SCIENTIFIC HORIZONS

Journal homepage: https://sciencehorizon.com.ua

Scientific Horizons, 23(12), 74-83

UDC 338.24:502.131

DOI: 10.48077/scihor.23(12).2020.74-83

Ecosystem Approach in the Context of Economic Interest Management

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Article's History:

Received: 14.10.2020

Revised: 06.11.2020

Accepted: 23.12.2020

Suggested Citation:

Antonenko, V., & Sukhina, O. (2020). Ecosystem approach in the context of economic interest management. *Scientific Horizons*, 23(12), 74-83.

Abstract. The relevance of the study was conditioned by the necessity of seeking solutions of environmental security issues and ensuring its effective management. The purpose of the study was to structure the national security system with the allocation of environmental and economic subsystems, constructive and critical analysis of the main opinions and positions of researchers on the essence and areas of the ecosystem approach concerning the solutions of environmental security issues, further development of the ecosystem approach based on economic management methods. The study was based on the use of system and matrix approaches, methods of generalisation, modelling, analysis and synthesis, and content analysis. It was proved that the national security system includes, in particular, environmental and economic subsystems and that there is an objective internal system connection between these subsystems, which, if used correctly, should ensure the effective functioning and development of both subsystems. The study outlined the functional and subject matrix of the environmental security system, which will contribute to the systematisation of various areas in its research. It was established that from the standpoint of management theory, the ecological subsystem is defined as the managed one, and the economic subsystem is defined as the managing one. Management is ensured by the fact that the first one includes not only natural, but also human resources (consumers of ecosystem services, managers in the environmental sphere or performers of environmental functions). It was proved that the effective solution of environmental issues necessitates the consideration of the economic interests of these people, since economic interests constitute the basis of an economic (effective) management method. The practical value of the study was to develop an economic method for managing the environmental security system and substantiate the role of economic interests, which would contribute to the practical solution of environmental issues in Ukraine

Keywords: national security, environmental problem, economic security, environmental security management, natural resources

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INTRODUCTION

Modernity is described by many issues, the rapidly increasing number of which demands timely and adequate solutions from humankind. In the conditions of a changing and unpredictable present, there is a need to ensure the safety of humanity and the environment of its functioning. Therefore, it is logical and timely to actualise research on practical issues of protecting the humankind and the environment of its functioning. This subject is also very relevant for modern Ukraine. The increased attention to this subject is evidenced by the fact that over the past 1.5-2 decades, a considerable number of studies by Ukrainian and foreign specialists have already been developed; many of these articles are conditioned by different angles of such research, when researchers address the same category from different standpoints.

An insight into the subject area of publications on national security proved that research concerns its various structural components, to the list of which researchers (generalisation of scientific approaches in this regard is provided in [1]) include: political, economic, state, social, socio-cultural, demographic, information, technological, environmental, humanitarian, military, defence, public, fire, environmental, food, epidemic, and financial safety. Specific components of national security become more or less relevant in view of a certain scenario of factors affecting them. It is worth paying attention to the statements of experts on this matter, who noted the current growth of environmental risks for the development of national economies, while the actual economic and political risks have become secondary in importance [2].

Environmental issues are fundamentally based on the so-called "green economy" and "green development". Back in 2012, Cameron Allen (UN Sustainable Development Division) prepared a document that addressed the green economy issues and examined the experience of developing and implementing green growth strategies in different countries. He pointed out that political priorities should include reforming the system of economic incentives, promoting the development of sustainable investment infrastructure and promoting investment in natural capital [3, p. 6]. The development of environmental security of the country is defined by the Law of Ukraine "On the Fundamental Principles (Strategy) of the National Environmental Policy of Ukraine for the Period up to 2030", which makes provision for the introduction of international standards of environmental management systems in enterprises and companies, which will contribute to the development of the environmental management system and the implementation of international environmental initiatives in Ukraine [4]. However, despite the demand for these studies and related reforms, numerous issues remain unresolved, even with some unidentified issues concerning the application of a systematic management approach for effective implementation of reforms and achievement of the intended results. Considering the economic interests of stakeholders, there are no studies of the ecosystem approach in science.

Thus, *the purpose of this study* was to investigate the structuring of the national security system with the allocation of environmental and economic subsystems in it, the implementation of constructive and critical analysis of the main opinions and positions of researchers on the essence and areas of applying the ecosystem approach in solving the problem of ensuring environmental security, the justification of the management approach to the use of economic methods as the basis for further development and the essential content of the ecosystem approach. The authors of this study set the following tasks: to investigate the developments of researchers regarding the structuring of national and environmental security systems and related areas of scientific research; to determine the essence and development of the ecosystem approach and the practice of its application; to "chart the contours" and justify their vision of the essence of the ecosystem approach based on the concept concerning the consideration of the economic interests of all subjects relating to or taking part in ecosystem development, and with the division of the latter into subjects and objects of management, as well as the development of methods for influencing the latter (objects) by the former (subjects).

METHODOLOGICAL REASONING

Classical and special methods of scientific cognition were used in this study. To identify the essence of environmental security, the study used a systematic approach, which makes provision for its consideration, firstly, as a system element of a larger system (namely, national security), and, secondly, as a complex ecological, extensive system, which, for its part, includes internal system components. Functional and subject components were identified as internal components requiring the use of a system-matrix approach. A systematic approach also allowed combining research on the environmental and economic components of security, as well as determining the critical points of their intersection.

The systematic approach is associated with the objective necessity of employing the classification method, which was applied in this study to determine

the classification components of the national security system. The portfolio (matrix) research method was used to provide a compelling development of the environmental security format. This allowed presenting the environmental security system as a matrix with two parameters – functional and subject.

The paper focused on the environmental and economic components of safety and their mutual impact. It is this influence that determined the use of factor analysis, which allowed evaluating their causation. The interdependence and interrelation between them suggested that further development of the ecosystem approach is possible only if these components are integrated. The integrative combination of environmental and economic components of security has led to the need and possibility of applying a transdisciplinary approach, that is, the transfer of research methods from one scientific area to another. Notably, in this case, this approach is based not so much on classical transdisciplinary transfer, but on an essential integrative combination.

Consideration of the integrated ecological and economic system in this study was based on the modern theory of management, and, in particular, on the correlation of the managing (as the economic subsystem is perceived by the authors) and the managed (as the ecological subsystem is perceived by the authors) subsystems, where attention is focused on the fact that the management is improved at a more dynamic pace. This underlies the statement on the primary importance of applying economic incentives to the influence of the managing subsystem on the managed one, that is, consideration of the economic interests of the latter.

The content analysis method was used to identify the essence of the ecosystem approach category, which allowed comparing its interpretation by different authors. Furthermore, heuristic and associative methods were also used in the development of an original definition and interpretation of the essence of the ecosystem approach, considering the economic interests. The combination and mutual influence of two components in the ecological and economic system implied the need to monitor economic and environmental development and their comparative analysis, which is theoretically formed by the so-called decoupling method, the function of which is to maintain the gap between economic growth and to reduce the anthropogenic load on the environment [5, p. 31].

RESULTS AND DISCUSSION

Systematic relationship of environmental and economic components in the structure of national security

The national security system constitutes a sophisticated, complex, and interconnected combination of a considerable number of conditionally separate subsystems. The authors generalised the types of subsystems of national security, demonstrating the structural place of each of them in the hierarchical security systems and highlighting the connecting role of scientific security (Fig. 1) [1].

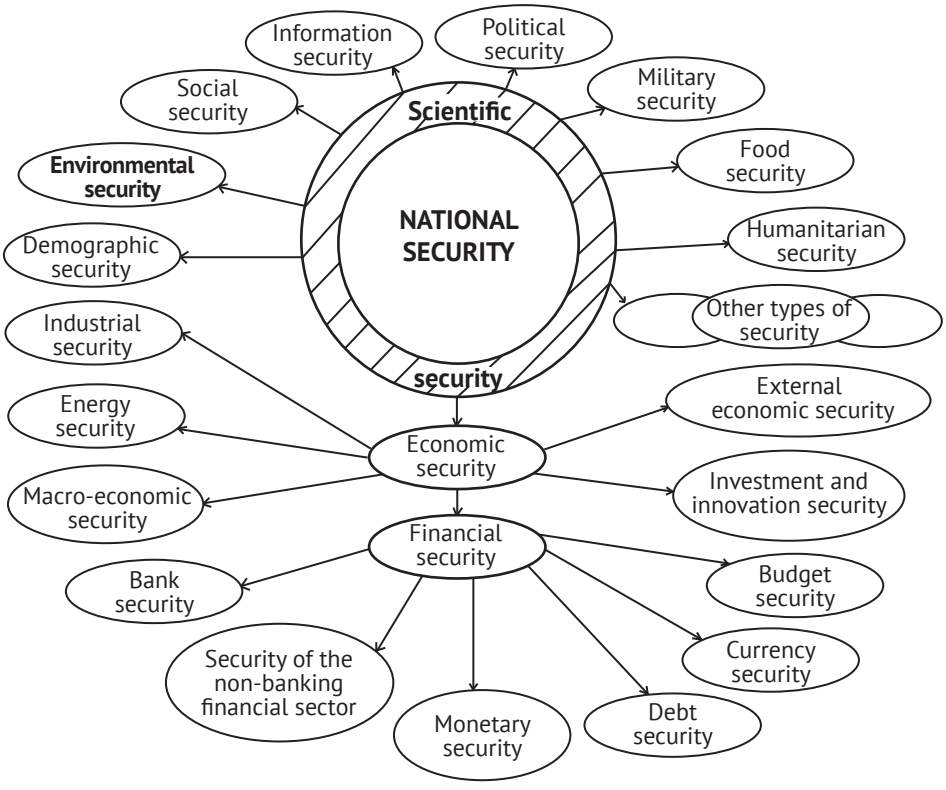

Figure 1. *Structuring of the national security system with identification of the place of environmental and economic subsystems in it*

Source: *developed by the author V.M. Antonenko*

Narrowing down the scope of the study and focusing on the environmental and economic components of security, the authors had to properly identify them. Notably, the environmental component of a security system cannot be separated from the other components of this system. Most importantly, according to the authors, it is worth focusing on the systemic relationship between environmental and economic security. In the specialised literature, the term "ecosystem" can be interpreted both from the standpoint of environmental and economic content, and, consequently, has a systemic combination into a unified security system.

The study considered their connection through the managerial aspect. From the standpoint of classical management, the management has managing and managed subsystems, between which the purposeful influence of the former is exerted on the latter. Applying the transdisciplinary method of transferring management elements to the essence of the security system, the authors considered the economic subsystem to be the managing one, while the environmental subsystem is the managed one (Fig. 2).

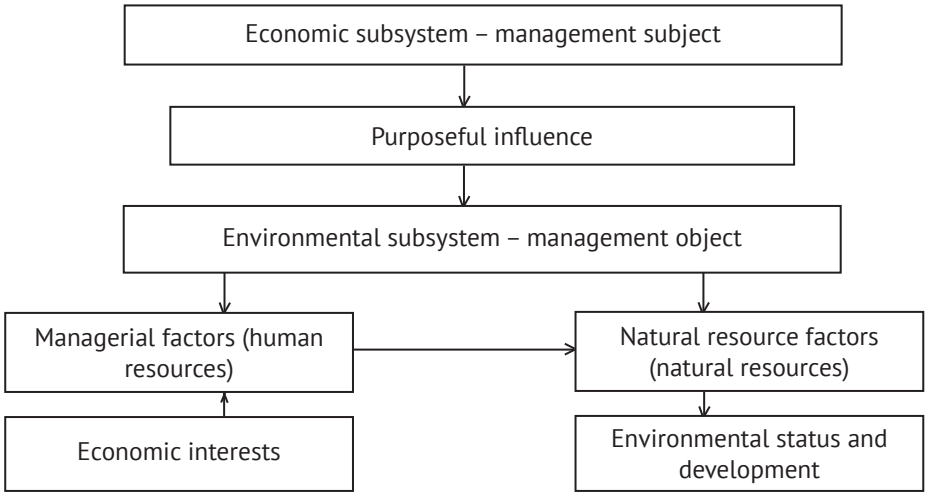

***Figure 2**. Mechanism of influence of the economic system on the environmental one*
***Source**: developed by the author V.M. Antonenko*

Such a statement certainly requires scientific evidence and an appropriate explanation. The fact is that the environmental security system, according to the authors, makes provision for the study of both purely physical problems of nature management (natural resources, their state and development), and human factors (developers and performers of environmental programmes, projects, performance of functions, environmental measures, etc.), which, due to the presence of their personal economic interests, can treat and react to the purposeful influence on the environmental system differently.

Research of environmental security as an object of management

Environmental security is a complex concept, and therefore is studied by researchers in various functional and subject formats. Functional formats, according to the authors, can be called precisely functions in ensuring and maintaining such security, that is:

– development of an appropriate strategy;

– organisation of infrastructure for its practical implementation;

– environmental risk management, establishment and implementation of standards, limits, quotas, payments for special use of natural resources and fines for environmental pollution;

– planning and organisation of work on the sparing use of natural resources, keeping records of their reserves and consumption volumes;

– environmental control, etc.

The fundamentally functional interpretation of environmental security is officially defined by the Law of Ukraine "On the Fundamental Principles (Strategy) of the National Environmental Policy of Ukraine for the Period up to 2030" [4] and is stipulated in the Regulation "On the State Environmental Inspectorate of Ukraine" [6]. In particular, the above law sets important strategic tasks to strengthen the efficiency and effectiveness of these functions, namely:

– "strengthening institutional capacity to plan, monitor, and evaluate the effectiveness of environmental policy implementation;

– introduction of environmental accounting to evaluate the effectiveness of policy and management;

– provision of scientific and informational and innovative support for the managerial decision-making process;

– strengthening the ability of environmental management to conduct comprehensive monitoring of the state of the natural environment and state control concerning environmental security, rational use, reproduction, and protection of natural resources;

– differentiation of functions for environmental

protection and economic activities for the use of natural resources;

– ensuring a clear distribution of powers concerning environmental protection at the state, regional, and local levels;

– improvement of personnel policy and professional training of specialists in the system of environmental protection and nature management" [4].

The subject format concerns the consideration of the management of natural resources of a certain, particular type: land, namely landscape resources, for example: [7-10]; water resources, specifically marine and river ecosystems [11-13]; forests, namely wood and plant resources [14-16]; atmospheric air, even bees [17]. A combined, i.e., functional-subject approach to ensuring the functioning of the environmental security system is developed by special departments and assigned to particular executors. Thus, the environmental security system in the understanding of the authors can be presented as a combined matrix, which unites functional and subject formats (Table 1).

***Table 1**. A combined matrix that unites the functional and subject formats of an environmental security system*

Parameter	Natural resources				
Functions	**Land**	**Water**	**Forest**	**Atmospheric air**	**Other**
Environmental strategy development					
Environmental infrastructure organisation					
Environmental risk management					
Establishment and implementation of standards, limits, quotas, payments, and fines					
Planning and organisation of sparing use of natural resources					
Accounting for reserves and consumption of natural resources					
Environmental control					

***Source**: developed by the author V.M. Antonenko*

It is clear that for each type of natural resources, all the functions listed in the figure must be performed. In general, environmental measures should contribute to improving the environmental situation, positively affecting the state and development of the ecological system, but the authors also emphasised that all functions can be implemented only through the involvement of specialists – their executors, who would perform them if they have their personal economic interests (see Fig. 2).

For example, relevant state or public institutions are involved in the development and implementation of environmental strategies for any natural resources; therefore, it is appropriate to evaluate the results of their work and form their remuneration depending on the implementation of the corresponding strategies. The introduction of standards, limits, quotas, payments, and fines should take place in such a way that the persons for whom restrictions or payments are established are economically incentivised in sparing environmental security activities, that is, that the size of such economic levers of influence is economically tangible for them. Therewith, environmental control requires bringing to justice all violators of established environmental standards; moreover, to increase the probability of their detection and prosecution, regulatory authorities should receive sufficient remuneration so that they are not tempted, for example, to engage in any illegal corruption activities.

Thus, the mechanism of influence on environmental security is based on the economic interests of all stakeholders. As a matter of fact, this position requires a revision of the essence of the current and fairly common ecosystem approach to the study of natural resource management in the specialised literature.

Research and meaningful development of the category "ecosystem approach" with the inclusion of the human factor

The officially recognised interpretation of the term "ecosystem approach" was adopted and introduced in 2000 at the V Conference of the parties to the Convention on Biological Diversity [18]. Withing the framework of the development of this Concept, decision V/6 "Ecosystem Approach" was adopted in 2000, the annex to which

contains a description of the ecosystem approach (Section "A"): "ecosystem approach means an integrated management strategy for land, water and bioresources that ensures their conservation and sustainable use on an equitable basis. It is based on corresponding scientific methodologies covering all levels of biological organisation, including the main processes, functions, and relationships between organisms and the environment" [19].

As the above interpretation of the essence of the ecosystem approach suggests, there is no express and specific mention of the obligation to consider both the human factor (executors of functions) and their economic interest in the qualitative and effective performance of these functions. This, according to the authors, is somewhat erroneous and in practice can provoke failures in the functioning of the system under study. Notably, this aspect largely concerns the Ukrainian reality rather than the European or American one, since the underdevelopment of the functional content of the system under study and the lack of adequate performance of these functions in Ukraine is a generally recognised fact.

Therewith, considering economic issues relating to the green economy, Cameron Allen wrote: "It is important to conduct an informed analysis of policy measures, identify major trade-offs and synergies between economic, environmental, and social goals, and use this information to establish policy priorities. An important component of this is cost-benefit analysis, which requires adequate information about the costs associated with policy implementation" [3, p. 30]. In other words, the researcher emphasised the need to consider economic goals and interests, as well as to analyse costs and benefits upon implementing environmental policies.

As the analysis of specialised literature has shown, at present, apart from the ecosystem approach, such synonyms as "ecosystem management", "management based on the ecosystem approach", "ecosystem-oriented approach", "ecosystem management approach", "integrated approach" are also used. Furthermore, some researchers focus on highlighting, for example, an ecosystem approach to fisheries, integrated river basin management, or integrated marine and coastal management. According to the authors, the essence of the ecosystem approach lies not in the use of new terms or names of natural resources, but rather in the mechanism of management involving economic interests. Only a few authors dare to somehow include the human factor in the concept of an ecosystem approach (Table 2).

***Table 2**. Content analysis of ecosystem approach definitions with the inclusion of the human factor*

Author(s)	Definition
M.A. Deineha [20, p. 132-133]	The ecosystem approach is a tool that allows considering the relationships within ecosystems with other systems and **people for whom ecosystems are a place of residence and a means of subsistence**. The ecosystem approach relates to how the use of ecosystems by a person is affected by their functioning and productivity. Ecosystem approach **includes people... human needs** are associated with the biological capacity of ecosystems to **meet these needs**
N.M. Nechyporenko [12, p. 34]; I.B. Hobyr [21, p. 249]	The ecosystem approach is based on a new integrated approach, which involves a continuous comprehensive understanding of the essence of ecosystems, the products and services they provide, as well as support, **with the participation of people**, their productivity. The ecosystem approach recognises that people with their socio-cultural diversity **form an integral and active component of ecosystems**
N.V. Dehtiar [13]	Upon determining the state of an ecosystem, attention is often focused only on the biological components of ecosys-tems, while others include the functioning of the ecosystem or **aspects of physical, human, and economic dimen-sions**. The ecosystem approach constitutes a methodological framework for justification of management decisions made by **economic entities** in the process of designing development strategies and forming planning methods
Ye.P. Suietnov [19, p. 199]	The ecosystem approach is designed to guarantee a fair **distribution of all benefits** derived from the use of biodi-versity, **among all people** at the local, state, regional, and global levels
K.P. Smith, A.T.F. Bernard, A.T. Lombard, K.Y. Sink [22, p. 11]	The idea of a socio-ecological system stems from an ecosystem approach to management, which considers the social benefits of rendering ecosystem services, as well as **effects of human pressure** on the integrity of marine ecosystems

***Note**: The bold text highlights the proof that human participation and economic interests (benefits) are considered to form an integral and active component of ecosystems*
***Source**: developed by the author V.M. Antonenko*

It is the human factor, based on the economic interests and benefits of people (as consumers of ecosystem services, managers in the environmental sphere, or executors of environmental functions), that will contribute to the effective functioning and long-term development of environmental systems. In this sense, the ecosystem approach can have the following definition: it is an integrated system method of ensuring the effective functioning and long-term development of ecosystems, including natural resources and human factors (consumers of ecosystem services, managers in the environmental sphere, or executors of environmental functions), which is based on consideration of and attracting the economic interests of stakeholders as the main economic method of exerting influence by the managing system on the managed one.

Effective functioning and long-term development of ecosystems is possible only if economic growth is outperforming compared to the accumulation of environmental issues, which relates to decoupling – the gap between economic growth and reduction of the anthropogenic load on the environment [5, p. 31]. Ursula von der Leyen, President of the European Commission, quite aptly refers to the need for humankind to ensure this gap between economic growth and the anthropogenic load: "the European green course is our new growth strategy. It shows how to change our way of life and work, production and consumption so that we live healthier and make our business more innovative. We will help our economy become a global leader by moving quickly" [23]. Such a vector in the development of ecosystems should also be a reference point for Ukraine.

CONCLUSIONS

From the standpoint of a systematic approach, national security, has a structured hierarchy wherein all its components occupy a certain systemic place, among which environmental and related economic components are becoming increasingly more relevant. Their combination into a single ecosystem (meaning the integration of ecological and economic subsystems) is considered as an objective basis for the existence of effective factors for its efficient functioning and solving pressing environmental issues. Management of this integrated system is based on the fact that the economic subsystem acts as a managing subsystem, while the environmental subsystem acts as a managed subsystem.

In the ecological system, researchers quite frequently include exclusively natural resources that cannot directly respond to managerial actions stemming from the management subsystem, since management teams can only be perceived by people. Therefore, the environmental system should include both natural and human resources (consumers of ecosystem services, managers in the environmental sphere, or executors of environmental functions). Moreover, proceeding from the theory of management and the necessity of applying incentives, consumers of environmental services, managers in the environmental sphere, or executors of environmental functions should be economically interested in the effective functioning of the environmental system. It is the economic method of management that is based on the economic interests of stakeholders that is most effective. Thus, the authors corrected the definition of an ecosystem approach, which, in contrast to the generally accepted one, includes a managerial aspect, namely considering the economic interests of participants that ensure the functioning of ecosystems.

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Екосистемний підхід у контексті управління економічними інтересами

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Анотація. Актуальність теми статті зумовлена необхідністю пошуку шляхів вирішення проблеми екологічної безпеки та забезпечення ефективного управління нею. Метою дослідження було структурування системи національної безпеки з виділенням екологічної і економічної підсистем, конструктивний і критичний аналіз основних поглядів та позицій вчених щодо сутності та напрямів екосистемного підходу у вирішенні проблеми екологічної безпеки, подальший розвиток екосистемного підходу на основі економічних методів управління. Дослідження базується на використанні системного та матричного підходів, методів узагальнення, моделювання, аналізу та синтезу, контент-аналізу. Доведено, що система національної безпеки включає, зокрема, екологічну та економічну підсистеми та що між цими підсистемами об'єктивно існує внутрішній системний зв'язок, який при правильному використанні має забезпечити ефективне функціонування та розвиток обох підсистем. Окреслено функціонально-предметну матрицю системи екологічної безпеки, що сприятиме систематизації різних напрямів у її дослідженні. Встановлено, що з позицій теорії управління екологічна підсистема визначається як керована, а економічна – як керуюча; а управління забезпечується тим, що перша має у своєму складі не тільки природні, а й людські ресурси (споживачів екосистемних послуг, управлінців в екологічній сфері чи виконавців екологічних функцій). Обґрунтовано, що для ефективного вирішення екологічних проблем необхідно враховувати економічні інтереси таких людей, оскільки економічні інтереси є основою економічного (найефективнішого) методу управління. Практична цінність дослідження полягає у розробці економічного методу управління системою екологічної безпеки та обґрунтуванні ролі економічних інтересів, що сприятиме практичному вирішенню екологічних проблем в Україні

Ключові слова: національна безпека, екологічна проблема, економічна безпека, управління екологічною безпекою, природні ресурси