

Study of the Relationship Between Green Bonds, Other Financial Assets, and Sustainable Finance: A Systematic Literature Review

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ABSTRACT

Objective: This study aims to map and analyse the relationship between green bonds, sustainable finance, and other financial assets to understand thematic developments, empirical findings, and research gaps in the post-Paris Agreement era. **Method:** A systematic literature review was conducted using the SPAR-4-SLR protocol combined with bibliometric analysis through VOSviewer and Biblioshiny on 110 peer-reviewed articles published between 2018 and 2025. **Results:** The analysis reveals an exponential growth in publications with an annual rate of 55.12%, highlighting the rapid expansion of the sustainable finance research ecosystem. Empirical evidence consistently confirms the presence of a greenium – green bonds offering lower yields than conventional bonds – along with diversification benefits and reductions in portfolio volatility. Thematic mapping identifies six dominant clusters: sustainable finance, green finance, ESG/SDGs, renewable energy, portfolio and risk, and green innovation, while investor attention emerges as an under-studied moderating variable in cross-asset dynamics. **Novelty:** This study contributes by identifying the most influential works, structuring the intellectual landscape of sustainable finance, and proposing a future research agenda focused on deepening cross-asset connectivity and enhancing policy relevance, particularly in emerging markets such as Indonesia.

INTRODUCTION

Climate change and environmental degradation have driven the world to shift towards sustainable development. In recent years, the concept of sustainable finance has gained popularity as an innovative financial instrument aimed at financing environmentally friendly projects such as renewable energy, energy efficiency, and waste management [1]. Since its inception by the European Investment Bank (EIB) in 2007, the green bond market has grown significantly. In addition to serving as a source of funding for environmentally friendly projects, [2] green bonds have also become a barometer of global commitment to reducing carbon emissions and promoting energy efficiency [1]. Green bonds can be conceptualized as securities whose proceeds are specifically earmarked for financing projects that generate environmental and climate benefits. Research confirms the positive impact of green bonds, with evidence of reduced carbon emissions of up to 0.8 tons per capita and increased renewable energy production of up to 66 kWh per capita [3].

The 2014-2022 period marks a transformative period for the global green bond market, with issuance volume experiencing a significant increase in line with growing awareness of climate change and the need for sustainable financing [4],[5]. Data shows

that the proportion of sustainable investment assets to total assets under management increased substantially during this period, with various countries demonstrating positive trends in the adoption of green financial instruments [4]. This period was also marked by the development of more mature standards and regulatory frameworks, as well as the geographic diversification of green bond issuance from traditional European and North American markets to the Asia-Pacific region and emerging markets [6].

The relationship between green bonds and sustainable finance is symbiotic and mutually reinforcing. Green bonds act as a catalyst in the transformation of the financial system towards a sustainable paradigm, integrating environmental considerations into investment decisions and capital allocation [3]. Previous studies have demonstrated a positive relationship between green bonds and increased renewable energy output, but also a negative relationship with carbon emissions, highlighting the crucial role of these instruments in mitigating the impacts of climate change [7], [8]. The study of green bonds and sustainable finance has progressed rapidly in recent years [9]. Numerous studies have found that green bonds serve as financial instruments that are not only attractive to environmentally conscious investors [10] but also make a significant contribution to reducing carbon emissions and strengthening sustainable energy infrastructure. Interrelations have also been identified between green bonds and other financial instruments, including commodities, clean energy indices, and corporate securities, indicating that fluctuations in the green bond market can impact the broader financial market ecosystem.

The literature on green bonds and sustainable finance is experiencing increasingly intense dynamics along with growing global awareness of climate change issues [9], [11]. Bibliometric studies of systematic literature reviews have demonstrated a surge in the number of publications and contributors in this area, particularly following the enactment of international regulations such as the 2015 Paris Agreement [12]. Furthermore, methodologies such as main path analysis have been applied to map the evolution of the green bond concept within the framework of sustainable finance and identify key research groups and emerging topics of contemporary research interest [13].

In Indonesia, the development of green bonds is beginning to receive serious attention from the government and financial regulators. The Financial Services Authority (OJK) has published a Sustainable Finance Roadmap, which is entering its second phase [3], with the development of green bonds as a top priority [3]. This roadmap was launched in January 2021 and subsequently updated in January 2022, demonstrating the Indonesian government's commitment to developing a sustainable finance ecosystem. However, the green bond market in Indonesia is still relatively new compared to developed countries [14], [15]. Challenges in developing green bonds in Indonesia include the need to clarify legal perspectives, standardize green project criteria [16], and increase investor literacy regarding sustainable financial instruments. The Indonesian government has begun issuing various types of green bonds, including standard green use bonds, green revenue bonds, green project bonds, and green securitization bonds [17].

In the regulatory context, the Financial Services Authority (OJK) continues to update its sustainable finance framework through various initiatives, including climate risk management & scenario analysis (CRMS) in 2024 [18], [19]. This demonstrates the ongoing evolution in the development of the green finance ecosystem in Indonesia [11]. Based on the background outlined, this study aims to answer the following research questions:

RQ1: What are the publication trends for green bonds, sustainable finance, and other financial assets?

RQ2: What are the most influential articles contributing to the study of green bonds, sustainable finance, and other financial assets?

RQ3: How have the dynamics and thematic evolution of research mapped the relationship between green bonds, sustainable finance, and other financial assets since the Paris Agreement?

RQ4: How does investor attention moderate the relationship between green bonds and other financial assets?

Publications on green bonds, sustainable finance, and related financial assets show exponential growth (RQ1). The most influential articles were identified through an analysis of citation performance, co-citation, and co-authorship using VOSviewer/Biblioshiny (RQ2). Thematic dynamics and evolution since the Paris Agreement demonstrate a shift from early adoption to standardization (RQ3). The relationship between green bonds and other financial assets is thought to be influenced by investor attention (RQ4).

Next, this study explains the methodology used, followed by a dissemination of key findings [20]. Finally, this study concludes the study and provides an agenda for future research to help further expand the green bond market.

Based on a recent bibliometric analysis, the trend of green bond research publications shows exponential growth with an annual growth rate of 55.12%. This phenomenon indicates increasing academic interest in sustainable financial instruments [21], particularly after the introduction of the Paris Accord and the Sustainable Development Goals [22], [23]. This development is relevant to the context of research on the relationship between green bonds and other financial assets, as it demonstrates a market evolution that requires a comprehensive analysis of the interconnectivity between sustainable financial instruments [24]. This study combines two previous articles: the first from the Indonesian Journal of Sustainability Accounting and Management, which used the variable other financial assets [25], and the second from the Journal of Humanities and Social Studies, which used the variable sustainable finance [26], which refines the results of these two variables.

Existing literature focuses heavily on the benefits the green bond market brings to investors through portfolio diversification, which in turn helps various investors adopt appropriate trading strategies with a better understanding of these green instruments [15]. Strong evidence of “greenium” – the difference in yield between green and conventional bonds – is found in the presence of lower yields on green bonds compared

to conventional bonds [27]. Research demonstrates the important role of financial markets in stimulating the private sector, with increased returns and reduced volatility in green bond portfolios [28], [29]. As a result, green bonds are considered a safe tool in avoiding climate risk issues. The relationship between bonds and investor attention is rarely examined in green bond research, despite the strong relationship between green bonds and investor attention [30].

RESEARCH METHOD

This study uses a systematic literature review (SLR) approach to map and analyze literature that focuses on the relationship between green bonds, sustainable finance, and other financial assets. This approach allows researchers to comprehensively identify trends, categories, and existing research gaps [20]. This study uses VOSviewers for analysis. Collection of articles from major databases such as Google Scholar with keywords "green bonds", "sustainable finance", "other financial assets", "green finance", "green bond", "climate change", "sustainable development", "sustainable investment", "climate finance", "green financing", "green innovation", and "renewable energy" [31]. Implementing eligibility verification using inclusion and exclusion criteria, namely articles published in the 2018-2025 period and that examine the correlation between Green Bonds and aspects of sustainable finance [32], [33]. Articles that focus on green bonds and their application in supporting environmentally friendly projects. Empirical and bibliometric studies that discuss the relationship between green bonds and other financial assets. Articles published in reputable journals and policy documents, including the OJK's Sustainable Finance Roadmap. Policies and regulations regarding the issuance of green bonds in Indonesia support the sustainable development agenda [3], [29]. This review specifically applies the "Scientific Procedures and Rationales for Systematic Literature Review" (SPAR-4-SLR) criteria. The rationale behind the choice of this method lies in the superior quality of SPAR-4-SLR over with the VOSViewers tool. In addition, this method follows three main stages which include "assembling", "arranging", and "assessing" articles [20].

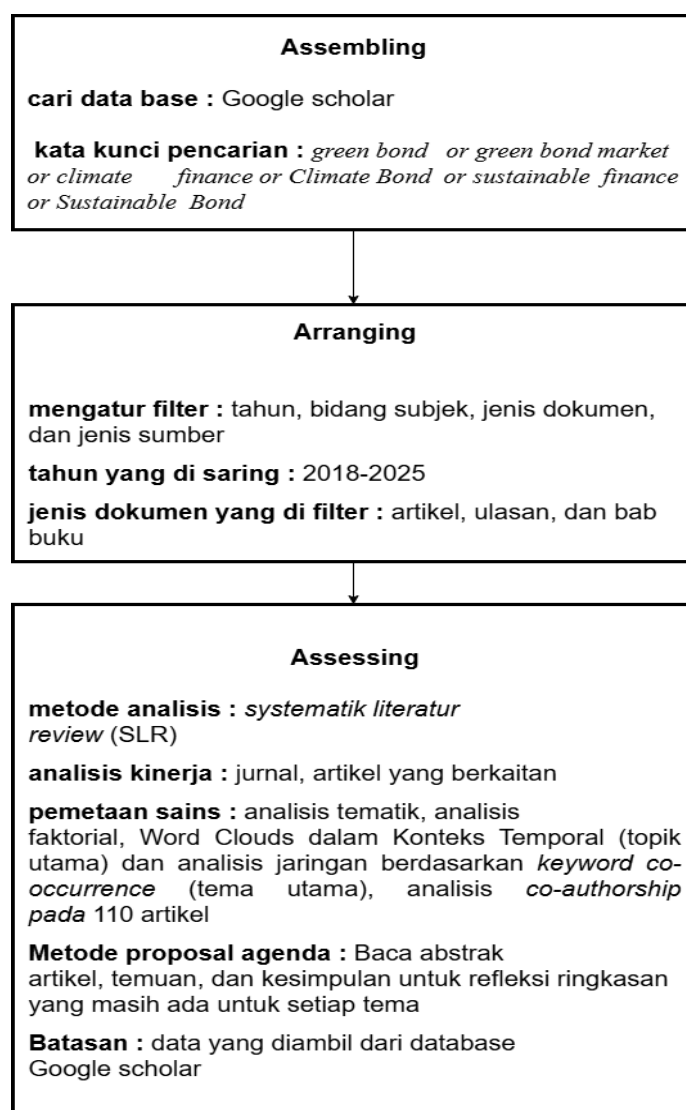


Figure 1. explains the management stages.

The assembling stage involved searching Google Scholar for data using keywords related to green bonds, the green bond market, climate finance, and sustainable finance. The arranging stage included filtering based on publication year (2018-2025) and document type, such as articles, reviews, and book chapters. The assessing stage employed a systematic literature review (SLR) method with journal performance analysis, science mapping through thematic analysis, factorial analysis, temporal word clouds, and network analysis based on keyword co-occurrence and co-authorship across 110 articles. This methodology was designed to provide a comprehensive overview of the development of green bond and sustainable finance research over that period.

1. Assembling

The study reviewed previous scientific papers, where insights were essential, and thus various keyword combinations were developed [20], [21]. In the first search, the keywords "green bond" or "green bond market" were used, resulting in a total of 124 documents, 75% of which were international articles and 25% were Indonesian articles. In the second search, the keywords "climate finance" or "climate bond" or "sustainable bond" or "sustainable finance" were used, yielding 356 documents, 79% of which were

international articles and 21% were Indonesian articles. Through this literature collection, a number of data and information were obtained to support the study of the relationship between sustainable finance instruments and their role in achieving the SDG targets, particularly the climate action goal (SDG 13) [22], [23]. This data served as the basis for the keyword grouping and clustering stage in the next step.

2. Arranging

After the literature was collected, the next stage was keyword grouping and clustering (arranging) [21]. This stage was carried out using bibliometric analysis techniques, in which data from cross-disciplinary publications were identified, grouped, and analyzed. After the literature was collected, the next stage was to filter the articles by year, document type, and source type. Data from cross-disciplinary publications were identified, grouped, and analyzed to identify patterns and trends using VOSviewers. Identification and extraction of keywords used included green bonds, green finance, sustainable finance, green bond, climate change, sustainable development, sustainability, ESG, SDGs, sustainable investment, climate finance, portfolio, green financing, green innovation, innovation, panel data, environmental performance, and renewable energy. This identification was obtained through citation analysis and collaboration networks conducted in several studies [34], [35]. Next, the data was downloaded and exported to an MS Excel spreadsheet, and each article was read with particular emphasis on the abstract, findings, and conclusions, resulting in a corpus of 110 articles.

3. Assessing

After evaluating all 110 articles compiled on green bond research, this study applied a bibliometric approach to the review. This study integrates a systematic literature review method because it credibly increases research transparency. Furthermore, bibliometric analysis reduces bias and utilizes qualitative review. This study used bibliometric analysis to conduct performance analysis and science mapping analysis using Biblioshiny and VOSviewer [20]. The former unpacks journals and related articles, and the latter identifies key themes and topics for green bond searches. A review based on a synthesis of previous literature curates further research in this domain.

RESULTS AND DISCUSSION

A. Performance Analysis

This analysis shows the performance of specific research areas, specifically the green bond research discussed in this article. Furthermore, it illustrates publication trends and the most influential articles.

1. Publication Trend

The annual publication trend in green bonds is depicted in Figure 2, clearly showing the growing publication trend in the green bond area. Specifically, 2015 and 2016 saw the first publications with a single article. Since then, the trend has shown a decreasing number of publications. While 2017 did not follow the green bond publication trend due to the initial implementation of green bonds in Indonesia in 2018, publications doubled in 2019, and then surged dramatically due to the introduction of the Paris

Agreement and the SDGs. However, between 2018 and 2025, green bond research gained momentum among various researchers with the announcement of green bond principles. The year 2025 stands out for its high number of publications, increasing to 27 compared to 2019. The publication trend has increased exponentially with an annual growth rate of 55.12% [21]. It is understandable that with the increasing level of awareness about sustainability, the annual scientific output for green bonds, sustainable finance and other financial assets in the current scenario has increased and emerged as an appropriate topic in the current era. As it is trending in the environmental era.

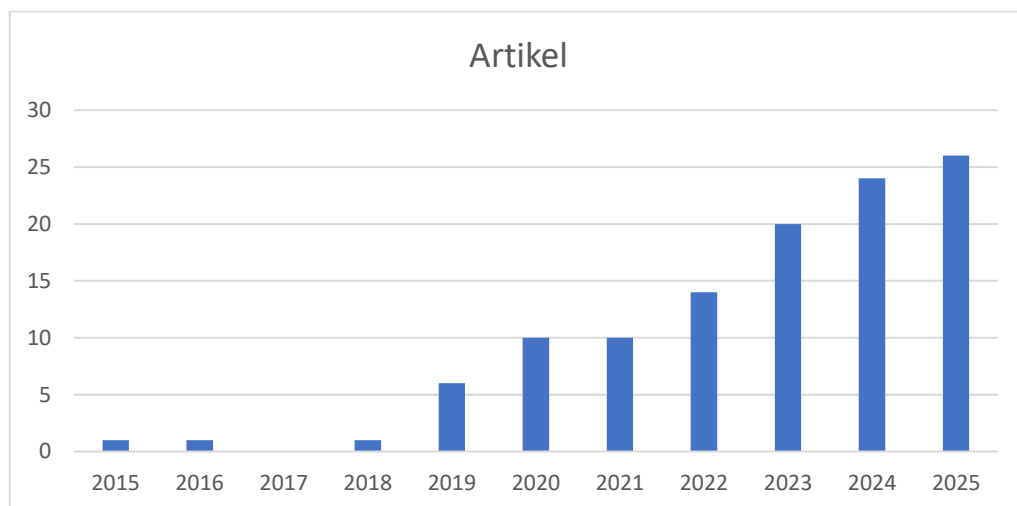


Figure 2. Annual Article Diagram

Figure 2 shows a diagram of articles discussing green bonds, sustainable finance, and other financial assets per year. It shows that from 2015 to 2017, there were fewer international articles, and from 2028 to 2025, there were more Indonesian and international articles. The high number of international articles compared to Indonesian articles suggests a lack of attention to green bonds in Indonesia.

2. Influential Articles

Table 1 shows the most influential articles in green bond research in terms of total citations. It is observed that the article (M Nanayakkara, S Colombage, 2019) titled "Do investors in the Green Bond market pay a premium? Global Evidence" is the most influential article on green bonds with a total of 330 citations and 82.5% of total citations per year, followed by the article (C Debrah, APC Chan, A Darko, 2022) titled "Green finance gap in green buildings: A scoping review and future research needs" with a total of 255 citations. Furthermore, the top 10 most-cited articles have amassed a total of 1,919 citations. Another 10 articles have amassed 463 citations. Interestingly, this study explains the influence of green bonds in the current era, their interconnectedness with other financial assets, and the diversification benefits they offer investors [36].

Table 1. Example table

Researcher(s)	Year	Source / Journal	Title	Total Citations	Citations per Year
M. Nanayakkara, S. Colombage	2019	<i>Applied Economics</i>	Do investors in Green Bond market pay a premium? Global evidence	330	82.50
C. Debrah, A.P.C. Chan, A. Darko	2022	<i>Building and Environment</i>	Green finance gap in green buildings: A scoping review and future research needs	255	63.75
L. Pham, T.L.D. Huynh	2020	<i>Finance Research Letters</i>	How does investor attention influence the green bond market?	242	40.33
R. Ferrer, S.J.H. Shahzad, P. Soriano	2021	<i>Journal of Cleaner Production</i>	Are green bonds a different asset class? Evidence from time-frequency connectedness analysis	239	59.75
G. Cortellini, I.C. Panetta	2021	<i>Journal of Risk and Financial Management</i>	Green Bond: A Systematic Literature Review for Future Research Agendas	166	41.50
M.A. Naeem, T. Conlon, J. Cotter	2022	<i>Journal of Environmental Management</i>	Green bonds and other assets: Evidence from extreme risk transmission	152	38.00
M.A. Naeem, T. Conlon, J. Cotter	2022	<i>Journal of Environmental Management</i>	Green bonds and other assets: Evidence from extreme risk transmission	151	37.75
K.E. Yeow, S.H. Ng	2021	<i>Managerial Finance</i>	The impact of green bonds on corporate environmental and	147	36.75

Researcher(s)	Year	Source / Journal	Title	Total Citations	Citations per Year
A. Russo, M. Mariani, A. Caragnano	2021	<i>Business Strategy and the Environment</i>	financial performance Exploring the determinants of green bond issuance	140	35.00
A. Alsmadi, M. Al-Okaily, N. Alrawashdeh, A. Al-Gasaymeh, A. Moh'd Al-hazumeh, A. Zakari	2023	<i>Sustainability</i>	A Bibliometric Analysis of Green Bonds and Sustainable Green Energy	84	27.67
A.A. Alsmadi, M. Al-Okaily, N. Alrawashdeh, A. Al-Gasaymeh	2023	<i>Sustainability</i>	A bibliometric analysis of green bonds and sustainable green energy	84	28.00
M. Alamgir, M. Cheng	2023	<i>Sustainability</i>	Do Green Bonds Play a Role in Achieving Sustainability?	78	19.50
M.A. Siddique, H. Nobanee, S. Karim, F. Naz	2023	<i>International Review of Economics & Finance</i>	Do green financial markets offset the risk of cryptocurrencies and carbon markets?	74	24.67
A. Kashi, M.E. Shah	2023	<i>Sustainability</i>	Bibliometric review on sustainable finance	49	16.33
K.H. Wang, C.W. Su, M. Umar, A.D. Peculea	2023	<i>Borsa Istanbul Review</i>	Oil prices and the green bond market: Evidence from time-varying and quantile-varying aspects	48	12.00
T. Lin, M. Du, S. Ren	2022	<i>Green Finance</i>	How do green bonds affect green technology	31	7.75

Researcher(s)	Year	Source / Journal	Title	Total Citations	Citations per Year
N.J. Marín-Rodríguez, J.D. González-Ruiz, A. Valencia-Arias	2023	<i>Sustainability</i>	innovation? Firm evidence from China Incorporating Green Bonds into Portfolio Investments: Recent Trends and Further Research	28	9.33
Abhilash, S.S. Shenoy, D.K. Shetty	2022	<i>Cogent Economics & Finance</i>	A state-of-the-art overview of green bond markets: Evidence from technology-empowered systematic literature review	27	9.00
D.H. Gabr, M.A. Elbannan	2024	<i>Management & Sustainability: An Arab Review</i>	Green finance insights: evolution of the green bonds market	23	7.67
A. Tsagkanos, A. Sharma, B. Ghosh	2022	<i>Sustainability</i>	Green Bonds and Commodities: A New Asymmetric Sustainable Relationship	21	5.25

This table displays the 20 most influential articles on green bonds and green finance published between 2019 and 2024, sorted by citation count, and trending articles. This indicates increased research interest in green bonds in recent years.

3. Thematic Evolution Since the Paris Agreement

There was a surge in publications and research participation after the 2015 Paris Agreement, driven by increased regulation and standardization of sustainable finance frameworks, and the use of main path analysis to map the evolution of key concepts and research groups. The 2014–2022 period marked a transformative phase, with geographic diversification from Europe and North America to Asia-Pacific and emerging markets, broadening the thematic context and enriching cross-market study variables. The bibliometric analysis used in this study, through keyword co-occurrence, co-authorship, and thematic mapping of 110 articles using VOSviewer/Biblioshiny, allows mapping of theme clusters such as sustainable finance, climate finance, renewable energy, ESG/SDGs, portfolio/risk, and green innovation in Table 2 [8], [37].

Thematic dynamics move from the initial adoption phase to standardization and cross-asset integration, following the increasing volume of scientific work and methodological deepening in science mapping. Implications for articles: This section could be filled with thematic maps of co-word/co-occurrence results for two or three time periods, showing the shift in focus from “adoption, standardization, cross-asset interconnectivity,” and highlighting influential nodes/topics that are also visible in the list of most cited articles in Table 1.

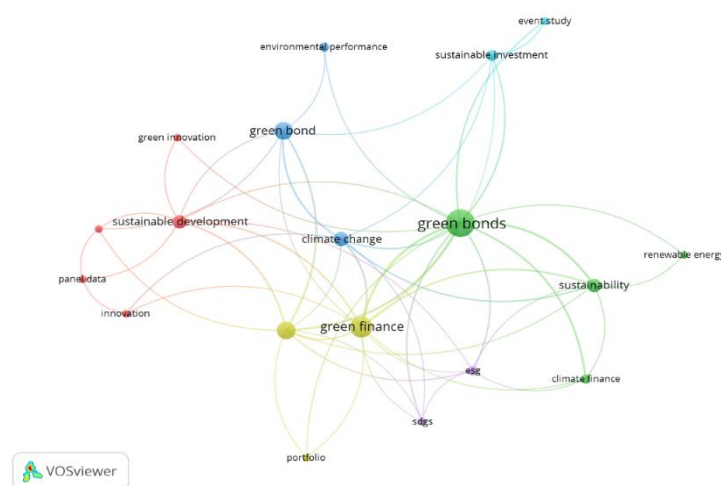


Figure 3. Keyword Co-Occurrence

Figure 3 illustrates the visualization of data from Google Scholar performed by the author using VOSviewer. The bibliometric analysis used in this study included keyword co-occurrence, co-authorship, and thematic mapping in 110 articles. The most frequently used keywords in previous articles were green bonds, green finance, and green bond because these keywords represent the largest circle and are most frequently used in previous research [38], [39].

4. Investor Attention as a Moderator

The relationship between green bonds and other financial assets is an aspect that is rarely researched in the green bond literature, despite the strong association between green bonds and investor attention. Based on the bibliometric analysis of the 110 articles collected in this study, it was found that the relationship between bonds and investor attention remains an underexplored area. This is interesting considering that, based on the VOSviewer analysis results in Figure 3, the concept of investor attention as a moderator has strong theoretical relevance to the findings of this study regarding the interrelationship between green bonds and other financial instruments, including commodities, clean energy indices, and corporate securities. An analysis of the most influential articles [21], in Table 1, shows that studies such as Pham & Huynh's (2020) paper, entitled "How does investor attention influence the green bond market?" with 242 citations, have begun exploring the role of investor attention, but have not specifically analyzed its moderating effect on cross-asset relationships. The "greenium" phenomenon

found in Nanayakkara & Colombage's (2019) study with 330 citations also provides an empirical basis for suggesting that green bond price dynamics are sensitive to investor behavior and preferences, indicating the potential for investor attention to moderate its relationship with other financial assets [36], [40].

B. Cluster 1: Sustainable Finance

The largest cluster related to Sustainable Development consists of 19 items with 8 links and 6 occurrences in the green bond research network. The most popular keyword or topic in Sustainable Development itself contributed 6 articles, 8 links, and 10 total link strengths. Other keywords in this cluster are green finance, green innovation, innovation, and panel data. Under this cluster, it is highlighted that green finance, as a new financial mechanism, is urgently being deployed towards green projects, where the active involvement of the private sector and banking companies is strongly encouraged [41], [42], and the emergence of green bonds to distribute proceeds towards sustainable development goals is well-documented.

Table 2. Keyword Co-occurrence by Cluster

Cluster 1 – Sustainable Finance

Keyword	Link	Total Link Strength	Occurrences
sustainable finance	–	–	–
sustainable development	8	10	6
green finance	4	4	2
green innovation	2	2	2
innovation	3	2	2
panel data	3	3	2

Cluster 2 – Sustainability and Climate Finance

Keyword	Link	Total Link Strength	Occurrences
sustainability	–	–	–
sustainability (duplicate keyword)	7	12	6
climate finance	4	6	3
green bonds	14	31	25
renewable energy	2	2	2

Cluster 3 – Green Bond & Climate Change

Keyword	Link	Total Link Strength	Occurrences
green bond	–	–	–
green bond (duplicate keyword)	7	11	10
climate change	8	14	7

Cluster 4 – Sustainable Finance & Environmental Performance

Keyword	Link	Total Link Strength	Occurrences
sustainable finance	–	–	–
sustainable finance (duplicate keyword)	10	18	10
environmental performance	2	2	3

Cluster 5 – Green Finance, ESG, SDGs

Keyword	Link	Total Link Strength	Occurrences
green finance	–	–	–
green finance (misspelled: <i>grreen finance</i>)	12	21	14
ESG	7	9	3
SDGs	5	6	2

Cluster 6 – Sustainable Investment & Portfolio

Keyword	Link	Total Link Strength	Occurrences
sustainable investment	–	–	–
sustainable investment (duplicate keyword)	5	7	4
portfolio	3	3	2

Table 2 describes each cluster of green bond results using VOSViewers. The table explains the links, total link strength, and occurrences. There are six clusters in the table.

C. Cluster 2: Sustainability

The second cluster, focusing on sustainability, consists of four key items with the main theme "green bonds," which has 14 links and 31 total link strengths with 25 occurrences, making it the most dominant node in the research network. This cluster includes sustainability (7 links, 12 total link strengths, 6 occurrences), climate finance (4 links, 6 total link strengths, 3 occurrences), and renewable energy (2 links, 2 total link strengths, 2 occurrences). The dominance of "green bonds" in this cluster confirms the central position of this instrument in the sustainable finance ecosystem [43]. The analysis shows that green bonds serve as a key link between the broader concept of sustainability and the practical application of climate finance and renewable energy projects [44], [45]. This aligns with the finding that green bonds function not only as a financing instrument but also as a catalyst in transforming the financial system toward a sustainable paradigm. The strong link between green bonds and sustainability in this cluster reflects the evolving literature, which demonstrates the deepening integration of green financial instruments with the global sustainable development agenda [10].

D. Cluster 3: Green Bond

The third cluster focuses on green bonds as the primary keyword, with 7 links, 11 total link strengths, and 10 occurrences. This is closely linked to climate change (8 links,

14 total link strengths, 7 occurrences). This configuration demonstrates that research on green bonds is consistently linked to climate change mitigation efforts. The strong relationship between these two concepts confirms that green bonds are viewed as a strategic financial response to the challenges of climate change and reflects the research focus on evaluating the effectiveness of these instruments in achieving carbon emission reduction targets [7]. The position of green bonds as a key node in this cluster is consistent with the finding that research confirms the positive impact of green bonds, with evidence of reduced carbon emissions of up to 0.8 tons per capita and increased renewable energy production of up to 66 kWh per capita [7], [46]. The close integration of green bonds and climate change in this bibliometric mapping also reflects a shift in the research paradigm from a focus on financial mechanisms to measurable environmental impact evaluation.

E. Cluster 4: Sustainable Finance

The fourth cluster is dominated by sustainable finance with 10 links, 18 total link strengths, and 10 occurrences, all of which are connected to environmental performance (2 links, 2 total link strengths, and 3 occurrences). This configuration indicates that sustainable finance is viewed as a broader framework that includes environmental performance evaluation as an indicator of success. The relationship between sustainable finance and environmental performance indicates that research is increasingly focusing on measuring the tangible impact of sustainable financial instruments on specific and measurable environmental outcomes. The dominance of sustainable finance in this cluster is in line with the finding that the OJK continues to update its sustainable finance framework through various initiatives [3], including climate risk management & scenario analysis (CRMS) in 2024 [47], [48]. This demonstrates the ongoing evolution in the development of the green finance ecosystem in Indonesia, where sustainable finance is not only seen as a theoretical concept but as an operational framework that requires concrete environmental performance measurements [49], [50].

F. Cluster 5: Green Finance

The fifth cluster features green finance as a central node with 12 links, 21 total link strengths, and 14 occurrences, connected to ESG (7 links, 9 total link strengths, 3 occurrences) and SDGs (5 links, 6 total link strengths, 2 occurrences). This configuration reflects the increasingly strong integration of green finance with global frameworks such as Environmental, Social, and Governance (ESG) criteria and Sustainable Development Goals (SDGs) [51], [52]. The central position of green finance in this cluster confirms that this instrument has evolved into a financial mechanism that focuses not only on environmental aspects but is also integrated with a more comprehensive sustainable development agenda [21]. The strong link with ESG and SDGs indicates that green finance is seen as a tool for achieving sustainable development targets, particularly in the context of implementing the Paris Agreement and the 2030 Agenda [53].

G. Cluster 6: Sustainable Investment

The final cluster focuses on sustainable investment with 5 links, 7 total link strengths, and 4 occurrences, which are linked to portfolios (3 links, 3 total link strengths, 2 occurrences). This configuration indicates that sustainable investment is viewed from

the perspective of portfolio management and investment strategy [15]. The relationship between sustainable investment and portfolio management indicates that research is increasingly focusing on the practical aspects of implementing sustainable investment in the context of portfolio optimization and risk management [48], [54]. This finding aligns with the strong evidence of greenium—the yield difference between green and conventional bonds—found in the presence of lower yields on green bonds compared to conventional bonds. The focus on portfolio management in this cluster reflects the growing interest among financial practitioners in integrating sustainable instruments into investment strategies that optimize returns while considering ESG factors [10], [55].

CONCLUSION

Fundamental Finding : This study demonstrates that research on green bonds, sustainable finance, and related financial assets has grown exponentially between 2018 and 2025, driven by post-Paris Agreement momentum and expanding geographic diversification toward emerging markets. The literature consistently confirms the presence of a greenium—lower yields for green bonds compared to conventional bonds—along with portfolio diversification benefits and reduced volatility, while thematic clusters reveal a shift from early adoption toward standardisation and cross-asset integration connecting sustainability, climate finance, ESG-SDGs frameworks, renewable energy, and sustainable investment strategies. Investor attention emerges as an important but underexplored moderating mechanism shaping green bond dynamics. **Implication :** These findings highlight the strategic need for stronger policy frameworks, clearer standards, and enhanced investor literacy, particularly in emerging markets such as Indonesia, to support market development and reinforce the broader sustainable finance ecosystem. **Limitation :** The study is constrained by its reliance on Google Scholar indexing, the 2018–2025 publication window, and the bibliometric approach, which maps structure but does not establish causal relationships. **Future Research :** Further studies should expand data sources, incorporate advanced quantitative methods, examine domestic market responses empirically, and deepen analysis on investor attention and cross-asset connectedness to strengthen theoretical and policy contributions in sustainable finance.

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