

ISSN: 2543-6821 (online)

Journal homepage: <http://ceej.wne.uw.edu.pl>

Bartosz Sobik

Green bonds - financial innovation for sustainability financing: The case of the Polish green bonds market and their development barriers

To cite this article

Sobik, B. (2023). Green bonds - financial innovation for sustainability financing: The case of the Polish green bonds market and their development barriers . Central European Economic Journal, 10(57), 287-303.

DOI: 10.2478/ceej-2023-0017

 To link to this article: <https://doi.org/10.2478/ceej-2023-0017>



Bartosz Sobik 

SGH Warsaw School of Economics, al. Niepodległości 162, 02-554 Warsaw, Poland
corresponding author: bartosz.sobik@doktorant.sgh.waw.pl

Green bonds - financial innovation for sustainability financing: The case of the Polish green bonds market and their development barriers

Abstract

The struggle against climate change and the increasing implementation of sustainability and environmental, social and governance (ESG) standards have contributed to the dynamic development of green finance. Green bonds have become one of the key tools of green finance. The aim of this paper is to provide a comprehensive study related to the development and barriers of the green bonds market in Poland. A literature review, comparative analysis, and financial data were used in this research. The publication uses data from the Climate Bonds Initiative and includes global data on the development of the green bond market. The research was also enhanced by data from the Polish Ministry of Finance. Green bonds are an increasingly popular financing tool for renewable energy, zero-emission transport, or green buildings. The biggest advantages of green bonds are compliance with ESG standards, hedging of climate risk, and reputational benefits. Disadvantages include significant transaction costs, lack of uniform standardisation, or the risk of greenwashing – particularly when issuing sustainability-linked bonds. The development of green bonds in Poland faces barriers related to the lack of green projects. The development of municipal green bonds in Poland is clearly hampered by high transaction costs and the lack of clear economic benefits for issuers. Green bonds are not an instrument to finance all environmental investments, hence their implementation is limited; however, they are playing an increasingly important role in the transition towards sustainability.

Keywords

green bonds | green finance | sustainability | ESG | climate finance

JEL Codes

O13, Q40, Q56

1. Introduction

Financial challenges related to the mitigation and adaptation to the climate change play a significant role in the strategy towards a sustainable world. Climate instability, natural disasters and climate risk affect the whole economy, and therefore taking appropriate action is a necessary (Więckowska, 2013, p. 455). Climate issues among financial sector are currently one of the crucial challenges. Financial innovations play a key role in the process of mitigating climate risk and adaptation to climate changes. Contemporary financial instruments, for instance, green bonds, create the possibility to set new standards in sustainable finance. Energy transition, environmental, social and governance (ESG) objectives, and investment in renewable energy sources (RES) require new approaches in finance. As a result, we can assume

green finance is a combination of finance and business activities guided by care for the environment (Wang & Zhi, 2016, p. 311). Green finance creates possibilities for many participants, among others capital lenders, investors, government, energy companies or business entities in terms of financing environmental friendly activities.

Green bonds are considered to be one of the most prominent financial innovations in the recent years (Maltais & Nykvist, 2021, p. 1). As a crucial part of green finance, green bonds play a significant role in financing, among other things, renewable energy, recycling, and green infrastructure (Gilchrist, Yu & Zhong, 2021, p. 478). Globally, the number of green bonds issued has risen explosively (Wang & Zhi, 2016, p. 314). They are an effective and efficient instrument in financing green investments, in line with sustainability and ESG objectives. Green bonds have a similar structure to

conventional bonds with the exception of restricting the use of funds from the green bonds. They have a clause which indicates the aims of financing only those costs related to green projects or assets.

Green bonds are a crucial element for financing energy transition. The case of Polish energy transition is especially important because of the energy sector's dependence on coal and the need for large-scale decarbonisation and transformation of the electricity generation sector. Polish energy transition requires high capital expenditures on new energy facilities, particularly those related to RES. Articles discussing the use of green bonds in Poland are plentiful. As Gemra (2021) emphasized, Poland has made a significant contribution to the development of the green bonds market as a result of issuing the world's first sovereign green bonds in December 2016 (Gemra, 2021, p. 32). That this issue was an important development in the history of the global financial market (Mosionek-Schweda & Szmelter, 2018, p. 216). Gemra pointed out that meeting ESG standards tends to be increasingly common in business activity and not being in compliance with sustainability goals could pose a financial risk to the company (Gemra, 2021, p. 37). Several authors have emphasized the advantages of implementing green bonds in Poland (Laskowska, 2019; Mosionek-Schweda & Szmelter, 2018; Więckowska, 2013; Witek, 2021). Nevertheless, some of them pointed out the difficulties related to the underdevelopment of the corporate bond market in Poland (Lipowicz, 2020, pp. 127–128) and the impossibility of financing all RES projects using green bonds, especially those in early phases of development (Więckowska, 2013, p. 460). Nevertheless, among the above-listed articles, there is a research gap related to conditions influencing the development of the Polish green bonds market. Most of those articles are focused on the perspectives for the use of green bonds, the demand for them from various stakeholders, and their advantages.

The aim of this paper is to provide a comprehensive study related to the development and barriers to the green bonds market in Poland. The selection of Poland is not coincidental; it is a country facing the need for a profound decarbonisation of the economy and a comprehensive energy transition. The data that has been used in this research was mostly taken from the Climate Bonds Initiative for the period from 2014 to 2020 (for some of them it was possible to get data from 2021). The data used includes green bonds (municipal, sovereign, corporate) connected to the global market

as well as to the European Union and Poland. The article also discusses the subject of uncertified sustainability-linked bonds, using the bond market in Poland as an example, in order to demonstrate the risk of 'greenwashing'. As of publication of this article, the data from 2022 has not yet been made available.

2. Green Finance

The challenges posed by climate change have resulted in the need to change the approach to environmental protection and have intensified efforts to reduce human pressure and negative impact on the climate and the environment. The concept of sustainability has been spread significantly across the world. The implementation of sustainable development principles has led to the need to revise the approach to financing sustainable investments and to develop new, effective solutions to support pro-environmental initiatives. The response of the financial sector to new trends related to the implementation of sustainable development principles was the creation of the sustainable finance system. The concept of a sustainable finance system assumes the enabling of financing for projects connected with activities for the benefit of climate and environmental protection as well as development of pro-ecological energy sources. Therefore, the sustainable finance system may include new financial innovations (Figure 1).

The above-mentioned concepts are similar, and there are currently no coherent and precise definitions of them in the literature. A sustainable financial system supports sustainable development

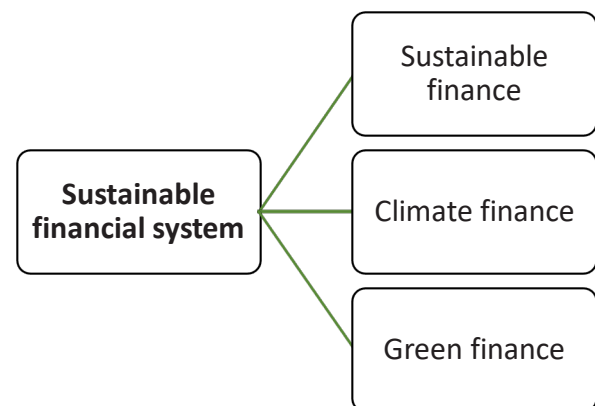


Figure 1. The concept of a sustainable finance system
Source: Author's own study based on (Ryszawska, 2016, p. 188)

Table 1. Framework of sustainable finance factors depends on the time horizon

Time horizon	Ranking of factors	Value created
Short term	Financial value > Social impact and Environmental impact	Shareholder value
Medium term	Total value = Financial value + Social value + Environmental value	Stakeholder value
Long term	Social impact and Environmental impact > Financial value	Common good value

Source: Author's own elaboration based on Schoenmaker, 2017, p. 9

across the various sectors of the economy; thus, it interacts with economic, social, and environmental issues (Schoenmaker, 2017, p. 8). The complexity and correlation between these interactions depends on the time horizon and the targeted value created, as is presented in Table 1.

The first phase of sustainable finance, in the short term, is focused on shareholder value. Financial value plays a significant role compared to the social and environmental impact. In the medium term, the key area of interest is stakeholder value. Therefore, the aim is to maximise the total value of the investment. In the long term, common good value is the most important value created from the investment. Therefore, as the investment approaches its time horizon, more emphasis should be placed on its social and environmental impact, rather than on the financial value.

Green finance is also not a precisely defined term for two reasons: a large part of the literature does not attempt to define the concept at all, while the already proposed definitions clearly differ from each other, causing a general blurring of the concept (Lindenberg, 2014, p. 1). From another perspective, according to (Berrou et al., 2019, pp. 31–32), the attempt to define green finance is associated with two distinct challenges: First, it is necessary to identify the sectors and investments that can be financed through green finance instruments. Secondly, it is necessary to standardise the processes to recognise an investment as green and thus financeable through green finance (Berrou et al., 2019, pp. 31–32). Table 2 (next page) presents selected definitions of green finance from the literature.

A precise definition of green finance is not possible, however, as there is no uniform taxonomy or standard by which investments are classified as compatible with green finance and sustainable development. Definitions also vary between different economic sectors and geographical areas. The heterogeneity of these elements results in the heterogeneity of

definitions proposed by different authors in the literature.

The breadth of the concept of green finance predestines it as a financial tool for wide application in order to implement the principles of sustainable development and environmental and climate protection. Green finance focuses on three main areas (Lindenberg, 2014, p. 3):

- Financing of public green policies related to sustainable development
- Green financial system, for example, green bonds
- Financing of green investments that meet specified environmental standards

In turn, the International Development Finance Club report identifies the following as the most important areas for applying green finance (International Development Finance Club, 2012, p. 12):

- Climate change mitigation
- Climate change adaptation
- Other environmental issues

The objectives of investments financed by a range of green finance tools should be carefully selected so they are compatible with environmental, social, and ethical objectives. Figure 2 (next page) shows the most important investment directions that are financed with green finance. Two main areas can be distinguished: energy sources and efficiency and climate change mitigation and adaptation (left side) and environmental aspects (right side) and support to circular economy.

The application of green finance is therefore wide-ranging and also refers to the financing of investments in renewable energy sources, energy efficiency, but is also directed towards supporting the circular economy. Green finance offers a wide range of financial tools, among which we can distinguish (Wang & Zhi, 2016, pp. 312–313):

- Green bonds
- Environmental funds
- Weather derivatives
- Nature-linked securities
- Green investment funds
- Ecological options

The rest of this article will deal exclusively with green bonds.

3. Literature review—green bonds

Green bonds can be classified as one of the most significant financial innovations in recent years (Maltais & Nykvist, 2021, p. 1). Green bonds are structurally identical to traditional bonds. The distinction lies in the objective of the funds raised using this method, the purpose of which is closely linked to the pursuit of environmental, climate, and

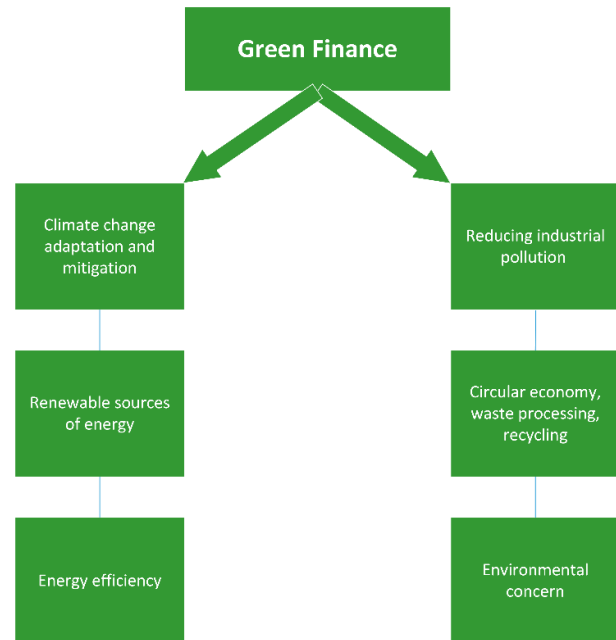


Figure 2. Major directions in the field of green finance
Source: Author's own study based on Lindenberg, 2014

Table 2. Various definitions of green finance

Definition	Author
'Green finance refers to financial investments flowing into sustainable development projects and initiatives, environmental products, and policies that encourage the development of a more sustainable economy. Green finance includes climate finance but is not limited to it. It also refers to a wider range of other environmental objectives, for example, industrial pollution control, water sanitation, or biodiversity protection'.	International Development Finance Club, 2012
'Green finance represents a wider lens than green investment. It includes capital cost and, unlike green investment, includes operational costs such as project preparation and land acquisition costs'.	Zadek, Flynn, 2013
'For the banking sector, green finance is defined as financial products and services, under the consideration of environmental factors throughout the lending decision-making, ex-post monitoring, and risk management processes, provided to promote environmentally responsible investments and stimulate low-carbon technologies, projects, industries, and businesses'.	PricewaterhouseCoopers Consultants (PWC), 2013
'Green finance is finance for achieving economic growth while reducing pollution and greenhouse gas emissions, minimising waste and improving efficiency in the use of natural resources'.	Organisation for Economic Co-operation and Development (OECD)
'Green finance comprises the financing of public and private green investments (including preparatory and capital costs)..., the financing of public policies (including operational costs) that encourage the implementation of environmental and environmental-damage mitigation or adaptation projects and initiatives..., and components of the financial system that deal specifically with green investments...'	Lindenberg, 2014
Green finance is a set of financial instruments used to finance environmentally friendly investments. These investments must meet certain environmental standards and must not have negative environmental and social effects. The aim of projects financed through green finance is to develop a low-carbon economy, adapt and mitigate climate change, implement sustainable development, and establish a circular economy.	Sobik

Table 3. Various definitions of green bonds

Definition	Author
'Fixed-income debt securities issued (by governments, multi-national banks or corporations) in order to raise the necessary capital for a project which contributes to a low carbon, climate resilient economy'.	Della Croce et al., 2011
'A debt security that is issued to raise capital specifically to support climate-related environmental projects'.	The World Bank, 2015
'Green bonds are fixed income securities issued by capital raising entities to fund their environmentally friendly projects, such as renewable energy, sustainable water management, pollution prevention, climate change adaptation and so on'.	Tang & Zhang, 2020
'Green bonds are debt instruments (i.e., 'bonds'), whose proceeds are committed to the financing of low-carbon, climate-friendly projects (i.e., 'green'). Issuers of green bonds include corporations, municipalities, government entities, and supranational institutions'.	Flammer, 2020
'Green bonds are any type of bond instrument where the proceeds or an equivalent amount will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects (see Use of Proceeds section below) and which are aligned with the four core components of the GBP'.	ICMA, 2021
Green bonds are a financial instrument financing pro-ecological, sustainable or climate-related projects without any possible damages to the environment and the climate. In order to qualify as 'green', bonds must meet specific standards that are respected worldwide.	Sobik

social objectives. Thus, compared to vanilla bonds, which finance the working capital of the issuer, green bonds focus on financing pro-environmental and pro-social goals. It should also be stressed that the purchaser of a green bond lends its funds to the issuer and is therefore not directly exposed to the financial risk of the projects financed by the issue (Gemra, 2021, p. 32). This creates a favourable circumstance for investing in green bonds and makes it easier for investors seeking to raise capital from this source to proceed with green investments.

The attempt to define the term green bonds faces similar problems as with the term green finance. Therefore, there is no single, consistent definition of green bonds in the literature (Lipowicz, 2020, p. 123). The term "climate bonds" is also sometimes used in the academic literature to emphasise the use of emissions funds for adaptation and mitigation of climate change. Another term found in the literature is "transition bonds", specifying the use of funds for the purposes of energy transition (KPMG, 2021, p. 15). Table 3 reviews the definition of green bonds based on a literature review.

Based on the definitions quoted above, the most important characteristics of green bonds can be identified as follows (Laskowska, 2019, p. 49):

- innovative financial instrument
- debt security

- different classification—for example, based on the type of issuer (corporate, municipal, government) or the type of interest method (fix or float)
- purpose, which is to finance and refinance investment projects
- the possibility to spend all or part of the funds raised from the issuance
- the use of funds obtained from issuance is possible only for pro-environmental purposes

Based on the above characteristics, it can be concluded that the most important distinction separating green bonds from traditional bonds is the last point, which conditions the use of funds exclusively for pro-environmental purposes (Laskowska, 2019, p. 49). Green bonds are used to finance investment projects, the beneficiary of which is, as a rule, the general public, and not specific social groups as in the case of social bonds (Kultys, 2020, p. 127).

Green bonds are particularly important to both investors and policy makers (Banga, 2019, p. 2). Investors are encouraged to adjust their business so as to concentrate on creating financial value as well as on social and environmental values (Schoenmaker, 2017). In the other hand, policy makers need financing resources in order to meet their commitments to the Paris Agreement (Banga, 2019, p. 2).

A defining feature of green bonds is the area in which they can be used to finance certain specific types of investment. Green bonds, as already mentioned,

are intended to support environmental, pro-climate, and pro-social projects. The heterogeneity of the definition of green bonds as well as the geographical diversity of their use is reflected in the lack of clear, precise, and universally applicable issuance standards. The lack of consistent rules for the issuance of green bonds in the initial phase of the development of this financial instrument was a clear drawback that limited its development (Pawłowski, 2017, p. 222). There are currently two global standards for issuing green bonds: Green Bond Principles (GBP) and Climate Bond Initiative (CBI) (Gemra, 2021, p. 33). GBP considers four criteria for a bond to be considered green (Voluntary Process Guidelines for Issuing Green Bonds, 2021, pp. 4–6; Sartzetakis, 2020, p. 768):

- Use of Proceeds—for instance: renewable energy, energy efficiency, pollution prevention and control, and environmentally sustainable management of living natural resources and land use
- Process for Project Evaluation and Selection
- Management of Proceeds
- Reporting—most of the standards require enclosing following information:
 - A list of projects and the amount of the proceeds which has been allocated
 - Unallocated proceeds and the way they were managed
 - Short description and up-to date information about project's progress
 - Project's environmental benefits

The CBI, on the other hand, focuses on analysing the particular sector of the economy in which the issuer operates and indicates the precise criteria that must be met by entities in the sector in order for the bonds thus issued to be considered green (Gemra, 2021, p. 33).

The dynamic development of the green bond market in recent years has resulted in the emergence of different types of this financial instrument. The categorisation of existing types of green bonds can be done on the basis of three main factors (Laskowska, 2019, p. 113; Laskowska, 2020, pp. 49–50):

- Type of issuer—seven types of green bonds can be distinguished:

- supranational, quasi-state, agency green bonds – issued by, e.g., The World Bank, governmental agency, etc.
- corporate green bonds
- bonds issued by financial sector, e.g., commercial banks
- municipal green bonds
- governmental green bonds issued by the state
- income green bonds: repayment is based on revenues from a single or multiple investment projects financed by a given debt emission
- green asset-backed securities (ABS): a debt security issued in a securitisation that is based on various types of underlying assets that serve as collateral for financial assets

- Protecting investors' interests:

- Secured green bonds: decreasing the exposition on the financial risk for bondholders
- Unsecured green bonds

- Emissions certification:

- Labelled (certified) green bonds – compliance with internationally accepted green bond standards, increasing the reliability of the investor and the emission
- Unlabelled (uncertified) green bonds

The dynamic development of corporate green bonds has led to the emergence of a number of new types of this instrument (Lipowicz, 2020, pp. 124–125):

- Standard Green Use of Proceeds Bond: in compliance with GBP, with recourse to the issuer
- Green Revenue Bond: in compliance with GBP, without recourse to the issuer, an exposure to credit risk
- Green Project Bond: project bond with or without recourse, in compliance with GBP, emission taken so as to finance a one or more pro-ecological investment; investor is exposed to the risk associated with the project
- Green Securitised Bond: in compliance with GBP, collateralised by one or several proecological projects, these may include covered bonds, asset-backed securities (ABS), mortgage-backed securities (MBS), and other structures

Issuing green bonds allows the issuer to achieve numerous benefits and opportunities. On the other hand, it also carries certain risks and the green bond instrument itself is not free of drawbacks.

Among the advantages of green bonds are the implementation of ESG (environmental, social, governance) and sustainable development principles, building trust on the part of investors and improving the image of the issuer (Kultys, 2020, p. 125). Green bonds make it possible to finance new projects for the construction of renewable energy sources or to take action to protect the climate and the environment; thus, they are both environmentally and socially useful. Issuing green bonds allows investors to diversify and reduces the risk of fluctuations in demand for the instrument. Further advantages also include lower volatility of the instrument's price in the secondary market (greater buy-and-hold investor participation), the possibility of higher investor demand leading to oversubscription, and an increase in issue size (Grabowski & Kotecki, 2020, p. 83), as well as access to a source of funding with a longer maturity. In the article (Sartzetakis, 2020, p. 759), it was also pointed out that the advantage of green bonds could be 'that green bonds, as debt financing instruments, could help spread the costs of transformation in a more equitable and conscientious manner over generations.' Thus, it represents a combination of environmental and social aspects. The three most common incentives for issuing green bonds according to (Maltais & Nykvist, 2021, p. 10) are broadening the investor base, lowering capital costs, and meeting investor demand for sustainable investment products.

Among the disadvantages of green bonds, on the other hand, it should be pointed out (Maltais & Nykvist, 2021, p. 10) that there are no uniform standards and regulations for classifying bonds as green. In turn, simply applying for a certificate of compliance with the standards generates further costs. In the event of noncompliance with the obligations outlined in the issue, issuers may be fined. In addition, if the investment fails, the issuer risks reputational damage. It is also important to point out the relatively small market for green bonds (compared to traditional bonds), which is seen as a disadvantage, despite the continued dynamic development of this sector. The lack of sufficient regulation and uniform standardisation may encourage the occurrence of greenwashing – issuers may issue 'green bonds' by simply claiming that they are 'green', but will only mislead their buyers as they will not, in fact, meet the

relevant standards (Flammer, 2020, p. 96). Insufficient and decentralised regulation, shaped by private sector actors, results in the recognition of bonds as green being at the discretion of third parties (private actors), and standards vary between certifiers. As a result, the 'greenness' of bonds is not clearly and precisely verifiable (Flammer, 2020, p. 96).

Advantages and disadvantages of green bonds has been compared in Table 4 (next page). (OECD, Bloomberg Philanthropies, 2015, p. 11).

4. Worldwide and European Green Bonds Market Development

The growing role of green bonds as an innovative financing instrument for environmental initiatives is proof of their effectiveness and usefulness. Globally, the popularity of green bonds continues to grow (Table 5 on next page), with Europe leading the way in terms of issuance volume. The proliferation of green bonds over recent years is also evident in Asia and Pacific and in North America.

Over the period 2014–2020, there was a large increase in the number of green bond issuers in the European bond market, from 31 to 226 issuers (KPMG, 2021, p. 26) (Table 6 on page 10). Of all issuers between 2014 and 2020, nonfinancial corporations, financial institutions, and public sector entities were the largest number. This shows the high use of corporate green bonds by the private sector, but also demonstrates the popularity of this financial instrument among financial institutions and public sector entities.

The development of the European green bond market is also evident in the volume of issuance (Table 7 on page 10).

Energy is the dominant sector. Due to the huge capital needs resulting from the energy transition, green bonds are one of the most important instruments for financing energy investments. Building construction and transport ranked next in terms of the volume of green bonds issued.

Table 4. Advantages and disadvantages of green bonds for issuers and investors

For Issuers	
Advantages	Disadvantages
Demonstrating and implementing issuer's approach to ESG issues	Up front and ongoing transaction costs from labelling and associated administrative, certification, reporting, verification and monitoring requirements (cost estimates vary)
Reputational and marketing benefits	Reputational risk if a bond's green credentials are challenged
Improving diversification of bond issuer investor base, potentially reducing exposure to bond demand fluctuations	Investors may seek penalties for a 'green default', whereby a bond is paid in full but issuer breaks agreed green clauses
Evidence of more 'buy and hold' investors for green bonds which can lead to lower bond volatility in secondary market	
Articulation and enhanced credibility of sustainability strategy	
Access to 'economies of scale' as the majority of issuance costs are in setting up the processes	
For Investors	
Advantages	Disadvantages
Investors can balance risk-adjusted financial returns with environmental benefits	Small, nascent, and less liquid market, small bond volumes
Satisfies ESG requirements	Lack of unified standards can raise confusion and possibility for reputational risk if green integrity of bond questioned
Potential use to actively hedge against climate policy risks in a portfolio that includes emissions-intensive assets	Limited scope for legal enforcement of green integrity
Improved risk assessment through use of proceeds reporting	Lack of standardisation can lead to complexities in research and a need for extra due diligence that may not always be fulfilled
Marketing and image benefits of investing in pro-environmental financial instruments	

Source: Author's own elaboration based on OECD Bloomberg Philanthropies, 2015, p. 11

Table 5. Green bond issuance volume by region and total green bond issuance in 2014–2021 (\$billion)

Region	2014	2015	2016	2017	2018	2019	2020	2021
Europe	49.5%	43.4%	29.6%	38.4%	39.4%	45.3%	52.9%	56.0%
Asia and Pacific	4.3%	8.5%	31.5%	22.3%	29.2%	24.9%	19.0%	23.1%
North America	20.0%	27.8%	24.7%	30.7%	23.0%	22.3%	20.1%	16.6%
Latin America	0.5%	2.4%	1.9%	2.5%	0.9%	1.8%	3.1%	1.4%
Africa	0.3%	0.0%	0.2%	0.2%	0.1%	0.3%	0.4%	0.1%
Transnational corporations	25.4%	18.0%	12.1%	6.0%	7.4%	5.3%	4.5%	2.8%
TOTAL (issued \$billion)	37.0	46.1	84.5	159.5	172.5	269.3	297.2	444.4

Source: Author's own elaboration based on Climate Bonds Initiative Interactive Data Platform, KPMG, 2021, p. 52

Table 6. Number of issuers by sector in the European bond market in years 2014–2020

Number of issuers	2014	2015	2016	2017	2018	2019	2020
International development banks	3	2	1	2	3	5	5
Financial institutions	1	8	7	13	22	44	53
Public sector entities	6	12	12	23	18	28	44
Local authorities	5	5	6	7	12	9	12
Nonfinancial corporations	16	15	18	31	40	80	94
Governments	0	0	1	1	5	5	6
Others	0	0	2	8	6	8	12
TOTAL	31	42	47	85	106	179	226
y/y change	-	35%	12%	81%	25%	69%	26%

Source: Author's own elaboration based on Climate Bonds Initiative Interactive Data Platform, KPMG 2021, p. 26

Table 7. Volume of issuance of European green bonds by target category

Volume of green bond issuance, EUR billion	2014	2015	2016	2017	2018	2019	2020	Average
Energy	10.06	9.15	12.58	22.50	20.11	36.45	48.12	22.71
Building construction	2.34	2.80	3.87	12.70	14.55	29.54	31.97	13.97
Transport	0.81	1.89	1.97	6.79	12.25	21.94	31.02	10.95
Water resource management	1.08	0.98	1.12	3.45	3.87	6.30	4.57	3.05
Waste management	0.72	0.91	0.34	2.30	3.10	3.77	2.70	1.98
Land use	0.72	0.19	0.44	2.82	3.61	5.16	10.48	3.35
Others	0.55	0.81	0.69	0.96	1.95	3.23	3.04	1.60
TOTAL	16.27	16.73	21.01	51.52	59.44	106.40	131.90	57.61

Source: Author's own elaboration based on Climate Bonds Initiative Interactive Data Platform, KPMG 2021, p. 31

Table 8. Issuance of funds of sovereign green bonds in Poland

Emissions' information	1st emission	2nd emission	3rd emission	4th emission
Date of emission	20th December 2016	7th February 2018	28th February 2019	
Maturity	5 years	8 years	10 years	30 years
Coupon	0.50%	1.13%	1.00%	2.00%
Profitability	0.63%	1.15%	1.06%	2.07%
Value	0.75 billion EUR	1 billion EUR	1.5 billion EUR	0.5 billion EUR
Reported demand	1.5 billion EUR	3.25 billion EUR	3.5 billion EUR	1.3 billion EUR

Source: Author's own elaboration based on Laskowska, 2021, p. 55; Ministerstwo Finansów, 2022

Table 9. Allocations of funds from Polish sovereign green bonds in mln EUR

Allocations from issuances [mln EUR]	1 st (2016)	2 nd (2018)	3 rd (2019)	4 th (2019)	TOTAL
Clean transportation	241.3	767.9	750.7	247.6	2007.5
Sustainable agricultural operations	292.1	84.1	198.1	65.3	639.6
Renewable energy	155.2	71.7	92.8	30.6	350.3
National parks	35.4	54.1	41	13.5	144
Afforestation	21	19.8	17	5.6	63.4
Reclamation of heaps	0.02	0.2	0.94	0.3	1.46

Source: Author's own research based on the data from Polish Ministry of Finance

5. Green Bonds Market Development in Poland

Poland's green bond market was established in December 2016 with the world's first sovereign green bond issue (Gemra, 2021, p. 32). Since then, there have been further issues, not only of sovereign green bonds, but also of corporate green bonds and municipal green bonds (obligacje.pl, 2020). The first issuance of Polish sovereign green bonds was recognised internationally by the Climate Bond Initiative and received recognition from the Climate Bond Award chapter, which said that the pioneering issuance of sovereign green bonds was a milestone for the market (Pawłowski, 2017, p. 225) (Skuzza & Modzelewska, 2020, p. 9). There have been four issues of sovereign green bonds in Poland to date, details of which are set out in Table 8 on page 10.

In total, between 2016 and 2019, the Polish government issued more than EUR 3 billion green bonds. Also noteworthy is the demand, which has always clearly exceeded the value of the issue, as well as the increasingly longer maturity – the last bond issue of 2019 included papers for 10 years and as long as 30 years, which shows the growing interest in long-term green bonds.

The allocation of funds from the above green bond issues is presented in Table 9.

The use of funds from the issuance of sovereign green bonds can be divided into six areas (Ministry of Finance, 2017, 2019, 2021; Skuzza & Modzelewska, 2020, pp. 17–18):

- The predominant use of the funds raised from the issue of green bonds was for clean transport: investment in railway infrastructure (general renovation of railway lines, e.g., Warsaw–Łódź,

Cracow-Katowice or purchase of new railway fleet)

- Sustainable agricultural operations: The majority of the funds were directed by subsidies to the Rural Development Programmes
- Renewable energy: development of renewable energy sources
- Subsidies for tasks commissioned to national parks pursuant to the Environmental Protection Act in order to conduct sustainable forestry management
- Afforestation: management of nature reserves, protection of forests, wildlife, plants
- Reclamation of heaps: restoration of degraded lands affected by coal mining

In addition to issuances of sovereign green bonds, corporate, and municipal green bonds have also been issued in Poland.

The first issue of corporate green bonds was carried out in 2020. Cyfrowy Polsat Group S.A (ICT sector) issued green bonds for an amount of PLN 1 trillion. Maturity is reached in seven years, and the interest rate is floating and depends on the Polish WIBOR 6M. The issuer intends to use the proceeds from the issue to improve energy efficiency and reduce its carbon footprint (Grabowski & Kotecki, 2020, pp. 102–107). Corporate green bonds were also issued by energy and fuels companies: PKN ORLEN (oil and gas) carried out two issues for PLN 2 billion and EUR 500 million, respectively. The first issue did not have any external verification (therefore it was de facto only a sustainability-linked bond issue), while the second one had a second-party opinion and CBI certification (KPMG, 2021, p. 58). The company said it would use the funds from the issue to develop low-carbon transport infrastructure and RES. Sustainability-

linked bonds were also issued by energy company TAURON in 2020 for 1 billion PLN, which also did not pass any external verification. Funds from their issue will be used to finance the company's decarbonisation (KPMG, 2021, p. 58). Other energy entities investing in photovoltaics (R. Power, Columbus Energy) were also issuers of corporate green bonds in Poland, as was Famur from the machinery and equipment for the underground mining sector (i.e., a company-related strictly, *inter alia*, to hard coal mining; in this case, funds from the issue were to be used to invest in RES installations and energy efficiency improvements), and the construction sector company Globe Trade Centre (real estate investor and developer), which wanted

to allocate funds from the issue with a Second Party Opinion to green building and energy- efficiency improvements (KPMG, 2021, p. 58).

Financial sector entities in Poland also made four green bond issues. The issuers were three banks: mBank, PKO Mortgage, and ING Mortgage. All issues had a Second Party Opinion, and three of the four were also certified by the CBI (KPMG, 2021, p. 58). The purpose of the funds raised was to finance mortgages secured by green buildings.

For years, municipal bonds have accounted for a small share of the debt structure of Polish municipalities, as the predominant source of capital is loans (KPMG, 2021, p. 64). For this reason, municipal green bonds have so far not been very popular in Poland: they have only been issued by the city of Łódź, which used them to raise financing for an investment in a sewage treatment plant and the renovation of a tramway track (KPMG, 2021, p. 55). Other municipal green bond issues in Poland do not meet the issuance standards for green bonds. The municipal green bond market is at a seed stage; local governments generally prefer credit financing, arguing that obtaining a loan is faster and cheaper than issuing bonds (KPMG, 2021, p. 66). Issuing municipal green bonds involves issuance costs that are higher than for ordinary bonds or borrowing costs. Additional costs also include the commissioning of an independent pre-issue opinion, the development of a Green Bond Framework or the annual review of the funds allocation report. In addition, the *greenium* in the case of Polish municipal

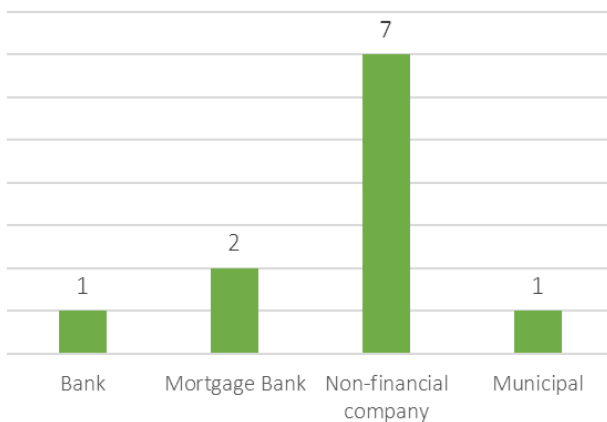


Figure 3. Number of Polish green bonds and sustainability-linked issuers
Source: Author's own elaboration based on KPMG, 2021, p. 55

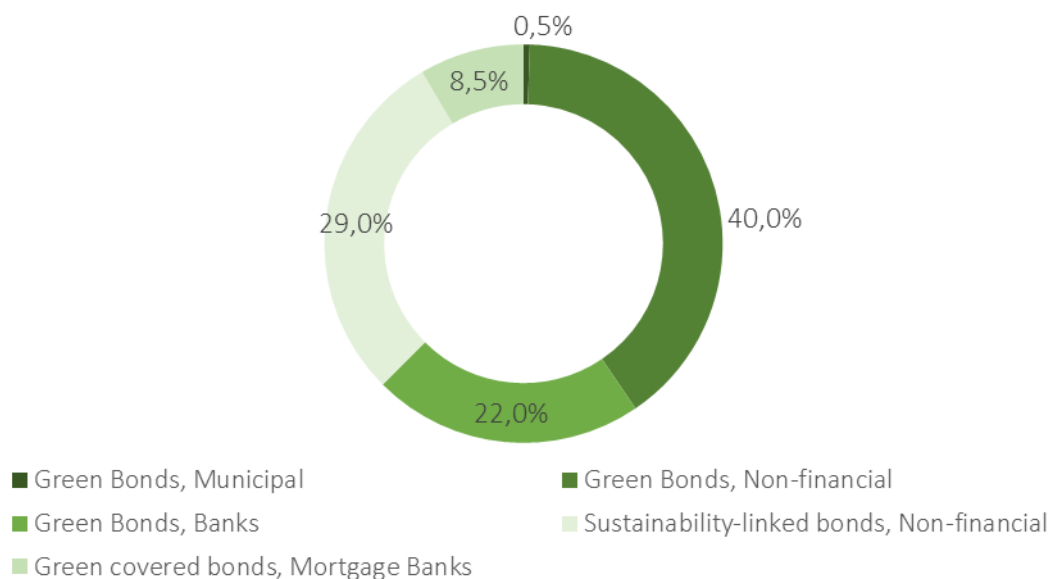


Figure 4. Percentage volume of Polish green bonds and sustainability-linked bonds issued
Source: Author's own elaboration based on KPMG, 2021, p. 57

green bonds is missing or negligible, hence municipalities have no economic incentive to issue green bonds (KPMG, 2021, p. 66). Figure 3 (page 12) Shows the number of entities issuing green bonds and sustainability-linked bonds in Poland.

Nonfinancial companies predominate by far, with seven nonfinancial issuers. Issues by banks and municipalities are much smaller. Figure 4 (page 12) Shows the percentage distribution of the volume of green bonds and sustainability-linked bonds issued in Poland.

In terms of volume, nonfinancial sector entities issuing green bonds (40%) and issuing sustainability-linked bonds (29%) dominate. The volume of green bonds issued by banks is 22%, while green covered bonds issued by mortgage banks accounted for 8.5% of the total issuance volume. The issuance volume of municipal green bonds was a negligible 0.5% of the total volume. On the other hand, making a breakdown between green bonds, sustainability-linked bonds, and green covered bonds, green bonds have the largest share of the issuance volume at 62.5%.

6. Barriers to the Green Bonds Market Development—the Polish Case

Barriers to the green bond market development could be divided into two groups: institutional barriers and market barriers (Banga, 2019, p. 8).

The lack of a unified standard for issuing green bonds and a uniform standard for reporting to investors are examples of institutional barriers in Poland. Moreover, legal risk is another important factor – examples include de facto blocking of investments in on-shore wind farms due to a legal act called ‘10H rule’, resulting in a shortage of green projects on the market (Deloitte, 2022). Regulatory uncertainty and political instability regarding energy and climate policy as well as the approach of policy makers to sustainable development financing are also barriers slowing down the development of the green bond market in Poland (Więckowska, 2013, p. 460).

Banga (2019, p. 9) pointed out three main market barriers for the green bonds’ market development; the issue of too low a volume of emissions being mitigated, the currency of issuance, and high transaction costs. The small size of emission is not an attractive

investment for the large investors. An insufficient volume of emissions increases transaction costs and results in low liquidity in the market (Więckowska, 2013). The currency of issuance relies on the issue of currency risk. Most of the issuances have been done in the worldwide currencies like RMB, USD, and EUR (Banga, 2019, p. 10). High transaction costs are related to the process of green label certification from the independent second party and to published documents during the project duration in order to demonstrate the allocation of the funds from the emission. Transaction costs could play a significant role, particularly for small issuers, and it seems to be a one of the major barriers in green bond market development (Banga, 2019, p. 10). The Polish bonds market is still relatively small, compared to Western Europe. Nevertheless, there is space for development, by following the development of the whole Polish financial market and economy in the coming years. Thus, the development of the Polish green bonds market is closely associated with the development of the entire bonds market in Poland (Deloitte, 2022). Further barriers include lack of knowledge about the green bond mechanism and lack of confidence in the ecological impact of that investment and reduction to climate risk exposure (Więckowska, 2013, p. 461).

Lack of green investments in Poland that could be financed by green bonds is a significant barrier. The majority of the funds are allocated to renewable energy sources and ecological transport. Due to the limited opportunities to invest funds from green bonds, the demand for them exceeds the investment capacity of issuers (Ślęzyńska-Kluczek, 2022, p. 36). Additionally, there is a lack of a clear economic benefits from issuing a green bonds. Costs related to the issuance could be higher as a result of reporting obligations and the need to obtain independent opinions (Ślęzyńska-Kluczek, 2022, p. 36).

Among other barriers, the insufficient supply of green bonds in comparison to demand from investors has been pointed out. This mostly concerns corporate green bonds issued by companies from industry, energy, utilities, and consumer goods (KPMG, 2021, p. 47). It has also been pointed out that investors are taking environmental credibility into account (KPMG, 2021, p. 47).

The issuance of green bonds and sustainability-linked bonds may also provide an opportunity for greenwashing. Sustainability-linked bonds, because of the lack of a need to meet the standards attributed to green bonds and report on the allocation of funds, can

provide a platform for abuse in the form of misuse of funds. The lack of independent third-party opinions drawn up during the issuance, as well as the *de facto* lack of control over the disbursement of funds, may result in sustainability-linked bonds being a source of greenwashing, and their marketing relevance as well as market perception is not as clear as in the case of certified green bonds. It is also necessary to introduce minimal criteria for the qualification of bonds as sustainability-linked bonds in order to avoid their use as a greenwashing tool (Kölbel & Lambillon, 2022, p. 4).

Green bonds, despite the fact that they are certified and verified by independent third parties, may also be affected by the negative practice of greenwashing. Baldi and Pandimiglio (2022, pp. 2–11) argue that greenwashing is a key risk related particularly to corporate green bonds. It has been shown that the risk of greenwashing is more likely to occur in the manufacturing sector (e.g., consumer goods, materials), while in the services sector this risk is lower (because investors are more likely to accept lower returns). Based on the research conducted by Baldi and Pandimiglio (2022, p. 14), in order to minimize exposure to the greenwashing risk, investors should focus on municipal and corporate green bonds issued by the services sector. These types of green bonds tend to be less exposed to greenwashing risks because municipalities are obliged to be transparent, and they are not focused on financial profit and high returns. The services sector is also orientated towards lower returns compared to industry.

The risk of greenwashing is higher in sustainability-linked bonds than in green bonds. Nevertheless, the greenwashing issues could occur both in the green bonds and sustainability-linked bonds markets. The risk of greenwashing can be a major drawback for the investor, as the financial instrument in which the investment has been made with a view to supporting green activities may not in fact be 'green', and the funds raised from the issue may be used for activities contrary to energy and climate policy or sustainable development objectives. Greenwashing therefore distorts the idea underlying green finance and is a damaging action that undermines investor confidence in green finance instruments as well as in specific sectors. In fact, the development of a sustainability-linked bond market represents a potential threat and a barrier to growth for the certified green bond market and increases the risk of greenwashing; thus, it erodes the confidence of investors, all stakeholders, and the public in green finance instruments.

7. Conclusions

The struggle against climate change and the energy and climate policies undertaken, as well as the widespread implementation of ESG standards and sustainability in its broadest sense, make environmental impacts an important consideration in investment decisions. Green finance is an important element of the financial system for facilitating the financing of sustainable investment projects. Undertaking pro-environmental investments, in an era of increasing emphasis on ESG compliance, is not only linked to purely prestige, but is also triggered by external pressure: investors putting their capital under increasing pressure not to allocate these funds to unethical or environmentally damaging investments (Więckowska, 2013, p. 459).

Green bonds are an important element of green finance, becoming an increasingly common instrument for financing green investments on a global scale. Green bonds are a suitable financing instrument not only for investments in renewable energy sources, but also for clean transportation, green buildings, sustainable agricultural operations, afforestation, or reclamation of heaps. The growing global market for green bonds and the strong demand for green bonds by financial corporations is a predictor of continued growth in the popularity of its their use. Green investments may face a bottleneck due to their scarcity in the market, however, compared to the demand for green bonds. Further advantages of green bonds include the possibility of hedging against climate risk, marketing advantages, and compliance with ESG standards. The use of green bonds also has some barriers and limitations. It is not a suitable financial instrument for every environmental project, especially those in the early stages of development (Więckowska, 2013, p. 460). Among the barriers to the development of green bonds, the lack of uniform standards and the possibility of issuing sustainability-linked bonds that are not verified by independent third parties should be mentioned first and foremost. As a result, green bonds as well as (especially) sustainability-linked bonds can be used as a greenwashing tool. Transaction costs are also a significant problem, discouraging potential issuers – this is particularly concerning to issuers of municipal green bonds, whose issuance volumes are so low that transaction costs make the issuance economically inefficient in practice.

The use of green bonds in Poland is broad and includes not only the financing of investments related to the energy transition, but also investments in transport, infrastructure, and other environmental investments. Green bonds are becoming increasingly popular globally; however, their development in Poland has encountered a number of barriers. Legal risk, an insufficient number of RES projects, and high transaction costs affect the slower development of the green bond market in Poland. While the market for sovereign and corporate green bonds is growing, the market for municipal green bonds is stagnant and is hampered mainly by high issuance costs, which make credit a more attractive form of financing. Sustainability-linked bond issuance in Poland may also pose the risk of issuer abuse and greenwashing. Despite the existence of the indicated barriers and constraints, the development of the green bonds market in Poland will be characterised by growth trends in the coming years, because of the numerous investment needs related to the ongoing energy transition and the need to implement sustainable development principles and ESG standards. The area where this growth will be most pronounced will be corporate green bonds, as well as green bonds issued by the financial sector.

References

- Baldi, F., & Pandimiglio, A. (2022). The Role of ESG Scoring and Greenwashing Risk in Explaining the Yields of Green Bonds: A Conceptual Framework and an Econometric Analysis. *Global Finance Journal*, 52. <https://doi.org/10.1016/j.gfj.2022.100711>
- Banga, J. (2019). The Green Bond Market: A Potential Source of Climate Finance for Developing Countries. *Journal of Sustainable Finance and Investment*, 9(1), 17–32. <https://doi.org/10.1080/20430795.2018.1498617>
- Berrou, R., Ciampoli, N., Marini, V. (2019). Defining green finance: existing standards and main challenges. In M. Migliorelli & P. Dessertine (Eds.), *The Rise of Green Finance in Europe* (pp. 153–174). London: Palgrave Macmillan.
- Della Croce, R., Kaminker, C., & Stewart, F. (2011). The role of pension funds in financing green growth. *OECD Working Papers on Finance*. Paris: OECD Publishing.
- Deloitte. (2022). Zielone obligacje Kluczowy instrument finansowania zrównoważonej przyszłości? Retrieved from Deloitte: <https://www2.deloitte.com/pl/pl/pages/risk/articles/zielone-obligacje.html>
- Flammer, C. (2020). Green Bonds: Effectiveness and Implications for Public Policy. *Environmental and Energy Policy and the Economy* (1). <https://doi.org/10.1086/706794>
- Gemra, K. (2021). Świadomość Funkcjonowania Green Bonds Na Polskim Rynku Obligacji Korporacyjnych. *Kwartalnik Nauk o Przedsiębiorstwie*, 61(4), 30–38. <https://doi.org/10.33119/knop.2021.61.4.3>
- Gilchrist, D., Yu, J., Zhong, R. (2021). The limits of green finance: A survey of literature in the context of green bonds and green loans. *Sustainability*, 13(2), 1–12. <https://doi.org/10.3390/su13020478>
- Grabowski, M. & Kotecki, L. (2020). *Zielone Obligacje w Polsce - przewodnik dla emitenta*. Retrieved from Centrum Myśli Strategicznych: https://fundacjacms.pl/wp-content/uploads/2020/10/Zielone-obligacje-w-Polsce_ebook.pdf
- ICMA. (2021). *Voluntary Process Guidelines for Issuing Green Bonds*. Retrieved from Green Bond Principles: www.icmagroup.org/gssbresourcecentre.
- International Development Finance Club. (2012). Mapping of Green Finance Delivered to IDFC Members in 2012. Retrieved from IDFC: <https://www.cbd.int/financial/publicsector/idfc-greenfinance-2013.pdf>
- Kölbel, J., & Lambillon, A.-P. (2022). Who Pays for Sustainability? An Analysis of Sustainability-linked Bonds. Swiss Finance Institute Research Paper Series, 23(07). Retrieved from Swiss Finance Institute: <https://dx.doi.org/10.2139/ssrn.4007629>
- KPMG. (2021). *Perspektywy rozwoju rynku zielonych obligacji w Polsce*. Retrieved from KPMG: <https://assets.kpmg.com/content/dam/kpmg/pl/pdf/2021/12/pl-Raport-KPMG-na-zlecenie-MF-Perspektywy-rozwoju-rynku-zielonych-obligacji-w-Polsce.pdf>
- Kultys, A. (2020). Obligacje społeczne, zielone i zrównoważone – specyfika i wykorzystanie. In M. Ćwiklicki, A. Frączkiewicz-Wronka, A. Pacut, & K. Sienkiewicz-Małyjurek (Eds.), *Współczesne problemy zarządzania publicznego i przedsiębiorczości społecznej* (122–132). Kraków: Uniwersytet Ekonomiczny w Krakowie.
- Laskowska, A. (2019). Zielona obligacja skarbową jako perspektywiczny instrument rynku długu.

Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach, 382, 109–122.

Laskowska, A. (2020). Zielone obligacje w Polsce - teoria i praktyka. In L. Kotecki (Ed.), *Zielone finanse w Polsce* (pp. 47–60). European Financial Congress.

Lindenberg, N. (2014). Definition of Green Finance. Retrieved from German Development Institute: <https://ssrn.com/abstract=2446496>

Lipowicz, M. (2020). Nowoczesne formy obligacji jako źródła gromadzenia kapitału przez polskie przedsiębiorstwa. *Zeszyty Naukowe Wydziału Zarządzania GWSH - Globalna Gospodarka, Zarządzanie, Prawo i Administracja*, 13, 115–132.

Maltais, A., Nykvist, B. (2021). Understanding the Role of Green Bonds in Advancing Sustainability. *Journal of Sustainable Finance and Investment*, 11(3), 233–252. <https://doi.org/10.1080/20430795.2020.1724864>

Ministerstwo Finansów. (2022). *Wycena obligacji Green Bonds w euro*. Retrieved from the Polish Ministry of Finance: <https://www.gov.pl/web/finanse/wycena-obligacji-green-bonds-w-euro>

Ministry of Finance, Republic of Poland. (2017). Green Bond Report on the Use of Proceeds. Retrieved from Ministry of Finance: https://www.gov.pl/documents/1079560/1080340/Green_Bond_Report_on_the_Use_of_Proceeds.pdf

Ministry of Finance, Republic of Poland. (2019). Green Bond Report on the Use of Proceeds. Retrieved from Ministry of Finance: <https://www.gov.pl/web/finanse/issues-international-bonds>

Ministry of Finance, Republic of Poland. (2021). Green Bond report on the Use of Proceeds—Update. Retrieved from Ministry of Finance: <https://www.gov.pl/web/finanse/issues-international-bonds>

Mosionek-Schweda, M., Szmelter, M. (2018). Zielone obligacje – nowy instrument finansowania inwestycji polskiego rządu. *Prace Naukowe Uniwersytetu Ekonomicznego We Wrocławiu*, 532, 215–224. <https://doi.org/10.15611/pn.2018.532.21>

obligacje.pl. (2020). *Pierwsze zielone obligacje komunalne*. Retrieved from Obligacje.pl: <https://obligacje.pl/pl/a/pierwsze-zielone-obligacje-komunalne>

OECD, Bloomberg Philanthropies. (2015). Policy Perspectives: Green Bonds - Mobilising the Debt Capital Markets for a Low-Carbon Transition.

Retrieved from OECD Publishing: <https://www.oecd.org/environment/cc/Green%20bonds%20PP%20%5Bf3%5D%20%5Blr%5D.pdf>

Pawłowski, M. (2017). Zielone obligacje rządowe. *Ekonomiczne Problemy Usług*, 129(4), 219–227. <https://doi.org/10.18276/epu.2017.129-18>

PricewaterhouseCoopers Consultants (PWC). (2013). Exploring Green Finance Incentives in China. Retrieved from PwC: <https://silo.tips/download/exploring-green-finance-incentives-in-china>

Sartzetakis, E. S. (2020). Green Bonds as an Instrument to Finance Low Carbon Transition. *Economic Change and Restructuring*, 54(3), 755–779. <https://doi.org/10.1007/s10644-020-09266-9>

Schoenmaker, D. (2017). Investing for the Common Good: A Sustainable Finance Framework. Retrieved from Bruegel: <https://www.bruegel.org/comment/investing-common-good-sustainable-finance-framework>.

Skuza, S., Modzelewska, A. (2020). Zielone finanse publiczne w Polsce. Stan obecny i autorskie propozycje zmian. *Zeszyty Prawnicze BAS*, 165(1), 9–29.

Ślażyńska-Kluczek, D. (2022). Zielone obligacje jako metoda finansowania projektów inwestycyjnych. *Kwartalnik Nauk o Przedsiębiorstwie*, 1, 33–44. <https://doi.org/10.33119/KNoP.2022.63.1.3>

Tang, D. Y., & Zhang, Y. (2020). Do Shareholders Benefit from Green Bonds? *Journal of Corporate Finance*, 61. <https://doi.org/10.1016/j.jcorpfin.2018.12.001>

The World Bank. (2015). What Are Green Bonds? Retrieved from the World Bank: <https://documents1.worldbank.org/curated/en/400251468187810398/pdf/99662-REVISED-WB-Green-Bond-Box393208B-PUBLIC.pdf>

Wang, Y., & Zhi, Q. (2016). The Role of Green Finance in Environmental Protection: Two Aspects of Market Mechanism and Policies. *Energy Procedia*, 104, 311–316. <https://doi.org/10.1016/j.egypro.2016.12.053>

Więckowska, M. (2013). Stan i perspektywy rozwoju rynku obligacji klimatycznych. *Zeszyty Naukowe Uniwersytetu Szczecińskiego Finanse, Rynki Finansowe, Ubezpieczenia*, 62(766), 455–465.

Witek, K. (2021). Zielone obligacje jako instrument realizacji celów zrównoważonego rozwoju. In M. Staniszewski & H. Kretek (Eds.), *Zrównoważony Rozwój i Europejski Zielony Ład wektorami na drodze*

doskonalenia warsztatu naukowca (pp. 101–114). Gliwice: Wydawnictwo Politechniki Śląskiej.

Zadek, S., & Flynn, C. (2013). South-Originating Green Finance: Exploring the Potential. Retrieved from The Geneva International Finance Dialogues: http://www.iisd.org/pdf/2014/south-originated_green_finance_en.pdf