



# Green Management and Green Bond in Academic Literature: A Systematic Review

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**Abstract.** This study presents a scientometric and bibliometric analysis to identify and examine research trends in green management and bonds. By utilizing a comprehensive dataset of scholarly articles from reputable journals and conference proceedings, the authors apply scientometric and bibliometric techniques to assess publication patterns, identify influential authors and institutions, and analyze the authorship network of the research domain. The author's findings revealed a significant growth in research output on green management and bonds over the past decade, indicating increasing scholarly interest in the topic. Through network analysis, the authors identified key thematic clusters and their interrelationships and described existing research themes on green management and green bonds. In addition, the authors identify a subset of leading authors and institutions contributing to this field, highlighting the key players in the research community. Based on these insights, the authors propose a research agenda that addresses important thematic literature. This study is a valuable resource for researchers, policymakers, and practitioners who want to understand the current state of research, identify opportunities for collaboration, and guide future research directions in green management and green bonds.

**Keywords:** Green Management, Green Bond, Environmental Management, Supply Chain Management, Bibliometric, Scientometric.

## 1 Introduction

In recent decades, attention to environmental sustainability has increased significantly [1]. Along with the increasing urgency of global environmental issues, research on green management and green bonds has grown rapidly [2]. Academic literacy on this topic covers various aspects, ranging from implementation strategies to the resulting economic and environmental impacts [3]. To understand the evolution and trends of Green Management and Green Bond research and identify collaborations between researchers and institutions, scientometric and bibliometric analysis can be handy tools.

Green Management and Green Bonds are two closely related concepts in the context of environmental and economic sustainability [4]. Green management refers to managerial practices that focus on reducing negative environmental impacts so that green bonds have environmental benefits, being a financial instrument design that

funds projects [4]. Scientists have investigated several aspects of this occurrence, ranging from the technological elements of collecting and analyzing data to the ethical and legal ramifications of data utilization [5]. Given the growing emphasis on environmental issues, it is crucial to explore how these approaches can further global sustainability goals [6].

Green management is more than a passing trend; it constitutes a strategic approach that provides long-term benefits for both companies and the environment [7]. Implementing green management strategies enables businesses to enhance operational efficiency, lower costs, and comply with stricter environmental regulations [8]. Additionally, companies that adopt such practices can bolster their public image, attracting consumers and investors who are increasingly focused on sustainability [9]. Therefore, green management not only reflects ethical responsibility but also contributes significantly to business growth and value creation [10].

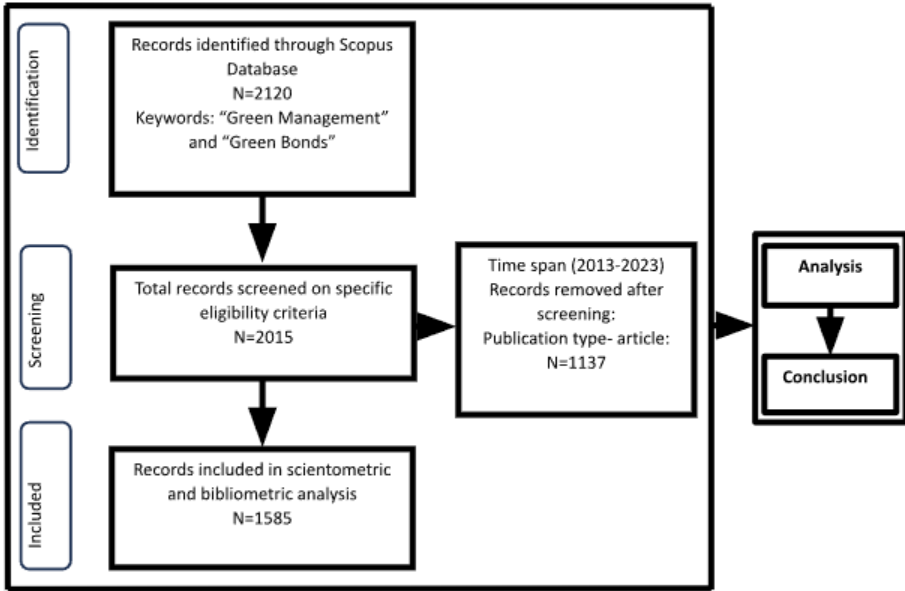
Similarly, green bonds present an attractive opportunity for investors who wish to support sustainable projects while achieving financial gains [11]. As investor interest in socially responsible investments rises, green bonds offer a viable solution by channeling funds into projects that promote a low-carbon economy [10]. The funds acquired through green bonds are utilized to support initiatives such as solar and wind energy projects and advancements in efficient water management [12]. Therefore, advancing the understanding and application of green management and green bonds is vital for encouraging responsible business practices and aiding global efforts to tackle environmental challenges [13].

Despite the growing amount of literature on green management and bonds, there is still a need to analyze this topic's research patterns and areas thoroughly. This study aims to visually represent the intellectual framework of research on green management and bonds. This will be achieved by examining publication patterns, co-authorship networks, and the evolution of the theme over time.

This article aims to provide an in-depth understanding of the development of Green Management research through scientometric and bibliometric analysis. The authors will explore publication trends and collaboration networks between researchers and institutions and identify the research areas that have received the most attention. This study provides insight into the current state of Green Management and Green Bond research and points to future directions for researchers and practitioners in this field.

## 2 Methods

This research uses scientometric and bibliometric analysis to review research on "Green Management and Green Bond" from 2013 to 2023. This research aims to reveal the current state, areas of high activity, and future research directions in Green Management and Green Bond research during this period. Figure 1 illustrates the research procedure.



**Fig. 1.** Number of articles published per year in Green Management and Green Bond research (2013-2023).

Source: prepared by the authors.

## 2.1 Selection of Databases

The initial stage of this investigation was to determine the specific database used, namely Scopus, developed by Elsevier. To consider the potential emergence of foreign literature related to "Green Management and Green Bond", this research selected the globally recognized Scopus database. This database was chosen because Scopus is a comprehensive and extensive multidisciplinary database that combines data from various national and regional institutions worldwide. In addition, journals included in Scopus undergo annual evaluation based on four quantitative measures: h-Index, CiteScore, SJR (SCImago Journal Rank), and SNIP (normalized source impact per paper) [14]. Therefore, journals included in Scopus are considered to meet the peer-reviewed quality criteria set by various research funding organizations for grantees and by degree accreditation bodies in many countries. The CiteSpace program facilitates the import of literature from Scopus.

## 2.2 Data Collection

Having selected Scopus as the database for Green Management and Green Bond research in this study, a comprehensive search for relevant literature was conducted in this database.

### **Literature search strategy.**

The search was conducted on Scopus using the keywords "Green Management and Green Bonds". The era from 2013 to 2023 is characterized by significant progress in Green Management and Green Bonds. Therefore, this study used literature sourced from the database between 2013 and 2023, which resulted in 2015 articles.

### **2.3 Analysis**

Data from Scopus was processed using CiteSpace V.6.3.R2 Advanced, a visualization and analysis software created by Professor Chao-Mei Chen from Drexel University, USA.

CiteSpace is a powerful application that allows quick access to information on specific themes. Her research focuses on information visualization and analysis of knowledge graphs and atlases of scientific boundaries [15]. This research applies a specific processing state, covering the time span from 2013 to 2023, divided into 11 different time zones. Term types are defined as burst terms, while node types are defined as keywords.

## **3 Results and Discussion**

The results section provides a comprehensive explanation of the findings from the data analysis, which can be presented using visual aids such as charts and graphs. During the discussion, the authors will explain their understanding of the data and speculate on its significance for current and future studies.

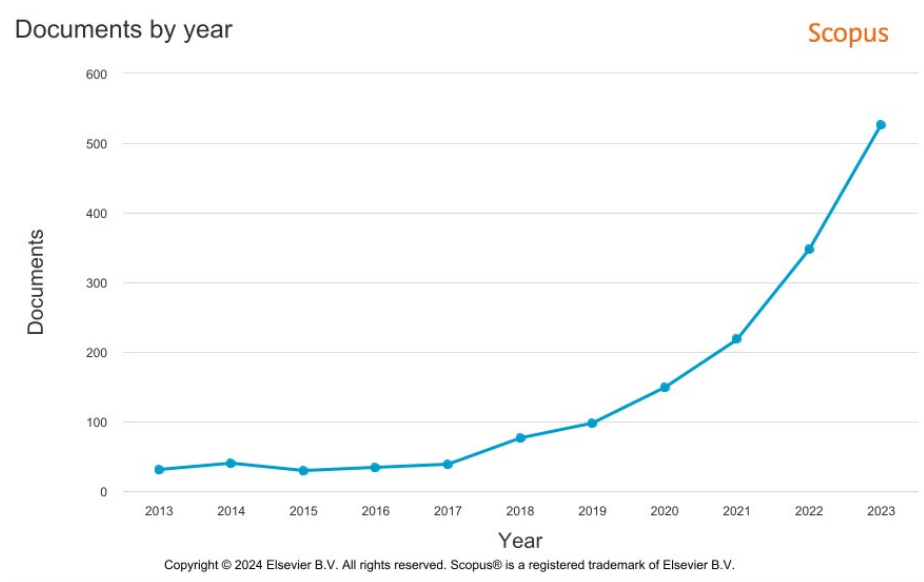
### **3.1 Current research status and hotspot**

A total of 1,585 articles related to Green Management and Green Bonds were published between 2013 and 2023. These articles were selected by filtering out specific types of records, such as program files and editing materials, and focusing solely on reviews or articles to eliminate irrelevant information from the database. The articles included the terms Green Management and Green Bond in the title, index terms, or abstract. Figure 2 displays the number of annual publications. Wherein in 2013-2016, there were fluctuations. The number of publications on Green Management and Green Bonds has experienced significant growth, from 31 publications in 2013 to 526 publications in 2023. This increasing trend shows the expanding interest of academics in studying Green Management and Green Bonds. Based on the trends depicted in the vertical bar graph, It is possible for us to group them *within* two separate timeframes:

1. During the first development era, from 2013 to 2017, annual article publications were below 50, and the growth rate was relatively slow. This initial stage was where data on Green Management and Bonds guided the focus.
2. During the period of rapid development from 2018 to 2023, there was a significant increase in the number of articles published on Green Management and Green

Bonds. In 2020, the number exceeded 100 and continued to increase rapidly until 2023, reaching 1,585 articles.

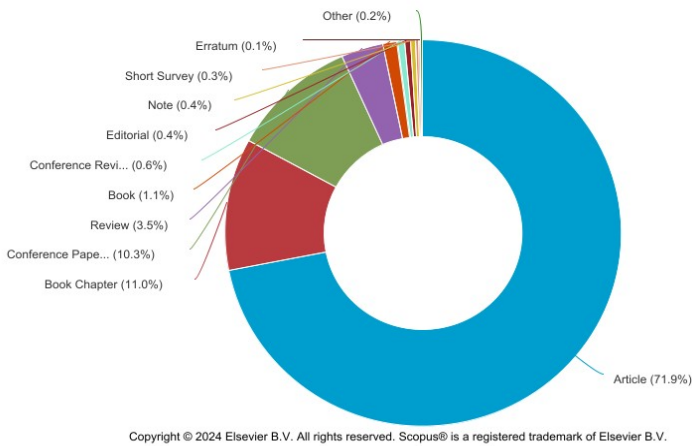
Green Management and Green Bond research documents cover ten file types: Article, Book Chapter, Conference Paper, Review, Book, Conference Review, Editorial, Note, Short Survey, and Erratum. The specific document types are depicted in Figure 3. Research on Green Management and Bonds has evolved into a multidisciplinary field, as seen from the subject distribution. Figure 4 provides a comprehensive overview of the top 10 subjects in the research field, focusing on Green Management and Bonds. The data clearly shows that the 'Economics, Econometrics, and Finance' category has the highest popularity, with 618 publications representing 19.3% of the total publications. The 'Business, Management, and Accounting' category comes second in popularity, with a total of 528 publications or 16.5% of the overall publications. 'Environmental Science' has 503 publications, 'Social Sciences' has 344 publications, and 'Energy' has 317 publications. The number of publications in the fields of 'Engineering', 'Computer Science', 'Earth and Planetary Sciences', 'Decision Sciences', and 'Agricultural and Biological Sciences' is below 300. A systematic review, which includes analysis of citations, co-citation patterns, and co-occurrence relationships, allows for a visual representation of the overall structure of scientific knowledge.



**Fig. 2.** Quantity of articles released annually in Green Management and Green Bond research (2013-2023).

## Documents by type

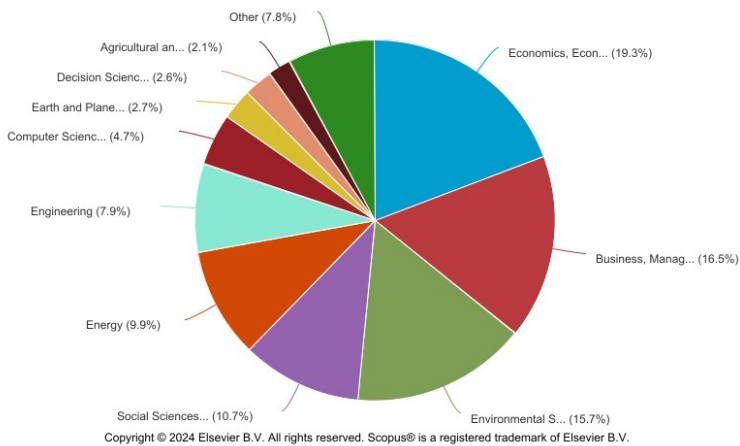
Scopus



**Fig. 3.** Types of documents in Green Management and Green Bond research (2013-2023).

## Documents by subject area

Scopus



**Fig. 4.** Scopus subject categories in Green Management and Green Bond research (2013-2023).

How research boundaries are interconnected and the understanding can be gained by analyzing a set of graphical representations (including collaboration networks, co-citation networks, and co-occurrence networks) generated with CiteSpace software.

Before analysis, the data was cleaned using CiteSpace's 'remove duplicates' feature. Ultimately, 1,585 data points were preserved. A workflow diagram is presented in Fig. 1 to demonstrate this procedure.

### 3.2 Citation Analysis in Green Management and Green Bond Research

To tackle complex scientific challenges and encourage inventive thinking, it is necessary to build collaborations among nations, organizations, and scholars across different research areas. This study has developed collaborative visualizations, such as networks of author collaborations, institutional partnerships, national collaborations, and geographic networks. These visualizations are derived from the collected literature data and aim to identify prominent researchers, institutions, and countries, along with their social connections.

#### Author collaboration network analysis in Green Management and Green Bond research.

The author collaboration network analyzes the degree of cooperation and mutual relationships among various authors, as depicted in Figure 5. The network consists of 380 nodes representing authors and 239 lines, which represent the relationships between them. The size of each node corresponds to the number of times an author is referenced, while the width of the line indicates the number of shared articles. This network diagram has a low overall density of 0.0033, which indicates that it does not appear to be dense sufficient. Grid 1 summarizes the 7 most influential authors sorted by the frequency of their collaboration. The frequency of Taghizadeh-hesary, Farhad in the first place is 16, with his first appearance in a collaborative relationship in 2021. The second place is occupied by Naeem, Muhammad Abubakr with 15 frequencies. Following close behind is Tiwari, Aviral Kumar with a frequency of 14 and a first appearance in 2022. All other researchers have a frequency of collaboration below 14, and they started collaborating with other researchers later. The statement shows that the researchers involved in Green Management and Green Bond studies are widely dispersed and have few academic connections.

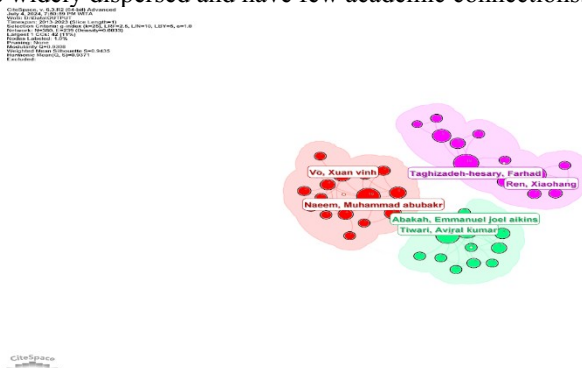


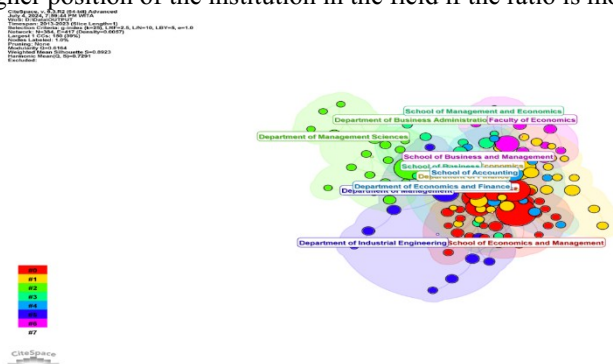
Fig. 5. Visualization of the author's collaboration network.

**Table 1.** Top 7 authors by frequency in Green Management and Green Bond research (2013-2023).

Authors	Year	Frequency
Taghizadeh-hesary, Farhad	2021	16
Naeem, Muhammad Abubakr	2021	15
Tiwari, Aviral Kumar	2022	14
Abakah, Emmanuel joel aikins	2021	12
Ren, Xiaohang	2022	12
Vo, Xuan vinh	2021	9
Rasoulinezhad, Ehsan	2020	9

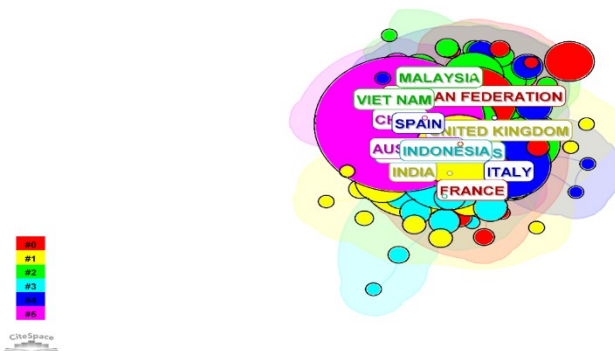
### Network analysis of Institutional collaboration in Green Management and Green Bond research.

The Aggregate Density of the 384 nodes and 417 relationships that make up the institutional collaboration network is 0.0057. Each node in Figure 6 represents a different institution. The number of documents the organization publishes is defined by the node size. The more documents distributed by the organization, the larger the node. The Department of Accounting node is the largest among them. In addition, the interconnectedness shows how the organizations cooperate. The deeper the interaction between organizations, the more links there are. It is clear that there are complex relationships across institutions, and the color schemes are mostly diverse, signifying the various interactions that are and will be taking place. In addition, the prominence of each institution is reflected in the outer blue circles on the nodes. This circle indicates the percentage of the network's longest path that passes through the node and connects to all other nodes. Blue circles indicate a higher node centrality and a higher position of the institution in the field if the ratio is more significant.

**Fig. 6.** Visualization of the institution's collaboration network.

### Analysis of country cooperation networks in Green Management and Green Bond research.



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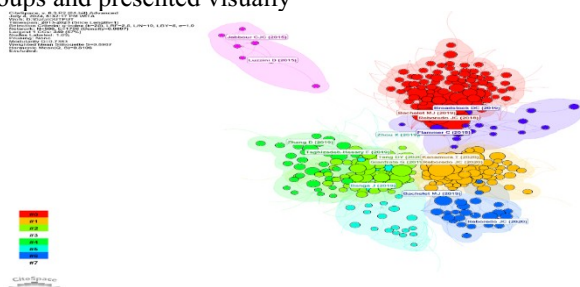
Countries	Year	Frequenc y	Centrality
China	2021	402	0.11
United States	2021	130	0.18
Italy	2022	90	0.1
Australia	2021	67	0.09
Malaysia	2022	57	0.08
Taiwan	2021	45	0.01
Hong Kong	2020	22	0

### 3.3 Co-citation Analysis in Green Management and Green Bond Research

Citation the analysis is capable of characterize dynamic framework of scientific progress and disclose the internal relationships as well as rules concerning scientific literature. Research into document relationships, literature search, and literature structure indicates that two documents create connections with one or more additional documents. The features of co-citation stipulate those two documents with a co-citation relationship are always passive. Their partnership continuously awaits the creation of additional documents. As a result, it can better adapt to current study items that are constantly evolving. Simply put, Green Management and Green Bond research is a dynamic and changing field of knowledge. A citation analysis of authors, documents, and journals has been conducted in this article to look at the evolution of Green Management and Green Bond research. The author hopes to understand the body of knowledge and leadership positions in this field.

#### Network analysis of document citations in Green Management and Green Bonds.

Typically, traditional document reviews rely on qualitative analysis through narrative, which relies heavily on people's judgment and explanations. However, CiteSpace software can visually represent these non-descriptive judgments. These two strategies complement each other and contribute to the overall persuasiveness of the research. Document citation analysis is a method that can be used to find important or key literature in the field of research on Green Management and Green Bonds. Figure 8 displays the overall view of the document citation network. The citation network in this article consists of 596 nodes and 1726 links. The overall network map has a density of 0.0097. The citation rings represent the entire citation record of each article. The color of the citation tree rings corresponds to the relevant time. By applying multivariate statistical methods like cluster analysis, intricate citation network connections among numerous items are simplified into a smaller set of groups and presented visually



**Fig. 8.** Visualization of document co-citation network.

**Table 3.** Top 7 references by frequency in Green Management and Green Bond research (2013-2023).

Cluste r	Size	Shilhouette	Label (LLR)	Mean Year
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0	97	0.915	Portofolio Management	2020
1	65	0.866	Dynamic Dependence	2020
2	64	0.842	Chinese Secondary Market	2019
4	32	0.931	Green Finance	2019
5	29	0.907	Financial Performance	2017
6	26	0.983	Global Green Bond	2019
8	20	0.913	Price Connectedness	2017

Specifically, table 3 provides a summary of the results for the seven leading clusters. The term 'size' indicates the number of publications within each cluster. The largest grouping is, labeled as cluster #0, contains references to 97 individuals. Cluster #1 references 65 individuals, and the other clusters vary, as presented above. Silhouette score is a metric used to quantify the level of homogeneity within a cluster [16]. A elevated silhouette score indicates a greater degree of homogeneity. Clustering results are considered highly credible when the silhouette score is 0.7 and only credible when it exceeds 0.5 [17]. All seven clusters mentioned in Table 3 have a silhouette score over 0.7, which indicates showing that these clusters are efficient and persuasive. The average score indicates the average publication year for the papers in a given cluster. This can be used to determine whether the cluster is new or established [18]. Cluster #6 represents recent developments, indicating that the "Global Green Bond" is the focal point of current studies on the subject. Table 4 displays the top 7 references that have received exceeding 5 citations. The literature provided are the leading frequently documented soruces among the 1,585 documents obtained within this article and might not necessarily correspond to the maximum frequently referenced documents within Scopus or Google Scholar. These cited publications represent a body of knowledge that benchmarks the current state of research in the literature. The article titled 'Green Bonds and Financial Markets: Co-movement, Diversification, and Price Spillover Effects' by Reboredo JC in the Journal of Energy Economics is the most frequently mentioned among the 7 references listed, with a total of 193 citations. The essay reveals that green bond prices tend to move with corporate and government bond prices. However, this co-movement is not as strong with stock markets and energy commodities. Diversification suggests that green bonds provide limited benefits to investors holding corporate bonds. That is, adding green bonds to a corporate bond portfolio does not significantly reduce the overall risk of that portfolio. In the price spillover effect, price changes in the green bond market can affect other financial markets. Green bonds receive significant price spillover effects from government and currency markets, but the effects are weaker in the stock, energy, and high-risk corporate bond markets. At the same time, the conclusion demands that although green bonds have linkages with broader financial markets, they have unique characteristics that may affect the stability and risk of investment portfolios that include them. This paper is a fundamental literature in the field of Green Management and Green Bond studies. In addition, the authors suggest that research boundaries signify the progress of a particular research area. Research boundaries consist of publications that refer to frequently used sources. Table 5 provides a list of the top 7 papers [15], [19], [20], [21], [22], [23], [24] that cite the

article by Reboredo JC, these cited papers were recently published. Studying data-driven Green Management and Green Bond research topics allows for a comprehensive understanding of the growth of scientific knowledge and changes in essential research areas. Additional documents in Table 4 cluster (#0) include 'The green advantage: Exploring the convenience of issuing green bonds' published in the Journal of Cleaner Production, authored by Gianfrate G has provided a noteworthy addition to this topic.

**Table 4.** Top 7 references by frequency in Green Management and Green Bond research (2013-2023).

Title	Author	Year	Frequency	Source
Green bond and financial markets: Co-movement, diversification, and price spillover effects	Reboredo JC	2018	193	Energy Economics
The green advantage: Exploring the convenience of issuing green bonds	Gianfrate G	2019	69	Journal of Cleaner Production
Are green bonds environmentally friendly and good performing assets?	Kanamura T	2020	58	Energy Economics
Price connectedness between green bond and financial markets	Reboredo JC	2020	56	Economic Modelling
The green bonds premium puzzle: The role of issuer characteristics and third-party verification	Bachelet MJ	2019	54	Sustainability
Network connectedness of green bonds and asset classes	Reboredo JC	2020	35	Energy Economics
The effect of pro-environmental preferences on bond prices: Evidence from green bonds	Zerbib OD	2019	35	Journal of Banking and Finance

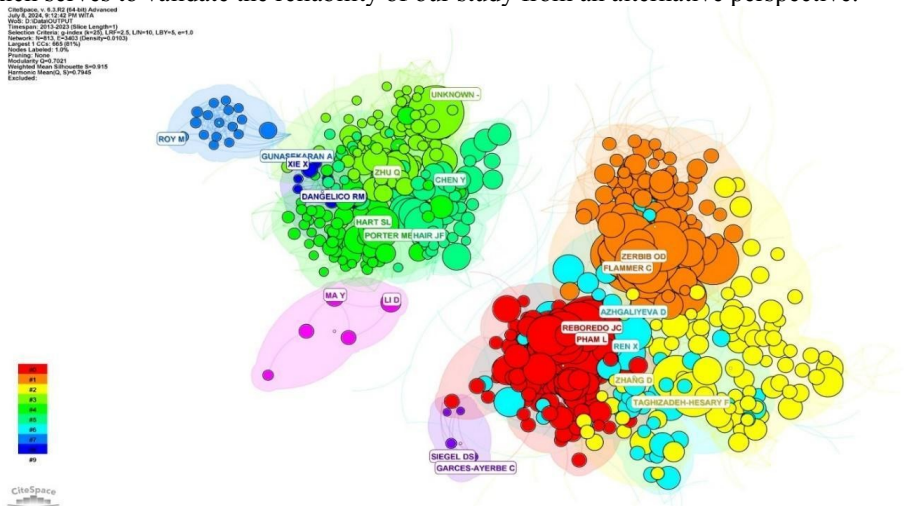
**Table 5.** Top 7 articles citing the article titled 'Green bonds and financial markets: Co-movement, diversification and price spillover effects'.

Title	Author	Year	Citation	Source
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Green bonds for sustainable development: Review of literature on development and impact of green bonds	Bhutta US	2022	234	Technological Forecasting and Social Change
Evolution of green finance and its enablers: A bibliometric analysis	Bhatnagar S	2022	91	Renewable and Sustainable Energy Reviews
Does green finance inspire sustainable development? Evidence from a global perspective	Wang KH	2022	153	Economic Analysis and Policy
Dynamic spillover effects among green bond, renewable energy stocks and carbon markets during COVID-19 pandemic: Implications for hedging and investments strategies	Tiwari AK	2022	247	Global Finance Journal
Asymmetric effects of geopolitical risks and uncertainties on green bond markets	Tang Y	2023	70	Technological Forecasting and Social Change
The interrelationship between the carbon market and the green bonds market: Evidence from wavelet quantile-on-quantile method	Ren X	2022	137	Technological Forecasting and Social Change
Quantile time–frequency price connectedness between green bond, green equity, I sustainable investments and clean energy markets	Chatziantoniou	2022	170	Journal of Cleaner Production

### Author citation network analysis in Green Management and Green Bond.

Through author citation analysis, we are able to identify influential individuals in the research fields of Green Management and Green Bond and offer guidance for the recruitment of talented individuals by certain relevant organizations. The network consists of 813 nodes and 3403 links, with an overall density of 0.103, as shown in Figure 9. The most prominent node corresponds to the referenced author, Reboredo JC, with a frequency of 277. The red-ring nodes have high degree values, including 57 and 50, indicating that Reboredo JC and Pham L have a special place in this field. Table 6 presents the names of the 7 most frequently referenced writers, having a citation occurrence of more than 277. The node Reboredo JC has a degree value of 50 and Pham L of 57, indicating they are important nodes. Degree is used to measure how much interaction and influence or popularity an author has in the scientific research network [25]. The higher an author's degree, the more other authors cite them in the same context [26]. Other authors, including Flammer C, Zerbib OD, Pham L, Tang DY, Unknown, and Naem MA, have been cited, and their degree values are all above 10, so they are also worth considering. The identification of Reboredo JC as the lead author is in line with the findings pertaining to the document citation analysis, which serves to validate the reliability of our study from an alternative perspective.



**Fig. 9.** Visualization of the author's co-citation network

**Table 5.** Top 7 most cited authors by frequency in Green Management and Green Bond research (2013-2023).

Author	Degree	Frequency	Year
Reboredo JC	50	277	2019
Flammer C	27	261	2019
Zerbib OD	30	234	2019
Pham L	57	222	2019

Tang DY	31	198	2020
Unknown	11	166	2013
Naeem MA	56	161	2021

**Network analysis of journal citations in Green Management and Green Bond.**

The scientific literature on Green Management and Bonds is sourced from various periodicals. Gaining insight into the distribution of key journals in these disciplines can be a reliable basis for collecting literature. Key journals cited in the research areas of Green Management and Green Bonds are listed in Table 7. Key journals in these areas include Sustainability, Journal of Cleaner Production, Energy Policy, Diversification and Price Spillover Effects, Finance Research Letters, J. Clean. Prod, and Energy Econ. Sustainability is the most frequently mentioned journal among the 7 journals on the list, with 462 citations. Journal of Cleaner Production achieved the highest degree, ranking first with a score of 65. According to this indicator, this journal has a significant impact on connecting with other journals. The journal is precious for academics in the field of Green Management and Green Bonds.

**Table 6.** Top 7 most cited journals by frequency in Green Management and Green Bond research (2013-2023).

Journal	Frequency	Degree	Year
		e	
Sustainability	462	31	2018
Journal of Cleaner Production	379	65	2013
Energy Policy	226	10	2014
Diversification and Price Spillover Effects	213	24	2019
Finance Research Letters	181	33	2020
J. Clean. Prod	180	53	2015
Energy Econ	144	36	2018

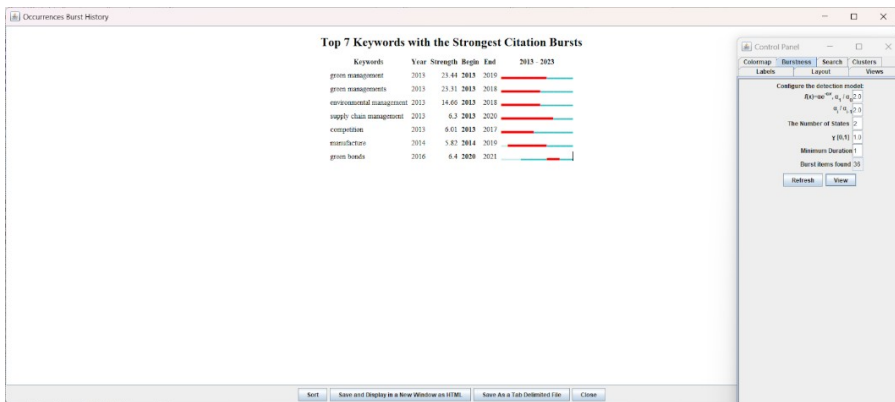
**3.4 Co-occurrence Analysis in Green Management and Green Bond Research**

**Detection of explosive keywords.**

Keywords are concise representations of the main substance of a work, effectively capturing the author's ideas and scientific perspective. The term “sudden detection of keywords” relates to terms used with greater frequency or over a shorter timeframe of time and which attract special attention from scholars in a certain period. The frequent occurrence and changes in certain terms can be used to assess the current boundaries and trends in this academic field. Table 8 displays the top 7 keywords that show the most prominent spikes. The final column in the row shows the complete duration associated with the study, ranging from 2013 to 2023. The red line indicates the timeframe in which the keyword explosion occurred. Ranking highest in terms of

burst strength is 'Green Management' with a burst of 23.44. Following below it was 'Green Managements' with a burst of 23.31. Occupying the third position was 'Environmental Management' with a burst of 14.66. In descending order, the next categories were 'Supply Chain Management' (6.3), 'Competition' (6.01), 'Manufacture' (5.82), and 'Green Bonds' (6.4). These keywords appear to exemplify the distinctive attributes of a particular time frame. By conducting a thorough analysis, we can ascertain that the subjects of most interest in this domain undergo shifts over time. In 2013, the main focus of research in the field of Green Management and Green bonds was “green management” and “green management”. More recently, the research focus has shifted towards 'green energy' and 'environmental pollution'.

**Table 7.** Top 7 keywords by explosive power in Green Management and Green Bond research (2013-2023).



## 4 Conclusion

This article presents a comprehensive scientific assessment of 1,585 data on Green Management and Green Bonds. The review is based on data obtained from the Scopus database and analyzed using CiteSpace. Valuable insights have been gained from examining citations, co-citations, and co-occurrences. The literature on Green Management and Green Bonds has increased, especially since 2017. Nevertheless, the research is still fragmented, and there is still a lack of collaboration among experts. China has been a major provider, as many high-yielding institutions are located within its borders. Europe and America have also extensively researched Green Management and Bonds in several sectors. In addition, Farhad Taghizadeh-Hesary and Muhammad Abubakr Naeem have emerged as noteworthy researchers in the field of Green Management and Green Bonds. The Journal of Cleaner Production, Energy Policy, and Sustainability has been instrumental in creating linkages with other journals. In recent years, research has focused on several key areas including 'Green Management', 'Green Managements', 'Environmental Management', 'Supply Chain Management', 'Competition', 'Manufacture', 'Green Bonds'. Scientometric and bibliometric analysis is essential to detect potential relationships between books and study the development of knowledge in Green Management and Green Bonds.



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