

Green Bonds: A Mini-Review

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Abstract

The globalization process continues to threaten various sectors due to the associated adverse effects of climate change. Financial management has been found to have a positive correlation with sustainable practice. With many institutions increasingly expressing concerns about the reality of global warming, sustainability has become a critical tool in responding to climate changes. The objective of this mini literature review was to explore the published literature to comprehend the role of green bonds in aiding sustainability. The articles used for the analysis were obtained from two sets of databases. Twenty publications were retrieved from Scopus, an online repository with thousands of scholarly references, while the remaining five were obtained from the SSRN database. The findings revealed that green bonds are obviously used by various agencies to achieve sustainable growth, thus addressing the problem of climate change. Notably, the effective execution of financial management has the potential to enhance sustainable business operations. Critical to achieving this objective is the issuance of green bonds to finance ecologically sound projects. Nonetheless, the feasibility of green bonds in contributing to sustainability is undermined by several challenges. Some of the significant impediments include the absence of appropriate organizational arrangements, the high cost of processing transactions, and the considerable volatility clustering. The role of green bonds in aiding sustainability can be significantly improved by addressing these critical limitations.

Key words: Green bonds, sustainability, stock prices, financial management; climate change, investors, volatility clustering.

Introduction

Along with the widespread development of the global economy, environment-related challenges have become more rampant in the contemporary world than ever before. These trends have a sharp scholarly interest in economic issues and sustainable development, thus attracting the attention of numerous countries from various parts of the world (Panaitb & Radulescu, 2014; Zhou & Cui, 2019). In financial circles, increased awareness of sustainability has led to the establishment of the practice of green bonds. Despite the existing impediments, the green bond market has expanded remarkably in the last few years (Hachenberg & Schiereck, 2018). In essence, this growth underlines the necessity of exploring this practice to understand the associated dynamics and mechanisms better.

The concept of green bonds is a recent innovation aimed at promoting sustainability in financial circles. Flammer (2019) describes green bonds as debt instruments whose proceeds are used to finance low-carbon and environmentally-friendly initiatives. Diverse entities such as municipalities, corporations, government agencies, and supranational bodies issue bonds to meet this objective. For instance, the European Investment Bank (EIB) issued the first green bond in 2007 to fund the establishment of renewable and energy efficiency programs across Europe (Flammer, 2019). Overall, the issuance of green bonds highlights financial institutions' commitment to addressing the problem of climate change.

The practice of green bonds has gained popularity in the past decade, with figures rising considerably over the years. In 2018, for instance, more than \$143 billion in green bonds were issued compared to about \$1 billion in 2008 (Flammer, 2019). Indeed, the green bond boom is likely to attain higher heights in the coming years as more entities focus on sustainability in response to climate change. Currently, national governments and global bodies have become conscious of the contribution of anthropogenic factors to environmental degradation. Thus, going forward, many nations are likely to embrace green bonds as the preferred financial avenue to fight climate change.

The growing concerns about the unfavorable impacts of climate change have culminated in the establishment of new ways of doing and evaluating businesses. Presently, governments, in close collaboration with multinational agencies, have diversified investment in green initiatives, with financial considerations being at the top of the agenda. Through green bonds, local and regional institutions, as well as government agencies, have been channeling substantial amounts of their budgets to support projects aimed at achieving greater sustainability (Zhou & Cui, 2019). Overall, this practice has become a common aspect in present financial management corridors as a strategy of addressing the challenges brought about by climate change.

The rising popularity of green bonds notwithstanding, there is still minimal understanding concerning various critical aspects. Notably, knowledge about their effectiveness, their contribution to the management of climate change, potential bottlenecks that affect their implementation, and the existing public regulation to ensure enforceability remains scarce (Zhou & Cui, 2019). Therefore, further review of the available literature is imperative in gaining valuable insights into these areas. This mini-literature review critically examines the published scholarly research on green bonds to comprehend the state of affairs regarding the above-identified elements.

Methodology

The objective of this short literature review was to assess the existing scholarly publications to understand various topics associated with the practice of green bonds among national and global entities. Remarkably, the paper intended to shed light on the evolution of green bonds, their implications on the principal stakeholders, their contribution to climate change mitigation, and the challenges associated with their implementation. Thus, the ability to access relevant, peer-reviewed sources for review was critical in meeting this objective.

The first set of articles was obtained from the Scopus database. This online library is one of the scholarly platforms featuring thousands of academic peer-reviewed journals that researchers can depend on to complete a top review. For this reason, I obtained 20 journal articles from this database for cross-examination. For optimal results, I used a systematic search approach to locate the most relevant publications. The following innovative strategies guided this technique.

Firstly, the word “and” was utilized to combine keywords and phrases to locate relevant articles. In choosing this method, I recognized that with Scopus, contrary to conventional search engines such as Google, it was indeed challenging to access satisfactory outcomes if lengthy phrases were entered in the search space. Instead, better results were achieved by picking out keywords and phrases, then combining them with “and.” Overall, this approach proved useful in accessing journal articles covering various aspects of green bonds from the Scopus database.

Secondly, I took advantage of the database’s provision of “all, pages, books, and journals” options. Through this alternative, it was possible to narrow down the search to journals. This focused scope was critical to promptly scan through the results to determine the specific journals that fitted best given the context under examination.

Thirdly, I exploited personal imaginative capabilities by playing around with keywords and phrases. During the search process, it became apparent that sometimes alternative wording was used to develop titles for a specific component of green bonds. For this reason, utilizing limited keywords for particular journals proved challenging. Mindful of this fact, I creatively used different phrases, terms, and keywords to obtain more articles covering similar concepts, thus avoiding the likelihood of running short of empirical publications for review.

Scopus aside, the Social Science Research Network (SSRN) database was consulted for additional sources. This platform was considered critical in accessing several articles about the concept of sustainability that may not be available in other databases but are profoundly insightful. Due to the narrow scope of the literature review, I limited the number of articles from this repository to five. Unlike Scopus, this database is well-designed to assist researchers in accessing various sources. The platform provides scholars with multiple search options such as “title only,” “title and abstract,” “full text,” as well as “authors and publication date.” Undoubtedly, these alternatives eased the process of locating articles. An appropriate search approach was utilized to find relevant publications for inclusion in the review, depending on the type of information available for each source.

In both databases, the search for articles was guided by the established themes. As already observed, some aspects of green bonds are yet to be explored in significant depth. Thus, the search process was structured according to the theme that each article intended to expound. Effectively, this strategy ensured that I remained focused on identifying the most relevant information. Table 1 below outlines the journal and publisher from which the 25 articles belong to, while table 2 provides the objectives, findings, and recommendations of the 25 articles.

Table 1*Journal and Publisher Distribution*

Article Name	Author(s)	Journal	Publisher	Year	Scopus IF
1. Financing the response to climate change: The pricing and ownership of U.S. green bonds	Baker, M. P., Bergstresser, D. B., Serafeim, G., & Wurgler, J. A.	SSRN Electronic Journal.	Elsevier	2018	N/A
2. The green bond market: A potential source of climate finance for developing countries.	Banga, J.	Journal of Sustainable Finance & Investment.	Elsevier	2018	0.8
3. The microstructure of the bond market in the 20th century.	Biais, B., & Green, R.	Review of Economic Dynamics.	Elsevier	2019	1.580
4. Investing in a green future.	Clapp, C.	Nature Climate Change.	Elsevier	2018	19.181
5. Climate change, financial stability and monetary policy.	Dafermos, Y., Nikolaidi, M., & Galanis, G.	Ecological Economics.	Sciencedirect	2018	4.281
6. Green bond finance and certification.	Ehlers, T., & Packer, F. (2017).	BIS Quarterly Review.	Elsevier	2019	2.1
7. Are green bonds priced differently from conventional bonds	Hachenberg, B., & Schiereck, D.	Journal of Asset Management	Elsevier	2018	0.38
8. The changing value of the “green” label on the US municipal bond market.	Karpf, A., & Mandel, A.	Nature Climate Change.	Elsevier	2018	19.181
9. Climate change implications for the catastrophe bonds market: An empirical analysis.	Morana, C., & Sbrana, G.	Economic Modelling	Elsevier	2019	2.056
10. Do investors in green bond market pay a premium? Global evidence.	Nanayakkara, M., & Colombage, S.	Applied Economics.	Elsevier	2019	0.518
11. From sustainability accounting to a green financing system: Institutional legitimacy and market heterogeneity in a global financial center.	Ng, A. W.	Journal of Cleaner Production.	Elsevier	2018	6.395
12. Is it risky to go green? A volatility analysis of the green bond market.	Pham, L.	Journal of Sustainable Finance & Investment.	Elsevier	2016	0.8

13. Green bond and financial markets: Co-movement, diversification and price spillover effects.	Reboredo, J. C.	Energy Economics.	Elsevier	2018	4.151
14. Price connectedness between green bond and financial markets.	Reboredo, J. C., & Ugolini, A.	Economic Modelling.	Elsevier	2019	2.056
15. Do shareholders benefit from green bonds?	Tang, D. Y., & Zhang, Y.	SSRN Electronic Journal.	Elsevier	2018	N/A
16. Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability.	Tolliver, C., Keeley, A. R., & Managi, S.	Journal of Cleaner Production.	Elsevier	2020	6.395
17. Green investments – Between necessity, fiscal constraints and profit.	Voica, M. C., Panait, M., & Radulescu, I.	Procedia Economics and Finance.	Elsevier	2015	1.42
18. The effect of pro-environmental preferences on bond prices: Evidence from green bonds.	Zerbib, O. D	Journal of Banking & Finance.	Elsevier	2019	2.205
19. Green bonds, corporate performance, and corporate social responsibility.	Zhou, X., & Cui, Y.	Sustainability	Elsevier		2.075
20. Green bonds: Effectiveness and implications for public policy.	Flammer, C.	Environmental and Energy Policy and the Economy.	Elsevier	2019	N/A
21. How sustainability contributes to shared value creation and firms' value	Almansoori, A. M., & Haitham, N.	SSRN	Elsevier	2019	N/A
22. The role of financial management in promoting sustainable business practices and development	Al Breiki, M., S., & Nobanee, H.	SSRN	Elsevier	2019	N/A
23. Sustainable financial management	Al Muhairi, M. M., & Haitham, N.	SSRN	Elsevier	2019	N/A
24. Conceptual building of sustainable financial	Al Ahbabi, A., & Haitham, N.	SSRN	Elsevier	2019	N/A

management & sustainable financial growth					
25. A study on financial management in promoting sustainable business practices & development	Alkaabi, H. S., & Haitham, N. (2019).	SSRN	Elsevier	2019	N/A

Table 2

Articles' Category Based on the Subject

	Article Name	Objectives	Findings	Recommendations
1	How sustainability contributes to shared value creation and firms' value.	The purpose of this article was to determine the role of sustainability in contributing to the shared value creation and an enterprise's alue.	The results revealed that corporate sustainability is recognized as the most critical topic in contemporary financial and economic systems. At the same time, it was found that this practice improves financial growth and decision-making with respect to capital budgeting, cost of capital, and working capital management.	Risks associated with sustainability reporting can be addressed by implementing risk mitigation and management practices. Similarly, the element of bankruptcy can be minimized through efficient initiation of low-risk sustainability financing frameworks in the enterprise.
2	Sustainable financial management.	The aim of this article was to ascertain the role of sustainability in financial management.	It was found that this practice fosters a climate that eradicates climate change, reduce inequality, and decrease greenhouse gas emissions.	Threats associated with financial sustainability can be eased through the implementation of appropriate management techniques.
3	The role of financial management in promoting sustainable business practices and development.	The objective of this study was to explore the role of financial management in promoting sustainable business practices and development.	The findings revealed that appropriate financial management models are critical in enhancing productivity while mitigating issues of financial risks. Additionally, the outcomes showed that the allocation of capital budgeting for sustainable initiatives improves the competitive advantage of the business.	The study recommends organizations to embrace the concept of financial sustainability to enhance environmental management.
4	Conceptual building of sustainable financial management & sustainable financial growth.	The article aimed at using recent research papers to determine the connection between financial management	The study found that financial executives ought to incorporate financial management to sustainability issues,	The study suggests that the incorporation of sustainable practices in financial management can be critical

		and sustainable business growth.	respond to issues that affect prudent management, and comprehend the mutual association between sustainability practices.	in promoting sustainable long-term growth.
5	A study on financial management in promoting sustainable business practices & development.	This study was intended to explore the significance of financial management in the sustainability process.	The findings revealed that most Islamic financial institutions are increasingly recognizing the importance of sustainable financial management in organizational growth.	The study underscores the value of incorporating sustainability into financial management to create an environment of accountability.
6	Financing the response to climate change: The pricing and ownership of U.S. green bonds	To study pricing and ownership patterns of through a simple framework encompassing assets with nonpecuniary bonds.	The findings revealed that green bonds sell for a premium.	There is a need for the creation of standards upon which certifications can be issued.
7	The green bond market: A potential source of climate finance for developing countries.	To examine the potential value of green bonds in financing sustainable projects in the developing world.	The findings revealed that green bonds are yet to be fully appreciated in developing countries.	It is important to use national and multilateral banks as intermediaries for the issuance of green bonds in these countries.
8	The microstructure of the bond market in the 20 th century.	To comprehend the microstructure of the bond market in the contemporary world.	Trading costs in corporate bonds for small investors are currently higher than before.	There is a need to continue to improve technology to continue bringing these costs further down.
9	Investing in a green future.	To examine the trend in investments in green projects.	There is a positive green premium bond in recent times.	Investors need to turn to the green premiums to respond to effects of climate change.
10	Climate change, financial stability and monetary policy.	To analyze the effects of climate change on financial stability.	Climate change has the potential to destroy the capital of firms.	The implementation of a green corporate system can alleviate this risk.
11	Green bond finance and certification.	To comprehend the various certifications being used in the issuance of green bonds.	Multiple certifications are currently being utilized to assess green bonds.	There is a need for a more consistent green bond standards across jurisdictions to further develop the market.
12	Are green bonds priced differently from conventional bonds?	To determine whether green bonds are priced differently from traditional ones.	Green bonds trade tighter as compared to non-green ones.	There is a necessity to focus on widening the market to benefit more.
13	The changing value of the “green” label on the US municipal bond market.	To understand the impact of the green label on the bond market.	Returns from traditional bonds are slightly higher.	With climate change threatening businesses, more investments in green bonds seems more feasible in the future.
14	Climate change implications for the catastrophe bonds market: An empirical analysis.	To examine the effect of climate change on the bond market.	Climate change results in risks in the capital market.	Green bonds present an opportunity to respond to climate change.

15	Do investors in Green Bond market pay a premium? Global evidence.	To determine whether investors would be willing to pay premiums for green bonds over traditional bonds.	Green bonds are traded at a premium.	There is need for urgent support for the growth of the green bond market to achieve sustainability.
16	From sustainability accounting to a green financing system: Institutional legitimacy and market heterogeneity in a global financial center.	The study aimed at exploring the value of sustainable accounting in the adoption of green financial system.	Sustainable accounting aids in the process of implementing greener financial systems.	Institutions need to shift to green bonds as parts of achieving sustainable management of finances.
17	Is it risky to go green? A volatility analysis of the green bond market.	To examine whether it is a risk adventure for entities to invest in green bonds.	The green bond market results in significant volatility clustering.	It is important to be careful in asset pricing to gain from this adventure.
18	Green bond and financial markets: Co-movement, diversification and price spillover effects.	To evaluate co-movement between the green bond and financial markets.	Green bonds have insignificant diversification benefits for investors in both treasure and corporate markets.	There is no need to worry when investing in green bonds because their prices are hardly influenced by external forces.
19	Price connectedness between green bond and financial markets.	To explore the connection between green bond and financial markets.	The green bond market is strongly connected to the fixed-income and currency markets.	Green bonds should be an area of focus for environmentally-minded investors.
20	Do shareholders benefit from green bonds?	To examine whether stakeholders benefit from green bonds.	Issuance of green bonds is beneficial to stakeholders.	It is important for institutions to invest in green bonds to increase the value for their investors.
21	Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability.	To examine the driving forces behind the adoption of green bonds.	The implementation of green bonds is influenced by various microeconomic and institutional factors.	There is necessity for a broader examination of the determinants of issuance of green bonds.
22	Green investments – Between necessity, fiscal constraints and profit.	To demonstrate the role of private investors and public agencies in promoting the green bond market.	These bonds have greatly contributed in the development of infrastructure and regulation policies for green bonds.	More partnerships between government bodies and private entities is necessary to keep the field growing.
23	The effect of pro-environmental preferences on bond prices: Evidence from green bonds.	To explore the effect of pro-environmental preferences on bond prices.	The outcome of a small premium is lower than that of the traditional bond.	It is important for investors to support the expansion of the green bond market.
24	Green bonds, corporate performance, and corporate social responsibility.	To examine the nexus between green bonds, corporate performance, and corporate social responsibility.	The issuance of green bonds has multiple benefits, which include stock prices, profitability, among many others.	Organizations should invest more on green bonds to improve their competitive advantage.
25	Green bonds: Effectiveness and implications for public policy.	To examine the effectiveness of green bonds and their implications on policy.	Certified green bonds improve an entity's environmental footprint.	Policy-makers should hasten the certification process to benefit investors.

Results and Discussion

The reviewed literature sheds significant insights into green bonds and their association with the concept of sustainability. A critical cross-examination of the outcomes is essential in highlighting emerging themes and issuance-related issues. Therefore, this section reports and discusses the implications of the findings from the reviewed articles to understand diverse aspects associated with the issuance of green bonds.

The results indicate that the concept of green bonds has gained immense popularity among various institutions in the recent past, with many of them focusing on financing programs meant for achieving sustainability. This outcome delineates a paradigm shift in the management of finances by firms in the contemporary world. As indicated by Flammer (2019), multiple organizations, notably, government agencies, supranational bodies, and corporations, have recognized the significance of financial sustainability in responding to the problem of climate change. In essence, the issuance of green bonds is considered vital in averting the worsening of climate change.

The findings also showed that government agencies in many countries have recently diversified their climate change mitigation efforts working closely with multinationals and local private entities. The growing focus on reversing global warming highlights the increasing efforts by diverse institutions to promote sustainable practices in their operations.

Enterprises are actively using green bonds to finance projects intended to encourage sustainable activities (Hachenberg & Schiereck, 2018; Zhou, & Cui, 2019). Therefore, this evidence affirms the utilization of green bonds as a means of reversing the impact of global warming on the atmosphere.

The evolution of the issuance of green bonds by institutions is attributed to the rising concerns about the negative impacts of climate change. Since the 1990s, many entities have been focusing on sustainable financial management as a means of responding to climate change. As outlined by Morana and Sbrana (2019), the green bonds market allows entities to find immediate investment in climate change mitigation. Similar observations are shared by Biais and Green (2019), Ng (2018), and Tolliver, Keeley, and Managi (2020), who note that green bonds are growingly applied in financing initiatives aimed at reducing emissions, sustainable development, and other cleaner production investments. Collectively, this evidence gives the underlying ground upon which institutions started to incorporate green bonds to manage their climate change.

The changing value of the US municipal bond provides the best example of the growing focus on sustainability in financial management. The review of the available literature revealed that most institutions in the United States have shifted from the traditional bonds to green bonds as an effective strategy to unlock climate finance. Historically, municipal markets in the country have tended to penalize green bonds by trading them at lower prices and generating higher yields than anticipated by their clients (Karpf & Mandel, 2018). Nonetheless, this approach has recently changed. Presently, green bonds have become an attractive investment, with a keen eye on bridging the climate finance gap (Biais & Green, 2019). Indeed, without adequate financing, it is significantly challenging to respond to an impending problem.

Therefore, the reviewed literature confirms that the need for funds to support sustainable projects laid the foundation for the rise of green bonds.

The findings of the review also implicate climate change to negative impacts on the stability of financial systems. Notably, climate change-related risks such as transition and physical issues have potentially harm financial transactions in many ways. However, most of the studies

have tended to focus on the implications of transition risks on the financial management system (Baker, Bergstresser, Serafeim, & Wurgler, 2018; Dafermos, Nikolaidi, & Galanis, 2018; Clapp, 2018). In effect, these studies underscore the need for an urgent response to climate change to ensure normal operations. In essence, the evolution of green bonds confirms the efforts made by national and global organizations towards achieving sustainability in financial management.

Moreover, the analyzed literature confirms a positive correlation between sustainable business practices and prudent financial management. The efficient incorporation of financial management into business operations can go a long way in promoting sustainable business practices (Ehlers & Packer, 2017; Reboredo & Ugolini, 2019; Tang & Zhang, 2018; Voica, Panait, & Radulescu, 2015). Critical to achieving financial sustainability is the implementation of the concept of the green bond. As observed by Voica, Panait, and Radulescu (2015), investments in green bonds, especially in infrastructure, is critical to realizing the objective of sustainability in financial management. Overall, the reviewed literature accentuates the importance of this paradigm shift in enabling institutions to overcome the negative implications of climate change.

In spite of their promising potential, green bonds face various challenges. Some of the most striking bottlenecks include the low impact of investors' pro-environmental preferences on bond prices, significant volatility clustering, lack of suitable institutional arrangements, the aspect of minimum size, and the associated higher transaction expenses (Banga, 2018; Pham, 2016; Zerbib, 2019).

These limitations indicate that additional work is needed to improve the productivity of green bonds in financial management. Undoubtedly, for any great idea to achieve the intended goal, any inherent drawbacks ought to be adequately addressed. Indeed, the reviewed literature underlines the necessity for financial practitioners to respond to the fundamental weaknesses.

Notably, they should ensure that green bonds support institutions' attempts to adapt to the negative impact of climate change on financial management systems.

Conclusion

The rapid globalization process continues to threaten various sectors of society due to the associated negative implications of climate change. The financial management system is one of the segments that have been affected most by the issue of global warming. As with many other areas, sustainability has become a viable tool in addressing this issue in financial management circles. Institutions that embrace sustainable practices engage in activities that promote the conservation of the planet, thus averting the possibility of adverse climate change. The concept of green bonds has gained recognition due to its potential in enabling organizations to manage their finances efficiently, thus enhancing sustainable development.

The application for and issuance of green bonds have become standard practices among institutions as part of their grand strategy to respond to climate change. Government agencies, supranational corporations, and multinational enterprises currently offer green bonds to fund projects aimed at supporting sustainability initiatives. This paradigm shift suggests that contemporary business and public entities have realized the importance of helping individuals or groups whose focus entails operating without posing negative implications on the environment. In this new realm, public institutions have tended to actively collaborate with private entities in the provision of green bonds to support programs anchored on sustainable grounds.

The rapid growth in the practice of green bonds is attributed to the growing appreciation of the impact of climate change mitigation on financial management. Since the 1990s, many organizations have raised concerns about the worsening of climate change its potential toll on

financial aspects, thus prompting the search for practical answers. Governmental and non-governmental bodies have identified green bonds as one of the most appropriate tools in responding to this problem. The issuance of green bonds can enable entities to find immediate solutions with the ability to exert a long-term impact on the issue of climate change.

The widespread recognition that the issuance of green bonds continues to receive among institutions is attributed to the positive correlation between sustainability and financial management. The effective execution of financial management has the potential to enhance sustainable business operations. Critical to achieving this objective is the issuance of green bonds to finance sustainable projects. Nonetheless, the feasibility of green bonds in contributing to sustainability is undermined by several challenges. Some of the significant impediments include the absence of appropriate organizational arrangements, the high cost of processing transactions, and the considerable volatility clustering. Overall, the role of green bonds in aiding sustainability can be significantly improved by addressing these critical limitations.

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