

Disclosure of SDG 13 Climate Action and Responsible Investment: A Comprehensive Bibliometric Meta-Analysis

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Abstract: *This article researches the scientific landscape of academic literature on Sustainable Development Goal 13 disclosure and its connection with responsible investment tools to improve costs arrangement for covering damages after climate change and more effectively use funds to regulate possible climate action consequences. The methodology of this paper includes a bibliometric meta-analysis. The databases for such analysis consist of Scopus and Web of Science databases in 2016-2022. The cluster analysis is created with VOSview software. All key findings from this study can be used as input for further research purposes.*

Keywords: *Sustainable Development Goal 13, SDG 13, responsible investments, climate action, bibliometric meta-analysis*

JEL codes: Q01, Q54, Q56, E22

1 Introduction

In 2015, the United Nations provided the 17 Sustainable Development Goals (SDGs) for global human development until 2030. The ecological component is an inseparable part of sustainable development and the future life of people on the planet in general. That is why SDG 13 was formed: "Take urgent action to combat climate change and its impacts" (UN, 2022). The main drivers for solving this goal are continuing climate crisis (large unabated), rising greenhouse gas, requiring shifting economics (towards carbon neutrality), and increasing climate finance. Yearly, the countries suffer from severe losses and damages to lives, livelihoods, and infrastructure, which are caused by unavoidable impacts of climate actions. These countries do not always have resources (especially funds) to handle and recover damages accordingly. 2021 was an unprecedented year of climate disasters (UN, 2022).

According to the report Spotlight on Sustainable Development 2019, the financial gap in achieving SDG 13 is estimated at over \$140-300 billion of climate change costs by 2025-2030, when it would be \$1 trillion a year by 2050, in case average temperature below 2°C

(Bose, 2019). Moreover, more than \$2.38 trillion would need to be invested annually in mitigation to keep this temperature. A clear understanding of the primary economic process in the regulation of SDG 13 can significantly decrease costs for rebuilding /covering damages after climate change and more effectively use funds for prediction or regulation of possible climate action consequences. However, before renovating this area, it needs to analyze and explore before starting to renovate this area, it needs to analyze and explore the stages of the investigation process of direct connections between SDG 13 and investments, mainly responsible investments.

Thus, the present research *aims* to conduct a bibliometric meta-analysis of the connection between SDG 13 disclosure and responsible investments.

Analysis of the scientific literature shows the growing role of research in the environmental area. In particular, high interest has been devoted to the formation concept of a green economy (Loiseau et al., 2016) and related terms such as green investments, green bonds, green financing (Singh et al., 2021; Bhatnagar & Sharma, 2022). The ecological component is reinforced in the SDGs achieving, especially the goal of climate action (Reyers & Selig 2020). It should be noted that the study of sustainable development is quite branched in methodology and tools because it has more than 10 years of experience (Kazuhiko et al., 2017). These investigations include full-fledged and large-scale sustainability studies either at the UN level or on specific aspects: health and education (Makarenko et al., 2021a, 2021b), energy use (Sun et al., 2018), etc. In such conditions, arranging existing findings and highlighting the most significant research on this topic is essential, which is possible with bibliometric meta-analysis.

The works that research the principles of financing and investment of SDG 13 (Plastun et al., 2020) are highly interested in these studies. For instance, Ishiwatari et al. (2022) examine the principles of protection against climate change (including floods) and relevant investments that help reduce losses in Japan. Desalegn & Tangl (2022) and Baker et al. (2018) also analyzes green finance and green bonds forms, instruments, and measurements. However, there is a gap in academic papers, namely structural exploring of direct connections between determinants of SDG 13 and investments, green financing (green bonds), and responsible investments.

2 Methodology and Data

Bibliometric analysis is gaining mass appeal because it allows a comprehensive investigation of the existing scientific landscape on the selected research topic. Despite the quantitative nature of this type of analysis, it is quite dynamic and complex, which allows for pulling qualitative conclusions too. That is why it has the power to convert some intangible bibliometric indicators into managed data for analysis (Wallin, 2005). It includes many methods: analysis of publications, authors, journals, bibliographic coupling (egg. co-citation, co-occurrence), citation analysis, mapping and clustering, and other hybrid forms. Generally, it can be represented as performance analysis and science mapping, which can characterize individual scientific papers' productivity, impact, and links' social trends etc. (Debmalya et al., 2022).

In the framework of this study, it was offered to use some elements of the bibliometric meta-analysis, which will include the following steps:

1. quantitative step via in-built Scopus and Web of Science (WoS) tools, which include dynamic analysis of the number of publications/citations, structural analysis by research and geographical areas;
2. qualitative step via VOSviewer that allows building clusters for keyword co-occurrence.

To obtain bibliographic data, the authors used the following search queries: "SDG 13" AND investments; "SDG 13" AND "green bonds"; "SDG 13" AND responsible investments. All search queries are as of 16 May 2022.

3 Results and Discussion

Despite the global importance of the SDG 13 implementation, there is insufficient attention to their studies. Over the last five years in WoS and Scopus databases, the total volume of publications on climate actions was 183/208 and began to be more actively studied in 2020. To fill the gap to achieve SDG 13, it is necessary to attract various funding channels where investment is significant. Nevertheless, research papers in this area are confined and only begin to appear (Table 1). More specifically, there were 16 publications in Scopus for 2016-2022 on investment and SDG 13, in WoS - 56. Such instruments as green bonds and responsible investments in the context of achieving SDG 13 also do not find their full coverage in the present moment.

Table 1 Dynamic analysis of SDG 13 and Investments in literature over 2016-2022 (based on publications of WoS/Scopus)

	Overall	2016	2017	2018	2019	2020	2021	2022
SDG 13 AND investments								
Output	53/16	0/0	1/0	0/1	1/1	4/5	6/4	2/5
Cite	108/119	0/0	0/0	0/0	51/4	12/21	45/56	0/38
SDG 13 AND green bonds								
Output	7/1	0/0	0/0	0/0	1/0	1/0	5/1	1/0
Cite	72/1	0/0	0/0	0/0	29/0	13/0	30/1	3/0
SDG 13 AND responsible investments								
Output	3/4	0/0	0/0	1/0	1/1	0/1	1/1	0/1
Cite	60/55	0/0	0/0	9/0	15/52	0/2	36/1	0/0

Source: author's elaboration

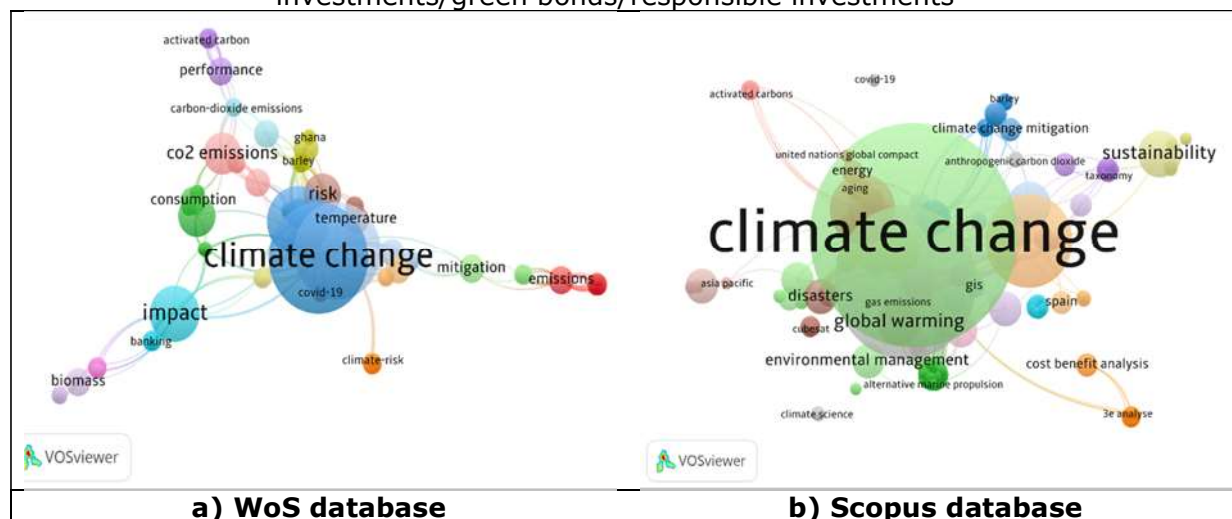
Structural analysis by research areas of SDG 13 and investments, green bonds and responsible investments shows the focus on environmental sciences and green sustainable science technology. On average, economics and related research areas are 14-15% of the academic literature in WoS/Scopus database. The same analysis by geographic area for SDG 13 and investments showed some similar tendencies: the most relevant articles are from Turkey, China and India; for SDG 13 AND green bonds are from Nigeria, South Africa, Pakistan; for SDG 13 AND responsible investments are from Nigeria, Norway, Australia and Nepal.

The conducted quantitative bibliometric analysis allows forming a wide range of data that can be used to build bibliometric maps. Using WoS and Scopus databases, bibliometric maps of publications on SDG 13 and investments/green bonds/responsible investments were developed by the co-occurrence of keywords (Fig. 3). The initial data show that the topic of investment is only within the management of climate change, which indicates one-sided attention to this issue in the academic literature on SDG 13.

Climate Change, Environmental Management, and Sustainability are the top three main concerns in the literature on the WoS and Scopus platforms. The objective of SDG 13 and investments is to cope with climate action, and this is an environmental management relevant question. The bibliometric map of publications in Scopus has 254 items within 3652 links related to SDG 13. There are thirteen main clusters. General aspects of SDG 13 sustainable development are discussed in 8 clusters (1-3 — impact group of clusters, 5,6 — a regulation group of clusters, 10-12 — ecological infrastructure group of clusters). The couple keywords in other clusters relate to economic performance and econometric

modeling (cluster 4, 7-9, 13). However, we can see the lack of specific attention to financing and investments as one of the ways to achieve SDG 13.

Graph 1 Bibliometric map of publications concerning SDG 13 and investments/green bonds/responsible investments



Source: author's elaboration

Conclusions

This paper investigated the level of reflection among scientists on SDG 13 and investment issues using Scopus and WoS tools and VOSviewer software for qualitative analysis. This revealed the following trends. The quantitative bibliometric analysis showed that research related to climate change and the peculiarities of their investment has not become widespread today. The total volume of publications for 2016-2022 on climate actions was 183/208 in WoS and Scopus databases, and their amount in connection with investments – was 53/16. Most of them are in the environmental sciences and green sustainable science technology; only 14-15% of the research is in the economy and related areas. The structural analysis by geographic area showed that the authors published the most relevant articles for SDG 13 and investments from Turkey, China, and Nigeria. China was a leading country in publications about links between SDG 13 and investments.

Appropriate clusters or bibliometric maps were constructed using qualitative bibliometric analysis via VOSviewer. Using co-occurrence of keywords, it formed 13 clusters. Their analyses showed that they could be grouped into two types: Climate Action and Economy management. As a result, these results have some limitations, like time constraints and focusing on specific keywords and platforms. However, these limitations do not affect the quality of results because they showed general tendencies in the research area. These key findings from this study can be used for further research on developing investment and financing for SDG 13 achievement.

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