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## METHODOLOGY FOR DEFINING SUSTAINABLE SPATIAL FORESTRY

**Topicality.** The current change in the ideology of forest management in Ukraine towards sustainable spatial development of forestry is due to the promising importance of ecosystem, economic and social values of forest resources, their multifunctional and intersectoral nature of the use of resource and ecological potential of forests, as well as the growing needs of society regarding the quality of the natural environment. Structural negative changes taking place in the forest sector during the transformation of the economy focus on the problem of sustainable spatial forestry. In particular, the restructuring of forest ownership forms, fiscal policy in the sector, forest management functions and integrated multi-purpose forest use are not consistent with the requirements of sustainable spatial development and a market-oriented model of forestry economics. More active implementation of institutional, ecological and economic, organizational and managerial mechanisms for ensuring sustainable spatial forestry requires conceptual and methodological reflection on the spatial approach to forestry.

**Aim and tasks.** The purpose of the article is deepening the conceptual and methodological principles of sustainable spatial forestry in the context of modern environmental and economic problems of rational use of forest resource potential. Conceptually-methodological understanding of forestry requires: the disclosure of the substantive content of the spatial forestry; definition of features of formation and development of forest management; formation of criteria (classification) signs of the forestry space.

**Research results.** The conceptual and methodological basis for the formation of forestry space is proposed in order to ensure sustainable development of the forestry complex. The basic economic-organizational principles of spatial development of forestry systems are considered. The content basis of sustainable forest management, in contrast to the forestry (in the broad sense), includes a wider range of organizational and technological components of forest-ecological, environmental, economic and social trends that are associated with sustainable use and the reproduction of forest resource potential and forestry space. Forestry space represents a combination of components of forest resource potential and socio-economic environment within a certain forestry region with their links and diverse relationships that are necessary for the sustainable development of society. The natural, informational, economic, financial, and intellectual components of forestry complement the institutional, which outline the legal norms for forest management. Forestry within the understanding of forestry space includes aspects of socio-ecological and economic equilibrium of forestry systems of different hierarchical levels of the organization.

**Conclusion.** Research of the economic space of forestry goes beyond the substantive basis of the forestry economy, the theoretical and methodological basis of the regional economy, therefore, there is a problem of the formation of a new direction in the implementation of sustainable spatial forestry, which requires the consolidation of research into a coherent whole. It is the formation and development of an environmentally balanced, economic forestry space that is a prerequisite for rational use, reproduction and conservation of forest resource potential on an ecosystem basis.

**Keywords:** forestry space, forestry system, sustainable development, forest management, forest resource potential.

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## МЕТОДОЛОГІЯ ВИЗНАЧЕННЯ СТАЛОГО ПРОСТОРОВОГО ЛІСОГОСПОДАРЮВАННЯ

**Актуальність.** Сучасна зміна ідеології ведення лісового господарства України в напрямку сталого просторового розвитку лісогосподарювання обумовлено перспективно важливим екосистемним, економічним і соціальним значенням лісових ресурсів, їх багатофункціональністю та міжгалузевим характером використання ресурсного та екологічного потенціалу лісів, а також зростаючими потребами суспільства щодо якості навколишнього природного середовища. Структурні негативні зміни, що відбуваються в лісовому секторі в період трансформації економіки ще більш загострюють проблему збалансованого просторового лісогосподарювання. Зокрема реструктуризація форм власності на лісові ресурси, фіскальна політика в галузі, функції управління лісогосподарським виробництвом і інтегрованим багатоцільовим лісокористуванням не узгоджуються з вимогами сталого просторового розвитку і ринково орієнтованою моделлю економіки лісового господарства. Більш активна імплементація інституційних, еколого-економічних, організаційно-управлінських механізмів забезпечення збалансованого просторового лісогосподарювання в систему управління лісовим господарством вимагає концептуально-методологічного осмислення просторового підходу до лісогосподарювання.

**Мета та завдання.** Метою статті є поглиблення концептуально-методологічних засад сталого просторового лісогосподарювання у контексті сучасних еколого-економічних проблем раціонального використання лісоресурсного потенціалу. Концептуально-методологічне розуміння простору лісогосподарювання вимагає: розкриття сутнісно-змістовної основи просторового лісогосподарювання; визначення особливостей формування та розвитку простору лісогосподарювання; формування критеріальних (класифікаційних) ознак визначення простору лісогосподарювання.

**Результати.** Запропоновано концептуально-методологічну основу формування лісогосподарського простору з метою забезпечення сталого розвитку лісового комплексу. Окреслено основні економіко-організаційні засади просторового розвитку лісогосподарських систем. Сутнісно-змістова основа сталого лісогосподарювання на відміну від лісокористування (у широкому розумінні) включає більш широкий спектр організаційно-технологічних складових лісоекологічного, еколого-економічного та соціального спрямування, які пов'язані зі сталим використанням та відтворенням лісоресурсного потенціалу та лісогосподарського простору. Лісогосподарський простір являє собою сполучення компонентів лісоресурсного потенціалу та соціально-економічного середовища в межах певного лісогосподарського регіону з їх зв'язками і різноманітними відносинами, які необхідні для сталого розвитку суспільства. Природні, інформаційні, економічні, фінансові, інтелектуальні компоненти лісогосподарського простору доповнюють інституціональні, які окреслюють правові норми щодо лісогосподарювання. Лісогосподарювання в межах розуміння лісогосподарського простору містить у собі аспекти соціально-еколого-економічної збалансованості лісогосподарських систем різного ієрархічного рівня організації.

**Висновки.** Дослідження економічного простору лісогосподарювання виходить за межі змістовної основи економіки лісового господарства, теоретико-методологічної бази регіональної економіки, тому існує проблема формування нового напрямку в реалізації сталого просторового лісогосподарювання, що потребує консолідації досліджень в єдине ціле. Саме формування та розвиток екологічно збалансованого, економічного лісогосподарського простору є необхідною умовою раціонального використання, відтворення та охорони лісо-ресурсного потенціалу на екосистемній основі.

**Ключові слова:** лісогосподарський простір, лісогосподарська система, сталий розвиток, лісогосподарювання, лісоресурсний потенціал.

**Problem statement and its connection with important scientific and practical tasks.** The modern policy of sustainable development of the forestry complex of Ukraine is based on the principles of balanced forestry, the need for integrated ecologization of reproductive processes and ecosystem management of forests. Under such conditions, the achievement of the spatial balance of economic, ecological and social parameters of forestry causes the formation of a new dominant of sustainable (balanced) development of the forestry complex. Transformation of the forestry space as a new dominant in forestry should become the prevailing methodology for balanced use of natural resources in forest ecosystems, taking into account the internal and external environmental factors.

**Analysis of recent publications on the problem.** Forestry space is multidimensional because it is an integral result of the interaction of economic, financial, informational, innovative, social and environmental components of spatial development. The deepening of complex and integral multidimensionality, as well as acceleration of the dynamic characteristics of the forest management system in the form of forestry space, is the result of an objective transformation of social relations towards the practical implementation of the principles of sustainable development.

Further development of natural resource relations and the globalization of economic and ecological development, and in particular sustainable forestry, form a methodological platform for the definition of forestry space.

The scientists such as Antonenko, I.Ya. Dubas, R.Gh., Gholjan, V.A., Koval, Ya.V., Lakyda, P.I., Lychur, I.M., Synjakevych, I.M. Furdychko, O.I., Shershun, M.Kh. and other have made significant contribution to solving ecological and economic problems of use and reproduction of forest resources in the spatial dimension, and the formation of economic mechanisms for the spatial development of the forestry complex. Scientific investigations of Ukrainian and foreign scholars have a great theoretical-conceptual and practical significance and characterized by research concerning the problems of sustainable spatial development of forest management, as well as the validity of scientific regulations. It should be noted that the spatial approach as a methodology for forestry systems research from the point of view of their distribution, development and transformation in space is not sufficiently developed from theoretical and methodological point of view. This is due to the fact that in practice the theory of sustainable development of spatial systems for improving the economic and environmental principles of forestry spatial organization is not used very well.

**Allocation of previously unsolved parts of the general problem.** The further development of a new paradigm of nature management, characterized by innovativity, knowledge capacity, changing forms and manifestations of social (economic) relations, deepening of the directions of balanced ecosystem development, the formation of new mechanisms for ensuring regulation of natural-resource relations from the perspectives of forestry spatial organization.

The development of theoretical, methodological and conceptual foundations of the forestry space is an important problem in the forestry economy in the context of the post-industrial development, the principles of sustainable nature management, as well as the flow and process economics. The formation of a modern continuous forestry space requires deepening of the methodology for defining its essence, content, structural elements, peculiarities of transformation according to the principles of sustainable development.

**Formulation of research objectives (problem statement)** is formation of conceptual and methodological foundations of forestry from the point of view of solving of economic and ecological problems of the modern forestry.

**An outline of the main results and their justification.** Forest ecosystems and forest resource potential are an important component of national wealth that have a significant impact on the structuring, organization and transformation of the economic space, as well as the components of natural and economic systems. From these perspectives, it should be emphasized the close relationship between such definitions as "natural and economic territorial system", "natural and economic space" and "spatial development".

Academician A.G. Grunberg substantiated that in the research aspect the spatial development is associated with the construction of integral natural and economic systems [1]. All these concepts in their structural and functional construction are aimed at reducing the current and future contradictions between nature and economic systems. The forestry system is also a territorially relatively isolated region with the certain features of an integrated spatial organization of forestry within the boundaries of homogeneous natural and geographical conditions. Forestry management is considered as a self-developed, social, material and spiritual system, created and functioning by attracting and using the components of forest resource (forestry) potential, as well as the intelligence and spirituality of the society in order to create and harmonize livelihood conditions, and also to meet interests and needs of society, taking into account the laws of the functioning of forest ecosystems in the system of economic relations [2]. In this case, structural elements of forest management are as follows: use of forests for functional purpose (multipurpose forest use), development of forestry space, forest resources consumption (forest products, ecosystem forest products and services); forestry reproduction, forest management, forest conservation, forestry protection, information activities, innovation activities, intellectualization and cultural-spiritual processes.

Thus, the content basis of sustainable forestry, in contrast to forest using, includes a wider range of organizational and technological components of forest ecological, economic and social orientation that are associated with the sustainable use and reproduction of forest resource potential and forestry space. The

development of organizational and economic principles and appropriate mechanisms for sustainable management of environmentally-oriented forest management must be carried out within the economic forestry space.

Forestry space represents a combination of components of forest resource potential and socio-economic environment within a particular forestry region with their links and diverse relationships that are necessary for sustainable development of society. The natural, informational, economic, financial, and intellectual components of the forestry space are complemented by institutional ones that outline the legislative and regulatory framework for forestry. Within the forestry space, the forestry potential is intended to provide with the maximum possibility of realizing the economic, ecological and social forestry functions at different hierarchical levels of management (regional, national, global). The balance between these functions can be practically supported by adjusting their ratio when using forest lands.

The content of sustainable environmentally oriented forestry within the meaning of the forestry space, taking into account existing approaches to the content of management in the forest resource sphere, is disclosed through the following provisions:

1. The essential basis of forest management implies the implementation and development of a productive organization of reproductive processes in forestry systems of different hierarchical levels. Reproductive processes in the forestry space are considered in organizational and technological forms, such as use, reproduction, logging, forest resource development, information and innovation activities, development of culture and spirituality, etc. Forestry provides for economic use of forest resource (forestry) potential.

2. Forestry management is based on the achievement of socio-ecological and economic equilibrium in the processes of use and reproduction of forest resources, forest resource potential, as well as ecological and economic harmonization of forestry and forestry production within the forestry space.

3. Ecologisation is considered as the basis (condition) of transition to the principles of sustainable development of forestry space and, thus, forms a sustainable environmental forestry.

4. Forestry as a system for the organization of sustainable use of forestry space includes various types of industrial relations: technological, organizational, managerial, social, psychological (personality-behavioral), which are also subject to ecologisation.

5. Forestry management as an effective form of spatial forest management involves the development of entrepreneurial initiatives on an innovative and investment basis.

6. Forestry involves a continuous assessment of the effectiveness of integrated multipurpose use of the forest resource potential.

The content of forest management has a dual nature. On the one hand, it is a complex system of organizational, technological and socio-ecological components that are connected with the processes of sustainable use and reproduction of forest resource potential, which ultimately determines and ensures the environmental and social orientation of forestry development. On the other hand, forestry is a resource-based system within which productive organizational use of forest resource potential is carried out on the basis of harmonization and balancing of ecological, economic, social and spiritual parameters of the forestry space [3]. The multifunctional orientation of forest potential, which implies the possibility of using various functions and services of forest biogeocenoses, is not only a resource but also an ecosystem basis for the transformation of natural-economic systems in the spatial-territorial dimension. Such a conceptual platform for improving the efficiency and effectiveness of forestry potential use implies the use of spatial analysis, which is defined as the modeling of complementarity of forestry potential functions and is based on an analysis of its location, implementation peculiarities, problems of development, and the identification of links with other spatial structures (objects) [4, p.5].

The relevance of rational reproduction of forestry potential is related to the regional and sectoral specificity of forest management and related problems such as:

1. Extensive, environmentally destructive and territorially concentrated forest use.

2. Disparity of economic, ecological-economic and natural-resource relations and actions - state, business-entrepreneurial structures and population (households).

3. Disconformity of the model of regional spatial development with the model of spatial forest management in conditions of decentralization.

4. Ensuring ecological and economic safety of forestry potential (in particular, it concerns illegal logging, fires).

5. Providing the practical implementation of the principles of sustainable socio-economic development, in the context of which the forest potential serves as a multifunctional platform that has not only raw material properties but also features of the ecological framework [5, p.227].

The structuring of the forestry economic space, depending on the research objectives is possible by the following criteria (classification criteria):

1. By the scale (level) of forest management: mega-level, sub regional level, macro level and local level.

2. By the functional purposes: economic, forest resources, ecological, social, informational, communication, market, institutional, innovative, entrepreneurial, cultural-educational, spiritual and other.

3. By the types of forestry: state-regulated, entrepreneurial-oriented, market-oriented, as well as integrated and specialized.

4. By the level of developing. On the basis of integral, integrated assessments, various levels of gradation are applied, in particular: the level is higher than the average, the average level, the level below the average.

5. By the nature of the capacity: potential, real, busy (indicators of management that have been achieved in past periods).

6. By the nature of saturation: homogeneous, mixed, dispersed. The level assessment (strong, medium and poorly saturated) determines the prospects of the spatial forest management strategy. And here it should be noted that the utility created by an additional unit of benefit beyond the boundary of saturation is zero or negative, that is, the acquisition of this unit of the product or does not create utility or creates anti-utility [6, p.173]. In this context, we can say, for example, about the "saturation" of the forestry space with wetlands. It is also important to take into account the information saturation [6, p.173], which may be manifested in the richness of the information space of forestry, in which the system can not answer all the questions (requests made) quickly enough. It reduces the efficiency of the information space.

7. By the nature of density. Under the density of the economic space, forest management refers to the degree of saturation of the area with forest resources, elements of the productive forces of the forest sector. In particular, this applies to forestland, density of forest infrastructure with appropriate gradation of assessment levels.

8. By the nature of tension.

9. A degree of mastery (accommodation).

10. By the forms of reproductive processes: dispersed and poorly structured, etc.

11. Specifics of foreign economic integration: dependent on exogenous factors; cross-bordered, export-oriented, import-oriented.

The plurality of the economic space determines its interpretation through a set of certain properties (characteristics) that have qualitative certainty [7]. The qualitative definition of the economic space of forestry is manifested in the presence of necessary and sufficient conditions in which it is necessary to exist, to function, to interact with forestry entities within the limits of forest resource space. The main parametric characteristics by which the economic space of forestry obtains its qualitative certainty are: capacity, saturation, density, developing (placement), connectivity and tension.

The relevance of the forestry space quantitatively characterizes the degree of intensity of economic, ecological-economic, social and other interactions between different forestry entities, as well as the movement (mobility) of the main factors of reproductive forest management processes. And here it is necessary to take into account the speed (intensity), acceleration, as well as the directions of the corresponding interactions and factors.

The tension of the economic forestry space can be defined as the socio-ecological and economic state of the forestry, which arises in response to the extreme situation in the management system. This is also the state of the forestry space, associated with destabilizing processes in society, conflicts and contradictions, as well as dissatisfaction resulting from the large gap between the level of expectations of positive change in various spheres of public life and the level of realization of these expectations [8].

The application of the principles of a process economy in spatial forestry involves a certain classification of reproductive processes of a diverse nature and their content orientation. For example, according to [9], in the economic space the following processes are distinguished: basic economic processes; auxiliary economic processes; life support processes; destructive processes that counteract economic activity.

The activation of the sustainable spatial forestry should be carried out on such conceptual provisions, which will ensure harmonious and continuous transformation of the forestry space on a market-oriented basis:

1. Gradual expansion of the application of effective market relations in the system of forest management at various spatial levels of management, taking into account the critical assessment of foreign experience in the implementation of transformation processes in the forest sector.

2. Balanced and gradual transition to a variety of forms of ownership of forest land and organizational and legal forms of forestry business taking into account the spatial characteristics of the functioning of forest ecosystems.

3. Activization of implementation of the state forestry policy in the context of the principles of sustainable development at different spatial levels of forest management with the definition of strategic guidelines (stages, priorities, mechanisms).

4. Increase the powers of local self-government bodies, regional and local bodies for managing socio-economic and natural-resource development, as well as increase the level of autonomy of territorial communities in solving the problems of spatial forestry management.

5. Provision of sustainable spatial forest management on the priority of ecosystem, social and environmental concept in the forestry, stimulation of balanced development, increase of the role of financial and economic relations within the territorial forest resource capital.

6. Extensive and intensive acceleration of transformation processes in spatial forestry on the innovation-investment and entrepreneurial basis, as well as increasing the efficiency and effectiveness of cross-border cooperation in the forestry.

7. Improvement of the institutional design of spatial forestry as an integral part of the economic space of the country, systemic regulation of relations (especially financial and economic) of forestry entities, as well as principles of the functioning of the global forestry in the spatial and territorial dimension.

8. Facilitation of integrated, integrated multi-purpose forestry within the territorial forest-resource meta-space of forestry.

Implementation of the above-mentioned directions concerning activation and efficiency of forestry transformation processes is a prerequisite for ensuring economization and ecologization of the territorial-spatial organization of rational use and reproduction of forestry (forest-resource) potential. The effectiveness and efficiency of the continuous transformation of forest management is determined by the adherence to a system of principles that, for example, are divided into general economic principles (complexity, systemicity, historicism, efficiency, etc., only 26) and specific (functional, integration, hierarchy, feedback, necessity and expediency, diversity, only 25) character [10, p.40].

Further, it is important to note that the operation of economic and territorial forest resource complex within the forestry space objectively requires the use of a set of assessments to establish on the basis of payments for forest useful services, through which together will form and reproductive fund of forest ecosystems.

Sustainable spatial forestry requires the formation of an institutional environment for the continuous transformation of forestry space towards the innovative forestry entrepreneurship, the creation of integrated regional business-entrepreneurial structures of the cluster type. Innovative development of forestry in the spatial dimension should be based on the continuous search and use of new ways and areas for realizing the forestry potential and capital within the framework of the chosen strategy and motivating rational use of forest resources, and also associated with modifying existing and creating new markets for forest ecosystem goods and services. At the same time, the national innovation system should also be involved in the process of creating and applying new forest-ecological knowledge and forestry technologies, thus, determining the legal, economic, organizational and social conditions of innovation processes.

Forestry institutionalization should effectively implement the principles of sustainable environmental management in order to overcome the tendency of increasing losses from the environmental destructive state of forest resource potential, as well as expand the economic, social and environmental benefits of attracting forest resource capital and ecosystem services to economic circulation.

Therefore, the innovative development of organizational and economic foundations of environmentally oriented forestry management is connected with an understanding of the production greening and management in the forestry complex. *Forestry ecologization* is a system of technological, organizational, economic and institutional regulatory processes of an innovative nature, which provides a sustainable, ecosystem, environmentally balanced and socially responsible, integrated, multi-purpose use and reproduction of the forestry potential. The intensification of the role of environmental factor in forest management processes is determined by the directions of greening production, the growing importance of the ecological and social functions of forest resources in the space-time dimension. Spatial harmonization and

balance of economic, environmental and social aspects of forestry activities requires the development of forestry ecosystem management.

As a matter of fact, solution of the problems of sustainable forestry, the implementation of an environmentally oriented forest management system is promoted by the national policy and legislative acts, as well as Ukraine's international commitments regarding the principles of sustainable development, as well as the rational use and reproduction of natural resources. And here it is advisable to note that the Concept of the National Environmental Policy of Ukraine for the period until 2020 determines the content of sustainable use of animal and plant resources (in fact, the ecosystem approach is declared), as well as the direction of forestry greening.

Forestry ecosystem management is aimed at the implementation of the ecosystem approach to the rational use and reproduction of forest potential and it should have a regulatory basis on the part of government agencies, taking into account international initiatives for the sustainable development of forestry. Forestry ecosystem management should, of course, be carried out in conjunction with forestry and forestry production, as well as the state of the environment in a space-time dimension. Thus, the ecosystem approach to organizing the management of spatial forestry implies organizational and institutional design, as well as a review of the fundamentals of forest management design.

**Conclusions and perspectives of further research.** The content of the conceptual and methodological basis of the forestry space is focused on the interpretation of the concept of "economic space", which has a multidimensional nature. The essence, structural and functional construction of the forestry economic space is revealed due to the peculiarities of economic activity in the sphere of use, reproduction, protection and preservation of forest resource potential, as well as functioning of the territorial forest resource potential. Forestry economic space is localized in the geographical area and can have certain administrative, organizational or legal and specific natural and geographical boundaries, as well as zones of functioning of the territorial forest resource potential (capital) (for example, it is a forest cluster, zones of transborder cooperation in the system of global forestry, etc.)

In summary it should be stated that research of the forestry economic space goes beyond the substantive basis of the forestry economy, the theoretical and methodological basis of the regional economy; therefore, there is a problem of the formation of a new direction in the implementation of sustainable spatial forestry, which requires the consolidation of research into a coherent whole. Formation and development of the forestry space is a prerequisite for rational use, reproduction and protection of forest resources on an ecosystem basis. According to this approach, there are more opportunities for regulating the multi-purpose integrated use of economic, ecological and social functions of forest biogeocenoses. Further research should be aimed at the economic, organizational and environmental support of transformations in the forestry space of Ukraine, namely, the formation of an organizational and economic model for the forestry space transformation in the context of the principles of sustainable development.

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