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Green Finance in the Context of Digitalization: Implications for International Business

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Abstract: The importance of the study lies in the growing value of green finance in the context of the rapid digitalization of public life and the expansion of international business directions. It has been established that green finance is the leading tool for influencing the world's major economic players.

The purpose of this scientific article is to study the state of green bond issuance and analyze the role of green finance in the digital environment.

The study used data from authoritative sources and projects in the financial and economic fields that are directly related to green finance. An analysis of green bond issuance indicators for the period 2020-2024 was carried out, which made it possible to establish the main trends in the development of green finance as a tool for influencing the digital economy. Using statistical computer programs, changes in the main indicators of green bond issuance were calculated.

The paper analyzes the essence of the concept of "green finance" and establishes its relationships with the concepts of "digital economy" and "green bonds". It has been established that green finance is an important aspect of the transformation of international business, which is due to modern environmental trends. However, a problematic area of development of green finance is information barriers, since information about green finance spreads rather slowly and is available only in narrow circles of the business environment. Further directions of development of green finance are also considered, including the provision of environmentally friendly renewable energy sources and a general focus on environmental problems.

It has been determined that green finance contributes to the development of international business and the digitalization of the economy. It has been established that the role of the state in increasing the volume of green bond issuance is quite significant, because with its help, it is possible to overcome existing barriers [4]. It is necessary to disseminate more information about green finance, which will allow development of an innovative economic environment. Green finance is a key tool for transforming international business in the digital economy, ensuring sustainable development and introducing innovative financial mechanisms. However, to fully realize the potential of green finance, it is necessary to overcome barriers, including information asymmetry, fragmented regulation and political instability in some regions.

Keywords: digital economy, digital economy, green bonds, green finance, government, international business.

Introduction

The concepts of "green finance", "digital economy", and "green bonds" are rapidly being introduced into international business. The development of economic cooperation between strong market players and the strengthening of globalization processes are changing the vision of traditional approaches to financial solutions. Attention is growing to non-traditional projects, which allows us to reflect the modernization of the entire economic world. Such projects include, in particular, ideas in the field of finance and the environment. Accordingly, the phenomenon of "green finance" is emerging, which is "financial instruments aimed at supporting sustainable and environmentally friendly projects" [1].

The development of projects related to green finance is evidence of the increased attention of business and economic organizations to solving environmental problems. Modern environmental issues, in particular, the accumulation of garbage, water and air pollution, and the problems of hazardous waste processing, require the involvement of all economically active forces, and not only the state and specialized companies. At the same time, this requires the formation of an idea of the economic benefit from the implementation of environmentally friendly initiatives [2].

Green finance mobilizes leading market players, promotes the creation and implementation of environmental innovations, and shapes socially responsible business [3]. This results in redirecting funds to important projects and engaging businesses in working on effective environmental programs. Green finance has a number of advantages over traditional investment instruments, but existing problems in the global economy and politics hinder their development [4]. Types of green finance are as follows: "green loans", "green investments", and "green bonds". "Green loans" are the receipt of funds from banks and financial institutions by organizations under debt obligations for the implementation of environmentally friendly projects, which is also due to the availability of lower deposit rates [5]. "Green investments" involve companies investing in environmental projects [6]. "Green bonds" are debt securities issued to finance environmentally friendly projects [7].

Sufficient attention from economic players is currently paid to green bonds, which have not only economic but also social impact, and they are also aimed at activating participants in the "green market" [8]. This allows for the development of public-private partnerships, during which governments and the private sector are interested in investing in projects aimed at solving environmental problems [9].

At the same time, the development of green finance and green bonds has a significant impact on the modern digital economy. The "digital economy" is interpreted as "economic activity built on computer technologies" [10]. The digitalization of the economy reflects fundamental changes in business models, where the use of the Internet, cloud technologies, marketplaces to promote products and provide business services is an indicator of economic growth. An economy built on computer systems and a virtual environment is focused on creating new jobs, increasing labor productivity, automating key processes, reducing costs, and improving the availability of socially important services [11].

The relevance of the topic is determined by the fact that the growth of competition in the digital economy and the rapid introduction of innovations require business orientation towards green finance. Investments in the development and implementation of environmental projects are a tool for adapting international business to an unstable environment and expanding the possibilities of digital transformation.

The main aspects of the study are the analysis of green bond issuance indicators for the period 2020–2024, which reflects the main trends in the development of green finance as a tool for influencing the digital economy. The main statistical data are demonstrated, which reveal the dynamics of green bond issuance during the specified period and depict the activity of digital platforms.

The purpose of this scientific paper is to study the state of green bond issuance and analyze the role of green finance in the digital environment, determine the interpretation of such concepts as green finance, "digital economy", "green bonds", describe the impact of green finance on transformations in the digital economy and international business, and establish prospects for the development of the green finance sector.

Literature review

The issue of green finance as a tool for the transformation of international business in the digital economy has been studied by a number of researchers. Scientists B. Lucsiv, T. Mayorova, P. Lucsiv drew attention to the fact that green finance is an indicator of the level of the state and is able to ensure its competitiveness in the international market. This phenomenon is related to the fact that for a long time the economy and ecology were opposite directions of state development, where the economy was reflected as an aggressive environment, and ecology, on the contrary, was perceived as a sphere that develops slowly and has no leverage to influence government decisions. However, currently, the management of the state, which seeks to occupy key positions in world politics, must be based on innovations. Such non-standard solutions are green finance, which is aimed at sustainable development of society and ensuring environmental solutions. Currently, such areas of green economy as blockchain, bioeconomy, circular, low-carbon are leading in ensuring the impact of green finance on the international market [5, 12].

Scientist O. Krushelnytska emphasizes that "green finance" as a field is currently developing quite rapidly. Previously, companies sought to invest in new projects in order to create a positive image. These were frequently youth-led ventures with intriguing goals that could not yield substantial returns on investment. Nowadays, company owners can no longer risk their money as the business environment is volatile. As a result, green market projects are becoming more and more popular in the current environment because they have the potential to be profitable, are founded on cutting-edge technologies and scientific solutions, amass substantial resources, and can be swiftly turned into a finished product [6].

It has been established that the financial world cannot develop separately from the existing environment. The financial sector is limited in promoting traditional directions since there has long been competition in those areas that are popular among individuals and clients. The state should also be involved in solving problematic aspects of the financial world, which will allow to normalize and regulate relations between key players. The involvement of the state in the format of public-private partnership in the digital economy and green finance will allow to form a legal framework for cooperation between various representatives of business and the green market, since currently this area requires harmonization in the legislative dimension. The state should strengthen cooperation with the banking sector, which will allow to fully understand the role and place of green finance in the current economic system [13].

Green finance is aimed at various areas of environmental protection and solving environmental problems. Business representatives are advised to pay attention to the following aspects that will help make investments profitable. First of all, you need to pay attention to environmental projects that have a specific goal. They should contain a precise vision of how to actually solve the problem with the help of available resources and additional funds. In this aspect, small projects that are aimed at solving local environmental issues are valuable, but they are realistic to implement because they are defined by clear geographical boundaries. It is recommended to invest in environmental projects with a defined business model, where the benefits for all parties are defined. The project should be reviewed by a number of experts who have an understanding of the implementation of environmental initiatives. The entire period of cooperation should be accompanied by reporting from the environmental project management on the implementation of the identified initiatives and the use of funds [14].

The place of green finance in the development of the digital economy of international business is determined by the fact that the economy requires new strategies, takes into account the priority of solving environmental problems, and depends on the amount of available resources [15, 16]. The introduction of green finance as a tool for influencing economic players also involves the inclusion of society, which reacts sharply to environmental problems [17]. Green finance is mostly aimed at solving problems with deforestation, preserving protected areas, recycling waste, preserving ecosystems. Despite the fact that they cannot solve global environmental problems and are mainly aimed at solving local environmental problems, green finance generally contributes to economic growth [18].

Studies related to international business and the digital economy demonstrate the social and environmental orientation of economic players. Social orientation is due to the fact that for their development, companies must have sufficient information about customer needs and risk factors [19]. To this end, organizations closely assist society, in particular, those who find themselves in difficult life circumstances, which allows them to obtain data on customer requests and understand promising development directions [20].

At the same time, environmental orientation is related to the need to make investment decisions. Investing in green projects is a historical and cultural tradition of responsible business, which could solve undesirable environmental phenomena at the local level. The digital economy and international business are investing in environmental projects because such initiatives are unique and allow building sustainable connections between society and progress. The issuance of green bonds is an attempt by the state to initiate cooperation between leading economic players and government structures [21, 22].

Theoretical analysis of the issue of green finance as a tool for the transformation of international business in the digital economy has revealed the interest of scientists in this issue [23, 24]. The scientific basis is complete and indicates that this issue has been developed at a sufficient level. It has been determined that green finance affects international business and the digital economy through the implementation of mostly local projects that are able to solve specific environmental problems.

Materials and methods

The methodological basis of the scientific article is a comprehensive analysis of the volume of green bond issuance as an indicator of the impact of green finance on transformations in international business and the digital economy. For the purpose of the analysis, statistical data for 2020–2024 related to the issuance of green bonds were systematized [25–27].

The research presents data taken for each year in graphical and tabular format, as well as information on the areas of financing of environmental projects for which green bonds are spent.

By calculating the bond issuance of each year, the main aspects of changes in bond issuance were identified. The dynamics are demonstrated by indicating both indicators related to the decrease and indicators related to the increase in the volume of bond issuance. In general, the methodology contained comprehensive and structural information on changes in the volume of bond issuance. The data are provided with accurate calculations to establish the informativeness of the indicators.

Monitoring the main trends in the issuance of green bonds allowed us to identify trends in this area and develop forecasts for further changes. By using computer and statistical programs, the results were visualized, which made it possible to clearly demonstrate trends in the impact of green technologies on international business and the digital economy.

The research is based on the indicators of the largest issuers that issued green bonds for the period 2020–2024. The financing features of each environmental project are identified, which shed light on the political attitudes of the issuers.

A comprehensive analysis of the research problem allowed us to identify qualitative and quantitative changes in the issuance of green bonds. The digitalization of the economy and the growth of the competitiveness of international business are the factors that green finance can influence, and at the same time, the factors that influence green finance. It was determined that the research conducted is systematic and holistic in its implementation. The analysis tools used are qualitative in terms of data reliability.

Results

After analyzing data on the issuance of green bonds for 2020-2024 in the world, the following data was obtained, which is presented in Figure 1.

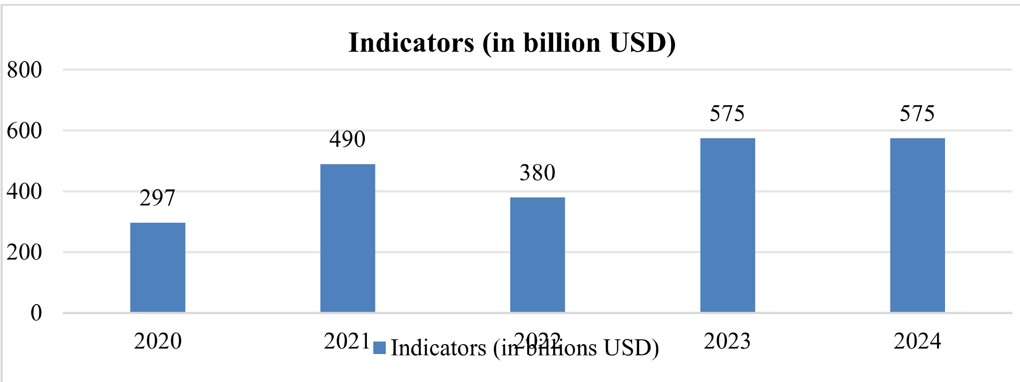

Figure 1. Green bond issuance indicators for 2020–2024 in the world (in billions USD)
Source: compiled by the authors

The results obtained indicate a gradual increase in the volume of green bond issuance. In 2021, an increase of 60.6% compared to 2020 can be observed. In 2022, there is a decrease of 77.5% compared to 2021. The indicators for 2023 and 2024 are higher than the indicator for 2022 by 60.0%.

2020 can be characterized by the predominance of green bond issuance, which were aimed at implementing clear environmental initiatives. These were mostly global projects that were supposed to solve important environmental protection issues. The largest number of green bonds in 2020 was sold in the Pacific and Asia regions, amounting to $55 billion.

The reason for the sharp increase in issuance in 2021 is that, unlike in prior years, more focus is being placed on a variety of projects rather than only particular environmental projects. In fact, investors have been given the opportunity to invest in those projects that will definitely bring a positive result. In 2021, the share of specific green projects was only a third of the green market compared to 2020, when such projects made up 90% of the market. The largest issuers in the green bond market are financial institutions and utilities.

In 2021, the largest number of green bonds was sold in the Asia-Pacific region, where the amount of sales reached $ 125 billion. At the same time, countries in the European region began to actively issue and buy green bonds. Already in 2021, the volume of green bond sales in Europe reached almost half of the global market [28].

In 2022, there was a decline in the volume of green bond issuance. The reasons for this include the formation of strict monetary policy rules around the world, the war in Ukraine, and market volatility. There was a decline in issuance and a decrease in the number of companies with a sustainable business model for environmental projects. EU regulatory initiatives have led to an increase in green bond sales. Germany issued $16 billion in green bonds and France issued $8 billion, indicating a gradual expansion of the market. Denmark has begun issuing green bonds in the form of souvenirs [29].

In 2023–2024, the growth in the volume of green bond issuance is characterized by the fact that the environmental focus of international business is gradually increasing. Small companies and institutions are gradually being involved in the green bond issuance system, which will allow expanding the areas of green projects, activating financial mechanisms, modernizing infrastructure, and contributing to energy conservation. The increase in volumes and frequency of issuance indicates the expansion of the market and the inclusion of new participants in the system. The world's leading economies are trying to form a public-private partnership that is beneficial for all participants, where the purchase of green bonds is a step towards the introduction of new financial instruments [30].

In 2025, the green bond market only expanded. This can be explained by the fact that green finance is a new tool for investing funds, the ability to establish the type of expenses, the availability of targeted financing, systematic reporting of the issuer to the investor on the volume of work performed and the level of budget development.

It is advisable to demonstrate the following factors that have an impact on the green bond market, which is presented in Table 1.

Table 1. Factors influencing the green bond market

Factor type	The essence of the factor
Regulatory	Changing legislation and standards regarding economics, financing, green markets
Ecological	Environmental issues and the actual environmental impact of the project
Reputational	The use of green PR as a form of marketing, where under the guise of using funds for environmental problems, they are spent on other needs; inconsistency of sustainable development goals with project requirements
Macroeconomic	Market decline and growth
Debt	Features of market structure, rate, term

Source: compiled by the authors

Political factors are also no less important. Risk perception is determined by the security situation, political attitudes, and the general economic situation. In 2022, the war in Ukraine also had an impact on the decline of the green bond market, while before 2022 the market confidently demonstrated growth indicators.

Discussion

At the current stage, the growth of the green finance market can be explained by the development of the digital economy, where tools such as data analytics, blockchain, artificial intelligence, increase the reliability of the implementation of environmental projects and allow green initiatives to integrate into international business. With the help of digital platforms, it is possible to check reports on the use of funds and determine the level of finance utilization. At the same time, computer technologies contribute to the quick and effective placement of messages about green initiatives in virtual space, which contributes to a high level of engagement of the target audience and international business.

The prospects for the issuance of green bonds and the impact of green finance on the digital economy and international business are the transition to a circular economy, increased capital investment in energy-efficient projects, increased international investment, and international integration. Currently, the main areas of the green market are the design of environmentally friendly cars, energy-saving projects, the use of renewable energy sources, zero-waste production, energy-efficient buildings, and ecological infrastructure of cities. Green startups, technologies to mitigate climate threats, and investments in sustainable solutions will be the primary future directions. Bonds will be issued as a result, drawing additional players to the green market.

The main problems of the green finance market at the current stage are the difficulties of legal regulation, the lack of complete information about green finance, the low level of cooperation between international business and environmental organizations. The countries of the Middle East and North Africa do not have stable approaches to solving the issue of green capital. At the same time, the natural conditions of the region are sufficient for the implementation of energy-efficient projects and the construction of a wind generation system. The lack of sufficient employment opportunities, the difficult political situation, and problems with the functioning of basic infrastructure negatively affect the willingness of investors to invest in environmental projects in the region.

For this region, as well as for others seeking to implement environmental projects, the solution to the problem is the introduction of public-private partnerships. The essence of this form of cooperation lies in long-term cooperation between the state and private business, which allows for the implementation of joint projects, pooling resources, and accumulating capital. For the government, the advantage of this form is the ability to spend money on other initiatives, and business gets the opportunity to spend money on important environmental initiatives. An example of such cooperation is the experience of the United States, which provided loans to businesses in the amount of more than $ 40 billion in the course of public-private partnerships [31].

The digital economy, through the use of digital marketing, actively promotes the development of the green market. Key economic players are forming a sustainable vision of green finance and creating models for managing economic risks. By using digital platforms, dozens of projects worth more than $22 billion were financed by such financial and economic institutions as Agricultural Bank of China Limited, Agricultural Bank of China Limited, Industrial Bank Co in 2024 [31]. These projects are aimed at water purification, irrigation, wind generation, solar energy, environmentally friendly public transport, smart cities.

Austria and Germany have allocated $7.4 billion by early 2025 for the construction of energy-efficient housing, the construction of "green" offices, decarbonization, and the launch of energy-efficient public transport [31].

China is also attracting available resources to expand the green finance market and develop environmentally friendly agriculture.

Conclusions

The results of the research show that green finance is a significant tool for influencing the digital economy and international business. This allows for environmental sustainability and helps attract more economic players to the green market. It has been determined that the implementation of digital technologies in the field of green finance allows for an increase in the level of investment in environmental initiatives, contributes to the expansion of the green bond market, and forms new areas of investment in environmental startups. The advantage of implementing digital technologies is the ability to thoroughly verify the received financial reports and disseminate information about green finance to the majority of economic players.

The dynamics of green bond issuance in 2020–2024 indicate a gradual growth of the green finance market. Despite the drop in issuance in 2022, the indicators for 2023–2024 are stable, indicating a gradual growth of the market. Prospects for further research indicate a shift in the global community's attention to green startups, the transition to a green economy, the development of a circular economy, and an increase in the volume of green bond issuance.

The forecast for the future development of the situation is the emphasis of researchers on the impact of policy instruments on green finance, which is especially relevant for Third World countries [32]. It is important to investigate how digital tools can expand the green finance market and encourage economic players to master this market [33]. It is necessary to pay attention to the possibilities of public-private partnerships for the development of the green finance sector and the transformation of international business [34]. It is advisable to develop models for integrating green finance into the digital economy and implementing innovative tools to influence sustainable global economic systems.

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