

**KAPITEL 1 / CHAPTER 1 ¹****GREEN BONDS AS A MECHANISM FOR FINANCING ENVIRONMENT
PROJECTS****DOI: 10.30890/2709-2313.2023-16-04-004****Introduction**

Environmental problems reached the global scale and are turning into a life threat to the people on our planet. The concept of ensuring sustainable development has already become an invariable trend on the global arena. More and more countries are adopting environmental protection measures. The amount of "green" projects implemented is rising and they require appropriate financing. Increasing number of the countries considers Green Recovery a necessary package of reforms, in particular to revive the economy after the pandemic.

The aggression of the Russian Federation has become a new challenge for the Ukrainian environmental security. In particular, active warfare is being conducted near the objects of the nuclear energy infrastructure of Ukraine. There is already an increase in the radiation background in the Chernobyl zone due to the actions of the Russian military. These environmental problems can spread to all neighboring areas, as we saw during the 1986 disaster.

Along with the negative impact on the environment from the military operations in Ukraine, the world has been fighting for the environment and climate changes for a long time. In particular, the EU plans to achieve climate neutrality by 2050. All 27 EU Member States committed to turning the EU into the first climate neutral continent by 2050. To get there, they pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels. This will create new opportunities for innovation and investment and jobs, as well as: reduce emissions; create jobs and growth; address energy poverty; reduce external energy dependency; improve our health and wellbeing (European Commission, 2019).

In turn, the implementation of "green" projects requires significant investments. One of the most prevalent barriers faced by cities, communities, developers of eco-projects is the issue of funding. Environmental projects, while having many undeniable advantages for the well-being of the society, require substantial long-term investments.

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To solve this issue, a new financial instrument was introduced, meaning green bonds.

Following the entire progressive world, Ukraine has joined the implementation of the goals of sustainable development, has chosen and maintains a course to protect the environment and preserve the climate.

The issue of the development of green bonds in Ukraine has become of interest due to the problems of obtaining adequate financing of green projects through local capital markets. Therefore, on June 19, 2020, Ukraine approved a bill on the simplification of investment attraction and the introduction of new financial instruments, based on the European best practices. This law introduces green bonds in Ukraine as a separate subtype of securities for the first time and establishes rules for the participants of the relevant market. Ukrainian government officials worked together with the GIZ, the IFC, the UNIDO, the UNDP, and the Climate Bonds Initiative to develop the bill.

According to the above-mentioned bill, green bonds will become a powerful financial instrument that will allow various categories of issuers to raise funds for environmental projects. These can be projects for the energy efficiency, the waste management, the alternative energy, the introduction of the ecological transport, as well as other projects aimed at protecting the environment and reducing harmful emissions into the atmosphere.

In order to create a holistic model of the green bond market and improve its investment attractiveness, the Concept of the Green Bond Market Development in Ukraine was developed and a plan of measures for its implementation was approved. Together with the partners, the development of secondary legislation was started, in particular, guiding procedures were created for the selection and assessment of the projects in the ecological area, which will be funded by the national and local budgets (Government Portal, 2020).

Ukraine decided to pursue the EU membership (been forced to defend this choice on the battlefield), also takes into account the best practices of the functioning of the green bond market in Europe. In particular, the European green deal of 11 December 2019 underlined the need to better direct financial and capital flows to green investments. The European green deal investment plan of 14 January 2020 announced that the Commission would establish an EU green bond standard (EUGBS). Green bonds play an increasingly important role in financing assets needed for the low-carbon transition. However, there is no uniform green bond standard within the EU. Establishing such a standard was a recommendation in the final report of the



Commission's High-Level Expert Group on sustainable finance. It was then included as an action in the 2018 Commission action plan on financing sustainable growth (European Commission, 2020). And finally it was assessed by the Commission's Technical Expert Group on Sustainable Finance (TEG), which provided detailed input on this subject in its recommendation for an EU GBS in June 2019 and provided further usability guidance and an updated recommendation in its March 2020 report (EU TEG on Sustainable Finance, 2020).

The European Green Deal is a plan to decarbonise the EU economy by 2050, revolutionise the EU's energy system, profoundly transform the economy and inspire efforts to combat climate change. But the plan will also have profound geopolitical repercussions. The Green Deal will affect geopolitics through its impact on the EU energy balance and global markets; on oil and gas-producing countries in the EU neighbourhood; on European energy security; and on global trade patterns, notably via the carbon border adjustment mechanism. At least some of these changes are likely to impact partner countries adversely. The EU needs to wake up to the consequences abroad of its domestic decisions. It should prepare to help manage the geopolitical aspects of the European Green Deal. Relationships with important neighbourhood countries such as Russia and Algeria, and with global players including the United States, China and Saudi Arabia, are central to this effort, which can be structured around seven actions: 1. Help neighbouring oil and gas-exporting countries manage the repercussions of the European Green Deal. The EU should engage with these countries to foster their economic diversification, including into renewable energy and green hydrogen that could in the future be exported to Europe. 2. Improve the security of critical raw materials supply and limit dependence, first and foremost on China. Essential measures include greater supply diversification, increased recycling volumes and substitution of critical materials. 3. Work with the US and other partners to establish a 'climate club' whose members will apply similar carbon border adjustment measures. All countries, including China, would be welcome to join if they commit to abide by the club's objectives and rules. 4. Become a global standard-setter for the energy transition, particularly in hydrogen and green bonds. Requiring compliance with strict environmental regulations as a condition to access the EU market will be strong encouragement to go green for all countries. 5. Internationalise the European Green Deal by mobilising the EU budget, the EU Recovery and Resilience Fund, and EU development policy. 6. Promote global coalitions for climate change mitigation, for example through a global coalition for the



permafrost, which would fund measures to contain the permafrost thaw. 7. Promote a global platform on the new economics of climate action to share lessons learned and best practices (Leonard et al., 2021).

Taking into account the trends in the development of the green bond market in Ukraine, the government decree adopted the Concept of the introduction and development of the "green" bond market in Ukraine. The purpose of the Concept is to define directions and tasks to introduce the green bond market, which will make it possible to attract funding to implement ecological projects, create prerequisites for the development of such a market in Ukraine, and increase its investment attractiveness. The implementation of the Concept, including the defined tasks, was planned for the period of 2022-2023 (Verkhovna Rada of Ukraine, 2022).

Unfortunately, the military aggression of the Russian Federation against Ukraine slowed down all progressive investment processes in the country, and today it is all about the survival of the nation. However, we are optimistic about the future and hope that the conceptual provisions defined in the above-mentioned legislation will be implemented.

The measures determined by the Concept will be implemented for the following areas: creation of prerequisites to introduce the green bond market; ensuring to attract funding to implement the environmental project by issuing green bonds; promoting the development of the green bond market. The creation of prerequisites to introduce the green bond market includes: establishing a taxonomy, in particular, the metrics of ecological projects in accordance with international criteria and standards; implementation of national regulations and rules regarding disclosure of information by issuers of green bonds, reporting standards; establishment of the accreditation framework for the external verifiers and appraisers of green bonds; offering incentives for the development of the green bond market and the creation, if necessary, of appropriate public target programs; preparing for the introduction of securitization and determining types of green bond collateral considering their defining features. Ensuring to attract funding to implement the environmental project is carried out by: raising the awareness of interested parties regarding the emerging of the green bond market in Ukraine, attracting key players to the market; supporting the preparation and implementation of experimental projects on offering green bonds by various categories of issuers with the involvement of the EU aid programs, foreign governments, international organizations and donor institutions; promoting creation of domestic investment demand for funding green bonds by various categories of potential



investors, in particular attracting general public and local institutional investors; inviting cooperation of the international development banks to improve the credit quality of green bonds of Ukrainian issuers and investing in green bonds of Ukraine; promoting national green bond issuers to the global capital markets; conducting external presentations on the global capital markets in order to attract international investors to invest in Ukrainian issues of sovereign and municipal green bonds (Verkhovna Rada of Ukraine, 2022).

The best practices of Lithuania remain of interest to Ukraine as it is progressive state and a reliable partner of our country. In Lithuania, the green bond market is developing quite effectively. Back in 2018, the international rating agency Moody's Investors Service rated the emission of the "green" bonds issued by the Lithuanian government with a higher score (GB1 Excellent) in terms of energy efficiency. Lithuania is among the leading countries that have issued "green" bonds as the third country in Europe and the seventh country in the world. Lithuania has provided a process that the whole world is talking about and which was evaluated with the highest score by the world-class experts. The GB1 Excellent rating means that the green bond issuer adheres to the highest standards in managing the funds received from the issuance of green bonds, administering them and directing them to projects in the field of environmental protection, as well as in providing the necessary reports (Ministry of Finance of the Republic of Lithuania, 2022).

Energy independence is one of the key topics discussed at the 6th Ukrainian-Lithuanian Economic Forum "Economy and the Pandemic: Crisis and New Opportunities", which took place as part of the visit of the President of the Republic of Lithuania Gitanas Nausieda to Ukraine on March 18-19, 2021. It was noted that the support and best practices of our friends and our international partners, particularly Lithuania, are important in all reforms necessary for sustainable economic growth. The cooperation of the business groups of our countries has a good history and significant prospects, noted Volodymyr Zelenskyi and recalled the steps taken to improve the business climate in Ukraine. In turn, the President of Lithuania informed about the importance of the cooperation of the countries to overcome all challenges and to achieve economic upturn.

At the forum, it was noted that Lithuania is a strategic partner for Ukraine, that the countries are united by the common goals of energy independence and energy security. All steps in these directions also contribute to the revitalization of economic relations between the states. Outlining the status, initiatives and development plans in



the field of energy efficiency and "green" energy, the participants focused on the broad possibilities of partnership in bioenergy. The total potential of bioenergy to replace imported fossil energy resources in Ukraine is 37 billion cubic meters of gas per year, in particular: the cultivation of energy crops and their use for energy purposes makes it possible to replace up to 20 billion cubic meters per year; use of a third of agricultural waste allows up to 10 billion cubic meters per year; production of biomethane offers another 8 billion cubic meters of gas per year (Government Portal, 2021).

It is an indisputable fact that Russian military aggression has slowed down and called into question the implementation of large green investment projects in the near future. But this does not reduce the relevance of conducting scientific research in the field of green bond market development, which is a new financial instrument for Ukraine.

Literature review

The development of the green bond market and investments in the "green" projects remain the subject of research by many scientists around the world. We will focus on the analysis of the scientific publications dedicated to the development of the green bond market and investments in Europe. This choice is due to the chosen course of the European integration of Ukraine, as well as the research of the best practices for the development of "green" investments.

Thus, the research identifies the main determinants of the growth of the green bond market, as well as the potential of these financial instruments in the sustainable economy (Draksaite et al., 2018). Scientists also note that the growing potential of the green bond markets facilitates mobilization of the financial resources for green projects, which significantly contribute to the achievement of the Sustainable Development Goals (SDGs). (Kocaarslan, 2021). The growing importance of green bonds in the financial markets is also emphasized by other scientists (Laborda & Sánchez-Guerra, 2021).

The articles also assess the impact of green bonds on other financial instruments, energy markets, and conduct a comparative analysis of the development of the green bond market in European countries. In particular, it is informative to compare the uptake of green bonds in Norway and Sweden from 2013 to 2019, that analysis helps to identify factors that can be used by other countries and, therefore, can contribute to the growth of green bonds in different markets (Torvanger et al., 2021). It is of interest for the development of the financial market in general to assess the impact of the implementation of green bond policies by European insurance companies on their share



prices. Scientists positively estimate the development of green bonds in Europe (Jakubik & Uguz, 2021).

The empirical response of the stock market and credit default swaps (CDS) to the issuance of the green bonds by 10 EU countries during the period 2016–2021 is investigated. It was concluded that the issuance of the green bonds is considered by investors as the behavior of the EU countries, which increases the value and reduces the risks. The issuance of sovereign green bonds is a powerful signal of a certain country's commitment to a low-carbon economy by increasing social and reputational benefits. This effect is even more noticeable during the pandemic crisis. The reaction of the equity and CDS market is determined by several factors, such as bond and country features. Overall, our results suggest that sovereign green bond issuance acts as a country risk mitigation mechanism (Dell'Atti et al., 2022).

The relationship between five energy markets (crude oil, natural gas, fuel oil, gasoline, and coal) and green bonds was studied using a time-varying optimal copulas (TVOC) model. Analysis of the efficiency of the hedging has shown that green bonds can effectively hedge most energy commodities (Naeem et al., 2021).

The non-linear impact of green bonds, conventional bonds and energy resources on the behavior of the European Union cap-and-trade carbon market (European Union Emissions Trading System [EU-ETS]) is assessed. Estimating four models using Markov-switching (MS) econometric methodology, non-linearity is confirmed in the dynamic behavior, the global calculations demonstrate the positive impact of green bonds (S&P Green and Sol Green) on the carbon market, in both high and low volatility modes, whereas conventional bonds (S&P Agg) and energy commodities (DJCI En) contribute to the carbon market in high volatility modes. The importance of green bonds is emphasized while determining the behavior of the carbon market, in addition to the greater stability of the low volatility mode. These results allow both investors and fund managers to implement strategies for different scenarios of volatility or economic activity using a diversified portfolio and environmental/climate structure (Leitao et al., 2021).

The research underlines that the EU has adopted a new development strategy based on the "green" growth and announced carbon neutrality by 2050. However, the previous EU development approach was mainly based on trade openness and globalization with positive economic and negative climate impacts. The hypothesis of carbon emissions caused by globalization was tested to estimate the possible future path of development.



The Arellano–Bond estimator was employed for dynamic panel analysis in 26 EU countries over the period 2000–2018. A significant and positive relationship was found between economic globalization and passenger mobility and greenhouse gas (GHG) emissions, while environmental taxes can correct the negative climate effect. On the other hand, social and political dimensions of globalization reduce negative climate impacts. To achieve net zero emissions, the EU needs to continue its global climate leadership, extend the use of environmental taxes, and stimulate economic growth based on low-carbon technologies such as hydrogen, energy storage, and CCUS (Vlahinić Lenz & Fajdetić, 2021).

Considering the purpose of our article, the research of Ukrainian scientists analyzing the best practices of the EU and the possibilities of their implementation in Ukraine is of interest. The authors identified the main prerequisites for the development of the green bond market in Ukraine and identified the attractive courses of the green bond market for investors. Possible economic, social, political and environmental benefits of the green bond market for issuers were highlighted in order to attract their attention and develop the green bond market in Ukraine (Chygryn et al., 2018).

Data and methods

The purpose of this article is to carry out an empirical comparative analysis of the implementation and circulation of green bonds in the EU countries, an assessment of the best practices of the European countries, in particular Lithuania, regarding the application of the framework of financing environmental projects through the use of green bonds. Besides, the creation of recommendations on the development course of the green bond market in Ukraine, which will be integrated into the single European area for green investment projects.

The economic concept of green bonds as a framework for financing green investment projects was studied using the dialectical method of cognition, which allows researching economic phenomena in the process of their development and interrelationship. Graphical financial analysis was used to explore the dynamics and trends of the development of the green bond market in European countries. The methods of analysis and synthesis, induction and deduction were used to substantiate the recommendations regarding future trends of the green bond market in Ukraine, which will be integrated into the single European area of green investment projects. The methods of correlation-regression analysis, as well as economic forecasting, were used to determine the prospects for the development of the green bond market in Ukraine and its impact on the dynamics of the development of environmental (green)



investment projects.

The research was based on the information contained in the regulatory legal acts of the EU, the EU member states and Ukraine, governing the green bond market. To evaluate the best practices of the EU countries utilizing green bonds for financing green investment projects, official data from the European Commission, the World Bank, the IMF, the data from statistical yearbooks and information and analytical bulletins, and other official sources of information are used. Publications containing data on the volume of green bond issuance are analyzed. A number of scientific methods are used to evaluate the best practices of the European countries applying the framework for financing environmental projects through the use of green bonds.

Empirical results and discussion

In 2021, the annual offering of the green bonds exceeded the half-trillion mark for the first time and amounted to 522.7 billion US dollars, which is 75% more than in 2020. Europe was the most prolific issuance region (in 2021, the volume of green bond emissions in Europe amounted to 264.9 billion USD) (Fig. 1.).

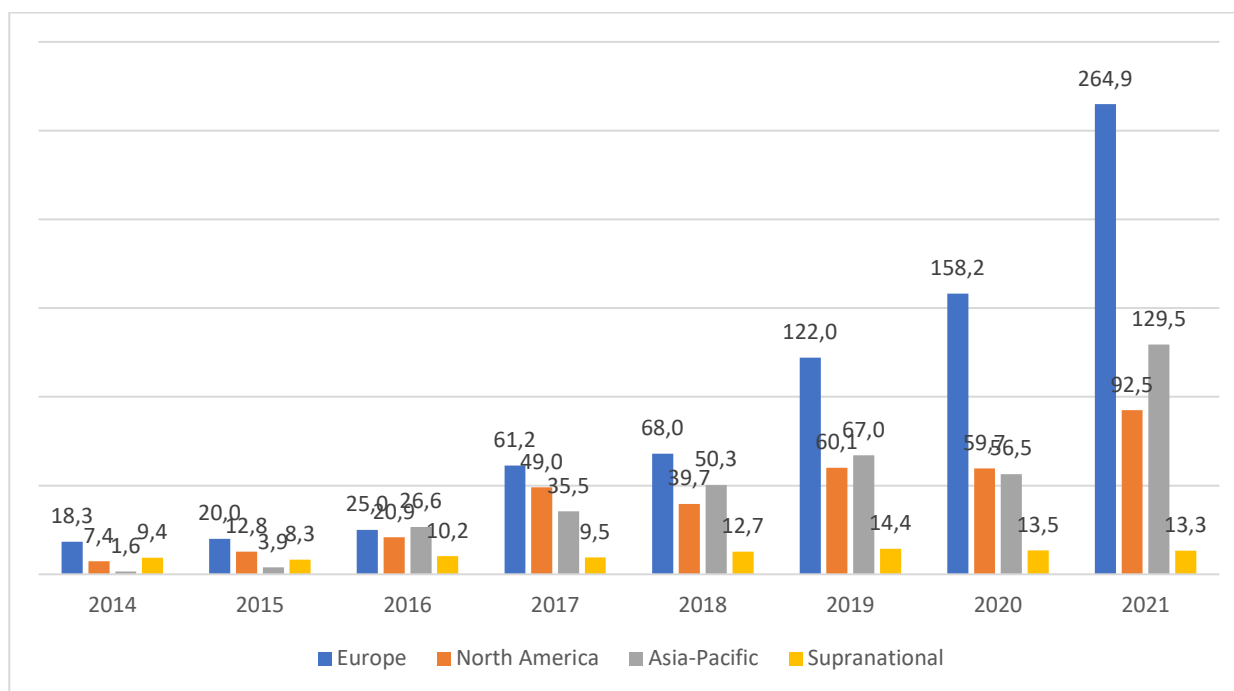


Fig.1 - The volume of green bond issuance (2014-2021), billion USD

Source: <https://www.climatebonds.net/market/data/>

Europe will remain the principal center of development of the green bond market. Even rising interest rates and geopolitical uncertainty following Russia's aggression against Ukraine will not affect new issues of the green bonds.



The main distribution of green bonds issuance in Europe in 2021 were Financial corporate (31%), Sovereign (24%), Non-financial corporate (21%), Government-backed entity (15%), Development bank (6%) (Fig.2).

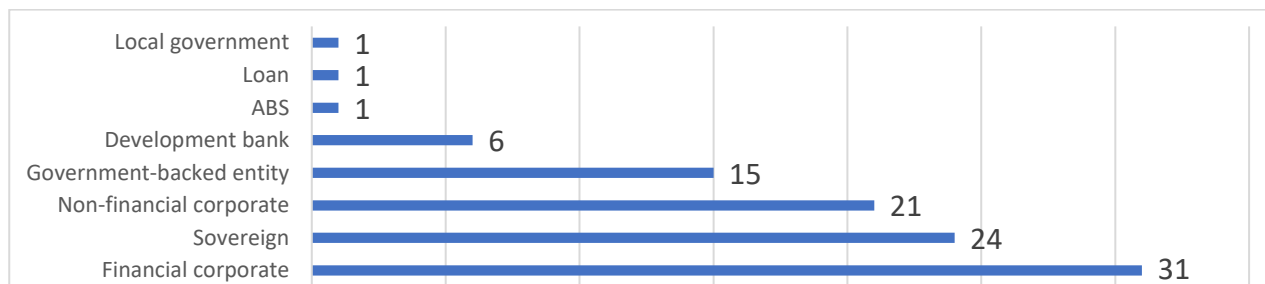


Fig.2 - Distribution of green bonds issuance in Europe in 2021, by issuer type (%)

Source: <https://www.statista.com/statistics/1078071/green-bonds-issuance-value-europe/>

France, Germany, the Netherlands, Sweden and Spain were the leaders in the volume of green bond issuance in the EU in 2021 (Fig.3.). Lithuania and Ukraine are still only increasing their potential for the development of the green bond market by building up their own practices and taking into account the trends and dynamics of the developed EU countries.

Germany and France also became the leading issuers of the green bonds in Europe in the first quarter of 2022. Germany leads the region with 15.9 billion USD of the international offering of the green bonds, followed by France with 7.6 billion USD (Tanchico & Ahmad, 2022). The Scandinavian region is also among the leaders in the EU in issuing the green bonds.

Empirical analysis showed that the war in Ukraine had a negative impact on almost all socio-economic aspects throughout Europe, including the green bond market. The offering of the green bonds decreased in the first quarter due to uncertainty related to the military aggression of the Russian Federation against Ukraine and threats to other countries, including the EU member states. Among such countries is Lithuania, which is at the forefront of supporting sanctions against Russia.

Thus, the volume of sales of the green bonds decreased in the first quarter of 2022 by 23.9% (Fig. 4).

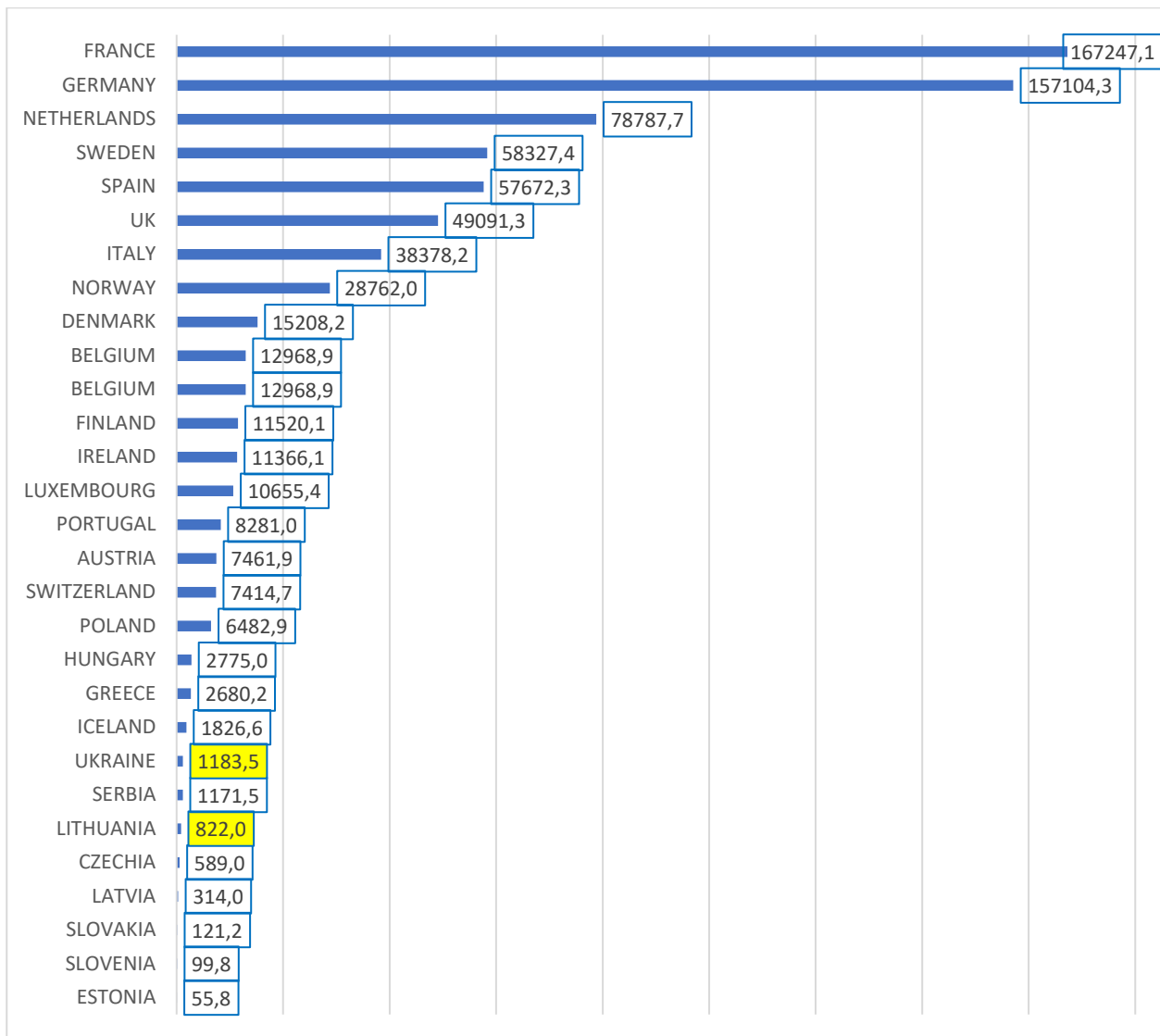


Fig.3 - Volumes of the emission of green bonds in European countries in 2021, million USD

Source: <https://www.climatebonds.net/market/data/>

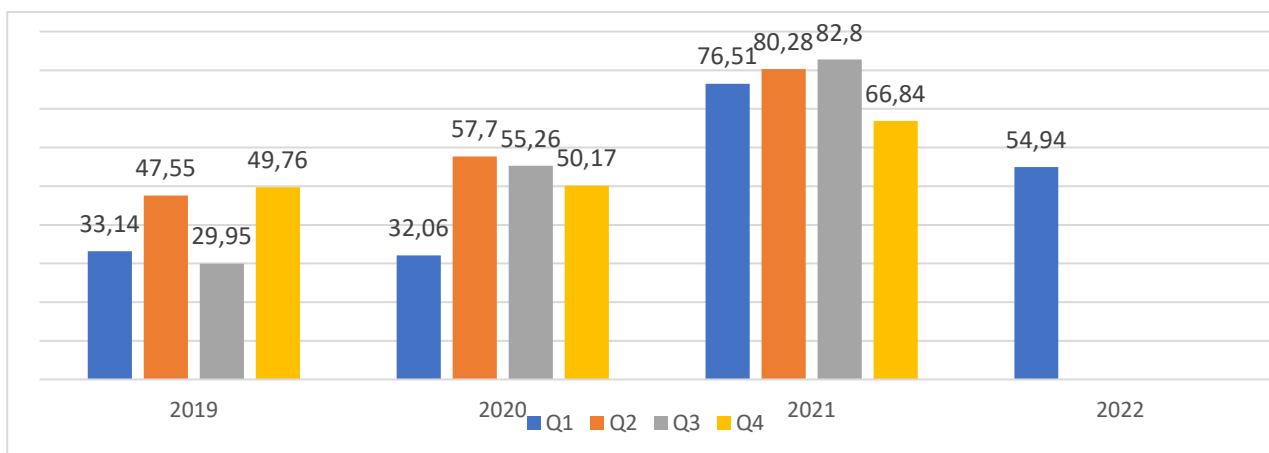


Fig.4 - Volumes of green bonds issuance in Europe in 2021, billion USD

Source: <https://www.climatebonds.net/market/data/>



Pessimistic forecasts regarding the world economy due to Russia's invasion of Ukraine also affected the financing of green investment projects, in particular in the energy area regarding reducing greenhouse emissions.

It should be emphasized here that the implementation of green projects is one of the factors of economic growth, which is determined in particular by means of economic and mathematical modeling. The data from the EU countries were selected for our analysis given the purpose of the article.

The modified economic growth function (formula 1) was used for the analysis:

$$GDP=F(GI, GHG, RE), \quad (1)$$

where GDP – gross national product,

GI – green investment,

GHG – greenhouse gas emission volume,

RE – share of renewable energy sources in the total energy consumption.

To analyze the data, the function (formula 2) will be utilized:

$$\ln GDP_{it} = \phi + \alpha \ln GI_{it} + \beta \ln GHG_{it} + \gamma \ln RE_{it} + \mu_{it}, \quad (2)$$

where α, β, γ – regression parameters;

μ – statistical error;

$i=1, \dots, N; t=1, \dots, T$.

The results of the analysis demonstrated the existence of a relationship between the chosen parameters. Based on the main empirical calculations (using the cases of the enterprises of the EU countries and Ukraine) it was determined that a 1% increase in the volume of green investments attracted to the business sector can ensure a 6% increase in the GDP generated by economic entities in the business sector of the economy; the reduction of greenhouse emissions by 3%; the growth of the share of the renewable energy sources in total energy consumption by 5%. This approach provides grounds for substantiating the ecological and economic effects of the growth of green investment volumes.

Thus, the best practices of the EU proved that in the long run the development of the green bond market and investments in green projects will ensure sustainable economic development in accordance with the European Green Deal.

The European Green Deal is a plan to decarbonise the EU economy by 2050, revolutionise the EU's energy system, profoundly transform the economy and inspire efforts to combat climate change. But the plan will also have profound geopolitical repercussions. The Green Deal will affect geopolitics through its impact on the EU



energy balance and global markets; on oil and gas-producing countries in the EU neighbourhood; on European energy security; and on global trade patterns, notably via the carbon border adjustment mechanism. (Leonard et al., 2021).

Standardization of the green bond market remains up for the discussion. The researchers noted that the green bond market is growing and becoming increasingly important for green financing and the transition to a low-carbon economy. However, it is obvious that the green bond market is largely non-standardized. There is no widely accepted definition of the term "green". This is considered as one of the toughest challenges when it comes to the development of the green bond market, which led to the creation of the EU Green Bond Standard. However, the researchers noticed that new standards have their pros and cons. The results of the study showed that Nordic green bond issuers generally approved of the EU green bond standard. The EU GBS has an admirable purpose to harmonize and expand the green bond market. However, the standard carries challenges that are largely well-known issues that the EU GBS aims to address, such as cumbersome reporting processes, lack of initiative and reputational risk. In addition, it is argued that the standard is not fair and applicable to all countries and companies. National laws of countries may not always go hand in hand with the standard. For example, in Scandinavian countries, the requirements for green buildings are considered difficult. If these problems are not taken into account, the Nordic green bond issuers fear that the market will not grow, but shrink instead. In addition, the Nordic green bond issuers argue that the adoption of GBS by the EU is not a guarantee for the issuers. For other issuers, the demands of the investors and the positive impact on the reputation of their company are considered key factors in adopting the standard (Björkholm & Lehner, 2021).

Conclusion and recommendations.

The purpose of this research was to conduct the empirical comparative analysis of the implementation and circulation of green bonds in the EU countries, evaluating the best practices of the European countries applying the framework of financing environmental projects using the green bonds. Besides, the creation of recommendations on the development course of the green bond market in Ukraine, which will be integrated into the single European area for green investment projects.

The study demonstrated that the green bond market in the EU is developing dynamically, ensuring the GDP growth and sustainable economic development. Also, the best practices of the European countries showed that the effective development of



the green bond market is possible only in the case of the implementation of a common integrated government policy.

The majority of the countries implemented relevant legislation, determined the approaches to stimulate the development of the green bond market, and established new international investment standards. The formation of the green bond market in Ukraine requires harmonization with the European legislation, the use of the world's leading green investment practices, adapted to national conditions.

The development of the green bond market in Ukraine is also a systemic issue of the stock market, energy sector, manufacturing, housing and utility services, agro-industrial complex, etc. Politically and economically motivated decisions to implement and create the green bond market should be made for many sectors of the economy and be coordinated with the principal market participants. The governments of the EU member states adopt relevant action plans, which are used as a reference point when developing strategies for organizing the relevant market and attracting financing to implement environmental projects by issuing green bonds in various sectors of the economy.

The barriers to the development of the green bond market in Ukraine are insufficient awareness of government authorities of all aspects of the implementation and development of the green bond market; insufficiently clear division of competencies, low level of coordination of activities and institutional capacity of the government authorities regarding planning and implementation of actions in the specified area; the need to improve the regulatory framework in this area in accordance with the EU standards.

Therefore, it is advisable to take the following steps to facilitate the development of the green bond market: to create institutional and regulatory conditions for the development of the green bond market; to ensure the attraction of financing to implement the green investment projects by issuing green bonds; to offer economic incentives for the development of the green bond market and to create, if necessary, relevant government target programs; to support the implementation of projects for the emission of the green bonds by various categories of issuers involving the EU aid programs, foreign governments, international organizations and donor institutions; to achieve cooperation of the international development banks to improve the credit quality of green bonds of Ukrainian issuers and to invest in green bonds of Ukraine

Also promising areas of cooperation are the participation of Lithuanian companies in the Ukrainian sector of energy efficiency and bioenergy; the involvement of



Lithuania in the work on the green bond market of Ukraine; the implementation of joint projects for the production of biomethane and "green" hydrogen in Ukraine (Government Portal, 2021).

The implementation and development of the green bond market, financing environmental projects through the issuance of green bonds will positively affect the quality of life of the citizens as a whole, improve the state of the natural environment, and spread "green" technologies both in the short-term and in the long-term.

The implementation of the above-mentioned recommendations will make it possible to: increase the amount of financing for the green projects; contribute to reducing the consumption of fuel and energy resources and lowering greenhouse gas emissions; stimulate the development of the green bond market in Ukraine using the EU best practices; improve the investment attractiveness, business climate and competitiveness of the state; stimulate socio-economic development in Ukraine; contribute to the achievement of the national strategic goals, as well as obligations undertaken by Ukraine as a candidate for the EU membership.