

THE CONCEPTUAL FRAMEWORK FOR PROTECTION OF THE BIOLOGICAL DIVERSITY OF UKRAINE'S RURAL AREAS

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Abstract

Loss of the territory biological diversity is one of the most serious challenges for sustainable development of Ukraine. Solution of that problem is the essential constituent of the national ecological policy, which is focused on introduction of the ecosystem approach in all spheres of social and economic development, including protection of biological diversity. The goal of the article is to study some aspects of protection of the biological diversity of rural areas by means of ecosystem renaturalization by transforming degraded and marginal arable lands into forests, grassland and wetlands. The research proposes an organizational mechanism of increase and expansion of the territories with natural lands, which includes planning of land use, landscape and ecological zoning, territorial organization, evaluation of ecosystem benefits, land users' motivation. The researchers stress on the necessity to create ecological networks and agroforestry. Such structural organization of rural area supports a balanced combination of the "human-land-ecosystem" system due to protecting the main ecosystem functions, i.e., provision of regulating and habitat services. While determining the directions of use of the land plots with degraded and marginal arable lands, the obligatory condition is to justify the benefits from those ecosystem services. To regulate the environmental land relations, it is recommended to introduce conservation easement.

Key words: biological diversity, ecosystem services, degraded and marginal arable lands, rural area, organizational mechanism.

Introduction

Biological diversity or biodiversity is the variety of wildlife on the Earth. The larger biodiversity a territory has the more consistent and productive it is (Magurran A.E., Dornelas M., 2010). Moreover, biodiversity is a source of goods and services people obtain from the nature for their living (Business and the 2010 biodiversity ..., 2005). In the scientific literature, goods of nature, which are actively or passively used to create well-being, are interpreted as ecosystem services (Fisher B., Turner R. K., Morling P., 2009). According to «The economics of ecosystems and biodiversity», those services are divided into 22 types and grouped into 4 categories, namely provisioning services, regulating services, habitat services, cultural & amenity services (TEEB – The Economics of Ecosystems ..., 2010). Moreover, one ecosystem service can provide several benefits from its use (Boyd J., Banzhaf S., 2007). In general, the concept of ecosystem services denotes the interdependence between the human well-being and ecosystem stability, which is largely dependent on their biodiversity. In its turn, loss of biodiversity negatively influences the essential services, provided by the ecosystem, and it will cause great economic losses and healthcare cost (Millennium Ecosystem Assessment ..., 2005).

The territory of Ukraine covers Polissia, Forest-Steppe, Steppe and mountainous landscape zones, which possess a powerful biodiversity (above 70 thousand kinds of animals and plants). However, development of industrial, agricultural, forest, and water economies, as well as urbanization has caused physical transformation of the natural landscapes. Almost 71% of the country's territory is used for agricultural purpose, including about 54% of the area is plowed. Forest vegetation covers only 16% of the territory. The conservation index is 6.6%. The ecosystem overuse is the reason of the extensive soil erosion, degradation of land cover, desertification and loss of biodiversity (The state of reflection ..., 2017).

A particular focus is made on the natural resources management, which should secure their use, recovery and protection in the total compliance with the main principles of the biosphere organization. The approach to nature management, which is based on a consumer's attitude to natural resources, should be substituted by the approach, which expects a compromise between "non-interference" and "subjugation" of nature (Vernadskii V. I., 1965).

The noospheric focus of the society development is elaborated in the concept of the environment sustainable development, i.e. a general concept of economic development, which is to secure the optimal economic growth along with protection and improvement of the natural environment of human living (Hryniv L. S., 2016). Within the frame of that concept, sustainable land use should be considered as an integral process of recovery of a full complex of the "human-land-ecosystem" relations. Generation of such process should be implemented at the global, national and regional level, whereas its practical fulfilment should be secured at the local level through managerial decisions with consideration of each specific area peculiarities.

The goal of the article is to substantiate the expediency of use of the concept of ecosystem services while solving the problem of protection and recovery of biodiversity of the rural areas in Ukraine. The key task of the research is to determine the organizational mechanism of increase and expansion of the territories with natural lands.

Methodology of research and materials

Rural area is a geographical area outside cities, where agriculture is the principal kind of activity. Rural areas consist of different lands (arable land, hay fields, grassland, forests, shrubs, wetlands, water bodies, household buildings, roads, reclamation canals, etc.) and perform production, social and ecological functions (Rural area. National Geographic). The rural areas of Ukraine cover almost 90% of the land fund: arable land – 53.9%, hay fields and grassland – 13.0%, forests – 16.1%, shrubs – 0.7%, wetlands – 1.6%, water bodies – 4.0% (Land Fund of Ukraine).

According to the estimates by Ukrainian scientists, in Ukraine it is reasonable to reduce the area of arable lands by 6.5 million hectares for the purpose of renaturalization. It mainly includes degraded, marginal or erosion-dangerous land plots, which demonstrate low economic efficiency in crop production. It is recommended to transform 1.6 million ha of arable lands into meadowlands, and 0.7 million ha – into forests. It is recommended to use 0.2 million ha for revival, i.e., self-restoration of aboriginal ecosystems (mainly wetlands, alkali lands, rocky area) (Dobriak D. S., Kanash O. P. and others, 2009).

In the International Environmental Performance Index (EPI), Ukraine takes the 66th position (49.9 grades) by the Ecosystem Vitality category (Fig. 1).



Fig. 1. Rankings in the Ecosystem Vitality policy objective.

Source: The authors develop it based on (Wendling Z. A., Emerson J. W., et al., 2020).

The Ecosystem Vitality policy objective measures how well countries are preserving, protecting, and enhancing ecosystems and the services they provide. It comprises 60% of the total EPI score and is made up of seven issue categories: Biodiversity & Habitat, Ecosystem Services, Fisheries, Climate Change, Pollution Emissions, Agriculture, and Water Resources. Publicly available datasets were analysed in this study about Ecosystem Vitality (Wendling Z. A., Emerson J. W., et al., 2020). For 10 years, in Ukraine that index has reduced by 0.5 and confirms reduction of the ecosystem resilience and failure of the policy on conservation, protection and improvement of the ecosystems and the services they provide.

In the research, the abstract and logical method was used to make theoretical consolidation of the results, to shape conclusions and proposals; the method of sociological interviewing was used to collect information about the landowners' willingness to use lands for environmental purposes.

The interviewing was done among 150 people of the age from 30 to 65 years, who have privately owned land. Geographically, these lands are located in the western part of Ukraine (Lviv region, the hilly ridge of Roztocze). Some areas of arable land began to self-afforest (Fig. 2).



Fig. 2. Fragment of the cadastral map of Ukraine from study area.
Source: The authors develop it based on <https://map.land.gov.ua/>

To solve some tasks of the mentioned problem, the article applies the concept of ecosystem services in combination with such instruments as planning of land use, territorial organization, evaluation, motivation.

Discussions and results

The ecological policy of Ukraine until 2030 is focused on improvement of environmental conditions by applying the ecosystem approach to all directions of the social and economic development. The targets of that policy include reduction of losses of the biological and landscape diversity due to creation of an ecological network and protection of the unique natural landscapes; increase and expansion of the territory of the natural reserve fund; support for sustainable use and protection of lands, improvement of the conditions of damaged ecosystems (On the Basic Principles ..., 2019). It justifies the necessity to consider the concept of ecosystem services while solving the problems of protection and revival of the biodiversity within rural areas.

Considering the variety of natural, social, economic, political and other conditions of rural territories development, there are no approved specific measures on improvement of the biodiversity of those territories. It is important to develop a complex of measures, focused on prevention or minimization of the processes of natural ecosystem degradation and recovery of the degraded area quality (Fig. 3).

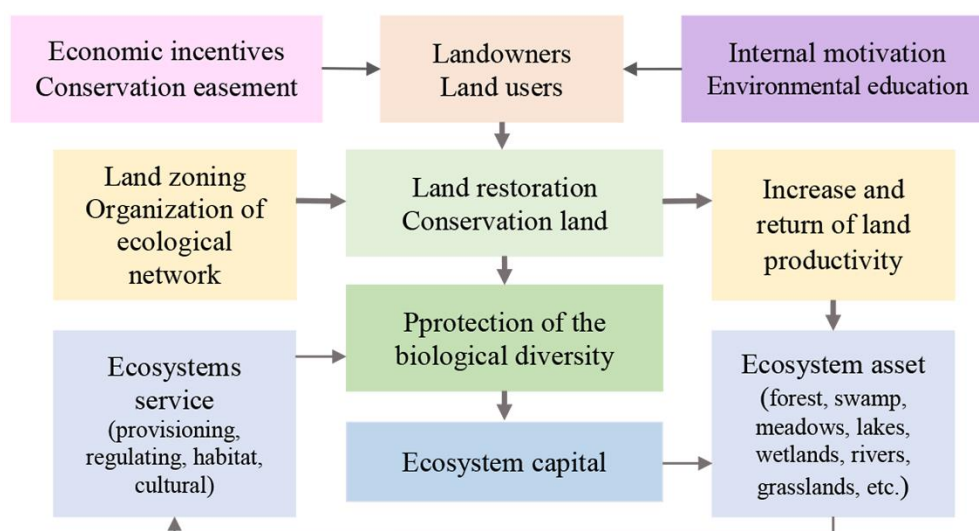


Fig. 3. The conceptual framework for biodiversity protection through the relationship between land conservation, restoration of land productivity and the formation of ecosystem capital.
Source: the authors develop it.

One of the methods to protect and recover the biodiversity in Ukraine is to expand the territory of natural lands using the degraded and marginal arable lands, which occupy the area of 6.5 million ha. The decision on a change of the land use structure by means of renaturalization should be made at the local level after a detailed analysis of the natural and ecological conditions. In July 2021, a new type of planning documentation “Complex plan of spatial development of the area of territorial communities” will come into force (On amendments to some legislative ..., 2020). The authors of the article consider that the documents will solve the tasks, related with land conservation for environmental purposes and will serve as a basis for managerial decisions on the balanced land use.

While planning use of degraded and marginal arable lands it is recommended to make the landscape and ecological zoning of the territory (Stoiko N., Parsova V., 2017). It is used for grouping degraded and marginal arable lands by the types of use with consideration of their quality, estimates of the sensibility to anthropogenic burden, current use and determination of the target functions of the future development. It will provide the regime of land use and identify the regulations of land use within the corresponding zones and types. It is proposed to make the following distribution while zoning rural territories, particularly:

- agricultural zone with soil-protective, hayfield and grassland, garden, special type of land use;
- environment-stabilizing zone with the forest, water, reserve, recreation and mixed type of land use.

It is suggested that variability of the land use alternatives depends on the goals, which all participants of the planning process wish to achieve.

Deciding on the direction of use of the degraded and marginal arable lands, it is reasonable to consider the ecosystem benefits and services, provided by different ground ecosystems. That approach is basic for economic evaluation of the natural goods, including those, which do not have a direct market value, i.e. cannot be sold (protection of biodiversity, carbon sequestration, water purification, soil formation, etc.). In that context, it is important to secure protection of the biodiversity of lands, which is considered as a capability of the surface cover to support a sufficient photosynthesis activity and accumulation of the biomass, used by people (Dominati E., Patterson M., Mackay A., 2010; Science for Environment Policy ..., 2015; Zero Net Land Degradation ..., 2012). For that goal, forest lands, natural grasslands and wetlands are the best. Those territories should be afterwards organized in the form of the biocentric-network landscape-territorial structures (Hrodzynskyi M. D., 1995; van Strien M.J., Axhausen K.W. and others, 2018). Such step will support migration of kinds.

In practice, such arrangement of landscapes can be achieved by creating ecological networks. However, in Ukraine the process is aggravated by the heavy fragmentation of lands and agricultural development of the territory (Stoiko N., Cherechon O., 2019). Therefore, it is recommended to run agroforestry as an alternative in agricultural zone that is a system and technology of land use, which expects combination of crop production, animal breeding, gardening and forest husbandry within one farm, community or an area (Sarita Soraia de Alcântara Laudaes, Luís Antônio Coimbra Borges and others, 2017). Such approach is a dynamic and ecologically argued method of natural resources management, which combines arrangement of lands with agricultural crops and tree vegetation. In practice, it secures diversification and support of production to increase the social, economic and ecological benefits for land users at all levels. Moreover, agroforestry is of significant value for small farms and rural citizens because it can improve their food supply, income and health.

To evaluate the service of the biodiversity protection, researcher’s use the contingent valuation method, i.e. the value of ecosystem services is identified in the price, which respondents are ready to pay for the goods or to get reimbursement in case of the goods absence. The consumers’ interviewing mainly determines it (Fig. 4).

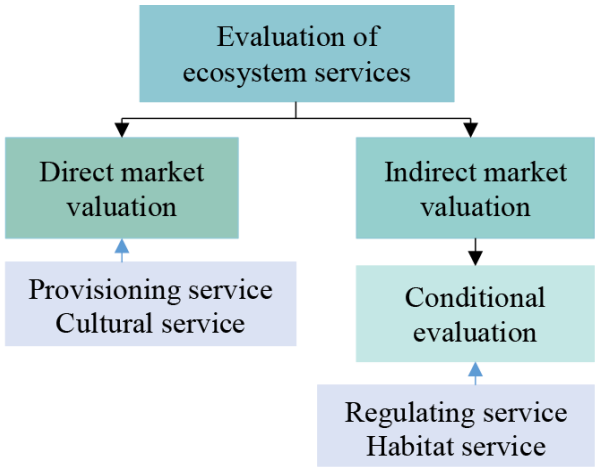


Fig. 4. Integrated valuation of ecosystem services considers.
Source: Adapted by us from (Soloviy I., 2016).

However, in Ukraine, land owners, even those having land plots of degraded and marginal arable lands, are not ready to submit their lands for environmental purposes or to pay for such natural goods as the biodiversity. Results

of the survey questionnaire demonstrate next: 32% respondents are against to stop the intensive land use, 34% – are ready to make temporary conservation, 10% – are ready to make permanent conservation in the form of forestation, 8% – are ready to sell their land shares to the state for environmental purposes, 16% – agree to make conservation upon condition of obtaining another land plot for agricultural production.

When social benefits, which appear in case of using degraded and marginal arable land for environmental purposes, cannot be related with the definite beneficiaries, it is proposed to complete a conservation easement to process payments for the ecosystem services production (Roddewig R., 2019).

Conservation easement – is a voluntary, legal agreement that permanently limits uses of the land (e.g., to plow, to apply mineral fertilizers, to make timber cutting, to conduct construction and others) in order to protect its natural values. The easement also expects protection of the land space for agricultural and forestry production; protection of the relatively natural environment for living the kinds of wild flora and fauna; protection of lands for environmental and recreational purposes. Such experience is new for Ukraine, but it is rather effective.

To improve motivation of landowners and land users to protect and recover natural ecosystems, including due to the degraded and marginal arable lands, it is required both to pay great attention to legal and economic instruments of management, and also actively develop the system of non-legal social responsibility, and particularly its constituent – ecological responsibility (Lokhorst A. M., Staats H, and others, 2011).

It is necessary for landowners and land users to master specific knowledge and practical skills on protection and recovery of the biodiversity, provided by the advisory, scientific and research, promotion and educational establishments. That advisory and educational function should be provided by the special institution, which is authorized to develop the internal motivation of land owners and land users to protect and recover productivity of natural ecosystems as a principal source of the regulating and habitat services. Therefore, the local population will be informed about the advantages and benefits they can get from forests, water bodies, grasslands, etc., as well as about the risks of the excessive anthropogenic impact on landscapes.

It is important to use the experience of the European Union in motivating and stimulating the support of biodiversity on private lands. European Union (EU) afforestation programmes applied to marginal agricultural land contribute significantly to strengthening the rural economy and provide multiple products and ecosystem services. However, it also contributes to the spread of invasive plants and trees, which is an environmentally hazardous phenomenon. Therefore, it is important to monitor the processes of ecosystem restoration. It is important to conduct special training and use effective methods to restore natural plants in order to preserve biodiversity (Lazaridou D. C., 2021).

Conclusions and proposals

1. In Ukraine, viability of natural ecosystems is ceased because of excessive anthropogenic burden on the environment. The potential reserve for expansion of the area with natural lands can be provided by degraded and marginal arable lands, which are recommended to be withdrawn of the intensive use for the forestation or grassing. It is important to use areas with self-seeding forests on agricultural lands to increase natural lands.
2. In spatial planning at the local level, it is suggested to make landscape-ecological zoning of rural territories, which involves determination of the land use types. It provides information for all interested parties about available reasonable directions of use of the degraded and marginal arable lands.
3. Substantiation of the transition of degraded or marginal arable lands into environmental territory needs determining the value of the potential ecosystem services, which can be obtained from the natural ecosystems (e.g. from forestation, grassing). For legalization of such transition of lands into the category of environmental territories, it is expedient to initiate the institute of the conservation easement of lands.
4. Concerning the landowners' motivation to change management of degraded or marginal arable lands basing on the ecosystem approach, it is recommended to define at the legislative level the procedure for the transfer of agricultural land for environmental purposes. Exempt landowners from paying land taxes, who save the natural capital in the form of biodiversity both for themselves and for future generations.

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