opción

Revista de Antropología, Ciencias de la Comunicación y de la Información, Filosofía, Lingüística y Semiótica, Problemas del Desarrollo, la Ciencia y la Tecnología

o

Año 34, 2018, Especial N° 14

Revista de Ciencias Humanas y Sociales
ISSN 1012-1587/ ISSNe: 2477-9385
Depósito Legal pp 198402ZU45

Universidad del Zulia
Facultad Experimental de Ciencias
Departamento de Ciencias Humanas
Maracaibo - Venezuela

Opción, Año 34, Especial No.14 (2018):1398-1412
ISSN 1012-1587/ISSNe: 2477-9385

Diversity and spatial structure of the landscapes of the Khemchik river basin

Aldynay O. Khovalyg[1]
[1]Candidate of Geographical Sciences, Department of geography and tourism, Tuvan State University, Kyzyl, Russia
aldyn@mail.ru

Sergey N. Kirpotin[2]
[2]Doctor of Biological Sciences, Department of botany of Institute of biology, ecology, soil science, rural and forestry,National Research Tomsk State University, Tomsk, Russia
kirp@mail.tsu.ru

Sergey O. Ondar[3]
[3] Doctor of Biological Sciences, Department of biology and ecology, Tuvan State University, Kyzyl, Russia
ondar17@yandex.ru

Abstract

Now landscape researches and it results are used not only for the purpose of assessment of economic use of territories, but also at an interpretation of spatial regularities and dynamics of ecosystems.As a method, we adhere to the basic modeling approach, where the natural-territorial complexes are divided into a system of hierarchically interacting ecosystems. It can be concluded that the landscapes of the Khemchik river basin are characterized by a predominance of larch forests in the mid-mountain zone, which in turn marked as ecosystem with a high diversity and complexity of the spatial structure of the resulting terrain feature.

Keywords: landscape, diversity, spatial structure, Khemchik.

Recibido: 08-12-2017 •Aceptado: 24-04-2018

Diversidad y estructura espacial de los paisajes de la cuenca del río Khemchik

Resumen

Ahora las investigaciones de paisaje y sus resultados se utilizan no solo para evaluar el uso económico de los territorios, sino también para interpretar las regularidades espaciales y la dinámica de los ecosistemas. Como método, nos adherimos al enfoque de modelado básico, donde los complejos naturales-territoriales se dividen en un sistema de ecosistemas que interactúan jerárquicamente. Se puede concluir que los paisajes de la cuenca del río Khemchik se caracterizan por un predominio de bosques de alerces en la zona media de la montaña, que a su vez marcó como ecosistema con una gran diversidad y complejidad de la estructura espacial de la característica del terreno resultante.

Palabras clave: paisaje, diversidad, estructura espacial, Khemchik.

1. INTRODUCTION

Landscape diversity of the territory is a complex integral indicator, characterizing their systemic organization. Landscape structure reflects the patio-temporal organization of ecosystems, their mutual arrangement and connection methods (LyudkevychandKvasnikova, 2013). The relevance of studying the landscape diversity is determined by the increase in anthropogenic load, reduction of biological diversity of a number of plant and animal

species, in some cases, the disappearance of natural units, i.e. the reduction of biological and landscape diversity of a planetary scale. Since landscape diversity is the basis of biodiversity conservation and leads to sustainable development of the areas (Lauscha et al., 2015).Currently, landscape research and its results are used not only by representatives of the natural sciences to assess the economic use of territories, in interpreting the spatial regularities and dynamics of geo-systems, the identification of the consequences of environmental changes, but also by humanities - ethnographers, linguists, folklorists, philosophers and other specialists . Thus, the study of the landscape structure of the territory is an urgent task not only for geographic sciences and earth sciences, but also for sociocultural, ethanegenetic and other studies (Ochur-ool et al., 2016), that is, it has a fundamental general scientific value and can serve as a universal basis of any scientific interpretation, for example, as a methodological basis of studying the resettlement of ancient tribal groups of Tuvan ethane using GIS-technologies. So, the interdisciplinary approach in ethane-anthropological researches as a consequence of the integration of the sciences makes it possible to solve a number of problems and the problems of modern historical science. One of such interdisciplinary methods used in historical studies are landscape-geographical ones (Ochur-ool et al., 2017).

The diversity and spatial structure of the landscapes of the south of SiberiaLysanova et al.(2016) adjacent territories Chalovet al.(2004)Kosheleva et al. (2011) have been sufficiently studied in the

framework of not only landscape-geographical, but also similar studies, in particular, landscape-geochemical ones. Along with this, for the territory of Tuva, landscape diversity is shown more generally without taking into account local concretization. The analysis of the landscape base of the Khemchik depression was carried out from the point of view of landscape-geochemical studies (Ochur-ool, 2016; Ochur-ool et al., 2016;Ochur-ool et al., 2016).The purpose of work is studying of variety and spatial structure of landscapes of a river basin Hemchik.for further use as a methodological basis of a research of resettlement of ancient tribal groups of Tuvan ethanes using GIS-technologies.also for the analysis and assessment of dynamics of populations of economic and significant species of plants and animals of the Tuva mountain area.

River basins are convenient to use as the operating unit in the study of spatial structure and landscape diversity(Gaillardet et al., 2004; Gerasimova et al., 2014). Regionally, the Khemchik river basin covers the western part of the vast Central Tuvinian basin, the so-called Khemchikskaya, and is included in the basin of the upper Yenisei and occupies the southern part of Siberia.Thus, Siberia is one of the most interesting vast natural polygons for studying landscape diversity and climate-driven changes in the landscapes (Kirpotin, 2009; Kirpotin et al., 2011).Landscapes of the Khemchik river basin belong to themountainsand differentiated under the influence of contrasting natural conditions and bioclimatic factors determined by altitudinal zone, roughness and contrast of the relief, the most complex territorial

geology that have stipulated a variety of soils and diversity of vegetation (Ochur-ool et al., 2015).It is known that the landscape structure of the mountain areas is characterized by much contrast and complexity (Lysanova et al. (2011) and the map is like a mosaic varying in size, shape, origin, number, mutual arrangement, and configuration (BryksinaandKirpotin, 2012). Analysis of the morphological structure of landscapes of the Khemchik river basin revealed a large variety of spatially interrelated and interacting natural-territorial complexes.

2. METHODOLOGY

In our work, we adhere to the basic modeling approach, where the natural-territorialcomplexes are divided into a system of hierarchically interactingecosystems. The hierarchical system approach allows identifying the interdependence of landscape taxa to conduct their evolutionary dynamic interpretation. Diverse features of the landscapes structure, assessment of measures of internal differentiation and connectedness was carried out by using ArcGIS software. The assessment was not taken into account existing anthropogenic landscapes. As the lower map units were selected group of faces, the most important feature of which is the similarity of the dynamic tendencies of its constituent units (Lysanova et al., 2011).

3. RESULTS

According to a hierarchical classification systemin the study area provided 20 groups of faces (Fig. 1) on the square equal to 69882 sq. km, grouped into three categories of landscapes as per. He singled out three contrast differentiated biogeochemical zones on the territory of Tuva: Alpine tundra and Alpine Meadows(we have high mountain); mountain forest (middle-mountain); steppe and dry steppe depressions (intermountainhollow steppes). The percentage areas of natural-territorial complexes in the morphological structure of landscapes in the study area are shown in table 1.

Table 1. The ratio of the areas occupied by landscape complexesof the Khemchik river basin

№	Landscape complexes	Area (in %)
1	High-mountain landscapes	32,11
2	Middle-mountain landscapes	45,41
3	Steppe (intermountain hollow) landscapes	22,48

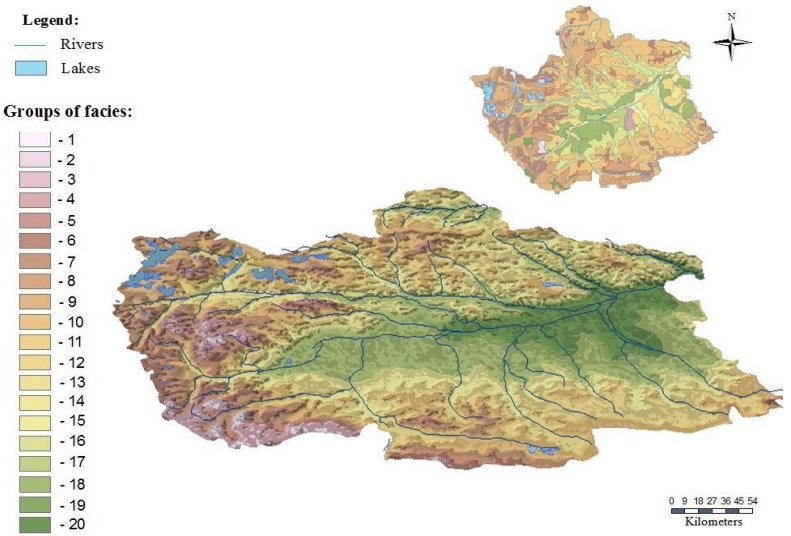

Figure 1. Morphological structure of landscapes of the Khemchik river basin

Table 2.An explication legend to the landscape map of the Khemchik river basin

The number of facies	Landscapes	Area sq.km	Area, %	Features
High mountain				
1	Tundra hilly-ridge ofthe basin bottomwith cryogenic meso-and microforms of relief	1083	1,55	with loamyboulder moraine, locally sandy-pebble-loam deposits withlichen, shrub, meadow tundra soils, associated with the marshes on peat-humus-gley permafrost soils
2	Deeply-dissected, tundra planated	1170	1,67	with a thin loamy-gravelly cover, Nival-frozen with moss-lichen treatment, shrub and other sometimes associated with cryophyte forb-grass sedge-cobresia communities on mountain-tundra peat-humus soils

3	Alpine type slope and intermountain depressions	3203	4,58	with a thin loamy-gravelly cover, Nival-frozen-treatment with Alpine and subalpine meadows and shrubs, tundra-forests area on mountain-meadow soils
4	Planated, with rounded summitsdeeply-dissected	4526	6,48	with soft, loamy-gravelly areas, Alpine and subalpine meadows and shrubs, tundra-forests area on mountain-meadow soils
5	Planated deeply-dissected	4011	5,74	with soft, loamy-gravelly cover tundra (lichen-moss, shrub and other sometimes association with cryophyte forb-grass sedge-cobresiacommunities on mountain-tundra peat-humus soils
6	Alpine type sharply dissected (sometimes fragmented)	3702	5,30	with glaciers, with stony placers, with snowfields cryopetrophyticcommunities, fragments of tundra vegetation on primitive mountain-tundra soils
7	Slope, intermountain depressions and stony-screes	4004	5,73	with a thin loamy-gravelly cover, moraine fragments deposited in the valleys with cryopetrophyticcommunities, moss-lichen, shrub tundra on mountain-tundra soils underdeveloped associated with the Nival-glacial complexes
Medium mountain				
8	Steep slopes, sharp-dissected goltsysubalpinewoodland	2072	2,96	with a shallow mantle of deflection-solifluction loams, light and sparse forests (larch, cedar-larch, pine) and subalpine meadows, and shrubs on mountain-meadow, mountain peat-humus cryogenic soils
9	Planated, deeply-dissected forest	3526	5,05	with a shallow mantle of deflectiondeposits, locally with rock outcrops with pine, larch forests, with admixture of spruce, small-leaved species on mountain humus podzolized soils
10	Steep slopes, deeply dissected forest	5121	7,33	with shallow mantle of deflection deposits, locally with rock outcrops with larch, spruce and larch, sometimes mixed with cedar forests on mountain podburs and humus-peaty long-seasonally-frozen soils

11	Deeply dissected with steep slopes forest-steppe	5876	8,41	with a thin loamy-gravelly cover, locally with rock outcrops and stony talus, with larch, birch-larch forests on slopes of northern aspectsonmountain soddy long-seasonally-frozen and mountain-forest chernozem soils, associated with dry (bunch-grass on mountain-steppe chernozem soils on slopes of southern aspects ("peristeppes" or slope-differentiated forest-steppe)
12	Low and medium dissected, sometimes planated forest	6017	8,61	with a cover deflection loams with larch, larch and spruce forests, marshy mountain, humus-peaty long-seasonally-frozen soils
13	Deeply dissected forest with steep slopes	2499	3,58	with thin mantle ofdefluctiondeposits, locally with rock outcropsand talus with larch (sometimes garden-like), birch-larch forests on mountain-forest chernozemic and mountain-forest soddy soils alternating with forest meadows (“yelan”) on mountain humus-accumulative soils
14	Steep slopes, deeply dissected steppe	2099	3,00	with a shallow mantle of loose deposits, locally with rock outcrops and stony talus with a moderately moist, rich-forb-grass and moderately dry forb-feather grass steppes on leached,podzolized and typical mountain chernozems and mountain-steppe chernozemic soils
15	Steep slopes, deeply dissected steppe	2495	3,57	with a shallow mantle of loose deposits, sometimes stony-scree dry low-bunchgrass steppes on mountain chestnut soils, locally with petrophytic variants of moderately dry steppes on mountain-steppe soils and chernozemsoils
16	Slope and intermountain depressions of the steppe	2031	2,91	with a shallow mantle of loose deposits, in places rocky and stony-scree moderately wet and moderately dry forb-feather grass steppes on mountain-steppe chernozems and mountain chestnut soils

Steppe (Intermountain hollow)				
17	Lowland forest-steppe	4432	6,34	with forb-grass meadow steppe, forb-grass meadow steppe, sometimes with shrubs, locally rocky with a mix of small-leaved birch- willow-shrub - poplar, poplar-birch forests on gray forest, chestnut, dark chestnut soil, grasslands, moderately dry and dry steppe chestnut soils
18	gently sloping steppe	4007	5,73	with the accumulative deposits, dry low-bushgrass steppes, sometimes with Caragana on chestnut soils-psammophyte options to underdeveloped chestnut soils
19	Steppe elevated, sloping, flat, sometimes with hummocks, fractional, fan-shaped divided	3889	5,56	with the accumulative deposits with hummocks dry-grassland communities, or desert grasslands, sometimes with Caragana on chestnut, solonetzic chestnut, light chestnut soils, and their petrophytic variants-psammophyte and halophytic plant communities
20	Gently rolling steppe bottoms of the depressions	3379	4,84	with the areas of hummocks, small depressions with saline gravelly-loamy, pebbly-boulder-gravelly-loamy deposits of different genesis with a dry sagebrush-grass, often with Caragana steppes on dark-chestnut and chestnut, locally withsolonetzic soils

4. DISCUSSION

The map of the morphological structure of landscapes of the Khemchik river basin (Fig. 1) clearly revealed differences in the complexity of their landscape drawings, specific hydroclimaticconditions, and altitude zonation, and have the following features.The largest proportion of the landscape structure of the

territory belongs to the mountain geosystems (of 45.41 %) and represent erosion and denudation of natural-territorial complexes. An order-of-magnitude smaller share is assertional and erosion-denudation Alpine (32.11 %), and least represented intermountain hollow steppe-basin (of 22.48 %). The greatest number of the landscape units observed in the group of medium - 9 groups of 20 faces (tab. 2), while the dominant role among them belongs to the woody vegetation, i.e., it can be noted that the forest area is more diverse compared to other types due to spatial heterogeneity of the environment. In General, we observed that goltsy and sub-goltsyecosystems distributed mostly on the tops of ridges of the Western Sayan, Shapshalskii, andWestern Tannu-Ola. High mountain Alpine-type landscape presented with screen and snowfields with cryopetrophytic groups in the lower parts of the tundra, interspersed with Alpine Meadows. Depending on the number of active temperatures and soil temperature, at different exposures at the same elevation boundaries of forests and mountain steppes varies. Thus, in drier conditions, where more insolation, mountain steppes directly passinginto Alpine meadows and tundra (Lysanova et al., 2013).In the mountain zone among the forest ecosystems edificatory role belongs to the optimal development of larch and dark coniferous limited development. At the same time, forests are confined mainly to the Northern slopes, and on the South, depending on macro exposure,dry grassland steppe are widely distributed.

Steppe landscapes represented by these steppes with the domination of xerophytes grasses on low-humus brown soils.Along with them are widely distribute dry Central Asian steppe with thickets of xerophytes shrubs with Nan fine-feather grass associations on light chestnut soils. Meadow steppes occupy the smallest area and are confined to depressions and river valleys. In General, for landscapes of the Khemchik river basin is characterized by the sharp boundary of the steppes and forests stable over time (Lysanova et al., 2013).

5. CONCLUSION

From the above analysis it can be concluded that the landscapes of the Khemchik river basin are characterized by a predominance of larch forests in the mountain zone, which in turn are marked as a landscape with high diversity and complexity of spatial structure, mainly due to the relief and associated exposure differences that determine the mosaic landscape structure of the study area. In general, the diversity of landscapes in the river basin areinvolved inSouth Siberian (taiga, forest-steppe, and steppe) and Central Asian groups ofgems.Based on the analysis of the landscape basis of the local site on the example of the Khemchik river basin, we found that a common "mosaic" of landscape distribution is also characteristic for the whole territory of Tuva. At the same time, the study of the evolution of the system of settlement of tribal groups of peoples of Central Asia shows that this process was under the influence of natural, geographical,

economic and social factors. Thus, the analysis of the settlement system of the tribal groups of the peoples of Central Asia, which was established many centuries ago, showed that the areas of ethane depended to a large extent on the landscape and geographical features of the development area, primarily within the river valleys. That is, the formation of the range of genus was mainly based on the landscape principle of territorial differentiation, and the landscape structure of the territory determined not only the areas of residence of tribal groups, but also their way of life, differentiating them into hunters and anglers.

6. ACKNOWLEDGES

The work is written with the financial support of RFBR 16-21-03002 and 17-44-170696.

7. DISCLOSURE STATEMENT

The author reported no potential conflict of interest

REFERENCES

BRYKSINA, N., and KIRPOTIN, S.N. 2012. **Landscape-space analysis of change of themokarst lakes areas and numbers in the permafrost zone of Western Siberia**.Tomsk State University Journal of Biology.Vol. 4. N°20: 185-194. Russian.

CHALOV, S., JARSJÖ, J., KASIMOV, N., ROMANCHENKO, A., PIETRON, J., THORSLUND, J., and BELOZEROVA, E. 2004.

Spatio-temporal variation of sediment transport in the Selenga river basin.Mongolia and Russia. Environ Earth Sci. Vol. 73. N°2: 663-680. Russia.

GAILLARDET, J., VIERS, J., and DUPRE, B. 2004.**Trace Elements in River Waters**.Treatise on Geochemistry.Vol. 5. Pp. 225-272. Russia.

GERASIMOVA, M., KASIMOV, N., GORBUNOVA, I., BOGDANOVA, M., RYABOVA, N., and LYCHAGIN M, Y. 2014. **Landscape-geochemical regionalization of the Selenga River basin**. Bulletin of the Moscow university..Vol. 6. Pp. 66-72.Russian.

KIRPOTIN, S. 2009. **Western Siberia special issue**.International Journal of Environmental Studies.Vol. 66. N°4: 403-404. Russia.

KIRPOTIN, S., POLISHCUK, Y., BRYKSINA, N., SUGAIPOVA, A., KOURAEV, A., ZAKHAROVA, E., POKROVSKY, O., SHIROKOVA, L., KOLMAKOVA, M., MANASSYPOV, R., and BERNARD, D. 2011.**West Siberian palsa peatlands: distribution, typology, cyclic development, present-day climate-driven changes, seasonal hydrology and impact on CO2 cycle**.International Journal of Environmental Studies**.**Vol. 68. N°5: 603-623. Russia.

KOSHELEVA, N., KASIMOV, N., DORJGOTOV, D., BAZHA, S., GUNIN, P., GOLOVANOV, D., ENKH-AMGLANAN, S., and BATKHISHIG, O. 2011. **Soil Pollution with heavy Metals in the Industrial Cities of Mongolia**.Mongolian Journal of Biological Sciences.Vol. 9.N°1-2.Russia.

LAUSCHA, A., BLASCHKEB, T., HAASEC, D., HERZOGD, F., SYRBEE, R., TISCHENDORFF, L., and WALZG, U. 2015. **Understanding and quantifying landscape structure – A review on relevant process characteristics, data models and landscape metrics**. Ecological Modelling.Vol. 295.pp.31-41. Russia.

LYSANOVA, G., SEMENOV, Y., and SOROKOVA, A. 2011.**Geosystems of the Upper Yenisei basin.Geography and Natural Resources**.Vol. 4. Pp. 92-99. Russia.

LYSANOVA, G., SEMENOV, Y., and SOROKOVOY, A. 2016.**Landscape mapping of the Republic of Khakassia**.Geodesy and cartography.Vol. 12. Pp. 16-23. Russia.

LYSANOVA, G., SEMENOV, Y., SHEKHOVTSOV, A., andSOROKOVA,A. 2013. **Geosystems of the Republic of Tyva.**Geography and Natural Resources.Vol. 3.Pp.181-184. Russia.

LYUDKEVYCH, E., and KVASNIKOVA, Z.N. 2013.**Landscapes of the Basandayka river basin (South-East of Tomsk region). Basin territories: problems and ways of their decision, a collection of works of conference**. Ishim: the branch of FGBOU VPO Tyumen State University. pp. 52-55. Russia.

OCHUR-OOL, A. 2016.**Geochemical specialization of landscapes of the Hemchiksky hollow.Current problems of the research of ethaneecological and ethanecultural traditions of the people of Sayan-Altay region, a collection of works of conference**.Kyzyl.the branch of FGBOU VO Tuvan State University.pp. 188-189. Russia.

OCHUR-OOL, A., AIYZHY, E. and ONDAR, S. 2017. **Landscape and geographical regularities of resettlement of patrimonial groups of the people of Central Asia (on the example of the Tuva ethanes).**Natural and technical science.Vol. 10. N^{o}112: 52-54. Russia.

OCHUR-OOL, A., KIRPOTIN, S., and ONDAR, S. 2016.**Landscape structure Khemchiksky basin (western Tyva).**Achievements of modern natural sciences.Vol. 11. Pp. 171-175. Russia.

OCHUR-OOL, A., ONDAR, S., and ONDAR, U. 2015.**Ecological and Geochemical Characteristics of the Landscapes of Western Tuva**. Research Journal of Pharmaceutical, Biological and Chemical Sciences. Vol. 6. N^{o}5: 1670-1677.Russia.

UNIVERSIDAD DEL ZULIA

opción
Revista de Ciencias Humanas y Sociales

Año 34, Especial N° 14, 2018

Esta revista fue editada en formato digital por el personal de la Oficina de Publicaciones Científicas de la Facultad Experimental de Ciencias, Universidad del Zulia.
Maracaibo - Venezuela

www.luz.edu.ve

www.serbi.luz.edu.ve

produccioncientifica.luz.edu.ve