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LAND USE OF THE VELYKOBEREZOVYTSKA TERRITORIAL COMMUNITY: GEOENVIRONMENTAL ASSESSMENT AND OPTIMISATION IN CONTEXT OF THE CLIMATE CHANGE

The article analyses and geoecological assessment of the structure of land use in the Velykoberezovytska community. It has been established that the structure of land use in the study area is dominated by arable land (68%), forests occupy 13%, built-up land – 7%, pastures – 4%, hayfields – 4%, perennial plantations – 3%, land under water and marshes – 1%. The share of natural lands in the community is 25%. Based on the results of the calculations, the coefficient of anthropogenic transformation of the territory of the Velykoberezovytska territorial community was determined, which is 4.7; the coefficient of environmental stability – 0.29; bal anthropogenic load – 3.7 and the coefficient of anthropogenic load – 3.7. According to the results obtained, it was found that the territory of the Velykoberezovytska territorial community is ecologically unstable with transformed landscapes, a fairly high score and an average degree of anthropogenic pressure.

The article substantiates the optimisation model of land use of the Velykoberezovytska territorial community, which provides for a 25% reduction in arable land, increasing forest cover by 12% and bringing the share of natural lands to the optimal level of 50%. It has been established that, if such an optimisation model is implemented, the territory of the Velykoberezovytska community will move from the status of a greenhouse gas emitter to a sink. The community's land will absorb more than 13,5 tonnes of greenhouse gases annually.

Ключові слова: *geoecological assessment, land use, ecological stability, anthropogenic load.*

Statement of the scientific-practical problem. As a result of the decentralisation reform, 55 territorial communities covering three administrative districts were formed in Ternopil region: Kremenetskyi, Ternopilskyi and Chortkivskyi [4]. The largest community in the region in terms of population and financial capacity is the Ternopilska city territorial community [15]. One of the territorial communities adjacent to the Ternopil city is the Velykoberezovytska territorial community (TC), which serves as a sleeping suburb of the regional centre and is actively used by local residents for recreational and economic purposes. In this regard, there is a need to study the degree of balanced use of land by assessing its structure, environmental stability and anthropogenic pressure.

Relevance and novelty of the research. The analysis of the geoecological state and optimisation of land use in the Velykoberezovytska territorial community allows us to explore the problems of balanced land use in the suburbs and the possibility of their inclusion in the development of urban agglomerations. Conducting such studies is important for suburban settlements, especially those bordering on regional or district centres. These settlements and communities play an important role in preserving urban ecosystems and are part of the forestry part of the city`s complex green zone [8]. Since the analysis of the land use structure was carried out only for certain communities in Ternopil region [7, 19, 21, 23], which do not include the Velykoberezovytska TC, the geoenvironmental assessment of land use in this community is a relevant and important scientific-practical task. This problem is particularly relevant in the context of climate change adaptation. In the current conditions of global and regional climate change, land use optimisation should take into account the potential capacity of different categories of land to produce and assimilate greenhouse gases. Therefore, in our study, we pay special attention to the prospects of the impact of the optimised land use structure of the Velykoberezovytska community on the climate parameters of the region through the volume of greenhouse gas production.

The *object* of the study is the structure of land use in the Velykoberezovytska territorial community, *subject* – geoenvironmental parameters and peculiarities of land use within the Velykoberezovytska territorial community. The *purpose* of the study is to assess the structure of land use in the Velykoberezovytska territorial community and to substantiate the directions of its optimisation, taking into account the impact on climate change. To achieve this goal, the following *tasks*: analysed the structure of land use in the Velykoberezovytska territorial community, the share of natural lands was determined; the coefficients of anthropogenic transformation, environmental stability and anthropogenic load of the community territory were calculated; the optimisation model of the Velykoberezovytska community land use is substantiated; the volumes of greenhouse gas production/absorption (in CO_2 equivalent) by the lands of the Velykoberezovytska TC were determined, including on condition that optimisation of the land use structure of studied territory.

Relation of the article topic to important scientific-practical tasks. The subject of the research corresponds to the theme of the research work of the Department of Geoecology and Methods of Teaching Environmental Disciplines for 2024-2028: «Optimisation of ecosystem services in natural-economic systems, including river-basin systems, on the basis of sustainable development as an important investment in maintaining natural processes in the environment, as well as in the well-being and living standards of the population». The results of the study are of great practical importance for the implementation of the Environmental Protection Programme in Ternopil Region for 2021-2027, the Development Strategy of Ternopil Region for 2021-2027, and the Development Strategy of the Velykoberezovytska territorial community for 2021-2027.

Analysis of recent publications on the research topic. Among the recent publications covering the issues of land use and management of land resources of territorial communities in Ukraine, it is worth noting the following studies Tretiak A., Tretiak V. [17], Dorosh O., Melnyk D., Sviridova L. [5], Novakovsky L., Novakovska I. [11] ets. International experience in implementing land use planning policy was studied by Philip Booth [26], John W. Bruce, Anna Knox [27], Samuel B. Biitir, Baslyd B. Nara, Stephen Ameyaw [28], Suhardiman D., Keovilignavong O., Kenney-Lazar M. [29]. The analysis of land use by territorial communities was carried out by Putrenko V.V., Hapon S.V. [14]. The issues of administrative and territorial reform and the formation of capable territorial communities were studied by: Oliynyk Ya.B., Ostapenko P.O. [12], Lazarieva O. [9]. The role of land use in organizing the balanced development of territorial communities, issues of the land management and optimization of the land relations in new administrative units was studied by Bubyr N. [25]. The geoecological assessment of the land use structure of certain territorial communities of Ternopil region was carried out by Tsaryk L., Kuzyk I. [19], Kuzyk I, Novytska S., Yankovska L. [7], Chebolda I., Kuzyk I. [23]. The issue of accounting the amount of agricultural land of Ternopil region territorial communities was studied by Zablotskyi B., Gavryshok,B., Demyanchuk P [6].

Research methodology. For a comprehensive geo-environmental assessment of the land use structure of the study area, the coefficient of anthropogenic transformation was calculated, the coefficient of ecological stability was determined, and the level of anthropogenic load of the Velykoberezovytska territorial community was assessed. The coefficient of the anthropogenic transformation of landscapes is an integral indicator that can be used to assess the ecological state of natural and natural-anthropogenic systems of administrative or natural areas. The coefficient anthropogenic transformation according to the methodology V.A. Anuchina, M.Ya. Lemesheva, K.G. Hoffmana and P.G. Shyshchenka [24] is calculated by the formula:

$$К_{at} = \sum (r_i \times q_i \times p) \times n / 1000 \quad (1)$$

where $К_{at}$ – the coefficient of anthropogenic transformation; r_i – rank of the landscapes anthropogenic transformation by a certain type of natural resource use; q_i – the index of landscape transformation depth; p – rank area (%); n – the number of constituent parts within the landscape area contour [24].

Each type of natural resource use is assigned a rank of the anthropogenic transformation: 1 – natural protected areas; 2 – forests; 3 – marshes and wetlands; 4 – meadows; 5 – orchards and vineyards; 6 – arable land; 7 – rural building; 8 – urban building; 9 – reservoirs, canals; 10 – industrial land [24].

When calculating the index of landscape transformation depth (q_i) the «weight» of each type of the nature management is determined by experts. The index of landscape transformation depth for different types of the nature management, established by experts means, is as follows: 1.00 – natural protected areas; 1.05 – forests; 1.10 – marshes and wetlands; 1.15 – meadows; 1.20 – orchards and vineyards; 1.25 – arable land; 1.30 – rural building; 1.35 – urban building; 1.40 – reservoirs, canals; 1.50 – industrial land [19].

Given the significant range of fluctuations $К_{at}$, distinguish a five-stage scale of its interpretation: 2.00-3.80 – poorly converted landscapes; 3.81-5.30 – converted landscapes; 5.31-6.50 – medium converted landscapes; 6.51-7.40 – heavily converted landscapes; 7.41-8.00 – overly converted landscapes [24].

To determine the coefficient environmental stability of the territory and the ball anthropogenic load, a system of indicators has been developed that characterises each type of land by the impact that these lands impact on the environment (table. 1). The coefficient environmental stability is calculated by the formula:

$$К_{es} = (\sum К_i \times P_i / \sum P_i) \times К_p \quad (2)$$

where $К_{es}$ – the coefficient environmental stability; $К_i$ – the coefficient environmental stability of the certain type lands (table. 1); P_i – area of the certain type lands (ha); $К_p$ – coefficient the relief morphological sustainablility – 1.0 [1].

The value of the coefficient environmental stability determines of the study area environmental stability. If:

K_{es} < 0.34 – the territory is environmental unstable and radical measures need to be identified to remedy the situation and prevent the deterioration of the territory environmental state;

K_{es} = 0.34-0.50 – the territory is unstable, measures must be taken to correct and improve the situation, bringing the territory to environmental stability;

K_{es} = 0.51-0.66 – the territory is medium stable, recommend measures to improve and maintain the territory in a stable condition;

K_{es} = 0.67 і > – the territory is ecologically stable, identify the desired measures to maintain the territory in an ecologically stable state [1].

Table 1

Indicators characterising the environmental impact of certain types of land [1]

Name of the land	Coefficient environmental stability, $К_i$	The bal anthropogenic score, $Б_i$
Built-up area and roads	0.00	5
Arable land	0.14	4
Vineyards	0.29	4
Forest belts	0.38	4
Gardens, shrubs	0.43	3
Hayfields	0.62	3
Pastures	0.68	3
Land under water and marshes	0.79	2
Forests	1.00	2

The bal anthropogenic load is calculated by the formula:

$$B_{an} = (\sum B_i \times P_i / \sum P_i) \times K_p \quad (3)$$

where, B_{an} – the bal anthropogenic load; B_i – the bal anthropogenic load of the certain type lands (table. 1); P_i – area of the certain type lands (ha); K_p – coefficient the relief morphological sustainablility (1,0). The bal anthropogenic load in ranges from 2 to 5. The closer of the bal anthropogenic load is to 5, the greater the anthropogenic pressure on the territory, and vice versa.

Separately, the coefficient anthropogenic load of the territory is determined (K_{an}), which shows how much human activity affects the state of the natural environment. This indicator is calculated by the formula:

$$K_{an} = \sum(P_i \times B_i) / \sum P_i \quad (4)$$

where K_{an} – the coefficient anthropogenic load, P_i – area of the land with the appropriate level of anthropogenic load (ha), B_i – bal corresponding to an area with a certain level of anthropogenic pressure (is measured on a five-point scale, table. 2) [19].

Table 2

Scale for assessing the impact of land use types [19]

Type of the land use	Bal	Degree of the anthropogenic pressure
Built-up land, industrial and transport land	5	High
Arable land and perennial plantations	4	Significant
Pastures and hayfields	3	Medium
Forests, shrubs, forest belts, marshes and land under water	2	Insignificant
Protected areas	1	Low

Optimisation modelling of the land use involves the implementation of a number of approaches based on the techniques of Grodzynskyi M.D. [3] and Tsaryk L.P. [22] and take into account of the territory zonal characteristics. In particular, the optimisation performance of the zone of mixed, broadleaved forests and the forest-steppe zone of the temperate belt. The development of the territorial communities an optimisation model land use structure is based on the optimisation indicators of the broadleaf forest zone 23-40% forest cover and the share of natural lands 50-60%. After all, it is 60% of natural lands that the geosystem needs to maintain dynamic equilibrium and perform its main stabilisation and regenerative functions [22].

Presentation of the main material. The Velykoberezovytska territorial community of the Ternopil distric is located in the central part of Ternopil region, bordering on the southern outskirts of the oblast centre of city Ternopil (Fig. 1) [10]. The hromada consists of 13 settlements: Butsniv, Velyka Luka, Yosypivka, Luchka, Maria-nivka, Myroliubivka, Myshkovychi, Nastasiv, Ostriv, Petryky, Seredynyky, Khatky and the community centre – Velyka Berezovytsia [4].

The Velykoberezovytska territorial com-munity is bordered: in the north – with the Terno-pilska TC, in the east – with the Velykohaivska TC, in the south – with the Mykulynetska TC, in the west – with the Kupchynetska and Zolotnykivska communities and in the north-west – with the

Podgorodnya TC [10]. The total area of the Velykoberezovytska territorial community as of 1 January 2024 is 20 thousand hectares, with a population of 23174 people [4].

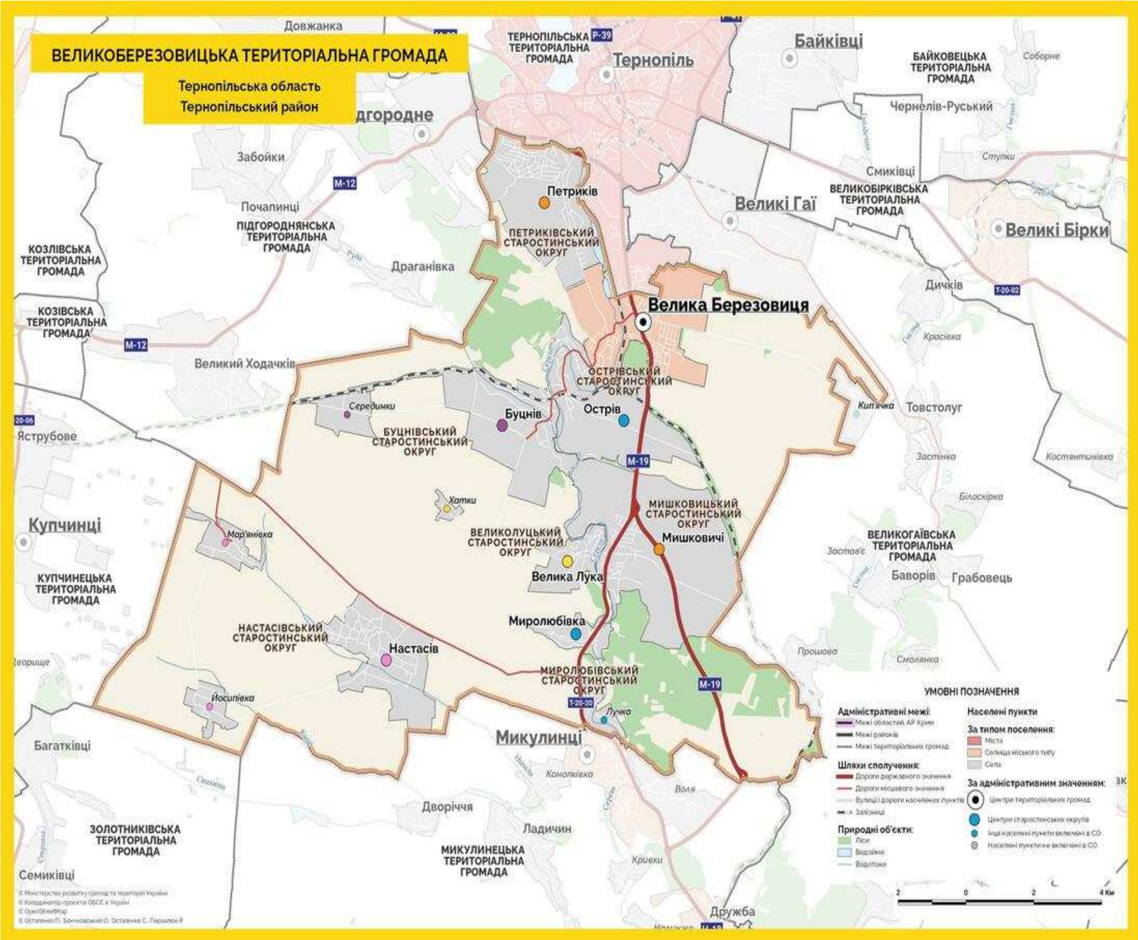

Fig. 1. Velykoberezovytska territorial community [10]

The territory of the Velykoberezovytska territorial community is located within the Ternopil plateau of the Podilska Upland. The surface is hilly and flat, divided by river valleys and gullies [2]. The lands of the Velykoberezovytska community are dominated by podzolised chernozems with a humus layer thickness of 80-90 centimetres. The humus content is 3.6-3.8%, the pH level ranges from 5.7-5.9. Meadow-carbonate soils are common in river valleys. The humus content in them is about 4%, the pH level is 6.7-6.9 [16]. Meadow-boggy soils predominate in river floodplains [2].

The climate of the Velykoberezovytska territorial community is temperate continental, with warm, humid summers and mild winters. Average air temperature ranges from -6 °C in January to +20 °C in July. Winds are most often north-west and south-west. Active cyclone activity causes a large amount of precipitation, which averages 580-600 mm per year. In summer, there are often showers, less often thunderstorms, and sometimes hail. Snow cover lasts from the second half of December to early March. Snow depth is 8-10 cm, reaching its maximum in the second decade of February [2]. In recent years, the Velykoberezovytska territorial community has seen a trend towards changes in regional and global climatic parameters, which is reflected in a decrease in precipitation and an increase in average annual air temperature.

The land use structure of the Velykoberezovytska community is dominated by agricultural land – 79%, of which 68% is arable land. Forests occupy 13%, built-up land – 7%, pastures – 4%, hayfields – 4%, perennial plantations – 3%, land under water and marshes – 1% (Fig. 2).

In terms of starosta districts, of which there are 8 in the Velykoberezovytska community, structure of the land use is as follows (tabl. 3): the highest ploughing is observed in Nastasivskyi and Velikolutskyi starosta districts. The least ploughing is in Myroliubivskyi and Petrykivskyi starosta districts. The forest cover is highest in Myroliubivskyi starosta district (37.5%). The forest cover is high in Petrykivskyi (20%), Ostrovskyi (16.5%) and Myshkovytskyi (16%) starosta districts. However, there are starosta districts in the territorial community with extremely low forest cover: Nastasivskyi (0.5%), Velikolutskyi (2%) and Velykoberezovytskyi (4%). Most of the land under pasture and hayfields is by Myroliubivskyi (10%), Myshkovytskyi and Nastasivskyi starosta districts. Perennial plantations (gardens) are the most numerous in Petrykivskyi (10%) and Butsnivskyi (8%) starosta districts. The largest amount of built-up land is in Ostrovskyi starosta district. The share of land under water and marshes in the starosta districts of the Velykoberezovytska territorial community varies between 0.5-1%.

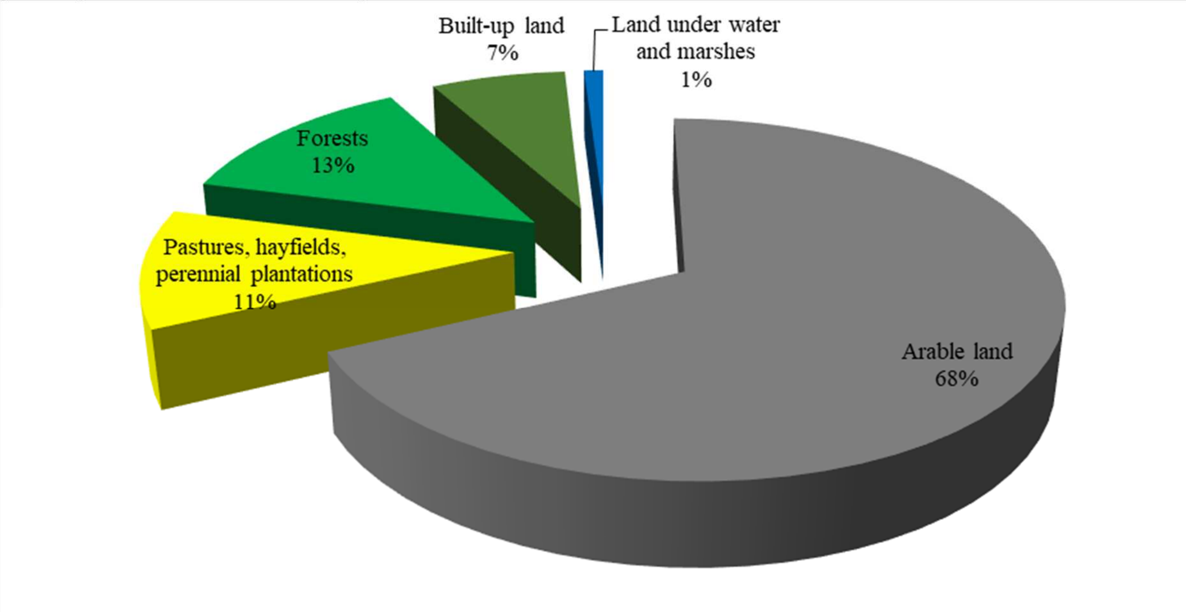

Fig. 2. **Land use structure of the Velykoberezovytska territorial community**

Table 3

Land use structure of the Velykoberezovytska territorial community by starosta districts, %

Starosta districts	Arable land	Built-up land	Land under water and marshes	Forests	Pastures, hayfields and perennial plantations	Share of natural lands
Velykoberezovytskyi	74.0	10.0	1.0	4.0	10.0	*15.0*
Butsnivskyi	74.0	4.0	0.5	8.0	13.0	*21.5*
Velikolutskyi	83.0	4.0	1.0	2.0	9.0	*12.0*
Myroliubivskyi	46.0	4.0	0.5	37.5	11.0	*49.0*
Myshkovytskyi	61.5	7.0	1.0	16.0	13.5	*30.5*
Ostrovskyi	60.0	17.0	0.5	16.5	6.0	*23.0*
Nastasivskyi	85.0	3.5	1.0	0.5	10.0	*11.5*
Petrykivskyi	50.0	11.0	1.0	20.0	18.0	*39.0*
Velykoberezovytska territorial community	**68.0**	**7.0**	**1.0**	**13.0**	**11.0**	***25.0***

According to the analysis of the structure of the starosta districts land use of the Velykoberezovytska territorial community, it was found that the highest share of natural lands (pastures, hayfields, perennial plantations, forests, land under water and marshes) is recorded in Myroliubivskyi (49%) and Petrykivskyi (39%) starosta districts. In such starosta districts as Nastasivskyi, Velikolutskyi and Velykoberezovytskyi the share of natural lands is less than 15% (at a rate of 50-60%). In general, the share of natural lands in the Velykoberezovytska community is 25%, which is an extremely unfavourable factor in the formation of a balanced structure of natural resources use in the administrative unit.

Taking into account the imbalance in the structure of the Velykoberezovytska territorial community land use, we conducted a geoecological assessment of the studied area land use structure and determined the following indicators: the coefficient of anthropogenic transformation, the coefficient of environmental stability, the coefficient and bal of anthropogenic load.

According to formula 1, we calculated *the coefficient of anthropogenic transformation* of the Velykoberezovytska territorial community landscapes:

$$К_{at} = (((2×1,05×13) + (4×1,15×8) + (5×1,2×3) + (6×1,25×68) + (7×1,3×7) + (9×1,4×0,3) + (10×1,5×0,7)) × 7) / 1000 = ((27+36,8+18+510+63,7+4+10,5) × 7) / 1000 = 670 × 7 / 1000 = 4690 / 1000 = 4,7$$

Thus, *the coefficient of anthropogenic transformation* of landscapes in the study area is *4.7*. According to the five-stage scale of interpretation of the coefficient of anthropogenic landscape transformation, the territory of the Velykoberezovytska community belongs to transformed landscapes.

The coefficient of environmental stability of the Velykoberezovytska community is calculated using the formula 2:

$$К_{es} = (((0,0×1284) + (0,14×13145) + (0,43×550) + (0,62×680) + (0,68×770) + (0,8×165) + (1×2260)) / (1284 + 13145 + 550 + 680 + 770 + 165 + 2260)) × 1 = ((0+1840,3+236,5+421,6+523,6+132+2260) / 18855) × 1 = (5415 / 18855) × 1 = 0,29.$$

Thus, the *coefficient of environmental stability* of the territory of the Velykoberezovytska community is *0.29*. That is, the territorial community is *environmentally unstable* and requires the introduction of effective optimisation measures to balance the structure of land use and improve the ecological state of the territory.

Similarly to the determination of the environmental sustainability coefficient, according to table 1 and formula 3, we calculate *the bal anthropogenic load* of the study area:

$$B_{an} = (((5×1284) + (4×13145) + (3×550) + (3×680) + (3×770) + (2×165) + (2×2260)) / (1284 + 13145 + 550 + 680 + 770 + 165 + 2260)) × 1 = ((6420+52580+1650+2040+2310+330+4520) / 18855) × 1 = (69 850 / 18 855) × 1 = 3,7.$$

Thus, according to the results of the relevant calculations, the *bal anthropogenic load* of the Velykoberezovytska territorial community is *3.7*. Accordingly, it can be concluded that the study area is subject to a *fairly high anthropogenic load* and requires the introduction of optimisation measures to minimise it.

Separately, according to formula 4, we calculate *the coefficient of anthropogenic load* of the community, which shows how much human activity affects the state of the natural environment:

$$К_{an} = (1284×5) + (13700×4) + (1450×3) + (2425×2) + (3×1) / 1284+13700+1450+2425+3 = 6420+54800+4350+4850+3 / 18 862 = 70 423 / 18 862 = 3,7.$$

Thus, the *coefficient of anthropogenic load* in the Velykoberezovytska territorial community is *3.7*, which corresponds to the category of *medium anthropogenic load*.

Based on the analysis of the coefficient of anthropogenic transformation, the coefficient of environmental stability, the coefficient and bal anthropogenic load of the Velykoberezovytska community, it can be concluded that it is necessary to optimise the use of land in this area. The analysis of the distribution of natural and anthropogenic land in the Velykoberezovytska community showed a significant differentiation and difference from scientifically based norms (the share of natural lands is 25%). Taking into account the basic principles of the concept of sustainable development, we have developed an optimisation model of the Velykoberezovytska territorial community land use (tabl. 4), which is located in the zone of broadleaf forests with a standard forest cover of 23-40% [3, 22].

able 4

An optimisation model of the Velykoberezovytska territorial community structure of land use

Starosta districts	Arable land *existing /* ***optimal***	Built-up land	Land under water and marshes	Forests *existing /* ***optimal***	Pastures, hayfields and perennial plantations *existing /* ***optimal***	Share of natural lands *existing /* ***optimal***
Velykoberezovytskyi	74 / **40**	10.0	1.0	4 / **24**	10 / **24**	15.0 / **49.0**
Butsnivskyi	74 / **46**	4.0	0.5	8 / **25**	13 / **24**	21.5 / **49.5**
Velikolutskyi	83 / **50**	4.0	1.0	2 / **22**	9 / **22**	12.0 / **45.0**
Myroliubivskyi	46 / **45**	4.0	0.5	**37,5**	11 / **12**	49.0 / **50.0**
Myshkovytskyi	61 / **42**	7.0	1.0	16 / **25**	13.5 / **24**	30.5 / **50.0**
Ostrovskyi	60 / **40**	17.0	0.5	16 / **24**	6 / **18**	22.5 / **42.5**
Nastasivskyi	85 / **50**	3.5	1.0	0,5 / **23**	10 / **22,5**	11.5 / **46.5**
Petrykivskyi	50 / **40**	11.0	1.0	20 / **25**	18 / **23**	39.0 / **49.0**
Velykoberezovytska territorial community	68 / **43**	7.0	1.0	13 / **25**	11 / **24**	25.0 / **50.0**

Given the high ploughing of the Velykoberezovytska TC territory (68%), it is considered appropriate to reduce it by 25%. Taking into account the peculiarities of the landscape, it is recommended to reduce arable land at the expense of low-productive, slightly and medium-eroded lands. Lands with a slope of more than 6° should be reforested, which will increase the forest cover of the territory by an average of 12%. The rest of the land with a slope of less than 6° can be used for land alkalinisation, which will increase the share of pastures, hayfields and perennial plantations to 24%. Such measures will help increase the share of natural lands in the Velykoberezovytska territorial community from 25% to 50%.

Thus, the optimisation structure of land use in the Velykoberezovytska territorial community will include: 43% – arable land, 25% – forests, 24% – hayfields, pastures and perennial plantations, 7% – built-up land and 1% – land under water and marshes (fig. 3). This model is based on the principle of equilibrium and parity development of the husbandry [3, 19, 22]. This means that the exploitation of lands and natural resources in the study area will not adversely affect the quality of the environment and natural geosystems. The optimisation measures are aimed at improving the environment and creating an environmentally safe system of natural resource management in the Velykoberezovytska territorial community.

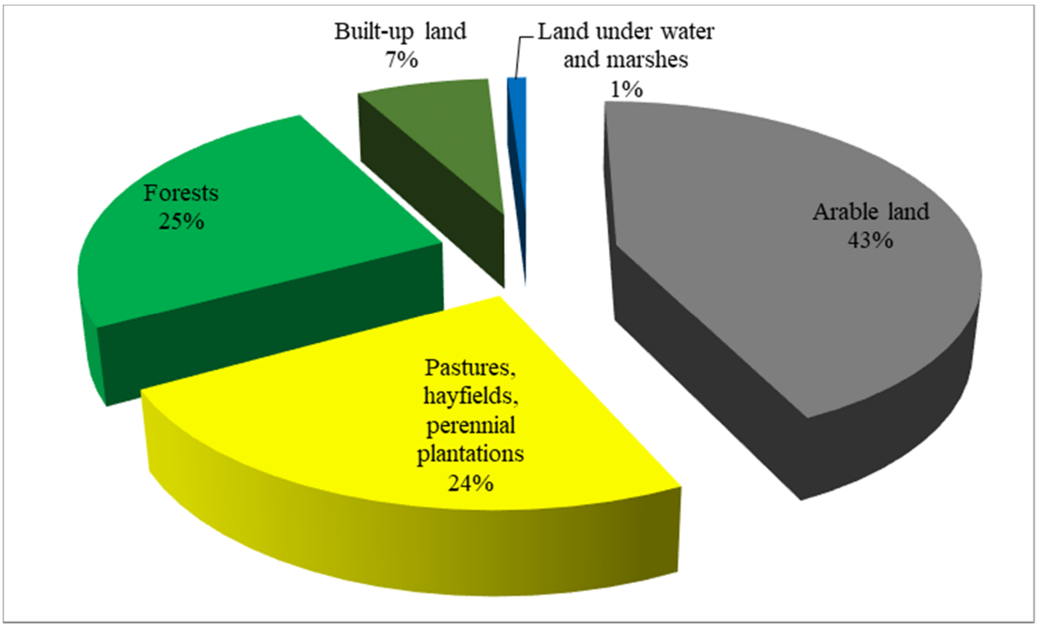

Fig. 3. **The optimal for land use structure of the Velykoberezovytska territorial community**

According to the methodology of the the Intergovernmental Panel on Climate Change [13], we have assessed the impact of different types of the Velykoberezovytska territorial community land on emissions and assimilation CO_2. Considering the average impact of different types of land on climate change in CO_2 equivalent units per hectare [13] (tabl. 5) and spatial analysis of the Velykoberezovytska community land use structure revealed that the study area is an emitter of greenhouse gases. With the current structure of land use (as of 2022), the community's land produces 4751.5 tonnes/year CO_2. If the optimisation model of land use is implemented, the study area will move from being a greenhouse gas emitter to a sink, absorbing about 13.6 CO_2 thousand tonnes annually.

Therefore, the need to optimise of the Velykoberezovytska TC land use structure is caused not only by the low share of natural lands, transformed landscapes, environmental instability of the territory and high anthropogenic load, but also by the impact on climate parameters. As the current structure of the community's land use produce more than 4.7 thousand tonnes of greenhouse gases per year, the need to optimise it and, accordingly, increase the share of natural land is extremely important. Our proposed mechanisms for optimising of the Velykoberezovytska TC land use structure will increase the share of natural lands in the study area to 50% and create a balance of land in which the community will absorb more than 13.5 thousand tonnes of greenhouse gases.

Conclusions. The study found that the main geoenvironmental problems of land use in the Velykoberezovytska territorial community are the imbalance in the structure of land, the lack of master plans for rural settlements, and the lack of inventory and regulatory monetary valuation of land. In order to ensure the effective development of the Velykoberezovytska community, its landscape and territorial planning, a geoenvironmental assessment of the land use structure was carried out. The coefficient of anthropogenic transformation (4.7), the coefficient of environmental stability (0.29) and the bal anthropogenic load (3.7) were determined. It has been established that the territory of the Velykoberezovytska community is characterised by transformed landscapes, is environmentally unstable with an average anthropogenic load. This, in turn, necessitates the optimisation of land use through the phased implementation of an optimisation model of the structure of land in the study area. Changing the designated purpose of individual land plots, reforestation of low-productive and highly fertile lands will form the following optimisation structure of the Velykoberezovytska community land use: 43% – arable land, 25% – forests, 24% – hayfields, pastures and perennial plantations, 7% – built-up land and 1% – land under water and marshes. If such an optimisation model is implemented, the territory of the Velykoberezovytska territorial community will move from the status of a greenhouse gas emitter (4751.5 tonnes of CO_2 equivalent) to a sink (-13.6 thousand tonnes of CO_2 equivalent).

Table 5

Assessment of the impact of the Velykoberezovytska territorial community land on climate change in units of CO_2 equivalent per hectare

Land category	**Coefficient of tonnes of CO_2 equivalent per hectare**	**Actual land area, ha**	**Greenhouse gas emissions, tonnes**	***Optimal land area, ha***	***Greenhouse gas emissions, tonnes***
Arable land	**1.18**	13 145	15 511	*8600*	*10 150*
Pastures and hayfields	**0.03**	1450	43.5	*4800*	*150*
Forests	**-4.78**	2260	-10 803	*5000*	*-23 900*
Land under water	**0.0**	150	0	*150*	*0*
Built-up land	**0.0**	1284	0	*1284*	*0*
Total			**4751.5**		***- 13 600***

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Анотація:

Ігор КУЗИК, Роман ФЕНТОН. ЗЕМЛЕКОРИСТУВАННЯ ВЕЛИКОБЕРЕЗОВИЦЬКОЇ ТЕРИТОРІАЛЬНОЇ ГРОМАДИ: ГЕОЕКОЛОГІЧНА ОЦІНКА ТА ОПТИМІЗАЦІЯ В КОНТЕКСТІ КЛІМАТИЧНИХ ЗМІН

Метою роботи є оцінка структури землекористування Великоберезовицької територіальної громади та обґрунтування напрямків її оптимізації із врахуванням впливу на зміни клімату. Під час дослідження було використано загальнонаукові методи: узагальнення та систематизація, описовий, статистичний, оцінювання; спеціальні методи: конструктивно-розрахунковий, картографічний, оптимізаційного моделювання, а також окремі методики для визначення антропогенного навантаження, коефіцієнтів екологічної стабільності та антропогенної трансформації території Великоберезовицької громади.

Великоберезовицька територіальна громада розташована в центрі Тернопільської області, Тернопільському районі, на площі 200 км². На території громади проживає 23 175 осіб. Великоберезовицька громада об'єднує 13 населених пунктів, на базі яких створено 8 старостинських округів.

У статті проведено аналіз та геоекологічну оцінку структури землекористування Великоберезовицької громади. Встановлено, що в структурі землекористування досліджуваної території переважає рілля (68%), ліси займають 13%, забудовані землі – 7%, пасовища – 4%, сіножаті – 4%, багаторічні насадження – 3%, землі під водою та болотами – 1%. Частка природних земель у громаді становить 25%. За результатами проведених розрахунків визначено коефіцієнт антропогенної трансформації території Великоберезовицької територіальної громади, який становить 4,7; коефіцієнт екологічної стабільності – 0,29; бал антропогенного навантаження – 3,7 та коефіцієнт антропогенного навантаження – 3,7. Відповідно до визначених показників, можна стверджувати, що територія Великоберезовицької територіальної громади є екологічно нестабільною з трансформованими ландшафтами, високим балом та середнім ступенем антропогенного навантаження.

Для виправлення та покращення ситуації і приведення досліджуваної території до нормативних показників екологічної стабільності, необхідно здійснити низку оптимізаційних заходів. У статті обґрунтовано оптимізаційну модель землекористування Великоберезовицької територіальної громади, яка передбачає скорочення ріллі на 25%, збільшення лісистості на 12% та доведення частки природних угідь до оптимального рівня 50%. Враховуючи особливості ландшафту досліджуваної території, ми пропонуємо зменшити площу ріллі

за рахунок малопродуктивних та еродованих земель. Таким чином, оптимізована структура землекористування Великоберезовицької територіальної громади, включатиме 43% – орних земель, 25% – лісів, 24% – пасовищ, сіножатей і багаторічних насаджень, 7% – забудованих земель та 1% – земель під водою та болотами. Встановлено, що за умови реалізації такої оптимізаційної моделі територія Великоберезовицької громади перейде зі статусу емітента парникових газів до їх поглинача. Землі громади щорічно поглинатимуть понад 13,5 тонн парникових газів. Реалізація такого підходу потребує зміни цільового призначення окремих земельних ділянок та організації їх ландшафтно-адаптованого використання.
Ключові слова: геоекологічна оцінка, землекористування, екологічна стабільність, антропогенне навантаження.

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