

Green bonds as a source of financing: trends

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Abstract. The article discusses the concept of green bonds as a financial instrument aimed at supporting environmentally significant projects. It describes the history of their emergence, starting with the issuance of the first Climate Awareness Bonds by the European Investment Bank in 2007 and the first official green bonds of the World Bank in 2008. Key differences between green bonds and traditional debt instruments are discussed, including the targeted use of the raised funds to finance projects in the field of renewable energy, waste treatment, water treatment and green transport. Special attention is paid to the development of the green bond market. The article also notes the economic advantages of green bonds, such as the ability to attract financing at lower rates, and reputational benefits for issuers supporting the environmental agenda.

1 Introduction

Green bonds first appeared in 2007 when the European Investment Bank (EIB) issued so-called Climate Awareness Bonds [1,2,3]. The funds from these bonds were intended to finance renewable energy and energy efficiency projects. A year later, in 2008, the International Bank for Reconstruction and Development (IBRD), a member of the World Bank Group, introduced bonds that were officially called "green bonds". The prerequisites for the emergence of green bonds are related to the global awareness of environmental and climate threats, the need to attract significant financial resources to address these problems, as well as a change in the preferences of investors and regulators towards sustainable financing [4].

2 Materials and Methods

In the process of the research the system approach, evolutionary approach, approaches of the theory of sustainable development were used. The methods of analysis and synthesis, grouping and comparison were used as a methodological technique of the research.

3 Results and Discussion

In Russia, the topic of green bonds was addressed in 2016, when the Ministry of Natural Resources and the Ministry of Economic Development started to develop a methodology for the application of green financial instruments in national development institutions and public

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companies on the instructions of the President. The first issue of green bonds in Russia took place in 2018 by Resursosberezhenie KhMAO. Green bonds are fixed-income debt securities, the proceeds of which are used to finance or refinance (in full or in part) new or existing projects aimed at improving the environmental situation. The main difference from standard bonds is the intended use of the proceeds: they are used for the construction of renewable energy facilities (solar and wind power plants), waste treatment plants, modernisation of wastewater treatment facilities, development of electric transport and other environmentally significant projects. While ordinary bonds can be used to replenish working capital or for current needs of the company [5,6,7].

Green bonds are otherwise similar to conventional bonds: they are issued on the stock exchange and are available for purchase by investment funds, banks, individuals and companies. Due to the high interest in these securities, rates on green bonds are often lower than those of conventional bonds of the same issuers. This allows to reduce the cost of borrowing and at the same time demonstrate the company's commitment to environmental initiatives, which increases its reputation as an environmentally responsible player in the market [8,9].

The green bond mechanism includes several key steps and requirements to ensure that the funds raised are used for their intended purpose, comply with environmental standards and are transparent to investors. Let's look at the process in detail (Figure 1):



Fig. 1. Circulation mechanism of green bonds.

1. the Issuer and the Target Programme

- The issuance is usually initiated by governments, large companies, banks or international financial organisations. The issuer develops an environmentally oriented programme under which the capital will be used.

- Projects financed by green bonds must fall into certain categories, for example: renewable energy (solar and wind farms), energy efficiency, clean transport infrastructure, water resource management, waste management, etc.

2. Issue preparation and standards

- The issuer prepares the structure of the issue and defines the project categories. In order for an issue to be recognised as green, the bonds must comply with certain international standards, e.g. the Green Bond Principles or the Climate Bonds Initiative.

3. Verification and certification

- Verification is an important stage where an independent organisation verifies the feasibility, environmental relevance and compliance of selected projects with green finance standards.

- In some cases, green bonds may receive a certificate of compliance from an independent organisation, such as the Climate Bonds Standard, which confirms compliance with strict environmental criteria.

4. Market placement

- After all preparatory procedures are completed, the bonds are placed on the stock exchange. Like any other bonds, green bonds are placed with a certain yield and maturity date.

5. Utilisation of funds and control

1. Funds management. The issuer keeps separate records of funds raised from the placement of green bonds and regularly reports to investors on their use. Temporarily free cash (e.g. before it is spent on green projects) should be invested in liquidity management instruments and not used to finance projects that do not meet the criteria of green projects.

2. Reporting. The Issuer provides and annually updates information on the use of funds, including a list of projects to which green bond funds have been channelled, a brief description of the projects, an indication of the amount of funds channelled and the expected environmental and climate impact of the projects.

6. Reporting and monitoring

- Under the established rules, issuers are required to provide regular reports on the progress of project implementation and the environmental results achieved.

- Periodic monitoring and auditing may also be conducted to ensure that projects are meeting their stated objectives and criteria.

7. Redemption of bonds

- Like ordinary bonds, green bonds are redeemable at the end of the term. The issuer returns the principal to investors, as well as the payment of interest income accrued during the bond circulation period.

8. Post-project evaluation and reporting

- After the projects are completed, the issuer may provide a final report to assess their effectiveness and compliance with environmental standards. The report may contain information on the conduct and results of an independent external assessment of compliance of the issue (programme) of green bonds or the issuer's policy on the use of funds received from the placement of bonds with the principles and standards of financial instruments. The report may also contain assessments and forecasts regarding future events and actions, prospects of development of the industry in which the issuer conducts its core business and the issuer's performance, its plans, probability of certain events and actions. However, investors should not fully rely on the estimates and forecasts, as the actual results of the Issuer's operations in the future may differ from the forecasted results for many reasons.

Investor interest in green bonds is due to several factors at once, which are related to both financial and non-financial benefits (table 1):

Table 1. Financial and non-financial benefits that support investor interest in green bonds

Financial benefits	Non-financial benefits
<p>Strong demand and potential economic benefits:</p> <ul style="list-style-type: none"> • The green bond market is growing due to the rapid development of sustainable finance and support from governments and international organizations. • Due to growing interest, green bond rates are sometimes lower than traditional debt instruments from the same issuers, which can have a positive impact on long-term returns. 	<p>Social and environmental responsibility:</p> <ul style="list-style-type: none"> • More and more investors want to be involved in solving global environmental problems such as climate change, pollution and depletion of natural resources. Investing in green bonds allows them to actively support projects aimed at protecting the environment, thereby contributing to their own environmental and social responsibility (ESG) goals. • For many investors, environmental projects and related financial instruments have become an integral part of their corporate and individual strategies aimed at achieving sustainable development.
<p>Risk reduction:</p> <ul style="list-style-type: none"> • Investing in projects with a low carbon footprint and sustainable characteristics reduces long-term risks for investors. For example, projects aimed at reducing dependence on fossil fuels or improving the environment are less exposed to risks associated with regulatory changes and environmental disasters. 	<p>Reputational and image benefits:</p> <ul style="list-style-type: none"> • By investing in green bonds, investors confirm their commitment to the principles of sustainable development, which strengthens their reputation as socially responsible market participants. • Support for environmental initiatives attracts new clients and partners focused on ESG values, which increases the competitiveness of companies and funds in the market.
<p>Access to a new investment segment and portfolio diversification:</p> <ul style="list-style-type: none"> • The green bond market opens up a new asset class that investors can diversify their portfolios by investing in projects with a positive impact on society and the environment. • High demand and positive growth forecasts make green bonds financially attractive, but also relatively stable assets in the long term. 	<p>The desire to comply with regulatory requirements and standards:</p> <ul style="list-style-type: none"> • Regulators in various countries increasingly require investors to disclose information on the environmental impact of their assets. Green bonds help to comply with such requirements by reporting on environmental standards and achieved results. • In Europe, for example, the European Taxonomy is in force, which requires companies and investors to be transparent about the environmental aspects of their activities, and green bonds fit this requirement perfectly.
<p>Possibility of obtaining a "green premium" (greenium):</p> <ul style="list-style-type: none"> • Green bonds have a so-called "green premium" or "greenium" when demand for them is so high that they can trade at a lower yield than conventional bonds. This "premium" is a financial incentive for investors, who can earn 	

income with lower risks and additional environmental benefits.	
Progressive financial strategies and innovations: <ul style="list-style-type: none"> • Many investors also see green bonds as an opportunity to participate in the creation of a new economy with a higher level of sustainability and social responsibility. 	

These factors make green bonds attractive to both traditional and innovative investors who are looking for not only a financial but also a socially relevant return on investment. It is also worth noting that the green bond market is showing impressive growth and attracting more and more investors and issuers [10,11,12,13] (table 2).

Table 2. Key trends in the green bond market

Volume of green bond issued	<ul style="list-style-type: none"> • At the end of 2023, the cumulative size of the global green bond market exceeded \$2 trillion, indicating a rapid increase in the popularity of this financial instrument. • In 2022, the total green bond offering was around \$500 billion, and this is expected to grow by 20-30 per cent annually given the intensifying environmental agenda.
Leaders in green bond issuance	<ul style="list-style-type: none"> • The largest volumes of green bonds are issued in Europe, which leads in this segment thanks to the support of the European Union. In 2023, the European Union issued more than \$300 billion worth of green bonds. • The US also holds a significant share of the green bond market, having issued around \$90-100 billion in recent years. • In Asia, China and Japan are actively developing this market, with Chinese green bonds exceeding \$75 billion in 2022.
Main categories of projects	<ul style="list-style-type: none"> • Most of the funds raised through green bonds are used for renewable energy projects (about 40 per cent of the total). These funds are used to finance the construction of solar, wind and hydro power plants. • Energy efficiency projects take up about 30 per cent of the funds, going towards improving the environmental performance of buildings and infrastructure. • About 10-15% of the funds are allocated to the design and development of clean transport, including electric transport and public transport systems.
Yield and demand	<ul style="list-style-type: none"> • The average yield of green bonds is usually slightly lower than that of conventional bonds due to the "green premium" (greenium) as there is a higher demand for them. Yields can range from 2 to 5 per cent depending on region, type of issuer and maturity. • The share of institutional investors such as pension funds, banks and insurance companies among buyers of green

	bonds reaches 70-80 per cent. Private investors are also increasing their share of portfolios with green bonds, especially in Europe and the US.
Regional structure	<ul style="list-style-type: none"> • Europe leads the global green bond market with a share of around 45-50 per cent, boosted by measures taken under the European Green Deal and the Sustainable Finance Taxonomy. • The US ranks second with a share of about 20-25 per cent. • Asia (in particular China and Japan) is rapidly increasing volumes, its share is around 15-20% and continues to grow due to government support for sustainable projects.
Average maturity and structure of issues	<ul style="list-style-type: none"> • The average maturity of green bonds is 7-10 years, which makes them attractive to long-term investors. Some issues, especially government issues, have maturities of up to 20 and even 30 years. • More than 60 per cent of all green bonds issued are government or semi-government, which increases their reliability and interest from conservative investors.
Predictions for the future	<ul style="list-style-type: none"> • Total green bonds are expected to reach \$5 trillion by 2027 at current growth rates. The market could grow to \$10 trillion by 2030 if ESG and sustainable finance continue to receive widespread support. • It is predicted that the share of green bonds among all debt instruments issued will grow and by 2030 will account for about 20 per cent of the bond market in Europe and 10-15 per cent globally.

4 Conclusion

According to the above table, the green bond market demonstrates the growing importance of green bonds in global capital markets, showing how they facilitate the financing of environmentally significant projects and respond to the needs of investors seeking to support sustainable development [14,15]. The green bond market is on an upward trend, in part due to the European Union's commitment to achieve carbon neutrality by 2050. And the market is growing both geographically and sectorally. However, a common problem for all countries is the lack of a regulatory framework with clear requirements for the use of green finance instruments.

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