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Financing of the preserving ecosystems in Ukraine: Political and managerial aspects

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Abstract: This article explores the political and managerial aspects of financing ecosystem preservation in Ukraine under the influence of war, economic instability, and global climate and biodiversity challenges. Based on comparative analysis and international experience, particularly from the European Union, the authors assess the dynamics of state budget expenditures on the nature-protected fund of Ukraine from 2016 to 2025. The study applies systemic, economic, and decision-making methods, including cybernetic planning and the analytic hierarchy process (AHP), to identify optimal financing mechanisms. A comprehensive set of innovative tools is proposed—such as green bonds, sustainability-linked loans, blockchain monitoring, and public-private partnerships—to enhance financial resilience and ensure sustainable biodiversity conservation. The paper emphasizes the importance of private sector engagement, territorial communities, and international cooperation in forming a transparent, inclusive, and future-oriented financial system for nature protection. Particular attention is given to the role of ecosystem services in economic development and to mechanisms that integrate ecological protection with local economic strategies.

Keywords: financial system; preserving biodiversity; integration; economic policy; financial innovations

1. Introduction

Ukraine is home to approximately 35% of Europe's biodiversity, including numerous endemic species and unique habitats such as steppe reserves and floodplain ecosystems. This high biodiversity level underscores the global importance of conserving Ukrainian ecosystems and justifies the need for international cooperation and funding. Natural ecosystems and business are interconnected. Supply chain operations and the physical safety of entrepreneurs depend on nature, but supply chain maintenance also has an equal impact on the degradation of ecosystems, flora, fauna, and provision of ecosystem services. The extraction of natural resources or production from supply chains exacerbates environmental degradation. Such actions can, in turn, cause material losses to the business. Therefore, it is extremely useful to attract business financing, and not only the state budget, to the area of ecosystem conservation. In accordance with the international legal document, the Convention on Biological Diversity—conservation of biological diversity and ecosystems, sustainable use of its components, and fair and equal distribution of benefits in society arising from the use of genetic resources—was agreed upon by 196 countries of the world [1–3].

Every year, developed nations allocate substantial funding toward the preservation of ecosystems, the support of protected natural areas, and the safeguarding of biodiversity [4,5]. For countries like Ukraine, which operate under tight budget

constraints and limited financial capacity, such investments pose a considerable challenge. Therefore, greater attention from the Ukrainian government should be directed toward strengthening the system of nature-protected areas as a key component of sustainable economic growth [6–8]. The relationship between financing instruments of ecosystem conservation in the EU and socioeconomic growth has been investigated by different scientists [6–10]. It is known that agricultural subsidies that focus solely on increasing crop output have led to actions that are degrading biodiversity, natural resources, and ecosystems [11–16]. According to the Financing Nature Report [17], the potential level of conservation funding from biodiversity offsets is estimated at US \$162 billion. This amount is close in value to the estimate for all countries (US \$168 billion), as almost all higher-income countries are included in the 108 countries with compensation policies and provisions, and higher-income countries have higher compensation costs per hectare.

This article examines the financing of ecosystem conservation in Ukraine through the state budget, as well as the relationship between funding for nature-protected areas and successful business activity, taking into account additional influencing factors—financial, organizational, and political [18,19]. It proposes a range of measures aimed at promoting ecosystem preservation and introduces innovative financial instruments—such as green loans, green bonds, sustainability-linked loans, vouchers, obligations, and public-private partnerships—in line with the principles of sustainable development.

It is known that one million of all species are now under threat—this figure is hundreds of times higher than the average figure for the last million years. The World Economic Forum’s 2020 Global Risks Report identifies biodiversity loss and ecosystem collapse as the top threats humanity will face in the next decade. Society and the economy fundamentally rely on biodiversity [20]. The formation of economic value in the structure of the total world GDP is dependent on nature and its services [21,22]. Nature loss matters to most companies because of the impact on operations, supply chains, and markets [23]. Despite increasing attention to ecosystem and biodiversity loss, there is still limited understanding of why this is important to business and what the private sector can do about it.

2. Methodology

The methodological and theoretical foundation of this study is based on key economic principles related to ecosystem financing. The research employs several general scientific methods, including systematization, which was used to examine key indicators of financing for ecosystem preservation within Ukraine’s nature-protected areas and in developed countries, as well as to explore the impact of the war in Ukraine, the economic crisis, and the COVID-19 pandemic on biodiversity conservation. Additionally, the cause-and-effect analysis method was applied to reveal interrelations between these factors [24,25].

Among the specialized methods, the study utilized the cybernetic planning approach as an instrument of economic-ecological management for protected areas. This method enables preliminary assessment of the resource capacity of protected sites, analysis of service markets in the respective regions, and identification of potential risks for private entrepreneurs engaged in environmentally oriented business activities.

A cost-benefit analysis was conducted to evaluate the economic feasibility of implementing best international practices for optimizing ecosystem conservation financing in Ukraine. To select the most suitable mechanisms of state regulation and to define a development scenario for the country's nature-protected fund, the analytic hierarchy process (AHP) was applied. The analysis also considered factors such as changes in state budget financing for protected areas and trends in funding through innovative financial instruments. This study applied the Analytic Hierarchy Process (AHP) to prioritize financial mechanisms based on criteria such as efficiency, transparency, scalability, and risk. Pairwise comparison matrices were developed, and weights were computed using consistency ratios to validate reliability.

Ecosystem conservation methodology means protecting the environment from destruction by applying various methods of protecting biodiversity, such as reducing stocks, increasing the area of forest plantations, recycling waste, and planting cover crops [26]. The methodology of ecosystem restoration includes the process of ensuring that the quality of the environment does not deteriorate and the state of the environment constantly improves.

3. Literature review

Economic instruments can be an effective and cost-effective way to achieve environmental goals, such as biodiversity conservation and sustainable use of ecosystems and climate change mitigation. A distinction is made between commissions and fees related to the environment. All of them increase the cost of polluting products or harmful effects on nature and, as a result, discourage non-environmental production and consumption, regardless of whether this was the intended purpose of the collection or not. Usually, such instruments of ecopolicy for the environment as "commissions" and "fees" are used as synonyms. The data of the Biodiversity Indicators Partnership [19] indicates that the commission is a payment made to public administration bodies, which varies more or less in proportion to the services provided. According to specialists and experts Gao and Guo [13], Jones [16], it is planned to gradually reduce such ineffective incentives as subsidies that harm biodiversity in the future in order to avoid negative impacts on ecosystems. In addition, positive incentives for the conservation and sustainable use of biodiversity are currently being developed and are planned for gradual application in accordance with the Convention on the Conservation of Biological Diversity and other relevant international obligations, taking into account national socio-economic conditions.

The management system plays a vital role in ensuring the effective conservation and financing of ecosystems. This role is particularly critical in the context of growing environmental threats, climate instability, and wartime challenges. It is essential to conduct systematic and continuous ecosystem monitoring to ensure that reliable data and observations flow in real time to public institutions and state authorities. Such monitoring enables timely responses, adaptive management, and improved transparency in decision-making processes. This flow of information is of crucial importance for the proper governance of ecosystems and the generation of long-term socio-ecological and economic benefits arising from their functionality.

State institutions must work in close cooperation with territorial communities to co-create adaptive strategies and action plans aimed at conserving ecosystem biodiversity. These strategies should be grounded in evidence-based planning tools that support the design of ecologically coherent networks of protected areas and ecosystem corridors [27,28]. Ensuring ecosystem connectivity and integrity is fundamental to both effective biodiversity conservation and the broader goals of integrated ecosystem management, particularly in light of escalating climate change impacts and anthropogenic pressures [29–31].

A new paradigm is emerging around the concept of designing human-friendly environments through an ecosystem lens [32,33]. This approach emphasizes harmony between social systems and nature, prioritizing resilience, equity, and sustainability. For instance, Hilhorst and Mena [34] argue that the COVID-19 pandemic exacerbated societal tensions and conflict, increasing the urgency of proactive peacebuilding efforts. These scholars highlight that traditional peacekeeping models—where donors independently fund separate actors—are insufficient to address the complex dynamics of modern conflicts.

Instead, they propose viewing peace itself as an ecosystem. In this model, all stakeholders—donors, governments, civil society organizations, multilateral and regional institutions, territorial communities, private companies, and individuals—are interconnected participants in a collaborative and dynamic peacebuilding network. Recognizing peace as an ecosystem reinforces the need for sustainability and resilience: for such an ecosystem to endure and recover from crises, all its components must be meaningfully linked and mutually reinforcing [20].

Furthermore, Fontoura [21] emphasizes that many ecosystem services provided by nature have long been underappreciated in economic and policy frameworks. Only recently has there been broader recognition of the value of regulating, supporting, and cultural ecosystem services. These include not only the provision of clean water, soil fertility, air purification, and climate regulation, but also intangible benefits such as cultural identity, social cohesion, spiritual enrichment, and psychological well-being. Such services highlight the deep, multifunctional connections between ecosystems and human prosperity, underscoring the need for their comprehensive protection and valuation.

Payments for Ecosystem Services (PES) are relatively new and inherently political market-based instruments. They offer a unique mechanism for recognizing, quantifying, and valuing nature's contributions to human well-being. Various methodologies have been developed to estimate these values, and a growing number of financial and management models are associated with PES schemes. As of 2018, over 550 programs were active globally, collectively mobilizing more than US\$36 billion annually to support ecosystem conservation and the maintenance of ecosystem functions. Most of these initiatives focus on watershed protection, forest conservation, carbon sequestration, and habitat preservation [6,21].

Programs that ensure the provision and quality of critical natural resources for local communities are becoming increasingly widespread. Local communities and their governing bodies play a pivotal role in ecosystem preservation, as ecosystems function as productive systems that continuously deliver services to society. Accurate economic valuation of these services is essential. Moreover, PES can generate positive

externalities—such as enhanced aesthetic value and improved socio-economic conditions for local populations—that result from maintaining ecosystems in a healthy, functioning state.

Economic valuation of ecosystem services is important today, especially for indigenous groups and other local communities in developing countries, so that they can directly benefit from the management of these gifts of nature. This approach would combine livelihoods with ecosystem conservation, providing incentives for people to offset the opportunity costs they incur by choosing to protect natural systems. Based on the use of scientific assessments and financial indicators of ecosystem maintenance, it is possible to establish the economic value of ecosystem services—tangible benefits that people receive from nature. There are many forms of compensation for these ecosystem services that can prevent or correct the destruction of Earth's habitat and cooperate with the local population. The following payment mechanisms for ecosystem services are also used in the world: direct payments and financial compensation; in-kind benefits such as the provision of social services, livelihood support, and capacity building; and access to resources or markets. All these mechanisms, in a complex or individually, are created in order to make nature protection a reasonable and sustainable economic choice for the local population and territorial communities [26].

More than half of the world's GDP depends on the productivity of nature [21,22]. There is an intrinsic and universally recognized value of the natural world, ecosystem services, and products, which cannot be directly valued on the market but which exist and provide the vital activity of society. Therefore, the development of the concept of ecosystem services becomes particularly relevant, especially on a global scale and in economic terms. Preservation of ecosystems is a continuous cycle of human life. When humans invade an ecosystem, the slightest disturbance can disrupt the entire system, ending any particular flora or fauna that can thrive exclusively in that ecosystem. One of the advantages of ecosystem conservation is that not all ecosystems are created equal or endowed with the same amount of flora or fauna; no two ecosystems in nature are identical.

4. Results and discussion

The United Nations in 2015 approved its 2030 Agenda, an action program setting out 17 Sustainable Development Goals (SDGs) for everyone and society to follow to achieve sustainable growth from an environmental, social, and economic side. Researchers May et al. [3] note that the cooperation of financial institutions with environmental protection institutions and the expansion of the vectors of their activities in the field of environmental protection will contribute to the creation of innovative financial networks that can become the basis for transformational processes in the economy. The increasing costs for the preservation of ecosystems are caused primarily by the deterioration of their condition, the loss of the ability to recover, and the decrease in the production of ecosystem services. Environmental changes often lead to the loss of ecosystems. Catastrophic changes in the overall state of each state's ecosystem and biodiversity may ultimately come from how it is organized—from feedback mechanisms within it and from connections that are hidden and often

unrecognized. Changes can be caused by any obvious external event, such as the war currently taking place in Ukraine. However, once the changes take effect, they can be explosive and will eventually show some form of hysteresis, so that recovery is much slower than collapse. In extreme cases, changes can be irreversible. Therefore, Gruneveld [4] claims that during the process of creating protected areas, it is necessary to forecast the economic and ecological potential of the protected area, including costs for the protection and reproduction of unique ecosystems, and the possibility of introducing alternative economic and organizational ways of developing such areas.

From this point of view, in the opinion of Nikolaychuk [10], a public-private partnership should be developed in the field of the nature reserve fund in the form of a balanced, economically and socially beneficial partnership between the objects of the nature reserve fund of Ukraine, territorial communities, representatives of the business community, and financial institutions with the aim of implementing various projects aimed at solving environmental, economic-ecological, and socio-ecological problems of the territories.

According to the World Bank, a number of key factors influence a country's economic growth and its overall competitiveness. These include the natural environment and macroeconomic conditions, technological advancement and infrastructure, the state of healthcare and primary education, as well as the size of internal markets. These components are interrelated through a system of causal links. By managing environmental indicators—particularly those related to ecosystems and biodiversity—it is possible to influence both national competitiveness and the trajectory of economic development [13]. In recent years, many developed nations have significantly increased their investments in ecosystem protection and the conservation of natural resources with a view toward long-term sustainability for future generations.

The experience of the EU shows that Ukraine needs to develop an economic policy that would improve ecosystem financing as well as increase investment in this sphere for future Ukraine's sustainable economic growth. Yarova et al. [11] believe that the application of spatial analysis is important for the processes of reproduction of natural resource potential in the context of the principles of sustainable spatial development. The appropriate approach should be based on the system of indicators of the relationship between the socio-ecological and economic characteristics of the resource potential with the main subsystems of the national (regional) economic space. At the same time, the authors MacKinnon et al. [12] emphasize that humanity cannot ignore the fact that cybernetic planning is a modern trend that should be integrated into all spheres of economy and social life. However, for the purpose of its high-quality functioning, the implementation of cyber planning in any sphere of economic activity of the country must be accompanied by thorough measures of cyber and information security.

To implement the financing process optimizing the ecosystems' conservation of the NPF of Ukraine, the authors made a statistical analysis of expenditures of the State Budget of Ukraine for the preservation of ecosystems of the nature-reserved fund for the period from 2016 to 2021, which has been given in **Table 1**.

Table 1. Analysis of expenditures of the State Budget of Ukraine for the preservation of ecosystems of the nature-reserved fund, 2016–2021.

Year	Dynamics of the area of NPF objects (mln ha)	Amount of expenses for preservation of NPF (billion hryvnias)	Costs per 1 ha of NPF area, Hrn UA	Costs per 1 ha of NPF area (equivalent in US dollars)
2016	3.985	142.71	35,810.46	1401.5
2017	3.991	257.65	64,557.55	2426.9
2018	3.985	292.95	73,513.15	2708.7
2019	4.085	391.01	95,718.36	3702.8
2020	4.105	418.44	101,934.59	3576.6
2021	4.485	530.59	118,305.44	4065.5

Source: Calculated by the authors.

As the data in **Table 1** show, during the studied period, expenditures from the state budget for the preservation of ecosystems increased by 3.7 times, which had a positive effect on the qualitative side of the matter, since per hectare of the area of the nature-reserved fund, funding increased both in hryvnias and in US dollars (**Figure 1**).

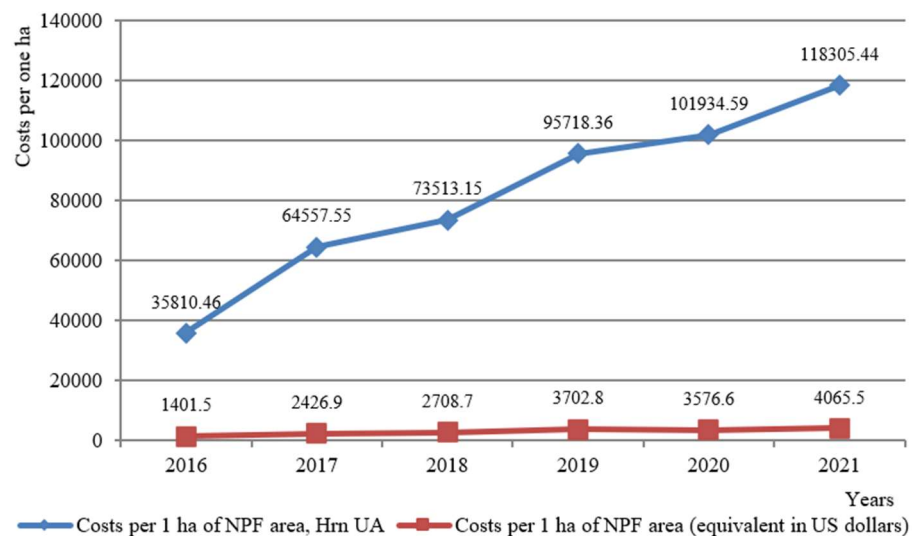


Figure 1. Dynamics of specific costs for the preservation of ecosystems in Ukraine in national currency and in US dollars.

Source: Calculated by the authors.

Funding per hectare of natural resources fund in hryvnias increased 3.3 times from 35.8 thousand UAH to 118.3 thousand UAH during the study period. Similarly, there was an increase in specific financing in US dollars—from 1.4 thousand dollars in 2016 to 4.1 thousand UAH in 2021; that is, the costs of maintaining the NPF increased by 2.9 times, which is an overall positive dynamic.

A large number of scientists are convinced that the introduction of the voucher system will help make nature conservation effective and provide certain guarantees. In particular, Gao and Guo [13] believe that the vouching institute should include a system of non-market risks, the guarantor of which will be the state, and traditional economic risks, where the guarantor will be representatives of the business community. In accordance with the requirements of the current legislation of Ukraine, the guaranty agreement defines the guarantor's obligation to the debtor's creditor to fulfill a certain

amount of obligations to him. Tan and believe that the development of the vouching institution is related to the blockchain system, since it is the system of transactions recorded on the blockchain that can form the most reliable reporting for a certain period and confirm the fulfillment or non-fulfillment of obligations, both from the side of the debtor and from the side of the creditor [14]. Miller and Savage [15] promote the vouching institute, which will be able to work clearly and transparently only if there are effective financial audit tools. Proper audit mechanisms are a tool to prevent financial and organizational distortions that may occur during vouching agreements. Jones [16] believes that vouching should take into account not only the targeted level of profit but also costs in case of bankruptcy of the enterprise and other types of payments. The scientist offers an approach that will predict probable risks as much as possible during the conclusion of such agreements. The method of cybernetic planning can integrate economic, social, ecological, legal, cultural, and investment factors when designing protected areas. It helps build a transparent and balanced project that aligns the interests of the state, communities, businesses, and landowners. A pilot blockchain-based biodiversity monitoring project was initiated in the Carpathian Biosphere Reserve in 2023 to ensure transparency in conservation financing.

On the data of The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability [17,21,24,30,35], in this work, the authors analyzed the prospects for the growth of the global market size of the economy until 2030 according to the main economic tools for preserving the biodiversity of ecosystems: green bonds, sustainability-linked loans, and green loans. The data are shown in **Table 2**.

Table 2. Prospects for the growth of market size of the economy according to the main economic tools for preserving the biodiversity of ecosystems in the world, US \$ bln a year, 2020–2030.

Indicator	2019	2020	2021	2022	2023	2024
Green Bonds	*	334.24	437.28	575.15	765.10	1006.32
Sustainability Linked Loans	*	154.34	196.05	257.86	343.03	451.17
Green Loans	*	119.08	152.31	187.95	229.12	268.99
Indicator	2025	2026	2027	2028	2029	2030
Green Bonds	1278.30	1527.92	1665.85	1641.31	1444.8	1120.12
Sustainability Linked Loans	573.11	685.03	746.86	735.87	647.76	502.19
Green Loans	295.63	293.86	252.44	182.77	107.66	48.88

* There are no data. Source: Compiled on the basis of data [1,5,17,35].

As shown in **Table 2**, the largest share of the total structure of financial instruments for biodiversity conservation is occupied by green bonds, the second position belongs to loans related to sustainable development, and in third place—green loans. For visual perception, the data are represented in **Figure 2**.

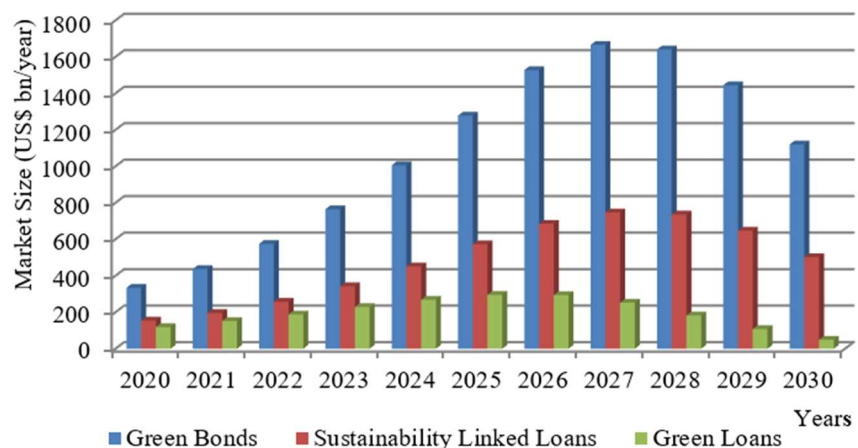


Figure 2. The dynamics of the involvement of financial instruments in the preservation of ecosystems and biodiversity for the perspective of 2030, bln of US dollars.

Source: Compiled on the basis of data [2,11,17,33–35].

The globally endorsed target of expanding both terrestrial and marine protected areas to 30% by 2030 aligns with initiatives advanced by the Campaign for Nature, The Nature Conservancy, and other international organizations [17]. However, several critical factors hinder the prioritization of funding for biodiversity conservation. Among them are the ongoing war between Russia and Ukraine, the adverse economic impacts of the COVID-19 pandemic, demographic decline in Ukraine, and increased labor migration to European Union countries. These challenges collectively complicate the attainment of internationally and nationally established goals for expanding the territory of nature-protected areas.

A significant number of financial institutions—particularly development finance institutions (DFIs) and multilateral development banks (MDBs)—possess the flexibility to leverage their financial contributions to infrastructure projects by setting rigorous requirements for biodiversity and ecosystem safeguards. These institutions are increasingly adopting environmental and social performance standards (such as those of the IFC or EBRD) as a prerequisite for project approval, thereby driving up global standards of environmental accountability. For instance, in 2017, approximately 17% of global infrastructure projects were financed by private investment, while 83% relied on public funding [18,27,32]. By 2023, the share of private investment in infrastructure—particularly in climate-resilient and green infrastructure—has increased to nearly 30%, according to OECD estimates. This trend reflects growing private sector interest in sustainable finance and ESG-compliant projects.

Governments also have tools at their disposal to mobilize capital for ecosystem preservation, including the issuance of sovereign green bonds and nature-linked bonds. These financial instruments are tied to measurable biodiversity and climate outcomes and have seen growing popularity in the global market. Sovereign and municipal bonds issued for ecosystem conservation purposes can be integrated into domestic budgets and tax frameworks. However, to avoid the risk of double counting, such instruments must be linked to specific, transparent projects and performance metrics rather than serving as general budgetary support.

Ukraine, tragically, is experiencing a catastrophic loss of ecosystem biodiversity as a result of full-scale war, drawing international concern and attention. Ukraine is home to 35% of Europe's biodiversity, representing a vital ecological reserve for the continent. The degradation of Ukraine's ecosystems means not only significant ecological damage but also substantial economic losses, as these systems provide essential goods—such as raw materials, agricultural productivity, and water regulation—and services like climate stabilization and pollination. According to UNEP (2023), over 3 million hectares of protected natural areas in Ukraine have been directly or indirectly impacted by hostilities, fires, pollution, and military occupation.

Financing the preservation and recovery of ecosystems must therefore be recognized as a global priority. This involves not only post-war restoration of natural capital but also proactive investment in ecosystem resilience and sustainable land use. Governments worldwide should treat ecosystem conservation as an integral part of national security, climate resilience, and sustainable economic development.

Excessive and uncontrolled human intervention in natural systems—through habitat destruction, industrial pollution, or unsustainable land conversion—poses a direct threat to biodiversity and, ultimately, to human survival. The decline of even small or seemingly insignificant species, such as pollinating insects, disrupts entire ecological networks. The global rate of species extinction continues to accelerate. According to the International Union for Conservation of Nature (IUCN), 15% of all mammals, 13% of birds, 37% of freshwater fish, and 23% of amphibians in Europe are now under threat of extinction [30,35]. The collapse of these species and ecosystems would trigger cascading consequences across agriculture, public health, water systems, and climate regulation.

An effective and well-designed financial mechanism for ecosystem preservation—supported by transparent governance and cross-sector partnerships—can halt or even reverse these destructive trends. Mechanisms such as biodiversity offsets, environmental trust funds, conservation finance platforms, and debt-for-nature swaps are gaining traction and should be expanded. Since ecosystems are a form of irreplaceable natural capital that must be safeguarded for future generations, this is not just a national issue but a global imperative. No country can address this crisis in isolation. What is needed is a unified vision, coordinated international action, and sustained, science-based investment.

An important organization in ecosystem financing is the Global Conservation Fund (GCF), which actively provides financial and strategic assistance to countries to enable local communities to protect their own biological wealth, especially in protected areas. This fund helps in the creation and expansion of nature conservation areas, as well as ensuring effective management of these areas in the future. Since territorial communities have just been created in Ukraine, they need such assistance from the fund so that they can effectively manage natural ecosystems, account for their natural wealth, and existing biological species.

Fund funding provides investments and makes decisions based on sound scientific evidence to benefit local areas with the highest priority for conservation. The Fund mobilizes additional financial resources to multiply and support the already obtained positive results in the preservation of ecosystems. This could include exploring other potential sources of revenue, such as site fees, tourism, or initiatives

that involve payment for ecosystem services, such as the sale of carbon credits from avoided deforestation. This fund also supports a wide range of approaches to the creation and expansion of protected areas, from government-created national parks to private lands and community-managed reserves, combining conservation with responsible and wise use of natural resources.

5. Conclusions

The systematic analysis of the dynamics of budget financing for the preservation of ecosystems of the nature-reserved fund carried out in the work showed that without the tools of economic and ecological growth and cooperation with representatives of the private sector of the economy, the protected areas will not have a sufficient amount of resources that will meet the needs of today. The amount of expenses for the preservation of the nature reserved fund from the State Budget of Ukraine for the period from 2016 to 2021 has more than doubled, by 387.88 million UAH. However, taking into account the annual official rate of inflation for this period, the volume of financing was increased by only 60% every year. Due to inflation movements in the country, about 1%–2% of the volume of financing is leveled. In the course of 2016–2021, there was a positive trend of increasing expenses in the field of environmental protection; that is, the state is interested in the formation and development of the economic and ecological activity of protected objects. However, to this day, one of the main tools for supporting the implementation of nature protection tasks and measures aimed at preserving the ecosystems of the nature-reserved fund is support from the private sector of the economy.

The method of cybernetic planning is proposed as an innovative approach to the management of economic activity within the institutions of the nature-reserved fund of Ukraine by using complex planning methods, which will ensure strict compliance with the norms and rational use of the resource potential of the objects of the nature reserve fund of Ukraine. At the same time, it is necessary to take into account the nature conservation restrictions, the organization of economic activity in the protected territories, which will meet the requirements of the market economy, the principles of development, and the formation of investment activity of civil society. In addition, the method of cybernetic planning will ensure the selection of an effective model of conducting business activities for the relevant administrative territory, taking into account the nature protection and economic and social features of the object of the Nature-Reserved Fund of Ukraine and the needs of the local community and regional business structures.

The European Union provides a valuable example of successfully applying innovative financing mechanisms for ecosystem conservation, which can serve as a model for Ukraine's economic context. One such approach involves the issuance of sovereign debt specifically dedicated to environmental protection goals. These funds may be integrated into national budgets and aligned with tax policy, though it is generally assumed that both sovereign and municipal bonds are issued for clearly defined projects and assets rather than for general fiscal support, thereby reducing the risk of double counting. In this regard, enhancing public financing for ecosystem conservation in Ukraine requires establishing strong interconnections between the

funding of nature-protected areas and the performance of responsible business, taking into account additional determinants such as financial, institutional, and political factors. To accelerate financial development in the field of ecosystem conservation, the authors propose the use of a range of innovative tools, including green bonds, sustainability-linked loans, green obligations, public-private partnerships, vouching mechanisms, green loans, cybernetic planning methods, and blockchain-based biodiversity technologies. All these instruments align with the principles of sustainable development. Furthermore, increasing private-sector investment would significantly contribute to the effective preservation of ecosystem biodiversity. A pilot blockchain-based biodiversity monitoring project was initiated in the Carpathian Biosphere Reserve in 2023 to ensure transparency in conservation financing.

A strong or stable ecosystem provides humanity with a multitude of invaluable benefits—often at no direct financial cost. These ecosystems continuously offer essential services such as soil protection against erosion and degradation, water purification by wetlands and riparian buffers, oxygen production by forests, carbon sequestration, and climate regulation, as well as recreational, spiritual, and aesthetic values that support physical and mental health. For instance, intact peatlands and wetlands absorb pollutants and store carbon more effectively than many artificial solutions, while natural forests not only purify the air but also serve as green infrastructure for cities under stress from urbanization and climate change. Yet, it remains common for society to assume that if an ecosystem has no formal price, it has no economic value. This outdated perception has led to widespread underinvestment in natural capital and the degradation of critical ecosystem functions. It is time to change this mindset and recognize that a functioning ecosystem is just as much a productive system as any industrial facility, enterprise, or service organization. Unlike artificial production units, ecosystems are renewable—if sustainably managed—and contribute continuously to human well-being.

As natural resources become scarcer and more expensive every day, the economic rationale for protecting and managing ecosystems grows stronger. Degraded ecosystems reduce agricultural productivity, increase health-related expenditures, and lead to rising costs in water treatment and disaster recovery. Therefore, the sustainable management of ecosystem services should be treated as a strategic economic priority, not only an environmental concern. It is essential to integrate ecosystem service management into local development strategies, particularly within the territorial communities. Such integration ensures long-term socio-economic resilience and environmental sustainability at the grassroots level. Territorial communities should not only benefit from ecosystem services but also be actively involved in their stewardship. Local populations, traditional knowledge holders, and civil society should be formally represented in the governance, monitoring, and adaptive management of protected areas and community-managed reserves.

Moreover, promoting the image and identity of territorial communities through their unique ecosystem services—such as pristine landscapes, rare species, and cultural landscapes—can generate long-term sources of budgetary support. Ecotourism, for example, is a rapidly growing sector that provides employment, encourages conservation awareness, and creates incentives for local authorities to protect rather than exploit natural areas. Well-managed ecotourism also attracts private

investment, development grants, and public-private partnerships that contribute to the economic development of the community. In this way, ecosystem services become not only ecological assets but also instruments of territorial branding, economic growth, and national environmental security. Therefore, a paradigm shift is needed: from viewing ecosystems as passive background elements to recognizing them as active, strategic assets in Ukraine's recovery, climate adaptation, and sustainable development agenda.

The geographic location of ecosystems matters, especially in low- and middle-income developing countries. A distinction is made between non-market financing, including government and philanthropic financing for biodiversity conservation, as well as financing biodiversity through market mechanisms. Relying on the assessment of ecosystem services is not enough to halt the current loss of global biodiversity of all ecosystems. Therefore, the need to develop an additional long-term financing mechanism for the preservation of ecosystems became relevant.

The global objective of expanding terrestrial and marine protected areas to 30% by 2030 has prompted countries worldwide to allocate substantial financial resources annually toward enhancing their environmental sustainability, improving the quality of life, and safeguarding natural ecosystems for future generations. In the case of Ukraine, the development of modern infrastructure and improved access to European markets are expected to serve as key drivers for advancing ecosystem conservation and fostering the formation of an innovative financial and economic system oriented toward sustainability.

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