

Journal of Geology, Geography and Geoecology

Journal home page: geology-dnu.dp.ua

ISSN 2617-2909 (print)
ISSN 2617-2119 (online)

Journ. Geol. Geograph.
Geology,
32(3), 540-549
[doi:10.15421/112348](https://doi.org/10.15421/112348)

V.V. Koval, V.V. Gonchar, V.V. Udovychenko, O.V. Kalinin, O.V. Slobodianiuk, O.M. Soloviova

Journ. Geol. Geograph. Geoecology, 32(3), 540-549

Risk management analysis of environmental investment in economic security

Viktor V. Koval^{*1}, Viktoriya V. Gonchar², Viktoriia V. Udovychenko³, Oleksandr V. Kalinin^{2,4}, Olha V. Slobodianiuk⁵, Olha M. Soloviova¹

¹Izmail State University of Humanities, Izmail, Ukraine

²Kyiv National Economic University named after Vadym Hetman, Kyiv, Ukraine

³Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

⁴Mykolas Romeris University, Vilnius, Lithuania

⁵National University «Odessa Law Academy», Odessa, Ukraine

*Corresponding author: victor-koval@ukr.net

Received 25.08.2023;

Received in revised form 01.09.2023;

Accepted 07.09.2023

Abstract. Biodiversity loss is irreversible and demands investment in organizational measures for environmental protection and effective risk management of relevant financial investments to ensure national economic security. This research analyzes the directions of investment support for economic security based on rational interaction between society and ecosystems. The goal

of this article is to identify the main directions of anthropogenic impact on the environment and the interdependence of improving ecological indicators through investment activities in the corresponding direction to ensure economic security. The study examines investment directions in environmental protection within the LIFE program projects to prevent negative cause-and-effect effects from the implementation of natural innovations. The maximization of the EU's efforts in ecosystem restoration and protection is identified to mitigate investment risks by promoting the adoption of innovations across a wider range of societal spheres. It is estimated that during the period from 2018 to 2022, there was an increase in investment in environmental protection by approximately 18%, resulting in a reduction in emissions intensity by 22.9% by economic activity types from 2016 to 2021, and the average CO₂ emissions indicator contributed to a decrease by 1.1%. Investing in the environment requires continuous adaptation to changing external conditions and requires adjustments to reduce risk threats, such as unforeseen consequences of financial investments in certain economic sectors, shifts in societal behavior, and unexpected ecosystem impacts. However, effective management of investment risks is a potential for the development of environmental investment activities, such as the implementation and support of sustainable innovations (transition to eco-friendly construction, reforestation, raw material certification).

Keywords: risk management, economic security, environmental protection, ecosystems, environmental investments.

Аналіз управління ризиками інвестицій в навколишнє середовище для забезпечення економічної безпеки

В. Коваль^{*1}, В. Гончар², В. Удовиченко³, О. Калінін^{2,4}, О. Слободянюк⁵, О. Соловійова¹

¹Ізмаїльський державний гуманітарний університет академія наук, Ізмаїл, Україна

²Київський національний економічний університет імені Вадима Гетьмана, Київ, Україна

³Київський національний університет імені Тараса Шевченка, Київ, Україна

⁴Університет імені Миколая Ромірса, Вільнюс, Литва

*Кореспондуючий автор: victor-koval@ukr.net

Анотація. Втрата біорізноманіття є незворотною, що вимагає інвестування у розвиток організаційних заходів щодо захисту навколишнього середовища та ефективного управління ризиками відповідних фінансових вкладень, з метою забезпечення національної економічної безпеки. В проведеному дослідженні проаналізовано напрямки інвестиційного сприяння економічній безпеці на основах раціональної взаємодії суспільства з екосистемами. Метою статті є виявлення основних напрямків антропогенного впливу на навколишнє середовище та взаємозалежності динаміки покращення екологічних показників від інвес-

тиційної діяльності у відповідному напрямку з метою забезпечення економічної безпеки. Досліджено напрямки інвестування в захист навколишнього середовища в межах проектів програми LIFE задля запобігання негативним причинно-наслідковим ефектам від впровадження природних нововведень. Виявлено максимізацію зусиль ЄС в напрямку відновлення та захисту екосистем, з метою попередження відповідних інвестиційних ризиків шляхом сприяння охопленню впроваджених нововведень в якомога більшу площу сфер суспільного життя. Розраховано, що протягом 2018 – 2022 років виявлено ріст інвестиційних вкладень в захист навколишнього середовища на близько 18%, що слугувало пониженою інтенсивністю викидів в атмосферу за видами економічної діяльності на 22,9%, з 2016 року по 2021 рік, а показника середніх викидів CO₂ сприяло зменшенню на 1,1%. Інвестування в навколишнє середовище потребує постійної адаптації до змінних зовнішніх умов і вимагає коригувань з метою зменшення загрози ризиків: непередбачуваних наслідків від фінансових вкладень в певні галузі економіки, переминою суспільної поведінки, неочікуваними змінами від впливу на екосистеми. Але, ефективне управління інвестиційними ризиками є потенціалом для розвитку екологічної інвестиційної діяльності, наприклад, для впровадження та підтримки сталих інновацій (перехід до екологічних будівель, лісовідновлення, сертифікація сировини).

Ключові слова: управління ризиками, економічна безпека, захист навколишнього середовища, екосистеми, екологічні інвестиції.

Introduction

Intensive land use and anthropogenic influence have a detrimental impact on the condition and sustainability of natural resources (Daz et al., 2019), thereby increasing the risks to the food and economic security of countries. The economic security of nations is contingent upon the state of the environment, whose degradation can weaken the creditworthiness of many companies and, consequently, national economies. Recognizing this, the European Central Bank has examined the dependence on natural resources of over 4.2 million individual companies, which have provided more than 4.2 trillion euros in corporate loans (ENCORE, 2023).

Further deterioration of the environment can lead to a reduction in the level of economic activity of relevant companies, affecting their ability to provide food, drinking water, timber, minerals, protection against natural disasters, carbon sequestration, and storage through vegetation. All of these factors can have adverse consequences on economic security.

To implement environmental programs successfully, innovative technologies are used and require investments along with government support. However, attracting investments may lead to environmental risks associated with mitigating the environmental consequences of investment projects (Kvach et al., 2020). These risks can result in financial and economic instability in countries, which is a pressing concern for halting environmental degradation. Preventing negative impacts on the environment is a crucial step toward ensuring economic stability in countries, necessitating integrated measures to implement conservation policies by European governments (Dmuchowski et al., 2023). Therefore, a pertinent issue today is researching the loss of biodiversity and other challenges related to the proper functioning of nature to identify pathways for harmonious interaction between society and nature. This is the focus of

our interest and the subject of our ongoing research in this field.

The need for planning a just and inclusive transition to an economy that supports the preservation and protection of natural resources while avoiding biodiversity loss requires specific financial investments in the organization of relevant initiatives.

Literature review

Irrational societal interactions with nature necessitate regulatory reforms at the country level and greater public awareness about the dependency of human existence on ecosystems to prevent irreversible ecological crises. Addressing these issues requires investments in a complex process, given the interdependence of various elements that directly impact societal economic security. Consequently, questions related to environmental finance in the context of economic security are currently the focus of research by numerous scholars.

Key directions for ensuring economic security through rational societal interaction with ecosystems involve exploring rational approaches to managing financial and investment support for innovations in environmental protection (Khalil & Nimmanunta, 2021). This approach is based on the responsibility to choose effective investment directions (Abdurahimova, 2023) and emphasizes instruments that stimulate the development of the green economy (Bondarenko et al., 2023). The environment serves as a means of existence and interaction among nations, which is why researchers devote considerable attention to studying global experiences in developing investment activities for nature protection (Dmuchowski et al., 2023; Piskulova, 2023).

Significant focus is also placed on researching investment risks associated with environmental projects, such as uncertainties in financial projections and impact indicators that measure investment outcomes rather than their value (Thompson, 2023). Equally

significant are the risks associated with the concept of natural and technological risks, which can result in financial, material, and social losses, particularly for small and medium-sized enterprises (Arsawan et al., 2021). The consequences of irrational investments in environmental protection and development include unwarranted monetary expenditures and an inefficient allocation of resources (Clarke et al., 2018).

However, the process of investing in the sustainable development of ecosystems is a long-term endeavor that requires numerous innovations and time to alter societal perceptions and behavior towards nature. This underscores the need for further scientific research into this pressing issue.

Research methods

In the process of conducting the research, statistical observation, comparison, and analysis methods were employed. Analyzing the dynamics of greenhouse gas emissions and air pollutants from 2016 to 2021 in the EU, comparisons of the average «CO₂ emissions per 1 km by passenger cars» and «emission intensity by economic activity type» were calculated as a percentage ratio to the previous year, indicating the change in the percentage indicator during the research period.

The calculation indicators for «emission intensity of greenhouse gases from energy consumption» and «net greenhouse gas emissions» represent the value of percentage point deviations over the study period, obtained by the difference in percentages between the reporting year and the year of comparison.

When examining the dynamics of environmental protection expenditure in the EU from 2018 to 2022, the following indicators were used, described as follows (Eurostat, 2023):

- national environmental protection expenditure measures the resources used by residents in a given period to protect the natural environment;

- production of general government environmental protection services by economic category includes operations related to the prevention, reduction, and elimination of pollution and any other degradation of the environment;

- government investment in environmental protection by environmental protection activity represents national expenditures on environmental protection;

- total economy environmental protection investments encompass (government authorities and corporations) expenditures for providing environmental protection services (e.g., waste management and water treatment, soil remediation);

- national environmental protection expenditure by institutional sectors measures the resources allocated by resident units for the protection of the natural environment.

Results

Increased resource consumption contributes to environmental degradation and biodiversity loss, prompting the need for corresponding government regulations that involve investments in measures to protect nature.

Unfortunately, among the resolved natural issues, many problems remain unresolved. For instance, while pollution reduction has improved water quality, only 40% of surface waters in the EU achieved a good ecological status by 2015. Land management has improved, but landscape fragmentation continues to grow, negatively impacting certain ecosystems and biodiversity. Approximately 75% of Europe's ecosystem area is subject to excessive nitrogen influence, leading to eutrophication (European Environment Agency, 2023).

Analyzing the dynamics of greenhouse gas emissions and air pollutants in the EU in 2021 (Fig. 1), it is found that the top three countries with the highest average CO₂ emissions per 1 km from new passenger cars are Croatia (129.0 g CO₂ per 1 km), Spain (126.8 g CO₂ per 1 km), and Romania (126.5 g CO₂ per 1 km). The lowest values are observed in Norway (27.6-126.8 g CO₂ per 1 km), Iceland (80.3-126.8 g CO₂ per 1 km), and Sweden (88.3-126.8 g CO₂ per 1 km). In terms of greenhouse gas emission intensity from energy consumption, Lithuania (103.7%), Cyprus (97.7%), and Bulgaria (95.1%) dominate, while Iceland (44.8%), Denmark (60.9%), and Finland (62.1%) show the best indicators.

The values of net greenhouse gas emissions in the EU have a positive trend. In the context of individual countries, a similar situation is observed in most EU countries, except for Cyprus, Ireland, Iceland, and Finland, which saw increases of 7.3, 5.5, 2.0, and 20.6 points, respectively, compared to 2020.

Decisions regarding the protection and conservation of nature serve as a means to address socio-economic issues by preserving and restoring biodiversity, creating resilient conditions for climate change impacts. More than half of the total global gross domestic product is estimated to be moderately or strongly dependent on nature and biodiversity. The major economic sectors reliant on nature include agriculture, food and beverage production, and construction, generating an annual gross added value of 8 trillion

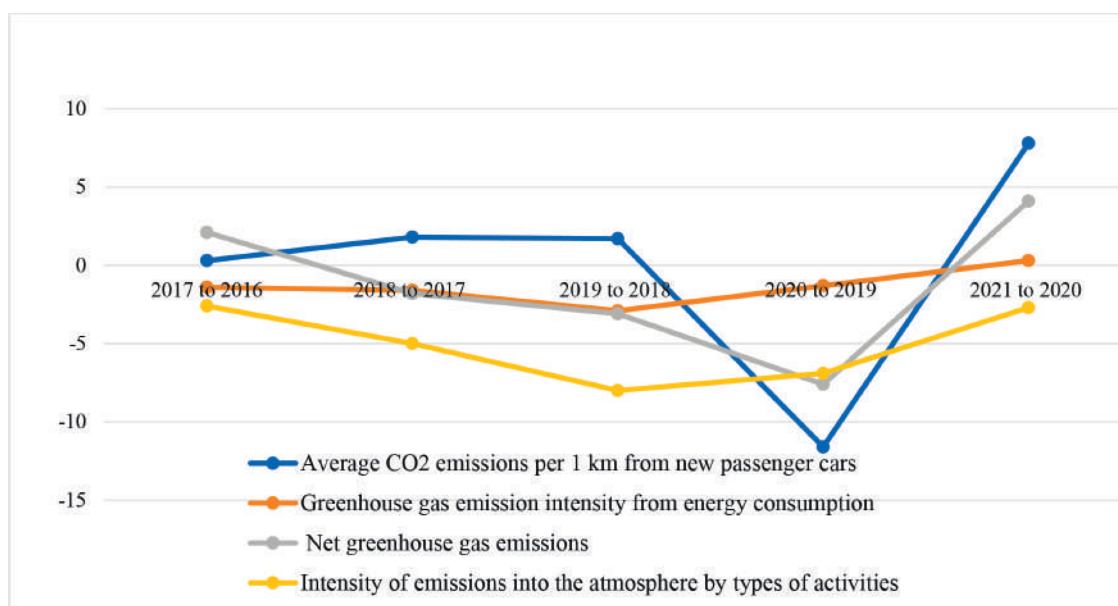


Fig. 1. The dynamics of greenhouse gas emissions and air pollutants in the EU from 2016 to 2021, % (Source: Eurostat, 2023)

dollars (World Economic Forum, 2023). According to assessments by The World Economic Forum, in order to achieve climate change, biodiversity, and land degradation goals, there is a plan to triple nature-related investments by 2030 and increase them fourfold by 2050, reaching a total investment level of 8.1 trillion US dollars and a future investment level of 536 billion US dollars (World Economic Forum, 2023). The primary challenge in financing nature-based solutions lies in the absence of a financial market value for most types of natural resources, despite the fact that nature underpins our societal life and development.

Based on the analysis of the current level of utilization and the assessment of potential scales of nature-based solutions in the EU, conducted by the European Investment Bank for the European Commission, as part of a comprehensive review of existing databases and online information on 1364 projects with real implementation in the European Union and the United Kingdom, predominantly matching potentials for nature-based solutions and ecosystem restoration were identified, and certain project-specific features regarding nature-based solutions were identified (Fig. 2).

Based on the results of the research (European Investment Bank, 2023), there is an insufficient level of investment in the protection and improvement of biodiversity, which currently primarily relies on funding from government sources. Therefore, measures are being considered to increase private investments in environmental conservation solutions through private financing (Žitkienė et al., 2020).

The majority of projects related to investing in nature conservation measures were categorized as urban (76%), with the least focused on forest development (2%). The leaders in implementing these measures are the United Kingdom (16%), Germany (13%), and France (10%). The cost of most known investments ranged from 1 to 10 million euros.

In terms of the physical scale of natural projects on ecosystems, urban projects covering an area of around 100 square meters are the smallest category. The largest projects are in the forestry ecosystem, and approximately half of the marine projects do not provide information about their scales, which is a common inhibiting factor that hinders a more thorough examination of the issue. EU funds are the most common primary investor in nature conservation solutions through funding mechanisms like the LIFE program (Fig. 3).

Strategic projects of the LIFE program, with a total investment volume of over 11 million, include the implementation of eight major projects in Belgium, Estonia, Spain, Italy, Poland, Slovakia, and Finland aimed at achieving climate and environmental goals (implementation of project activities in the fields of nature conservation and the environment, mitigation of the consequences of climate change and adaptation to them, projects transitioning to clean energy, etc.) (Table 1.). An additional goal of the projects is to expect mobilization of significant additional funds from sources such as agricultural, structural, regional, and research funds, which will contribute to the implementation of nature-based solutions along with national funds and private sector investments.

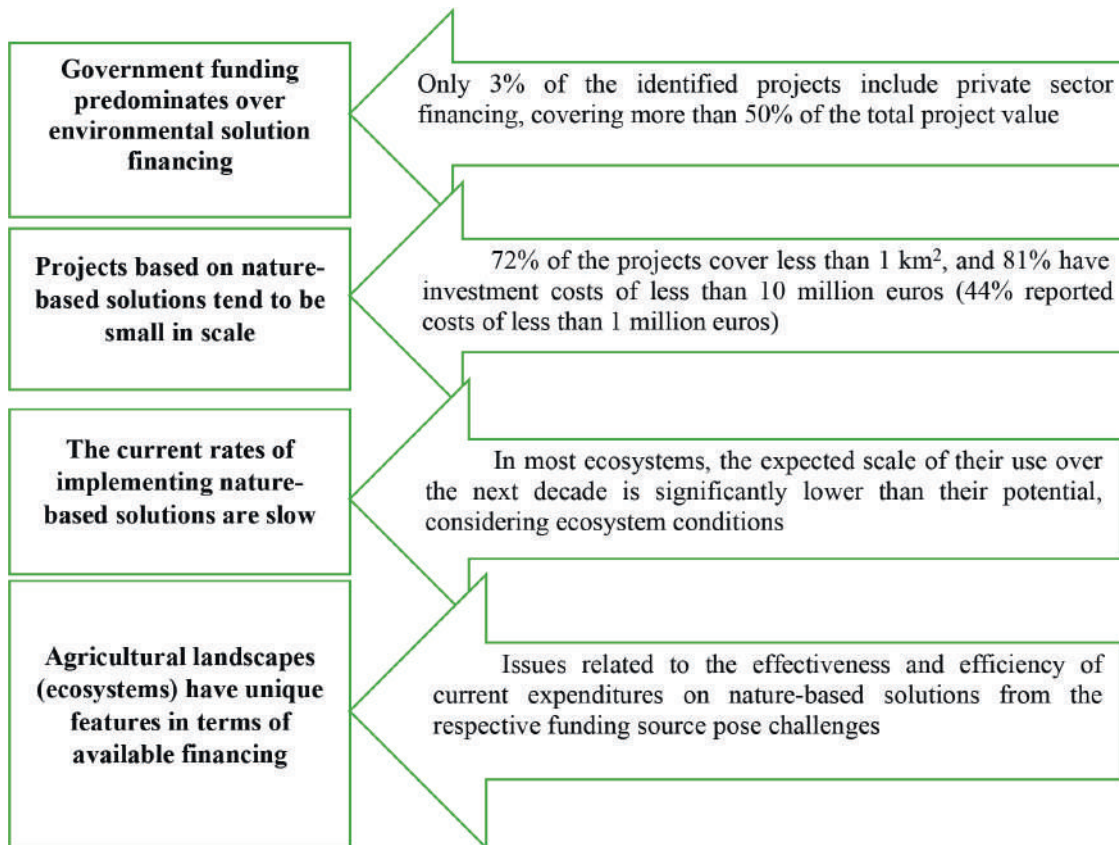


Fig. 2. Characteristics of projects regarding the potential of environmental protection solutions in the EU (Source: European Investment Bank, 2023)

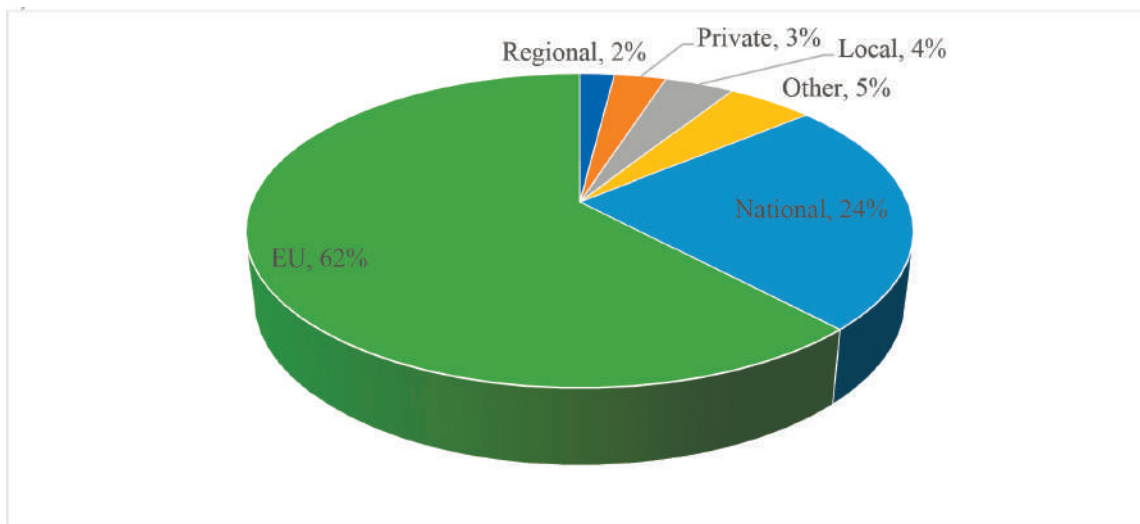


Fig. 3. The main investors in natural solutions in Europe during the period from 2000 to 2022 (Source: European Investment Bank, 2023)

The LIFE program, as an EU instrument for financing the environment and climate change, has been translating green ideas into action since 1992, co-financing over 5500 projects throughout the EU and other countries. The European Commission has increased the corresponding funding by 60%, reaching 5.4 billion euros for the period 2021-2027, includ-

ing a new sub-program for the transition to clean energy, with the following objectives:

- building a national, regional, and local policy framework to support the transition to clean energy;
- accelerating the deployment of technologies, digitalization, new services, and business models, enhancing relevant professional skills in the market;

Table 1. Investment Directions for Environmental Protection within LIFE Program Projects (European Commission, 2020; European Commission, 2023a; European Commission, 2023b; European Commission, 2023c)

Project Name	Project Direction	Project Objectives
A European Green Deal	<i>Striving to become the first climate-neutral continent</i>	- achieving zero greenhouse gas emissions by 2050; - achieving economic growth not tied to resource use; - ensuring all habitats and species receive attention
The Habitats Directive	<i>Preserving Europe's wildlife and fauna</i>	- protecting (conserving or restoring) over a thousand species (mammals, reptiles, amphibians, invertebrates, fish, plants) and 230 characteristic habitat types
Circular economy action plan	<i>Paving the way to a cleaner and more competitive Europe</i>	- establishing sustainable products as the EU norm; - expanding consumer and public procurement options; - focusing on sectors of the economy that use the most resources with high circularity potential (electronics, IT, transportation, packaging, plastics, construction, etc.); - promoting waste prevention; - activating circular production in urban, regional, and societal contexts
Zero pollution action plan	<i>Achieving zero pollution of air, water, and soil</i>	- improving air quality by 55%; - improving water quality (reducing waste, plastic litter in the sea) by 50% and microplastics by 30%; - enhancing soil quality (reducing nutrient losses and chemical pesticide use) by 50%; - reducing transportation noise; - cutting overall waste and household waste by 50%

- attracting private financing for sustainable energy;

- promoting the transition of citizens to clean energy (Clean Energy Transition, 2023).

Analyzing the European Union's expenditures on environmental protection over the last five years, an increase in relevant indicators is observed (Table 2). Among the directions of investment contributions to EU nature protection, the highest share is taken by wastewater treatment services (44%) and waste management (25.7%). Approximately 10.5% of invest-

ments were directed towards air protection, while the lowest investments were recorded for protection from radiation, environmental research, development, and other activities (7.8%), biodiversity and landscape protection (4.4%), and noise reduction (1.6%) (Eurostat, 2023).

According to Eurostat (2023), in 2022, 35% of environmental protection investments were made by governments and non-profit sectors, while 65% (approximately 44 billion euros) were made by corporations, including specialized providers of environ-

Table 2. The dynamics of environmental expenditures in the EU during 2018-2022

No	Indicator	Years					2022 to 2018, %
		2018	2019	2020	2021	2022	
1	National environmental protection expenditure, %	2.1	2.1	2.3	2.2	2.2	104.8
2	Production of environmental protection services of general government, million euros	89003.0	91586.6	93688.5	97390.9	101840.8	114.4
3	Investments of general government in environmental protection by environmental activity, million euros	20582.6	22039.5	22358.4	22989.1	24307.4	118.1
4	Investments in environmental protection of the entire economy, million euros	55392.2	59020.8	58793.0	62545.3	68565.7	123.8
5	National environmental protection expenditure by institutional sectors, million euros	284209.3	301186.8	303896.0	319722.8	340218.1	119.7

(Source: Eurostat, 2023)

mental services (private companies involved in waste collection, recycling, and sewage, as well as those purchasing technologies and equipment to reduce their environmental impact from production processes, e.g., equipment that reduces air emissions).

Recently, the European Commission launched a strategy for economic security in Europe in response to threats such as warfare in Ukraine, competition for crucial resources, and more. However, the main issue concerning threats to economic security caused by the destruction of nature, which is associated with increased societal well-being, receives insufficient attention. It requires addressing the costs of harming nature within the countries of production and consumption of goods in European markets.

Dasgupta (2021) pointed out the scale of the value of ecosystem services (pollination, soil formation, water and air purification) and their integration into economic processes. However, an unresolved issue remains the development of quantitative assessments of natural resources and climate risks. The value of natural capital should, at a minimum, reach the level of productive capital and, ideally, become the dominant value in societal life as a key influencer of human capital growth and development.

Implementing climate risk reduction policies should have a transnational character, uniting the goals and interests of European countries. Solving environmental issues involves long-term measures that affect the well-being of all Europeans and cannot be

addressed by individual country governments alone. The cost of inaction regarding measures that would ensure sustainable natural resource use is high and requires attention, understanding, and the adoption of necessary investment decisions (Fig.4).

In the European Union (EU), nearly three-quarters of companies are dependent on at least one ecosystem service, prompting the European Central Bank to assert that the loss of nature needs to be included in financial risk models (Grabbe, 2023). Currently, the main directions of ECB’s modern research are determining the scale of risks related to ecosystem services on the EU economy and the financial sector. The key assumption of the identified results of this research is that an increase in dependency on ecosystem services is likely to lead to a greater impact on ecosystem degradation. As the level of nature degradation increases, economic activities will suffer, resulting in certain negative consequences (e.g., supply chain disruptions, affecting the cost of goods and services, and potentially leading to inflation).

Investments in the environment address sustainable development issues and serve as a source of financial enrichment for investors (Höchstädter & Scheck, 2015). Effective environmental investment is based on creating an ecological impact and generating profit from the respective project (Mogapi et al., 2019). The absence of financial gains creates corresponding investment risks: discontinuation of further investment support for the project and a shift towards

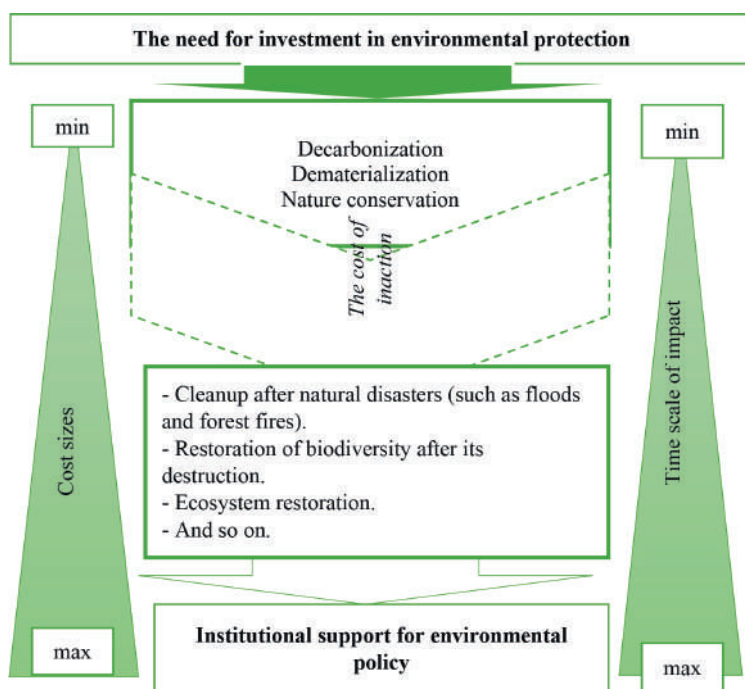


Fig.4. The institutional support for environmental policy in ensuring the economic security of countries (Source: Grabbe, 2023)

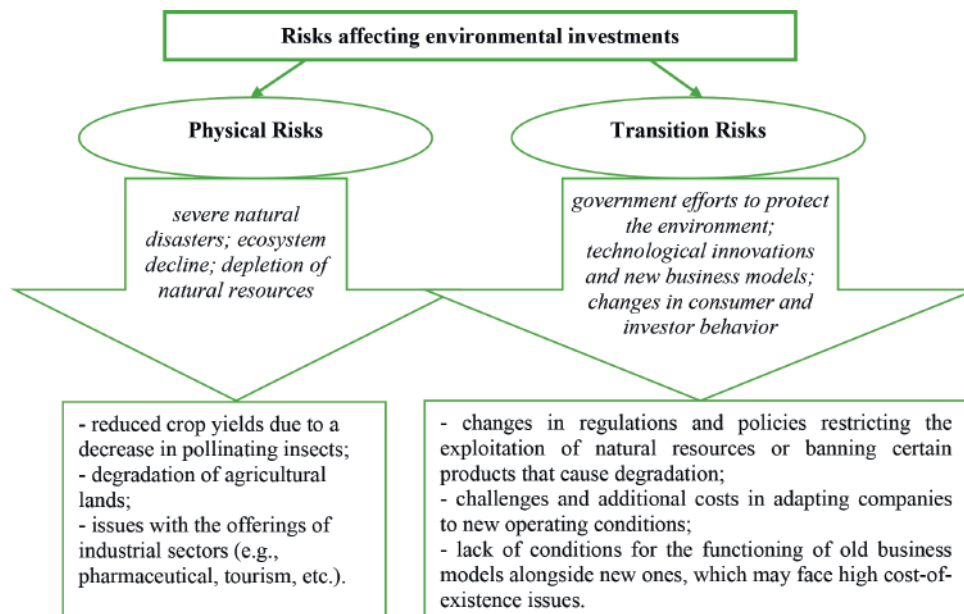


Fig. 5. Risks affecting environmental investments (Source: Elderson, 2023).

profit-oriented investment as the priority decreases in expected non-financial benefits of ecosystem improvement.

A significant economic and financial concern for investors that increases their investment threats is climate risks, which necessitates the consideration of climate risks in environmental investment management. Climate investment risks are divided into physical risks and transition risks (Figure 5), which constitute the potential for investments to generate unexpected profit or results, including full or partial losses.

Physical risk refers to the likelihood of natural disasters related to weather and climate, causing harm to assets, affecting their value, damaging infrastructure, and impacting businesses. Transition risks arise from technological developments and changes in consumer behavior.

Climate change remains the dominant theme in sustainable investing. To support investors in making long-term climate-related decisions, they must also consider the risks of a long-term energy transition. High costs associated with fossil fuels enhance the competitiveness of renewable energy providers and attract new investments to this sector. The long-term perspective of addressing issues associated with transitioning to a low-carbon economy may require further steps in upgrading relevant technological infrastructure, providing compelling potential opportunities for climate investors.

Biodiversity loss represents one of the highest financial risks for investors: the economic consequences of species and ecosystem destruction can negatively impact specific regions and industries. Industries

that may be most affected include construction and infrastructure, agriculture and raw materials, and food and beverage products (Jennifer, 2022). However, this does not imply the decline of these sectors; on the contrary, with effective management of investment risks, they hold great potential for supporting sustainable innovations (such as transitioning to green buildings, reforestation, raw material certification) and shaping sustainable business models to enhance the competitiveness of regional production (Koval et al., 2023).

Conclusions

The increasing anthropogenic influence underscores the importance of researching the relationships between environmental improvement and investment activities aimed at ensuring sustainable development. Investment directions in environmental protection have been examined within the LIFE program to prevent negative consequences of implementing nature-based innovations. It has been determined that the European Union has made significant efforts towards the restoration and protection of ecosystems to reduce investment risks while fostering the dissemination of innovations across various aspects of societal life.

As a result of the research conducted between 2018 and 2022, there has been an approximately 18% increase in investment in environmental protection. This has led to a reduction in emission intensity by economic activity by 22.9% over the last 6 years and a 1.1% decrease in average CO₂ emissions. Investing in the environment requires continuous adaptation to

changing external conditions and necessitates adjustments to reduce the threat of risks.

The primary challenge in the process of investing in environmental conservation measures is the underdevelopment of the market for environmental protection decisions due to the absence of established values for a range of natural goods. An urgent need remains for the development of quantitative assessments of natural resources and climate risks. The future development prospects of nature investment measures involve expanding investment channels, including the private sector, municipal enterprises, and more. Environmental policy should have a transnational character, uniting the goals and interests of European countries towards nature protection, restoration, and the increase of biodiversity. It should safeguard ecosystem functionality, enhance economic resilience, mitigate natural disasters, and pro-

mote food security. To enhance the effectiveness of investment measures, there is a need to promote the development of national strategies and government actions that encourage investors and companies to consider their impact on nature and their dependence on environmental resources. The current state of the environment demands funding for projects focused on nature restoration, creating incentives for their implementation, and their efficient integration into societal development.

Acknowledgement

The paper was prepared with the financial support of the project Mykolas Romeris University Sustainable Innovations Laboratory Project «Economic security of digitalization of investments» (agreement № S-PD-22-55), project No. P-PD-22-086.

References

- Abdurahimova, S. A. (2023). Methodological directions for the regulation of investments in macroeconomic processes. *World Economics and Finance Bulletin*, 22, 160-163.
- Arsawan, I. W. E., Supartha, I. W. G., Rustiarini, N. W., Sita Laksmi, P. A. (2021). SMEs Resiliencies and Agility During Pandemic Covid-19: A Bibliography Analysis and Future Directions. *Economics Ecology Socium*, 5, 19-28. <https://doi.org/10.31520/2616-7107/2021.5.3-3>
- Bondarenko, V., Pokynchereda, V., Pidvalna, O., Kolesnyk, T., & Sokoliuk S. (2023). Green Economy as a Prerequisite for Sustainable Development: Analysis of International and Ukrainian Experience. *European Journal of Sustainable Development*, 12(1), 221. Retrieved from: <https://doi.org/10.14207/ejsd.2023.v12n1p221>
- Clarke, R., Reed, J., & Sunderland, T. (2018). Bridging funding gaps for climate and sustainable development: Pitfalls, progress and potential of private finance. *Land Use Policy*, 71, 335–346.
- Clean Energy Transition. (2023). Retrieved from: https://cinea.ec.europa.eu/programmes/life/clean-energy-transition_en
- Dasgupta, P. (2021). *The Economics of Biodiversity: The Dasgupta Review*. London: HM Treasury.
- Díaz, S., Settele, J., Brondízio, E.S., Ngo, H.T., Guèze, M. and others. (2019). *The global assessment report on biodiversity and ecosystem services – Summary for policymakers*, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) secretariat, Bonn, Germany.
- Dmuchowski P. Dmuchowski W., Baczevska-Dąbrowska A. H., Gworek B. (2023). Environmental, social, and governance (ESG) model; impacts and sustainable investment – Global trends and Poland’s perspective. *Journal of Environmental Management*, 329, 117023. Retrieved from: <https://www.sciencedirect.com/science/article/abs/pii/S0301479722025968>
- Dovala E., Negulescu O. (2014). A Model of Green Investments Approach. *Procedia Economics and Finance*, 15, 847–852. DOI: [https://doi.org/10.1016/S2212-5671\(14\)00545-0](https://doi.org/10.1016/S2212-5671(14)00545-0)
- Elderson, F (2023). The economy and banks need nature to survive. Retrieved from: <https://www.ecb.europa.eu/press/blog/date/2023/html/ecb.blog230608~5cffb7c349.en.html>
- ENCORE. (2023). Retrieved from: <https://encore.natural-capital.finance/en>
- European Commission. (2020). *Circular economy action plan*. Retrieved from: https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en
- European Commission. (2023a). *A European Green Deal*. Retrieved from: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
- European Commission. (2023b). *The Habitats Directive*. Retrieved from: https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive_en
- European Commission. (2023c). *Zero pollution action plan*. Retrieved from: https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en
- European Environment Agency. (2023d). *State of Europe’s environment*. Retrieved from: <https://www.eea.europa.eu/en/topics/at-a-glance/state-of-europes-environment>
- European Investment Bank. (2023). *Investing in nature-based solutions. State-of-play and way forward for public and private financial measures in Europe*. 920230. Retrieved from: <chrome-extension://efaid->

- nbmnnibpcajpegclclefindmkaj/https://www.eib.org/attachments/lucalli/20230095_investing_in_nature_based_solutions_en.pdf
- Eurostat. (2023). Retrieved from: <https://ec.europa.eu/>
- Grabbe, H. (2023) The EU needs to move faster on valuing nature. Retrieved from: <https://www.ft.com/content/5ec8a56b-4362-4368-890c-69c6f6910571>
- Heinkel, R., Kraus, A., Zechner, J. (2001). The Effect of Green Investment on Corporate Behavior. *The Journal of Financial and Quantitative Analysis*, 36, 431–449. DOI: <https://doi.org/10.2307/2676219>
- Höchstädter, A. K., & Scheck, B. (2015). What's in a name: An analysis of impact investing understandings by academics and practitioners. *Journal of Business Ethics*, 132, 449–475. <https://doi.org/10.1007/s10551-014-2327-0>
- Jennifer, Wu. (2022) Climate change investment risks: What investors need to focus on. Retrieved from: <https://am.jpmorgan.com/us/en/asset-management/adv/investment-strategies/sustainable-investing/climate-change/climate-change-investment-risk/>
- Khalil, M. A., Nimmanunta, K. (2023). Conventional versus green investments: advancing innovation for better financial and environmental prospects. *Journal of Sustainable Finance & Investment*, 13(3), 1153–1180. <https://doi.org/10.1080/20430795.2021.1952822>
- Koval, V., Aleksieienko-Lemovska, L., Mikhno, I. (2023). Sustainable business models in enhancing regional product competitiveness. *Casopis za ekonomiju i trzisne komunikacije*, 13(1), 210-223.
- Kvach, Y., Piatka, N., & Koval, V. (2020). Management of sustainable entrepreneurship adaptation to tax changes in environmental investment. *Baltic Journal of Economic Studies*, 6(5), 96-105. <https://doi.org/10.30525/2256-0742/2020-6-5-96-105>
- Mogapi, E., Sutherland, M. M., & Wilson-Prangley, A. (2019). Impact investing in South Africa: Managing tensions between financial returns and social impact. *European Business Review*, 31, 397–419. <https://doi.org/10.1108/EBR-11-2017-0212>
- Piskulova N. Global Challenges:(2023) Environment. *World Economy and International business*. 213 – 233 Retrieved from: https://link.springer.com/chapter/10.1007/978-3-031-20328-2_11
- Sami Ullah, Rundong Luo, Tomiwa Sunday Adebayo, Mustafa Tefic Kartal. (2023). Paving the ways toward sustainable development: the asymmetric effect of economic complexity, renewable electricity, and foreign direct investment on the environmental sustainability in BRICS-T. Springer Link. Retrieved from: <https://link.springer.com/article/10.1007/s10668-023-03085-4>
- Thompson, B. S. (2023). Impact investing in biodiversity conservation with bonds: An analysis of financial and environmental risk. *Business Strategy and the Environment*, 32(1), 353–368. <https://doi.org/10.1002/bse.3135>
- World Economic Forum. (2023). Retrieved from: <https://www.weforum.org/>
- Žitkienė, R., Grigonis, V., Burak, P. (2020). Evaluation of Derivatives Impact to Early Systemic Risk of Euro Area. *Economics Ecology Socium*, 4, 62-71. <https://doi.org/10.31520/2616-7107/2020.4.1-7>