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GREEN BONDS AS AN INSTRUMENT OF SUSTAINABLE FINANCING – RATIONALE AND PROSPECTS FOR DEVELOPMENT

| Abstract

- ▶ *Goal* – Showing the specifics, rationale and prospects for the development of green bonds. This is currently an important issue that arises from the implementation of the climate policy goals set out in the Paris Agreement. Ensuring the financing of investments necessary to achieve climate goals requires the use of sustainable financial instruments, such as debt securities, especially green bonds.
- ▶ *Research methodology* – The article uses research methods such as literature studies on the subject, as well as content analysis of reports and statistics on sustainable financing issues.
- ▶ *Score/results* – The conducted research indicates that green bonds are becoming an increasingly popular form of debt financing for sustainable development projects. Funds raised from their issuance are used for renewable energy, energy efficiency, zero-emission transportation, or “green” buildings. They help transform countries’ economies toward climate neutrality and resource efficiency. Forecasts indicate that demand for these financial instruments will continue to grow as investors seek to align their portfolios with sustainability goals.
- ▶ *Originality/value* – The article has cognitive value regarding the rationale and prospects for the development of green bonds, which are the main instrument of debt financing for sustainable development.

| **Keywords:** sustainable financing, green bonds, financing instrument.

1. Introduction

Sustainable development and ESG (Environmental, Social, and Governance) considerations are increasingly influencing business operations, shaping new economies and markets. Climate policy, which remains highly dependent on fossil fuels (energy, heating, transport) remains a significant challenge for Poland and for the entire Eastern Europe region.

Estimates suggest that Europe will require an additional €350 billion annually by 2030 for energy systems alone and another €130 billion for other environmental goals [Zielone finanse w Polsce, 2021: 7]. Therefore, the proper selection of investments and the allocation of funds to relevant projects and technologies is crucial. Environmental regulations must be gradually complemented by frameworks for sustainable finance that direct funding towards projects reducing climate change and environmental risks. This implies both seeking new funding sources and adapting financial systems to the demands of sustainable development.

The concept of sustainable finance refers to the consideration of ESG issues, i.e. environmental, social and governance, when making decisions by financial institutions – banks, investment and pension funds, insurance companies. The value of global sustainable assets reached nearly \$40 trillion by the end of 2021, and it is projected to grow to approximately \$53 trillion by the end of 2025, representing one-third of all global financial assets [Zielone finanse w Polsce, 2021: 40]. The sustainable assets market includes various instruments, such as green bonds, social bonds, sustainability bonds, green loans, and investment funds¹.

The essence of sustainable finance reflects a gradual yet irreversible transformation of financial markets, aiming to facilitate climate transition through their significant impact on the overall economy. Green bonds are a key instrument dedicated to environmental protection. The green bond market is rapidly expanding, providing funding for energy transitions, socially impactful investments, green economic transformations, and climate change mitigation projects. Additionally, green bonds present an attractive investment alternative for increasingly sustainability-conscious investors [Daszyńska-Żygadło, Marszałek, Piontek, Zumente, 2023: 7–25].

The aim of this article is to evaluate green bonds as a sustainable financing instrument, with particular emphasis on the premises and development prospects of this form of funding green investments.

¹ Passive forms of investment are growing particularly rapidly in Exchange-Traded Fund.

2. Green bonds – essence and premises for development

The increasing awareness of the harmful effects of climate change has spurred calls for a profound transformation in how society uses natural resources [Ripple, Wolf, Newsome, Barnard, Moomaw, 2020: 8–12]. This aligns with the concept of sustainable development, although implementing its principles is a complex issue. It involves integrating environmental goals with the financial resources necessary to achieve them. In this context, sustainable finance gains importance, referring to any form of financial service that combines environmental, social, and governance criteria in business or investment decisions, providing enduring benefits to both clients and society [Schoenmake, Schramade, 2019: 4].

Sustainable finance embodies a comprehensive approach that merges various strategies aimed at improving the social, economic, and environmental dimensions of the financial system. A significant influence on the development of sustainable finance has been the Paris Agreement², which seeks to align global financial flows with climate objectives. The climate crisis has been recognized as one of the most significant risks, not only for individual entities but also for the stability of the financial system as a whole [Zielone finanse w Polsce, 2021: 39].

According to the Paris Agreement, the primary goal of sustainable finance is achieving climate neutrality in the global economy rather than merely in individual asset portfolios. This necessitates adopting an investment strategy focused on attaining specific objectives within portfolio companies. This applies particularly to entities the business activities of which have the most detrimental impact on climate and the environment [Komunikat Komisji z dnia 6 lipca, 2021]. The treaty underscores the critical role of financial markets in fostering a low-carbon economy by providing tools that allocate capital to environmentally friendly projects. Green bonds, as fixed-income financial instruments designed to finance green projects, play a pivotal role in this process.

The response to this agreement has included initiatives such as the Task-Force for Climate-Related Financial Disclosure (TCFD) under the Financial Stability Board, and the European Action Plan on Financing Sustainable Growth.

² It was adopted at COP21 in Paris on 12 December 2015 and entered into force on 4 November 2016. The aim of the agreement is to limit the average increase in the Earth's temperature to well below 2 degrees Celsius between 1750 and 2100 and to strive to limit this increase to 1.5 degrees C. The agreement also aims to achieve carbon neutrality by 2050. Almost 190 countries have joined the Paris Agreement, including the European Union and its Member States.

Since 2018, the European Union³ has been developing comprehensive policies for sustainable finance, aspiring to be a global leader in implementing ESG standards. This entails initiating, scaling up, and directing investments into sustainable technologies and enterprises to promote long-term sustainable economic growth.

One example is the Strategy for Financing the Transition to a Sustainable Economy, announced in July 2021. This strategy outlined new initiatives aimed at finalizing and consolidating the foundation of sustainable finance to address the vast investment needs associated with transitioning to a sustainable economy, ensuring a just transformation, combating climate change, and addressing other environmental challenges. It focuses on four key areas requiring additional efforts to fully support economic transformation towards a sustainable model: transition financing, inclusiveness, resilience and contribution of the financial system, and global ambitions [www1].

The strategy also proposed an EU Green Bond Standard and previously unexplored areas such as green budgeting, which aims to highlight sustainable public expenditures [*Zielone finanse w Polsce*, 2021: 40]. Two years later, the EU Council adopted a regulation⁴ establishing a standard for European green bonds⁵. This regulation provides unified requirements under which issuers of environmentally sustainable bonds can use the “European Green Bond” or “EuGB” label [Wang, Zhi, 2016: 311]. This standard will help to ensure consistency and comparability in the green bond market, reducing the risk of greenwashing, which will benefit both issuers and investors. This is particularly important since green bonds are one of the primary instruments for financing investments in green technologies (e.g., renewable energy), energy efficiency, and sustainable transport infrastructure (e.g., zero-emission transport) and research.

Unlike other green bond standards, this regulation requires that funds raised exclusively finance green projects that align with the criteria outlined in the EU Taxonomy [Grabowski, Kotecki, 2020: 17]. The regulation will come into effect

³ In 2018, the EU published an action plan on financing sustainable growth in its Communication of 8 March 2018. The plan consisted of 10 actions.

⁴ The regulation of standards by the EU by a regulation rather than a directive means that member states do not have to create their own regulations in this regard, and the applicable green bond regulations will be the same in each member state.

⁵ Regulation (EU) 2023/299 of the European Parliament and of the Council of 22 November 2023 on European green bonds and optional disclosure of information on bonds marketed as environmentally sustainable and sustainability-linked bonds (OJ 2023/2631 of the European Union).

on December 21, 2024, potentially driving market growth for these instruments. European green bonds will be issued under the first-ever detailed legal regulations specifying the purpose of issuance, uniform quality requirements for issuers, and supervisory procedures related to these issuers.

Green bonds are a leading instrument among sustainable debt securities, used to finance or refinance a mix of green and social projects. The classification of these bonds is presented in Table 1.

Table 1. Types of sustainable bonds

Type	Characteristics
Green Bond	Used exclusively for the full or partial financing or refinancing of new and/or existing projects that are classified as green projects.
Social Bond	Used exclusively for financing projects addressing social challenges. Investments with clear social benefits.
Sustainability Bond	Used to finance projects that intentionally combine green projects and social projects.
Sustainability-linked Bonds (SLB)	Financing is conditional upon the issuer achieving specified environmental indicators (e.g., a particular reduction in greenhouse gas emissions by a given date).

Source: [www 2](#).

Green bonds are debt securities, the proceeds of which are exclusively used to finance green projects – primarily those contributing to the development of a climate-resilient economy [Flaherty et al., 2017: 470]. They are fixed-income securities designed to finance projects with clear environmental benefits [Dörny, Schulz, 2018: 718]. These are fixed-income instruments issued to raise capital for infrastructure projects contributing to a low-carbon economy [Kaminker and Stewart, 2012: 35].

Analysing the presented definitions, green bonds are fixed-income debt securities intended for financing or refinancing investments, projects, expenditures, or assets addressing climate and environmental issues. They represent an innovative financial instrument aimed at funding pro-environmental activities. They provide investors with the opportunity to integrate sustainable development strategies and ensure that their investments are directed toward preventing worsening climate change impacts.

Funds obtained from green bonds are allocated to projects with objectives such as mitigating climate change, adapting to climate change, protecting natural resources, preserving biodiversity, and preventing and controlling pollution. Green bonds particularly focus on energy efficiency, renewable energy, pollution prevention and control, clean transportation, and green building projects.

A broad spectrum of entities can issue green bonds, including both public and private institutions:

1. International financial institutions such as the World Bank Group.
2. Commercial enterprises (non-financial), e.g., from the energy and construction sectors.
3. Financial institutions: banks, investment funds, and insurance companies.
4. Local government units.
5. States.

The first green bonds, known as Climate Awareness Bonds, were issued by the European Investment Bank in 2007. A year later, the World Bank issued similar bonds, taking on the role of an international issuer and advancing sustainable development goals [Trompeter, 2017: 5]. These issuances initiated a new segment of debt securities. In 2013, the first corporate green bonds were issued.

Green bonds, like any financial instrument, have their benefits and barriers to issuance. The primary benefit is obtaining debt capital to fund sustainable projects. Bonds enable combining economic profits with environmental protection goals [Wang, Zhi, 2016: 311]. Issuing green bonds positively impacts a company's stock value while improving its environmental performance [Baulkaran, 2019: 331–340; Glavas, 2020: 7–51; Tang, Zhang, 2020].

Issuing green bonds also signals to the market the enterprise's commitment to sustainable development and transformation through green investments. By issuing these bonds, a company sends a clear message that its operations are environmentally friendly [Flammer, 2021]. This often results in positive investor reactions on financial markets. Another cited benefit could regard potentially lower issuance costs. Factors influencing lower issuance costs for green bonds include growing investor demand for such securities. Besides lower debt costs, Zhang et al. [2021] highlight that green bond issuers experience lower capital costs due to reduced information asymmetry between investors and issuers, improved security liquidity, and lower perceived risk for bond issuers.

Green bonds also provide benefits from the investor's perspective. Green bonds cater to a clientele that values climate-friendly investments [Flammer,

2021]. These financial instruments enable green investment opportunities for companies that are not publicly traded and are typically inaccessible to retail investors [Derwall and Koedijk, 2009: 210–229]. They serve the preferences of more conservative and risk-averse investors wishing to engage in sustainable projects without assuming equity investment risks [Leite and Cortez, 2018].

However, green bonds are not devoid of challenges, such as their relatively low liquidity in secondary markets [Wulandari, Schäfer, Andreas, Sun, 2018] and the imbalance between investor demand and issuer supply. The lower liquidity of green bonds compared to conventional instruments stems from the secondary market's size and larger bid-ask spreads [McMorrow, Sahakyan, Zulaica, 2019]. Additionally, issuing green bonds entails significant obligations, such as reporting duties, detailed monitoring of investments for compliance with green financing requirements, and obtaining evaluations from independent experts.

3. Green bonds in the sustainable debt market

Green bonds are an innovative financial instrument designed to fund pro-environmental activities. They provide investors with the opportunity to engage in sustainable development strategies and ensure that their investments are directed toward goals that prevent worsening climate change impacts. Green bonds represent a significant portion of the sustainable bond market (Table 2).

Table 2. Sustainable bond market, 2020–2024

Type	2020		2021		2022		2023		2024	
	mld USD	%	mld USD	%	mld USD	%	mld USD	%	mld USD	%
All sustainable	519	100.00	1026.2	100.00	799.2	100.00	841.5	100.00	742.8	100.00
Green bond	228.1	43.91	549.3	53.53	462.1	57.82	496.2	58.97	424.7	57.18
Social bond	141.3	27.21	194.7	18.97	119.7	14.98	129.4	15.38	116.3	15.66
Sustainability bond	141.5	27.24	184.9	18.02	146.9	18.39	157.5	18.72	173.8	23.4
Sustainability – linked bond	8.5	1.64	97.3	9.48	70.4	8.81	58.3	6.93	27.9	3.76

Source: www.3.

During the analysed period, the sustainable bond market grew at varying rates. The highest growth was observed in 2021, with the market reaching \$1,022.8 billion – a nearly twofold increase compared to the previous year. Individual segments of the sustainable bond market developed at different paces. Despite significant growth, Sustainability-Linked Bonds (SLB) represented the smallest share. Unlike other bonds, SLBs do not finance specific “green” projects but involve the issuer’s commitment to improving their overall environmental or climate profile, such as reducing greenhouse gas emissions or increasing the share of low-emission energy in their energy use [Stefaniak, Kubiczek and Padiasek, 2023: 12].

Green bonds dominate the sustainable bond market, accounting for over 57% of the total market. Their popularity results from growing investor interest in socially responsible initiatives. Additionally, green bonds often offer various incentives (e.g., tax exemptions or tax breaks) to attract investors to finance projects benefiting the environment and climate.

Europe is the largest market for green bond issuance (Table 3).

Table 3. Green bond market by regions, 2020–2024

Markets	2020		2021		2022		2023		2024	
	mld USD	%	mld USD	%	mld USD	%	mld USD	%	mld USD	%
Africa	1.1	0.48	2.9	0.53	4.3	0.93	0.7	0.13	0.4	0.11
Asia	17.9	7.86	55.4	10.08	62.5	13.51	86.5	17.4	75.4	17.8
Europa	151.5	66.35	374.9	68.26	275.9	59.72	259.1	52.21	248.3	58.46
North America	38.3	16.81	67.4	12.27	49.8	10.78	50.6	10.19	45.7	10.77
Oceania	4.3	1.87	6.1	1.11	9.7	2.1	7.1	1.42	13.6	3.21

Source: [www 3](#).

The volume of green bonds is primarily driven by the European market, which accounted for over 58% of global issuance in 2024, despite a decline that year. In 2021, this share exceeded 68%. Next in the ranking is Asia, whose share of green bond issuance surpassed 17% in 2024. Africa and Oceania have the smallest shares.

In Europe, the volume of green bond issuance grew continuously until 2022, when rising inflation and accompanying increases in interest rates slowed the market's development. Leaders in green bond issuance include entities registered in France, Germany, the Netherlands, and Sweden, which accounted for over 70% of the total volume of all green issuance. Additionally, ten Western and Northern European countries, which recorded the highest green issuance volumes, account for approximately 90% of the total volume issued [*Perspektywy rozwoju...*, 24]. According to the latest Climate Bond Initiative data, Romania, Austria, and Hungary have joined this group in Europe. Green bonds most frequently financed projects related to the production and transmission of energy from renewable sources, as well as construction and transportation.

In Poland, the green bond market is still in its infancy. In 2016, Poland became the first country in the world to issue sovereign green bonds, raising €750 million to fund budgetary expenditures on projects such as sustainable agriculture, clean transportation, and renewable energy sources. Since then, four such issuances have occurred, and other countries have drawn upon Poland's experiences [Nowak, Zima, and Lipiec, 2020]. The issuance of sovereign green debt provided an impetus for market development in the municipal and corporate segments [Robins and Szwarc, 2020]. The first Polish city to issue such bonds was Grudziądz. This issuance financed expenditures related to stormwater and water-sewage infrastructure, with a total value of PLN 63.2 million [aleBank.pl, 2020]. The first issuance among Polish enterprises occurred in 2019. Since then, the commercial green bond market has begun to grow in value (Table 4).

Table 4. Examples of commercial green bond issuances in Poland, 2019–2024

Issuer (Year)	Issuance Value	Purpose
PKO BP (2019)	500 mln. PLN	Financing mortgage loans for residential properties meeting energy efficiency criteria
ING BH (2019)	400 mln. PLN	Financing or refinancing properties within the top 15% most energy-efficient buildings in Poland
Cyfrowy Polsat (2020)	1 mld. PLN	Financing of the modernisation and upgrading of Cyfrowy Polsat's telecommunications infrastructure (replacement of energy-intensive solutions of 2G and 3G technologies with 4G LTE technology and reconstruction and replacement of obsolete elements of the fixed-line infrastructure)

Issuer (Year)	Issuance Value	Purpose
New Energy Investments (2020)	75 mln. PLN	Financing the construction of photovoltaic farms with a total capacity of over 30 MW.
PKN Orlen (2021)	3 mln. EURO	Financing or refinancing of new or existing renewable energy, clean transport or pollution prevention projects
FAMUR (2021)	400 mln. PLN	Financing the infrastructure for renewable energy and for energy efficiency.
Bank Ochrony Środowiska (2023)	100 mln PLN	Financing or refinancing sustainable investments of the bank's clients.
Polenergia (2024)	750 mln. PLN	Financing the construction of offshore wind farms in the Baltic Sea
MLP Group (2024)	300 mln. EURO	Funding and refinancing of specific assets and expenditure that meet the criteria set out in the Green Financing Framework policy prepared and published by the Company.

Source: the author's own elaboration

The provided examples do not exhaust the full list of green bond issuers. However, they illustrate the scale and purpose of these issuances. As a response to market needs, the Strategy for the Development of the Capital Market (SDCM) was adopted in 2019. It also includes the area of sustainable finance, aligning with strategic global and European initiatives for sustainable development.

In this context, the goal of the SDCM is not only to effectively support the financing of the economic transition towards zero emissions by the private sector but also to leverage new trends to develop and build competitive advantages for the Polish capital market.

In 2023, the Warsaw Stock Exchange (GPW) decided to create a segment dedicated to sustainable bonds on the Catalyst market, named the Warsaw Sustainable Segment. This segment was designed as a dedicated section where companies and local government units can present their sustainable initiatives. This solution makes sustainable bond issuances more visible to investors. This is significant, as the development of the green bond market is crucial for decarbonizing Poland's economy. Currently, this segment includes 20 issuers offering debt securities denominated in both Polish złoty and euros [Zielone finanse w Polsce, 2024: 117]

4. Conclusions

The concept of sustainable development is a multidimensional issue, the integration of which into the financial system requires identifying financial instruments that support this development. Currently, the most popular form of debt financing for sustainable development projects worldwide, especially in Europe, is green bonds. The proceeds from their issuance are allocated to renewable energy, energy efficiency, zero-emission transport, and “green” buildings. They contribute to the transformation of national economies towards climate neutrality and efficient resource management.

The green bond market has experienced significant growth in recent years, reflecting the potential role these instruments can play in financing low-carbon projects and facilitating the transition to a more sustainable economy. Although the market has slowed over the past two years, forecasts indicate that this trend may reverse. This is supported by current market needs and an increasingly favourable regulatory environment.

The popularity of green bonds is driven by the awareness of both issuers and investors regarding the necessity of preventing the adverse effects of climate change. Therefore, it is essential to undertake initiatives related to sustainable finance, including fostering market dialogue through working groups, education, and promoting financial solutions that support environmental and social goals. Universities, business schools, and professional organizations are offering programs and certifications in sustainable finance.

The Warsaw Stock Exchange continues to expand opportunities to support the development of the sustainable debt market in Poland by organising workshops and conferences aimed at enhancing knowledge, skills, and attitudes among both issuers and investors.

Undoubtedly, regulatory measures set to come into effect in December 2024, which standardise EU green bonds, will influence the development of the green bond market. These measures will increase credibility among investors, who expect that funds raised by issuers will genuinely be used to finance sustainable activities, thereby reducing the risk of so-called greenwashing.

A key recommendation to stimulate the development of the green bond market would be to introduce fiscal incentives. These could subsidise the costs of financing green investments for both issuers and investors. For issuers, this could involve the ability to deduct qualified costs associated with issuing green bonds (e.g., certification, consulting, training, or monitoring systems). For investors, this

could mean reduced tax burdens (e.g., exempting interest income from taxation). Currently, EU countries do not offer tax incentives or grant systems for green bond issuers. The only country to implement tax relief, albeit not for green bonds, is Portugal, which introduced tax benefits in 2018 for investments in social impact bonds [KPMG, 2021: 71]. Outside the EU, countries such as the United States, Brazil, Malaysia, and others provide various incentives, including tax breaks for investors and grant programs to reduce the costs associated with preparing and issuing green bonds⁶.

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