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ENVIRONMENTAL PROTECTION AND SPATIAL PLANNING OF ECO-NET STRATEGIES IN REGIONS WITH HIGH LEVEL OF ANTHROPOGENIC TRANSFORMATION OF GEOSYSTEMS

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The features of the nowadays stage of transformation methodology spatial planning in Ukraine and the peculiarities of the formation mechanisms of environmental planning schemes in the region is shows. The characteristic features of specific land use Ukraine are described, differences in the development area and type of land use changes within the large natural-economic and administrative regions are characterized. The experience of the ecological network planning at the regional level, based on specific land use studies and determination of anthropogenic transformation of regional ecosystems submitted. Possible reserves of the eco-nets creation are identify and regional potential of eco-nets creation, possibilities of its realization are characterized. Determined by which land can form regional ecological network and outlines the main features and approaches of environmental policies and spatial planning ecological networks in regions with high anthropogenic transformation of landscapes. ***Key words:*** *territorial planning, land use, anthropogenic transformation of landscapes, ecological networks, regional potential ecological network.*

Досліджено сучасні стадії методології перетворення просторового планування в Україні, розкрито особливості механізмів формування схем планування охорони навколишнього середовища в регіоні. Названо характерні особливості землекористування в Україні, описано відмінності в розвитку й типах змін землекористування в межах великих природно-економічних та адміністративних районів. Представлено досвід екологічного планування мережі на регіональному рівні на основі конкретних досліджень землекористування й визначення антропогенної трансформації регіональних екосистем. З'ясовано можливі запаси створення екомереж, характеризується регіональний потенціал створення екомереж, можливості його реалізації. Визначається, які саме землі можуть формувати регіональну екологічну мережу, названо основні функції й підходи екологічної політики та просторового планування екологічних мереж у регіонах із високою антропогенною трансформацією ландшафтів. ***Ключові слова:*** *територіальне планування, використання землі, антропогенна трансформація ландшафтів, екологічні мережі, регіональний потенціал екологічної мережі.*

Мальчикова Д., Пономарева А., Моликевич Р. ОХРАНА ОКРУЖАЮЩЕЙ СРЕДЫ И ТЕРРИТОРИАЛЬНОЕ ПЛАНИРОВАНИЕ ЭКОСИСТЕМНЫХ СТРАТЕГИЙ В РЕГИОНАХ С ВЫСОКИМ УРОВНЕМ АНТРОПОГЕННОЙ ТРАНСФОРМАЦИИ ГЕОСИСТЕМ. *Исследованы современные стадии методологии преобразования пространственного планирования в Украине, раскрыты особенности механизмов формирования схем планирования охраны окружающей среды в регионе. Названы характерные особенности землепользования в Украине, описаны различия в развитии и типах изменений землепользования в пределах крупных природно-экономических и административных районов. Представлен опыт экологического планирования сети на региональном уровне на основе конкретных исследований землепользования и определения антропогенной трансформации региональных экосистем. Определены возможные запасы создания экосети, характеризуется региональный потенциал создания экосети, возможности его реализации. Указывается, какие именно земли могут формировать региональную экологическую сеть, названы основные функции и подходы экологической политики и пространственного планирования экологических сетей в регионах с высокой антропогенной трансформацией ландшафтов.* ***Ключевые слова:*** *территориальное планирование, использование земли, антропогенная трансформация ландшафтов, экологические сети, региональный потенциал экологической сети.*

Introduction. Nowadays in the Ukrainian sphere of social changes the "center of gravity" in solving of a lot of tasks is transferring from the state level to regional and local ones. The role of separate territories and territorial communities increasable grows in coordinated governmental and local administrative action making, realization of social rights and population guarantees. In Ukrainian industrial sphere the branch-wise planning and administrating were traditionally in priority, as long as the territorial aspects of

social development were considered to be secondary. Nevertheless, appearance of a lot of contradictions in the system between society and nature shows the necessity in changing the priorities. The major number of modern researchers in the sphere of territorial planning, territorial management, landscape planning (A. Antipov (2006), V. Bokov (2005), A. Isachenko (2008), S. Kuznetsov (2008), D. Malchykova (2012), E. Pertsik (2006), O. Topchiev (2008)), emphasize the necessity in usage of territorial model, directing on saving the ecological, social and economical balance. According to the modern methodology the main task of territorial planning lies in the growth of the living standards. The solution of this task by methods of territorial planning presupposes searching of the best spatial connection between nature – population – house holdings both in regions, or county in general. At the same time the planning organization of natural environment is oriented on the formation of natural ecological safety basis, and the resettlement planning – on the spatial organization of population with guaranteed territorial safety and capability of active agricultural activity, the industrial planning – on the effective natural-resources potential of territories, labor force usage and minimal environmental pollution (O. Topchiev (2008), D. Malchykova (2012)).

The modern national politics of Ukraine in the sphere of environmental safety and spatial planning is forming in the context of Europe politics and is mostly oriented on prevention, control and regulation of negative anthropogenic influence on conditions and quality of the environment. At present day in Ukraine on nationwide level the main principles of national and regional ecological net schemes are worked out and legislatively accepted. As for the basic structural elements of ecological net and its parts, their list differentiates in normative and scientific sources, but generally is quite defined and validate.

At the same time the development of regional eco-nets appears to be a hard task in Ukraine because of the high level of territorial land invasion and fragmentation of natural landscapes. Thus, land usage on the South of Ukraine, in Kherson oblast particularly, has a pronounced agricultural character – the level of agricultural land invasion is about 69%, in agricultural enterprises' ownership, and citizens ownership (generally, for agricultural activities) is about 64% of territory. Such specific way of management results in a very high level of natural environment transformation and causes different problems while the formation of ecological territorial safety basis – eco-net usage. Thus, the separate task of eco-nets' planning and further environmental strategy development is to evaluate the anthropogenic nature systems of territory transformation.

Analyses of recent publications. Numerous researches in the sphere of town-building and rayon planning, geography, regionalstics, urbanistics, landscape planning, are dedicated to the problems of territorial planning in Ukraine. Among those who laid the conceptual foundations for this important scientific and practical direction are M. Kolosovskiy, M. Baranskiy, E. Pertsyk, F. Listenhurt, G. Lappo, D. Bogorad, B. Davidovich, A. Izrailevych, V. Nudelman and many other professionals. A significant contribution to the theory and practice of regional planning made architects- urbanist V. Vladimirov, I. Fomin, Y. Belokon and other. The defining of the eco-net in researches and study of the current biodiversity of individual elements began in the 1990-s. The fundamental aspects of the formation and development of ecological networks one can find in the scientific works by Y. Shelyah-Sosonka (1999), P. Shyschenka, M. Hrodzynskoho (2001), V. Baranovskoho

(2001), T. Andriyenko (1991), S. Stoyka (1995, 2004), K. Sytnyka (1995), M. Holubtsya (1997). An important contribution to the development of the conceptual bases of ecological networks in line with international strategy development, the study of geographical aspects of their formation are worked out by L. Rudenko (1999, 2001), I. Horlenko (2001), N. Malyshevoyi, V. Oleschenka (2001), V. Paschenka (2000), O. Topchieva (1993–2007). Interesting and rewarding is the experience in constructive and geographical study of the regional ecological network formation and development by P. Tsaryk.

V. Sochava, V. Vinogradov (1981), K. Bilvitts (1980) developed a detailed gradation of anthropogenic changes of geosystems, and researched also the methodological tasks of anthropogenic geosystem transformation in Ukraine. The main methods of anthropogenic load, anthropogenic transformation analyses were being worked out in the papers of F. Milkova, A. Isachenko, P. Shischenko, K. Hoffman, M. Grodzinsky, G. Denysyka, L. Malyshev, L. Medynskoho, L. Nalyvayko, V. Slyusarenko and other researchers [1–5; 8; 9]. In all the papers the problem of anthropogenic load and landscape transformation evaluation is of great importance. Quantitative methods of anthropogenic geosystem transformation evaluation, which take into account the structure of land holdings within geosystems, were developed by F. Milkov (1973), P. Shischenko (1988), S. Romanchuk (1981) and M. Grodzinsky (1995) The anthropogenic transformation of Ukrainian landscapes on zonal level was defined by P. Shishenko (1988). At the same time, the questions of environmental safety formation under the conditions of extreme convert by human beings belong to new and actual.

The basic material exposition. In former USSR territory planning was centralized. Town-building and rayon planning (which objects were not the administrative territorial units, but industrial zones, rayons, urbanized areals at the earliest steps of their development) were regulated according to the system of regiment documents (building codes and other instructions), that provided the necessary system of public life arrangement, conditions of urban activity, spatial organization of settlements. As it is correctly mentioned in the paper (S. Kuznetsov (2008)) in the soviet system the rational idea, that was one of the central for town-building in the West, became the main facility of consistent approach. Command and Administration system created a sophisticated, detailed system of territorial planning with industrial prevailing. It is brightly shown while geo-ecological and natural safety problems solving by the methods of territorial planning.

The section "Environment protection" in schemes and projects of rayon planning at any territorial level was necessary and irreplaceable (V. Vladimirov (1979)), in addition to this, environmental actions of rational usage of different territorial resources were researched in the industrial context. Thus, to the main tasks while projecting and planning belong:

- Protection of the air space from pollution within industrial implementation;
- Protection of water pond, land cover, wild life;
- Improving of sanitation and epidemiological conditions;
- Protections of historical and material culture;
- Formation of territorial system of high protection priority;
- Creating of complex system of environmental protection of the region.

It should be mentioned that these tasks found their solution only in works of ministers and departments without any reflec-

tions on the level of development and implementation of rational territorial organization models of nature usage in the system "nature – society", which was developed in the context of ecological-social-economical balance ideas. It should be noticed that results of such a sectoral approach are presented even now, when, for example there is a list of ecological expertise objects which does not include territories of administrative regions as a necessary and important object of expert determination. It must be underlined that geographers have been working for a long time with models of rational territorial organization of systems "nature-population-government". Thus, the model of polar landscape, developed by B. Rodoman (1974) may be taken as one of the first tries in searching of territorial combination of different production units and, as a result, in making the functional territorial zoning. This model was modified and detailed by O. Topchiev (1996) into the model of rational territorial organization of nature usage, but taking in account different social and economic factors and mental specific of modern Ukrainian society, these models even now do not find their reflections in organizational and planning of territorial regions practice.

The law on the united ecological and economical space of multiplicity (O. Lytovka (2005)) can be reputed as a modification of an ecological-social-economical idea, according to which the biosphere multiplicity of elements that make up the system is necessary. Plus, all ecological and economical relations and connections between them have to correspond with the principals of balanced development and steady state, which form the process of dynamic balance inside the system.

At present day, there is a situation, where the great differentiations in territorial usage exist, especially from the point of view of environmental safety between Ukraine and European countries. Thus, for example, on the satellite images (photos), due to their visibility, the macro-scaling differentiations in territorial usage are clearly presented and it is well shown how the type of land usage transforms in the large natural and economic and administrative regions. As an example may be used the image of separate units of France territory (fig. 1) (region Poitou-Charentes) and Ukraine one (Novotroitsk rayon of Kherson oblast), which are located in similar geomorphologiacal conditions and Fig. 2, which shows the comparison of territorial "picture" of land use in near-border parts of neighboring countries, that allows to emphasize on the leading role of administrative factor in territorial formation and developing.

Social related borders of different land use types are of great interest from the geographical point of view. Such borders are used in different protected territories, for example reservations. In other cases borders, which characterize different changes in land use, are the same as the borders of administrative regions, states, oblasts.

The searching of the methodology and forming tools of ecological safety basses reflects in numerous projects in the spheres of geography, regional planning, town-building and land organization. In commercial geography the geoplanning paradigm is clearly defined by O. Topchiev (2008). It is emphasized that geoplanning will allow substantiating the rational territorial organization in context of proving the ecological territorial balance and making the productive functions of vital importance and, as a result, will support the growing of living quality in the region.

Realization of "eco-net" concept in regional aspect is directed on the solving of a number of important theoretical and practical tasks directing on the saving of biological multiplicity, keeping of a dynamic balance

between rational usage of natural resources potential and providing the approximation of interest in saving of environment and steady development while dominating of environmental criteria, demands and showings.

A)

B)

Fig. 1. Differentiations in land use of France and Ukraine* territories:
A) Novotroitsk rayon of Kherson oblast (Ukraine);**
B) Region Poitou-Charentes, France

* The images of one scale.
** The circles of the image show the zone of radial irrigation systems.

The potential spatial resources of eco-nets development are clearly noted in Ukraine legislation (table 1). It is important, that while including the territories to the eco-nets the form of owning and category of land do not change. Besides, owners and

users of these territories have an opportunity to take the public funding for wild life safety. The basis of eco-net – are the reservation units, but actually all units, with differently saved natural landscapes, may become the elements of eco-net.

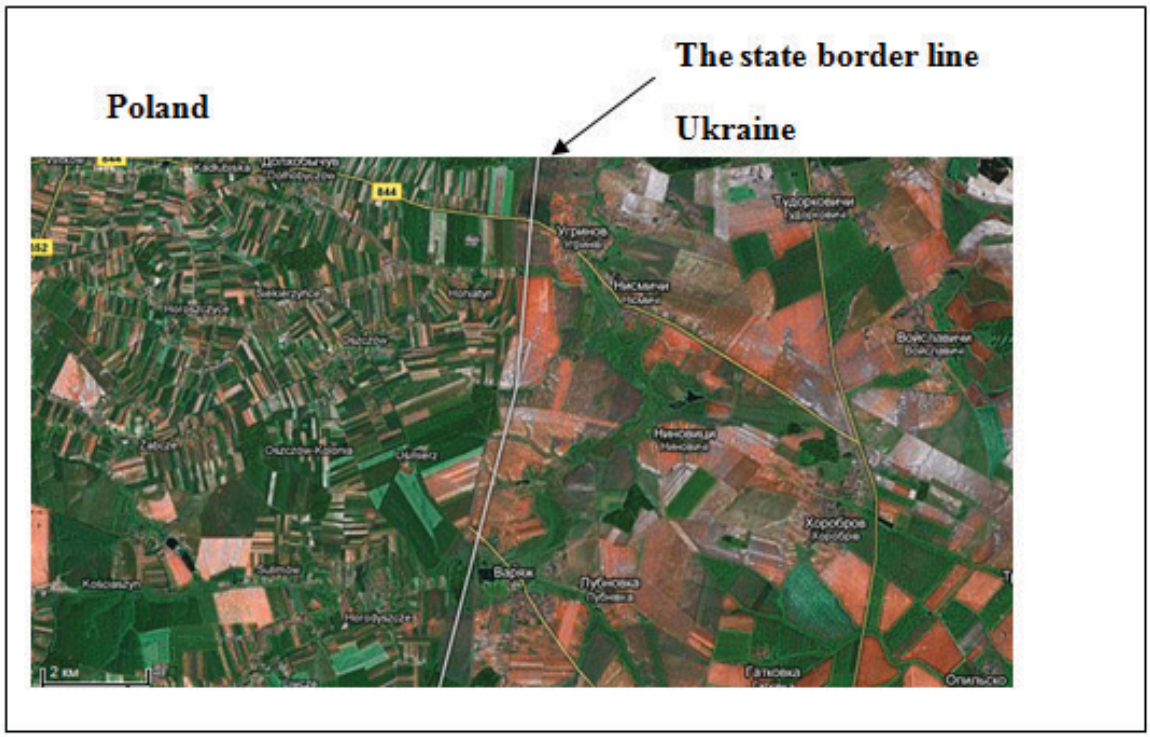

Fig. 2. Differences on land use in neighboring parts of Poland and kraine

It should be mentioned, that on the regional level there are reserves for creating the wildlife sanctuaries and developing of ecological net, especially in river valleys, in steppe hollows, on sand arenas, sea shores, in steppe podah, on outcrocks of rocks and other territories. A large reserve of regional ecological net formation may become the unproductive and degradated house holdings, which lost their agricultural potential in result of intense and irrational use.

The strategy of developing and planning of eco-net on the regional level will be defined according to the specific of land use and the level of anthropogenic transformations of regional geosystems. Here is shown the research on the example of Kherson oblast of Ukraine.

On the first step the main task becomes the defining of the level of anthropogenic nature systems transformations in Kherson oblast and showing the regional regularities in their transformation. Although even at this day there are different approaches to criteria and methods of anthropogenic load and transformation of natural territorial complexes valuation. In our opinion the most useful is usage of such an integral exponent as regional index of anthropogenic transformation of nature systems by K. Goffman (1977), specified in papers of P. Shishenko (1999):

$$Kan = \frac{\sum_{i=1}^{n}(r_i \times p_i \times a_i)}{100}, \text{ where}$$

Kat – coefficient of anthropogenic transformation; *r* – the rank of anthropogenic transformation by a certain type of land use; *p* – the area rank (in %); *a* – the index of

deepness of agro-landscapes transformation; *n* – the number of species inside the region.

Table 1

Structural elements of eco-net and their components, defined by the current legislation of Ukraine*

	Structural elements and their functions	List of territories and eco-net objects	Possible components of the structural elements of the eco-net
Structural elements of the econet	***The key ones (preservation of the most valuable and typical for the region component of landscape and biodiversity)***	Territories and objects of protected areas, wetlands of international importance, other territories within which preserved the most valuable natural complexes.	– areas and objects of nature reserve fund; – ground water resources; – (employed seas, rivers, lakes, reservoirs, other water bodies, swamps and islands, coastal protection strips along seas, rivers and around ponds, hydraulic, water facilities and other channels, as well as land allocated for the easement for them; coastal strips of waterways); – forest lands; – shelter belts and other protective plantings that are not classified as forest land; – land for health improvement on the basis of its natural resources; – recreational land used for the organization of mass recreation and tourism and sport events; – areas of steppe vegetation, pasture, hay, stone deposits, sand, salt marshes, land, within which are the natural objects of particular natural value; – land on which growth of natural plant communities listed in the Green Book of Ukraine and territories that are homebound or growth of species of flora and fauna listed in the Red Book of Ukraine; – part of extensive agricultural land use - pastures, meadows, grasslands, etc.; – contaminated lands that is not used and are subject to a separate protected as natural areas with separate status.
	The joining ones (combine together key areas, providing migration of animals and exchange of genetic material)	Areas that provide connections between key areas and eco-net integrity.	
	The buffer ones (providing protection and connecting key areas of external influences)	The area around the key areas of the eco-net that prevent the negative impact of economic activities in adjacent areas.	
	The renewable ones (ensuring the formation of spatial integrity of the eco-net, which should be implemented immediate measures to reproduce the initial state of nature)	Areas that are disturbed land, degraded and unproductive lands and lands affected by the negative processes and natural phenomena, other areas are important in terms of the formation of spatial integrity of the eco-net.	

* Compiled by the author according to the Law of Ukraine "On eco-nets of Ukraine", the Water Code of Ukraine, the Forest Code of Ukraine.

Division on 100 is used for comfortable using of coefficients that are changing in range $0 < Kat < 10$. Every type of land use has its own rank of anthropogenic transformation and index of transformation deepness (table 2). During the calculation of index of transformation landscapes deepness by expert way, the "weight" of every type of nature usage in their sum transformation is defined.

For defining the area of nature use ranks, the structural data of land resources of a particular part of land and the structure of land use is used.

A specific feature of land use in Kherson oblast is reclamation work of long-acting (irrigation) usage, which defines regional and local features of land use and, in addition to the nature characteristics, causes the high level of their degradation. It is mentioned that in the structure of Kherson land use about 15% of irrigated lands are observed – this is the largest figure in Ukraine. So, this category of land demands different valuation and approaches. The researching of irrigation influence on the territorial systems of the region (D. Malchykova (2005)) and expert valuation of specialists allow giving to the irrigated land the 7-th rank of anthropogenic transformation and 1.3 according to the index of transformation deepness. According to these data the final calculation was done.

Table 2

Ranks and indexes of transformation deepness of nature systems by different land use types (P. Shishenko (1999))

Rank of anthropogenic transformation	Index of transformation deepness
1) natural reservations;	1,0 – natural reservations;
2) forests;	1,05 – forests;
3) swamps and wetlands;	1,1 – swamps, marshes, wetlands;
4) meadows;	1,15 – meadows;
5) orchards and vineyards;	1.2 – orchards and vineyards;
6) arable land;	1,25 – arable land;
7) rural development;	1.3 – rural development;
8) urban development;	1,35 – urban development;
9) reservoirs, canals;	1.4 – reservoir;
10) industrial lands.	1, 5 – industrial lands.

The final results of anthropogenic transformation coefficients are given below (table 3).

Table 3

The structure of land use and the anthropogenic transformation coefficients in Kherson oblast*

Administrative units	Share of land use type, in %											Kat
	arable rainfed	Perennial plantation of rainfed	Measures and rainfed pastures	Irrigated - in summary	Forests	Rural development	Urban development	3Industrial lands	Reservoirs, canals	Болота, плавні, Wetlands	Nature reservations and nature lands	
Administrative regions												
Beryslavskiy	64,0	1,3	5,7	8,1	3,7	3,9	2,0	0,10	8,0	0,5	2,8	**7,59**
Bilozerskiy	48,5	0,9	4,0	17,4	2,8	2,2	2,7	0,20	0,7	3,5	17,1	**6,41**
Velykolepetykhskiy	74,6	0,5	2,8	6,6	2,7	2,0	1,7	0,05	8,3	0,0	0,7	**7,84**
Velykoalexandrivskiy	80,3	0,6	7,7	0,8	4,3	3,0	1,7	0,16	0,1	0,0	1,3	**7,08**
Verkhnerohachykskiy	68,2	0,5	5,7	3,0	3,0	1,7	0,9	0,20	16,4	0,0	0,5	**8,10**
Vysokopilskiy	80,6	0,6	8,4	0,2	3,8	2,2	1,9	0,34	0,2	0,0	1,8	**7,07**
Genicheskskiy	36,9	0,3	2,8	9,4	1,0	1,3	1,7	0,38	0,2	0,1	46,0	**4,64**
Holoprystanskiy	19,6	0,6	6,6	10,0	13,6	1,2	1,3	0,30	0,4	2,8	43,6	**3,88**
Hornostaivskiy	67,7	0,3	1,4	16,4	2,5	2,1	1,5	0,07	7,1	0,0	0,9	**7,97**
Ivanivskiy	67,2	0,3	8,9	17,6	1,2	2,3	1,4	0,05	0,4	0,1	0,6	**7,52**
Kalanchakskiy	58,3	0,5	10,2	18,9	1,5	3,2	2,7	0,32	4,7	0,6	10,3	**7,97**
Kakhovskiy	40,7	1,1	4,6	40,9	2,0	2,6	2,0	0,07	5,2	0,2	0,6	**8,22**
Nyzhnesirohozskiy	87,8	0,2	3,2	2,3	1,7	2,1	1,8	0,06	0,1	0,0	0,7	**7,40**
Novovorontsovskiy	67,5	0,6	3,6	5,8	5,0	2,0	1,5	0,16	12,6	0,0	1,3	**7,87**
Novotroitskiy	34,1	0,2	11,8	31,7	1,1	2,0	1,4	0,05	0,4	0,0	17,3	**6,58**
Skadovskiy	28,2	0,4	7,2	26,6	3,1	2,0	2,3	0,13	1,8	1,1	27,0	**5,94**
Tsiurupynskiy	28,5	2,0	5,7	10,2	26,2	2,7	5,5	0,21	0,4	3,3	15,3	**5,18**
Chaplynskiy	44,8	0,4	4,1	29,2	1,4	2,1	1,9	0,04	0,9	0,0	15,2	**6,93**
City regions												
Kakhovka	14,8	4,4	1,9	13,2	18,2	6,4	12,3	1,48	3,6	2,0	21,6	**5,91**
Nova Kakhovka	24,7	3,2	1,6	15,2	4,5	2,2	17,6	3,07	0,7	14,6	12,6	**6,85**
Kherson	**47,8**	**0,7**	**5,8**	**14,9**	**5,3**	**2,2**	**2,3**	**0,23**	**2,8**	**1,1**	**16,8**	**6,40**

* Calculated by the author according to the Department of Lands in Kherson region.

Calculated anthropogenic transformation coefficient ranges from 0 to 10 and characterizes the next regularity: the more is the area of land use type and the higher is the index of transformation deepness – the higher becomes the level of agricultural changes in the region.

Table 4

Grouping of Kherson oblast territories according to the level of anthropogenic transformation

Level of anthropogenic transformation of rayons territories	Transformed	Middle level of transformation	High level of transformation	Extremely transformed
Kat fluctuations	3,81 – 5,30	5,31 – 6,50	6,51 – 7,40	7,41 – 8,00
Share (in %) that occupies these territories from the total area	29,57	11,53	26,52	32,38

According to cluster results (fig. 3) was conducted classification of Kherson's administrative and territorial units in land usage structure (fig. 4).

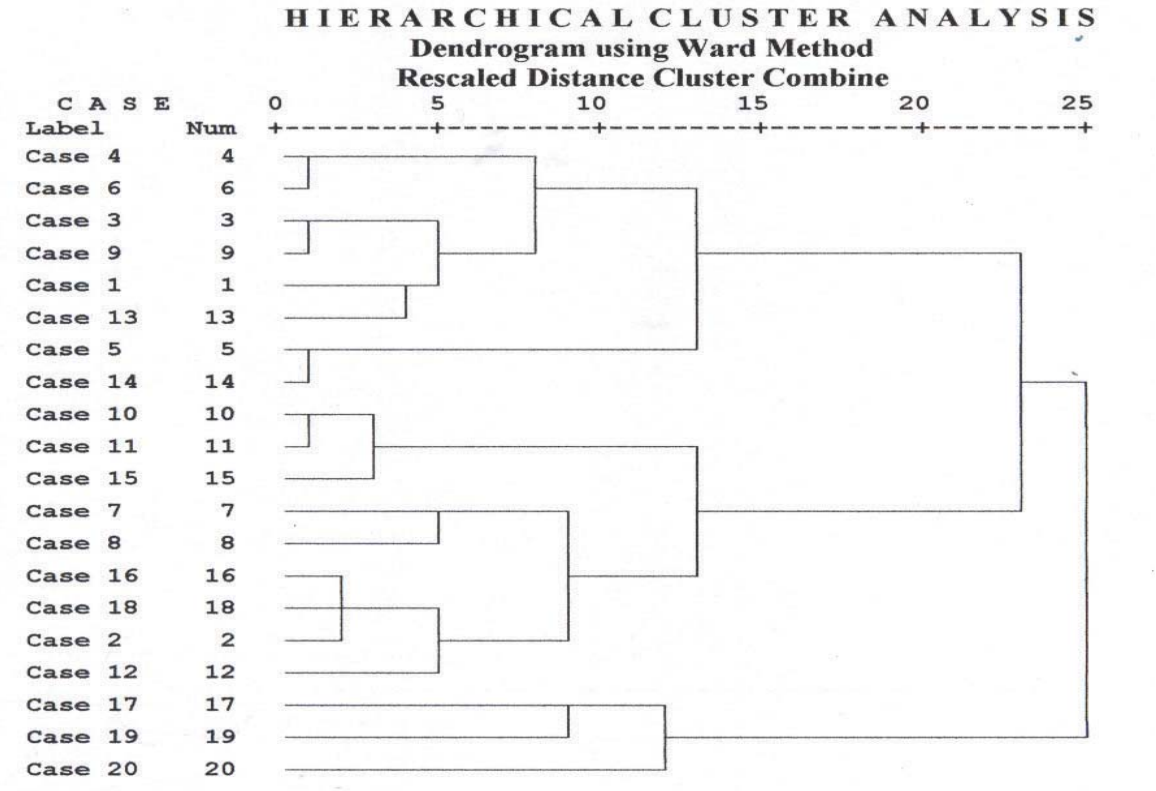

Fig. 3. Clusterization of Kherson's administrative districts by structural indices of land usage

Taking into account the large Kat range of fluctuations, the five-staged scale of its interpretation is used. It should be mentioned here that slightly transformed landscapes (Kat 2,00 – 3,80) in Kherson oblast are absent, and only Gola Pristan region with Kat = 3,88 approaches to this group. The calculation in terms of administrative units gave the opportunity to define certain groups of territories according to the level of anthropogenic transformation (table 4).

The analysis of results single out the following characteristics of the spatial distribution of natural areas that are anthropogenically transformed (Kherson Oblast):

1) lower from the expected territorial transformation within Kherson and Nova Kakhovka is due to the high percentage in structure land usage of natural areas, recreations and forests;

2) the majority of the administrative districts with high transformational indices are to the East and North of the area and are characterized by a high percentage of arable land in the structure of land usage;

3) high percentage of forests for the steppe zone (5,3%) obtained by the high localization of artificial forest plantation Oleshky Sands territory (Hola Pristan,Tsiurypinsk, Nova Kakhovka) Indices of forests for the majority territories is lower.

Types of districts by land usage structure 7,59 – coefficient of anthropogenic transformation.

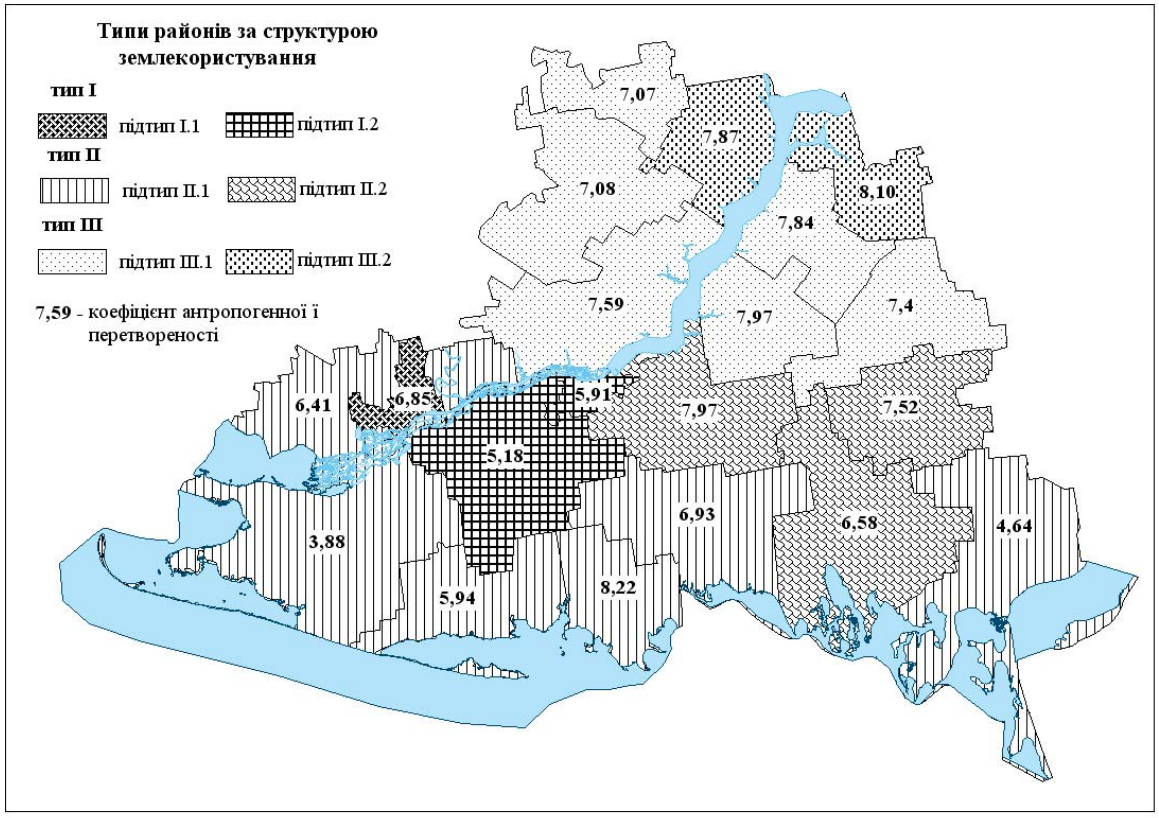

Fig. 4. Classification of Kherson's administrative-territorial units in land usage structure and the level of anthropogenic transformation of landscapes

To determine certain characteristics according to selected types of the land usage structure were defined indices of anthropogenic transformation on selected taxons (table 5) and coefficients of territorial localization of land usage of individual types (types and subtypes):

– Ctl=Lupts\Lupk;

– Ctl – coefficient of territorial localization in land usage aspects;

– Lupts – percentage of land usage by types or subtypes;

– Pulk – percentage of land usage in Kherson Oblast.

Table 5

The structure of land usage and the level of territorial anthropogenic transformation within the selected types

Administrative units	Percentage of type land usage											Kat
	Dryland farming	Long term plantationof dryland	Meadows,pasture of dryland	Irrigated–the whole	Forests	Rural development	Town development	Lands of industrial pur-pose	Storage reservoirs, ca-nals	Bogs, wetlands	Natural preserves and natural areas in the region	
Subtype I.1	24,7	3,2	1,6	15,2	4,5	2,2	17,6	3,07	0,7	14,6	12,6	**6,85**
Subtype I.2	27,0	2,3	5,3	10,5	25,3	3,1	6,2	0,4	0,8	3,1	16,0	**5,27**
The average by type I	**26,6**	**2,4**	**4,6**	**11,3**	**21,7**	**2,9**	**8,2**	**0,8**	**0,8**	**5,1**	**15,4**	**5,55**
Subtype II.1	34,1	0,6	4,9	18,9	5,0	1,7	1,8	0,2	1,2	1,4	30,2	**5,52**
Subtype II.2	45,4	0,3	10,7	25,3	1,2	2,3	1,7	0,1	1,3	0,2	11,5	**6,94**
The average by type II	**37,0**	**0,5**	**6,4**	**20,5**	**4,0**	**1,9**	**1,8**	**0,2**	**1,2**	**1,1**	**25,4**	**5,89**
Subtype III.1	75,1	0,6	5,0	5,8	3,2	2,7	1,8	0,1	4,1	0,1	1,5	**7,48**
Subtype III.2	67,8	0,5	4,6	4,5	4,1	1,9	1,2	0,2	14,4	0,0	0,9	**7,98**
The average by type III	**73,6**	**0,6**	**4,9**	**5,5**	**3,4**	**2,5**	**1,7**	**0,1**	**6,3**	**0,1**	**1,4**	**7,59**
In summary	**47,8**	**0,7**	**5,8**	**14,9**	**5,3**	**2,2**	**2,3**	**0,23**	**2,8**	**1,1**	**16,8**	**6,40**

Table 6

Coefficients of territorial localization of land usage types within selected types

Administrative units	Coefficients of territorial localization of land usage type										
	Drylnd farming	Long term plantationof dryland	Meadows,pasture of dryland	Irrigated–the whole	Forests	Rura development	Town development	Lands of industrial purpose	Storage reservoirs, canals	Bogs, wetlands	Natural preserves and natural areas in the region
Subtype I.1	0,52	4,57	0,28	1,02	0,85	1,00	7,65	13,35	0,25	13,27	0,75
Subtype I.2	0,56	3,29	0,91	0,70	4,77	1,41	2,70	1,74	0,29	2,82	0,95
The average by type I	**0,56**	**3,48**	**0,80**	**0,76**	**4,09**	**1,33**	**3,58**	**3,63**	**0,28**	**4,67**	**0,92**
Subtypell.1	0,71	0,86	0,84	1,27	0,94	0,77	0,78	0,87	0,43	1,27	1,80
Subtypell.2	0,95	0,43	1,84	1,70	0,23	1,05	0,74	0,43	0,46	0,18	0,68
The average by type II	**0,77**	**0,72**	**1,10**	**1,38**	**0,76**	**0,86**	**0,78**	**0,85**	**0,43**	**0,96**	**1,51**
Subtypelll.1	1,57	0,86	0,86	0,39	0,60	1,23	0,78	0,43	1,46	0,09	0,09
Subtypelll.2	1,42	0,71	0,79	0,30	0,77	0,86	0,52	0,87	5,14	0,00	0,05
The average by type III	**1,54**	**0,89**	**0,84**	**0,37**	**0,64**	**1,15**	**0,72**	**0,57**	**2,24**	**0,09**	**0,08**
In summary	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**

Table 7

Regional potential of the eco-nets creation in Kherson region*

Administrative units	The total area of land, ha	The area of land (NRF), ha	Regional potential of the econet: the area of land which can be used as elements of the econet, ha	Structure of regional potential of econet, percentage of the total area which are suitable for building of land econet										Percentage of territory which could be covered by econet	Percentage of territory(NRF)from the total area in region
				grassland	pastures	degraded and contaminated land for preserving	forests and forest covered areas	green covered lands for general usage	lands under camping, recreation's house and for vacations	Bogs, wetlands	dry open land with special plant covering	open lands without plant cover or with minor plant cover	Land of water fund		
Administrative regions															
Beryslavskiy	172059,4	0,0	39633,6	0,0	24,5	10,0	16,1	0,15	0,07	2,2	0,0	6,6	40,3	**23,0**	**0,00**
Bilozerskiy	153408,8	4124,5	43248,3	0,3	13,8	0,0	10,1	0,11	0,14	12,4	0,0	2,2	61,0	**28,2**	**2,69**
Velykolepetykhskiy	99990,6	0,0	18749,8	2,3	12,7	22,2	14,4	0,24	0,00	0,0	0,0	3,7	44,6	**18,8**	**0,00**
Velykoalexandriv skiy	154022,5	1286,0	26960,4	2,2	41,9	22,9	24,5	0,29	0,07	0,0	0,0	4,2	3,9	**17,5**	**0,83**
Verkhnerohachy kskiy	91537,0	0,0	28624,8	0,5	17,9	17,8	9,6	0,03	0,00	0,1	0,0	1,8	52,4	**31,3**	**0,00**
Vysokopilskiy	70123,8	30,0	14855,6	1,9	37,5	32,6	17,7	0,26	0,00	0,1	0,0	6,8	3,2	**21,2**	**0,04**
Genicheskskiy	300842,8	31969,0	161879,3	0,2	5,1	6,8	1,8	0,03	0,36	0,1	0,0	10,8	74,8	**53,8**	**10,63**
Holoprystanskiy	341130,1	109059,8	230617,0	1,5	8,9	0,0	20,1	0,03	0,16	4,2	2,0	15,4	47,8	**67,6**	**31,97**
Hornostaivskiy	101770,9	664,9	12139,7	0,0	12,1	0,0	20,7	0,31	0,00	0,0	0,0	7,2	59,7	**11,9**	**0,65**
Ivanivskiy	111998,7	25,0	12406,1	0,0	79,9	0,0	11,2	0,01	0,00	0,5	0,0	3,0	5,4	**11,1**	**0,02**
Kalanchakskiy	91580,1	1473,9	28213,6	2,3	32,0	14,0	4,8	0,00	0,20	2,0	0,0	23,6	21,2	**30,8**	**1,61**
Kakhovskiy	145084,5	177,0	19094,3	0,0	39,1	0,0	15,2	0,40	0,05	1,8	0,0	1,2	42,3	**13,2**	**0,12**
Nyzhnesirohozskiy	120866,9	636,0	7058,9	0,9	54,5	0,0	29,8	1,86	0,00	0,0	0,0	2,3	10,7	**5,8**	**0,53**
Novovorontsovskiy	100505,7	23,0	26025,1	0,0	13,8	12,9	19,4	0,21	0,01	0,1	0,0	4,6	48,9	**25,9**	**0,02**
Novotroitskiy	229777,0	20185,0	76340,9	2,2	33,4	7,6	3,2	0,09	0,00	0,1	0,0	9,9	43,6	**33,2**	**8,78**
Skadovskiy	145610,7	10012,0	59739,6	0,0	18,6	0,0	7,5	0,07	0,70	2,7	0,0	9,7	60,7	**41,0**	**6,88**
Tsiurupynskiy	175937,5	9198,6	89942,5	1,5	9,8	0,0	51,3	0,12	0,13	6,4	0,0	26,3	4,5	**51,1**	**5,23**
Chaplynskiy	172196,3	33307,6	41450,8	2,3	14,6	8,8	5,8	1,40	0,04	0,1	26,6	7,7	32,7	**24,1**	**19,34**
City regions															
Kakhovka	3130,7	15,0	1558,4	0,0	0,0	0,0	1,8	1,55	0,00	0,0	0,0	0,0	96,7	**49,8**	**0,48**
Nova Kakhovka	22274,5	1955,4	10665,5	1,7	2,3	0,0	38,1	0,95	0,15	4,1	0,0	24,1	28,6	**47,9**	**8,78**
Kherson	42286,5	28,3	14711,1	0,1	4,4	0,0	13,1	1,47	0,49	41,9	0,0	6,3	32,3	**34,8**	**0,07**
In summary	**2846134,9**	**224171,0**	**963915,0**	**1,1**	**16,2**	**5,4**	**15,7**	**0,19**	**0,18**	**3,2**	**1,6**	**11,7**	**44,6**	**33,9**	**7,88**

*Computed by author

Due to explored indices, a comparative analysis of selected types and subtypes permits to note specific features of the structure land usage and transformation of geosystem into its limits:

1) Type I is characterized by a high concentration in the structure of usage long term dryland's, an extremely high concentration of forests, rural and urban development, lands of industrial usage and owing to seaside location, the high percentage of wetlands, natural areas, unaltered by human activity;

2) Within II type features of type's differentiation in land usage permits to mark the following main features: regional highest con-

centration of natural preserves, irrigated lands, and dryland's meadows, pastures. It should be noted that the northern border of the type conducted by the boundaries of the administrative-territorial units, almost completely coincide with the medium-steppe's and south-steppe's bounds of steppe areas in the East European plain;

3) III type is characterized by the highest indices in the structure of farmland, rural development, water reservoirs and channels (only at the expense of subtype III.2 and its location and the banks of the Kakhovka reservoir). At the expense of land usage features, this type has the greatest indicators of anthropogenic transformation of natural geosystem.

The next research stage presupposes the identification of regional potential for forming an eco-net, its structure, regional peculiarities, problems and prospects of usage. Systematization of materials by the distribution of land fund (according to the conventional form 6-lem in Ukraine) gave the opportunity to identify possible reserves and regional potential of the eco-net's creation, to describe its structure (table 7).

Prepared computations show that land part of eco-net in Kherson oblast comprises almost 34% of the territory (from 5,8% to 67,6% in separate areas of the region).

Systematization of materials by the distribution of Land Fund (according to the conventional form 6-zem in Ukraine) gave the opportunity to identify possible reserves of the eco-nets creation and to characterize regional potential of eco-nets creation, possibilities of its realization:

1) firstly, these lands belong to natural-reserved Fund (NRF) which can become the nuclei of eco-net. In Ukraine established a norm of land areas NRF at the level of 5% of the territory. Within the arid, dry areas of Kherson, this standard should be increased to 7–10%. The current system of natural-reserved Fund is insufficient not only by the area, but also by the representativeness. It does not cover even all the typical zonal cenosis, types of plant, most of rare cenosis, most of old species diversity. Only 35% of rare plant kinds are located in preserved areas. Kherson oblast is one of the richest areas in Ukraine for its specific structure of living organisms. In the area are 40% of living organisms, which are known in Ukraine. Also noticeably that irregularity and ambiguity of objects location in natural-reserved fund on the territory: any preserved object in 2 regions, only about 1 in five areas;

2) to the part of eco-net should be included forest lands (forests of first group) and recreational areas;

3) the main problem is the legally uncertain in many cases, the status of recreational areas. For example, considerable area land of Black and Azov Seas, Kakhovka reservoir used for purposes of "unorganized" recreation on places not adapted for this type of activity. The main component of the eco-nets future should be lands of water fund, a special status which already defined on the usage of Land and Water codes of Ukraine. New categories of lands (water protective zones, coastal protective strips) which are statutory in the 1990s has not selected on districts and on land usage plan. Special land-designed work, appropriate organizational measures and significant resources are required;

4) the considerable reserve for forming eco-net is underproductive agricultural lands. Parts of truncated saline lands of Kherson oblast are unacceptably high. However, questions of its inventory and output from agricultural cultivation are problematic, "canning" and rotating to the condition of natural lands – pastures, bushes, forests, and wetlands.

It is impossible not to note that such simple and optimistic calculations in real life are complicated by a significant number of undefined and problematic issues, including:

1) according to the legislation, territories of NRF must become as regional key areas and

national eco-net. The high complexity and cost of works concerning the output of borders caused a situation, where in most cases there is no real border of territories NRF on a district (lands NRF "blurred" among the lands of the forest, water fund for agricultural purpose), a significant number of conflicts between land users is present here;

2) some of the objects and territories NRF of the local level are not marked on the map and it is difficult to define (for example, hydrological memorial of nature "Spring of Shilov Balka") on the district;

3) separated areas NRF due to the presence of errors and contradictions in the legal – normative base are actively been dividing. We cannot talk about the full implementation by such territories NRF, which stabilize the environmental functions;

4) within the Kherson, Mykolaiv oblasts and AR Crimea are located areas of wetlands, but its actual distribution by regions is absent and legislative status is uncertain.

This list can be continued, and in particular the uncertainty of such important environmental territorial elements as water protected zones and coastal protective strips, land areas, where natural plant grouping grows and which belong to the Green Book of Ukraine and the territory, which are places of stay or the growth of animal species and plant world listed in the Red Book of Ukraine, etc.

In this context it will be better to mention a comprehensive analysis of problems in eco-nets creation at national, regional and local levels, which conducted by the National Institute of strategic researches. Its analysts offer to generalize eco-nets problems:

1) Methodological. It is based on the amorphism and the absence of a consensus understanding of the purpose and structure of the eco-net. The incorrect understanding of the nature and objectives of the establishment and eco-nets development is negatively affects on an efficiency of management structures and agency that controls the process. Without a clear understanding and articulating of tasks an effective program of eco-nets creation on regional and local level cannot be designed;

2) Legislative. The disparity of Ukrainian law "about the nature reserved fund" to existing realities of the modern environment in part of the interpretation of "naturalness" of those or other territories. This and other laws are based on the principle of dividing territories and objects of natural and unnatural (modified) and conceptually aimed at preserving nature, and not at the optimization of nature management;

3) Management. It is consisted on the institutional weakness of regional structures, which have dealt with the issues of creation and eco-nets development. Considering the systemic nature of the formation's problem of the national eco-net, structural subdivision of oblast State administration should care for this problem, and not a structural unit of the regional public administration of environmental protection. Concerning the eco-nets creation one should accent on not only an environmental problems, but it affects a lot of socio-economic and internal relations. Managing problems also related to methodological principles of eco-nets building;

4) Mental:

– heads of governmental agencies and organizations in their activities are oriented to departmental interests, while eco-net's creation involves the need to care about national benefit;

– mentality of private commercial structures aimed at obtaining economic benefit, and not the environmental effect. Therefore, as a rule, there is strong opposition from the (visible or hidden) land users when it comes to granting permission to create an object NRF;

– mentality of the population in terms of land privatization and restoration of instinct landowner is not conducive to land set under

the elements of the eco-net. In addition, the mass of the population has a steady distrust to any government, including and to the environmental bodies; people have a fear of losing acquired property and means of existence.

5) Financial. Financing of new and existing protected areas is insufficient. It is not provided with proper financing of environmental activities, scientific research, environmental and educational, recreational and tourism activities of national natural parks and reserves. Practically no funds are allocated for capital expenditures;

6) Scientific research. The quantity and quality of scientific developments related to economic evaluation of biodiversity and social benefits from balanced usage of biodiversity, is insufficient. Missing mechanisms and methodologies for the calculation of the real monetary value of natural objects, which do not permit to count up damages for biodiversity harm, and to determine the degree of responsibility for violations of environmental legislation.

Conclusion. On the basis of the research there are highlighted basic features and approaches of developing the strategies of environment and spatial planning of eco-nets in regions with high levels of anthropogenic transformation in landscapes:

1. The practice of regional management and planning in Ukraine closely approached to the need assessment, analysis and planning of the regions as a whole "managerial" of natural-economic local systems. Geo-planning as an integrated territorial planning of regions on the basis of the ideas of ecological and socio-economic equilibrium that can solve most of the problems regarding the formation of a rational territorial organization of nature usage in the nature-society system.

2. The structure of land usage and the level of anthropogenic transformation can be differ on the regional level, which involves further identifying factors of this situation and development strategies of environmental protection with differentiation approaches of forming eco-nets. Under conditions of high anthropogenic transformation and specific nature usage by real possibilities of building eco-nets and expansion of protected areas NRF are:

– remove agricultural lands in case of economic loss and environmental hazards;

– remove from the industrial usage of the land, which lost the natural condition and constitute an increased danger for the preservation of the environment;

– providing the benefits of restoring natural landscapes as the most appropriate type of land usage that drop out from agricultural and industrial usage, a securing of the environmental status of the existing territories and objects NRF with the creation of its inventory;

– establishment of water protected zones and coastal protective lines around water objects, increasing of forest areas, forest belts around agricultural lands, industrial and residential zones.

3. By the criteria of selection of structural elements of the regional eco-nets within each of the regional eco-centre should be allocated the most important for the administration of eco-centers functions of natural nucleus-with high environmental status. In the structure of the regional eco-corridors, especially of archipelago form, to ensure the functional connectivity of this structural element of the eco-net it is to mark the key areas that will be environmental centers of the local level. For regional eco-centers it must be such territories NRF, nature protected and water protected areas, which has enough areas for the preservation of ecosystems, minimum viable population – 500 hectares in the steppe regions, 1000 hectares in the forest. For local eco-centers the area of natural zones should be more than 50 hectares.

4. Under the conditions of significant anthropogenic fragmentation of natural landscapes a role of pointed objects (for example, barrows, which are located in the middle of the field and not ploughed), which are able to fulfill the role of the local centers of biodiversity, is still growing. But the same eco-elements can fulfill the various functions, or become multifunctional: protecting forest belts in case of areas delimitation of intensive agriculture play a role of eco-corridors in the case of location around the nuclei of eco-net (preserves, sanctuaries) it is belong to the role of buffer zones.

In the conditions of significant anthropogenic load most of the econets elements must be integrated with the elements of the frame of technogenic load – in particular, protecting forest belts often forms a single structure of transport infrastructure, power lines without significant losses of its environmental functions.

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