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Oleksandra Tverezovska

PhD Student, Trainee-lecturer of the Department of Financial Technologies and Entrepreneurship, Sumy State University, Sumy, Ukraine;
 ORCID: [0000-0002-4755-8699](https://orcid.org/0000-0002-4755-8699)

Larysa Hrytsenko

D.Sc. in Economics, Professor, Head of the Department of Financial Technologies and Entrepreneurship, Sumy State University, Sumy, Ukraine; e-mail:
l.hrytsenko@bjem.sumdu.edu.ua
 ORCID: [0000-0003-3903-6716](https://orcid.org/0000-0003-3903-6716)

THE ROLE OF GREEN PROJECT FINANCING IN THE ECONOMIC DEVELOPMENT OF UKRAINE

ABSTRACT

Modern innovation processes taking place around the economic system of Ukraine in the current conditions of ecological require scientific and technological development. It is impossible without the implementation of significant and effective investment projects and ensuring adequate funding. The development of the national economy requires the implementation of large-scale and effective eco-projects and the concentration of financial resources. Such a process, especially eco-project implementation has a significant impact on accelerating the modernization of the economy, increasing its competitiveness and investment attractiveness for the successful ecological post-war recovery and future sustainable economic and investment development in Ukraine.

In the article, the main theoretical and methodological principles of green project financing as a driver for the economic development of Ukraine in the condition of uncertainty are presented. In the scope of researched issue bibliometrics analysis of the essence of the terms "green finance" and "project financing" was held. The current situation of innovation projects financing the role and place of investment projects in the conditions of instability was investigated. With the help of the economical-mathematical analysis, the level of financial support of innovation activity and the correlation between the sources of project financing was analyzed. Additionally, the recommendations for eco-project financing implementation in Ukraine in the situation of instability were proposed.

Keywords: project financing, green finance, eco-projects, investments, economic growth, sustainable development, instability

JEL Classification: O11, O22, O44, F21, F36, F65, G01, I22, P18, P45, Q56

INTRODUCTION

An important factor in the well-being and quality of life of the population is the state of the environment. The focus of production only on maximizing its profits at the expense of harming the environment, as practice shows, turns into great losses not only for production but also for society as a whole. Such damages arise because of natural and man-made disasters, deterioration of the environment, and climate change in general. The war in Ukraine poses a serious threat to global environmental governance, particularly regarding environmental protection and biodiversity conservation. Some 30 per cent of the country's protected areas, covering 3 million acres, have been bombed, polluted, burned, or hit by military manoeuvres, according to its Ministry of the Environmental Protection and Natural Resources [13]. Many industrial plants are damaged or abandoned; wrecked sewage works gush their contents into rivers; damaged pipelines are filling wetlands with oil; toxic military scrap is spread across the land. The expansion of "green" financing in Ukraine will contribute to the solution of urgent problems caused by war to additional popular worldwide issues, such as a poor waste disposal system, air pollution by automobile waste, climate changes, etc.

The expansion of the green finance market is aimed at the financial ensuring the economy of sustainable development, which involves solving a complex of environmental risks, increasing the level of energy efficiency of the economy, improving indicators of social development, and improving the quality of the existing management system at all levels.

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World practice shows that reducing the anthropogenic load on nature and preserving the environment is possible thanks to the introduction of resource-saving technologies and technologies for the reproduction of natural resources for the purpose of sustainable development of the modern economy, its environmentalization and the development of a green economy. Green investment as a component of the state environmental and economic policy of Ukraine requires solving many problems at the macroeconomic and microeconomic levels to increase the investment attractiveness of the green economy. In view of this, the problems of saving the ecological situation in Ukraine in various ways and stimulating future economic development, including with the help of green finance, are becoming especially urgent.

LITERATURE REVIEW

Green finance forms part of the financial market, which includes tools and mechanisms to encourage investment in natural and ecological technologies, energy-saving innovations, methods of improving the environmental friendliness of transport, etc., to stimulate the investment of money in the green economy. Defining the essence of "green finance" is of great importance in the process of green project financing.

A great part of domestic and foreign scientists' research is devoted to the study of the essence of this definition. The term "green finance" is just emerging in Ukraine. There is no unified formulation of that term at the legislative level of Ukraine. However, scientists define the essence of green finance in different ways. Foreign scientists include Zakari and Khan (2022) [25], Zhao et al (2022) [26], Rasoulinezhad and Taghizadeh -Hesary (2022) [15], Ye et al (2022) [24], Taghizadeh-Hesary and Yoshino (2020) [21], Sachs et al (2019) [16], Munitlak-Ivanovic et al (2017) [14], Kharas and MacArthu (2016) [10], Schmidt-Traub and Sachs (2015) [17], Berensman and Lindenberg (2016) [2], and others. Ukrainian specialists include Karlin (2018) [9], Frolov (2019) [5], Glushchenko (2017) [7], Sushchenko (2018) [20], Latysheva (2018) [11], Dobrovolska (2018) [4], and others.

However, we acknowledge that there are considerable discussions among researchers as to the unified definition of the term "green finance". Obtaining a single clear and transparent formulation of green finance will serve as the basis for the working standards of world organizations that regulate sustainable development and determine the rules according to which the amount of financing is determined.

First of all, green finance makes it possible to mitigate environmental damage, at most the results of climate change on the country's economy and population. Also, it plays an important role as targeted financing that develops green growth. Because "green growth" is a new model of economic development that connects ecological and economic spheres, its implementation requires the assistance of the financial system, which will meet the requirements of capital financing of areas of the economy suitable for greening. The formation of green finance through the financial system is expressed as a set of economic relations between economic objects of different levels: the state, private investors and financial agents who form, regulate, and use financial instruments for the organization of sustainable development of the economy, by achieving economic, social, and environmental balance.

In our opinion, the most appropriate is the interpretation of the term "green finance", defined by Karlin (2018) [9], who formulates it through financial relations, measures and subjects that affect the conditions of sustainable development and are characterized by a significant share of the financial and economic use of natural resources on all levels. Additionally, the most complete, in our opinion, is the definition of "green finance" as sustainable financing that creates value and executes transactions of financial flows to generate real income and meet the long-term needs of the ecological economics of sustainable development. It is worth highlighting the following approaches to characterizing the essence of green finance as a process of combining the financial sector with transformational processes that contribute to the functioning of sustainable development. According to Dobrovolska (2018) [4], we can clarify the structure of approaches to defining the essence of green finance: as a process (integration of the financial sector in the process of economic transformation and financing of measures aimed at ensuring sustainable development); as a financial investment in various forms of manifestation; as financial flows contributing to sustainable development; as a stable financial system.

In a broad sense, green finance includes financial instruments for stimulating the development of renewable energy; financial organizations involved in attracting green investments, which finance and insure these investments. In this sense, green finance consists of "environmentally responsible investments" and requires support through state funding and active management of environmental sector risks in the entire financial system. Green finance in the narrow sense is defined as a set of financial products and instruments, such as "green" loans and "green" bonds, the development and application of which are intended to reduce negative environmental and climate risks. This is the financing of natural and ecological measures, the provision of ecological goods and services, the development of low-carbon projects and the reduction of exhaust gas emissions.

Based on all the above definitions of the green finance category, the author`s definition was formed. In our opinion, "green finance" is a set of financial instruments through which cash flows are directed to finance targeted projects in the environmental sector and with the use of which the environmental condition in the country is improved with the aim of future country`s economic development.

For more detailed research on the problem of green project financing, we conducted additionally a bibliometric analysis of the concept of "project financing". The main purpose was to study the bibliographic material and determine the main scientific directions in the researched field and the relationships between them. An important step of bibliometric analysis is the determination of the most reliable and appropriate sources for collecting information according to the purpose of the study. Therefore, it is important to choose a database for data collection. This study uses the scientometric database Scopus [18], in which the search field "Article Title, Abstract, Keywords" was used. Only publications written in English were selected for further consideration. Accordingly, 12968 articles were selected for further research.

Using the "Analyze search results" function, we analysed publications by year, author, affiliation, country/territory, type (article, book), subject area, sponsor. During the analysis of scientific publications obtained by the request for the keyword "project financing", it was established that the first publication dates back to 1950. The distribution of scientific works by year is shown in Figure 1.

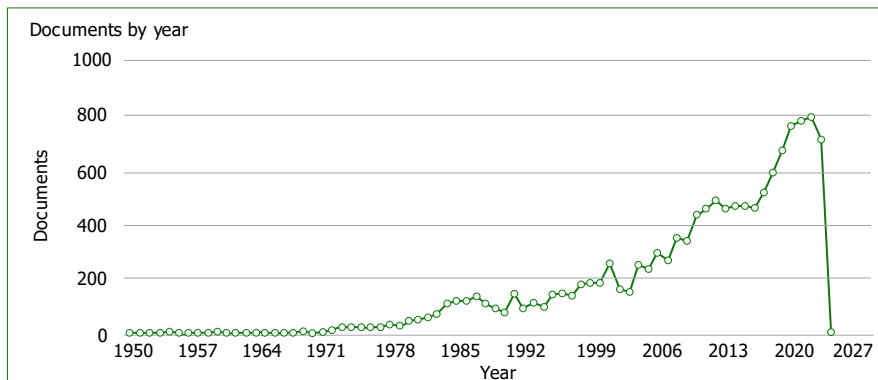


Figure 1. Dynamics of the number of publications on the keyword "project financing" from 1950 to the 2022 year. (Source: [18])

According to Figure 1, it can be noted that the problem we are investigating is becoming urgent in the last 15 years. The extreme growth began in 1990 and the number of publications is increasing still today. According to the Scopus database, the peak of publication activity falls in 2021 – 784 publications in Scopus in English. That is caused by the fact that the rapid development of humanity and the growth of its potential every year led to the deterioration of the environmental situation in the world, the decline of the planet`s natural resources and the emergence of significant risks. The world`s close attention to the deterioration of the environment and the emergence of ecological problems requires the development of new tools for the formation of environmental policy because one of the important components of the economic stability of any country is the preservation of the environment itself.

The top-5 countries that devoted great attention to the issue of project financing according to the analyse of the publication in Scopus in the period from 1950 to the 2022 year are the United States (3551 publications), United Kingdom (976 publications), China (876 publications), Germany (443 publications) and Canada (400 publications). This may be due to the presence of severe environmental pressures in this area, manifested in poor air quality, water scarcity and natural hazards, combined with high population concentrations. Ukraine in that rank has only 120 publications, which confirm the fact that the research in the sphere of project financing in our country is at a small level, compared with other countries.

Scientific publications related to project financing cover 11 fields of knowledge (Figure 2).

Analysing the data presented in Figure 2, we see that the most common fields are Engineering – 14.8 %, Social Sciences – 13.5%, Medicine – 12.2%, Business, Management and Accounting – 10.7%, Environmental Sciences – 9.0%, the number of other areas for publications are less than 9.0%. According to the above-mentioned data, we can confirm that project financing in the area of environmental sciences is among the most researched.

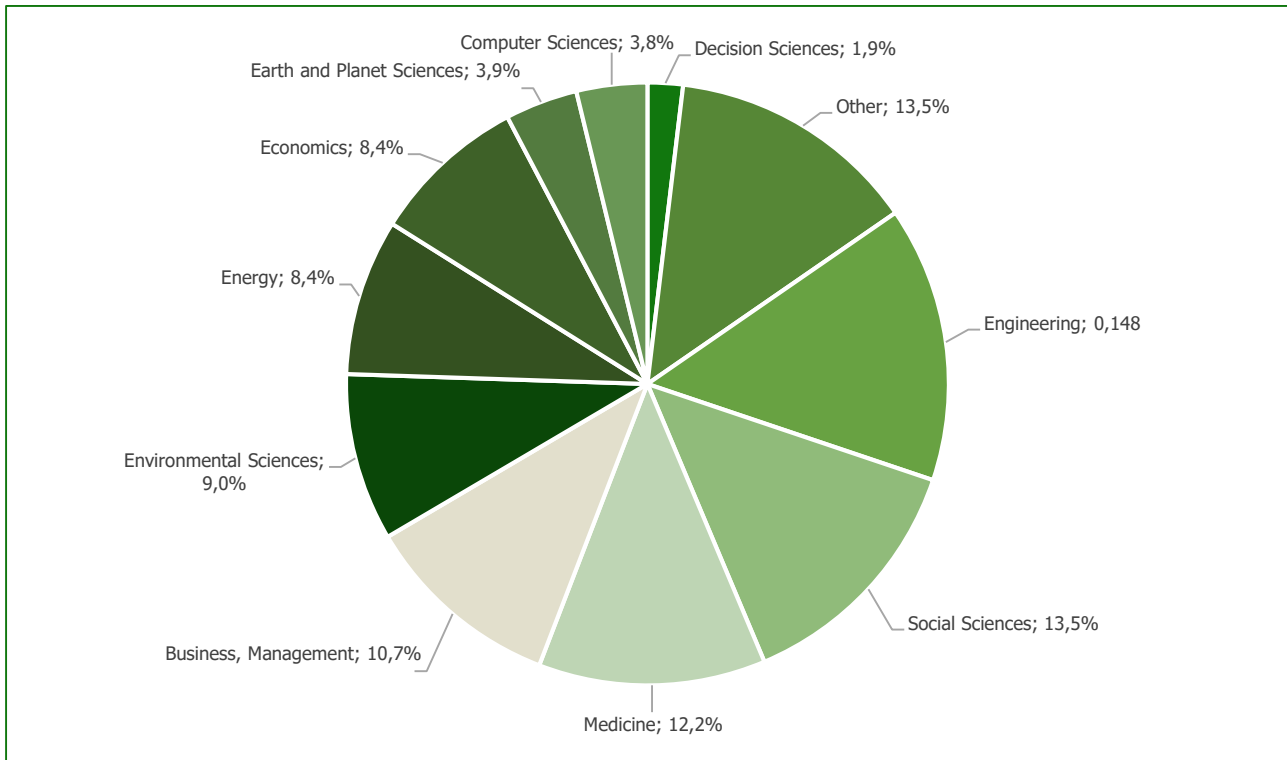


Figure 2. Fields of knowledge of scientific publications by research topic from 1950 to the 2022 year. (Source: [18])

To identify the most frequent keywords related to the research topic of "project financing", a relationship between them was formed with the help of VOSviewer (Figure 3).

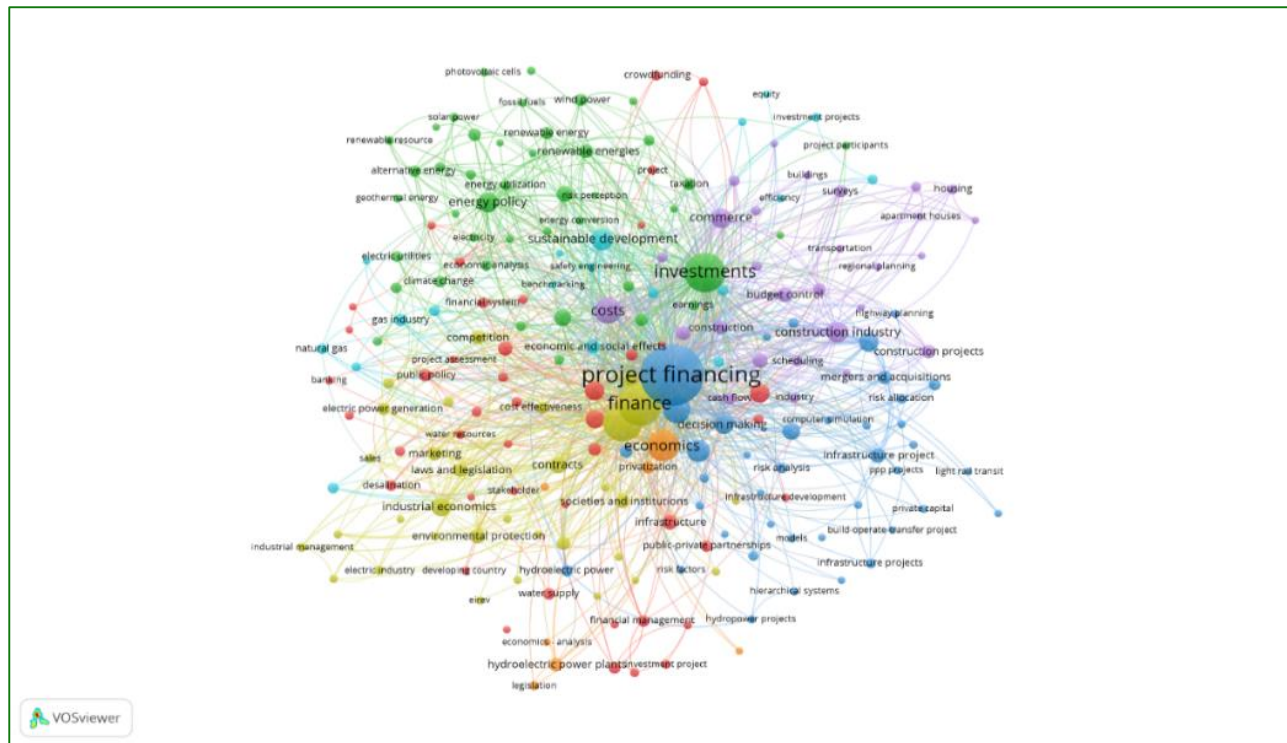


Figure 3. Visualization of the results of bibliometric analysis of scientific works devoted to the issues of project financing, grouped by clusters for the period 1950-2022. (Source: [18])

According to Figure 3, the clusters were formed by keywords. In total, these clusters represent the 22 most frequently occurring keywords. Different clusters are shown in different colours. The most common keywords on the basis of which

the clusters were formed are: "investments", "finance", "energy policy", and "sustainable development". This visualization demonstrated that, in general, the authors most actively connect the issue of project financing with the topical issues collected in the clusters. Moreover, investment, energy, climate changes and sustainable development – green cluster.

Additionally, the popular resource Altmetric [1] tracked more than 87.7 million mentions of 3.4 million scientific studies by social network users and compiled the TOP-100 most popular journal articles of 2020. The articles regarding climate policies in the framework of the subject area of Economics are among TOP-100 popular.

The analysis of the scientific literature on the research topic suggests that the issue of project financing in the environmental sphere in the framework of green finance is still urgent. A number of theoretical and applied problems remain unresolved in determining the nature, features, main directions of financial support of investment projects and mechanisms for their implementation.

AIMS AND OBJECTIVES

The aim of the article is to analyse the theoretical and methodological principles of green project financing as a driver for the economic development of Ukraine in the condition of uncertainty and to develop recommendations for eco-project financing implementation in Ukraine in the situation of instability for the ecological post-war recovering and future sustainable economic and investment development in Ukraine.

To reach these aims, the article will focus on different levels (specific objectives):

- investigate the role and place of investment projects in conditions of instability;
- observe the conceptual foundations, forms and methods of financial sources of innovation activities in Ukraine;
- investigate the problems and development prospects of financing investment projects in Ukraine;
- propose recommendations for the implementation of the financial support mechanism of eco-projects in the current conditions in Ukraine.

METHODS

The methods and approaches to be used are well established, such as logical-dialectical and historical methods (research of theoretical foundation of terms "green finance" and "project financing"); general scientific methods, namely synthesis, analysis, comparison, generalization (defining the role of projects financing in the future economic sustainable development); system-structural method and methods of economic-mathematical modelling (analysing the sources of financial support of innovation activity, which include project financing, in Ukraine), economic analysis and method of statistical research (to study the current situation of financial support in the environmental area), multifactor analysis (to make a research of the economic situation and develop further recommendations through the prism of a variety of factors and risks).

RESULTS

In the current conditions of economic crises in Ukraine and instability worldwide, the issue of innovation models for ensuring economic sustainable development, public-private partnership, investments, financial security at various levels of the economic system are very urgent and remained unsolved, especially in the condition of crisis.

The formation of green finance through the financial system is expressed as a set of economic relations between economic objects of different levels: the state, private investors and financial agents who form, regulate, and use financial instruments for the organization of sustainable development of the economy, by achieving economic, social, and environmental balance. The main idea of green finance is the absolute completion of the main idea of sustainable development. Today, according to the United Nations report [22], this policy has already been initiated by 170 countries of the world and the spread of green finance in the world continues to develop. First of all, green finance makes it possible to mitigate environmental damage, at most the results of climate change on the country's economy and population.

Also, green finance plays an important role as targeted financing that develops green growth. Because green growth is a new model of economic development that connects ecological and economic spheres, its implementation requires the assistance of the financial system, which will meet the requirements of capital financing of areas of the economy suitable for "greening". Green financing is generally referred to through the object being financed. First of all, we are talking about

the financing of green technologies, the provision of investments for green enterprises, and the development of conditions for the functioning of natural production. Green financing should be focused precisely on the results.

The world experience of using green financing is mostly positive, while in Ukraine it is only at the initial level. Recently, the idea of a green economy in the structure of sustainable development has taken on a particularly important role for Ukraine, because it is within the framework of the implementation of this concept that the leading prospects of Ukraine's economic development and the ways of achieving a high level of population prosperity in parallel with environmental protection for future generations are marked.

According to the Environmental Performance Index (EPI) [23], which calculates the combined environmental impact of all a country's policies combined. The 2020 EPI ranks 180 countries on 32 performance indicators related to environmental health and ecosystem viability, from the amount of particulate air pollution and clean drinking water to the health of fish stocks and wetland management. The top 10 countries at the EPI are Denmark, Luxembourg, Switzerland, United Kingdom, France, Austria, Finland, Sweden, Norway, and Germany (Table 1). Ukraine is on the 60 places in the rank and during the last 10 years, its indicator was changed only by 0.7 points. For instance, Denmark, which leads the rank according to the EPI, during the same analysed period changed EPI by 7.30 points. The low-developed countries are mostly at the end of the list, due to the insignificant economic development process.

The development of green financing directly depends on the level of development of the country's green economy and as we analysed in the above-mentioned table on the country's economic development. In order to find out its green potential, it is necessary to evaluate the economy using the Global Green Economy Index (GGEI) index [6]. The index consists of quantitative and qualitative indicators, with the help of which the potential of green development of each state is calculated in four directions: environment, efficiency sectors, leadership and climate change, markets, and investments.

GGEI is not the only index of environmental indicators of the economy of the world's countries, the fact that there are similar indices indicates the unconditional interest of the world in the prospects of sustainable development. Let us consider the rating of the GGEI index, according to the latest study in 2022, in terms of the leading countries of the world and the place of Ukraine in it. According to the research, the countries with a high level of economic development are among the leaders: Sweden – 0.799; Switzerland – 0.781; Norway – 0.747; France – 0.744; Denmark – 0.742; Iceland – 0.713; Austria – 0.711; United Kingdom – 0.704; Ireland – 0.703; Portugal – 0.701. This indicates their effective policy of stimulating and supporting governments of the "green" sector at the state level. Sweden, as a leader, is one of the most ecologically modernized countries in the world, which was one of the first to introduce an environmental policy. The policies of these advanced countries are focused on environmental innovation, branding and carbon efficiency, with the aim of promoting advanced "green" results.

Table 1. Most Environmentally Friendly Countries 2020 according to the EPI Rank. (Source: [23])

Country	EPI Ranking	EPI 2020	10-yr EPI change	Country	EPI Ranking	EPI 2020	10-yr EPI change
Denmark	1	82.50	7.30↑	Spain	14	74.30	8.60↑
Luxembourg	2	82.30	11.60↑	Belgium	15	73.30	2.10↑
Switzerland	3	81.50	8.60↑
United Kingdom	4	81.30	9.00↑	Venezuela	59	50.30	-0.5↓
France	5	80.00	5.80↑	Ukraine	60	49.50	0.70↑
Austria	6	79.60	5.40↑	Uruguay	61	49.10	1.00↑
Finland	7	78.90	6.00↑	Albania	62	49.00	10.20↑
Sweden	8	78.70	5.30↑
Norway	9	77.70	7.60↑	Giunea	175	26.40	-4.20↓
Germany	10	77.20	1.20↑	Sierra Leone	177	25.70	0.70↑
Netherlands	11	75.30	1.50↑	Afghanistan	178	25.50	5,00↑
Japan	12	75.10	-0.50↓	Myanmar	179	25.10	-1.20↓
Australia	13	74.90	5.50↑	Liberia	180	22.60	-3.70↓

Ukraine, unfortunately, ranks only 92nd in this ranking with a GGEI – 0.481. In 2021, Ukraine was at the 132 position, which can confirm the positive tendency. But in general, in comparison with other countries, the data indicates the low level of ecological modernization of the country and the improper implementation of effective stimulating measures in the

process of developing the green economy, which leads to a decrease in the attractiveness of investments in Ukrainian projects. Our country has great potential in the agricultural sector and therefore is very sensitive to environmental risks, first climate change. And therefore, it requires significant changes in the model of development of the national economy to support sustainable ecological development, through the use of green financing tools and financial support of eco-projects.

Analysing the final consumption expenditure of the general government by function during the last 5 years (Table 2) we can confirm that low attention is paid to the issue of environmental protection costs. The percentage of total expenditures for the 2017-2021 years is around 0.4-0.6%. At the same time in 2021, the most expenditures were in the sector of general public services, public order and safety affairs and health affairs and services. It was caused by a range of external and internal factors, such as the war in the east of Ukraine, the coronavirus crisis, deterioration of the country's security, inflation, and social factors.

Table 2. Final consumption expenditure of general government by function 2017-2021. (Source: [19])

	2017		2018		2019		2020		2021	
Final consumption expenditure of general government, mln UAH	616621	100%	739537	100%	746784	100%	814644	100%	985398	100%
General public services	54894	8.9%	59108	8.0%	65972	8.8%	68547	8.4%	194351	19.7%
Defense affairs and services	67978	11.1%	78102	10.6%	94100	12.6%	103802	12.7%	x	X
Public order and safety affairs	82981	13.5%	109307	14.8%	130677	17.5%	153820	18.9%	169163	17.2%
Economic affairs	40300	6.5%	62944	8.5%	37139	5.0%	40943	5.0%	48491	4.9%
Environment protection	2724	0.4%	3543	0.5%	4276	0.6%	4497	0.6%	5393	0.5%
Housing and community amenity affairs and services	7221	1.2%	8574	1.2%	10760	1.4%	10905	1.3%	17628	1.8%
Health affairs and services	95246	15.4%	112019	15.1%	114948	15.4%	159714	19.6%	192545	19.5%
Recreational, cultural and religious affairs and services	16011	2.6%	19054	2.5%	21440	2.9%	22852	2.8%	31364	3.2%
Education affairs and services	149841	24.3%	180476	24.4%	202654	27.1%	207186	25.5%	278581	28.3%
Social security and welfare affairs and services	99425	16.1%	106410	14.4%	64818	8.7%	42378	5.2%	47882	4.6%

But the biggest environmental problems remain unsolved even under other conditions of instability: a shortage of clean drinking water, global warming and climate change, droughts, and forest fires; among Ukrainian problems - the increase in the amount of household and industrial waste and atmospheric air pollution, among the problems directly in cities, villages and towns – the increase in the number household and industrial waste (54.1%). Moreover, the ecocide that is held by Russia against Ukraine during the war irreparably pollutes the water bodies and soils of Ukraine, destroying important energetical infrastructure.

The Minister of Environmental Protection [13], admitted, that damage from air pollution in the monetary equivalent has already reached about UAH 923 bln; of soil and land – more than UAH 138 bln. 40 Ukrainian oil depots were destroyed as a result of missile strikes, and more than 499.000 tons of toxic substances were released into the atmosphere due to fires. In 2021, about 2 tons of toxic substances were released into the atmosphere. During the six months of the war in Ukraine in 2022, emissions into the atmosphere will amount to 46 million tons. Rockets cause the worst damage to the environment: their fuel poisons the soil and water provoking chemical poisoning of the environment. Additionally, waste of war, such as unexploded shells, their fragments, mutilated and burned equipment, building ruins and parts of military equipment will have a huge negative long-time effect. Ukraine lives under constant rocket fire, and a large part of the territory will now and will take years to clear. These are far from all the environmental consequences of Russia's invasion that Ukraine and the whole world are experiencing today. Fires not only cause air emissions and atmospheric pollution but also destroy the upper, fertile layer of our earth. In the future, such soils will not produce crops. The infrastructure of entire regions is being destroyed, which leads to air and groundwater pollution. Many nature conservation facilities are forced to stop their activities, which has direct negative environmental consequences.

Analysing and future implementation of the EU experience of financial support of eco-projects can be one of the key directions in the case of Ukraine. The EU can play an active role in assisting Ukraine in its ever-more precarious environmental situation, and support neighbouring countries like Poland, Slovakia, Romania and Hungary that may suffer from transboundary pollution.

The implementation of the mechanism of financial support for investment projects, especially eco-projects, as a whole, forms the basis for an integral system of financial support for investment projects and can also be considered one of the driving forces in the fight against acute economic and environmental problems caused by the war, crisis situations, pandemics, digitization, a cashless economy, globalization, shortage of investment resources, lack of experienced creditworthy sponsors in the field of project financing, spread of financial inclusion, corruption, shadow economy and other accompanied internal and external risk factors, simultaneously increasing the share of large-scale investment and innovation projects, which in its turn enlarges the investment the attractiveness of the country continues to contribute to its economic sustainable growth.

The sources of financing of green finance, during the financing of economic and environmental programs, depend on the level at which it takes place, namely: national (local) and international level: state budget (targeted state and regional investments); international funds (foreign investments); own finds (funds of companies and organizations creating market infrastructure); commercial funds (funds of off-budget investment, environmental and other funds). The main participants operating in the process of financing these relations include two groups of subjects - investors (who finance "green projects") and recipients (who demand financing of eco-projects). Financial flows at these levels are divided according to their affiliation: private funds and financial flows of investors. At the same time, the general economic situation in the country and the world plays an important role in the formation of financial flows. At the international level, effective financial sustainable development requires global stability of the financial system and a low level of financial risks, which requires the introduction of financial regulation measures and control over the activities of banks and other financial institutions that actively work in the field of "green" financing and use appropriate financial tools.

The sufficiency of innovative development financing including project financing is relative a value that can be determined using the appropriate coefficients. For this, it is necessary to decide based on the comparison, that is, with a list of indicators with which it is necessary to compare the amount of innovation costs. Most of the authors, whose works are devoted to this issue or related to it, choose the volume of Gross Domestic Product (GDP) as the basis of comparison, therefore, indicators of the sufficiency of innovative activity financing will be:

- share of innovation costs in GDP;
- share of foreign investment in innovation in foreign direct investment (FDI);
- the specific weight of expenses for innovations from the State Budget in the total expenses of the State Budget;
- the specific weight of costs for innovations of enterprises in the currency of the balance sheet of these enterprises (Table 3 and Table 4).

The indicators in Table 3 show that the financing of innovations in Ukraine is insufficient since the volume of total costs occupies no more than 1% of the volume of the gross domestic product. Moreover, the weight with every year increases significantly. At least only less than ¼ of the total amount of expenditure goes to innovation in Ukraine. If we compare the volume of investment by foreign investors in innovation with the FDI in Ukraine, the conclusion will be similar: the volume of innovation financing is minor. Additionally, the situations of instability, such as the beginning of the Russian escalation in Ukraine in 2014 and the coronavirus crisis, only worsen the indicators. Since the focus of the allocation of funds from innovation activities is radically changing to other purposes. As we see from Table 3 the volume of FDI also depends on the economic situation in the country.

Table 3. Indicators of the total volume of innovation financing and volumes of financing from the funds of foreign investors. (Source: [12; 19])

Year	The total amount of expenditure on innovation, mln UAH	GDP volumes, mln UAH	The specific weight of innovation costs in GDP, %	Foreign investments in innovation, mln UAH	The volume of FDI in Ukraine, mln UAH	The specific weight of foreign investment in FDI, %
2012	11480.6	1408889	0.81	994.8	8401	11.84
2013	9562.6	1454931	0.66	1253.2	4499	27.86
2014	7695.9	1566728	0.49	138.7	410	33.83
2015	13813.7	1979458	0.70	58.6	-458	-12.79
2016	23229.5	2383182	0.97	23.4	3810	0.61
2017	9117.5	1982920	0.46	107.8	3692	2.92
2018	12180.1	3558706	0.34	107.0	4455	2.40
2019	14220.9	3974564	0.36	42.5	5860	0.73
2020	14406.7	4194102	0.34	125.3	-868	-14.44

Thus, since 2014, when the specific weight of foreign investors' expenses in the amount of total foreign investments in Ukraine was the largest and amounted to 33.83%, there has been a sharp drop in the indicator, and till nowadays, foreign investments in innovations amounted to only approximately 3% of the volume of foreign direct investments. Indicators of the sufficiency of innovation financing at the expense of the State budget and for the account of own funds of business entities that introduced innovations can be calculated by comparing the costs of innovation from the relevant source to the total costs of this source (in the case of business entities to the currency of the balance sheet).

Table 4. Indicators of innovation financing at the expense of the State Budget of Ukraine and the companies' own funds. (Source: [19])

Year	The amount of expenditure on innovations at the expense of the State Budget of Ukraine, mln UAH	Expenditures of the State Budget of Ukraine, mln UAH	The specific weight of costs for innovations from the State Budget of the aggregate expenses of the State Budget, %	Own funds of enterprises directed to innovative activities, mln UAH	The currency of the balance sheet of enterprises engaged in innovation activity, mln UAH	The specific weight of costs for innovations of enterprises in the currency of the balance sheet, %
2012	224.3	x	-	7335.9	no data available	-
2013	24.7	x	-	6973.4	no data available	-
2014	344.1	430217.8	0.08	6540.3	no data available	-
2015	55.1	576911.4	0.01	13427.0	no data available	-
2016	179.0	684743.4	0.03	22036.0	no data available	-
2017	227.3	839243.7	0.03	7704.1	no data available	-
2018	639.1	985842.0	0.06	10724.0	no data available	-
2019	556.5	1072891.5	0.05	12474.9	6676021.9	0.19
2020	279.5	1288016.7	0.02	12297.7	6964960.7	0.18

The results of the calculations (Table 4) show that financing from the State Budget of Ukraine also occupies a small part of the expenditure of budget funds, which did not exceed 0.1% over the last seven years. The most significant, in view of the analysis of the structure of sources of financing, is the own funds of enterprises engaged in innovative activities, their costs for innovations amount to approximately 0.08% of the total value of assets, which is significant in comparison with indicators of funding adequacy due to other sources.

Speaking about the financing of innovation activity in Ukraine, which directly includes investment in eco-projects, great attention should be paid to the sources of financing. As we saw, generally there are four variants of innovation activity financing: the expense of own funds of subjects, the expense of foreign investors, the expense of the state budget of Ukraine and financing from other sources. Therefore, the supply factors that have a fundamental influence on the state of economic development in the segment of project financing can be identified as the amount of expenditure on innovation activities in the country. In the following research, we define the different financial sources of innovations activity to analyze which of the proposed sets of recommendations should be focused on:

- volumes of financing of technological innovations at the expense of own funds of subjects of innovative activity (X1);
- volumes of financing technological innovations at the expense of foreign investors (X2);
- volumes of financing technological innovations at the expense of the state budget of Ukraine (X3);
- volumes of financing from other sources (X4).

Therefore, in order to forecast and regulate the process of economic development in Ukraine, there is a need to manage the specified factors. At the stage of specification of the econometric model, an analysis of factors that could be included in the model was carried out using the MS Excel table editor. For this, all the above indicators were considered (Table 5).

Table 5. Initial data for building an econometric model. (Source: [12])

Year	GDP volumes, mln UAH	Volumes of financing of technological innovations at the expense of own funds of subjects of innovative activity, mln UAH	Volumes of financing technological innovations at the expense of foreign investors, mln UAH	Volumes of financing technological innovations at the expense of the state budget of Ukraine, mln UAH	Volumes of financing from other sources, mln UAH
	Y	X ₁	X ₂	X ₃	X ₄
2012	1408889	7335.9	224.3	994.8	2925.6
2013	1454931	6973.4	24.7	1253.2	1311.3
2014	1566728	6540.3	344.1	138.7	672.8
2015	1979458	13427.0	55.1	58.6	273.0
2016	2383182	22036.0	179.0	23.4	991.1
2017	1982920	7704.1	227.3	107.8	1078.3
2018	3558706	10724.0	639.1	107.0	692.0
2019	3974564	12474.9	556.5	42.5	1147.0
2020	4194102	12297.7	279.5	125.3	1704.2

Using the standard built-in functions of MS Excel, the following indicators were determined, which proved the existence of a correlation between the factors of the econometric model (Figure 4):

- the correlation coefficient between GDP and volumes of financing of technological innovations at the expense of own funds of subjects of innovative activity is: $r_{yx1}=0.36$;
- the correlation coefficient between GDP and volumes of financing technological innovations at the expense of foreign investors is: $r_{yx2}=0.66$;
- the correlation coefficient between GDP and volumes of financing technological innovations at the expense of the state budget of Ukraine is: $r_{yx3}=-0.54$;
- the correlation coefficient between GDP and volumes of financing from other sources is: $r_{yx4}=-0.1$.

	Column 1	Column 2	Column 3	Column 4	Column 5
Column 1	1				
Column 2	0.35882	1			
Column 3	0.6597	-0.02799	1		
Column 4	-0.54024	-0.50815	-0.44445	1	
Column 5	-0.10262	-0.26186	-0.09446	0.60433	1

Figure 4. Correlation results.

Based on the calculations, the following conclusions were drawn:

- There is a close direct relationship between the amount of GDP and volumes of financing of technological innovations at the expense of own funds of subjects of innovative activity and at the expense of foreign investors;
- There is a close inverse relationship between the amount of GDP and volumes of financing technological innovations at the expense of the state budget of Ukraine;
- There is a slight inverse relationship between the amount of GDP and volumes of financing from other sources.

The selected main indicators formed the basis of determining the influence of their number and the size of the GDP of Ukraine based on the distributional model: $y_t = \beta_0 + x_1 + x_2 + x_3 + x_4 + \varepsilon_t$,

where: x_1 – volumes of financing of technological innovations at the expense of own funds of subjects of innovative activity; x_2 – volumes of financing technological innovations at the expense of foreign investors; x_3 - volumes of financing technological innovations at the expense of the state budget of Ukraine; x_4 - volumes of financing from other sources; ε_t - is the stochastic component of the model.

The evaluation of the parameters of the model according to the state of the public debt was carried out using the one-step least squares method using the built-in package "Data Analysis" of the MS Excel table editor as for the usual multi-variable linear model (Figure 5). Given the above, the estimated equation of which has the form:

$$y_t = 742308.7 + 68.49x_1 + 3125.18x_2 - 556.23x_3 + 248.8x_4 + \varepsilon_t$$

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.774344292							
R Square	0.599609083							
Adjusted R Square	0.199218165							
Standard Error	994006.8179							
Observations	9							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	4	5.91865E+12	1.47966E+12	1.497559152	0.352563013			
Residual	4	3.9522E+12	9.8805E+11					
Total	8	9.87085E+12						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	742308.7285	1563811.97	0.474679017	0.659770245	-3599529.362	5084146.819	-3599529.362	5084146.819
X Variable 1	68.49219116	89.35469831	0.766520311	0.486102958	-179.5962236	316.5806059	-179.5962236	316.5806059
X Variable 2	3125.184176	2096.26911	1.490831573	0.210265666	-2694.991937	8945.360289	-2694.991937	8945.360289
X Variable 3	-556.2272416	1308.17618	-0.425192914	0.692572608	-4188.306592	3075.852109	-4188.306592	3075.852109
X Variable 4	248.8202699	601.0581951	0.413970347	0.700130273	-1419.984814	1917.625354	-1419.984814	1917.625354

Figure 5. Results of the "Data Analysis" package for the model.

The main r-squared regression indicator demonstrates the quality of the model, with a dependency of less than 0.5 being an example of an inappropriate model. In our case, the r-square is equal to 0.6, so the model is quite high-quality (Figure 5). The constructed econometric model is still adequate because $F^* = 1.498$, and this allows its use for forecasting purposes (Table 6).

Table 6. Forecast for the GDP growth.

Indicators	Forecast variants										
	1	2	3	4	5	6	7	8	9	10	11
The share of change in the indicator, x_1	1	0.5	1.5	0.5	1	1	1	1.5	1	1	1
X_1	12297.7	6148.85	18446.55	12174.7	12297.7	12297.7	12297.7	18446.55	12297.7	12297.7	12297.7
The share of change in the indicator, x_2	1	0.5	1.5	1	0.5	1	1	1	1.5	1	1
X_2	279.5	139.75	419.25	279.5	139.75	279.5	279.5	279.5	419.25	279.5	279.5
The share of change in the indicator, x_3	1	0.5	1.5	1	1	0.5	1	1	1	1.5	1
X_3	125.3	62.65	187.95	125.3	125.3	62.65	125.3	125.3	125.3	187.95	125.3
The share of change in the indicator, x_4	1	0.5	1.5	1	1	1	0.5	1	1	1	1.5
X_4	1704.2	852.1	2556.3	1704.2	1704.2	1704.2	852.1	1704.2	1704.2	1704.2	2556.3
GDP growth- Forecast	2812385	1777347	3847423	2803960	2375638	2847231	2600382	3233519	3249131	2777539	3024387

Based on the data in Table 6, the first version of the forecast based on the model visualizes the value of GDP growth for 2021 in the amount of 219538 mln UAH. This happens in the condition when all x-indicators remain at the level of the 2020 year. Forecasts 2-11 are given with the consideration of changes in the positive or negative direction. According to the results, we can confirm that the GDP growth which is directly connected with the economic situation of the country and its sustainable development, depends on changes in the X_2 indicator – expenditure on innovative activity from foreign investors. For instance, forecasts 3 and 9, where the share of change in the indicator is positive (1.5) or forecasts 8 and 11, where the indicator leaves at the same level and shows a positive tendency to the GDP growth of Ukraine. Moreover,

other indicators should be also at least at the same level. In that regard, significant attention for future economics should be paid to financial involvement from foreign investors using various financial mechanisms.

Unfortunately, nowadays in Ukraine, there are no official organizations on the macro level that can be involved in the scheme of financial support of eco-projects and other infrastructures projects in future. Financial implementation of such projects is held only on the micro level, by the sources that we analysed in Table 5. In that situation, the EU's best practices of financial support for eco-project can be used.

Supporting innovation will be part of the investment in key green sectors needed to build resilience and promote sustainable development. In the EU there is a variety of programs and plans that focus on project financing: Horizon Europe, Next Generation EU, Recovery and Resilience facility and REPower EU. Ecological innovations that reduce environmental impacts, increase resistance to external pressures and use resources more efficiently are the key to supporting the transition to a circular economy and achieving the goals of the European Green Deal.

DISCUSSION

The active development of project financing in the world has proven the wide possibilities of its application for the implementation of eco-projects, which are characterized by strategic importance for the country's economy. In particular, project financing is traditionally used in foreign practice for the construction or restoration of large industrial facilities, and projects in the fields of communications, water supply, sewage, solid waste processing, etc.

The implementation of eco-projects makes it possible to significantly improve the state of the environment, implement environmental protection technologies, and ensure the saving of natural resources. The high level of requirements for state policy in the environmental sphere is determined by the importance of issues of a safe environment. Lack of control over processes in this area can have serious irreversible consequences for various social groups and the state. Imperfections in the formation of environmental policy and the implementation of environmental management, ensuring the environmental rights of citizens are obvious in Ukraine. The main problems of investment support of the economy are insufficient financial resources of domestic enterprises, low investment activity, imperfection of mechanisms for financing investments and innovations, the inertia of activity institutions of their investment support, corruption; shadow economy; absence of official organizations on macro level that can be involved in the scheme of financial support in cooperation with EU funds.

Considering the economic situation in Ukraine, today there is a need to identify new ways to ensure qualitative changes at all levels of functioning and the need to implement specific actions to implement the concept of project financing, including eco-projects, which is an element of the sustainable development program.

Therefore, we will form a set of recommendations in the issue of project financing implementation:

- creation of legal and institutional prerequisites for the formation of a "green" economy in Ukraine;
- development of the legal framework and harmonization of the existing legislative field of "green" financing, which has just begun to take shape, with the norms of relevant global and European agreements and conventions;
- changing existing approaches in industrial policy, which involves increasing innovative activity, strengthening resource and energy-saving measures, and reducing the negative impact on the environment;
- ensuring the competitive formation of state ecological programs in priority areas of science and technology development and their financing;
- dissemination of foreign design practices financing;
- introduction of "green" banking;
- improvement of investment attractiveness countries;
- application of modern models and schemes for project financing;
- implementation of public-private partnerships;
- creation of a single register from the project funding in which the highlighted statistical data on project stages financing are;
- disclosure of information about the stages of implementation projects;
- implementation of anti-corruption direction;
- reducing the level of the shadow economy;

- development of assessment and implementation methodology examinations of investment projects;
- organization of training of specialists-experts from assessment and analysis of financial justification implementation of investment projects;
- usage of the best EU practices of eco-project financing and implementation;
- development of recommendations that will help politicians make the best decisions to influence the future of Ukraine, providing clear assessment and guidance to develop criteria for evaluation and selection of projects for financial at the level of the Ministry of Economy of Ukraine.

As a result, the possible future eco-project directions could focus on energy system integration; hydrogen projects; support of green agriculture; green metallurgy; green reconstruction and transformation of cities; restoration of rivers to their natural state; "blue" projects (protection of marine biodiversity, coastal strips); circular projects (sorting of household waste, right to repair, etc.); creating a green building ecosystem.

CONCLUSIONS

The modern development of the economy of Ukraine is characterized by the need to solve problems in the field of management of innovative activities in the formation and implementation of environmental projects, which play an important role in ensuring the achievement of the strategic goal of the transition to the sustainable development of the country's economy. There is an urgent problem of managing the innovation and investment activities of business entities, which is connected both with the existing unbalanced state of ecological and economic development in Ukraine, as well as the absence of the necessary production demand for ecological projects, their inefficient structure, and the lack of investment funds.

The most important task of providing the modern economy with the necessary investment resources in the field of eco-innovative activity of business entities can be solved thanks to the use of economic levers and incentives, their coordinated interaction, a clear sequence of functioning in the system of effective institutions of the domestic innovation sphere, the use of new means of attracting foreign investments, which play a significant role in the co-financing of environmental projects and programs in conditions of crisis and lack of financial resources.

Future research could focus on the issue of the EU experience of project financing in the ecological area, such as observation of the conceptual foundations, forms, and methods of financial support of investment eco-projects in the EU; analysing of the principles of the main funding for climate action in EU; designing of recommendations for implementation of EU experience of the financial support mechanism of eco-projects in the current conditions in Ukraine.

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Тверезовська О., Гриценко Л.

РОЛЬ ЗЕЛЕНОГО ПРОЄКТНОГО ФІНАНСУВАННЯ В ЕКОНОМІЧНОМУ РОЗВИТКУ УКРАЇНИ

Сучасні інноваційні процеси, що відбуваються в теперішніх умовах навколо економічної системи України, вимагають науково-технічного розвитку. Цей процес неможливо уявити без реалізації значущих та ефективних інвестиційних проєктів і забезпечення належного фінансування їх. Розвиток національної економіки потребує реалізації масштабних та ефективних екопроєктів та концентрації фінансових ресурсів. Реалізація екопроєктів має значний вплив на прискорення модернізації економіки, підвищення її конкурентоспроможності та інвестиційної привабливості для успішного екологічного післявоєнного відновлення й майбутнього сталого економічного та інвестиційного розвитку України.

У статті представлено основні теоретико-методологічні засади зеленого проєктного фінансування як драйвера економічного розвитку України в умовах невизначеності. У рамках досліджуваного питання проведено бібліометричний аналіз сутності термінів «зелене» фінансування» та «проєктне фінансування». Досліджено поточний стан фінансування інноваційних проєктів, роль і місце інвестиційних проєктів в умовах нестабільності. За допомогою економіко-

математичного аналізу проаналізовано рівень фінансового забезпечення інноваційної діяльності та співвідношення між джерелами фінансування проєкту. Запропоновано рекомендації щодо впровадження екопроектного фінансування в Україні в умовах нестабільності.

Ключові слова: проєктне фінансування; зелене фінансування; екопроекти; інвестиції; економічне зростання; сталий розвиток; нестабільність

JEL Класифікація: O11, O22, O44, F21, F36, F65, G01, I22, P18, P45, Q56