	296
7	g-index	5	554	20	565	17	528

Source: elaborated by authors (PoP tools).

Laws for responsible investment regulation, which includes disclosures, resolutions, acts, and bills, turned out to be the most popular regarding the number of scientific papers and citations. Fewer results were found for Standards and Codes for responsible investment. Selected search queries within Titles and Keywords were analysed separately, indicating a high scientific interest and significant dissemination of the results for a more comprehensive study. The indicators of citations, h-index and g-index confirm it.

The dynamic analysis allows us to trace an upward tendency in the development of Laws and Guidelines for responsible investment and a downward tendency in Standards and Codes, which confirms the previous conclusions (Figure 2.21).

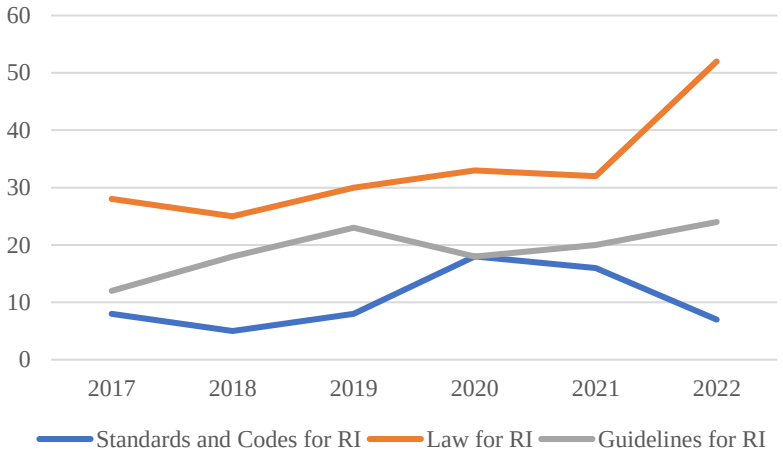


Figure 2.21. Regulatory framework for responsible investment over the period 2017-2022: dynamic analysis (among most cited 1000 studies)

Source: elaborated by authors (Google Scholar tools).

Table 2.18 systematizes the most cited papers on the Regulatory framework for responsible investment in the Google Scholar database according to Publish or Perish analyses.

Tripathy et al. (2020) analyze the development of the system and criteria of the taxonomy of sustainable financing and provide recommendations for forming the Climate Bonds Standard at the EU level. Mandal & Murthy (2021) study the specifics of CSR practice development in India and emphasize the urgent need to form a single model of investor stewardship and ESG reporting.

Dai et al. (2021) examine the connection between foreign direct investment and green innovation, which can be moderated by appropriate environmental regulation at the country level.

Table 2.18. Regulatory framework for responsible investment over the period 2017-2022: the most cited papers

№	Cites	Cites per year	Authors (Year)	Bibliometric
A	1	2	3	4
1	59	11.8	Melane-Lavado, A., Álvarez-Herranz, A., González-González, I. (2018)	Foreign direct investment as a way to guide the innovative process towards sustainability. *Journal of Cleaner Production*, 172, 3578-3590
2	57	28.5	Dai, L., Mu, X., Lee, C.C., Liu, W. (2021)	The impact of outward foreign direct investment on green innovation: the threshold effect of environmental regulation. *Environmental Science and Pollution Research International*. 2021 Jul; 28(26): 34868-34884.
3	46	11.5	Breedt, A., Ciliberti, S., Gualdi, S., Seager, P. (2019)	Is ESG an Equity Factor or Just an Investment Guide? *The Journal of Investing*, *ESG Special Issue*, 28 (2), 32-42.
4	33	33.0	Ellili, N.O.D. (2022)	Impact of ESG disclosure and financial reporting quality on investment efficiency. *Corporate Governance*, 22(5), 1094-1111
5	13	3.25	Tripathy, A., Mok, L., House, K. (2020)	Defining climate-aligned investment: An analysis of sustainable finance taxonomy development. *The Journal of Environmental Investing*, 10(1), 80-96.
6	7	2.33	Mandal, R., Murthy, A. (2021)	CSR in the post pandemic era: the dual promise of ESG investment and investor stewardship, *Indian Law Review*, 5:2, 229-249.

Source: elaborated by authors (PoP tools).

Ellili (2020) proves a positive connection between the disclosure of ESG information and the quality of financial reporting and investment efficiency in the example of the UAE.

Melane-Lavado et al. (2018) provide recommendations on the impact of foreign direct investment on the investment

activities of small and medium-sized enterprises with a focus on sustainability.

Breedt et al. (2019) test the impact of ESG criteria in the stock portfolio on profitability and prove the absence of a clear financial impact but note the social implications.

2.6 Regulatory framework for responsible investment in Academia: with Google tools

The level of interest in the regulatory framework for responsible investment and the main trends in search queries were investigated using Google Trends. Figure 2.22 shows the dynamics of searches characterizing Standards and Codes, Laws and Guidelines for responsible investment regulation and their average value for 2017-2022.

Generally, a stable positive trend is observed for all three search queries with minor fluctuations. The topic of Standards and Codes was the most popular during the analyzed period; the topic of Guidelines for responsible investment had the lowest level of queries.

We will additionally analyze the data using search queries exclusively in Business and Industry; the results are shown in Figure 2.23. The results are similar to the previous ones, with the same distribution of popular topics, a positive trend, etc.

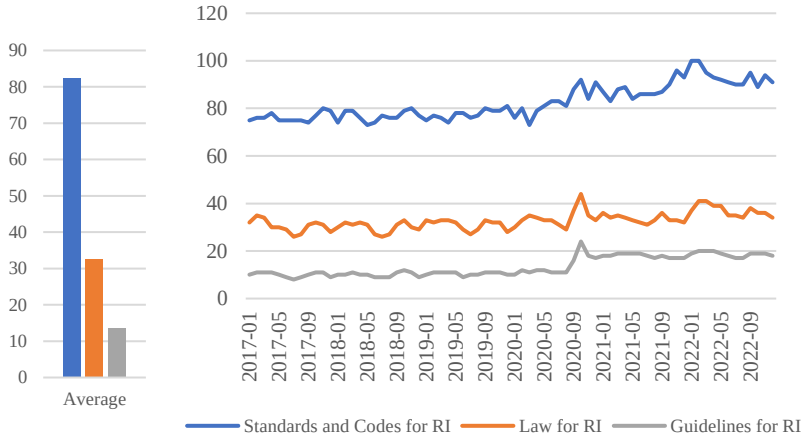


Figure 2.22. Internet queries concerning regulatory framework for responsible investment in 2017-2022

Source: elaborated by authors (Google Trends tools).

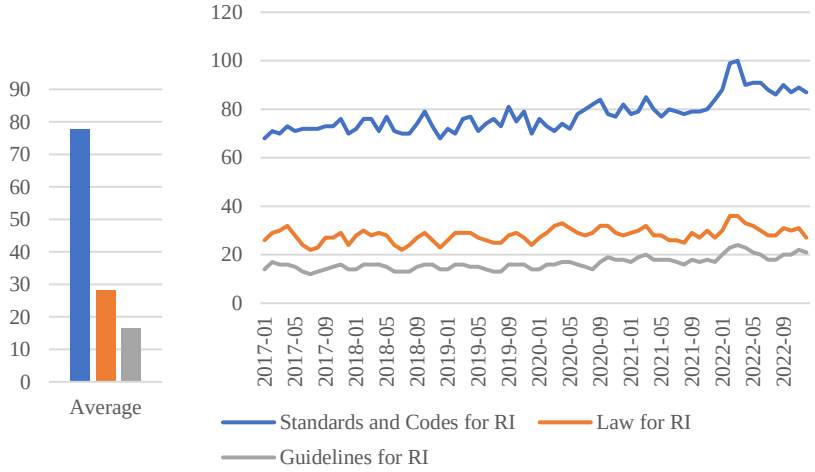


Figure 2.23. Internet queries concerning regulatory framework for responsible investment in 2017-2022: business and industrial areas

Source: elaborated by authors (Google Trends tools).

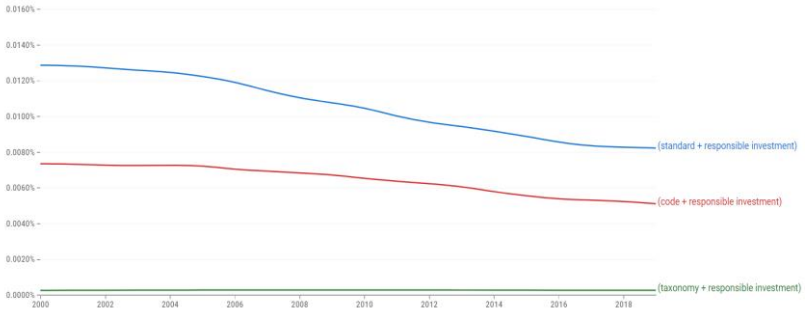
Regarding geography, the most popular topic of Standards and Codes for responsible investment in 2017-2022 was in France, Austria and Belgium, for Laws for responsible investment in Australia, New Zealand, and Ireland, for Guidelines for responsible investment in Chile, Mexico, and Argentina (Table 2.19).

Table 2.19. Internet queries concerning regulatory framework for responsible investment in 2017-2022: top countries

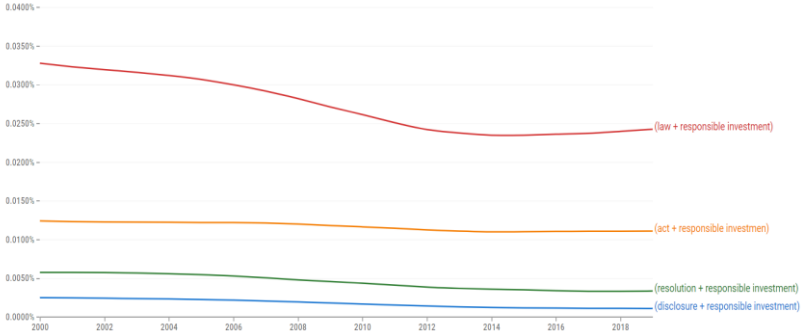
№	Standards and Codes for responsible investment		Laws for responsible investment		Guidelines for responsible investment	
	Country	%	Country	%	Country	%
1	France	88	Australia	40	Chile	36
2	Austria	83	New Zealand	34	Mexico	36
3	Belgium	80	Ireland	33	Argentina	34
4	Saudi Arabia	72	Philippines	32	Colombia	24
5	United Arab Emirates	71	Portugal	32	Russia	21
6	Vietnam	71	Indonesia	29	Spain	20
7	Germany	71	Kenya	28	South Korea	19
8	Pakistan	70	United States	28	Poland	19
9	Netherlands	70	Ghana	28	Brazil	19
10	Nigeria	69	Canada	28	Thailand	19

Source: elaborated by authors (Google Trends tools).

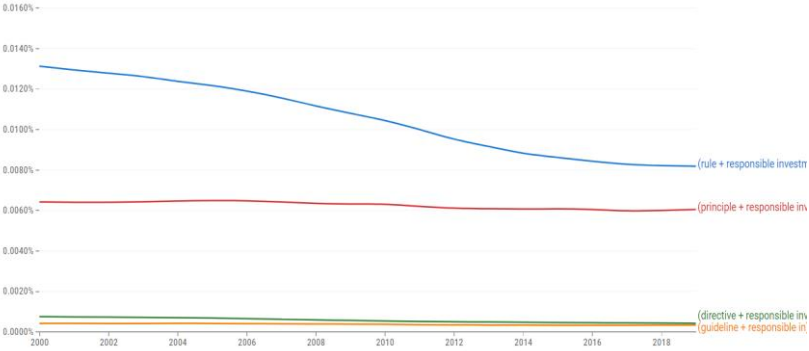
Certain aspects of the regulatory framework for responsible investment were investigated using the Google Ngram tool, which displays the main trends and frequency of use in the Google Books Library (Figure 2.24).



a) Standards and Codes for responsible investment



b) Laws for responsible investment



c) Guidelines for responsible investment

Figure 2.24. Ngram concerning regulatory framework for responsible investment in 2000-2019

Source: elaborated by authors (Google Books Ngram tools).

The resulting graphs show that the phrases regarding standards and codes, laws and acts, and rules and principles within responsible investment regulation topics are the most frequently used in Google Books. At the same time, all analyzed requests had a downward tendency, which stabilized around 2017.

A more in-depth analysis of the most relevant books in the Google Books library is given in Table 2.20.

Table 2.20. Regulatory framework for responsible investment: the most relevant books

№	Authors / Editors (Year)	Bibliometric
1	OECD (2020)	Developing Sustainable Finance Definitions and Taxonomies, Green Finance and Investment, OECD Publishing, Paris. doi:10.1787/134a2dbe-en.
2	Kendall, J., & Sullivan, R. (2022)	Responsible investment in Fixed Income Markets (1st ed.). Routledge. doi:10.4324/9781003055341
3	Alam, S., Bhuiyan, J. H., & Razzaque, J. (Eds.) (2018)	International Natural Resources Law, Investment and Sustainability. Routledge, Taylor and Francis Group. doi:10.4324/9781315726076
4	Chi, M. (2017)	Integrating Sustainable Development in International Investment Law: Normative Incompatibility, System Integration and Governance Implications. United States: Taylor & Francis.
5	Swedroe, L. E., & Adams, S. C. (2022)	Your Essential Guide to Sustainable Investing: How to Live Your Values and Achieve Your Financial Goals with ESG, SRI, and Impact Investing. Harriman House.
6	Krosinsky, C. (2017)	The Short Guide to Sustainable Investing (1st ed.). Routledge. doi:10.4324/9781351275446

Source: elaborated by authors (based on Google Books data).

The OECD (2020) study aims to analyze the existing taxonomy of sustainable finance using the example of five jurisdictions (e.g. EU, France, Japan, etc.). The work provides general recommendations for correctly designing a taxonomy system to achieve Sustainable Development Goals.

The work edited by Kendall & Sullivan (2022) contains a more substantive report on the features of responsible investing for fixed-income investors. It provides recommendations for improving financial indicators and investment sustainability and their role in achieving the SDGs.

A book edited by Alam et al. has a more ecologically oriented research area (2018) because it is based on the international law of natural resources. They provide general and legal recommendations for harmonising policies and principles to achieve sustainable development, particularly the sustainable use of natural resources. Chi (2017) explores the challenges and proposes solutions for aligning international investment agreements with sustainable development goals from conceptual, normative, and governance perspectives.

The book by Swedroe & Adams (2022) has a more journalistic style. However, it is more popular because of this, which provides an overview of responsible investing and its features, as well as general recommendations for potential investors. Krosinsky's guide (2017) is written similarly, breaking down the terminology and offering practical suggestions for creating a sustainable portfolio.

The analysis shows that many papers on the regulatory framework for responsible investment have a legal nature due to their specificity. In addition, there are journalistic papers of a broader nature in which the issues of regulatory framework occupy only a tiny part of the responsible investment issues.

2.7 Regulatory framework for responsible investment in Academia: with Infranodus

The continuation of the research of academic papers from the Google Scholar database carried out in subsection 2.5 uses the InfraNodus toolkit to analyse publications devoted to

various regulatory frameworks for responsible investment. PRI approaches (UNPRI (2023)) were used to codify these conceptual foundations. The types of regulatory instruments, such as ESG disclosure, stewardship codes, taxonomy, regulations, rules, recommendations, etc., are the objects of detailed bibliometric analysis in this chapter.

Search queries about the 1,000 most cited academic publications for 2017-2022 were formulated in this context in the Publish or Perish software product. Titles, keywords and abstracts of publications were used as filtering criteria. Findings for the list of publications were imported to create network graphs in the InfraNodus program.

The constructed network graph (mind map) regarding the regulatory framework for responsible investment regulation is presented in Figure 2.25.

The most significant ideas (clusters of nodes) within the studied mass of publications are the following (in descending order of importance) investment legislation, sustainable development, ESG regulation, and finally, responsible investing.

It is also confirmed by the cluster analysis results (Table 2.21), according to which the cluster of investment legislation (the most significant) has the highest quantitative characteristics of influence.

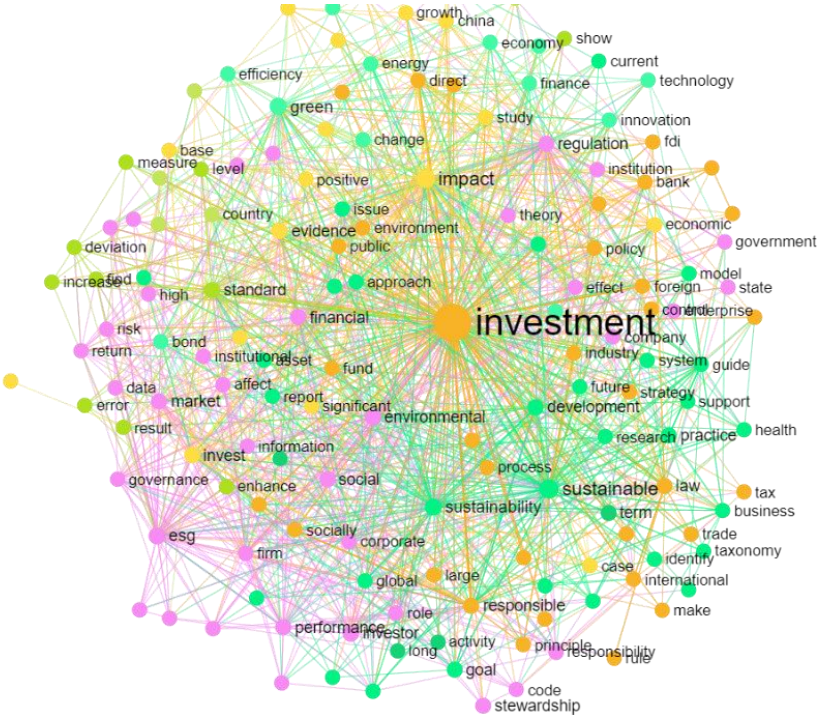


Figure 2.25. Regulatory framework for responsible investment: qualitative analysis of abstract and keywords on mind map
Source: elaborated by authors (InfraNodus tools).

Nodes united by the last idea of responsible investment are closely related to ESG regulation and have the strongest co-occurrences.

Table 2.21. Regulatory frameworks for responsible investment: the most relevant topic cluster, nodes, categories and keywords

Topical Cluster	Influ-ence,%	Total Nodes	Percentage of Entries ,%	Cate-gory	Keywords
1	63	39	38	Investment law	investment, law, term, fdi, enterprise, rule, significant, process, private, bank, capital, initiative, risk, opportunity, policy, public, level, environment
2	15	21	19	Sustainability	sustainable, sustainability, development, practice, goal, solution, support, taxonomy, system, framework, challenge, sdg
3	12	32	24	ESG	esg, environmental, regulation, social, financial, stewardship, investor, performance, role, positive, factor, company, quality, government, disclosure, data, governance, responsibility, relationship, code, corporate
4	2	7	3	RI	standard, responcible, measure, deviation, result

Source: elaborated by authors (InfraNodus tools).

At the same time, if we focus on the types of regulatory instruments (Figures 2.26-2.28), it should be emphasized that the tools presented in scientific papers intersect with the central idea of investment legislation (orange node).

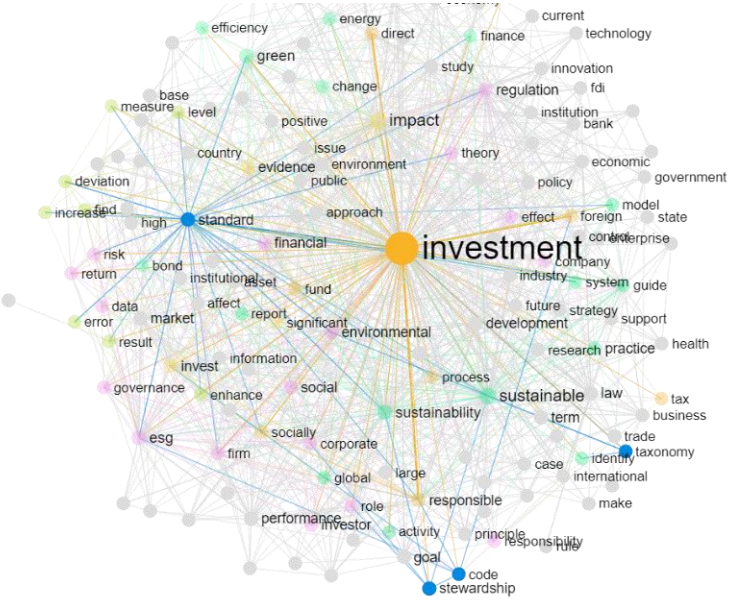


Figure 2.26. Regulatory framework for responsible investment: focus on standard, code, stewardship and taxonomy
Source: elaborated by authors (InfraNodus tools).

In particular, the blue nodes responsible for standard, code, stewardship and taxonomy are located on the mind map's periphery, indicating a relatively low frequency of their mention (Figure 2.26). Among these four types, responsible investment standards are most often encountered in scientific papers, which is confirmed by a more extensive system of nodes and keywords.

It is explained, firstly, by the tendency to standardize responsible investment and the normalization of issues of green, social, sustainability and sustainability-linked bonds ICMA, EU Green Bond Standards, in parallel with the strengthening of global trends to regulate the ESG segment. Secondly, regulatory documents on the disclosure of

information on sustainable development (European Sustainability Reporting Standards, Sustainability Accounting Standards Board Standards, Global Reporting Initiative Standards, International Financial Reporting Sustainability Standards, etc.) by companies and investors are most often found, which creates additional pressure due to the incomparability and inconsistency of these standards.

Blue nodes responsible for disclosure, law, resolution, act, bill, directive, regulation, and legislation as a group of responsible investment regulatory tools are also located on the periphery of the mind map, as in the case of previous tools (Figure 2.27).

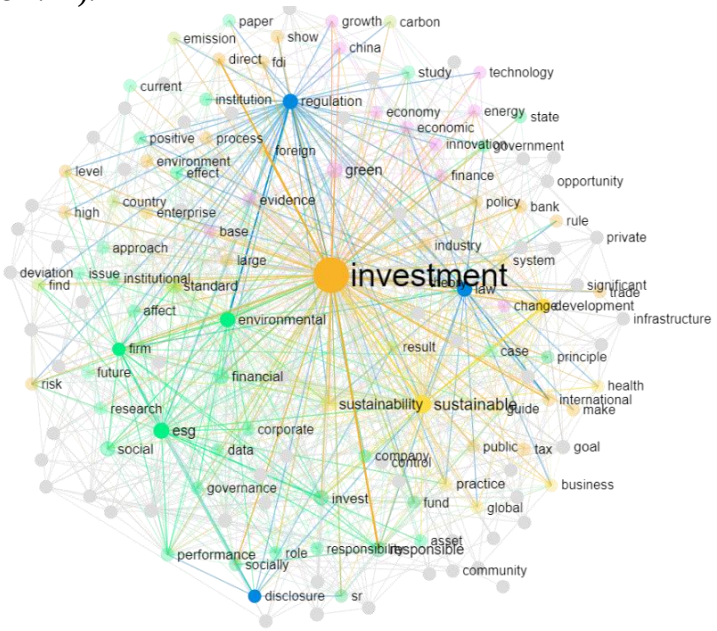


Figure 2.27. Regulatory framework for responsible investment: focus on disclosure, law, resolution, act, bill, directive, regulation, legislation

Source: elaborated by authors (InfraNodus tools).

At the same time, regulation is the most frequently used tool described in scientific papers. For example, recent EU Sustainability Financial Disclosure Regulation changes strengthen the requirements to disclose sustainability risks to financial institutions.

The least attention in scientific papers is given to guideline (guide), rule, principle, recommendation, report and instruction as parts of the regulatory framework for responsible investment (Figure 2.28).

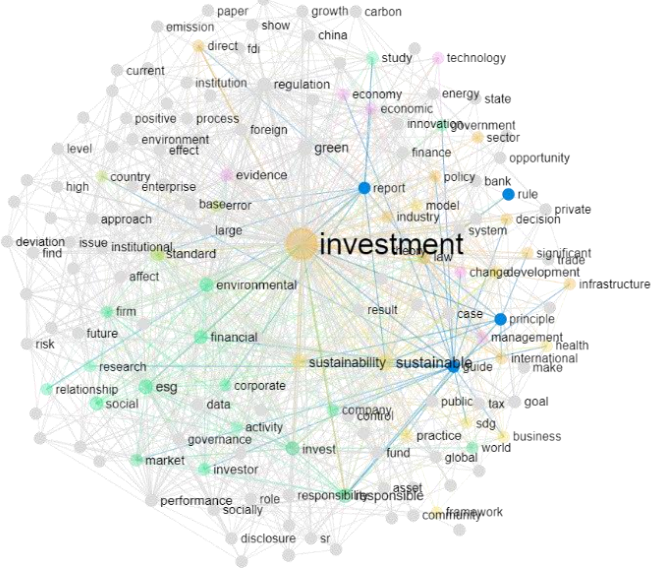


Figure 2.28. Regulatory framework for responsible investment: focus on guideline (guide), rule, principle, recommendation, report and instruction

Source: elaborated by authors (InfraNodus tools).

The analysis of the structural gap and conceptual gateway shows the most significant gap between the sustainability and investment law clusters. Such a gap can become a starting

point for further scientific efforts to improve the regulatory landscape of responsible investing. Technically, the nodes of a structural gap are characterized by a high level of influence (betweenness centrality) on their frequency. These nodes are essential points of change in the narrative.

The evolutionary aspect of the regulatory framework for responsible investment is an essential aspect of analysing the critical nodes in the array of works nvestigated using InfraNodus (Figure 2.29).

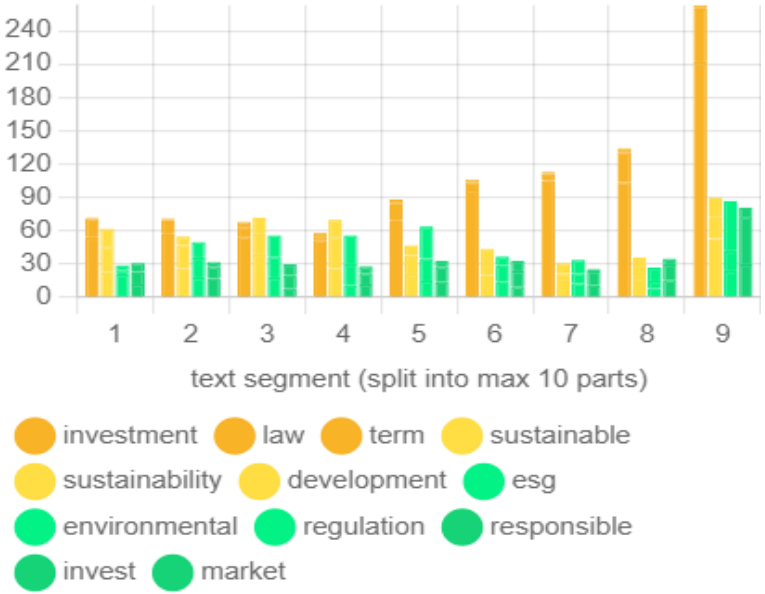


Figure 2.29. Evolution of key words in regulatory framework for responsible investment

Source: elaborated by authors (InfraNodus tools).

As we can see in Figure 2.29, the importance of keywords has increased primarily for the cluster of investment regulation with more than 240 occurrences per text segment.

Thus, forming a regulatory framework for responsible investment by various instruments in sustainability is gaining more and more relevance in scientific papers, which is confirmed by the presence of a structural gap between the most significant clusters.

Appendices
Appendix B

Table B.1. Regulatory framework for responsible investment: top researches

№	Author	Affiliation	Output	FWCI	Citation Count
A	B	C	1	2	3
Standards and Codes for responsible investment					
1	Zakari, A.	Beijing Institute of Technology	5	20.1	149
2	Azhgaliyeva, D.	Asian Development Bank Philippines	4	3.56	89
3	Bin Zaman, S.	Monash University	4	3.82	82
4	Bottero, M. C.	Polytechnic University of Turin	4	5.6	46
5	Dell'Anna, F.	Polytechnic University of Turin	4	5.6	46
6	Esty, D.C.	Yale University	4	1.7	19
7	Getz, K. A.	Tufts University	4	2.55	56
8	Ghazali, M. F.	Universiti Kebangsaan Malaysia	4	0.32	11
9	Kazakova, N. A.	Plekhanov Russian University of Economics	4	1.73	13
10	Khan, I.	Beijing Institute of Technology	4	23.19	133
11	Kruk, M. E.	Harvard University	4	11.21	507
12	Peeling, R.	University of Manitoba	4	1.4	56
13	Qamruzzaman, M.	United International University	4	1.18	21
14	Rahman, Q. S.	International Centre for Diarrhoeal Disease Research Bangladesh	4	3.82	82
15	Salomon, J. A.	Stanford University	4	16.88	855
Laws for responsible investment					
1	Bekun, F. V.	Lebanese American University	29	10.4	756
2	Zaman, K.	The University of Haripur	24	2.49	679
3	Murshed, M.	North South University	22	9.14	1052
4	Shahbaz, M.	Beijing Institute of Technology	22	9.14	2209
5	Udemba, E.N.	Istanbul Gelisim University	22	7.55	504

Continuation of Table B.1

A	B	C	1	2	3
6	Balsalobre-Lorente, D.	University of Castilla-La Mancha	19	9.19	918
7	Lin, B.	Xiamen University	17	3.6	746
8	Nassani, A. A.	King Saud University	16	2.4	353
9	Hao, Y.	Beijing Institute of Technology	15	13.27	1499
10	Abro, M.M. Q.	Mehran University of Engineering & Technology	14	2.2	332
11	Ozturk, I.	University of Sharjah	14	4.24	840
12	Gyamfi, B. A.	Istanbul Ticaret University	13	14.23	255
13	Ridzuan, A. R.	Universiti Teknologi MARA	13	1.43	122
14	Tabash, M.I.	Al Ain University of Science and Technology	13	1.67	75
15	Azam, M.	Abdul Wali Khan University Mardan	12	3.44	466
Guidelines for responsible investment					
1	Dinçer, H.	Istanbul Medipol University	16	11.17	527
2	Yüksel, S.	Istanbul Medipol University	16	11.17	527
3	Murshed, M.	North South University	15	10.11	750
4	Courchamp, F.	Paris-Saclay University	14	6.14	320
5	Taghizadeh-Hesary, F.	Tokai University	13	2.71	157
6	Diagne, C. A.	Research Institute for Development	12	6.96	307
7	Hussainey, K.	University of Portsmouth	12	6.59	241
8	Cuthbert, R. N.	Queen's University Belfast	10	7.01	254
9	Haubrock, P. J.	Gulf University for Science &Technology	10	7.01	254
10	Mahmood, H.	Prince Sattam Bin Abdulaziz University	10	10.92	297
11	Olokoyo, F. O.	Covenant University	10	0.8	27
12	Hromádka, V.	Brno University of Technology	9	0.79	8
13	Nesticò, A.	University of Salerno	9	0.5	21
14	Osabohien, R.	Covenant University	9	1.92	35
15	Tabash, M. I.	Al Ain University of Science and Technology	9	1.58	50

Source: elaborated by authors (Scopus and SciVal tools).

Table B.2. Regulatory framework for responsible investment: top papers in Scopus by relevance

№	Title	Authors, year	Source	Citations
A	B	1	2	3
Standards and Codes for responsible investment				
1	The Influence of Firm Size on the ESG Score: Corporate Sustainability Ratings Under Review	Drempetic, S., Klein, C., Zwergel, B. (2020)	Journal of Business Ethics, 167(2), 333-360	165
2	The Effects of Shareholding of the National Pension Fund on Environmental, Social, Governance, and Financial Performance: Evidence from the Korean Manufacturing Industry	Kim, J., Son, S., Jin, I. (2022)	Sustainability (Switzerland), 14(18), 11788	0
3	Material ESG Outcomes and SDG Externalities: Evaluating the Health Care Sector's Contribution to the SDGs	Consolandi, C., Phadke, H., Hawley, J., Eccles, R.G. (2020)	Organization and Environment, 33(4), 511-533	26
4	Will the Dax 50 ESG Establish the Standard for German Sustainable Investments? A Sustainability and Financial Performance Analysis	Nerlinger, M. (2020)	Credit and Capital Markets, 53(4), 461-491	1
5	EU Green Taxonomy Data - A First Vendor Survey	Hoepner, A.G.F., Schneider, F.I. (2022)	Economists' Voice, 19(2), 221-234	0
6	Appearance or Substance of Stewardship and ESG Reporting? The Challenges of Translating 'Commitment' into Tangible Outcomes	Tilba, A. (2022)	Sustainability Accounting, Management and Policy Journal, 13(5), 1015-1032	0
7	Sustainable Disclosure Versus ESG Intensity: Is There a Cross Effect between Holding and SRI Funds?	D'Apice, V., Ferri, G., Intonti, M. (2021)	Corporate Social Responsibility and Environmental Management, 28(5), 1496-1510	7

Continuation of Table B.2

A	B	1	2	3
8	Creating investment-grade corporate sustainability metrics (Book Chapter)	Esty, D.C. (2020)	Values at Work: Sustainable Investing and ESG Reporting, 51-66	2
9	Sustainable investing at a turning point (Book Chapter)	Esty, D.C., Cort, T. (2020)	Values at Work: Sustainable Investing and ESG Reporting, 3-9	1
10	Corporate Sustainability Disclosure and Investment Efficiency: The Saudi Arabian Context	Kouaib, A. (2022)	Sustainability (Switzerland), 14(21), 13984	2
11	Values at Work: Sustainable Investing and ESG Reporting (Book)	Esty, D.C., Cort, T. (2020)	Values at Work: Sustainable Investing and ESG Reporting, 1-239	7
12	Doing well by doing good: A comparative analysis of ESG standards for responsible investment	Barman, E. (2018)	Advances in Strategic Management, 38, 289-311	6
13	Sustainable Systematic Credit	Diep, P., Pomorski, L., Richardson, S. (2022)	Journal of Fixed Income, 32(1), 61-90	0
14	CSR in the post pandemic era: the dual promise of ESG investment and investor stewardship	Mandal, R., Murthy, A. (2021)	Indian Law Review, 5(2), 229-249	0
15	Private equity and ESG investing (Book Chapter)	Alfonso-Ercan, C. (2020)	Values at Work: Sustainable Investing and ESG Reporting, 127-141	0
Laws for responsible investment				
1	Keeping Promises? Mutual Funds' Investment Objectives and Impact of Carbon Risk Disclosures	Nofsinger, J.R., Varma, A. (2022)	Journal of Business Ethics (Article in Press)	0

Continuation of Table B.2

A	B	1	2	3
2	Evolution of ESG reporting frameworks (Book Chapter)	Bose, S. (2020)	Values at Work: Sustainable Investing and ESG Reporting, 13-33	10
3	Responsible investment and the Disclosure of ESG Information in the Companies' Integrated Reports	Ching, H.Y. (2020)	World Sustainability Series, 449-463	2
4	The effects of environment, society and governance scores on investment returns and stock market volatility	Meher, B.K., Hawaldar, I.T., Mohapatra, L., Spulbar, C., Birau, R. (2020)	International Journal of Energy Economics and Policy, 10(4), 234-239	9
5	The preventive character of disaster law: Tax incentives in environmental, social, and governance (ESG) investments as a risk mitigation mechanism	Coleta Eisaqui, D.D., Brasil, D.R. (2021)	Brazilian Journal of International Law, 18(2), 212-233	0
6	Enterprise ESG Information Disclosure and Financing Restriction	Lirou, J. (2022)	Conference Proceedings of the 10th International Symposium on Project Management, China, ISPM 2022, 1384-1394	0
7	Incorporating ESG in Decision Making for Responsible and Sustainable Investments using Machine Learning	Twinamatsiko, E., Kumar, D. (2022)	Proceedings of the International Conference on Electronics and Renewable Systems, ICEARS 2022, 1328-1334	3
8	Harnessing investor interest in sustainability: The next frontier in environmental information i regulation	Esty, D.C., Karpilow, Q. (2019)	Yale Journal on Regulation, 36(2), 625-692	10

Continuation of Table B.2

A	B	1	2	3
9	Sustainability and finance: utopian oxymoron or achievable companionship?	Bodellini, M., Singh, D. (2021)	Law and Economics Yearly Review, 10, 163-188	0
10	Fundamental ratios as predictors of ESG scores: a machine learning approach	D'Amato, V., D'Ecclesia, R., Levantesi, S. (2021)	Decisions in Economics and Finance, 44(2), 1087-1110	5
11	Market reaction to mandatory nonfinancial disclosure	Grewal, J., Riedl, E.J., Serafeim, G. (2019)	Management Science, 65(7), 3061-3084	92
12	Impact of ESG disclosure and financial reporting quality on investment efficiency	Ellili, N.O.D. (2022)	Corporate Governance (Bingley), 22(5), 1094-1111	22
13	Financial firm's performance: a comparative analysis based on ESG metrics and net zero legislation	Díaz-Peña, L.D.C., Castillo Delgadillo, V.M., Mario Iván, C.-V. (2022)	Journal of Sustainable Finance and Investment (in Press)	0
14	Relationships between ESG Disclosure and Economic Growth: A Critical Review	Hassani, B.K., Bahini, Y. (2022)	Journal of Risk and Financial Management, 15(11), 538	1
15	Does Business Group's Conscious of Social Responsibility Enhance its Investment Efficiency? Evidence from ESG Disclosure of China's Listed Companies	Hai, M., Fang, Z., Li, Z. (2022)	Sustainability (Switzerland), 14(8), 4817	7
Guidelines for responsible investment				
1	Rating the raters: Evaluating how ESG rating agencies integrate sustainability principles	Escrig-Olmedo, E., Fernández-Izquierdo, M., Ferrero-Ferrero, I., Rivera-Lirio, J.M., Muñoz-Torres, M.J. (2019)	Sustainability (Switzerland), 11(3), 915	109

Continuation of Table B.2

A	B	1	2	3
2	Evaluation of strategic and financial variables of corporate sustainability and ESG policies on corporate finance performance	Weston, P., Nnadi, M. (2021)	Journal of Sustainable Finance and Investment (in Press)	16
3	Sustainable investing in the US and European insurance industry: a text mining analysis	Gatzert, N., Reichel, P. (2022)	Geneva Papers on Risk and Insurance: Issues and Practice (in Press)	0
4	Integrating ESG factors in investment decisions by mutual fund managers: A case of selected Johannesburg Stock Exchange-listed companies	Fakoya, M.B., Malatji, S.E. (2020)	Investment Management and Financial Innovations, 17(4), 258-270	1
5	What about investors? ESG analyses as tools for ethics-based AI auditing	Minkkinen, M., Niukkanen, A., Mäntymäki, M. (2022)	AI and Society (in Press)	9
6	A Multidimensional Approach of Corporate Sustainability Ranking	Alajaji, S.A., Al-Fadhel, H., Perez-Gladish, B., Masri, H. (2023)	2023 International Conference on Cyber Management and Engineering, CyMaEn 2023, 97-102	0
7	Measuring the sustainability of investment funds: A critical review of methods and frameworks in sustainable finance	Popescu, I.-S., Hitaj, C., Benetto, E. (2021)	Journal of Cleaner Production, 314, 128016	17
8	ESG Investing as a Corporate Sustainability Factor	Muraveva, N., Chumachenko, E., Glyzina, M., Zhabin, E. (2022)	Lecture Notes in Networks and Systems, 380 LNNS, 577-583	0

Continuation of Table B.2

A	B	1	2	3
9	ESG Awareness and Perception in Sustainable Business Decisions: Perspectives of Indian Investment Bankers vis-à-vis Selected European Financial Counterparts	Sinha, R., Datta, M., Zioło, M. (2020)	Springer Proceedings in Business and Economics, 261-276	1
10	Long-term sustainable investment for retirement	Owadally, I., Mwizere, J.-R., Kalidas, N., Murugesu, K., Kashif, M. (2021)	Sustainability (Switzerland), 13(9), 5000	1
11	Sustainable Investment Strategies (Book Chapter)	[No author name available] (2012)	Sustainable Investing for Institutional Investors: Risks, Regulations and Strategies, 15-41	0
12	Sustainable and responsible investment (SRI) in South Africa: A limited adoption of environmental criteria	Giamporcaro,S., Pretorius, L. (2012)	Investment Analysts Journal, 75(1), 1-19	16
13	ESG awareness and perception in sustainable business decisions: Perspectives of indian investment bankers vis-à-vis selected European financial counterparts	Sinha, R., Datta, M., & Zioło, M. (2020)	Springer Proceedings in Business and Economics, 261-276	1
14	Do responsible investors invest responsibly?	Brandon, R. G., Glossner, S., Krueger, P., Matos, P., & Steffen, T. (2022).	Review of Finance, 26(6), 1389-14324	4
15	The optimal solution of ESG portfolio selection models that are based on the average ESG score	Shushi, T. (2022)	Operations Research Letters 50(5), 513-516	0

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CHAPTER 3 BENCHMARKS IN RESPONSIBLE INVESTMENT REGULATION: RESEARCH GAP

3.1 Benchmarks in responsible investment regulation in Academia: Scopus and SciVal tools

Developing benchmarks in financial markets is essential because they ensure the transparency of investment activities and form the basis for making informed and responsible investment decisions. It has led to the development of an entire sector of rating agencies or other similar ESG entities of the financial ecosystem (Boffo & Patalano, 2020). They evaluate companies' activities based on the information disclosure demonstrating sustainable development principles' implementation and form ESG scores depending on impact or risk (Mazzacurati et al., 2021).

According to the generalized data of Mooij (2017), in addition to numerous responsible investment ratings, there were more than 500 rankings, 170 responsible investment-related indices, 120 voluntary standards, etc. In addition, there are alternative forms, such as analytical reviews and judgments regarding the disclosure of ESG information or its relevance, impact on credit ratings, etc. (Mazzacurati et al., 2021). According to KPMG (2020), the number of rating providers forming these benchmarks was about 125-150, of which 10-15 are considered the most powerful (Sustainability, 2020).

Many benchmarks have different calculation methodologies with key indicators, metrics, and value judgments, so the issue of results comparability and interpretation is still open (Searcy & Buslovich, 2014).

According to the ESG Global Study (2022), information asymmetry is the most significant challenge to implementing responsible investment practices. It appears in problems of data

availability and consistency in responsible investment, contradictory and outdated ratings, low transparency of benchmarks and indices, etc. The need for more standardization and unified legal regulation of responsible investment and its assessment by rating agencies also aggravates the situation. It confirms the relevance and significance of studying existing benchmarks in the standardization and systematization of the responsible investment sector (Plastun, et al., 2023, Suresha et al., 2022).

According to the research of Plastun et al. (2019), the key benchmarks of responsible investing include such generalized categories as:

– ratings, which are understood as a score based on the results of the company's activity or its compliance with specific criteria (for example, MSCI ESG Ratings, RepRisk Ratings, ISS ESG rating, Vigeo Eiris, GISR, etc.);

– ranking as an arrangement of companies according to some specific attribute (for example, The RobecoSAM Country Sustainability Ranking, ESG Country Rating, The Sustainability Yearbook Rankings, etc.);

– indexes, that is, established indicators that measure specific performance results (for example, DJSI, FTSE Indexes, S&P LargeMidCap Indexes, Ethibel Sustainability Index (ESI) etc.).

They are the basis of the subsequent bibliometric analysis, in which the authors form the following search queries in scientometric databases, particularly in Scopus and SciVal, per the rules of syntax (Table 3.1). The research period is 2017-2022.

The first query has the broadest meaning, as it should cover the specific subspecies listed below (ratings, rankings, and indexes). At the same time, all categories are closely related and may intersect.

Table 3.1. Formation of search queries for bibliometric research in Scopus and SciVal

Group name	Detailed search query
Benchmarks in responsible investment regulation	benchmarks AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment
Ratings in responsible investment regulation	rating AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment
Rankings in responsible investment regulation	ranking AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment
Indexes in responsible investment regulation	index AND (responsible OR sustainable OR sustainability OR impact OR ESG) AND investment

Source: elaborated by authors.

The study of benchmarks in responsible investment regulation based on static analysis indicates a high level of scientific interest in this issue (Table 3.2). The story of citations for all research areas except rankings is higher than the average global indicator, a high level of international collaboration is observed, and the number of topics and thematic clusters is sufficiently robust.

Table 3.2. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: static analysis

Research area	Field-Weighted Citation Impact	Field-Weighted International Collaboration	Topics	Topics cluster
Benchmarks in responsible investment regulation	1.23	282	603	241
Ratings in responsible investment regulation	1.73	1755	1979	460
Rankings in responsible investment regulation	0.76	484	782	298
Indexes in responsible investment regulation	1.35	1394	1508	430

Source: elaborated by authors (SciVal tools).

The results of the dynamic analysis in 2017-2020 are given in Table 3.3. In total, the number of publications exceeds more than 13,000 papers with more than 128,000 citations. The issues of ratings and indices in responsible investment regulation are the most widespread in the scientific literature. Note that although benchmarks in the conceptual and categorical sense should be the broadest category, the results of static and dynamic analysis refute this claim. A gradual increase in publications in all areas is noted for the analyzed five years, while citations in 2022 decreased significantly. It is primarily due to the incomplete inclusion of information for 2022 in the SciVal database, which is currently being refined.

Table 3.3. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: dynamic analysis

	Overal	2017	2018	2019	2020	2021	2022
Benchmarks in responsible investment regulation							
Output	1056	145	137	150	198	197	229
Citations	9442	2325	1639	1628	1809	1339	702
Ratings in responsible investment regulation							
Output	6551	766	880	982	1195	1302	1426
Citations	56580	12111	10712	11282	11271	7621	3583
Rankings in responsible investment regulation							
Output	1485	153	190	214	272	285	371
Citations	15455	1704	5072	2386	3036	2279	978
Indexes in responsible investment regulation							
Output	4889	436	532	657	860	1066	1338
Citations	47229	8461	7614	9244	9639	8148	4123

Source: elaborated by authors (Scopus and SciVal tools).

The distribution of studies by subject area is given in Table 3.4. Most of them are concentrated in Economic (Economics, Econometrics and Finance, Business, Management and Accounting), Social and Environmental Sciences. Energy and Engineering Sciences are among the top five positions,

indicating a high level of multidisciplinarity in the selected issues.

Table 3.4. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: structural analysis by subject area

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Area	%	Area	%	Area	%
1	Economics, Econometrics and Finance	40.8	Social Sciences	26.4	Environmental Science	30.4
2	Environmental Science	37.4	Engineering	25.6	Economics, Econometrics and Finance	24.8
3	Social Sciences	34.1	Environmental Science	24.9	Social Sciences	23.1
4	Business, Management and Accounting	32.0	Business, Management and Accounting	21.1	Business, Management and Accounting	22.8
5	Energy	15.4	Energy	19.4	Engineering	19.8

Source: elaborated by authors (Scopus and SciVal tools).

An analysis of existing scientific research by geographical origin and institutional affiliation is given in Table 3.5. The most significant number of publications on benchmarks in responsible investment regulation was published in the USA, China, the United Kingdom and India. Institutionally, most institutions belong to China, for example, the University of Chinese Academy of Sciences. Harvard University, CNRS, Islamic Azad University, etc., are also among the leaders.

Table 3.5. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: top countries and institutions

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Country	Institution	Country	Institution	Country	Institution
1	USA	Chinese Academy of Sciences	USA	Chinese Academy of Sciences	China	Chinese Academy of Sciences
2	China	CNRS	China	Harvard University	USA	University of Chinese Academy of Sciences
3	UK	Russian Academy of Sciences	India	Islamic Azad University	India	CAS - Institute of Geography Sciences and Natural Resources Research
4	India	University of Chinese Academy of Sciences	UK	Istanbul Medipol University	UK	North China Electric Power University
5	Australia	Tsinghua University	Australia	CNRS	Brazil	Wuhan University
6	Russia	University of Oxford	Canada	Hong Kong Polytechnic University	Australia	Tsinghua University
7	Germany	Covenant University	Italy	Johns Hopkins University	Italy	University of Sao Paulo
8	Italy	Financial Academy of the RF Government	Spain	University of British Columbia	Spain	Beijing Normal University

Source: elaborated by authors (Scopus and SciVal tools).

Figure 3.1 shows the location of the top 100 institutions worldwide that researched benchmarks in responsible investment regulation. Most are concentrated in the USA, China, the United Kingdom, Australia, etc. The number of such

institutes is minor in Europe, particularly in Portugal (the University of Coimbra, the University of Lisbon) and the Netherlands (the University of Groningen, Wageningen University & Research); isolated ones are found in France, Switzerland etc. The map also shows the gradual involvement of other countries in Africa, Latin America, and Asia.

Figure 3.1. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: top 100 institutions

Source: elaborated by authors (SciVal tools).

It is appropriate to single out Sustainability, Journal of Cleaner Production, Energies, etc., among Scopus journals that published the most papers on benchmarks in responsible investment regulation (Table 3.6). Their topics relate to sustainable development and environmental and energy problems.

Table 3.6. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: top Scopus journals

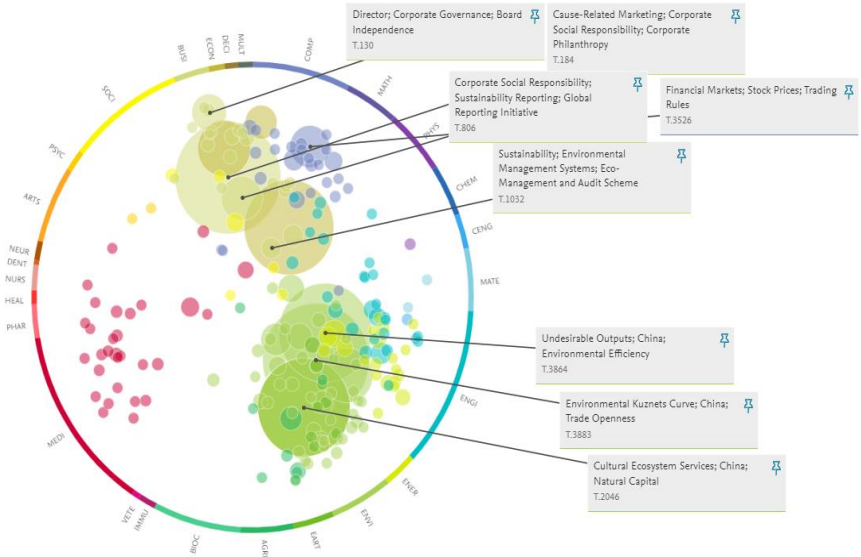
№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Journal	№	Journal	№	Journal	№
1	Sustainability	281	Sustainability	70	Sustainability	247
2	Journal of Cleaner Production	168	Energies	25	Journal of Cleaner Production	107
3	IOP Conference Series: Earth and Environmental Science	103	Journal of Cleaner Production	24	Environmental Science and Pollution Research	63
4	Energy	68	Energy	18	International Journal of Environmental Research and Public Health	53
5	E3S Web of Conferences	61	Environmental Science and Pollution Research	13	Resources Policy	52

Source: elaborated by authors (Scopus tools).

Appendix C, Table C.1 presents the most productive authors on benchmarks in responsible investment regulation. Among them, it is advisable to highlight Yoshino, N. (Keio University), Taghizadeh-Hesary, F. (Tokai University), Dinçer, H. and Yüksel, S. (Istanbul Medipol University), Dutta, A. (University of Vaasa), Bouri, E. (Lebanese American University) etc.

Figure 3.2 shows the top 1% topics in benchmarks in responsible investment regulation by prominence. So, the most significant issues in the economic sphere concern corporate social responsibility and sustainable development, sustainable reporting, corporate philanthropy, corporate governance, eco-management, financial markets and stock prices, etc. In

addition to the above, there are many more topics in various subject areas of a multidisciplinary nature.



Note COMP Computer Science; MATH Mathematics; PHYS Physics and Astronomy; CHEM Chemistry; CENG Chemical Engineering; MATE Materials Science; ENGI Engineering; ENER Energy; ENVI Environmental Science; EART Earth and Planetary Sciences; AGRI Agricultural and Biological Sciences; BIOC Biochemistry, Genetics and Molecular Biology; IMMU Immunology and Microbiology; VETE Veterinary; MEDI Medicine; PHAR Pharmacology, Toxicology and Pharmaceutics; HEAL Health Professions; NURS Nursing; DENT Dentistry; NEUR Neuroscience; ARTS Arts and Humanities; PSYC Psychology; SOCI Social Sciences; BUSI; Business, Management and Accounting ECON Economics, Econometrics and Finance; DECI Decision Sciences; MULT Multidisciplinary.

Figure 3.2. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: Top 1% Topics by Prominence

Source: elaborated by authors (SciVal tools).

Keyphrase analysis allows us to form an idea about research related to ratings, rankings and indices in responsible investment regulation, details in Figure 3.3.

Figure 3.3. Benchmarks in responsible investment regulation in SciVal: keyphrase analysis

Source: elaborated by authors (SciVal tools).

Similar and different trends are observed based on the obtained keyword clouds. Investment, sustainability, corporate social responsibility, economic and social growth, as well as

more specific terms related to the activities of firms, the specifics of investment decision-making, risks and benefits of responsible investment, etc., are the keywords that are most frequently found in scientific research on the selected issue.

Figure 3.4 shows new topics formed in recent years and with the highest level of relevance in scientific circles. Almost all of them are related to various aspects of the impact of Covid-19 (for example, on financial markets, food security, and environmental issues), the emergence of the cryptocurrency market, the development of artificial intelligence and robotics, etc.

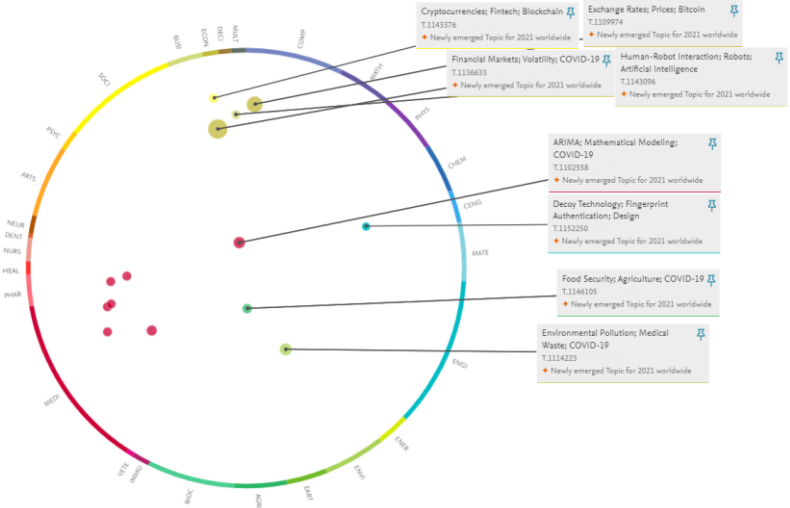


Figure 3.4. Newly emerged topics for benchmarks in responsible investment regulation in 2021

Source: elaborated by authors (SciVal tools).

Table 3.7 shows the top 5 thematic clusters and their prominence percentile in ratings, rankings and indices in responsible investment regulation. They contain similar results, including Monetary Policy; Economic Growth; Exports,

Corporate Social Responsibility; Corporate Governance; Firms, Electricity; Energy; Economics, Models; Risks; Finance, etc.

Table 3.7. Benchmarks in responsible investment regulation in SciVal over the period 2017-2022: the most relevant topic clusters and their prominence percentile (%)

Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
Cluster	%	Cluster	%	Cluster	%
Monetary Policy; Economic Growth; Exports	94.72	Electricity; Energy; Economics	99.47	Models; Risks; Finance	94.11
Corporate Social Responsibility; Corporate Governance; Firms	97.65	Corporate Social Responsibility; Corporate Governance; Firms	97.65	Monetary Policy; Economic Growth; Exports	94.72
Models; Risks; Finance	94.11	Decision Making; Fuzzy Sets; Models	97.66	Electricity; Energy; Economics	99.47
Electricity; Energy; Economics	99.47	Industry; Innovation; Entrepreneurship	98.99	Corporate Social Responsibility; Corporate Governance; Firms	97.65
Industry; Innovation; Entrepreneurship	98.99	Models; Risks; Finance	94.11	Data Envelopment Analysis; Banks; Efficiency	87.49

Source: elaborated by authors (SciVal tools).

The most relevant papers on benchmarks in responsible investment regulation are systematized in Appendix C, Table C.2; we will analyze some papers below.

Zeynep Ata & Ünal (2018) analyze the impact of sustainable supply chains on responsible investing, which is directly related to the coverage and dissemination of ESG indicators and ratings among investors.

The work of Gupta et al. (2021) investigates the role of environmental, social, and governance (ESG) factors in sustainable development. It highlights the potential of machine learning to inform and improve ESG strategies.

Sládková et al. (2022) analyze development trends, productivity, and other characteristics of European sustainable and responsible investment funds, including their investment strategies, fees, and risk profiles.

Vinodkumar & Alarifi (2022) study the role of ESG factors in hedging operational and financial risks and promoting responsible stakeholder engagement (in particular, stock exchanges, investors, and financial analysts). Using the example of the Kingdom of Saudi Arabia, it was studied how ESG investing contributes to long-term stock market sustainability.

Madison & Schiehl (2021) examine the effect of financial materiality on ESG performance assessment and how it impacts the relevance of ESG ratings for investors. Development data is essential in the context of the informational value of ratings and their further standardization to eliminate information asymmetry when making informed investment decisions.

A study by Diez-Cañamero et al. (2021) reviews corporate sustainability indices, rankings, and ratings and examines their utility in measuring corporate social responsibility performance.

A study by Vilas et al. (2022) validates the sustainability label of stock indices, examining the inclusion and exclusion processes regarding size and ESG ratings. These results raise concerns about whether SR passive investors can fulfil their non-financial expectations due to the convergence observed in sustainability indices.

Su & Chen (2020) examine the impact of inclusion in the Dow Jones Sustainability North America Index (DJSI) on the financial values of hospitality firms, considering their characteristics and the implications for the broader ESG literature.

Slepecký et al. (2022) investigate the influence of traditional and ESG stock market indices on a country's net international investment position. The study suggests that stock markets, including conventional and ESG segments, currently have limited significance in shaping the net global investment position. It highlights the need for further improvements in the stock market and ESG legislation and the development of a responsible investment market.

3.2 Benchmarks in responsible investment regulation in Academia: in-built WoS tools

A repeated dynamic analysis (Table 3.8) regarding benchmarks in responsible investment regulation in WoS database confirmed the previous conclusions. There is a growing trend in research and development of this issue in scientific circles. The most significant number of publications is devoted to ratings (over 13,700 publications) and responsible investment indices (over 6,300 publications). The total number of publications in all blocks exceeds 23 thousand, with more than 1 million citations.

We will focus on three main dimensions of benchmarks in responsible investment: ratings, rankings and indices for further analysis. The structural analysis by subject area (table 3.9) shows their similarity because the top 4 include Business Economics (30-40% among studies), Environmental Sciences Ecology (17-20% among studies), and Engineering and Science Technology Topics.

Table 3.8. Benchmarks in responsible investment regulation in WoS over the period 2017-2022: dynamic analysis

	Overal	2017	2018	2019	2020	2021	2022
Benchmarks in responsible investment regulation							
Output	1213	88	89	106	135	158	135
Citations	21024	1464	1749	2198	2640	3395	3896
Ratings in responsible investment regulation							
Output	13747	929	1031	1240	1467	1618	1579
Citations	875378	509	2596	6131	12001	20741	27184
Rankings in responsible investment regulation							
Output	1791	99	142	176	237	250	250
Citations	31369	1644	2233	2953	4029	5972	6907
Indexes in responsible investment regulation							
Output	6341	384	477	591	844	991	1109
Citations	101018	4834	6373	8820	12524	18728	25356

Source: elaborated by authors (WoS tools).

Table 3.9. Benchmarks in responsible investment regulation in WoS over the period 2017-2022: structural analysis by subject area

№	Area	Ratings in responsible investment regulation	Rankings in responsible investment regulation	Indexes in responsible investment regulation
		%	%	%
1	Business Economics	40.9	31.1	39.8
2	Environmental Sciences Ecology	17.2	19.1	24.5
3	Engineering	12.3	16.1	12.6
4	Science Technology Other Topics	9.5	14.5	13.9
5	Energy Fuels	8.7	10.3	6.9

Source: elaborated by authors (WoS tools).

The analysis of Web of Science categories (Table 3.10) shows the popular research topics based on the analysis of the specifics of the journal in which they are published. Benchmarks in responsible investment are studied primarily

within the framework of economic and environmental topics and sustainable development topics.

Table 3.10. Benchmarks in responsible investment regulation in WoS over the period 2017-2022: structural analysis by WoS categories

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Area	%	Area	%	Area	%
1	Economics	26.9	Environmental Sciences	14.4	Economics	21.0
2	Environmental Sciences	11.6	Economics	13.9	Environmental Sciences	19.2
3	Business Finance	9.5	Green Sustainable Science Technology	12.2	Green Sustainable Science Technology	11.5
4	Energy Fuels	8.7	Management	11.7	Business Finance	11.5
5	Environmental Studies	7.7	Energy Fuels	10.3	Environmental Studies	10.8

Source: elaborated by authors (WoS tools).

Regarding geographical and institutional distribution, research on benchmarks in responsible investment had the following features (Table 3.11). The USA, China, England, India, and Australia are among the top 5 countries, and most scientific research is concentrated here. Accordingly, the leading institutions are the University of California, the Chinese Academy of Sciences, the University of London, Vilnius Gediminas Technical University, etc. We note the presence among the institutions of the Ministry of Education and Science of Ukraine, which indicates an active study of benchmarks in responsible investment regulation in Ukraine.

Table 3.11. Benchmarks in responsible investment regulation in WoS over the period 2017-2022: top countries and institutions

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Country	Institution	Country	Institution	Country	Institution
1	USA	University of California	USA	University of California	China	Chinese Academy of Sciences
2	China	University of London	China	Vilnius Gediminas Technical University	USA	Ministry of Education and Science of Ukraine
3	England	Harvard University	England	Istanbul Medipol University	England	University of California
4	Australia	Udice French Research Universities	India	Islamic Azad University	India	University of London
5	Germany		Australia	Ministry of Education and Science of Ukraine	Australia	University of Chinese Academy of Sciences
6	Canada	CNRS	Spain	Chinese Academy of Sciences	Spain	Institute of Geographic Sciences Natural Resources Research
7	India	Chinese Academy of Sciences	Italy	Indian Institute of Technology System Iit System	Italy	North China Electric Power University
8	Italy	State University System of Florida	Canada	CGIAR	Brazil	Udice French Research Universities

Source: elaborated by authors (WoS tools).

The most relevant journals in WoS (Table 3.12) that publish research on benchmarks in responsible investment regulation

include Sustainability, Journal of Cleaner Production, Energies and Environmental Science and Pollution Research.

Table 3.12. Benchmarks in responsible investment regulation in WoS over the period 2017-2022: Top WoS journals

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Journal	Output	Journal	Output	Journal	Output
1	Sustainability	314	Sustainability	84	Sustainability	323
2	Journal of Cleaner Production	192	Journal of Cleaner Production	30	Journal of Cleaner Production	149
3	Energies	132	Energies	29	Environmental Science and Pollution Research	124
4	Energy Policy	127	Energy	20	International Journal of Environmental Research and Public Health	64
5	PLOS ONE	115	Environmental Science and Pollution Research	20	Energies	61

Source: elaborated by authors (WoS tools).

The top 3 publishing companies study benchmarks in responsible investment regulation in WoS (Table 3.13) included Elsevier (25% of research), Springer Nature (10% of research), and Wiley/MDPI (6-8% of research).

Based on the conducted analysis, we will form a list of the most relevant papers devoted to the problems of benchmarks in responsible investment regulation in the WoS database in Table 3.14.

Table 3.13. Benchmarks in responsible investment regulation in WoS over the period 2017-2022: top publishers

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Publisher	%	Publisher	%	Publisher	%
1	Elsevier	25.1	Elsevier	23.3	Elsevier	24.2
2	Springer Nature	9.9	Springer Nature	10.4	Springer Nature	10.4
3	Wiley	8.3	MDPI	8.8	MDPI	6.7

Source: elaborated by authors (WoS tools).

A study by Cunha et al. (2020) suggests that sustainable investments can outperform traditional benchmarks in global stock markets. However, the magnitude of this outperformance varies depending on the region and period analyzed. The article concludes that sustainable investing has the potential to generate financial returns while also promoting sustainable development and that investors should consider incorporating sustainability criteria into their investment strategies.

Muñoz-Torres et al. (2018) analyze the ESG ratings of a sample of companies and find that those with higher ESG ratings are more likely to have business models that emphasize environmental and social sustainability. They also find that companies with higher ESG ratings tend to have higher levels of disclosure and transparency, which can contribute to more informed investment decision-making.

Jain et al. (2020) suggest that sustainable investments, as measured by ESG indices, can indeed yield better financial returns than traditional indices such as MSCI indices.

Gyönyörová et al. (2021) analyze the relationship between ESG ratings and financial performance, finding mixed results. They suggest that investors should not solely rely on ESG ratings but instead use them with other relevant information to make informed investment decisions.

Table 3.14. Benchmarks in responsible investment regulation in WoS: the most relevant papers

№	Authors (Year)	Bibliometric	Cite
1	Cunha, F.A., Oliveira, E.M., Orsato, R.J., Klotzle, M.C., Cyrino Oliveira, F.L., & Caiado, R.G. (2020)	Can sustainable investments outperform traditional benchmarks? Evidence from global stock markets. Business Strategy and the Environment, 29(2), 682-697.	52
2	Muñoz-Torres, M.J., Fernández-Izquierdo, M.Á., Rivera-Lirio, J.M., & Escrig-Olmedo, E. (2018)	Can environmental, social, and governance rating agencies favor business models that promote a more sustainable development? *Corporate Social Responsibility and Environmental Management*, 26(2), 439-452	45
3	Jain, M., Sharma, G. D., Srivastava M. (2019)	Can Sustainable Investment Yield Better Financial Returns: A Comparative Study of ESG Indices and MSCI Indices. Risks, 7(1), 1-18. doi:10.3390/risks7010015.	33
4	Abate, G., Basile, I., Ferrari, P. (2021)	The level of sustainability and mutual fund performance in Europe: An empirical analysis using ESG ratings. *Corporate Social Responsibility and Environmental Management*, 28(5), 1446-1455	12
5	Gyönyörová, L., Stachoň, M., Stašek, D. (2021)	ESG ratings: relevant information or misleading clue? Evidence from the S&P Global 1200. *Journal of Sustainable Finance & Investment*, 1-35	11
6	Badía, G., Cortez, M.C., & Ferruz, L. (2020)	Socially responsible investing worldwide: Do markets value corporate social responsibility? Corporate Social Responsibility and Environmental Management, 27(6), 2751-2764.	14

Source: elaborated by authors (WoS tools).

Abate et al. (2021) examine the relationship between the level of sustainability via ESG ratings and mutual fund performance in Europe.

Badía et al. (2020) examine the relationship between corporate social responsibility (CSR) and financial performance. They found that the effect of corporate social

responsibility on financial performance was more significant in countries with higher levels of economic development, more robust regulatory frameworks, and higher levels of social welfare spending.

3.3 Benchmarks in responsible investment regulation in Academia: with Biblioshiny

The study of additional bibliometric parameters in scientific publications is possible with Biblioshiny. The optimal number of sources for analysis from the Scopus database was selected according to the following algorithm (Figure 3.5).

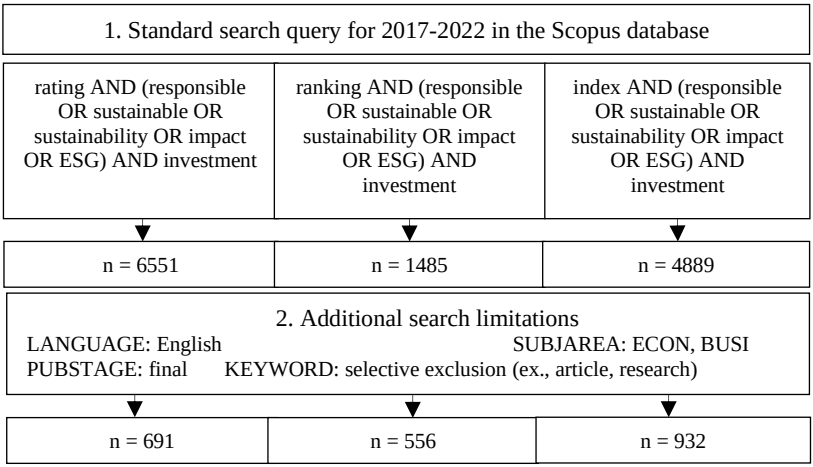


Figure 3.5. Formation of a data array for bibliometric analysis with Biblioshiny

Source: elaborated by authors.

First, we will provide the basic descriptive information of metadata, which will be used in further analysis (Table 3.15). They indicate a sufficient number of scientific papers on this

subject, which have a significant increase per year, significant levels of citations and signs of international collaboration. The results of the three blocks, which are studied concerning ratings, rankings and indices in responsible investment regulation, have similar results and trends, which will be more clearly visible in the subsequent stages of the analysis.

Table 3.15. Benchmarks in responsible investment regulation in Academia over the period 2017-2022: descriptive information

Form	Standards and Codes for responsible investment	Laws for responsible investment	Guidelines for responsible investment
Timespan	2017-2022		
Sources	461	408	431
Documents	691	556	932
References	34487	32501	44647
Annual Growth Rate	21.7%	21.6%	18.3%
Document Average Age	2.9	3.1	3.1
Average citations per document	9.4	15.9	10.3
Authors	2029	1940	2532
Authors of single-authored documents	98	55	129
International Co-Authorship	21.1 %	25.7%	24.3%
Co-Authors per Doc	3.2	2.8	2.9
Author’s keywords	2346	2090	3138

Source: elaborated by authors (Biblioshiny tools).

The logic of the study will be similar to the previous sections. We will analyze the keywords within the ***Conceptual Structure*** block. The presented word clouds in Figure 3.6 are quite similar for three blocks; they are based on such keywords as investment(s), sustainable development, decision-making, economics, climate change, energy efficiency, risk assessment, financial markets, etc.

a) Ratings in responsible investment regulation

b) Rankings in responsible investment regulation

c) Indexes in responsible investment regulation

Figure 3.6. Benchmarks in responsible investment regulation in Academia: word cloud of keywords

Source: elaborated by authors (Biblioshiny tools).

We will build clusters by co-occurrence keywords, using the example of Indexes in responsible investment regulation, which has similar trends with other blocks (Figure 3.7). Four selected clusters have different vectors. In particular, the blue cluster covers the broadest topics related to investments in sustainable development and corporate social responsibility, environmental management and emission control; the red cluster focuses on responsible investment's economic effects, particularly energy efficiency. The green cluster is about the place of responsible investment in the stock market and its condition in Covid-19; the purple cluster is the least numerous and focused on productivity issues.

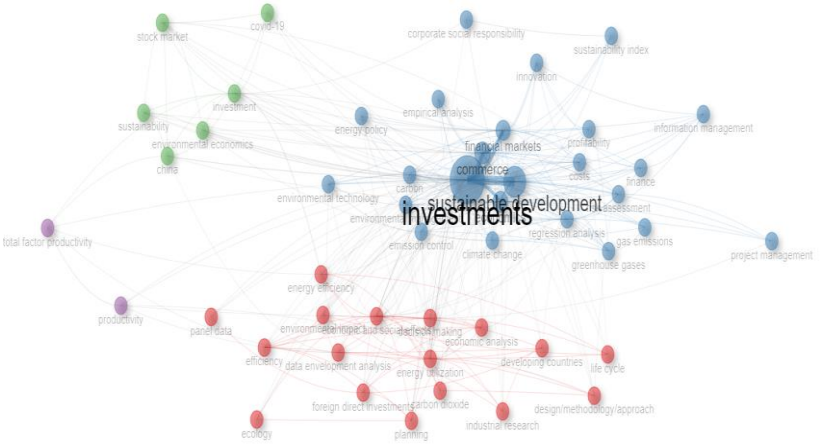


Figure 3.7. Benchmarks in responsible investment regulation: co-occurrence network

Source: elaborated by authors (Biblioshiny tools).

Based on the study of the thematic map regarding the scientific topic indexes in responsible investment regulation (Figure 3.8), the following is highlighted. Issues of investments in sustainable development, energy utilization and emission control belong to the topics that have gained maximum development and have the highest significance level (motor themes). Niche topics include energy efficiency, profitability, etc., and fundamental topics include financial markets and commerce. Issues of responsible investment's place on the stock market and economic and social effects belong to the Emerging or Declining themes.

The evolution of thematic clusters is shown in Figure 3.9, which allows us to trace the changes in the research topics of scientists for 2017-2022 using the example of the topic Indexes in responsible investment regulation.

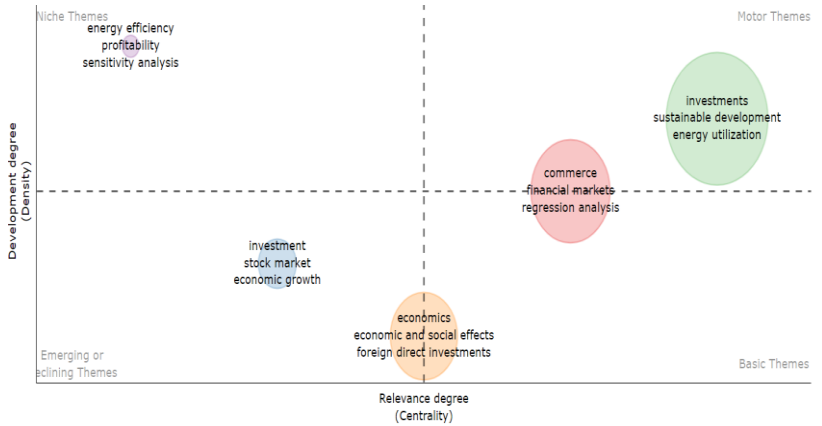


Figure 3.8. Benchmarks in responsible investment regulation in Academia: thematic map

Source: elaborated by authors (Biblioshiny tools).

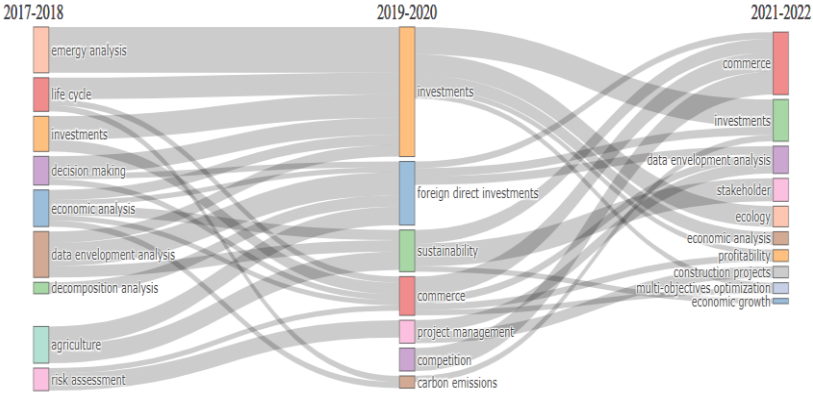


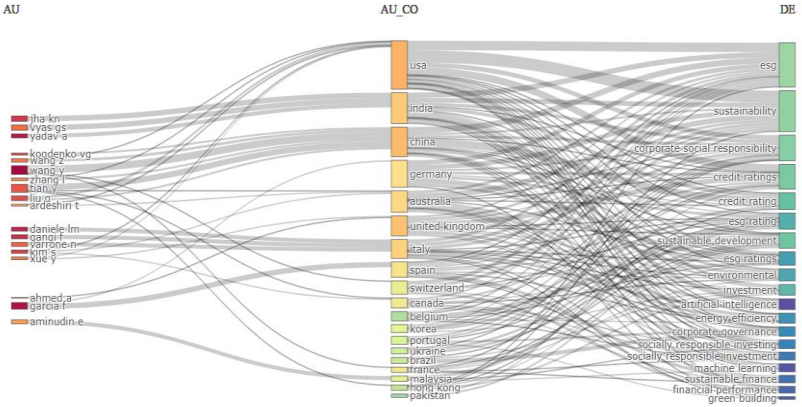
Figure 3.9. Benchmarks in responsible investment regulation: thematic evolution

Source: elaborated by authors (Biblioshiny tools).

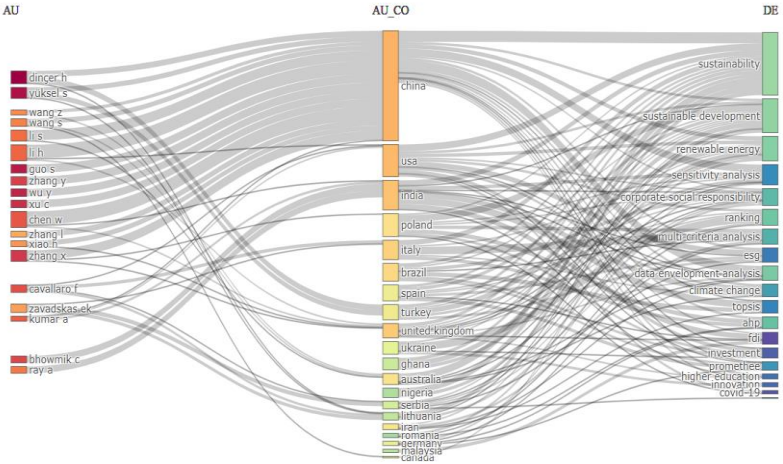
At the beginning of the analysis, most of the keywords were related to the methods used to measure the role and impact of

responsible investment regulation. Among them, it is advisable to highlight emergy analyses, economic and decomposition analyses, data envelopment analyses and risk assessments. The focus shifted to more general issues, such as sustainability investments, their role in carbon emissions reduction, project management and competition issues in 2021-2022. The main problems related to commerce and profitability, cooperation with stakeholders and optimization of investment processes in 2021-2022.

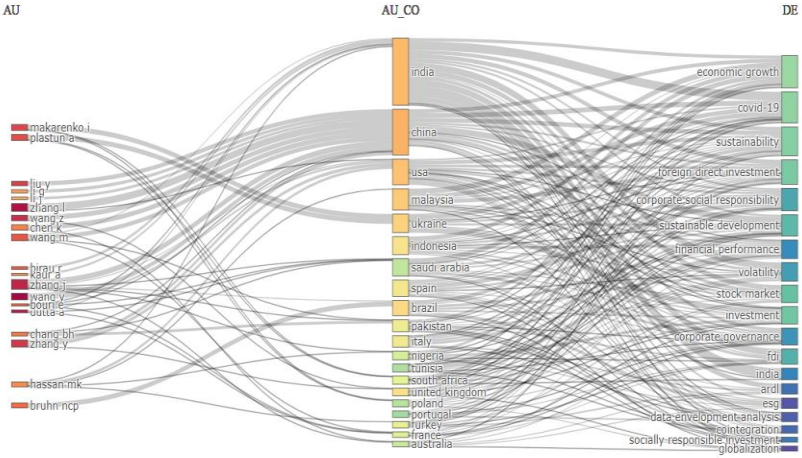
The relationship between specific authors and the subject of their research is traced in the following graphs, based on keywords (Figure 3.10). The above three-field plot shows that most authors are from China, the USA and India. Scientists from Germany, Australia, Poland, Italy, etc., also play an essential role. Their research topics are related to sustainable development and renewable energy, corporate social responsibility, ESG ratings and rankings, economic growth and financial activities, etc.



a) Ratings in responsible investment regulation



b) Rankings in responsible investment regulation

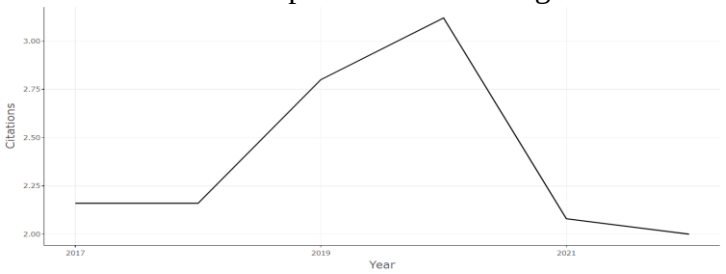


c) Indexes in responsible investment regulation

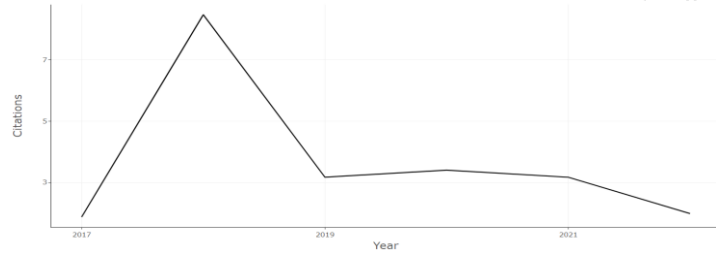
Figure 3.10. Benchmarks in responsible investment regulation in Academia: three-fields plot among authors (AU), countries (AU_CO) and keywords (DE)

Source: elaborated by authors (Biblioshiny tools).

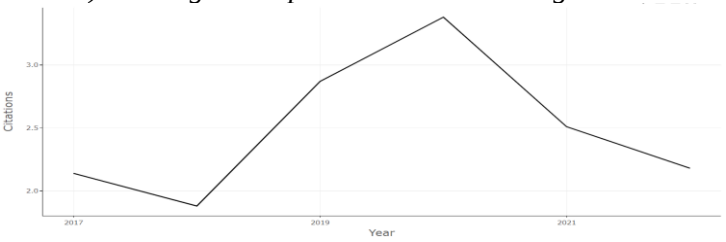
We will analyze the ***Intellectual Structure*** of scientific publications using the analysis of the dissemination of the results. The dynamics of citations during the analyzed period had an average downward tendency; the peak year should be noted in 2020 for ratings and indices in responsible investment regulation and 2020 for topics related to ratings.



a) Ratings in responsible investment regulation



b) Rankings in responsible investment regulation



c) Indexes in responsible investment regulation

Figure 3.11. Benchmarks in responsible investment regulation: average citations per year

Source: elaborated by authors (Biblioshiny tools).

A co-citation network is built, showing two clear clusters' existence in Figure 3.12. Therefore the papers are closely related and form a solid foundation for developing this topic.

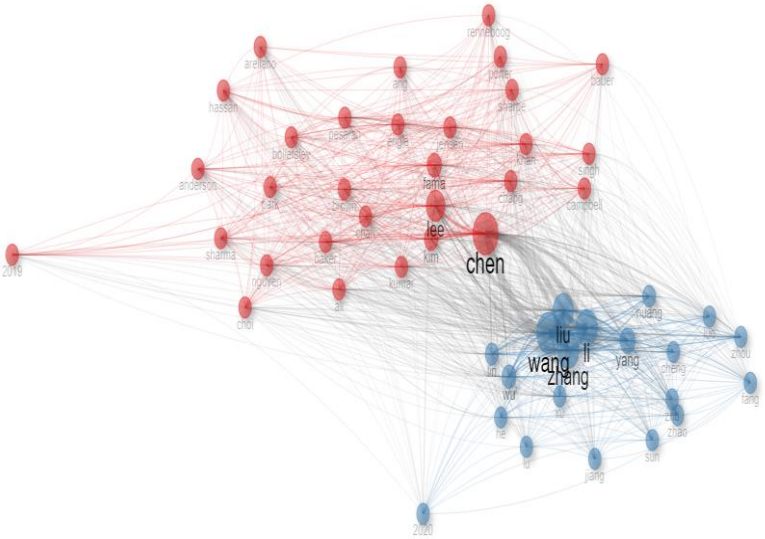


Figure 3.12. Benchmarks in responsible investment regulation: co-citation network

Source: elaborated by authors (Biblioshiny tools).

It is possible to measure the authors' productivity on benchmarks in responsible investment regulation based on Lotka's Law (Figure 3.13). The findings show that most of the authors (in particular, 95%) have only one publication on this topic; the percentage of authors with two or more publications is 4.1%.

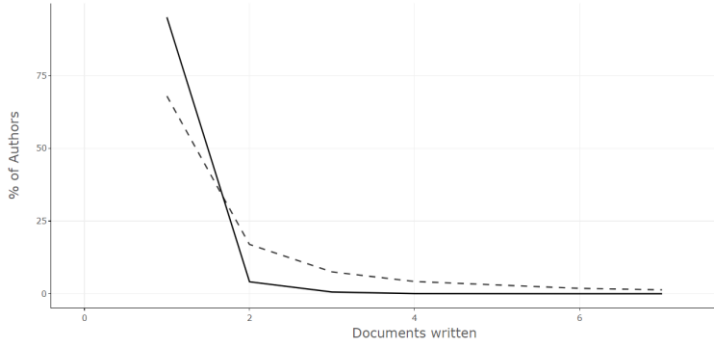


Figure 3.13. Benchmarks in responsible investment regulation: Author Productivity through Lotka's Law

Source: elaborated by authors (Biblioshiny tools).

The social structure analyzes the ways of collaboration at different levels. We observe branched groups of scientists researching various thematic areas of the benchmarks in responsible investment regulation in Figure 3.14. It includes the following authors: Liu Y., Wang Y., Dutta A., Makarenko I., Plastun A., Varrone N., Gangi F. etc.

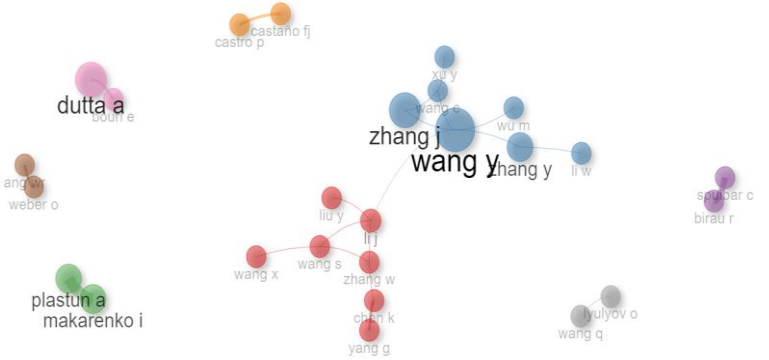


Figure 3.14. Benchmarks in responsible investment regulation: authors collaboration network

Source: elaborated by authors (Biblioshiny tools).

With the help of institutions' collaboration networks, close connections between institutions of higher education worldwide are traced. In total, eight different clusters were selected. The most numerous is the red cluster, which includes such educational institutions as Tsinghua University, University of Chinese Academy of Sciences (China), COMSATS University Islamabad (Pakistan), etc. Institutions of higher education in Malaysia (for example, Universiti Putra Malaysia), Saudi Arabia (Prince Sattam Bin Abdulaziz University), Romania (University of Craiova), South Africa (University of South Africa), etc., are also observed in separate clusters. The brown cluster even includes institutions of higher education from Ukraine, notably Sumy State University and the University of Customs and Finance.

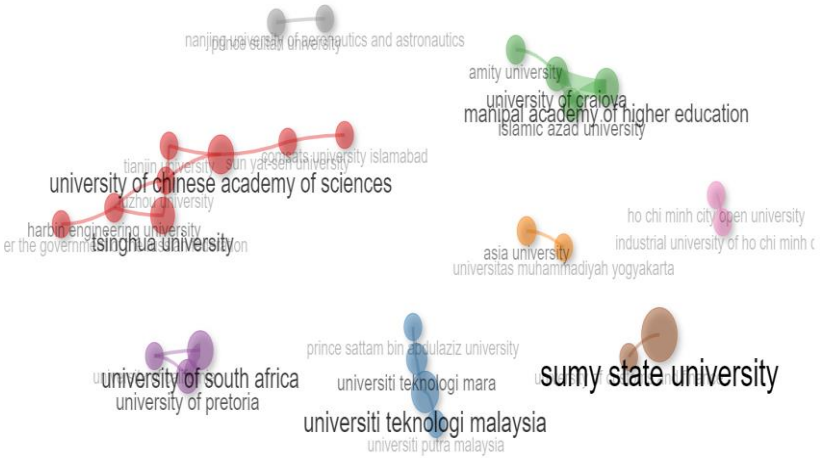


Figure 3.15. Benchmarks in responsible investment regulation: institutions collaboration network

Source: elaborated by authors (Biblioshiny tools).

The ways of collaboration at the global level are shown on the map below (Figure 3.16). It shows the international status

of scientists' involvement worldwide in the study of benchmarks in responsible investment regulation.

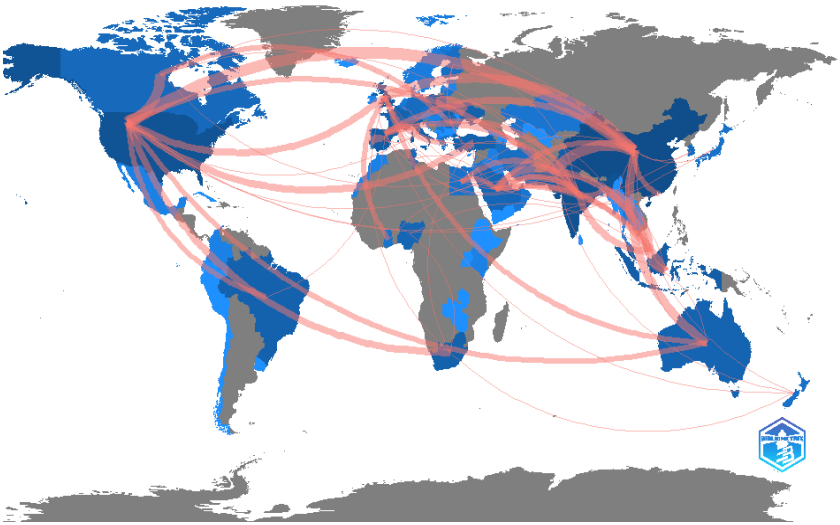


Figure 3.16. Benchmarks in responsible investment regulation: countries collaboration network

Source: elaborated by authors (Biblioshiny tools).

Most connections are noted in such countries as China, the USA, Malaysia, India, etc. Many links are observed in Europe (especially in France, Spain, Italy, Portugal, etc.) and Asia (Bangladesh, Thailand, Saudi Arabia, etc.), and it is worth establishing cooperation regarding the study of the topic Benchmarks in responsible investment regulation in countries of South America and Africa.

3.4 Benchmarks in responsible investment regulation in Academia: VosViewer keywords co-occurrence and co-authorship analysis

We will use VosViewer software to build possible bibliometric maps based on data integrated with the WoS database. It is necessary to form a data array by its selecting and reducing. The main steps of such a procedure are shown in Figure 3.17.

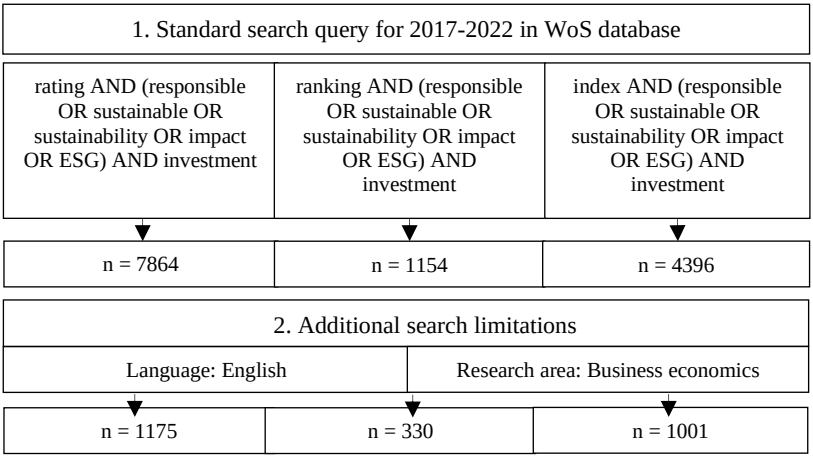
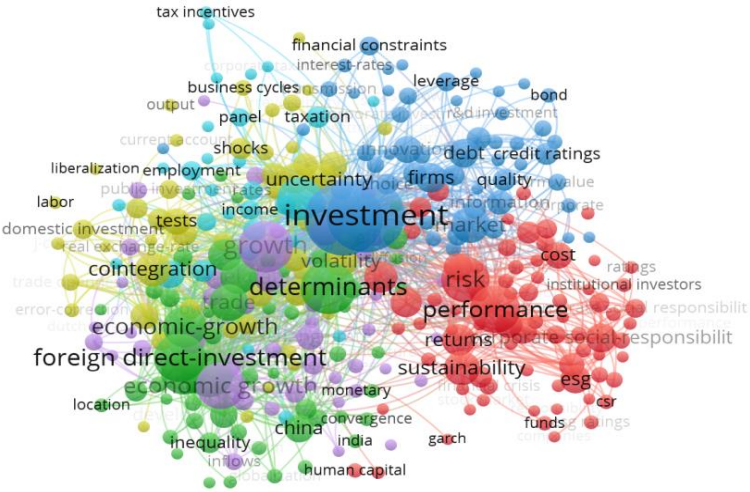


Figure 3.17. Forming a data array for bibliometric analysis with VosViewer

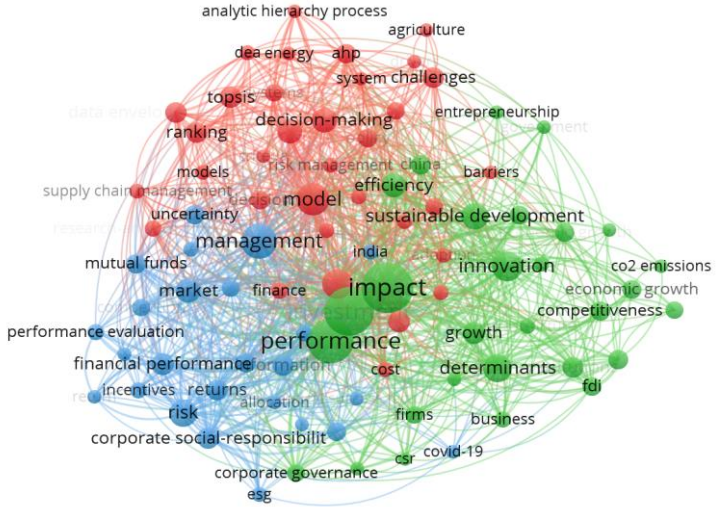
Source: elaborated by authors.

Bibliometric maps for keywords co-occurrence were built for three presented search queries based on integrated data from the WoS database. The results are shown in Figure 3.18.



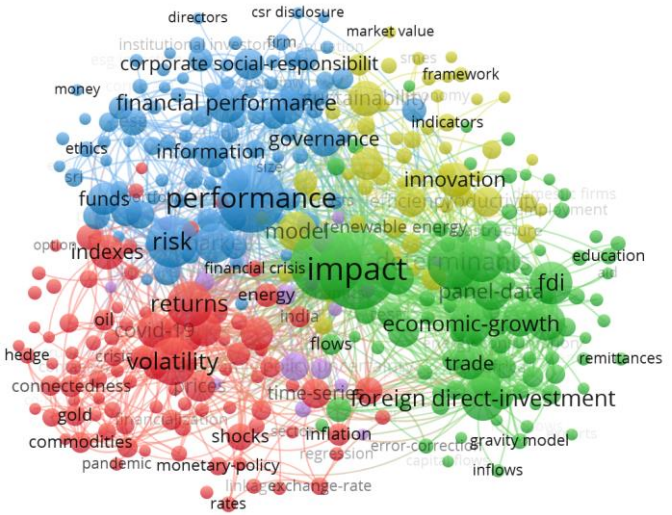
a) Ratings in responsible investment regulation

6 clusters 313 items 7459 links



b) Rankings in responsible investment regulation

3 clusters 88 items 982 links



c) Indexes in responsible investment regulation
5 clusters 352 items 9865 links

Figure 3.18. Benchmarks in responsible investment regulation: bibliometric map by keywords co-occurrence
Source: elaborated by authors (VosViewer tools).

The analysis of obtained clusters made it possible to form the following regularities (Table 3.16.). The most used terms for all clusters are investment, impact and performance. Separate clusters are devoted to corporate social responsibility issues within the companies' activities and at the state level, features of investment decision-making, challenges and risks of responsible investment, manifestations of economic, environmental or social impact, regulatory and tax regulation, etc. Note that the clusters in the three blocks are sufficiently similar, which is quite logical.

Table 3.16. Benchmarks in responsible investment regulation: clusters analyses by keywords co-occurrence

Parameters	Ratings in responsible investment regulation	Rankings in responsible investment regulation	Indexes in responsible investment regulation
Cluster 1 Red	Corporate social responsibility, financial performance, investment decisions, risks, profitability, returns	Decision-making processes, barriers and challenges, rankings and criteria	Monetary policy, volatility, shocks, uncertainty, indexes, inflation, green finance
Cluster 2 Green	Foreign direct investments, economic growth, inequality globalisation, climate change	Entrepreneurship, performance, impact, growth, efficiency, competitiveness, climate change	Impact, foreign direct investments, economic growth
Cluster 3 Blue	Firms' values, R&D, investments, capital structure and credit ratings, information asymmetry	Corporate social responsibility, performance evaluation, risks and returns, uncertainty	Corporate social responsibility and financial performance, Corporate social responsibility disclosure, governance
Cluster 4 Yellow	Business cycles, monetary policy, stock market, exchange rates, rate of volatility, shocks, uncertainty	X	Sustainability, renewable energy, market value, innovation
Cluster 5 Purple	Economic development, inflation, public debt, unemployment, poverty	X	X
Cluster 6 Sky-blue	Tax incentives, corporate taxation, income	X	X

Source: elaborated by authors (VosViewer tools).

The studies on corporate social responsibility disclosure, institutional investors, volatility, responsible investment

connectedness, and Covid-19 are the most relevant in the temporal dimension. The distribution of search terms by time dimension is shown in Figure 3.19.

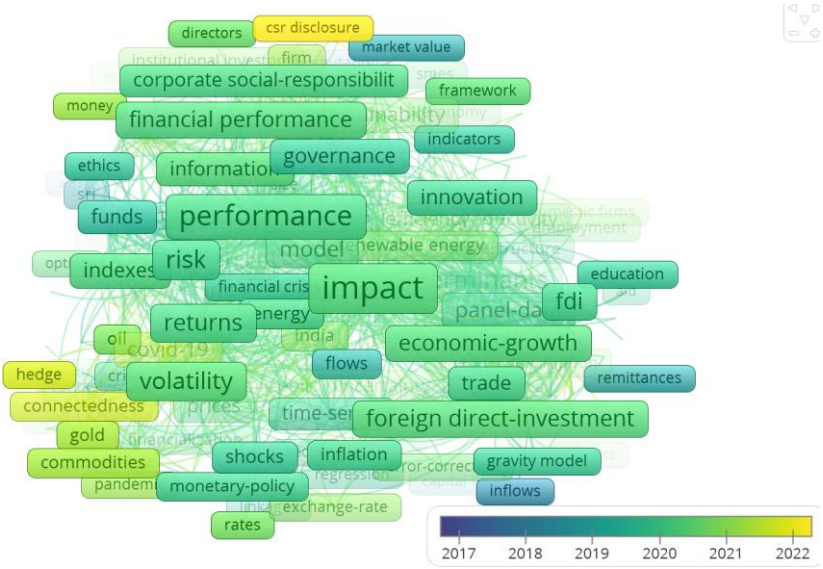
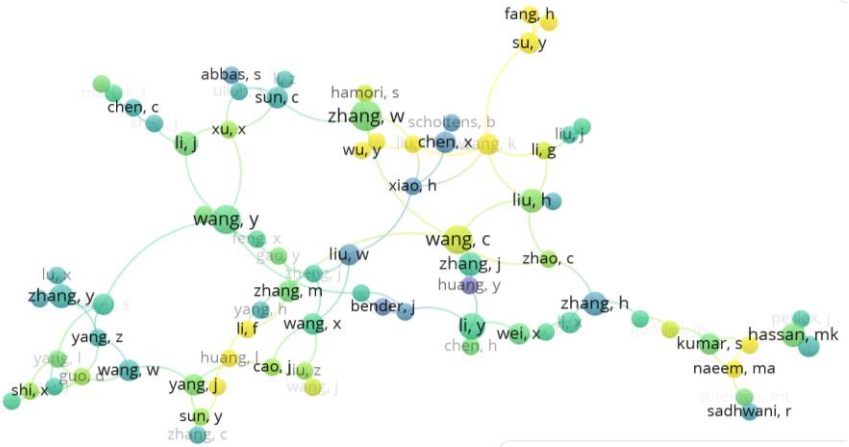


Figure 3.19. Benchmarks in responsible investment regulation: keywords co-occurrence by time dimension
Source: elaborated by authors (VosViewer tools).

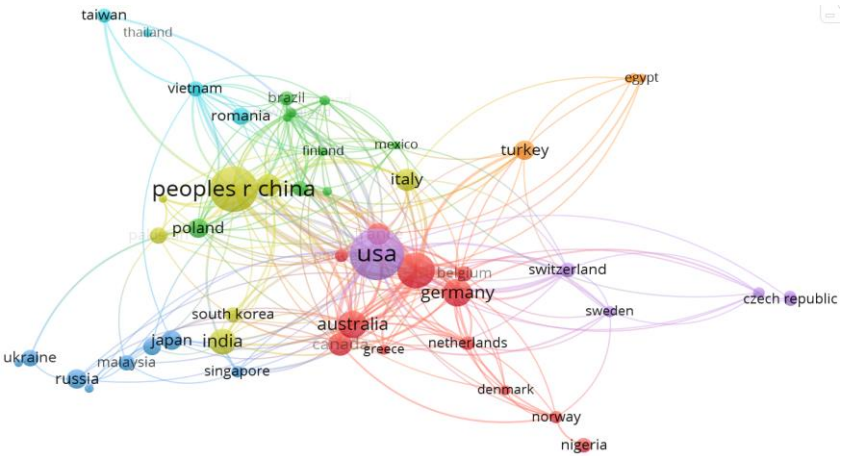
Co-authorship analysis allows us to trace the ways of collaboration between individual scientists, institutions, and countries. The results of this analysis in the form of a collaboration map are shown in Figure 3.20. They help to trace the formation of individual scientific schools (more than 34 scientists in 6 clusters were identified) or partnerships at the institutional level (7 clusters and 174 institutions were identified). The most significant role was played by the Shanghai University of Finance and Economics and Zhongnan

University of Economics and Law (China), the Australian National University (Australia), etc.



a) authors collaboration map

b) institutions collaboration map



c) countries collaboration map

Figure 3.20. Benchmarks in responsible investment regulation: collaboration maps by co-authorship

Source: elaborated by authors (VosViewer tools).

The study of countries' collaboration by co-authorship analysis indicates a high level of international cooperation, where the leaders are the USA and China; a large cluster (red) is formed by European countries, the countries of Eastern Europe and Asia (blue cluster).

3.5 Benchmarks in responsible investment regulation in Academia: Publish or Perish tools

The study of countries' collaboration by co-authorship analysis indicates a high level of international cooperation, where the leaders are the USA and China, a large cluster (red) is formed by European countries, countries of Eastern Europe and Asia (blue cluster).

Table 3.17. Benchmarks in responsible investment regulation over the period 2017-2022: static analysis (among most cited 1000 studies)

№	Metrics	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
		Title words	Key words	Title words	Key words	Title words	Key words
1	Papers	22	989	2	987	66	966
2	Citation	67	≈207 th.	32	≈202 th.	266	≈215 th.
3	Cites per year	11.1	34563.3	5.3	33700.8	44.3	35738.8
4	Cites per paper	3.1	209.7	16.0	204.9	4.1	221.9
5	Author per paper	1.8	2.8	1.5	3.1	2.2	2.9
6	h-index	3	219	2	222	9	260
7	g-index	7	380	2	367	14	414

Source: elaborated by authors (PoP tools).

A broader keyword analysis shows high results despite relatively low indicators when searching for title words. Indexes in responsible investment regulation have the highest level of citation and productivity among the analyzed options.

Figure 3.21 shows the results of the dynamic keywords analysis, which indicate a downward tendency of studies devoted to benchmarks in responsible investment regulation in all three areas in the selected array for analysis.

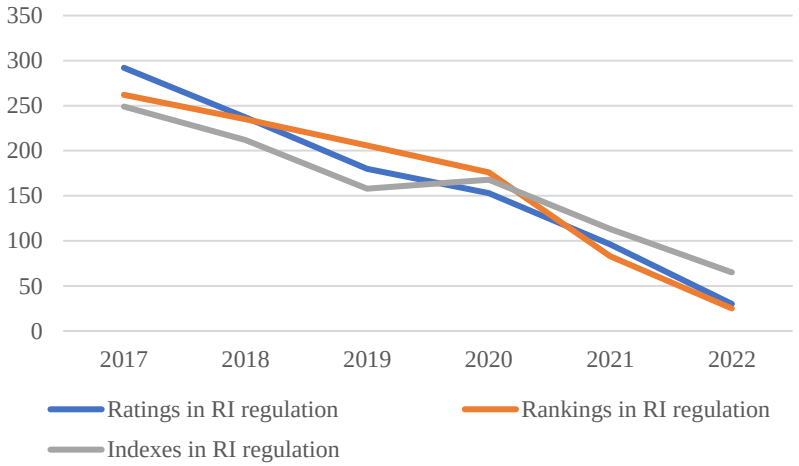


Figure 3.21. Benchmarks in responsible investment regulation over the period 2017-2022: dynamic analysis (among most cited 1000 studies)

Source: elaborated by authors (Google Scholar tools).

According to Publish or Perish analyses, the most cited papers devoted to responsible investment regulation benchmarks are grouped in Table 3.18 and analyzed below.

Ioannou & Serafeim (2017) investigate the impact of regulation on ESG information disclosure using Denmark, China, South Africa and Malaysia as an example and found a significant increase in information disclosure and its quality.

A study by Berg et al. (2022) aims to analyze discrepancies in ESG ratings and define the specificity of existing methodologies in the categories' taxonomy.

Mooij (2017) examines the life cycle of ESG initiatives development in the Rating and Ranking Industry and emphasizes the main obstacles to their story, among which the low quality and transparency of ratings, the lack of their convergence, etc., occupy a special place. Similar conclusions

were reached by Amel-Zadeh & Serafeim (2018) in their study, which analyzes the motivations and obstacles to ESG investing, particularly the lack of uniform reporting standards.

Table 3.18. Benchmarks in responsible investment regulation over the period 2017-2022: the most cited papers

№	Cites	Cites per year	Authors (Year)	Bibliometric
1	1128	188	Ioannou, I. and Serafeim, G. (2017).	The Consequences of Mandatory Corporate Sustainability Reporting. *Harvard Business School Research Working Paper*, 11-100
2	1018	1018	Berg, F., Kölbel J.F., Rigobon R. (2022)	Aggregate Confusion: The Divergence of ESG Ratings. Review of Finance, 26(6), 1315–1344.
3	931	186.2	Amel-Zadeh, A., & Serafeim, G. (2018)	Why and How Investors Use ESG Information: Evidence from a Global Survey, *Financial Analysts Journal*, 74:3, 87-103
4	777	194.25	Hartzmark, S. M. and Sussman, A. B. (2019).	Do Investors Value Sustainability? A Natural Experiment Examining Ranking and Fund Flows. *European Corporate Governance Institute (ECGI).* Finance Working Paper No. 565/2018,
5	28	4.6	Mooij, S. (2017).	The ESG Rating and Ranking Industry; Vice or Virtue in the Adoption of Responsible Investment? Socially Responsible investment eJournal.
6	16	4	Esterhuyse, L. (2020).	Towards corporate transparency: The link between inclusion in a socially responsible investment index and investor relations practices. *The Bottom Line*, 32(4), 290-307

Source: elaborated by authors (PoP tools).

Hartzmark & Sussman (2019) prove in their study that investors value sustainability, which can be measured in various benchmarks in responsible investment regulation, which is shown in the growth of net inflows.

Esterhuyse (2020) confirms the existing impact of inclusion in the index of socially responsible investments, which indicates a certain quality of reporting on sustainable development and the quality of investor relations based on their responsible investment web pages.

3.6 Benchmarks in responsible investment regulation in Academia: with Google tools

The popularity analysis of benchmarks in responsible investment regulation was carried out using Google Trends. For comparison, keywords such as benchmarks, ratings, rankings and indexes, studied in the context of responsible investment regulation, were used. Figure 3.22 shows the general trend of this topic's popularity in 2017-2022 and compares the average value for key search queries.

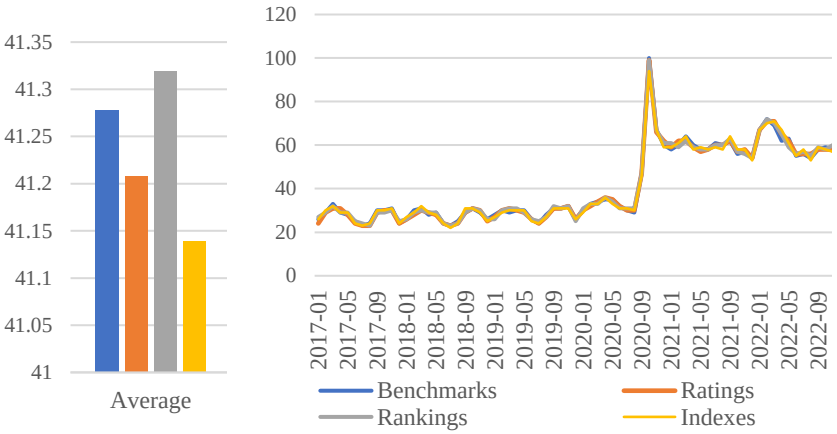


Figure 3.22. Internet queries concerning benchmarks in responsible investment regulation in 2017-2022

Source: elaborated by authors (Google Trends tools).

The topic of benchmarks in responsible investment regulation is consistent with selected search queries and has an upward tendency. It peaked in October 2020, after which a slight decline was observed. According to average indicators, rankings are the most important among search queries in the analyzed period.

If we refine the search query to the business and industrial area, the general trend of the benchmarks' popularity in responsible investment regulation will look like in Figure 3.23. In this context, the trend has a more pronounced upward tendency with periodic fluctuations. The ratings prevail according to the average value of search queries.

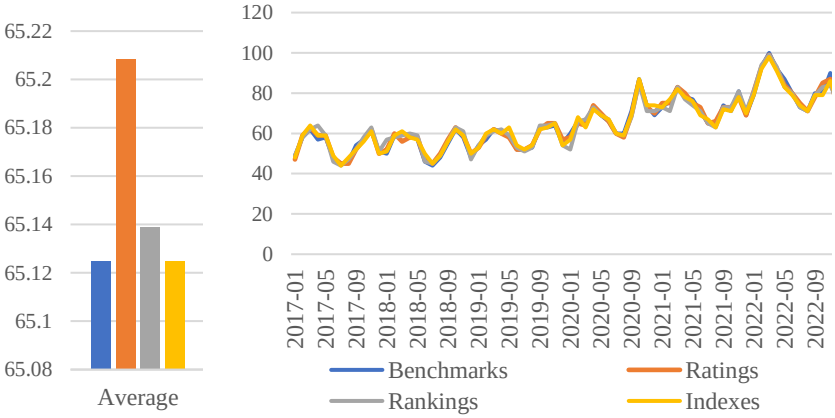


Figure 3.23. Internet queries concerning benchmarks in responsible investment regulation in 2017-2022: business and industrial area

Source: elaborated by authors (Google Trends tools).

The study of the geography of the benchmarks' popularity in responsible investment regulation allows us to trace the following tendencies (Table 3.19). A high level of search queries regarding ratings in responsible investment regulation

in 2017-2022 is typical for such countries as Romania, Iran, United Arab Emirates; regarding rankings – for Bangladesh, Algeria, and New Zealand; indexes – for France, Hungary, and Ukraine.

With the help of the Google Ngram tool, the usage frequency graph of various keyphrases concerning benchmarks in responsible investment regulation (ratings, rankings and indexes) was constructed in the Google Books library (Figure 3.24). The resulting graph shows three ngrams from 2000-2019, among which indexes in responsible investment regulation appear in the most significant proportion of scientific papers; this phrase began to decrease after 2000 and stabilized around 2017. The use of phrases with ratings and rankings began to decline after 2014.

Table 3.19. Internet queries concerning benchmarks in responsible investment regulation in 2017-2022: top countries

№	Ratings in responsible investment regulation		Rankings in responsible investment regulation		Indexes in responsible investment regulation	
	Country	%	Country	%	Country	%
1	Romania	26	Bangladesh	26	France	26
2	Iran	26	Algeria	26	Hungary	26
3	United Arab Emirates	26	New Zealand	26	Ukraine	26
4	Italy	26	Costa Rica	26	Uganda	26
5	South Korea	26	Egypt	26	Japan	26
6	Denmark	26	Ireland	26	Colombia	26
7	Morocco	26	Saudi Arabia	26	New Zealand	25
8	Poland	26	Argentina	26	Costa Rica	25
9	Kenya	25	United Arab Emirates	25	Egypt	25
10	United Kingdom	25	Italy	25	Ireland	25

Source: elaborated by authors (Google Trends tools).

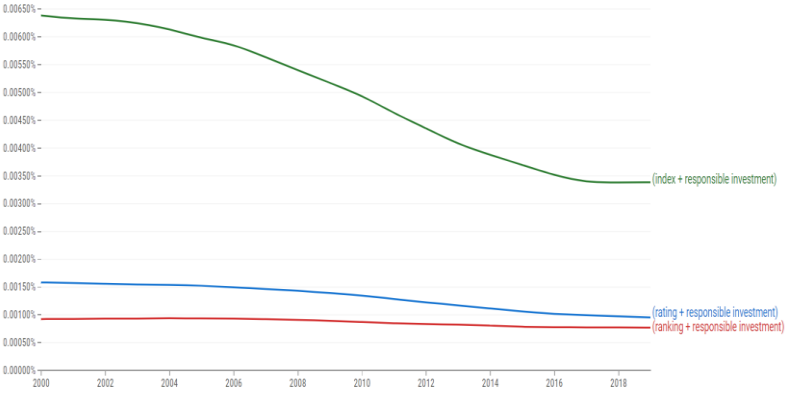


Figure 3.24. Ngram concerning benchmarks in responsible investment regulation in 2000-2019

Source: elaborated by authors (Google Books Ngram tools).

The analysis of the most relevant scientific papers in Google Books Library is given in Table 3.20.

The paper of Cash (2021) analyzes the difference and similarities between sustainability rating agencies and credit rating agencies and contextualizes the most effective way of their collision to obtain favorable results.

The article of Sherwood & Pollard (2018) presents the main theoretical and methodological foundations for developing the concept of responsible investing and an overview of the main ESG rating systems. The work of Silvola & Landau is quite extensive, in which the latest methods of responsible investment and financial profit are investigated, and the importance and features of ESG analysis are proven.

The paper edited by Sullivan & Mackenzie (2017) presents best practices for implementing responsible investing strategies and outlines existing problems and potential solutions to these processes. The research of Mason (2022), which describes the main concepts of investment portfolio management, existing

strategies and tactics of successful, responsible investing, has a similar area.

Table 3.20. Benchmarks in responsible investment regulation: the most relevant books

№	Authors / Editors (Year)	Bibliometric
1	Cash, D. (2021).	Sustainability Rating Agencies Vs Credit Rating Agencies: The Battle to Serve the Mainstream Investor. Germany: Springer International Publishing.
2	Silvola, H., Landau, T. (2021).	Sustainable Investing: Beating the Market with ESG. Germany: Springer International Publishing.
3	Sherwood, M. W., Pollard, J. (2018).	Responsible Investing: An Introduction to Environmental, Social, and Governance Investments. (n.p.): Taylor & Francis.
4	Sullivan, R., Mackenzie, C. (ed.) (2017).	Responsible Investment. United Kingdom: Taylor & Francis.
5	Mason, J. T. (2022).	The Investing Oasis: Contrarian Treasure in the Capital Markets Desert. United States: Wiley.
6	Zhang, W., Hamori, S., Nakajima, T., Liu, G., He, X., Zhang, Y., Liu, T. (2021).	ESG Investment in the Global Economy. Singapore: Springer Singapore.

Source: elaborated by authors (based on Google Books data).

Zhang et al. (2021) consider responsible investments as financial securities that should be reflected in companies' statements and analyze the significance and impact of ESG investments on other economic indicators, especially in the context of financial crises, Covid-19, etc.

It is obvious that most papers are quite extensive and cover conceptual issues of responsible investment development and distribution, among which specific benchmarks occupy a place from the point of view of evaluating this type of activity.

3.7 Benchmarks in responsible investment regulation in Academia: with InfraNodus

Building bibliometric maps based on scientific publications in 2017-2022 regarding benchmarks (ratings, rankings, indices) from the Google Scholar database from section 3.5 is possible with InfraNodus software. This section focuses on key benchmarks in sustainability and responsible investment, namely indices, ratings and rankings.

The logic of bibliometric analysis of benchmarks in responsible investment is similar to subsections 1.7 and 2.7. In particular, mind maps and network graphs are built for thematic searches in general – benchmarks for responsible investment and partial searches – ratings, rankings, and indices for responsible investment.

The constructed network graph (mind map) regarding the benchmark in responsible investment regulation is presented in Figure 3.25.

As we can see, the authors' work, directly related to the benchmarks in responsible investment as a generic concept, is limited, confirmed by the peripheral location of the corresponding node and the insignificant density of connections with relevant concepts (nodes).

Responsible investing is identified as a central cluster by the number of nodes and links in subsections 1.7 and 2.7.

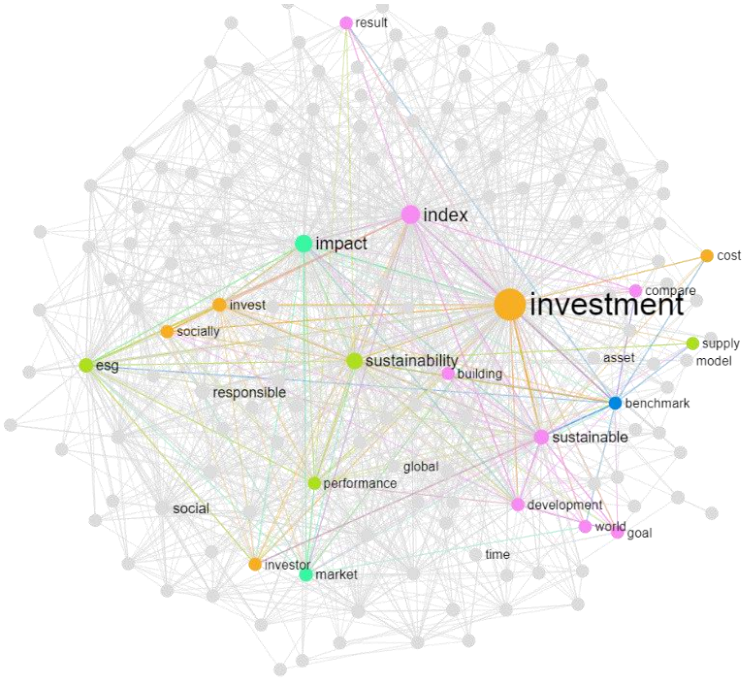


Figure 3.25. Benchmark in responsible investment: qualitative analysis of abstract and keywords on mind map
Source: elaborated by authors (InfraNodus tools).

It is also confirmed by the cluster analysis results (Table 3.21), according to which the specified cluster was evaluated with 54% influence. The cluster of responsible investing indices is connected with the degree of influence and the proportion of records and nodes.

Table 3.21. Benchmarks for responsible investment: the most relevant topic cluster, nodes, categories and keywords

Topical Cluster	Influ-ence, %	Total Nodes	Percentage of Entries ,%	Cate-gory	Keywords
1	54	38	38	Investment	responsible, invest, foreign, institutional, fdi, passive, private, public, cost, direct, portfolio, relationship
2	16	33	17	Index	index, sustainable, development, indicator, carbon, model, framework, result, sdg, level, average, focus, finance, benchmark
3	14	37	32	Sustainability	sustainability, esg, social, rating, responsibility, performance, environmental, corporate, financial, initiative, criterion, management, supply, innovation, perspective, analysis, csr
4	13	24	9	Impact	covid, market, factor, green, stock, emerging, economy, potential, technology, pandemic, positive, examine, bond, negative, return

Source: elaborated by authors (InfraNodus tools).

It is consistent with the results of focal studies of certain types of benchmarks for responsible investment according to network graphs (Figures 3.26-3.28).

The construction of the network graph 3.26 shows the prevalence of scientific publications on sustainability and ESG investing indices.

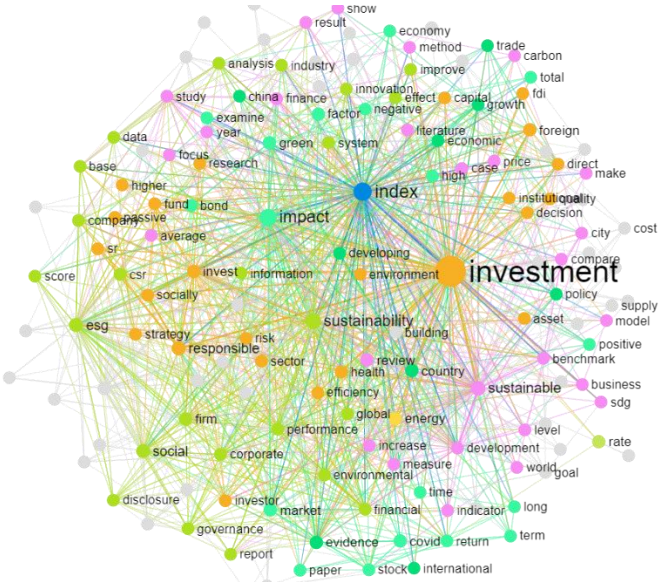


Figure 3.26. Indices for responsible investment: co-occurrence network

Source: elaborated by authors (InfraNodus tools).

The spread of influential index families The Dow Jones Sustainability Index and FTSE4Good (Europe), MSCI, and KLD 400 Social Index (the USA) explain research objects in scientists' papers.

In the case of responsible investment ratings (Figure 3.27), the significance of this topic is low compared to the sustainability indices.

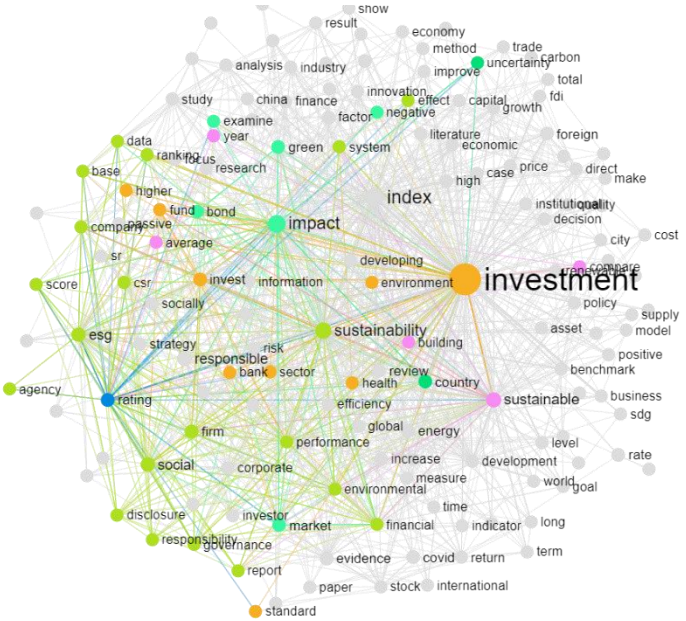


Figure 3.27. Ratings for responsible investment: co-occurrence network

Source: elaborated by authors (InfraNodus tools).

Studies on sustainability rankings are the least represented (Figure 2.28), which can be explained by their derivative nature relative to ratings and indices and by the terminology irregularity in responsible investing.

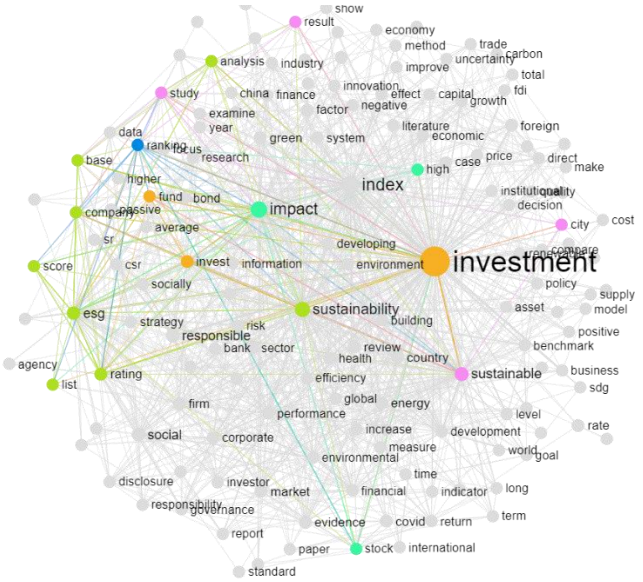


Figure 3.28. Rankings for responsible investment: co-occurrence network

Source: elaborated by authors (InfraNodus tools).

A separate focus in studying papers imported from the Google Scholar database using InfraNodus is the study of the keywords evolution of in benchmarks (Figure 3.29).

Figure 3.29. Evolution of key words in benchmark for responsible investment

Source: elaborated by authors (InfraNodus tools).

The dynamics presented in Figure 3.29 indicate an increase in publications devoted primarily to sustainability indices – about 135 occurrences per text segment along with the topics of responsible investing, impact investing and the impact of Covid-19 on the ESG market development.

Finally, software capabilities identify a structural gap between key clusters of scientific publications – responsible investing and sustainability indices – confirming this research area's perspective in developing the subject of benchmarks for responsible investment.

Appendices
Appendix C

Table C.1. Benchmarks in responsible investment regulation: top researches

№	Author	Affiliation	Output	FWCI	Citation Count
A	B	C	1	2	3
Ratings in responsible investment regulation					
1	Yoshino, N.	Keio University	1098	4.44	503
2	Taghizadeh-Hesary, F.	Tokai University	941	6.61	502
3	Sarkar, B.	Yonsei University	1,439	5.67	434
4	Hassan, M. K.	University of New Orleans	337	0.22	6
5	Lin, B.	Xiamen University	227	2.28	201
6	Omodero, C.O.	Covenant University	96	0.39	12
7	Santos, D. F.	Universidade Estadual Paulista Júlio de Mesquita Filho	322	0.48	47
8	Tabash, M. I.	Al Ain University of Science and Technology	1,437	0.65	22
9	Cebula, R. J.	George Mason University	99	0.07	4
10	Hysa, E.	Epoka University	283	2.53	130
11	Maselli, G.	University of Salerno	64	0.21	2
12	Mishra, U.	Vellore Institute of Technology	805	5.53	295
13	Nesticò, A.	University of Salerno	64	0.21	2
14	Odhiambo, N.	University of South Africa	124	0.8	55
15	Park, D.	Asian Development Bank Philippines	89	0.25	14
Rankings in responsible investment regulation					
1	Dinçer, H.	Istanbul Medipol University	706	3.79	232
2	Yüksel, S.	Istanbul Medipol University	660	3.99	217
3	Ray, A.	Maulana Abul Kalam Azad University of Technology	415	0.75	34
4	Liern, V.	University of Valencia	367	1.12	70
5	Pérez-Gladish, B.	University of Oviedo	367	1.12	70
6	Bhowmik, C.	Parul University	171	0.32	22
7	D'Alpaos, C.	University of Padua	302	2.41	64

Continuation of Table C.1

A	B	C	1	2	3
8	Cerqueti, R.	University of Rome La Sapienza	255	2.87	33
9	Owusu-Manu, De G.	Kwame Nkrumah University of Science and Technology	82	2.19	36
10	Ren, J.	Hong Kong Polytechnic University	118	1.01	26
11	Wang, C.	National Kaohsiung University of Science and Technology	252	3.57	46
12	Wu, Y.	North China Electric Power University	189	2.43	142
13	Xu, Ch.	North China Electric Power University	189	2.43	142
14	Aksoy, T.	İbn Haldun University	85	1.72	7
15	Almutairi, K.	University of Hafr Al Batin	365	6.94	80
Indexes in responsible investment regulation					
1	Dutta, A.	University of Vaasa	665	2.57	511
2	Bouri, E.	Lebanese American University	633	3.56	237
3	Tiwari, A. K.	Indian Institute of Management Bodh Gaya	469	3.57	192
4	Mokdad, A.H.I.	University of Washington	5038	18.45	1001
5	Vo, X.V.	University of Economics Ho Chi Minh City	375	4.27	195
6	Carvalho Malta, D.	Universidade Federal de Minas Gerais	4,972	19.9	874
7	de la Torre, O.V.	Universidad Michoacana de San Nicolas de Hidalgo	185	0.76	26
8	Dong, K.	University of International Business and Economics	253	9.48	149
9	Franklin, R. C.	James Cook University Queensland	4879	16.05	845
10	Hay, S. I.	University of Washington	4970	20.6	880
11	Jawadi, F.	Université de Lille	196	1.45	50
12	Lin, B.	Xiamen University	243	2.06	150
13	Robiyanto, R.	Satya Wacana Christian University	418	0.66	25
14	Sharma, G.D.	Guru Gobind Singh Indraprastha University	789	5.83	198
15	Su, C.	Qingdao University	140	7.32	134

Table C.2. Benchmarks in responsible investment regulation: top papers in Scopus by relevance

№	Title	Authors, year	Source	Citations
A	B	1	2	3
Ratings in responsible investment regulation				
1	Effects of sustainable supply chain management on responsible investment through ESG indicators (BookChapter)	Zeynep Ata, U., Ünal, G. (2018)	Handbook of Research on Supply Chain Management for Sustainable Development, 133-143	0
2	The Role of ESG in Sustainable Development: An Analysis Through the Lens of Machine Learning	Gupta, A., Sharma, U., Gupta, S.K. (2021)	2021 IEEE International Humanitarian Technology Conference, IHTC	2
3	Sustainable and responsible investment funds in Europe	Sládková, J., Kolomazníková, D., Formánková, S., Kolomazník, J., Faldík, O. (2022)	Measuring Business Excellence, 26(3), 229-244	4
4	Alternative esg ratings: How technological innovation is reshaping sustainable investment	Hughes, A., Urban, M.A., Wójcik, D. (2021)	Sustainability (Switzerland), 13(6), 3551	7
5	The influence of firm size on ESG score controlling for ratings agency and industrial sector	Gregory, R.P. (2022)	Journal of Sustainable Finance and Investment (Article in Press)	3
6	The pertinence of incorporating ESG ratings to make investment decisions: a quantitative analysis using machine learning	Sharma, U., Gupta, A., Gupta, S.K. (2022)	Journal of Sustainable Finance and Investment (Article in Press)	7
7	Pricing ESG equity ratings and underlying data in listed real estate securities	Brounen, D., Marcato, G., Op't Veld, H. (2021)	Sustainability (Switzerland), 13(4), 2037, 1-20	6

Continuation of Table C.1

A	B	1	2	3
8	Short- and long-term effects of responsible investment growth on equity returns	Ferrat, Y., Daty, F., Burlacu, R. (2022)	Journal of Risk Finance, 23(1), 1-13	49
9	Prediction of environmental controversies and development of a corporate environmental performance rating methodology	Svanberg, J., Ardeshiri, T., Samsten, I., Rana, T., Danielson, M. (2022)	Journal of Cleaner Production, 344, 130979	4
10	Mainstreaming socially responsible investment: Do environmental, social and governance ratings of investment funds converge?	Gangi, F., Varrone, N., Daniele, L.M., Coscia, M. (2022)	Journal of Cleaner Production, 353, 131684	4
11	ESG ratings and financial performance of exchange-traded funds during the COVID-19 pandemic	Folger-Laronde, Z., Pashang, S., Feor, L., ElAlfy, A. (2022)	Journal of Sustainable Finance and Investment, 12(2), 490-496	42
12	ESG Ratings in the optimization of the strategic asset allocation	Heinke, V.G. (2021)	Zeitschrift fur die gesamte Versicherungswissenschaft, 110(4-5), 317-342	1
13	The sustainability trap: Active fund managers between ESG investing and fund overpricing	Bofinger, Y., Heyden, K.J., Rock, B., Bannier, C. (2022)	Finance Research Letters, 45, 102160	4
14	ESG rating as input for a sustainability capital buffer	Neisen, M., Bruhn, B., Lienland, D. (2022)	Journal of Risk Management in Financial Institutions, 15(1), 72-84	2
15	Esg rating—necessity for the investor or the company?Open Access	Zumente, I., Lāce, N. (2021)	Sustainability (Switzerland), 13(16), 8940	9

Continuation of Table C.1

A	B	1	2	3
Rankings in responsible investment regulation				
1	Environmental social governance: a core value to responsible stakeholders and stock market sustainability in the Kingdom of Saudi Arabia	Vinodkumar, N., Alarifi, G. (2022)	Journal of Sustainable Finance and Investment, 12(4), 1085-1101	1
2	The effect of financial materiality on ESG performance assessment	Madison, N., Schiehll, E. (2021)	Sustainability (Switzerland), 13(7), 3652	16
3	Measurement of corporate social responsibility: A review of corporate sustainability indexes, rankings and ratings	Diez-Cañamero, B., Bishara, T., Otegi-Olaso, J.R., Minguez, R., Fernández, J.M. (2020)	Sustainability (Switzerland), 12(5), 2153	45
4	Challenges and opportunities to scale up sustainable finance after the COVID-19 crisis: Lessons and promising innovations from science and practice	Quatrini, S. (2021)	Ecosystem Services, 48, 101240	19
5	Measurement concerns and agreement of environmental social governance ratings	Widyawati, L. (2021)	Accounting and Finance, 61(S1), 1589-1623	13
6	Sustainable investing: The black box of environmental, social, and governance (ESG) ratings	Abhayawansa, S., Tyagi, S. (2021)	Journal of Wealth Management, 24(1), 49-54	23
7	Responsible Research for Responsible Investment—JUST Capital Case Study	Ng, E.C.H. (2020)	Palgrave Studies in Sustainable Business in Association with Future Earth, 183-210	1
8	Systems approach to environment, social and governance (ESG): Case of Reliance industries	Singhania, D.M., Saini, D.N. (2022)	Sustainable Operations and Computers3, 103-117	7

Continuation of Table C.1

A	B	1	2	3
9	A SMARTS-Choquet's approach for multicriteria decision aid applied to the innovation indexes in sustainability dimensions	Silva, M.C., Brito Alves Lima, G., Simões Gomes, C., Duncan Rangel, L., Goyannes Gusmão Caiado, R. (2019)	Soft Computing, 23(16), 7117-7133	9
10	Sustainability game	Pedol, M., Biffi, E., Melzi, S. (2021)	Corporate Social Responsibility and Environmental Management, 28(5), 1540-1548	4
11	Integrated Management for Capital Markets and Strategy: The Challenges of "Value" Versus "Values" Sustainability Investment, Smart Beta, and Their Consequences for Corporate Leadership	Mountfield, A., Gardner, M., Kasemir, B., Lienin, S. (2019)	CSR, Sustainability, Ethics and Governance, 105-128	2
12	Proposing an Integrated Approach to Analyzing ESG Data via Machine Learning and Deep Learning Algorithms	Lee, O., Joo, H., Choi, H., Cheon, M. (2022)	Sustainability (Switzerland), 14(14), 8745	6
13	3Q2010 July-September (Book Chapter)	Bendell, J. (2017)	Healing Capitalism: Five Years in the Life of Business, Finance and Corporate Responsibility, 343-364	0
14	Uncovering hidden signals for sustainable investing using big data: Artificial intelligence, machine learning and natural language processing	Antoncic, M. (2020)	Journal of Risk Management in Financial Institutions, 13(2), 106-113	7

Continuation of Table C.1

A	B	1	2	3
15	Assessment of the sustainability of a real estate project using multi-criteria decision making	Dobrovolskienė, N., Pozniak, A., Tvaronavičienė, M. (2021)	Sustainability (Switzerland), 13(8), 4352	12
Indexes in responsible investment regulation				
1	Cluster analysis to validate the sustainability label of stock indices: An analysis of the inclusion and exclusion processes in terms of size and ESG ratings	Vilas, P., Andreu, L., Sarto, J.L. (2022)	Journal of Cleaner Production, 330, 129862	3
2	Does sustainability index matter to the hospitality industry?	Su, C.-H.J., Chen, C.-D. (2020)	Tourism Management, 81, 104158	16
3	Net investment position and the stock market: The case of traditional and ESG indices	Slepecký, J., Vorontsova, A., Plastun, A., Makarenko, I., Zhyhlei, I. (2022)	Investment Management and Financial Innovations, 19(2), 51-66	1
4	A Comparative Performance Analysis of Sustainability Themed Indices in India: Markov Regime Switching Approach	Jasuja, D., Prosad, J.M., Nautiyal, N. (2021)	FIIB Business Review (Article in Press)	2
5	Can sustainable investments outperform traditional benchmarks? Evidence from global stock markets	Cunha, F.A.F.D.S., de Oliveira, E.M., Orsato, R.J., Cyrino Oliveira, F.L., Caiado, R.G.G. (2020)	Business Strategy and the Environment, 29(2), 682-697	56
6	The convergence between sustainability and conventional stock indices. Are we on the right track?	Vilas, P., Andreu, L., Sarto, J.L. (2021)	Sustainability (Switzerland), 13(14), 7613	3
7	R&D investment, ESG performance and green innovation performance: evidence from China	Xu, J., Liu, F., Shang, Y. (2021)	Kybernetes, 50(3), 737-756	33

Continuation of Table C.1

A	B	1	2	3
8	Socially Responsible Investing and Sustainable Indices: A Sustainability Agenda	Firdaus Khan, M.R. (2021)	Indian Journal of Corporate Governance, 14(2), 209-225	2
9	A factor approach to the performance of ESG leaders and laggards Open Access	Naffa, H., Fain, M. (2022)	Finance Research Letters, 44,102073	14
10	Sustainable Business Practices of Turkish Companies Listed on the Borsa Istanbul Sustainability Index	Hizarci-Payne, A.K., Kirkulak-Uludag, B. (2018)	CSR, Sustainability, Ethics and Governancepp, 329-344	1
11	The Effect of Environmental, Social, Governance and Sustainability Initiatives on Stock Value – Examining Market Response to Initiatives Undertaken by Listed Companies	Lo, K.Y., Kwan, C.L. (2017)	Corporate Social Responsibility and Environmental Management, 24(6), 606-619	78
12	Sustainable finance and Covid-19: The reaction of esg funds to the 2020 crisis	Pisani, F., Russo, G. (2021)	Sustainability (Switzerland), 13(23), 13253	7
13	Do irresponsible corporate activities prevent membership in sustainable stock indices? The case of the Dow Jones Sustainability Index world	Arribas, I., Espinós-Vañó, M.D., García, F., Riley, N. (2021)	Journal of Cleaner Production 298,126711	6
14	Socially responsible investment, should you bother?	Díaz, A., Garrido, G. (2018)	Mathematical and Statistical Methods for Actuarial Sciences and Finance, MAF 2018, 335-339	0
15	The impact of risk indicators on sustainability (ESG) and broad-based indices: An empirical analysis from Germany, France, Indonesia and Turkey	Öcal, H., Kamil, A.A. (2021)	International Journal of Sustainable Economy 13(1), 18-54	7

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Responsible investment regulation: comprehensive bibliometric analysis

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