The Development of Green Bonds: Current Issues and Solutions

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Abstract. The increasing deterioration of climatic issues in recent years promoted the development and the necessity of green finance, and green bonds have also developed rapidly under the opportunity. The purpose of this paper is to review the development of green bonds to figure out issues encountered in development and corresponding solutions. The main body of this paper can be divided into three sections. The first section of this paper concentrates on the historical development and current status of green bonds. The second and third sections first concentrate on analyzing issues that influence the development, then focusing on solutions from the viewpoints of investors, government, and issuers respectively. The results revealed that both historical and current overall development of green bonds shows positive; the issue of greenwashing can be solved with the policy of Third-Party Certification and enhancing investors' perceptions; the issue of financial performance can be improved by enhancing liquidity and fixed-income assessment; the barriers of globalization can be solved by setting up green investment banks in developing regions, enhancing regional relationships and setting forward contracts. It also provides suggestions for three parties: local government, global organizations, and issuers to carry out the solutions better. This paper contributes to further investigating the development of green bonds, which is conducive for researchers intending to study in related dimensions.

Keywords: Green Bonds, issuance volume, greenwashing, financial performance, globalization.

1. Introduction

Recent years have seen a worse deterioration of climatic conditions, which leads to environmental risks. Environmental risks could significantly affect the stability of the financial and macroeconomic systems [1]. In this situation, the demand for green finance has increased among governments and institutional investors. As the International Monetary Fund (IMF) indicates, green finance is essential to battle against environmental crisis through the strategy of encouraging risk minimization related to climatic changes and lessening the effects of unfavorable climatic occurrences [2]. IMF mentioned that green bonds can be considered a financial tool to realign investments into green [2]. Sachs et al. also demonstrate that newly emerged financial instruments, such as green bonds, could play a role in financing green projects, and the growth of renewable energy has some potential to be supported by green bonds [3]. Under such an opportunity, green bonds are also gradually stepping into the mainstream debt security market, gaining more space for development as well as attention from investors and financial institutions. In terms of the development of green bonds, according to the data collection conducted by the Climate Bonds Initiative, by the end of August 2023, the total global cumulative green bond issuance has achieved the number of 2.334 trillion US dollars, while the global 2023 green bond issuance is 359.733 US dollars [4]. Based on the green bond investigation conducted by Weber and Saravade, green bonds can be categorized into different types: "Corporate bond", "Projects bonds", "Asset-Backed Security bonds", "Covered bonds", "supranational, sub-sovereign and agency bonds", "Municipal bond" [5]. The existing data collection and literature demonstrate the necessity, fast-growing size, and mature system of green bonds.

In the context of the rapid development of green bonds and the continuous expansion of the market, this paper purposes to aggregate the existing related literature in the dimension of green bonds and visualize collected data through diagrams to review the development of green bonds, including encountered issues and countermeasures. Conducting this overview of green bonds has a specific reference value for scholars who want to understand the development of green bonds and, at the same

time, help them to be able to base on this paper for the development of green bonds encountered problems to put forward a new point of view or to improve the corresponding policy, which is very meaningful for green bonds.

The structure of this paper can be divided into three sections: Section 1 will concentrate on analyzing the development of green bonds in two components: historical growth and trend of green bonds and current development circumstances. Section 2 will emphasize interrupting the issues that appeared in the development of green bonds in three sections: the greenwashing phenomenon, underperforming financial performance and globalization difficulties. Section 3 will rely on the foundation of the aforementioned issues discussed in Section 2 to further interpret the suitable solutions to resolve the issues. Eventually, in the conclusion part, this paper will provide suggestions on three parties: local government, global organizations, and issuers to perform the solutions better to achieve the goal of successful development of green bonds.

The applied value of this paper is to collate the development of green bonds, and it helps to advance research and provide a reference in this area, as well as provide certain suggestions for the complete institutional development of green bonds.

2. The Development of Green Bonds

2.1. The Historical Trend of Green Bonds

Analyzing evolving trends in green bond development in recent periods from the perspective of background causes analysis and historical data collection, the development of green bonds is more likely to be described as continuous growth and expansion. Firstly, responding to recent extreme climatic circumstances changes such as global warming has enhanced the urgent demand for feasible green policies implementation and the establishment of the green economy system, green bonds as green debt instruments, and its development has benefited from the trend and is being emphasized [6]. Firms are also more likely to invest in similar environmentally friendly programs as it is an effective preventative technique for enterprises' potential environmental risks and enhances corporate reputation for amassing social capital [6]. This will help promote the expansion of green bonds for financing in order to conduct investments. At the same time, the implementation of green policies will influence the perceptions of investors. For instance, the signing of the Paris Agreement treaty not only strengthens the awareness and necessity of improving the progress of the low carbon transition to respond to extreme climatic risk but also has a significant decline in green bonds carbon emissions issued after the conference [7]. In a nutshell, environmental and social challenges might be addressed with the support of sustainable finance markets; for example, firms issuing green bonds could have better management on the deduction of emissions [8]. Likewise, investors in financial markets are aware of the possible environmental risks and take them into consideration in investment decisions [6]. These two factors will encourage the growth of green bonds.

From the historical data collection perspective, it can also confirm the continuous growth of green bonds. According to Figure 1, the amount of global green bond issuance demonstrated an overall rapid growth trend from 2014 to 2022 [9].

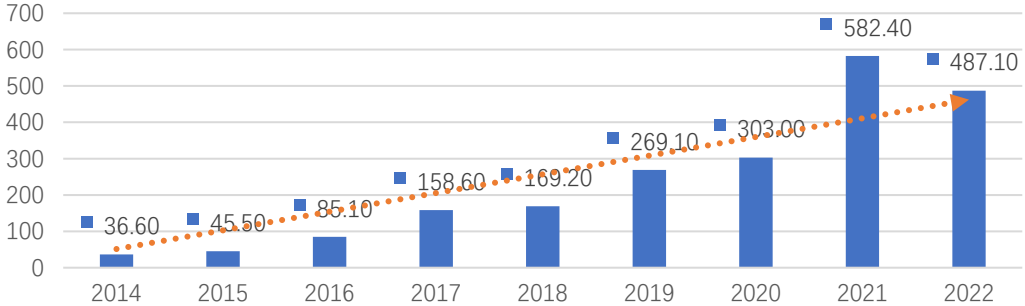

Figure 1. Amount of Global Green Bonds Issued from 2014 to 2022 ($bn) (Source: Climate Bond Initiative [9])

2.2. The Current Circumstance of Green Bonds

Analyzing current sustainable bond market conditions through the size of global issuance, as of H1 2023, the cumulative issuance volume of the aligned GSS+ bond (Green, Social, Sustainability and Sustainability linked) market has reached the goal of 4.2 trillion US dollars [10]. The issuance volume of aligned sustainable bonds (GSS+) in the first half of 2023 has reached a record of 448 billion US dollars, which is a 15% decrease contrasted with the H1 2022 [10]. Figure 2 shows that the issuance of aligned green bonds in 2023 H1 has reached the goal of 278.8 billion US dollars, accounting for a proportion of 62% when compared with the issuance volume of total aligned GSS+ bonds in the same period (448 billion US dollars) [10]. As compared with the 290 billion US dollars in 2022 H1, it is a modest decrease of 4% [10]. The total amount of green bonds issued on the world market by the end of August 2023 was 359.733 billion US dollars [4].

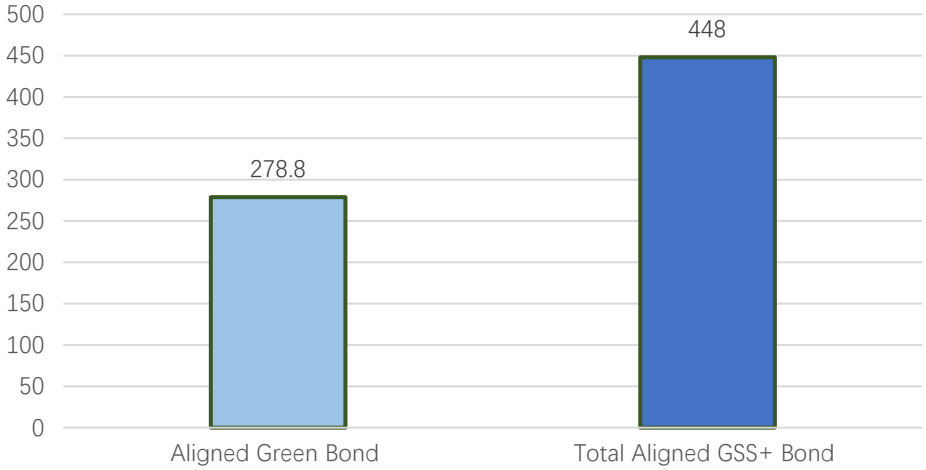

Figure 2. The Issuance Volume of Aligned Green Bonds VS Total Issuance Volume of Aligned GSS+ Bonds ($bn) in 2023 H1 (Source: Climate Bond Initiative [10])

Based on the data released on Climate Bond Initiative, the real market value of global green bond issuance in 2022 is 487.1 billion US dollars [9]. From the perspective of different regions and countries to assess the status, according to Figure 3, Europe is the most preeminent region for green bond issuance, amounting to 228.6 billion US dollars and accounting for 47% of the market in 2022, followed by Asia-Pacific and North America region with 133.4 billion US dollars and 76.6 billion US dollars respectively, accounting for 27% and 16% of the market separately [9]. The remains are Supranational, Latin America, and Africa, while the issuance of green bonds amounting to USD 45.1 billion, USD 3.1 billion, and USD 0.3 billion, respectively [9].

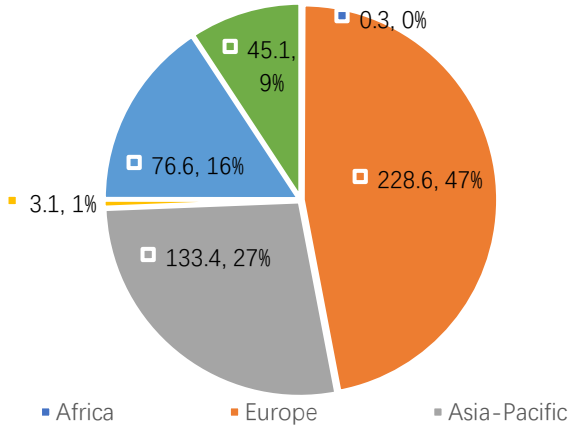

Figure 3. Amount of Green Bonds Issued in Different Regions in 2022 ($bn) (Source: Climate Bond Initiative [9])

Likewise, in terms of comparing the aligned green bond issuance volume by country in the H1 of 2023, the market pattern is led by Germany, contributing approximately 14% of the share with an issuance volume of 39.2 billion US dollars, followed by China, contributing an issuance volume of 37.4 billion US dollars, accounting for nearly 13% [10].

For sovereign green bonds, in 2023 H1, its total volume is 52.4 billion US dollars while Germany is still contributing the most (approximately USD 15.0 billion), Italy ranked second (approximately USD 13 billion), and the United Kingdom ranked third (approximately USD 9.8 billion) [10].

On top of that, in terms of the overall green bond market of 2022, the Figure 4 shows the current mainstream issuance institutions in the market [11].

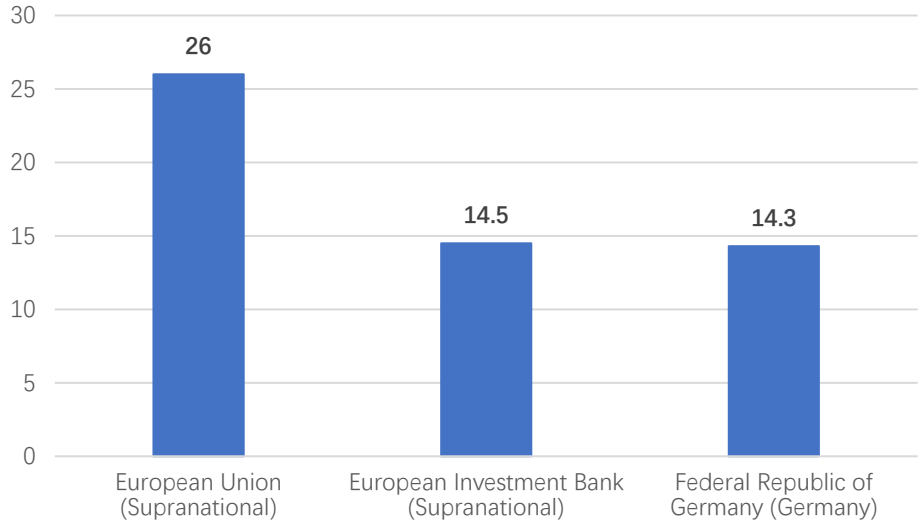

Figure 4. 2022 Top 3 Issuance Institutions in the market ($bn) (Source: Climate Bond Initiative [11])

3. The Main Issues in the Development of Green Bonds

3.1. Greenwashing Phenomenon

The first issue encountered in developing green bonds is the frequent occurrence of greenwashing phenomenon. Greenwashing can be described as an action of selective disclosure for corporations [12]. Greenwashing can also be considered as an act of "decoupling" for some firms, i.e., a symbolic act that enterprises have no intention or capability to perform pledges of environmental optimization and protection, essentially to assuage the public opinions and uncertainties to ensure and maintain their legitimacy in front of the external public supporters [12]. It can be summarized that greenwashing is the process for firms to overstate their positive performance on environmental benefits, or the enterprises package their financial organizations and projects as a sustainable and environmentally friendly image to mislead investors and shareholders [13].

Green bonds as debt tools for financing environmental projects, are easily associated with greenwashing. The literature review conducted by Zhu et al. has pointed out the perspective that the greenwashing risk also exists in the green bond market as firms prepare funds for investment and construction in high-carbon emission industries under the guise of issuing green bonds in the name of investing sustainable programs [13]. In addition, when utilizing the revenue acquired through the issuance of green bonds, especially high-carbon emitting corporations might also frequently give more emphasis on the quantity of green innovations instead of the quality (i.e., ostensibly filing more sustainable patent applications) [14]. This trend demonstrates that firms are more likely to attempt to project a brand image of being environmentally aware but not enhance sustainable invention capability for the environment [14].

In conclusion, greenwashing is a means of packaging the company, a means of advertising to disseminate restricted information, which can influence the transparency of green bonds (particularly

the utilization and flows of funds raised by the green bonds) as well as affect the judgment and the attitude of investors, and whether these green bonds are genuinely effective in mitigating climate risks.

3.2. Financial Performance

The second issue encountered is underperforming financial performance. The empirical test conducted by Maltais and Nykvist demonstrates that the main drivers for firms to participate in green markets in Sweden are non-financial incentives, such as expanding clients and employee base and utilizing them as a means of promoting brand image, but not financial incentives [15]. This indicates that the generated corporate revenue is not the primary factor for firms to issue green bonds. Sachs et al. also mentioned that financial institutions are similarly discouraged from investing in green projects due to lower rate of return [3]. The financial institutions are more prefer fossil fuel programs [3].

In addition, another research also demonstrates that the reaction of the stock market is inversely correlated with the launch of new green bonds (with a modest decline of the corporations' cumulative abnormal return by nearly -0.2% to -0.5% compared with the expected return after the date of issuance) [16]. Likewise, Yeow et al. experimented with the influence of green bond issuance on financial performance by evaluating the corporate ratio analysis (ROA and asset turnover), and the former result shows that compared with the traditional bond issuers, data is insufficient to draw the conclusion that green bond issuers have a competitive advantage on ROA [17]. The latter result demonstrates that the argument that green bond issuance helps improve the efficiency of corporations should need more evidence to support it [17]. This can prove that green bonds do not influence the issuers' financial outcomes in the components of efficiency and financial return [17].

In conclusion, the financial return of green bonds needs to realistically meet the expectation of improving the financial performance of the issuing corporations. Firms are more likely to take advantage of issuing green bonds as a promotion method. Besides, neither the market reaction nor the corporate ratio demonstrates a positive correlation between issuing green bonds and corporate outcomes.

3.3. Market Globalization

Obstacles in the market globalization is the third issue in the development. In terms of the geographical contribution in 2022, it shows a significant difference between the regional markets, with more than 67% of issuance volume coming from the developed markets (DM) and emerging markets (EM) issuers accounting for only 23% of the time [11]. From the perspective of the historical data, Africa and Asia (excluding China) together contributed to a little over 6% of the world's green bond issuance between 2007 and 2016 (approximately 6.5%), indicating the market for green bonds confronted obstacles for improving the growth in emerging nations [18]. Both current and historical data demonstrate uneven regional development. This situation demonstrates that uneven development impacts globalization as developing regions cannot compete in the global green bonds market effectively and might impact the opportunities for supranational investment and cooperation. Ning et al. also mentioned that the market has not yet fully globalized and has few issuance and trading options [19].

The limited issuance volume is the other factor affecting the globalization process [18, 20]. The minimal issuance volume of USD 200 million in green bonds demanded by investors in the market is not met by green projects in the great majority of underdeveloped nations [18]. The issued size makes it hard to support liquidity and attract potential investors [20]. In addition, the terms of fiduciary obligation in developing nations also might impact the green bond market access of foreign investments, i.e., the financial institutions are prohibited from investing in debt issued in undeveloped nations due to the smaller size and worse credit ratings [20].

Non-convertibility of interregional currency is also a factor that affects the globalization process [18, 20]. Based on the 2022 sustainable debt market report conducted by the Climate Bond Initiative, between 2018 and 2022, the main currencies used for green bond issuance are the EUR and the USD,

followed by CNY [11]. The total of these three currencies' five-year average utilization proportion accounts for approximately 80% [11]. Jones et al. point out that non-convertibility might limit the development of green bonds as it may lead to currency risk that limits foreign investment [20]. It might influence the local market's integration with the international community.

In summary, the globalization of the green bonds market has been impacted by the abovementioned factors: Uneven regional development, market barriers and currency problems.

4. Solutions to Continue Promoting the Development of Green Bonds

4.1. Avoiding Greenwashing

As previously discussed, the development of green bonds is vulnerable to the frequent occurrence of greenwashing, especially the transparency and usefulness of green bonds. The underlying reason for the proliferation of greenwashing is that the green bonds market operates without the obligatory rules for corporate disclosure on revealing the utilization of funds and monitoring the environmental effects created by green bond programs [20]. The operation should also be backed up with robust and standardized legislation [13].

Thus, it is necessary to introduce the regulatory instrument "Third-party Certification" (TPC) in order to reduce the possibility of greenwashing in green bonds [13]. The certification is helpful for investors to recognize green bonds and screening as investment decisions, which is an efficient strategy to mitigate information asymmetry [13]. Likewise, to further strengthen TPC for green bonds market regulation to distinguish issuers whether there is the presence of the greenwashing phenomenon, the incentive mechanism should be introduced into the operation of TPC, especially in the regions where TPC is not compulsory [13]. Specifically, a series of incentives such as adopting tax and fee reductions for issuers that actively participate in the TPC, corresponding with financial subsidy policies, and providing the right to prioritize approval of green bonds and streamlining the auditing process, which can make the issuers that participate in the TPC more profitable and efficient [13]. This will undoubtedly promote the participation of TPC to monitor the greenwashing phenomenon and boost investors' confidence in this market.

Additionally, it is also crucial for investors to distinguish between "financed emissions" and "real emissions", as the frontier indicates the risk of carbon emissions created by the monetary instruments [21]. In contrast, the latter indicates that carbon emissions directly affect the atmosphere via the operations carried out by the firms [21]. Investors should realize that the difference between the two types of emissions, i.e., mitigating funded emissions of the portfolio, does not represent an instant decline in atmospheric GHGs (as the actual emissions are merely impacted by firms). In contrast, investors can put stress on firms by sending market signals to achieve the goal of emission deductions [21]. Misunderstanding of concepts might result in greenwashing [21].

4.2. Improving Financial Performance

As previously mentioned, the financial performance of green bonds needs to live up to expectations. This situation can be interpreted that investors might be concerned about whether the issuance of green bonds (novel business structure) would continue to be as lucrative as the initial business model because the launch of new green bonds issuance is equivalent to an impending adjustment of investment decisions and capital disposition for sustainability [16]. This might be a signal of uncertainty for investors, which leads to lower profitability predictions and unfavorable market responses [16]. The uncertainty undoubtedly will decrease the investing demands in green bonds; in conjunction with the low rate of return described previously, corporations cannot utilize green bonds for expected financing purposes.

Thus, it is necessary to figure out the solutions for improving the financial performance of green bonds. The first strategy for improvement is enhancing fixed-income assessment to strengthen its demand from investors [20]. Jones et al. concluded that green bonds are less prevalent in traditional investment portfolio allotment, and due to inadequate inclusion in the evaluation, relying on

conventional benchmarks can no longer capture the opportunities and hazards of environmental change accurately [20]. Investors based on that point are more likely to continue to prefer traditional portfolios [20]. This can be summarized by optimizing valuation strategies to incorporate environmental factors in benchmarks and then achieving the goal of promoting green bonds as the option for investment decisions.

The second strategy for improvement is to enhance liquidity when the rate of return remains low [20]. This can be achieved by expanding the issuing volume of green bonds to enhance the trading volume and the convenient level of buying and selling in the marketplace; at the same time, it also requires expanding the secondary trading market, dispelling concerns about the liquidity risk, ultimately leading to the increased investor demand and base [20].

In summary, these two improvements are mainly aimed at expanding the sources of investment in green bonds by improving the fixed-income evaluation model and enhancing liquidity to increase the financing capacity of green bonds themselves in order to avoid the impacts of their low returns and uncertainty on the financial situation of the companies.

4.3. Improving the Globalization of Green Bonds Market

Resolving the obstacles in the globalization process requires focusing on figuring out the corresponding strategies for stepping up the market of undeveloped nations to keep pace with the global green bond development trend led by developed markets.

Establishing green investment banks in undeveloped nations might be feasible [18]. Because the government in developing regions is not capable of meeting the financial needs of green projects [3], building up green investments could be a potential solution to make up for the lack of green investments [18]. Effectively utilizing the currently existing resources of multilateral and national agencies with climate revenue to develop a suitable green banking model is a feasible strategy for guiding and promoting investments in green industries and achieving the aim of breaking through the minimum green bond issuance size limitation [18].

Likewise, Ning et al. indicate the necessity for undeveloped economies to establish a sophisticated green finance market framework for green bond trading and supervision by global financial organizations [19]. The empirical test of the Southeast Asia region conducted by Nguyen et al. also demonstrates that the market participants presented arguments in favor of learning from developed markets, such as the EU, on regulatory regimes to enhance their green bond issuance [22]. In addition, constructing an efficient trading and investing platform for green bonds is also mentioned by Ning et al. as a solution for enhancing globalization [19]. It can strengthen the relationships among different regions.

In terms of the currency risk brought by the non-convertibility of some currencies, it is not the product born out of the green bonds market [18]. However, it does exist in the green bonds market. The return of foreign investments might suffer from the uncertainty caused by the violability of local currency. Forward contract is the strategy to mitigate the currency risk. Forward contracts can be conducted through an appointment between two sides to trade at a predetermined future date with a predetermined price [23]. The forward contracts could be utilized to confirm the future exchange rate to reduce the uncertain risk of violability in currencies [23]. In the green bond market, foreign investors could take advantage of forward contracts to fix the future exchange rate for hedging currency risk brought by the non-convertibility of local currency, achieving the goal of improving the local market for globalization.

5. Conclusion

The examination of the historical improvement and current development circumstances of green bonds is the primary emphasis of this article, as well as the issues encountered in the process of its development and the correlated measures to solve them.

In terms of the historical growth and current status of green bonds, through the methodology of data aggregation and related literature supplementation, this paper finds that the development of green bonds presents a rapid growth in issuance size and still maintains the growing momentum. The increasing demand for implementing green policies (Paris Agreement), establishing the green economy system, and changing investors' perceptions also promote development.

In terms of its main encountered issues and solutions in development, through the methodology of literature review, this paper finds that the main encountered issues can be categorized as "greenwashing" underperforming financial performance, and barriers in the process of globalization. The corresponding strategies are implementing TPC and enhancing investors' perceptions; improving fixed-income assessment and liquidity; building up green investment banks in developing countries, enhancing regional relationships for efficient trades and conducting forward contracts (avoid currency risk), respectively.

Based on these abovementioned findings, green bonds, as an emerging sustainable financial product, are in a fast-growing phase because environmental issues are gradually receiving more cooperation from the external. However, its rapid development has also been slowed down by the abovementioned obstacles from different aspects. Based on the foundation of this paper, it also suggests that local governments could improve TPC participation by introducing incentives to curb greenwashing and increasing transparency; global organizations could pay more emphasis on the unmatured green bonds market in developing regions by providing regulation to enhance globalization, and issuers might also adjust issuance size for high liquidity as well.

The contribution of this paper is mainly through aggregating and reviewing the recent literature in the field of green bonds to further complement the research in the dimension of the overall state of green bond development as well as the obstacles to development and countermeasures. For scholars intending to further research in this field, this paper provides a clearer background framework and indicates the factors that need to be considered during the process of green bond development as well as solutions, which is conducive to researchers conducting reviews.

The limitation of this paper is that it is restricted to studies on current issues without forecasting future market trends and potential risks. The impacts of adopting solutions need to be backed up by more experiments to ensure rigor and authority. For future research on the development of green bonds, researchers could pay emphasis on forecasting trends and risks based on real-time environmental changes as well as conducting comparisons of improvement measures before and after implementation to future refine the research of the sector of green bonds.

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