

BIBLIOMETRIC AND AI ANALYSIS OF ENVIRONMENTAL RISKS OF SUKUK AND BOND YIELDS

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Abstract: This study investigates the progression of environmental threats and their relationship with sukuk and bond yields. A bibliometric analysis was conducted using articles from the Web of Science Core Collection database spanning from 2000 to 2023, employing VOSviewer and ChatGPT. The analysis encompassed a range of topics such as prominent writers at the journal and institution levels, citation patterns, keyword distribution, the top 10 publishing titles, and countries with the highest publication activity. The bibliometric analysis provided a clear depiction of the various steps involved in studying environmental concerns, sukuk and bonds yields, and identifies potential topics for additional investigation. The study demonstrates a higher level of understanding of environmental matters, specifically in issuing green sukuk and bonds, which prioritise corporate social responsibility and environmental, social, and governance factors.

Keywords: Environmental risks, sukuk, bonds, yields.

Introduction

Literary studies have extensively examined environmental issues, including those related to hazards, as socially conscientious, sustainable, and significant investments. The World Economic Forum's Global Risk Report 2021 identifies the top five risk factors humanity is most likely to face as extreme weather, inadequate climate action, anthropogenic environmental damage, infectious diseases, and biodiversity loss. With the rapid global spread of the unprecedented COVID-19 epidemic, there is a growing sense of urgency regarding climate change and the need for environmental conservation. There is a mounting consensus that the accelerated rise in the occurrence of aberrant climate phenomena (such as forest fires, droughts, and flooding) resulting from environmental degradation is the underlying factor behind viral infections such as COVID-19.

The endeavour to achieve a sustainable development trajectory that meets the needs of the present generation without jeopardising the welfare of future generations is not a novel

task. Climate change and the shift towards a sustainable development paradigm have become increasingly significant in recent years. According to the sustainable finance guidelines set by the European Central Bank (ECB, 2020), corporations strive to generate profit while upholding important principles such as providing fair compensation to employees, respecting ethical and social values, and conserving the environment.

This study is significant because it examines the risks and impacts of climate change on the capital market, emphasising the importance of implementing environmental measures for effective risk management. Environmental, Social and Governance (ESG) investing has increasingly garnered recognition as an investment strategy that not only addresses the world's sustainable development goals but also consistently generates financial rewards. According to Kanamura (2021), the total value of sustainability bonds also known as ESG bonds¹, rose from US\$14.8 billion in 2013 to

US\$261.4 billion in 2018, representing a 17-fold increase compared with 2013. Moreover, in 2019, it surged to US\$465 billion, nearly doubling the amount from 2018. Financial organisations, including hedge funds and asset management vehicles are actively integrating ESG factors into high-yield bonds, sometimes referred to as junk bonds.

Given that the bulk of ESG bonds consist of green bonds, research on green bonds must find indications of environmental risks. Conversely, there is an ongoing study investigating the impact of ESG factors on financial assets, particularly bonds. The emergence of a substantial private-sector green bond market is a significant and recent advancement. Furthermore, it exerts a notable influence on the environmental footprint of green bonds, as well as their marketability.

This research aims to enhance awareness of the environmental risks that affect bond yields by examining the current studies on the diversification and expansion of green bonds and the state-of-the-art ESG performance in the banking industry. Only a limited body of research (Fusco & Ricci, 2019; Ye *et al.*, 2020; Gao *et al.*, 2021) has explored the literature on ESG in a broad sense. However, there is a dearth of studies investigating long-term investments or the relationship between environmental risk and bond yields. Given the significant growth of green bonds and socially responsible investments (SRI) in the past two decades, it is imperative to examine this matter.

The distinguishing feature of this study lies in its strategy, which seeks to investigate the impact of environmental risk on bond yields as a mechanism for creating value for the economy. The study addresses the knowledge vacuum by gathering and analysing existing studies on environmental risks and bond yields. The goal is to discover patterns and prospective areas of interest. The following are the precise research questions of this study:

- (i) What is the publication trend of environmental risks for bonds and sukuk yields in the past 23 years?
- (ii) Who are the top publishers in environmental risks for bonds and sukuk yields?
- (iii) What are the most popular keywords in this area?
- (iv) Which journals and authors are the most productive and influential regarding environmental risks of bonds and sukuk yields?
- (v) What are the research gaps in environmental risks for bonds and sukuk yields?
- (vi) What is the anticipated future development in environmental risks for bonds and sukuk yields?

The bibliometric analysis conducted in this study is important as it offers a forward-looking perspective to comprehend the progression of literature from conceptual ambiguity to theory evaluation and to elucidate the essential constructs and their connections (De Bakker *et al.*, 2005). The growth of the literature is determined by considering the extensive academic collaborations within the research community, which play a crucial role in facilitating knowledge generation and exchange (Koseoglu, 2016). Hence, it is important to understand the escalating pattern of interdisciplinary academic partnerships. This study is also important as it serves as a foundation for empirical studies that require theoretical and conceptual support for analysis.

The subsequent section of the paper is structured in the following manner: Section 2 delves into the examination and discoveries derived from the study objectives and inquiry while Section 3 describes the research methodology and procedure. Section 4 concludes by examining the implications and constraints of the study's findings.

¹ Sometimes the market refers to bonds as both Islamic and conventional bonds, using the term "bonds" in a general sense.

Methodology

The focus of the study is on both sukuk and bond instruments. Selected keywords related to environmental risks and yields were used. The data were sourced from the Web of Science, specifically the Social Sciences Citation Index. The “All Fields” filter was used and the keyword search is shown in Table 1.

The data were extracted on 8th February 2023 and consisted of a total of 322 publications. These publications spanned from the year 2000 to 2023. The VOSviewer software was utilised for literature analysis. Given the novelty of the search topic in the field of bonds and sukuk, all sorts of documents were taken into consideration, including articles, early access publications, review articles, editorial materials, book chapters, and meeting abstracts.

The study also employed the aid of artificial intelligence (AI), namely ChatGPT 3.5. ChatGPT is an AI-driven natural language processing tool that enables human-like chats. Currently, the utilisation of AI has become a popular practice in research and significantly streamlines the process of conducting literature reviews. However, ChatGPT was solely employed in this study to uncover and investigate research trends rather than being solicited to generate content. Additionally, the information offered by ChatGPT necessitated careful assessment, particularly regarding the authenticity of the sources. The queries presented in ChatGPT were thoroughly verified to ensure they were in line with the study questions and to confirm the credibility of the publications.

Results and Discussion

The findings cover the citation and publication analysis, keywords co-occurrence analysis, bibliographic coupling, and the top journals in which these publications appeared. Figure 1 illustrates the cumulative count of publications and citations from 2000 to 2023, with 322 publications and 2,571 article citations. A higher number of citations was supported by an increasing number of publications, as demonstrated in Table 2. It showed a significant surge in the total number of publications, rising from a mere one publication in 2011 to 134 publications in 2022. Since 2019, there has been significant interest in studying the relations between environmental risk and sukuk and bonds, particularly in the context of green bonds and the environment. For nearly 23 years, there has been a significant upward trajectory in research activity in this field and a notable rise in the number of published works can be expected by the end of 2023.

Upon deeper analysis of the classification of the Web of Science categories, as presented in Table 3, it was evident that the economics category had the highest number of records at 105, followed by business finance with 91 records, and environmental studies with 84 records.

Citation analysis was undertaken to investigate the second research question regarding the top publisher. Table 4 displays the 10 most frequently cited topics that are primarily associated with sukuk and bond yields, as well as environmental risk. The

Table 1: Keywords search in Social Sciences Citation Index (SSCI)

Web of Science (Social Sciences Citation Index)
↓
“Environmental risk” AND “bonds” OR “Environmental risk” AND “Islamic securities”, OR “Environmental risk” AND “sukuk”, OR “Environmental risk” AND “Islamic bonds”, OR “Environmental risk” AND “sovereign bonds”, OR “Environmental risk” AND “sovereign sukuk”, OR “Environmental risk” AND “corporate bonds”, OR “Environmental risk” AND “corporate sukuk”, OR “Environmental risk” AND “conventional securities”, OR “Environmental risk” AND “bonds yield”, OR “Environmental risk” AND “sukuk yield”, OR “Environmental risk” AND “capital market”, OR “Environmental risk” AND “bonds returns”, OR “Environmental risk” AND “sukuk returns”, OR “Environmental risk” AND “yield to maturity”, OR “ESG” AND “bonds”, OR “ESG” AND “sukuk”, OR “SRI sukuk”, OR “SRI bonds”, OR “Green bonds”, OR “Green sukuk”.

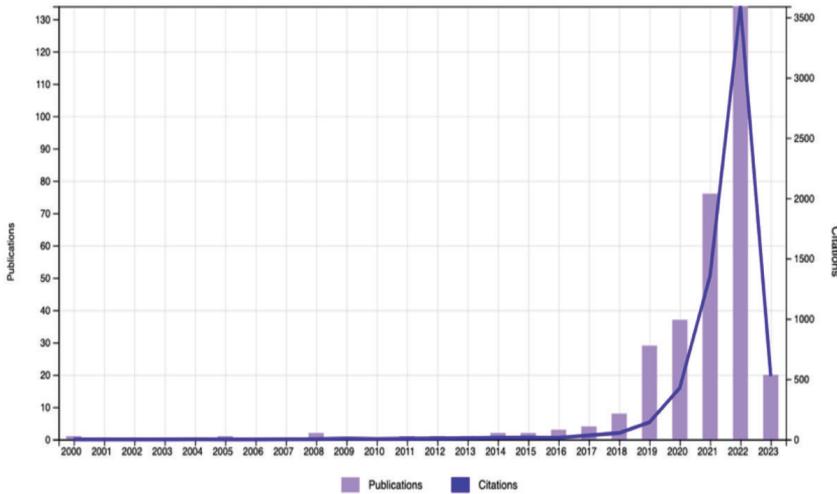


Figure 1: Publications and citations (2000-2023)

Table 2: Number of publications (2000-2023)

Year	Number of Publications	Year	Number of Publications
2023	20	2011	1
2022	134	2010	0
2021	76	2009	0
2020	37	2008	2
2019	29	2007	0
2018	8	2006	0
2017	4	2005	1
2016	3	2004	0
2015	2	2003	0
2014	2	2002	0
2013	1	2001	0
2012	1	2000	1

topic with the highest number of citations was management, with 96 cited publications. This was followed by economics, with 90 cited publications, and sustainability science, with 39 cited publications. These data indicate that the majority of environmental studies were primarily focused on business, particularly in the fields of management and economics. The remaining aspects of the subject pertained to science-oriented subjects.

Citations are commonly utilised as a measure to assess the significance and influence

of previous studies even within the realm of economic and business research. Citation analysis is the most objective method for assessing the influence and significance of research results (De Villiers & Hsiao, 2018). A research publication’s elevated citation index indicates that it has had or will have a substantial influence on the field. Feng *et al.* (2017) suggested that the impact of research on researchers can be observed through the patterns of citations in their publications.

Table 3: Web of Science categories

Web of Science Categories	Record Count	Percentages (%) of 322
Economics	105	32.609
Business Finance	91	28.261
Environmental Studies	84	26.087
Environmental Sciences	66	20.497
Green Sustainable Science Technology	45	13.975
Business	33	10.248
Management	20	6.211
Regional Urban Planning	16	4.969
Energy Fuels	15	4.658
Engineering Environmental	12	3.727
Geography	11	3.416
Development Studies	7	2.174
International Relations	7	2.174
Law	6	1.863
Public Administration	6	1.863
Political Science	5	1.553
Public Environmental Occupational Health	5	1.553
Mathematics Interdisciplinary Applications	4	1.242
Ethics	3	0.932
Meteorology Atmospheric Sciences	3	0.932
Social Sciences Mathematical Methods	3	0.932
Urban Studies	3	0.932
Anthropology	2	0.621
Engineering Industrial	2	0.621
Forestry	2	0.621

Table 4: Top 10 citation topics

Topic	Number of Cited Publications
Management	96
Economics	90
Sustainability Science	39
Security Systems	13
Political Science	7
Forestry	6
Climate Change	5
Human Geography	5
Artificial Intelligence and Machine Learning	3
Marine Biology	2

Figure 2 depicts the citation analysis. According to the map, the article by Flammer (2021) has the highest number of citations. Flammer examined the impact of green bonds on financing projects that promote environmental sustainability. The study’s findings demonstrated that issuers enhance their environmental performance after issuing securities and observed a rise in ownership by long-term and environmentally conscious investors. The article with the second highest number of citations is Tang et al. (2020). The study provided a concise summary of the policy considerations related to the governance of green bonds. It investigated the influence of green bonds on yield spread, credit ratings, Corporate Social Responsibility (CSR), and green certification. Remarkably, the findings indicated that green

bonds with green certificates have a lower interest rate compared with those without them. The subsequent citation of significance was Gianfrate (2019), which primarily focused on the role of green bonds in channelling financial resources towards environmentally friendly and sustainable investments. Furthermore, it signified that the green bond market exerts a substantial influence on the transition towards a more environmentally sustainable economy. In his study on green bonds and various asset classes, Reboredo (2020) received the highest number of citations in his field, along with Naeem (2021a; 2021b).

Figure 3 illustrates the citation distribution across authors, highlighting the top three authors with the highest citations in the specific research

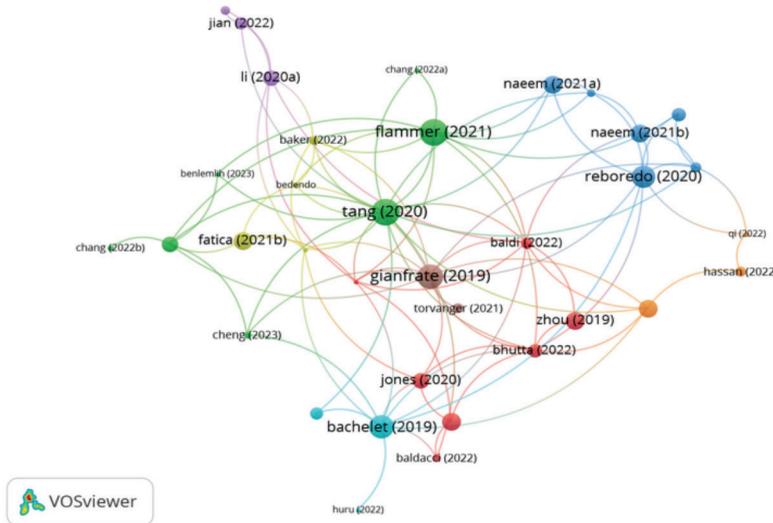


Figure 2: Citation analysis



Figure 3: Citation based on authors

area. Muhammad Abubakr Naeem emerged as the author most frequently referenced by other studies. Based on the data, his studies primarily focused on the contribution of green bonds to other assets and their impact on energy markets. Following is Farhad Taghizadeh-Hesary, whose research mostly centred around the topics of green bonds, energy price volatility, and geopolitical risk. Serena Fatica examined the consequences and efficacy of issuing green bonds for environmental purposes, particularly their impact on low-carbon economies.

Figure 4 depicts the citation distribution based on the sources of publishing. The diagram illustrates the connections between cited sources. The study commenced with the Sustainability journal in early 2020, followed by the Journal of Cleaner Production, Energy Economics, Finance Research Letters, and ultimately, Business Strategy and the Environment in early 2022.

Table 5 displays the highest number of publications among universities and educational institutions. Ho Chi Minh City University of Economics in Vietnam and the University of London in the United Kingdom were the two highest-ranking universities. Both organisations achieved a total of 12 publications, establishing themselves as the most effective institutions in publishing environmental content related to sukuk and bonds. While it was expected that a university from the United Kingdom would excel in the ranking, it was remarkable to witness a university from Vietnam achieve the

same level of recognition. The World Bank’s Emerging Market Green Bond Report 2018 states that Vietnam, a significant transitional economy has pledged to issue US\$125 million in green bonds. These bonds aim to mitigate flood risk in the urban core area, enhance connectivity to new urban growth areas, and strengthen the city’s ability to manage disaster risk. Vietnam’s aspiration to excel in the green bonds market was strengthened by the study conducted by Tu *et al.* (2020), which examined the elements that impact the growth of green bonds in Vietnam. They found that experts placed significant emphasis on infrastructural and economic criteria while considering political, social, and cultural criteria to have the least impact on the growth of the green bonds market in Vietnam.

South Ural State University held the second position in the ranking, having produced a total of 10 publications. The University of Bologna placed third, having produced eight publications while University College Dublin ranked fourth, with a total of seven publications. The Asian Development Bank, Ilma University, Massey University, Udice French Research Universities, and Universidade de Santiago de Compostela were placed sixth and lower, each with six publications.

Upon examining the top 10 publishers, as shown in Table 6, it became evident that Elsevier held the highest position with 152 articles, out of 298 articles. Following closely behind were Multidisciplinary Digital Publishing Institute

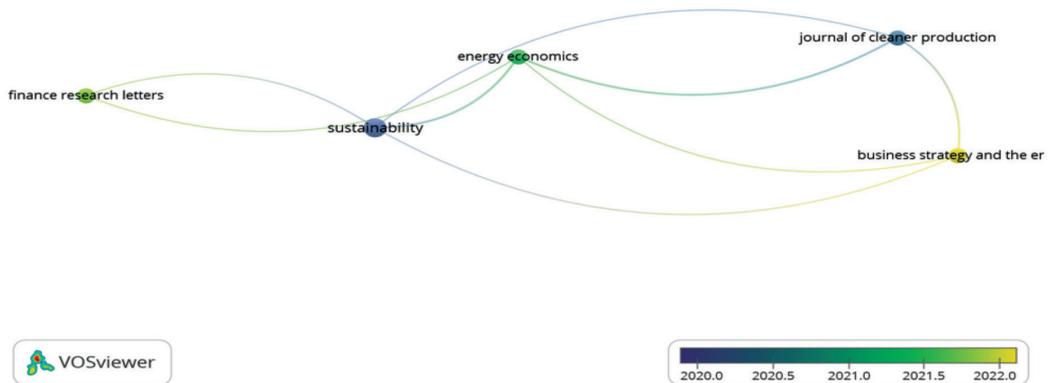


Figure 4: Citation based on sources of publication

Table 5: Top 10 authors' affiliation and number of publications

Author's Affiliation	Number of Publications
Ho Chi Minh City University of Economics	12
University of London	12
South Ural State University	10
University of Bologna	8
University College Dublin	7
Asian Development Bank	6
Ilma University	6
Massey University	6
Udice French Research Universities	6
Universidade de Santiago de Compostela	6

Table 6: Top 10 publishers

Publishers	Number of Publications
Elsevier	152
MDPI	35
Taylor & Francis	30
Springer Nature	28
Wiley	26
Sage	7
Emerald Group Publishing	6
Frontiers Media SA	6
Cambridge University Press	4
Oxford University Press	4

(MDPI), which had 35 publications; Taylor & Francis, which had 30 publications; Springer Nature, which had 28 publications; and Wiley, which had 26 publications. The remaining publisher produced just a small number of publications, mostly in single digits. ChatGPT recommended the following top publishers: Elsevier, Wiley, Emerald Group Publishing, Taylor & Francis, and Springer Nature. Nevertheless, ChatGPT did not assign a ranking to the publishers.

Only a few countries actively engaged in the scholarly publication of environmental, sukuk, and bond topics. Table 7 displays the 10 countries that published the highest number of articles. The three main providers were the People's Republic of China (94 articles),

England (44 articles), and the United States (38 articles). Notably, the scholarly writings on the environmental risk of sukuk and bond yields from countries such as France, Australia, Italy, Spain, Vietnam, Pakistan, and India each contributed less than 10% of the total articles. This may be attributed to a lack of awareness and widespread knowledge about environmental threats, the voluntary nature of environmental regulations, and the specific policy issues of a given country.

In addition to the above analysis, bibliographic coupling analysis examines the degree of relatedness between two objects based on the number of references they share. When two publications reference a third publication, they are considered to be bibliographically

connected. Bibliographic coupling aims to ascertain the current research focus within a particular topic. Figure 5 displays the bibliographic coupling of the articles and the visual representation of clusters through the use of colours. The different hues of nodes symbolise separate pathways that have been established in the green bond literature. The dimensions of the nodes in Figure 5 are directly proportional to the overall number of citations received by each article. Moreover, the level of bibliographic coupling between the nodes can be determined by examining the proximity or distance of the studies inside the network. For instance, when two articles are in close proximity, it suggests that they have a substantial number of references in common (Marchiori & Franco, 2020).

Figure 5 illustrates the overall bibliographic coupling strength. Every link possesses a magnitude, denoted by a positive numerical value, as outlined in the VOSviewer guide. The magnitude of the value is directly proportional to the intensity of the connection. Figure 5 shows that the red cluster has the strongest link strength, suggesting a new focus in research on the relationship between green bond issuances and the importance of companies in promoting the green economy and demonstrating their dedication to the environmental movement.

Flammer (2021) examined the issuance of corporate green bonds, focusing on how issuers enhance their environmental performance by achieving higher environmental ratings and reducing CO₂ emissions after issuing these bonds. The study found that long-term and environmentally conscious investors increased ownership. The findings repeatedly demonstrated that organisations exhibit their dedication to environmental performance and hence become more appealing to investors.

Fatica (2021) conducted a study on the association between green bonds and financial perspective within the purple cluster of literature. The findings indicated that the reduction in emissions is more noticeable, substantial, and enduring when excluding green bonds used for refinancing. This aligns with an increase in the scale of environmentally friendly initiatives resulting from new projects. Zhou (2019) posited that the disclosure of green bond issuance influenced firms' stock prices and the issuance of green bonds affected their financial performance and CSR. The study determined that the issuing of green bonds had a favourable effect on various aspects of firms, including their stock prices, profitability, operational performance, innovation capacity, and CSR. Additionally, they have the potential to augment a company's CSR efforts.

Table 7: Top 10 most active countries in publications

Countries	Number of Publications	Percentages of Publication (%)
People's Republic of China	94	27
England	44	13
USA	38	11
France	32	9
Australia	31	9
Italy	29	8
Spain	22	6
Vietnam	22	6
Pakistan	20	6
India	18	5
Total	350	100%

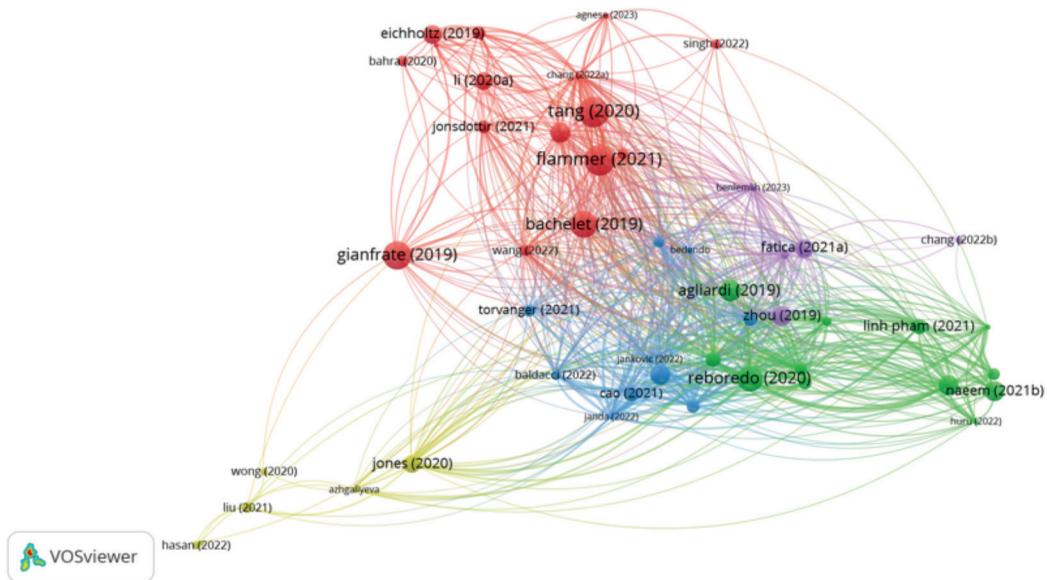


Figure 5: Bibliographic coupling

The next influential article was by Roboredo (2020), which is in the green cluster. The study introduced a novel approach that examined the relationship between green bonds and asset classes over various investing timeframes in the European Union and the United States asset markets. The primary findings of the study, however, indicated a lack of strong interconnection among green bonds and corporate bonds, stocks, and energy assets across various periods.

Figure 6 evaluates the content associated with significant keywords, serving as a valuable tool for discovering relevant literature and trends. The objective of conducting a keywords co-occurrence network analysis is to identify terms commonly used in several research articles pertaining to the subject being investigated (S. Galletta *et al.*, 2022). The keywords utilised were derived from the textual data extracted from these articles. Furthermore, co-occurrence is determined by the frequency at which two keywords appear together. Keyword analysis was employed to detect patterns within the topic matter of the tests. Such analysis can assist future researchers in understanding subjects and issues that have garnered the most scholarly attention. The findings provide scholars with

further insights into the prevailing search terms for prospective projects. Keyword analysis is an invaluable technique for uncovering the prevailing themes in the literature. It has the potential to forecast subjects that will receive greater attention in the future. However, due to the striking similarities between terms, there is a high likelihood that existing patterns will persist.

Figure 6 depicts multiple keywords interconnected by different lines. The co-occurrence of these terms in numerous publications within the dataset is evident from the lines. The prevalence of these terms indicates a higher level of study conducted in these specific domains. As depicted in Figure 6, the often-observed keyword pairings involve green bonds and sustainable financing, green bonds and sustainability, and green bonds and impact.

It is worth noting that the term “environmental risk” is not included in the top 10 keywords. The scarcity of research on the influence of environmental risk on green sukuk and bond rates is attributed to the limited number of studies conducted, despite the present attention given to this topic. Thus, it implies that this area may offer further opportunities for investigation.

Moreover, the findings indicated a shift in the utilisation of keywords between the years 2020 and 2021. Researchers’ primary interest was in the areas of market analysis, sustainable finance, and cost assessment, as indicated by the blue colour. The predominant keywords utilised in August 2020 have shifted to climate change and performance. In June 2021, the terms sustainability and ESG gained prominence in this context, indicating emerging research subjects that are receiving significant attention. ChatGPT provides a list of the most frequent keywords in the understudied area, as shown in Table 8.

The upcoming discussion will delve deeper into the most productive and influential publications and authors. Productivity and influence were quantified depending on the number of publications.

Table 9 presents authors who have published on the subject of environmental risk, sukuk, and bond yields. Muhammad Abubakr Naeem were the leading author, having each published 10 articles, placing at the top of the list. This

demonstrates that the conversation around environmental threats, sukuk, and bond yields maintained a consistent connection between its subjects and sources. The authors who offered at least four papers discussed the application of green bonds. Specific authors have extensively published on the topic of environmental risks, especially in the context of green bonds, indicating a specific focus in this area. This research is expected to grow in significance in the upcoming year.

This is corroborated by Table 10, which displays the top 10 journals according to the number of publications. The Sustainability journal has the highest number of articles, with a total of 30. Sustainability is a globally focused, interdisciplinary, academic publication that undergoes rigorous peer review, and is freely accessible. It explores the environmental, cultural, economic, and social aspects of human sustainability. A study published in the Sustainability journal examined the role of green bonds in promoting sustainable development and CSR (Zhou *et al.*, 2019).

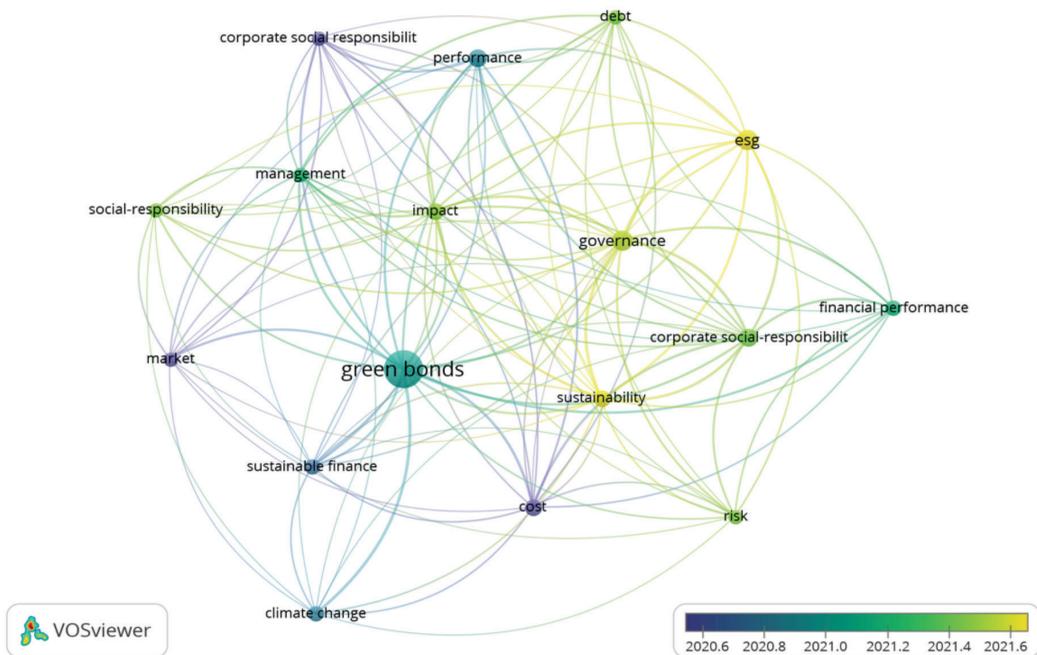


Figure 6: Co-occurrence of all keywords
 Note: 17 items, 3 clusters, 119 links, and 270 total link strength

Table 8: Popular keywords suggested by ChatGPT

No.	Keywords
1.	Environmental risks
2.	Climate change
3.	Sustainability
4.	Green bonds
5.	Socially Responsible Investing (SRI)
6.	Environmental, Social, and Governance (ESG)
7.	Carbon footprint
8.	Renewable energy
9.	Impact investing
10.	Sustainable finance

Table 9: Number of publications based on top 10 authors

Authors	Number of Publications
Muhammad Abubakr Naeem	10
Xuan Vinh Vo	7
Mensi, Walid	5
Abakah, Emmanuel Joel Aikins	5
Aghardi, Elettra	5
Reboredo, Juan C.	4
Tian, Shu	4
Bouri, Elie	4
Kang, Sang Hoon	4
Shahzad, Syed Jawad Hussain	4

Table 10: Top 10 journal publications title

Title of Journal	Numbersof Publications
Sustainability	30
Finance Research Letters	23
Energy Economics	19
International Review of Financial Analysis	13
Journal of Cleaner Production	12
Business Strategy and the Environment	9
Energy Policy	9
Technological Forecasting and Social Change	9
Resources Policy	7
Climate Policy	6

Finance Research Letters has the second-largest number of articles, with a total of 23. This journal primarily examines the impact of the ESG component on financial products, specifically focusing on high-yield bonds exchange-traded funds (Takashi, K., 2021). A study published in Finance Research Letters investigated the pricing of bank bonds, revealing that banks with higher ESG scores saw reduced costs during issuance (Paolo *et al.*, 2023). Energy Economics ranked third, with 19 papers mostly focused on the relationship between energy and economics.

Synthesising the analysis above, the results indicate a deficiency in research on both the theoretical and empirical aspects of environmental risks, sukuk, and bond yields. The network cluster and citation analyses reveal a gap in publications, specifically addressing the yields and returns of sukuk and bond investments. A significant portion of the studies on sukuk and bond yields have focused on financial and economic variables, including interest rates, credit ratings, macroeconomic indicators, and unique attributes of the issuer. Environmental concerns have only recently emerged as major factors and are regarded as exogenous contributors. Consequently, there can be a delay in academic research that focuses on the specific relationship between environmental concerns and sukuk/bond yields.

This study aids in determining the predominant journals that have published most of the research within the specified subjects. Undoubtedly, most of the noteworthy contributions to the field are found in economic journals. This study has maintained a clear distinction between environmental concerns and sukuk and bond yield, a topic that is often overlooked in economic and finance publications.

Implications and Conclusions

In the last decade, there has been a substantial increase in literature focused on environmental issues, sukuk, and bonds. However, a concerted effort is needed to integrate and improve this

framework within a single study. Environmental risks can potentially affect a firm's creditworthiness. Events such as environmental disasters, fines imposed by pollution regulations, or legal actions related to environmental damage may lead to financial losses for the company, affecting its ability to meet investment return obligations. In extreme cases, such risks can ultimately lead to a situation where the borrower is unable to repay their debt, resulting in default. As a result, investors want higher returns to compensate for the increased credit risk associated with issuers who pose environmental hazards.

The findings have numerous implications for this study. Integrating environmental factors into financial analysis and reporting frameworks is an ongoing process. While there is increasing recognition of the importance of environmental disclosure and sustainability reporting, the presence of diverse regulatory standards and market practices in various jurisdictions complicates comparative analysis and research in this area.

Furthermore, a coordinated effort is necessary to enhance the distribution and ensure the quality of available data. A reputable or reliable organisation should establish an extensive repository on environmental hazards, guaranteeing that the data accuracy aligns with established criteria. While the Department of Statistics Malaysia and the Department of Environment in Malaysia provide public access to statistical data, the information offered is insufficient and lacks comprehensiveness, requiring individuals to seek out additional resources independently. This lack of adequate data has indirectly resulted in methodological challenges for researchers, especially in designing empirical studies.

The results suggest that market participants may lack awareness or fail to acknowledge the importance of environmental considerations in relation to sukuk and bond markets. Investors, issuers, and regulators may possess limited comprehension of the significance and financial ramifications of environmental threats, leading

to a lack of enthusiasm for conducting or requesting research in this domain. This can also be substantiated by research articles that focus mostly on specific Western countries, with only a limited number originating from universities in the Middle East and Asia. Furthermore, the absence of occurrences of the keywords “returns” or “yields” indicates a lack of attention to this topic.

In summary, future research on the impact of environmental risks on bonds and sukuk yields is expected to involve greater collaboration across different fields, improved research methods, increased data transparency, active involvement of regulatory bodies, and heightened awareness among investors. These developments will foster a more comprehensive understanding of the financial implications associated with environmental challenges. Organisations must handle environmental risks to effectively respond to regulatory changes, market demands, and technological developments. Failing to do so may place their competitiveness and financial performance at risk in the long run.

These findings may stimulate further inquiry and scientific advancement regarding environmental sustainability. While this study can serve as a valuable reference, researchers are not obligated to confine their future research to the issues discussed or proposed herein. This study can be used as a tool to quickly identify key environmental indicators in the sukuk and bonds market for managers, governments, corporate issuers, and regulators.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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