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VALUATION FOREST RESOURCES IN THE CONTEXT OF ECONOMIC SUSTAINABILITY

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CONTENTS

1. CONCEPTUAL GUIDELINES FOR THE RESEARCH

Actuality and importance of the topic addressed. Natural resources are crucial for the planet: without them, life as we know it would not exist. Therefore, protecting them is our main mission. In addition, we rely on the goods and services that forest ecosystems provide. Therefore, besides protecting forest resources, we must also take care of their sustainable use. This involves using forest resources in a way that preserves their biodiversity, productivity, regeneration, vitality and potential for relevant ecological, economic and social functions now and in the future locally, nationally and globally, as well as other ecosystems.

The concept of sustainable exploitation of forest resources is a dynamic one that seeks a balance between all these aspects and functions in the changing environmental, economic and social conditions.

For centuries, forest resources have provided employment and livelihoods in rural areas. Due to its population and development, forest resources are influenced by human activity. Only about 2% of these resources are considered to be untouched by humans. Most of the forest resources are managed for a long period of time. However, most of them are semi-natural and, as a result, most of them have been incorporated into various conservation networks and are actively managed.

The subject of the research is the economic sustainability of forest resources, the importance of which can be not only for the economic field, but also for the forestry, managerial, financial, social, etc. including for ensuring effective decision-making processes of administrative authorities. Economic sustainability decisions are obviously taken into account for other considerations (eg: political, personal, short-term, moral, etc.) important that the effects are for a sustainable development of society in general.

Description of the situation in the research field and identification of associated problems. The National Program for Recovery and Resilience invests €1 billion in infrastructure for the accessibility, storage and classification of forest resources to reduce the environmental impact of logging activities and to achieve sustainable forest utilization planning when carrying out care work possibilities of forest resources, i.e. 22 million cubic meters each year.

Romania's vision for the year 2030 regarding the economic potential of forest resources are: sustainably managed forest resources represent the foundation of the bio economy, the growth and sustainable mobilization of wood resources, supporting sustainable growth for a clean and healthy environment, supporting local communities, rural economies, places of safe and attractive work, rural-urban links, social renewable energy, diversification of production technology and logistics.

Strategies regarding the sustainable development of forest resources at the level of the European Union began in 1972 at the first "Environmental Summit" (Stockholm Summit), organized by the United Nations. At this summit it was proposed to establish the Earthwatch Institute, founded a year later in Boston, Massachusetts, to promote the actions and understanding necessary to preserve the natural environment and to study and document the extent and rate of environmental degradation. The European Union has been in a state of equilibrium between the components of the sustainable exploitation of forest resources for decades, however, new pressures and challenges may cause this balance to change. The European Union has been in a state of balance between the components of sustainable exploitation of forest resources for decades, however, new pressures and

challenges may change this balance. In September 2013, the Commission communication entitled "A new strategy for forest resources and the forest sector of the European Union", establishes the new strategy of the European Union and proposes a European frame of reference for the development of sectoral policies, which will have an impact on forest resources. In September 2015, the Commission adopted a multi-annual plan for the implementation of the European Union's Forest Resources Strategy. This so-called "Multiannual Forestry Plan" (Forest Map) which sets out a list of actions to be taken to address the challenges of the European wood sector.

The degree of study of the research topic. Forest resources in the context of economic valorization is an interdisciplinary subject, which has been studied by scholars from the fields of life sciences, ecology, agriculture, economics and less management. The theoretical approach to the sustainable development of forests can be found in the works of authors from Romania such as: V. Giurgiu, I. Popescu-Zeletin, I. Seceleanu, I. Abrudan, C. Munteanu, M. D. Nita, I. V. Abrudan, V. C. Radeloff, M. Vasilescu , etc. They have characterized the sustainability of forest resources in the scientific works in the fields of agriculture, forestry and ecology, outlining the concept of the valorization of forest resources in the area of biological ecosystems, being examined as a phenomenon, as a system, as an element, as a living room and less as a sustainable resource in an economic context.

The works of authors Hera Cristian, Mihail Vincențiu Ivan, Otiman Păun Ion, Toderoiu Filon, Sima Elena, Ciulbea-Aref, T., Dumitraș, D., Ariton, F. and Merce E., etc., can be taken into account, in which deals with forestry strategies using the economic principles of supply and demand, but also management elements in the decision-making process regarding sustainable development. In their contemporary scientific approaches, some authors support the initiation of the concepts of forest sustainability, sustainable forest development, and sustainable forest management such as A. Balmford, J.M.H. Green, M. Anderson, R.J. Baumgartner, V. Brukas, A. Kulieshis, O. Sallnäs, E. Linkevičius, A. Buijs, A. Lawrence, L. Cesaro, P. Gatto, D. Pettenella, etc.

The subject of sustainability has been reflected in the research and studies of international scholar’s scholars, who explore how to ensure that economic development will have a positive impact on all segments of society, may include measures to reduce poverty, increase access to education and employment opportunities, and the increase of social protection. Under these approaches, we find research by J. Sachs, A.Sen, E. Duflo, Abhijit V. Banerjee, J. Stiglitz, P. Krugman, R. Welles, H. E. Daly, T. Jackson, K. Rawrth, S. Kara, M. Beck and others. At the same time, we also mention the contribution of researchers from the Republic of Moldova and Romania who, in one way or another, have developed economic concepts related to sustainable development, or their research will contribute to achieving the goal of economic sustainability and sustainable development for contemporary society. We can appreciate the numerous studies and research carried out by: G. Belostecinic, A. Stratan, A. Cotelnic, D. Cimpoies, M. Hămuraru, L. Șavga, A. Timuș, L. Covas, N. Platon, L. Șargu, R Perciun, V. Ganea, R. Burbulea, M. Jalencu, etc. oriented on the implementation of economic policies to capitalize on resources in the priority areas of the Republic of Moldova.

Topics of sustainable development and economic sustainability are also identified in the studies carried out by Romanian authors, for example I. Popa, C. Dobrin, G. Ignat, I.V. Dragulanescu, A. Micu, C. Coman, I. Pohoață adopting new values and goals, such

as human prosperity and social well-being, instead of pure economic growth. Economic sustainability is an important concern of scholars in various fields of research, as it has a direct impact on society and the environment.

However, the application of the concept of sustainability is growing in all fields, more and more obviously linked to the new theories of innovation, globalization, technological transfer, quality systems, etc. which will, on the one hand, increase transparency for all parties involved in the process of the effective exploitation of forest resources. In this context, we consider it absolutely necessary to solve the research problem, which consists in establishing the managerial processes of efficient management of the processes of valorization of forest resources for economic sustainability.

Purpose of the paper: The goal pursued consists in researching the particularities aimed at the valorization of forest resources in the context of economic sustainability by identifying and analyzing the economic potential of forest resources; the comparative evaluation of forest resources in Romania and the European Community as a component of the strategic and sustainable assurance regarding the economic sustainability of forest resources in Romania and in particular in the North-East region of Romania through modern management methods.

Research objectives: The main objectives of the thesis are organized in two directions, which aim at: substantiating the concept of the management of forest resources and territories in the field and of economic sustainability with reference to the state of forest resources in Romania, the valorization of forest resources through economic sustainability and the optimization of the management of forest resources in the economic sustainability context. They are thus defined:

- Identification of the notions, concepts, theories, principles and particularities of the economic valorization of forest resources in the conditions of sustainable development;
- Presentation of the principles of economic sustainability as determining factors for the exploitation of forest resources;
- identifying strategies and policies for sustainable development of forest resources in the European area;
- Analysis of the potential of forest resources in Romania and the Republic of Moldova in the context of sustainable utilization;
- Determining the economic component of forest resources in Romania in the context of valorization;
- Establishing the economic value and specifics of forest resources in ensuring sustainability
- Analysis of the valorization of forest resources in the North-East development region of Romania during the period 2017-2021;
- Modeling the sustainable development of forest resources in the North-Eastern region of Romania based on the P.S.R. model.
- The presentation of the model of sustainable management of forest resources for the North-Eastern area of Romania through the management of the forest cluster.

The research hypothesis is based on contemporary techniques of managerial management for the valorization of forest resources, in the context of economic sustainability that includes a long-term vision that will aim to ensure the persistence of the quantity and economic quality of forest resources and increase the efficiency of their use.

Synthesis of the research methodology and justification of the chosen research methods: In accordance with the main objectives and operational objectives of the thesis, the research methodology was based on the application of various methods such as: analysis, synthesis, deduction, comparison, modeling, estimation, forecasting, etc.

Through the analysis, several stages of the research were solved. In the documentation process, an analysis of the literature describing the current state of knowledge was achieved, using examples to illustrate and elucidate the mechanisms of change through the sustainable exploitation of forest resources. Analysis of statistical situations, qualitative and quantitative analysis of data collected from various studies, scientific works, books and research treatises. Interpretation of the resulting data regarding the estimation of forest resources, the economic valorization of forest resources in the North-Eastern area of Romania, the evaluation of the dynamics of forest resources. Analysis of the results of the study of the evolution, typology, economic components of the forest resources in Romania and the European Community presented in graphic form of figures and tables. The synthesis used in the process of studying the specialized literature, which included articles, manuals, available scientific information on the subject of forest resources in Europe and Romania. Comparing statistical data in periodical values; of the results of the analysis of the dynamics and evolution of the forest resources; of the estimation of the volume of sale of wood, wood and non-wood products; etc. The modeling of sustainable development based on the P.S.R. model, applied to forestry activity statistics to determine the sustainability of forest resources in the North-Eastern area of Romania. Deduction for generalization processes of conclusions; logical deductions in the solution of the research problem; identification of the process of efficient and sustainable management of forest resources through forest resource management and the cluster model.

The informational base that ensures methodological application includes both quantitative and qualitative data. The information available from the specialized literature (academic journals) was used to respond to the qualitative data and official sources were used (ministries, the National Institute of Statistics, the National Forestry Inventory, etc.), which was carried out in the period 2017 – 2021.

Scientific novelty:

The economic potential of the forest resources in the North-East region of Romania was determined in order to establish the economic sustainability

The sustainable development of forest resources in the Northeast region of Romania was modeled by means of the P.S.R model

A system of efficient management of forest resources through forest management was established and the forest cluster was conceptualized for economic sustainability in the valorization of forest resources.

A new direction for valorization of forest resources to achieve economic sustainability for universal use regardless of geographic area, region, country was scientifically substantiated.

The important scientific problem solved consists in: the development of the P.S.R. model, for the sustainable development of forest resources in the North-Eastern region of Romania, a fact that determined the forecast of the level of sustainable development of the counties in the North-Eastern region. And contributed to the establishment of an efficient management method of forest resources in order to apply forest management and

forest cluster systems for efficiency and effectiveness of managerial processes as a result of achieving economic objectives.

The applicative value of the research is based on the application of the results of the study not conditioned by the geographical area, the capacity of forest resources, the peculiarities of the economic value of the resources. Approaching the subject of the sustainability of forest resources through the prism of several arguments makes it even easier to implement the results obtained and publicly presented through scientific publications, communications within the various scientific events, but also the application of the results in practice due to the possibility provided by the professional field of activity carried out. Both the cluster and the P.S.R sustainable development model applied to the North East region of Romania are universal models that can be implemented in any region of Romania, including the Republic of Moldova.

Structure and content of the thesis. In the Introduction, the topicality and importance of the research topic are presented, the research problem is identified and the purpose is formulated, the research objectives are operationalized, the research methodology and scientific novelty. Are specified, the theoretical importance and practical value of the research is argued, the method of approval of the results is presented investigative and implementation, a summary of the thesis sections is presented.

Chapter 1. The foundation of the valorization and economic sustainability in the field of forest resources includes theoretical notions and the characteristics of contemporary theories, the role and determining factors of the sustainability of forest resources, the principles of economic sustainability in the concrete way of forest resources, through their valorization, policies to ensure the sustainability of resources European.

Chapter 2. Valorization of forest resources in Romania through economic sustainability determines the role of forest resources in the economy and their sustainable management, highlights the evolution of forest resources in Europe and Romania in the context of the development of sustainable forest management. It analyzes the economic potential with reference to the strategies of forest resources for the areas of Romania; it values the economic sustainability measures of the forest resources.

Chapter 3. Model for optimizing the management of forest resources in the context of economic sustainability includes the assessment of the valorization of forest resources in the North-East region of Romania, the assessment of the dynamics of forest resources in the North-East Region and the assessment of the volume of timber harvested from the forest resources of the North-East Region East. Economic modeling of forest resources in the context of economic sustainability, modeling of the sustainable development of forest resources in the North-Eastern region of Romania based on the P.S.R. model. Highlighting the importance of forest clusters as a sustainable management solution for forest resources in the North-East region of Romania

The general conclusions capitalize on the syntheses and results of the investigations within the case study and reveal the theoretical and methodological results of the research.

Approving the results of the investigation. The results of the investigation were presented in scientific conferences ETC6 International Conference A CENTURY OF ROMANIAN CAPITAL IN EUROPE AND ITS METAMORPHOSES IN THE INFORMATIONAL ERA, Organizers George Bacovia University; International Scientific Conference FINANCIAL-ACCOUNTING PARADIGM IN THE VIEW OF YOUNG

RESEARCHERS, Organizers State University of Moldova; International conference 2nd edition PROMOTION OF SOCIAL-ECONOMIC VALUES IN THE CONTEXT OF EUROPEAN INTEGRATION, University of European Studies of Moldova; 4th International Conference "PROMOTION OF SOCIAL AND ECONOMIC VALUES IN THE CONTEXT OF EUROPEAN INTEGRATION", Organizers University of European Studies of Moldova, DANUBIUS University of Galati, Stefan cel Mare University of Suceava, etc. Elements of the scientific novelty were registered with Innovator's Certificate, No. 70 of 16.02.2018, Bulletin of Innovations, 2018 edition. The conclusions and research results that strengthened the value and importance of the solved problem were published in internationally rated and accredited journals from the Republic of Moldova. The applicative value of the work was confirmed by the implementation documents.

Key words: forest resources, sustainability, capitalization, cluster, ecosystem, efficiency and effectiveness, innovation, optimization and modeling.

2. CONTENT OF THE THESIS

Chapter 1. ***The substantiation of the valorization and economic sustainability in the field of forest resources*** reflects the valorization of forest resources in the context of economic sustainability. In this chapter, topics such as: the principles of economic sustainability, determining factor of the exploitation of forest resources, policies and strategies for sustainable development of forest resources in the European area, etc. were reflected. The notions of valorization of forest resources, economic sustainability, sustainable development, sustainable valorization, sustainable valorization of forest resources, forest management unit, forest cluster, sustainable management, have been concretized. Valorization is the process of planning and implementing forest resource management and utilization practices to meet specific environmental, economic, social and cultural objectives. Forest resources play an essential role in the conservation of climate and biodiversity [21, page 11-16] if managed sustainably, they protect soil and water resources, provide livelihoods and contribute to the well-being of rural and urban communities.

In our view, forest resources are multifunctional, offering a wide range of ecosystem services, highlighted in Figure 1., which outlines the sustainability of forest resources - the subject of the study.

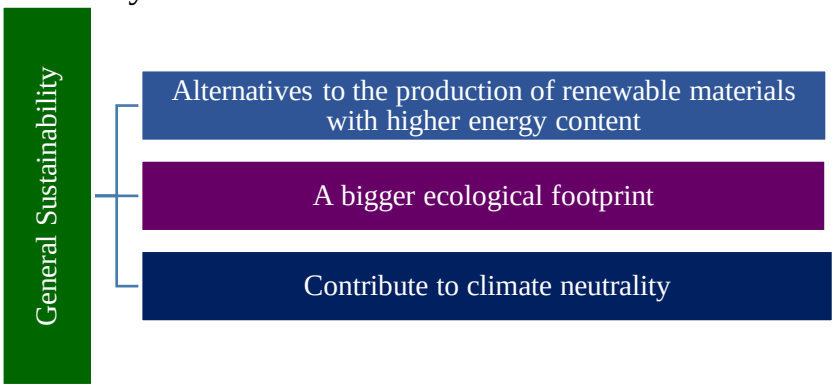


Figure 1. Ecosystem services provided by forest resources
Source: Elaborated by the author

Globalization and the different aspects of globalization emphasize the increasing sensitivity of populations and countries to the state of forest resources, the degradation of forest resources, and the resulting international and intergovernmental initiatives [18, pp.

1719-1732]. The expression of the relationship between countries at the national economic level is also more common in international forestry cooperation.

Currently, there are various forms of bilateral or multilateral international cooperation in the field of forestry: the priority activities to be discussed and implemented within the FAO, in relation to the thematic benchmarks of the World Forestry Congress [5]. In addition to the programmatic objectives of existing geopolitical institutions, it can be said that, in the current context, international cooperation in forestry is based on the unanimous recognition of the importance of forest resources in all contexts of our social and economic life. Research into the human future highlights more and more the anti-human functions of humans in exploiting natural ecosystems [22, page 66]. Members of the human collective are globally aware of the enormous utility of water and forest resources for human progress and survival [19].

The content and goals of the forest economy have been differentiated over time. In its simplest form, the goal of forest economics is to "generate exchange value and convert existing forest products into value" [3, page 32]. W.G. von Moser first explained the necessity of forest economy as a science in 1757, and later by G.L. Hartig, H. Cotta, G. Hundeshagen, M.M. Orlov, C. Wagner in their research, to prove that economic forestry has an importance like all scientific disciplines [13].

Currently, the concept of forest economy includes: "forestry activities, the development of forest resources and wood processing industries" [14, page 43].

The European Environmental Organization defines the forest economy as "the production, distribution and consumption of goods and services in the forestry sector" [25, page 270]. The forestry economy can be thought of as an economic system consisting of three distinct subsystems, highlighted in figure 2.

Figure 2 The economic subsystems of the forest resources
Source: Elaborated by the author

All three activities have technical and economic characteristics and differ from each other by the nature of the production process and the product.

Like the forest economy, when defining the valorization of forest resources, the dilemma of emphasizing the specific differences is unavoidable. The management of forest resources is defined as "***administrative, economic, legal, social and technical measures related to the conservation and use of natural and planted forest resources***" [4, page 23]. Supporting this concept, we believe that the management of the forestry segment belongs to the competence of state structures [15, page 3]. According to Leuschner, "***the management of forest resources integrates all the biological, social, economic and other factors that influence the management decisions of forest resources***" which confirms the involvement of management in the sustainable management and economic valorization of forest resources. In support of this argument, we also find statements by the Romanian academic Victor Giurgiu exposed in his works such as "*Sustainable management of Romanian forests*" [9, page 86-87], "*Forest*

entomology. New concepts and scientific foundations" [10, page 86-87] and which contributed to the sustainable valorization of forest resources in Romania. The continuity of the approach of the thesis can also be found in the statements of Drăgoi M., with reference to the management of forest resources "***it ensures all the necessary decision-making rules through the sustainable exploitation of forest resources***" [2, page 30-32], which once again confirms us involvement of the management in the solution of the valorization processes. From this point on, our point of view, it will be a personnel policy, which becomes an important part of the valorization of forest resources. Obviously, the role of personnel is identified above all engineering, economic, technical processes, etc. as a component part of the valorization of forest resources. It is sometimes believed that the social interactions, which take place at the first level outside the scope of forest funds, and the problems related to employment in the processing industry, also fall under the "utilization of the forest resource" [11, pp. 529-531]. Thus, in the studied professional literature, **the valorization of forest resources** is based on the motivation to evaluate forest resources and the professional profile of those who engage in this activity. We find that the valorization of forest resources is a management field that concretizes the specific ways of planning, organizing, implementing and rational use of various forest products and services based on the particularities of the forest production process, ecology, society and economic status, of the specific measures taken by state for ensuring the continuity of forest resources and the economic benefits of forestry companies [1, page 15-18].

Therefore, we establish and confirm the statements regarding the exploitation of forest resources, considering that it includes, in the long-term vision, technologies and methods aimed at ensuring the persistence of the quantity and quality of forest products and services and increasing the efficiency of their use.

In the contemporary economy, the valorization of forest resources requires radical changes and reforms in the direction of the institutional capacity to address the multiple problems of forest resources and the forest sector, in the context of establishing the economic and financial mechanisms to achieve strategic objectives and to ensure national priorities in this important area [12, page 541-542]. In contemporary times, the integration of forest resources into the lives and general social relationships of human communities has had a considerable impact on their culture and social organization. It is recognized that forest resources are indeed the foundation on which people build their material existence and that centuries of economic development bear the stamp of the "excellence" [9, page 214] of wood.

We thus find that global efforts to promote the sustainable exploitation of forest resources offer a wealth of knowledge, experience, best practice guidance, tools, mechanisms and partnerships that can support efforts to address the challenges of climate change. Adopting the sustainable utilization of forest resources as a general framework helps to ensure that climate change adaptation and mitigation measures are implemented in line with other forest management objectives, taking into account the economic, social and environmental values of forest resources [7, page 59].

The challenges of the sustainable development of the forest field is marked by the emergence of several new notions, such as "adaptive valorization", which is a dynamic approach to the valorization of forest resources, monitoring changing conditions and modifying practices accordingly. It clearly addresses complex and uncertain situations and is generally considered part of an appropriate global response to climate change, including

in the forest resources sector [9, p. 18]. The thematic elements of the sustainable exploitation of forest resources that support the contemporary approach of adaptive exploitation are represented graphically in figure 3.

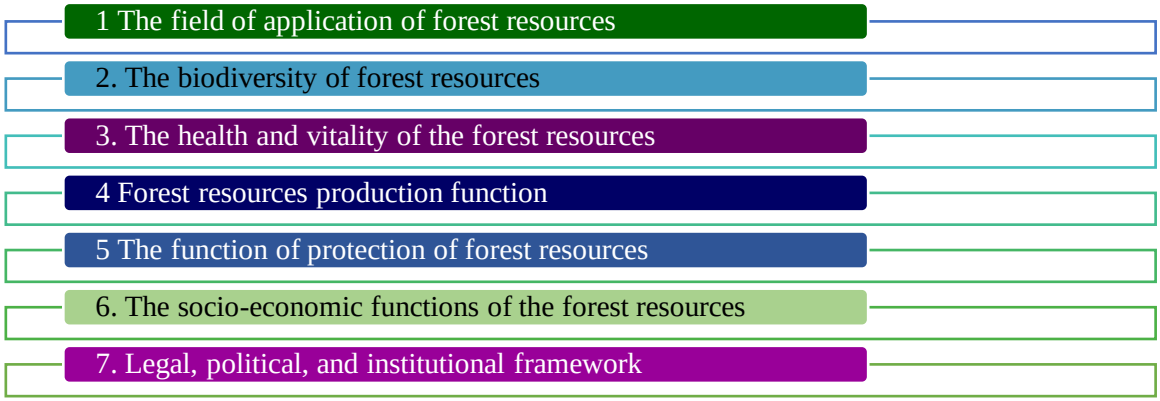


Figure 3 The thematic elements of the sustainable exploitation of forest resources
Source: Elaborated by the author

In this line of ideas, we consider that, ***Economic sustainability of forest resources*** [17, page 214] is the practice of managing forests to meet the current needs of society of forest resources (ie products, services and values) without compromising their availability for generations future

Following the theoretical study and analysis of notions, perceptions and orientations on the economic sustainability of forest resources, we consider it necessary to outline the notion in our vision. Thus, ***the sustainability of forest resources represents an action of the management with long-term development of the conservation, maintenance and valorization of forests in the context of maintaining the balance between satisfying the needs of the individual and the resistance of the environment to this process for the service of future generations***.

At present, there are three basic trends in the exploitation of global forest resources, namely [6]:

- globalization and the globalization process of policies and institutions in response to the growing interest of the international community in the state of forest resources,
- the rationalization of the exploitation of forest resources,
- expanding the range of participants in the decision-making processes in the field of forest resource exploitation.

The contemporary world economy is the sum of the economic aggregates of all countries, and the level and scale of economic development vary from country to country. The status of forest resource management in the national economy of economically developed countries, especially those in the process of development, can also have an important contribution to the satisfaction of basic needs of individuals and people through the presence of forest resources in the entire community [24, pages 42-47]. A considerable number of people find their services in forestry activities: forestry, timber extraction and harvesting, wood processing, pulp and paper industries. Finally, a third feature of the role of forest resource utilization at the national and global level cannot be minimized due to the overwhelming importance of forest resources and trees as essential elements for protecting and stabilizing the environment. Regardless of the level of economic development, each country has its own problems in environmental

pollution, the degradation of natural ecosystems, the protection and conservation of genetic resources, etc. In this sense, forest resources have special uses, and forest workers have a long and beautiful tradition in the arrangement and management of forest resources, being in a leading position in environmental protection.

Chapter 2 ***The sustainable potential of the forest resources in the economic context*** is based on the analysis of the potential of the forest resources in Romania and the Republic of Moldova regarding the sustainable exploitation. Presentation of the economic component of forest resources in Romania in the context of valorization, presentation of the specificity and economic value of forest resources regarding sustainability assurance.

All forest resources in Romania, land used for afforestation, land for cultural, productive or forest management needs, ponds, streambeds and land used for forestry purposes, including non-productive land, are included in forestry arrangements under the Forestry Law of 1990 from January 1, 2011. The forest, as an object of economic and legal regulation, presents itself as a true ecosystem, and the state must develop laws and binding rules for each of its components, in order to exploit its potential resources and protect them, thus contributing to the formation and conservation of a balance of forest heritage.

In Romania, forest resources [20] are represented by softwood species that cover *1,917,000 hectares (respectively 29.90%), deciduous species covering 4,501,000 hectares (respectively 70.10%)*, and highlighting the surface of the forest fund , by categories of use, in the period 2017 – 2021, is shown in table 1.

Analyzing the whole period from 2017 to 2021, the amount of wood cut in Romania by the Public National Forestry Fund increased by 17.11%, from 8,731,000 cubic meters in 2017 to 10,225,000 cubic meters.

Table 1 The area of the forest fund, by category of use, in the period 2017 - 2021 (ha)

Category of use	The period of analysis				
	2017	2018	2019	2020	2021
Forest fund - total	**6.565.000**	**6.583.000**	**6.592.000**	**6.604.000**	**6.607.000**
Forest resources area	**6.406.000**	**6.418.000**	**6.427.000**	**6.449.000**	**6.450.000**
– species of resinous trees	1.924.000	1.917.000	1.915.000	1.916.000	1.919.000
– species of deciduous trees	4.482.000	4.501.000	4.512.000	4.533.000	4.531.000
Other land (from the forestry fund)	**159.000**	**165.000**	**165.000**	**155.000**	**157.000**

Source: INS, Forest resources statistics from Romania in the period 2017-2021

In the year 2021, the volume of wood harvested by the Public Forestry Fund of the administrative-territorial units increased by 10.83%, from 2,899,000 cubic meters in 2017 to 3,213,000 cubic meters in 2021.

Table 2 Volume of wood mass harvested, by main species, in the period 2017 - 2021

Main species	The period of analysis				
	2017	2018	2019	2020	2021
The volume of harvested woody mass – total – m^3	**18.316.000**	**19.462.000**	**18.904.000**	**19.652.000**	**19.994.000**
Resin species - m^3	6.531.000	7.128.000	6.962.000	8.261.000	8.024.000
Beech tree – m^3	6.212.000	6.584.000	6.431.000	6.110.000	6.146.000
Oak- m^3	1.788.000	2.041.000	1.927.000	1.894.000	2.019.000
Various strong species - m^3	2.228.000	2.191.000	2.163.000	2.096.000	2.261.000
Various soft species- m^3	1.557.000	1.518.000	1.421.000	1.291.000	1.544.000

Source: INS, Forest resources statistics from Romania in the period 2017-2021

This fact shows that the forest resources have a considerable economic value, and by increasing its exploitation, the application of sustainable exploitation is obviously felt. In terms of private forest resources, the exploitation peak occurred in 2020, and the volume of timber exploitation registered an upward trend, from 5,788,000 cubic meters in 2017 to 5,805,000 cubic meters in 2021, in 0.29% increase.

The structure of wood products, in the total volume of wood harvested, in the period 2017-2021 highlights the share of the main species within Romania's forest resources, as can be seen in figure 4.

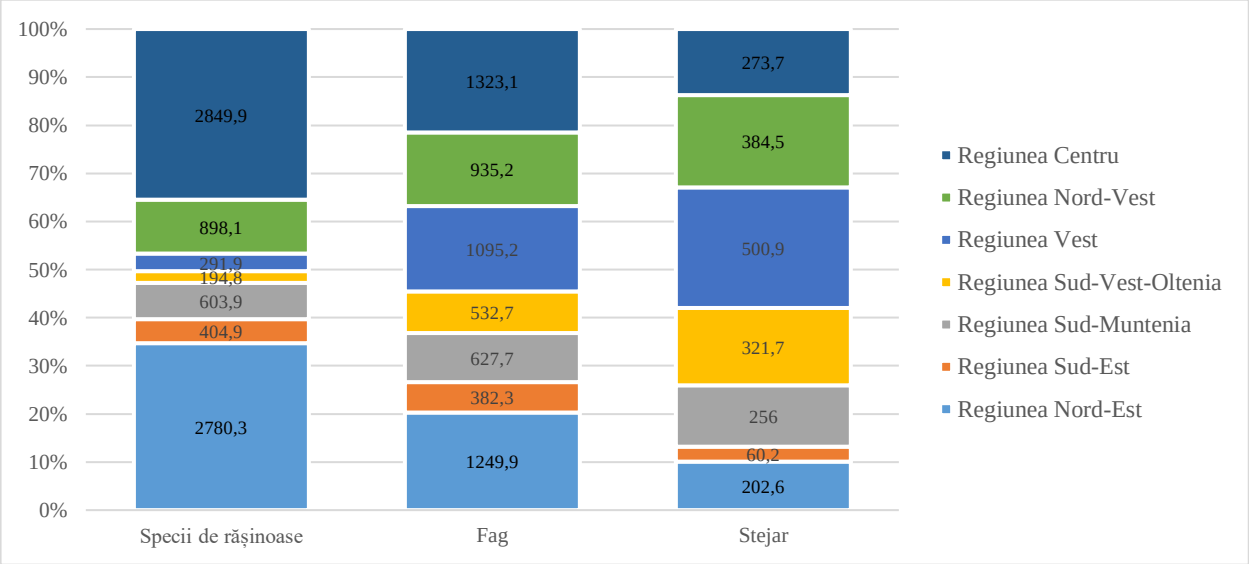


Figure 4 The structure of the main wood species by development regions in Romania, during the period 2017-2021

Source: Elaborated by the author

The efficiency and effectiveness of forest resources is also evident through the way forest resources are taken care of over the years, the way cutting is carried out on different types of treatments, but also on types of regeneration and on different types of cutting. Table 3 includes the area of forest resources where felling was carried out by treatment type, in the period 2017-2021.

Thus, within the various programs to improve the efficiency of forest resources in Romania, in the period 2017-2021, the following types of felling were carried out: regeneration felling in the forest, regeneration felling in the grove, replacement felling or restoration of poorly productive stands and degraded, conservation cuttings.

Table 3 Area covered with cuttings, by treatment types, in the period 2017 – 2021 (ha)

Types of cuttings	The period of analysis				
	2017	2018	2019	2020	2021
The surface covered with cuts - total	**177.296**	**181.561**	**190.610**	**185.339**	**177.620**
Regeneration cuts in the forest	**70.321**	**64.507**	**74.258**	**68.724**	**75.309**
– Successive cutting	2.542	2.044	1.924	1.835	1.996
– Progressive cutting	60.620	54.235	64.022	59.955	65.712
– Gardening cuttings	3.446	4.793	4.794	4.161	3.411
– Shaved cuts	3.713	3.435	3.518	2.773	4.190
Regeneration cuttings in groves	**3.212**	**3.573**	**4.022**	**3.499**	**4.226**
Cuttings for replacements-restoration of weakly productive and degraded trees	**728**	**867**	**576**	**872**	**549**
Conservation cuts	**103.035**	**112.614**	**111.754**	**112.244**	**97.536**

Source: INS, Forest resources statistics from Romania in the period 2017-2021

Figure 5 graphically highlights the regenerated surfaces, by deciduous species, during the period 2017-2021 in Romania, which are some of the most widespread. From the figure, we can see that in 2019 walnuts were mainly planted, the other species being distributed proportionally by years of study.

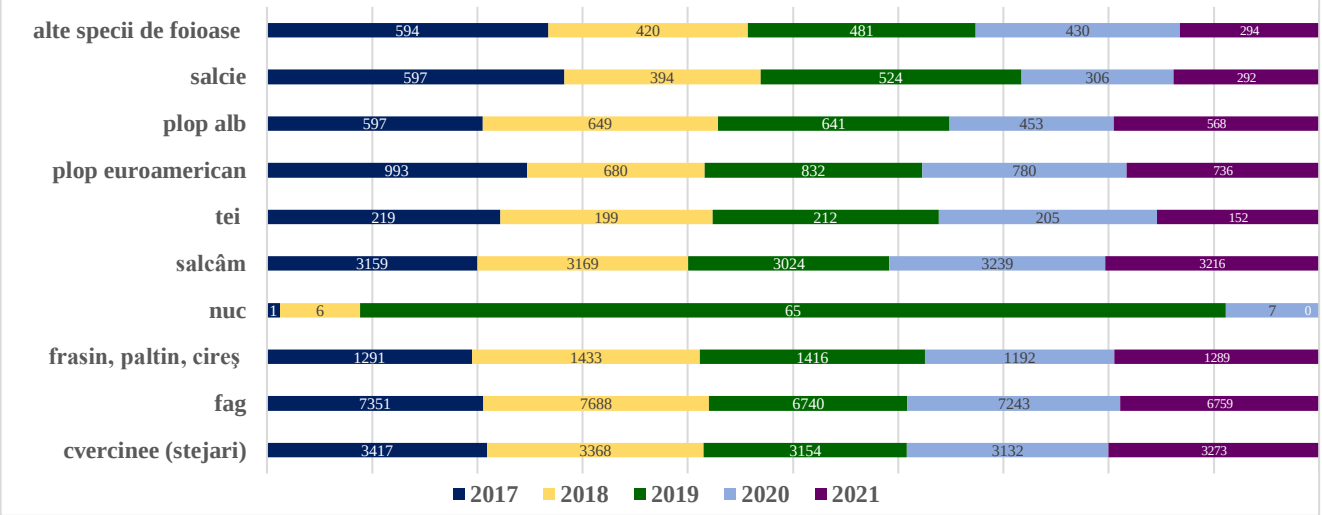


Figure 5 Regenerated surfaces, by species of deciduous trees, in the period 2017 – 2021 (ha)

Source: Elaborated by the author

As can be seen, the largest share of deciduous species is that of oaks and beech, followed by ash, willow, poplar, cherry and acacia. At the level of the softwood species, the most cultivated species is the spruce, followed by the fir and the pine (figure 6).

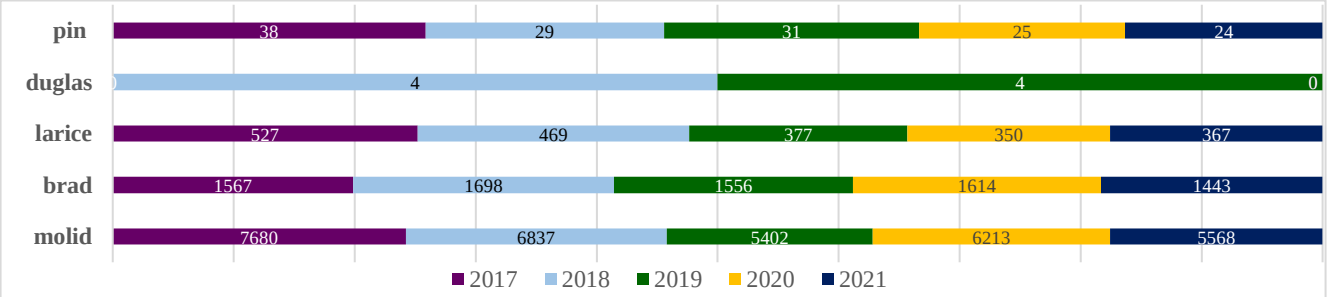


Figure 6 Regenerated surfaces, by species of resinous trees, in the period 2017 – 2021 (ha)

Source: Elaborated by the author

In terms of artificially regenerated surfaces, the largest share is recorded by deciduous species, where the largest artificially regenerated surface was in 2017 of 6,096 hectares, and the smallest of 4,417 hectares in 2020.

In order to succeed in bringing arguments in the universal application of the sustainable management model regarding the valorization of forest resources, it was decided to analyze the forest fund in the Republic of Moldova. Analyzing the dynamics of the forest resources fund at the level of the Republic of Moldova in the period 2011-2020 (Figure 7), we notice that there is no varied dynamics, rather a linear trend with decreasing values in the year 2020.

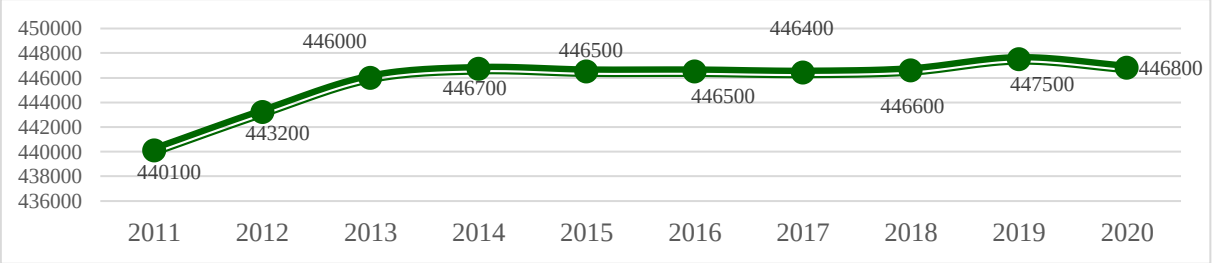


Figure 7 Dynamics of forest resources in the Republic of Moldova during 2011-2020 (ha)
Source: Elaborated by the author

In 2020, the forest resources covered an area of 446,800 hectares, including 372,300 hectares of forest, 19,400 hectares of shrubs and shrub plantations and 31,100 hectares of shelter forests. The total volume of wood material was 41.6 million cubic meters. For each inhabitant of the Republic of Moldova there are 0.075 hectares of forest and 9.35 cubic meters of wood mass. The distribution of forest resources in the Republic of Moldova is extremely uneven: approximately 60% in the central area, 26% in the northern area and 16% in the southern area. The average volume of stock per hectare is 124 cubic meters, and the average increase in yield is 3.0 cubic meters/ha/year.

The Republic of Moldova has a relatively low forest cover (about 450,000 hectares, or 13.70% of the country's territory), while only 11%, or 379,300 hectares, are forested. This is significantly lower than the European average (45%), but on par with other European countries (Great Britain 12%, Denmark 13%). Forest resources tend to occupy the hilly areas of the country, with most of the forests in the central part of the Republic of Moldova, with less forest in the north and less in the south. The coverage with forest vegetation covers about 52,000 ha, outside the Forest Fund of the Republic of Moldova and includes:

a) forest protection curtains on agricultural lands, 30,100 ha;

b) forest protection curtains and plantations of trees and shrubs along the transport routes and on water bottom lands, 21,200 ha;

c) botanical gardens, arboretums and zoological gardens, green spaces in the urban and rural environment, about 8,000 ha.

In the specific composition of the forest resources of the Republic of Moldova, deciduous species absolutely predominate (98.00%), including cypress - 39.60%, ash - 4.60%, oak - 2.60%, acacia - 36.10 %, poplar - 1.60%, coniferous trees 2.20% (figure 8).

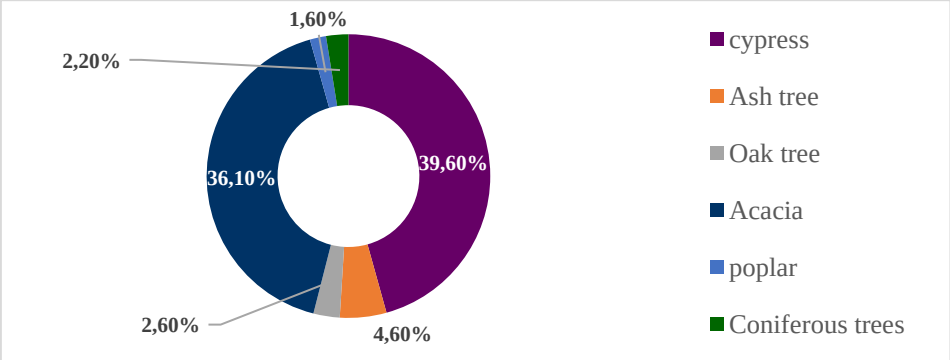


Figure 8 The specific composition of the forest resources of the Republic of Moldova
Source: Elaborated by the author

Cypresses are the most valuable trees in the forest resources, of their total area; about 27% comes from seeds and 73% from cuttings. This distribution also affected the

productivity of the oak trees, with approximately 43% of the trees being highly productive and 57% poorly productive. The second composition is the acacia, which has a low ecological and economic value and is of major but not negligible local significance. Acacias are dominant in public forests, especially off the Codrii Plateau, and in forest belts that protect agricultural land. Acacias played a decisive role in the expansion of plantations between 2010 and 2021, because of which its share increased from only 900 hectares in the 1980s to over 130,000 hectares today. In recent years, the protection area of forest resources has continued to expand, and in 2011, the protection area of forest resources reached 31,000 hectares.

Thus, we find that for each country, the forest resource has a diverse economic capacity, but the management process and the context of economic sustainability can have the same manner.

Sustainable management of forest resources comprises a set of practices based on technical and scientific principles that establish how forest resources can be managed in a balanced, equitable and responsible way while balancing its three objectives: social, economic and environmental. Forest resources and forestlands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. The first effort to define modern sustainability came in the 1987 report of the World Commission on Environment and Development, chaired by Prime Minister Brundtland of Norway. This report defined sustainable development as: "***meeting the needs of the present without compromising the ability of future generations to meet their own needs***"[23, pg 11-12].

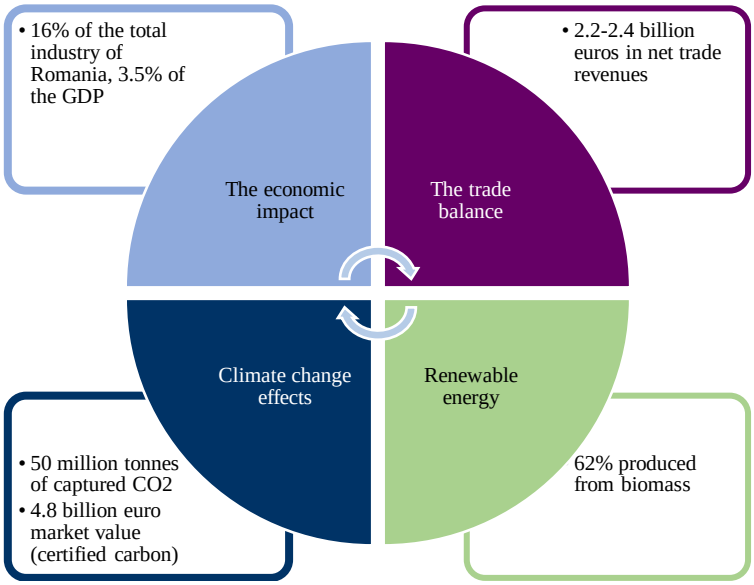


Figure 9 The criteria and the expected impact of the economic and sustainable potential of the forest resources in Romania

Source: Elaborated by the author

By financing the expansion of the Romanian Forestry Fund, the undercapitalization of Romania's land potential can be transformed into a huge opportunity. The criteria as well as the expected impact of the economic and sustainable potential of the forest resources in Romania are highlighted in Figure 9.

We find that the ***sustainable utilization of forest resources*** has proven to be one of the pillars of a green, circular, clean economy, a bioeconomy that represents the future

development of Romania. This huge economic impact capitalized on forest resources, is estimated at 16.00% of the entire Romanian industry, with approximately 3.50% of GDP. The value of the revenues capitalized by the forest resources industry in Romania is 6.1 billion euros, if we also include the pulp and paper industry, which is also based on wood resources plus recycling, we arrive at 7.36 billion euros, these figures represent 16.00 % of Romania's industry revenues [26]. The principles regarding the economic potential of forest resources for Romania's areas included the development and sustainable mobilization of wood resources, supporting sustainable growth for a clean and healthy environment, renewable energy, circular economy, diversification of production technology and logistics.

The economic evaluation of forest resources is understood as: "the value expression of the maximum possible economic benefits obtained from the area of the unitary forest fund on the basis of the rational use of various resources". The sustainable management of forest resources is an approach to fulfill the three basic functions of forest resources, namely: the economic, the social and the environmental. Table 3 highlights the functions of forest resources with examples of the goods and/or services they provide in the economy.

Table 3 Forest resource functions and examples of goods or services they provide to the economy

<table>
<tr><th>Production functions</th><th>Regulatory functions</th><th>Habitat functions</th><th>Information functions</th></tr>
<tr><td>food and nutrition</td><td>CO_2 depreciation</td><td rowspan="2">habitat for indigenous populations</td><td rowspan="2">aesthetic, spiritual, religious and cultural or artistic information</td></tr>
<tr><td>oxygen</td><td>solar energy capture and biomass production</td></tr>
<tr><td>the water</td><td>climate control</td><td rowspan="3">recreation and tourism</td><td rowspan="2">historical information (heritage)</td></tr>
<tr><td>genetic resources</td><td>protection of hydrographic basins</td></tr>
<tr><td rowspan="5">raw materials for: production, fuel, energy, feed, fertilizers and biochemical products</td><td>protection against erosion</td><td rowspan="3">educational and scientific (scientific information)</td></tr>
<tr><td>storage and/or recycling of organic substances</td><td rowspan="3">cultivation</td></tr>
<tr><td>maintaining biological diversity</td></tr>
<tr><td>storage and/or recycling of human waste</td></tr>
<tr><td>the formation of topsoil and the maintenance of soil fertility</td></tr>
</table>

Source: adapted from De Groot 1992

The first stage is at the international level, through governments, through various processes of the United Nations Organization, which have established a series of international principles for the ***sustainable management of forest resources***. Examples of these processes include: The Pan-European Process or the Helsinki Process – which covers all European forest resources, the International Tropical Timber Organization – which covers all major tropical timber producing countries, the Montreal Process, which covers all forest resources from boreal and temperate areas outside Europe (including North America, Russia, Australia and Chile).

The second stage involves the interpretation and adaptation of international ***principles of sustainability in national forestry policy***, laws and regulations. This requires the consultation of a wide range of interests to establish consensus on the content of the sustainable forest resource standards.

The third stage is the most difficult and involves ensuring that sustainable forest resource standards are effectively implemented on the ground. In practice, this can be effectively achieved on a large scale only in those countries that have robust frameworks for forest resource ***governance*** by identifying ***the economic value of forest resources***.

In order to characterize forest resources as economic factors, it is necessary to examine the diversity of their uses, especially from the perspective of forest resources and ecological resources. In the same context, it is important to understand that forest resources have become part of the productive field and fulfill various functions depending on the context. On the basis of these considerations, we formulated a graphic scheme of the economic value of forest resources (figure 10), an adaptation of the economic value of natural resources developed by Munasinghe in 1992.

The direct use value of goods and services of forest resources traded in the market can easily be converted into monetary form through market prices. However, we believe that there are many other non-marketable forest resource goods and services, which have direct use value. These capabilities can be better evaluated through evaluation tools such as the commodity approach, the feature evaluation approach, or the cost approach.

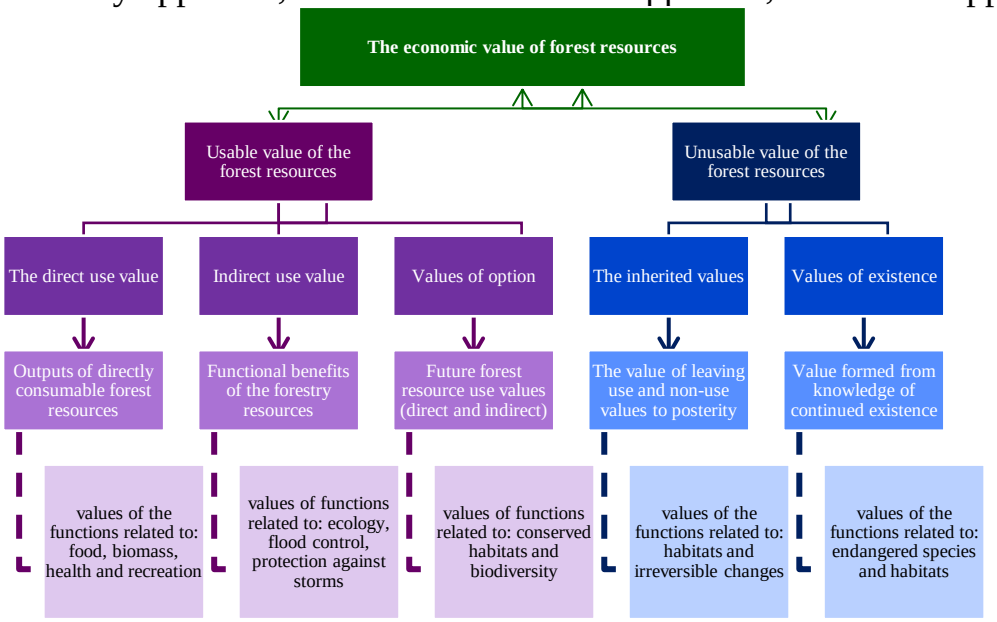


Figure 10 The scheme of the economic value of forest resources

Source: Adapted from Munasinghe 1992

The measures of economic sustainability of forest resources in Romania aim at certain input and output indicators for measuring the efficiency of forest resources, highlighted in table 4. Thus, the primary level indicators are identified in three categories inputs with labor, capital, land and energy followed by the desired production represented by the economic benefits and raw materials with consequences of the unwanted effects of water and air pollution. [16, page 139].

Table 4 Input and output indicators for the measurement of the efficiency of forest resources in Romania

Indicator	**Primary level**	**The secondary level**
Inputs	Terrain	Forest area
	Workforce	Number of employees in the forestry system at the end of each year
	Capital	Investments in fixed assets
	Energy	Investments in forest energy
Desired output	Economic benefit	Total value of forestry production
	Direct benefit	Cutting wood
Unwanted production	Waste water pollution	Evacuation of waste water from forestry
	The air pollution	Waste gas emissions

Source: developed by the author

The secondary level is characterized by inputs of forest area, the fluctuating number of employees, investments in fixed assets, and investments in green energy, characterized by straight production such as forestry production and woodcutting with undesirable effects summarized by wastewater and gas emissions. The current state of the forest ecosystem in the European Union is the result of natural and anthropogenic pressures that have occurred since mid-century.

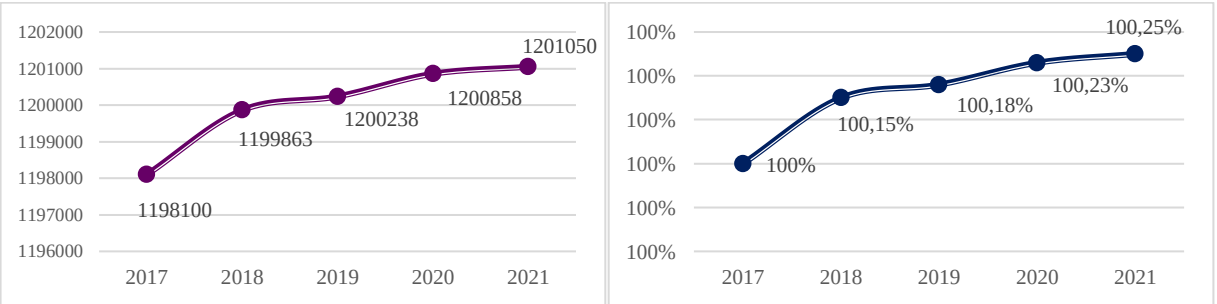
The aim of the sustainable use of forest resources is to ensure that forest resources provide goods and services that meet current and future needs and contribute to the sustainable development of communities. Ecologically, forest resources help protect soils, participate in nature's water cycle, and balance local as well as global climates (especially by storing carbon). From a socio-economic point of view, the development of forest resources generates resources, mainly wood.

Chapter 3 ***Economic sustainability of forest resources through cluster management presents the economic evaluation and valorization of forest resources in the North-Eastern region of Romania***, modeling the sustainable development of forest resources based on the P.S.R. model, in the North-Eastern region of Romania. It proposes the use of the cluster model for the purpose of efficient managerial management and sustainable utilization of forest resources.

The three pillars that are the basis of the sustainability of forest resources and that contribute to local, regional and national well-being are reflected in their coordination, organization and management. Thus, the role of forest resource management contributes to the sustainable way of conservation, improvement and exploitation of forest resources. The valorization of forest resources contributes to the identification, analysis and evaluation of the dynamics of forest resources at the level of the North-East region of Romania, as well as to the evaluation of the volume of wood harvested from the forest resources of the North-East region.

The analysis of the valorization of forest resources in the North-East development region of Romania in the period 2017-2021 assumed: 1- the analysis of the dynamics and evolution of forest resources; 2 - the highlighting of the volume of wood mass harvested; 3 - the evolution of sales of the main assortments of wood mass; 4 - the evolution of sales of wood pulp by assortment.

The evaluation of the dynamics of forest resources in the North-East Region involved the investigation of the evolution of forest resources at the level of the region in the period 2017-2021, where the movement of forest resources at the level of the six counties within the region was followed.



a) evolution (hectares) *b) dynamics (%)*

Figure 11 The evolution of the area of forest resources in the North-East region of Romania during 2017-2021

Source: developed by the author

The evolution of the area of forest resources in the North-East region of Romania during the period 2017-2021 is represented graphically in figure 11. As can be seen from the absolute evolution of the area of forest resources in the North-East region of Romania, expressed in hectares , as well as their relative evolution, expressed as a percentage, follows an upward trend in the 2017-2021 period. If in 2017 the area of forest resources in the North-Eastern region of Romania was 1,198,100 hectares, in 2021, they will reach 1,201,050 hectares, an increase of 0.25% of the area during the period 2017-2021.

As part of the analysis regarding the determination and evaluation of the profitability of forest resources, in addition to the assessment of the dynamics and evolution of forest resources from a quantitative point of view, of the North-East development region and finally of the component counties within the North-East region of Romania, it was determined and evaluation of the volume, structure and weight of harvested wood. Figure 12 shows the evolution of the volume of wood harvested in the North-East region of Romania in the period 2017-2021 (thousand m3 - gross volume). In the North-Eastern region of Romania, the volume of wood mass harvested registered a downward trend in the period 2018-2021, if in 2018 5499.2 thousand m3 of wood mass were harvested, in 2021 this volume reaches 5097.9 thousand m3.

The volume of harvested mass differs from one county to another (figure 3.8) in the counties of the North-Eastern region of Romania, it is rather uneven, being mainly represented by the counties of Vaslui and Suceava.

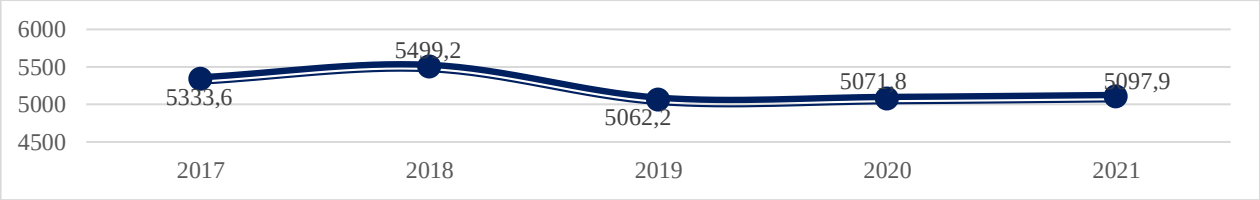


Figure 12 The volume of timber harvested in the North-East region of Romania in the period 2017-2021 (thousand m3 – gross volume)

Source: developed by the author

Within the counties of the North-East region, it can be observed, according to figure 13, the share of counties with the largest volumes of harvested wood. Thus, the highest volume is registered in 2018, in Suceava county, where 2561.2 thousand m3 of wood pulp were harvested, the average for the 5 years was in Suceava county of 2292.9 thousand m3, followed by the average Neamț county (1230.2 thousand m3), Bacău county (1029.78 thousand m3), Iași county (284.78 thousand m3), Botoșani county (199.7 thousand m3) and Vaslui county (175.5 thousand m3).

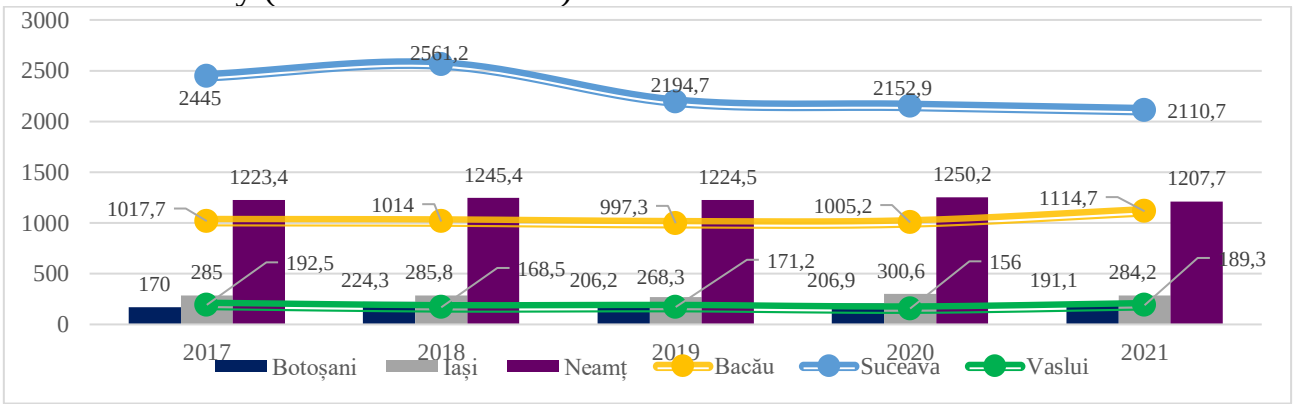


Figure 13 The volume of wood harvested in the counties of the North-East region in the period 2017-2021 (thousand m3 - gross volume)

Source: developed by the author

Analyzing the wood mass on the 3 types of harvested wood, it can be seen that the largest share is held by the wood mass per foot with a gross volume ranging from 2022.39 thousand m3 in 2017 to 2165.88 thousand m3 recorded in year 2021. Figure 3.13 shows the type of wood mass in gross volume, harvested in the North-Eastern region of Romania during 2017-2021.

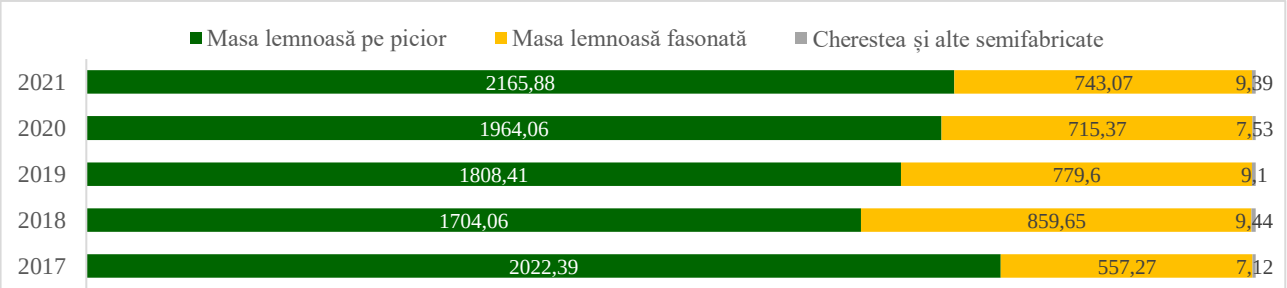


Figure 14 Wood mass (in gross volume) – total – in the North-Eastern Region of Romania (thousands of m3)

Source: developed by the author

Regarding the dynamics of wood mass sold in gross volume in the North-Eastern Region of Romania compared to 2017 (figure 14), it can be observed the upward evolution of shaped wood mass increasing in 2018 by 32.58%, in 2019 by 27.81%, in 2020 with 5.76% and in 2021 with 31.88%. The same cannot be said about the woody mass per leg, where it decreases compared to 2017 by 15.74%, in 2018 by 10.58%, in 2019 by 2.88% and in 2020, in the last year alone, it increased by 7.10% compared to 2017.

The evaluation of the potential of forest resources in Romania highlights the identification, analysis and evaluation of other wood products, which are part of the total forest resources, namely: forest and ornamental saplings from forestry nurseries and forest seeds. As a result of the analysis of the potential of forest resources in the North-Eastern area of Romania, reflected in the presented figures, we find a sustainable economic potential for this area. Regarding the sustainable valorization of forest resources in the context of economic sustainability, the dynamics, share and structure of forest resources in Romania vary depending on the method of valorization of forest resources, the type of useful resource, available and exploited in a sustainable way both at national level as well as at the level of macro-regions in Romania. More precisely in the North-East region of Romania as well as at the level of its component counties.

At the same time, we consider that the sustainability of forest resources also includes economic values such as the turnover obtained in the framework of the exploitation of forest resources in the North-East Region. The turnover capitalized from forest resources for the North-Eastern region of Romania during the analyzed period represents an upward trend for the five years. The evolution of the turnover of forest resources in the North-East Region is shown in figure 15.

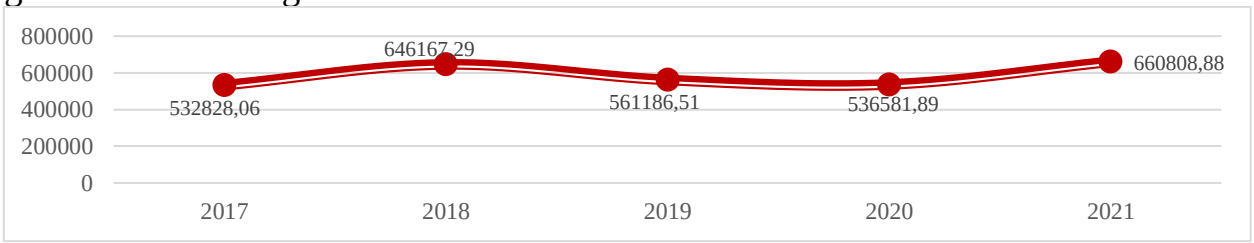


Figure 15 The evolution of the turnover of forest resources in the North-East Region (thousands of lei)

Source: developed by the author

The average turnover of the forestry units in the North-East Region in the 5 years analyzed is 587,514,53 thousand lei, with a maximum of the turnover recorded in 2018 of 646,167.29 thousand lei, and a minimum of 532,828.06 thousands of lei at the level of 2017, having the following dynamics compared to 2017: 21.27% higher in 2018, 5.32% increase in 2019, 0.70% in 2020 and an increase of 24, 02% in the year 2021 compared to the year 2017.

Based on previous research and references, this study designed an evaluation index system for the ***sustainable development of forest resources in the North-East region of Romania and used the P.S.R.*** model to comprehensively assess the sustainable development of forest resources within the counties from this region. In our view, ***the sustainable development of forest resources*** is an important basis for an efficient social and economic development. Based on the model P.S.R. (pressure-state-response). In this subchapter we built a system of indicators for modeling, evaluating and forecasting the sustainable development of forest resources in the North-East development region of Romania, then we quantified the weight of the indicators using the entropy method and, finally, we assessed ***the level of sustainable development of forest resources*** at the level of each county in the North-East development region of Romania.

Table 5 System of indicators

The factors of the P.S.R. model	Main indicators	Secondary indicators	Unit of measure
Pressure (P)	Population pressure	1. Forest area/capita	(ha/head of inhabitant)
		2. Percentage of GDP of forest resources/Total population of the county	(lei)
		3. The volume of wood mass harvested / County population	(m^3/ head of inhabitant)
	Pressure from society and the economy	1. Area of forest resources / Roads and access roads	(%)
		2. Percentage of GDP on forest resources	(%)
		3. Percentage of the volume of harvested mass	(%)
		4. Percentage of the volume of shaped wood mass	(%)
		5. Percentage of the volume of timber and other semi-finished products	(%)
		6. Area of forest resources/ Area of cities	(%)
		7. Area of forest resources/ Area of cities	(%)
		8. The volume of total wood mass harvested	(m3)
		9. Import value rate	(%)
		10. Export value rate	(%)
	The pressure on resources and the environment	1. Amount of discharged wastewater/Area of forest resources	(m^3/ha)
		2. Quantity of waste water discharged/Area of forest resources	(m^3/ha)
		3. Number of deceased persons/Total area of forest resources	(heand/ha)
		4. Area affected by diseases/Total area of forest resources	(%)
		5. Area affected by pests/Total area of forest resources	(%)
Status (S)	Quantitative status of forest resources	1. Area of forest resources/Total area of the county	(%)
		2. Area of protected forest resources/Total area of forest resources	(%)
		3. Area of protected forest resources/Total area of the county	(%)
	State of the quality of forest resources	1. Forest coverage rate/County area	(ha)
		2. Forest coverage rate/Urban area of the county	(ha)
		3. Forest coverage rate/Rural area of the county	(ha)
Response (R)	The response to increasing forest resources	1. The degree of growth of the forest reserve	(%)
		2. The degree of growth of nature reserves (Nature reserves/Total area of forest resources)	(%)
		3. The degree of afforestation (The forested area/County area	(%)
	The response of investments in forest resources	1. Investments in forest resources	(lei)
		2. Investments in the protection of natural areas	(lei)
		3. Investments in the construction and ecological protection of forest resources	(lei)
	The policy response on forest resources	1. Number of major ecological forestry policies	(lei)
		2. Key forest plantations	(ha)
		3. The forested area within the project for the protection of natural forest resources	(ha)
		4. The afforestation area for the construction of protective belts	(ha)

Source: developed by the author

In order for the study to be representative and truthful, I used as a basis the data used mainly from the "Statistics of forestry activities in the years 2000, 2010 and 2020", from the I.N.S., the statistics and database of the Ministry of Economy and Finance, the data collected from within the Forest Directorates at the level of each county and from the

statistical data provided by Romsilva. Data sources within the optimization model calculated for the years 2000 to 2020 using the integrated assessment method allow the development of a forecast for the subsequent ten-year period to 2030.

Model P.S.R. was created by the Organization for Economic Co-operation and Development (O.C.D.E.) and the United Nations Agency for Co-operation and Development (U.N.E.P.) in the late 1980s, and has been widely applied in assessing resource use and sustainable development. Within the model:

• ***the "P" index*** *stands for pressure*, always used to characterize human economic activities and consumption models that lead to unsustainable development;

• ***the "S" index*** *stands for state*, used to characterize the state of the system process of sustainable development;

• ***the index "R"*** *means response*, used to characterize measures to promote the sustainable development process.

According to the steps above, we can determine the weight of each index entropy weight and selected indicators shown in Table 5

Table 6 shows the final data calculated based on the 3 factors (pressure, state, response) and the index determined by coordination on the basis of which the development of the sustainability of forest resources in the counties of the North-East region of Romania was determined.

Table 6 The calculated value of the assessment index of the sustainability of the forest resources in the North-East region of Romania

The component counties of the North-East region	Evaluation index			Coordination index			Sustainability of forest resources		
	2000	2010	2020	2000	2010	2020	2000	2010	2020
Bacău	0.606	0.800	0.849	2.068	2.107	2.175	Sustainable critic	sustainable	sustainable
Botoșani	0.14	0.272	0.300	0.910	0.874	0.990	No sustainability	Unsustainable	Unsustainable
Iași	0.291	0.176	0.352	1.544	1.605	1.673	Unsustainable	No sustainability	Unsustainable
Neamț	0.868	0.919	1.061	3.616	3.701	3.841	sustainable	sustainable	sustainable
Suceava	0.888	0.99	1.092	3.623	3.450	3.998	sustainable	sustainable	sustainable
Vaslui	0.104	0.186	0.195	0.651	0.603	0.576	No sustainability	No sustainability	No sustainability

Source: developed by the author

The results show that the sustainable development of the forest resources in the North-East region of Romania is not high. At the level of 2000, the sustainable development of forest resources is sustainable in Neamț and Suceava counties, critically sustainable in Bacău county, unsustainable in Iași county and unsustainable in Botoșani and Vaslui counties.

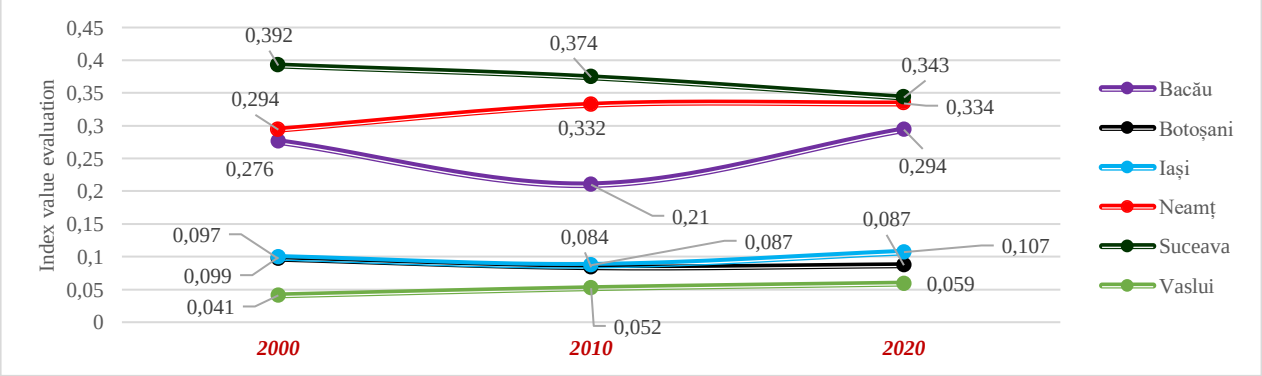


Figure 16 Evaluation of pressure indices

Source: developed by the author

With the passage of a decade, where the factors of the optimization model have varied, at the level of 2010, the sustainable development of forest resources is sustainable

in the counties of Bacău, Neamț and Suceava, Botoşani county is unsustainable and the counties of Iasi and Vaslui remain without sustainability. In 2020, the weight of the sustainable development of forest resources remains approximately the same as in 2010, with the difference that Iași County rises to the unsustainable class compared to 2010, where it declined due to urban development, the movement of masses of people, the decrease in investments in forest resources and the decrease in the rate of afforestation.

Figure 16 shows that the value of the pressure is lower, which means that the pressure system strongly threatens the sustainability of forest resources at the county level, that is, there is an increasing demand for the sustainability of forest resources.

When quantifying the stress index, we can find that the indices of road construction mileage, timber harvest, and forest pest area have a relatively high weight, while the indices of fire victim area and rural population have a relatively low weight. low in share, therefore infrastructure as well as traditional demand for wood products have a greater impact on system pressure. The quantity and quality of the forest resources have an important influence on the sustainability of the forest resources in the North-East region of Romania. As can be seen from figure 17, the state of the forest resource system has a growing trend, but has stabilized in recent years. Regarding the representation of the condition index, forest reserves have the largest weight, which shows that forest reserves visibly affect the condition index of forest resources in the North-East region of Romania.

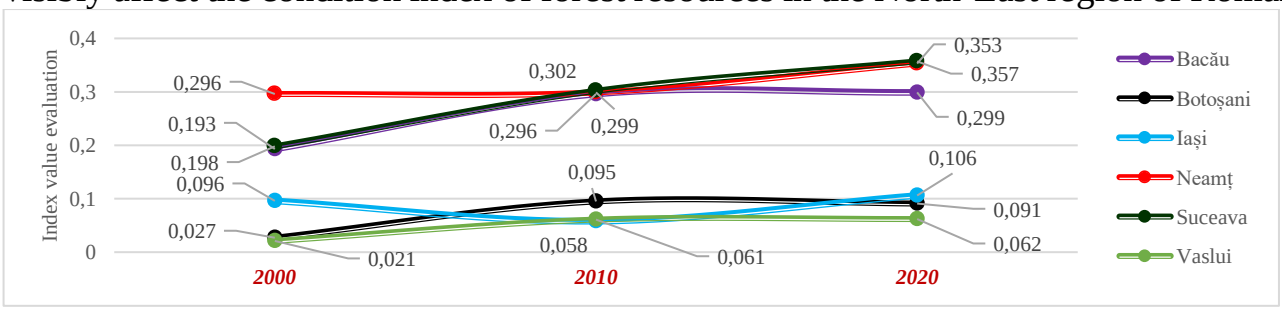


Figure 17 – Evaluation of condition indices

Source: developed by the author

The response index for the P.S.R. model. of the North-Eastern Region of Romania involves ecological and environmental factors in the context of sustainability and ensuring a climate of comfort for the sustainable development of forest resources in time figure 18. Due to the increasing ecological pressure, forest resources suffered influencing the response factors due to: the increased response of forest resources, the response of investments in forest resources and the response of the ecological policy in the forestry field. In this case, the response of forest policy has the highest weight, indicating that the policy response is the most important indicator in the response system.

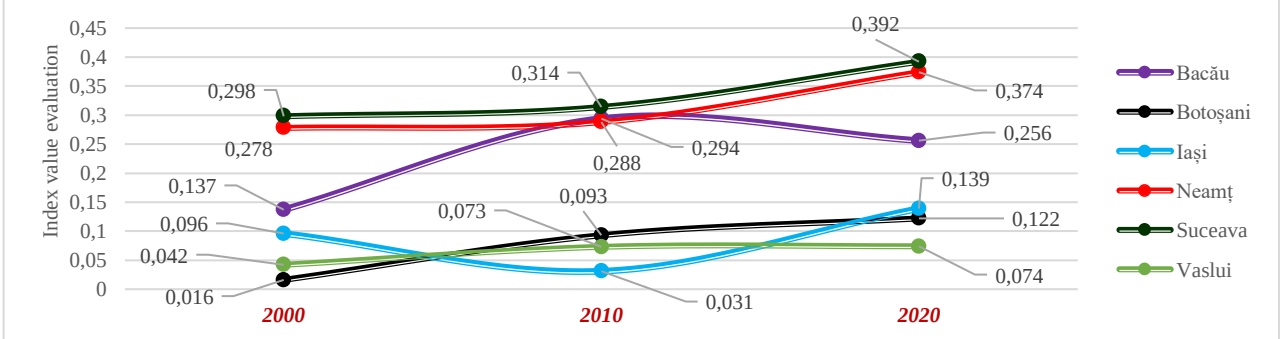


Figure 18 Evaluation of response indices

Source: developed by the author

The indicators of the surface of the natural reserve have a high weight, which means that, being one of the important indicators of forest ecological response, the natural reserve has an important influence on the sustainability of the forest resources in the North-East region of Romania.

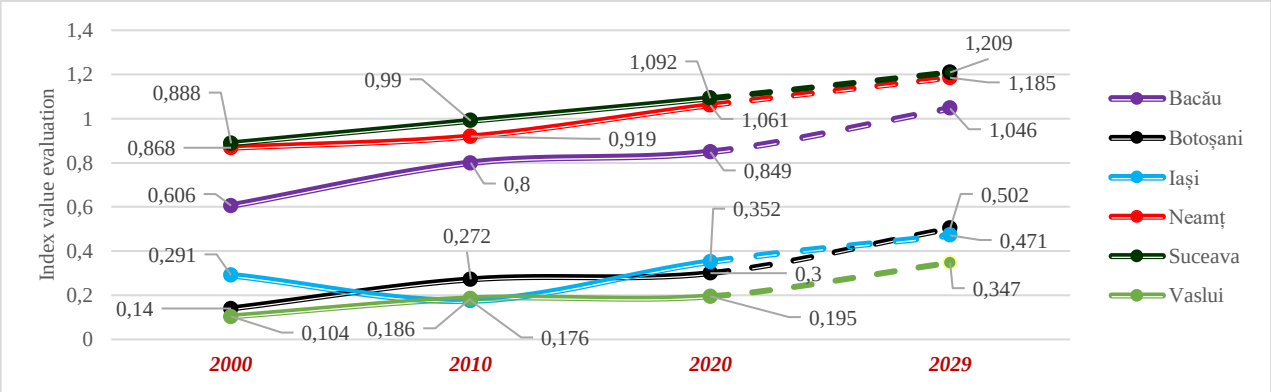


Figure 19 Evaluation and prediction of the level of sustainable development of forest resources in the North-East region of Romania

Source: developed by the author

Meanwhile, the change trends of the index in Figure 19 show that the total value of the comprehensive assessment has an increasing trend, and has a tendency to continue to increase in the coming years. And ***the forecasts regarding the level of sustainable development*** through the gray prediction based on the theory of the gray system, show that the global results of the gray forecasts fit very well with the P.S.R. model, and the sustainability of forest resources at the level of the counties of the North-East region of Romania could continue to improve in the future and is expected to reach a sustainable level in the year 2029. The forecasts regarding the level of sustainable development through the gray prediction at the level of each component county of the North-East region until the year 2029, were based on the correlation between the static indicators and the dynamics influenced by the pressure of society and the economy, by the state of forest resources that have a direct influence on the response factors to the growth of forest resources and investments in forest resources until the year 2029.

Within the P.S.R. model, by calculating the degree of coordination of the system, the paper measured the coordination of the P.S.R. system, and adopted the GM (1,1) gray system model in ***predicting the sustainable development level*** in the next ten years (2021-2030).

The results showed that ***the level of sustainable development of forest resources*** in the North-East development region of Romania will continue to improve, which will increase from 0.651 in 2010 to 2.175 in 2020, with a critical unsustainable state, and also expected to reach the sustainable level in 2030.

The results of the previous research as a whole confirm us that the sustainability of forest resources is one of the current problems of society, and the solution and development of the process is becoming more and more obviously achievable through joint efforts. The responsibility for the future does not belong to separate elements but to the group, made up of integrated elements with common strategic objectives. Investigating the experience of the integrated use and reproduction of natural resources, as studied on the basis of the example of the use of the forest by different enterprises, provides grounds for the development of general guidelines for the integration and development of the forest cluster.

Cluster formation initiatives can facilitate improved innovation processes and technology transfer. As a result, new standards can be developed to transfer new technologies and improve production processes. In this sense, we believe that the common goal of obtaining benefits, such as improving competitiveness, increasing productivity and profitability, exchanging knowledge and resources and creating an environment favorable to innovation and development can be achieved through the management of the forest cluster.

The economic justification for the creation of the cluster is characterized by the following parameters viewed from the perspective of valorization and sustainability. In table 7, some resulting parameters of the forest cluster provided by efficient management are marked.

We believe that as the evolution of the market progresses, economic management mechanisms must be given priority. The administrative ***mechanism for the management of the forest complex*** is made up of direct administrative influences from the authorities on the subjects of legal relations in the forest complex. In the organizational and economic framework of the ***rational management of forest resources***, the authors recognize the aggregate principles and economic methods of intentional interaction between all participants in forest relations in order to ensure the ***sustainable development of forest resources*** and their rational use and reproduction, while maintaining the most recent functions: environmental, protection, health and other beneficial functions. The following components can be distinguished within the economic mechanism of forest resources management: planning, economic stimulation, pricing, financing and crediting.

Table 7 Characteristics of the economic justification parameters of the cluster

The parameters of economic justification through valorization	**The parameters of the economic justification through sustainability**
• territory limits; • volume of forest exploitation for primary and secondary use; • volume and nomenclature of wood exploitation and processing industries; • volume and types of accessory use of forest resources; • productions of auxiliary services; • volume and structure of forest exploitation. • The initial data for the system are the indicators of the production forces in the area, namely: • the extent to which existing wood processing facilities have the capacity to produce timber. • the volume of collateral that is used is proportional to the volume of collateral that is lent. • the volume of forestry operations is the total amount of trees that are harvested, divided by the total number of hectares of forest land.	• Increasing economic efficiency: (reducing production costs, increasing productivity and improving product quality.) • Promoting innovation: (creating new business opportunities and improving global competitiveness.) • Improving regional development: (regional development by creating jobs, increasing incomes and developing local infrastructure, increasing the standard of living of the local community and reducing migration.) • Promoting sustainability: (sustainable management of forests, efficient use of resources and reduction of carbon emissions, helps to improve the reputation of companies and attract investors interested in responsible business.) • Access to international markets: (increasing exports and promoting the brand image of the local industry.)

Source: developed by the author

The creation of a management structure is important, but it must also have specific characteristics of integrated education - ***forest cluster***. For this, we should take into account the system of mechanisms and principles that has evolved in ***the management of the forest complex***.

We are advancing the ***Forestry Cluster Management approach***, which involves identifying the specific needs and resources of cluster members, developing common strategies to maximize efficiency and competitiveness, and creating links between members to share knowledge, technologies and resources.

The management of the proposed forest cluster involves collaboration between cluster members, government and other stakeholders to ensure sustainable development of the forest industry and the regions involved in this field.

The forest cluster will have several sustainable strategic goals, which may include the following:

Development of a circular economy: The forestry cluster can encourage the development of a circular economy by using forest resources in a sustainable way and by encouraging the reuse and recycling of forest materials and products.

Improving energy efficiency: The forestry cluster may have the objective of improving the energy efficiency of its production processes by reducing energy consumption and using renewable energy sources such as biomass.

Promoting sustainable development: The forestry cluster may aim to promote sustainable development in the local community, by creating a sustainable business environment and supporting the social and economic development of the local community.

Stimulating innovation and research: The forestry cluster can encourage innovation and research in forestry by creating partnerships with universities and research centers, sharing knowledge and experiences and developing new and more effective solutions.

Protecting Biodiversity: The forest cluster can take responsibility for protecting biodiversity and maintaining the health of forest ecosystems by promoting sustainable management practices and engaging in nature conservation projects.

In this context, we propose the forest cluster, which is a group of organizations from the forest industry and research, which collaborate in an environment favorable to innovation and development, in order to achieve common benefits, such as improving competitiveness and increasing sustainability. The main organizational form of integration of forestry, wood production and processing, mining and research organizations is the forestry cluster, which is an organization that combines all the following components: a forestry company, a mining company, a wood processing company and a research company (Figure 20).

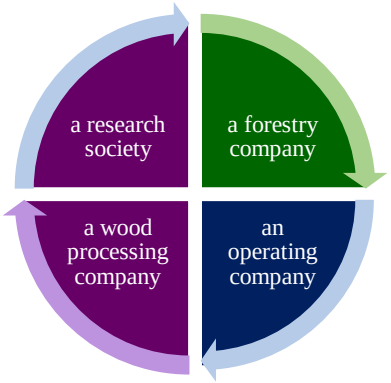


Figure 20 The organizational form of a forestry cluster

Source: developed by the author

This organization is composed of legal entities that participate in common activities and that are connected through a system of ownership and non-ownership participation. The unique characteristic of cluster relationships is the interaction, territorial and geographic

convergence, home fusion of industries from multiple different fields, which lead to synergies and functional relationships that are possible. In fact, the unification of knowledge and technology exchange cycles within a single management system will facilitate the building of institutional structures to support a future cluster combining multiple industries.

This is a model of a sustainable forest cluster that could be implemented by any other geographical area in Romania (including the Republic of Moldova)

The forest cluster management mechanism may vary by country and specific regulations. In general, however, there are some key aspects that are common to most forest cluster management programs shown in figure 21.

The management mechanism of forest clusters must be flexible and can be adapted to the specifics of the respective application area. It is also important to note that management must be based on sustainability and environmental protection principles, to ensure sustainable use of resources and to protect biodiversity and other aspects of the forest ecosystem. The operation of the mechanism is based on following some important steps:

1. we identify the objectives of the management of forest clusters
2. we evaluate the available resources for the management of forest clusters
3. defining the area of interest and the specific objectives for the forest clusters area
4. resource management and management plan application
5. determining the objectives achieved and identifying the problems that arise
6. review and adjustment of the management plan

Therefore, this is a conventional model of the ***management mechanism of forest clusters*** that can be applied in different regions with adjustments and adaptations according to the specific needs and constraints of each area.

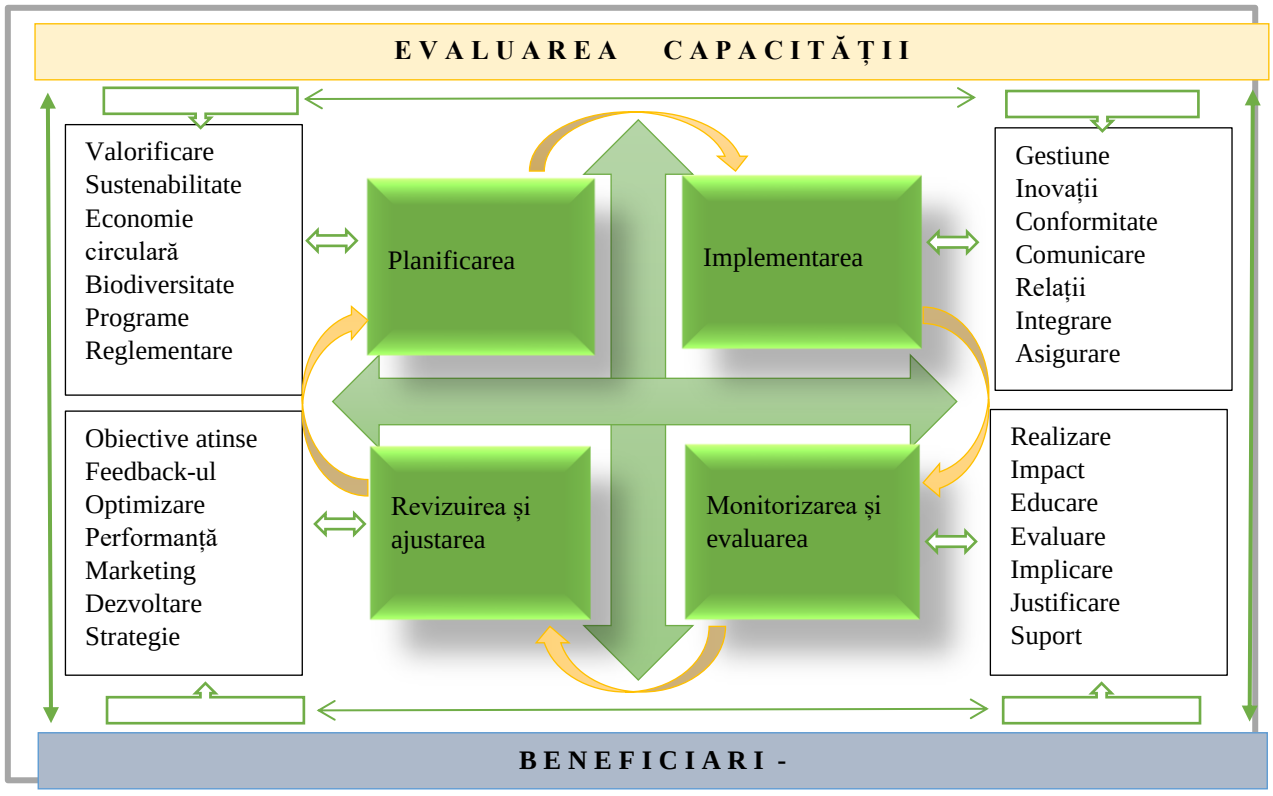


Figure 21 Conventional model of the management mechanism of forest clusters

Source: developed by the author

We believe that forest cluster management involves a close collaboration between the cluster members and the beneficiaries in the local community, in ensuring sustainable forest resources for future generations. This can be achieved by implementing enabling technologies and practices, by developing strong collaborative relationships and by supporting research and innovation in managing forest resources in an ecologically, socially and economically sustainable way.

In conclusion, a sustainable forest cluster is a complex network of companies and organizations that join forces to manage forest resources in a sustainable and sustainable way. By taking an integrated approach to these elements, the efficiency and sustainability of the entire forestry industry can be improved.

3. GENERAL CONCLUSIONS AND SUGGESTIONS

Valorizing forest resources in the context of economic sustainability is one of the primary problems in contemporary society, and the need to approach the subject from a theoretical and practical point of view will contribute to their sustainable development for future generations. The study presented by the author appears as a result of the growing awareness of the socioeconomic, environmental and cultural importance of forest resources leading to new approaches to the sustainable exploitation of forest resources, which focus on maintaining and improving various forest ecosystem services at the national, local and international levels.

The main conclusions

1. In chapter 1 of the present research, the notions, concepts, theories, principles and particularities of the exploitation and sustainability of forest resources were studied. Because of consulting the theoretical-scientific sources of international authors, it was possible ***to identify at a theoretical level the interaction between the concepts that determine the sustainability of forest resources***. The theoretical and scientific assertion of ***the sustainable exploitation of forest resources*** was confirmed in the study carried out, which involves the use of forest resources in a way and at a pace that preserves their biodiversity, productivity, regeneration capacity, vitality and their potential to perform ecological functions, economic and social relevant for the locality in the present and in the future, at national level without causing damage to other ecosystems.

The content of the management system of the interaction between participants in forest resources includes property rights and control over its use; financial and credit relations between the management company and participants; production interactions between participants; relations with forestry organizations on reproduction, monitoring and protection of forest resources issues; sales relations. The main objective is to describe the content of the corporate center's functions, its purpose is to create value and have a synergistic effect. The training and development of the forestry sector is attributed to this objective.

2. By studying and systematizing national and international strategies and policies in the field of sustainable development, the role and determining factors of the sustainability of forest resources, as well as the principles of sustainability in the context of economic exploitation, were identified. From the synthesis of policies to ensure the sustainability of European resources and the analysis of the fundamentally theoretical concepts of sustainability, common visions were outlined between certain economic, managerial, ecological notions in the context of the field of forest resources through which sustainability is ensured in a complex manner. Determining the role of forest resources in

the economy, analyzing the particularities regarding the efficiency and effectiveness of forest resources for one of the sectors that support the industrial development of Romania, an effective way of managing the organizations in the wood processing industry, the forestry industry that has prospects for expansion in from ***the requirement of sustainable development***, that is, from the requirement to protect forest resources. It was possible to identify and outline the role and factors of the sustainability of forest resources, as well as the principles that generate their economic exploitation. The management of forest resources and the territories in the field and economic sustainability with reference to the state of forest resources in Romania. Sustainable valorization of forest resources as sustainable use and conservation of forest resources aimed at maintaining and enhancing the multiple values of forest resources through human intervention.

3. In paragraph 1.3 of this paper, the most relevant and important policies, strategies and visions at the level of the European Community, the UN, Romania regarding the sustainable development and exploitation of forest resources were presented in the author's view. Decisions about conservation and use of forest resources in the context of land sharing are highly scale and context dependent. Establishing the link of the value of use of goods and services with the functions and tools for evaluating the economic sustainability of forest resources. The knowledge, innovations and practices of these communities develop through the experience gained in the face of changing environmental, economic, political and social conditions.

Forest resources are of great economic value and have the potential to fundamentally alter the economy. They also serve important ecological functions for people, animals and plants. It is essential that forest resources grow in volume more than the number of trees that are cut down each year and for every tree that is removed, a new tree is planted. The procedure is responsible for the environment as it complies with certified wood standards. This means that conservation requirements have been met for rare species, specific habitats, biodiversity and trees of particular importance to humans or animals. It also requires the fulfillment of requirements for the conservation of water resources and important areas of society.

4. In chapter 2, the practices of using forest resources were studied and analyzed, they can have effects of changing the dynamics of the surface of forest resources, both at the European level and at the Romanian level. The role of forest resource management contributes to the conservation and sustainability of ecological processes. The author identified the three pillars of the sustainability of forest resources environment-society-economy that contributes to ensuring the management functions of organization, coordination and control. The surface of the forest resource in the European Union has increased by 9% in the last 30 years. With 227 million hectares of forest, more than a third of Europe's land area is covered by forest. Over the past 30 years, the volume of wood and the weight of carbon stored in forest biomass in the European Union has increased by 50% as the area of the forest resource expands, with only part of this growth being used and approximately three quarters of the net growth of wood it is harvested each year. Analyzing the evolution of forest resources in Europe, Romania and the Republic of Moldova, a potential for the development of sustainable forest management has been identified. The recommendations regarding the valorization of forest resources in the context of economic sustainability aim at: the use of a wide range of principles and attributes related to the use and management of forest resources in a sustainable context that complements the principles of sustainable development of the environment by

maintaining biodiversity, their productivity through regeneration, the vitality and potential for ecological functions from an economic and social point of view.

5. Economic evaluation based on the sales of wood mass, forest fruits and seeds, edible mushrooms and truffles, game meat, other non-wood products in the context of economic valorization in the North-East region of Romania. Analysis and assessment of other wood products that are part of the forest resources with profitability influencing factor. When determining the profitability, the author, apart from the dynamics and evolution of the wood mass, established the structure of forest resources as a factor influencing profitability. At the same time, to identify from the result of the analysis of the economic potential of the forest resources in the North-East of Romania, the ability to develop sustainable forest clusters.

6. The evaluation of the potential of the forest resources in the North-East Region of Romania, the evaluation of the volume of wood mass harvested from the forest resources of the North-East Region, gave the opportunity to identify and apply the P.S.R. model, for sustainable strategic orientation in the Northeast region. By comparing the dynamics of the exploited production of forest resources in the North-Eastern Zone of Romania, it was determined which of them may present risks in the future. These difficulties mainly relate to the insufficiency of financial, human resources to prepare, implement, and monitor forest management plans, and lack mechanisms to ensure the participation of all stakeholders in the governance, planning and development of forest resources. Development of the P.S.R. model "Pressure-State-Response", effective optimization of forest resource management in the context of economic sustainability. The sustainable value calculated on the basis of the state of forest resources, the state of the quality of forest resources, the growth of forest areas and resources, investments in forest resources. Not all parts of the forest resource contribute equally to the persistence of species and ecological processes. Special measures are needed to ensure the ecological integrity of these critical areas.

7. Chapter 3 focused on solving forest resource management issues caused by human use factors that overuse natural resources and destroy ecosystem services that support the restoration of those resources. Sustainable management of forest resources based on the model determined with the indicator values for the North-East region is essential, and can be determined for any other area in the country.

8. Estimation of the exploitation of forest resources in the North-Eastern region of Romania in the context of economic sustainability. In conclusion, the results of the research provided the answer regarding the valorization of forest resources, the answer to the effective management and management of forest resources and the answer to the policy and strategies of sustainable development in the forestry field, the sustainability of forest resources at the level of the counties of the North-East region of Romania which could continue to grow improve in the future and is expected to reach a sustainable level in the year 2030 according to the forest development strategy. The formation of clusters in the forestry field as a common trend in modern advanced economies, because the formation of clusters for this field will increase the efficiency and modernization of all economic processes. Group programs are concentrated efforts to improve the quality and competitiveness of a region, including companies, local administrations, research and training organizations.

9. Considering the number and diversity of forest interests, all stakeholders must be involved in the exploitation of forest resources. Partnerships and participatory approaches can work at all levels, from the national to the local. These may involve governments, forest

extension agencies, forest-dependent communities, NGOs, private sector entities, research and academic organizations and forest resource managers. Concluding in this context, the author identified forest clusters - sustainable management solution of forest resources in the North-East region of Romania. We believe that all the benefits of the forest cluster must be manifested in the development process, which is determined by the chosen strategy of forming the material and technical base, the creation of working groups, the justification of the volume and structure of production. The extension of the forest cluster will be facilitated by specific initiatives that conserve resources and respect the environment, the development of all reserves for the use of forest resources, the creation of a rational production structure, the creation of stable collectivities and a normal social infrastructure.

The research results of the study, the coherence of the results set in the conclusions, the solution of the scientific problem allow the formulation of recommendations:

1. For Romania's areas to the sustainable development and mobilization of wood resources through broader policies to protect the environment, through the development of green, renewable energy, circular economies that will contribute to the diversification of production technology.

2. As a way of sustainable management of forest resources through activities based on sustainable development which will be reflected in the growth rate of the industry as well as in the increase of production. The main objective of management is the creation of a market system for the forest complex based on public or private ownership of forest resources and other means of production.

3. In order to improve the sustainable development of forest resources in the North-Eastern region of Romania, based on the P.S.R. model, with the identification of the factors that contribute to influencing, determining and predicting their medium and long-term development.

4. As a potential for economic valorization of forest resources, both their quantity and quality on the sustainability of forest resources in the North-East region of Romania, the state of the forest resources system has a tendency to increase, and the state index has the largest weight, which shows that forest reserves visibly affect the index of forest resources status.

5. *The formation of clusters and their development composed of companies*, universities and the geographic concentration of research institutes, but also local or regional governments, as a result, specialized suppliers are attracted, they have access to the workforce and they have access to information. By fostering this dynamism, specialization and information sharing in the workforce, all types of businesses can benefit from local innovation potential, *promote entrepreneurship and increase productivity*.

6. Providing information tools and educating the public and the industrial environment to respect environmental protection, including water, ensuring involvement in preserving the environmental state of the area, including tangential forces, and last but not least, *applying strategic elements in the management of forest resources* in the area .

7. The government's focus on the forestry sector as an element of the specific economic valorization and local policies implicit in the context of sustainability.

The most important factors for the successful operation of this system are: uniform distribution of forest resources by age groups that maintains a constant and relatively uniform use of forest resources, the availability of affordable prices for finished wood products that take into account the cost of resource recovery forestry, a system that strictly regulates people's compliance with the rules on the use of forest resources and reforestation.

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Articles in the proceedings of conferences and other scientific events

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8. Idriceanu Catalin-Ionel CERTIFICATE OF INNOVATOR, Clustering in the context of forest management, No. 70 of 16.02.2018, Bulletin of Innovations 2018 edition https://citt.ase.md/wp-content/uploads/2018/05/Buletinul_Inovatiilor_nr_2.pdfuletinul

ADNOTARE

Idriceanu Cătălin-Ionel

„Valorificarea resurselor forestiere în contextul sustenabilității economice”.

Teza de doctor în ştiinţe economice, Chişinău, Republica Moldova, 2023

Structura tezei: Teza este constituită din introducere, trei capitole, concluzii generale, bibliografie (156 de surse). Lucrarea conţine 157 pagini de text de bază, 92 figuri, 27 tabele. Rezultatele obţinute sunt publicate în 8 lucrări ştiinţifice.

Cuvintele cheie: resurse forestiere, sustenabilitate, valorificare, cluster, ecosistem, eficiență și eficacitate, inovație, optimizare și modelare.

Scopul și obiectivele cercetării. Scopul urmărit constă încercetarea particularităților ce vizează valorificarea resurselor forestiere în contextul sustenabilității economice prin identificarea, analiza potențialului economic al resurselor forestiere și evaluarea evoluției managementului durabil. **Obiectivele cercetării** prezentarea noțiunilor, conceptelor, teoriilor, principiilor și particularitățile managementului resurselor forestiere ale abordărilor moderne în contextul sustenabilității; identificarea factorilor determinanți ai sustenabilității resurselor forestiere în condițiile dezvoltării durabile a managementului forestier; investigarea potențialului economic al resurselor forestiere pentru zonele României în contextul dezvoltării sustenabile; evaluarea dinamicii resurselor forestiere din Regiunea Nord-Est a României și a volumului de masă lemnoasă recoltată din resursele forestiere ale Regiunii Nord-Est; analiza evoluției resurselor forestiere a Uniunii europene și României în contextul celor mai mari teritorii și suprafețe forestiere ale continentului european; cercetarea strategiilor și politicilor de asigurare și susținere a resurselor forestiere; determinarea eficienței economice a resurselor forestiere prin eficacitate și eficientizare; evaluarea profitabilității resurselor forestiere în funcție de destinația de utilizare; formularea managementului sustenabil forestier prin prognoză, evaluare și control pentru realizarea procesului sustenabil; prezentarea modelului de cluster ca metodă de gestiune sustenabilă a resurselor forestiere pentru zona de Nord-Est a României.

Noutatea şi originalitatea ştiinţifică, constă în identificarea, analiza și evaluarea situației resurselor forestiere din regiunea de Nord-Est a României și alcătuirea unui model de optimizare a managementului resurselor forestiere în contextul sustenabilității economice.

Rezultatele obținute care contribuie la soluționarea unei probleme științifice importante constă în stabilirea unei metode de gestiune eficientă a resurselor forestiere în contextul sustenabilității economice prin intermediul fundamentării teoretice din perspectiva științifică a managementului forestier și particularităților de aplicare a sistemelor de clustere forestiere pentru o eficiență și eficacitate a proceselor manageriale ca rezultat al atingerii obiectivelor economice.

Semnificaţia teoretică a cercetării rezidă din contribuția pentru știință adusă din analiza teoriilor, conceptelor și principiilor conceptual practice a particularităților managementului resurselor forestiere, a conceptelor, condițiilor și factorilor determinanți ai sustenabilității resurselor forestiere pentru dezvoltarea societății durabile contemporane.

Valoarea aplicativă a lucrării se bazează pe aplicarea rezultatelor studiului necondiționat de zona geografică, capacitatea resurselor forestiere, particularitățile valorii economice a resurselor. Abordarea subiectului sustenabilității resurselor forestiere prin prisma mai multor argumente face și mai facilă implementarea rezultatelor obținute și prezentate public prin intermediul publicațiilor științifice, comunicărilor în cadrul diverselor manifestări științifice, dar și aplicării rezultatelor în practică datorită posibilității asigurate de domeniul profesional de activitate desfășurat.

Implementarea rezultatelor ştiinţifice. Implementarea este confirmată de Certificatul de inovator Clusterizarea în contextul managementului forestier, Nr. 70 din 16.02.2018.

Prin actele de implementare a rezultatelor cercetării.

ANNOTATION

Idriceanu Cătălin-Ionel

„Valuation forest resources in the context of economic sustainability"

Doctoral Thesis in economical sciences, Chisinau, 2023

Thesis structure: The thesis consists of an introduction, tree chapters, general conclusions, bibliography (156 sources). The paper contains 157 pages of basic text, 92 figures, 27 tables.

The results are published in 8 scientific papers.

Keywords: forest resources, sustainability, harvesting, cluster, ecosystem, efficiency and effectiveness, innovation, optimization and modelling

Research purpose and objectives. Research purpose is to investigate the peculiarities of forest resources valorisation in the context of economic sustainability by identifying and analysing the economic potential of forest resources and assessing the evolution of sustainable management. **Research objectives** are to present the notions, concepts, theories, principles and peculiarities of forest resources management of modern approaches in the context of sustainability; to identify the determinants of forest resources sustainability in the context of sustainable development of forest management; to investigate the economic potential of forest resources for Romanian areas in the context of sustainable development; to evaluate the dynamics of forest resources in the North-East Region of Romania and the volume of wood mass harvested from forest resources in the North-East Region; analysis of the evolution of the forest resources of the European Union and Romania in the context of the largest territories and forest areas of the European continent; research of strategies and policies for securing and sustaining forest resources; determination of the economic efficiency of forest resources through effectiveness and efficiency; evaluation of the profitability of forest resources according to the destination of use; formulation of sustainable forest management through forecasting, evaluation and control to achieve sustainable process; presentation of the cluster model as a method of sustainable management of forest resources for the North-East region of Romania.

Scientific novelty and originality, consists in the identification, analysis and evaluation of the forest resources situation in the North-East region of Romania and the composition of a model for the optimization of forest resources management in the context of economic sustainability.

The obtained results that contribute to the solution of an important scientific problem is to establish a method of efficient management of forest resources in the context of economic sustainability by means of theoretical foundation from the scientific perspective of forest management and the specifics of application of forest cluster systems for efficiency and effectiveness of management processes as a result of achieving economic objectives.

Theoretical significance of the research The theoretical significance of the research lies in the contribution to science brought from the analysis of theories, concepts and practical conceptual principles of the peculiarities of forest resources management, concepts, conditions and determinants of forest resources sustainability for the development of contemporary sustainable society.

The applicative value of the work is based on the application of the results of the study unconditional on geographical area, capacity of forest resources, peculiarities of economic value of resources. The approach to the subject of sustainability of forest resources through the prism of several arguments makes it even easier to implement the results obtained and presented to the public through scientific publications, communications at various scientific events, but also to apply the results in practice due to the possibility provided by the professional field of activity carried out.

Implementation of scientific results. The implementation is confirmed by the Certificate of Innovator Clustering in the context of forest management, No. 70 of 16.02.2018.

By the acts of implementation of research results.

АННОТАЦИЯ

Идричану Кэтэлин-Ионел

« Валоризация лесных ресурсов в контексте экономической устойчивости ».
Докторская диссертация в области экономических наук, Кишинев, Республика Молдова, 2023 г.

Структура диссертации: Диссертация состоит из введения, трех глав, общих выводов, списка литературы (156 источников). Работа содержит 157 страниц основного текста, 92 рисунков, 27 таблиц. Полученные результаты опубликованы в 8 научных работах.

Ключевые слова: лесные ресурсы, устойчивость, валоризация, кластер, экосистема, результативность и эффективность, инновации, оптимизация и моделирование.

Цель и задачи исследования: Преследуемая цель - исследовать особенности, направленные на повышение ценности лесных ресурсов в контексте экономической устойчивости, путем выявления, анализа экономического потенциала лесных ресурсов и оценки эволюции устойчивого управления. **Задачи исследования:** представить понятия, концепции, теории, принципы и особенности современных подходов управления лесными ресурсами в контексте устойчивого развития; выявление определяющих факторов устойчивости лесных ресурсов в условиях устойчивого развития лесного хозяйства; исследование экономического потенциала лесных ресурсов для районов Румынии в контексте устойчивого развития; оценка динамики лесных ресурсов Северо-Восточного региона Румынии и объемов заготовленной древесины из лесных ресурсов Северо-Восточного региона; анализ эволюции лесных ресурсов Евросоюза и Румынии в разрезе крупнейших территорий и лесных массивов европейского континента; исследование стратегий и политики по обеспечению и поддержке лесных ресурсов; определение экономической эффективности использования лесных ресурсов через результативность и эффективность; оценка рентабельности лесных ресурсов в зависимости от целевого назначения; разработка устойчивого лесопользования посредством прогнозирования, оценки и контроля для обеспечения устойчивого процесса; представление кластерной модели как метода устойчивого управления лесными ресурсами для северо-восточной части Румынии.

Научная новизна и оригинальность заключается в выявлении, анализе и оценке ситуации с лесными ресурсами в северо-восточном регионе Румынии и создании модели эффективности управления лесными ресурсами в контексте экономической устойчивости.

Получены результаты, способствующие решению важной научной проблемы, решаемая проблема в исследовании, состоит в установлении метода эффективного управления лесными ресурсами в контексте экономической устойчивости посредством теоретического обоснования с научной точки зрения лесоуправления и особенностей применения лесных кластерных систем для повышения эффективности и результативности лесопользования. управленческие процессы как результат достижения экономических целей.

Теоретическая значимость исследования заключается во вкладе в науку анализа теорий, концепций и концептуально-практических принципов особенностей управления лесными ресурсами, представлений, условий и определяющих факторов устойчивости лесных ресурсов для развития. современного устойчивого общества.

Прикладная ценность работы основана на применении результатов исследования безоговорочно по географическому району, мощности лесных ресурсов, особенностям хозяйственной ценности ресурсов. Подход к теме устойчивости лесных ресурсов через призму нескольких аргументов еще больше упрощает реализацию полученных и публично представленных результатов посредством научных публикаций, коммуникаций в рамках различных научных мероприятий, а также применение результатов на практике благодаря возможность, предоставляемая профессиональной сферой деятельности.

Внедрение научных результатов. Внедрение подтверждено Сертификатом инноватора Кластеризация в сфере лесопользования, № 11. 70 от 16.02.2018. и через акты внедрения результатов исследования.

IDRICEANU CĂTĂLIN-IONEL

VALUATION FOREST RESOURCES IN THE CONTEXT OF ECONOMIC SUSTAINABILITY

521.03. Economics and management in the field of activity

Summary of the thesis of the doctor of economic sciences

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