UDC 332: 631.1
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O. Butrym,
PhD in Economics
O. Shvets,
Institute of Agroecology and Nature Management of NAAS

Efficiency of land-use as criterion of the level of anthropogenic load

Goal. To propose an approach to improving the method of assessing the efficiency of land use in the region while simultaneously adapting it to international statistical requirements. Methods. Analysis and synthesis, abstract-logical, expert evaluations. Results Expansion of the assessment scale for calculating the indicators of ecological stability of the region provides an opportunity to optimize the costs of environmental measures, affecting the price of land, which is relevant to the current economic conditions of market transformations of land use. Conclusions Using the proposed scale provides a higher level of accuracy, transparency and objectivity of the characteristics of the level of anthropogenic load in the region.

Key words: category of land use, state of the environment, level of anthropogenic loading, balanced land use, agricultural land, soils.

The economic and consumer approach to nature use and land use, which took place until recently, has proved its failure to provide acceptable living conditions. The deterioration of the natural environment leads to a deterioration in the health of the population, and, ultimately, to significant economic losses, which manifests itself in raising the overall level of social tension. In the field of land utilization, there were disproportions in the territorial organization of production, in particular agricultural production, and the ecological and economic conditions of the regions are becoming signs of an acute crisis. The solution of the problem is seen in the implementation of scientifically grounded approaches to the territorial organization of productive forces, which requires the normalization and improvement of the estimation of the level of anthropogenic pressure on the environment. The results of such assessments are the basis for the development of environmental measures and programs. Implementation of such measures requires resource support, therefore, the cost effectiveness and the level of implementation of environmental protection measures depend on the accuracy of the source information on the ecological status of the region. In addition, with the reform of all spheres of economic activity, in particular, the spheres of land relations, the availability of objective and reliable information on the level of environmental security becomes of particular relevance, as the state of agroecological safety affects the cost of land plots.

In view of this, the question arises of the methodological nature of assessing the level of anthropogenic loading, the degree of violation of the ecological balance of natural landscapes under the pressure of human activity, which affects the ability of the environment to restore the initial (or close to such) state and its the ability to resist anthropogenic disturbance.

Analysis of recent research and publications. On the need to develop methodological approaches An estimation of the level of anthropogenic loading on the territory has been emphasized on several occasions; however, universal methodology has not yet been developed, and approaches vary both in terms of a set of land use categories and quantitative parameters of the optimal level of correlation between their areas. Thus, N. Palapa [5] thinks that the agrolandscape should consist of forests and meadows (30% of the territory), and the arable land and water objects occupy no more than 20%. At the same time, other researchers consider it important to preserve agroecology landscape another set of land use categories. For example, it is proposed to study the ratio of the areas of land of different intensity only to agricultural use within the region (V. Yatsukhno) [10] or by the proportion of erosionally hazardous lands in agricultural land (S. Nosov, V. Kochurov) [7] . The position of Slovak researchers A. Rybalsky and E. Haisse [8] is quite widely used to determine the measure of anthropogenic pressure by the ratio of values of areas of various categories of land use using coefficients characterizing the extent of anthropogenic variability of landscapes: for forests-1, pastures - 0,58, grassland - 0,62, arable land - 0,14. The latter principle of evaluation was widely used in the writings of O. Furdicka [1] et al. and is proposed for assessing the ecological and economic state of use of agricultural land in the works of A. Tretiak [9], L. Kazmir [4].

The purpose of the research is to substantiate the need to improve the method of assessing the efficiency of land use in the region, which is the key criterion for the level of anthropogenic load, and to propose an approach to extending the assessment scale with its simultaneous adaptation to international requirements for the preparation of statistical data.

Materials and methods of research. The theoretical and methodological basis of the research is the works on the issues of environmental safety assessment (B. Danylyshyn [2], S. Balyuk [6]), the definition of the degree of anthropogenic imposition in the region (A. Tretiak [9]), and optimization of the development and placement of productive forces (I. Bistryakova [3]). The research methodology is based on general scientific research methods to generalize the results of existing research and to find ways to improve their practical application (analysis, synthesis, scientific abstraction, induction and deduction), and on special (mathematical statistics - correlation and dispersion analyzes) to compare the results of applying different approaches to assessing the level of anthropogenic pressure on the environment.

Research results. To determine the ecological status of the territory, an anthropogenic load index was proposed as a part of the anthropogenically altered landscapes, taking into account the intensity of these changes (Kan) and the ecosystem stability index (Kes), which shows the level of anthropogenic disturbance of the natural state of the territory [1]. We propose to combine these inverse proportional land use characteristics in the system of equations (1) and to correlate them with the total area of the region, which will allow a complex characterization of the state of land use. An estimate is made as the sum of the product areas of land use categories of a certain type on the weight coefficients with the following ratio of the result to the total area of the region:

……..(1)

where Si is the area of the ith category of land use, ha; S - area of the investigated region, ha; ki - coefficient of ecological property of different types of lands; di - rating point for the degree of anthropogenic loading.

The coefficient of ecological property of different types of land (ki) is a measure of the correspondence of the state of territories with different types of anthropogenic activity to the natural state of pristine landscapes - reduces the value of the area relative to the natural state of the landscapes from 1 - for forests to 0,00 - for areas with a profound change the natural state of the environment, for example, for the forgotten territories or roads. For arable land it is assigned a value of 0,14; vineyards - 0,29; forest strips - 0,38; perennial plantations - 0,43; cities - 0,50; hayfields and pastures - 0,62 and 0,68 respectively, and for ponds and natural swamps - 0,79. At the same time, the scale for the points of anthropogenic loading (di) is proposed for only 5 categories: from 1 for the land of the reserves to 5 for the built up land. For arable land and perennial plantations - 4; for natural forage lands - 3 and for forests, forest belts, swamps, land under water - 2 [1].

Applying the proposed gradation of land use for calculations is a complex task both because of the inconsistency of the scale considered within the framework of the proposed methodology [1] and through inconsistency in the interpretation of views on the content of land use categories and on the approach adopted in the preparation of national statistical reporting. In Ukraine, approaches to European classifications have been used to provide comparisons of statistical data with similar parameters of other countries for the creation of classifications of types of economic activity, which provides a close interpretation with international ones. Consequently, the list of positions proposed in the methodology and the list of positions on taking into account the areas of land use categories in Ukraine from the form of statistical reporting 6-earth need to be reconciled. In addition, in order to increase the accuracy and transparency of the presentation of the versatile anthropogenic impact on the environment, the proposed scale of assessments, in our opinion, needs to be expanded. This is substantiated by varying degrees of anthropogenic pressure within the categories of land use, for example, within the first category "Constructed Territory and Roads". For calculations it is logical to use the values of the land use category "Buildings land" from the form of statistical reporting of the 6th land. However, within this category of land use, land occupied by a wide range of economic activities from "land used by extractive industries on open development, quarries and mines "(graph 40, 6-earth) to" green plantations within settlements "(graph 56, 6-earth). Consequently, the reflection of such heterogeneity of the level of anthropogenic loading on the environment within certain categories of land use requires methodological refinement. The essence of the improvement is not only in an attempt to detail the proposed environmental scale for the scale, but also to try to correlate it with the scale of assessment points for the degree of anthropogenic load. The boundary measures of a wide

spectrum of anthropogenic loading are: 1 - the state of almost complete absence such as on pristine (primary) lands in their natural state regardless of the type of landscape (in the proposed approach only forest landscapes were considered) and values 0 - the earth is degraded destroyed by natural landscapes - for the category of land used by mining industry for open development, quarries and mines. All categories of land use are divided into 5 groups based on expert judgment (table). The aforementioned improvement opens up the possibility to more accurately reflect the existing level of anthropogenic loading on natural landscapes. In order to compare the results of the assessment with the use of both scales of varying degrees of detail, taking into account the areas of land use categories in Ukraine, estimates were calculated according to the data of the form of statistical reporting 6-earth, which showed a decrease of the indicator of ecological stability by more than 6%, and for the indicator of anthropogenic - loading - an increase of almost 5,5%.

Conclusions

The use of an expanded assessment scale contributes to increasing the level of conservatism of assessments and reduces the level of uncertainty of results, that is, increases their accuracy. The calculations show that the available level of anthropogenic load on the territory of Ukraine is higher than that estimated using existing approaches. The application of the updated method reduces the index of economic stability of the territory by more than 6%, and the indicator of anthropogenic loading increases by almost 5,5%. This approach contributes to more accurate development of environmental programs, and hence, there is a way to optimize the material and financial provision of environmental protection activities. In addition, the approach will have an impact on land rental rates.

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