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## Selected results of landscape planning in Ust'-Koksinskii District of the Altai Republic

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## Selected results of landscape planning in Ust'-Koksinskii District of the Altai Republic

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**Abstract.** Landscape planning for the territory of the Ust'-Koksinskii district of the Altai Republic is carried out. Rather severe environment prevents formation of normal intercommunications in the area. The agro-industrial complex is one of priority and socially important sectors of economy. The livestock production was and remains traditionally prevailing industry of agricultural production. The largest spaces in the district are occupied by the agricultural land. Large number of natural sights and nature sanctuaries form a basis for tourism development. The concepts of target development for concrete territories in the district are defined on the basis of integration of maps of the development purposes for separate natural components. Mountain glacial-nival and mountain-tundra landscapes are recommended for withdrawal from current use. Mountain-tundra landscapes with larch-cedar forests are attributed to the preservation of the existing extensive use with the abandonment of certain uses. For mountain taiga landscapes, it is recommended that existing widespread use should be observed in compliance with environmental measures. Adjustable widespread use is recommended for mountain-valley landscapes. Territories with steppe landscapes in the intermontane basins belong to the category of regulated development of agriculture and tourism with a possible increase in activity and local improvement of disturbed areas.

### 1. Introduction

The relevance of identifying priority areas for the development of the mountain regions of the Russian Federation is caused by the need to solve social and economic problems, especially raising the living standards of the population of these territories, preserving the culture and traditions of local people [1]. An analysis of natural conditions and socio-economic status of the Ust'-Koksinskii district, and identification of development trends can provide examples for similar territories.

The features of settlement and lifestyle of the local population, the prevailing nature management and culture of the inhabitants need to be taken into account to determine the prospects for the development of the region. The relative isolation of the region greatly contributed to the mutual influence and interpenetration of Altai and Russian cultures. Long-term residence of the Russian and Altai peoples led to the formation of nationally mixed marriages, single type of management, focused on cattle breeding, agriculture and hunting. The agricultural orientation of the region is obvious at the present time [2]. Almost all of the region's exports are raw materials that require transportation. Relatively harsh environmental conditions, especially in its individual parts, reduced the formation of normal relations in the area. Construction costs are more expensive in mountain conditions, as well as economic development. The lack of stable and high-quality channels for the transportation of



goods and the population, their high cost especially increases the remoteness of the region. Orientation to agriculture narrows the profession choice for young people and contributes to the labor outflow to the city.

## **2. Natural features of the region**

Ust'-Koksinskii district belongs to the Central Altai landscape province of Gornyi Altai. 20% of the areas have the altitude of 2,500 m, 57% of the area occupied by the slopes with a slope of more than 20 degrees. The relief-forming processes of the territory are frosty weathering, glacial and water erosion. The region is original in its large landscape diversity, dense forest cover with a predominance of fir and pine woods, which, in turn, have a high healing and aesthetic value.

The district is located within a cold climatic zone and is characterized by continental climate. Winters are long and severe, with low temperatures and relatively thin snow cover. The snow cover depends on the relief and altitudes. In open areas, the height of the snow cover is 20-25 cm, the highest snow cover is in the intermountain depressions (1.5 m). With increasing absolute altitude above sea level, local climatic conditions become milder, more rain falls, and natural vegetation is well developed. In the highlands the climate level is increasing. Winds here are much colder and stronger than in the valleys. Decrease in summer temperatures to 0°C and lower at night is common [3]. The area is located within an unstable and inadequate humidification zone. Maximum rainfall occurs in the summer months. Main climate features of the Ust'-Koksinskii district can be defined as follows: long, harsh winters, short, moderately hot summers, late spring and early frosts, sharp temperature fluctuations throughout the year and day, pronounced temperature inversion in winter and clear summer nights, and sharp swings from winter to summer.

The main waterway of the Ust'-Koksinskii district is the Katun River with high water content and strong currents (the average speed in flood up to 5 m/s) [4]. Snow drifts in the Belukha Mountain area remain throughout the summer and, along with glaciers, are a good regulator of runoff, regardless of summer precipitation; they provide significant water availability to Katun in the summer. The rivers of the region are typical mountain character. They have particularly turbulent and rapid current in the mountains. All this contributes to the development of water tourism with interesting trips of any category of complexity.

In the bottoms of the intermontane depressions, thin chernozems and chestnut soils are developed. The southern slopes are completed by dry steppe chestnut and chernozem-like soils. Mountain-forest chernozem-like soils occur on the shaded northern slopes. Under sparse Siberian stone pine-larch forests near the upper border of the forest, brown forest coarse humus soils are widespread in a narrow strip. In the highlands, the belt of mountain forest soils is replaced by mountain meadow and mountain tundra.

The alpine zone is characterized by the complete absence of forest, development of mountain meadows, thickets of the polar birch, moss and lichen cover. It is divided into two bands - mountain meadow and mountain tundra. In general, mountain-tundra landscapes prevail over mountain-meadow, which is a characteristic feature of the Altai highland belt. In mountain taiga landscapes, the main forest-forming species are Siberian larch, Siberian fir and Siberian stone pine. Extensive swamps are not common within the forest belt, and forest grassy vegetation reaches a more powerful development. Forest-steppe, steppe and grass-bog landscapes of intermontane depressions are distributed by discontinuous islands and individual spots. In the composition of vegetation, feather grasses, fescue, and a lot of steppe alfalfa prevail here. Mountain steppes are the main pasture, therefore plowed. The bottoms of the depressions previously had a forest-steppe character, were occupied by herb-stipa and meadow steppes on chernozem soils. Separate groups of birches and larches scattered among the plowed territories give the basins, as before, a forest-steppe appearance.

## **3. Inventory taking, assessing and defining purposes of the development of natural components**

The territory of the municipality "Ust'-Koksinskii district" includes 9 rural settlements (administrations) and 42 settlements [5]. The population of the Ust'-Koksinskii district municipal

community at the beginning of 2018 amounted to 16,317 people. The area of Ust'-Koksinskii district is 12951 km<sup>2</sup>.

The agro-industrial complex is one of the priority and socially significant sectors of the economy, both of the municipality and the Altai Republic. Livestock breeding has been and remains the traditionally predominant branch of agricultural production on the territory of the region due to climatic conditions. The main specialization of the region's farms is the breeding of Siberian red deer, meat and dairy cattle breeding, sheep breeding and horse breeding.

At the inventory stage, published materials, including the map "Landscapes of Altai (Altai Republic and Altai Territory)", scale 1: 500 000, were used to assess and determine the development goals of the natural components of the territory of the Ust'-Koksinskii district [6].

We used materials from forestry and land management in constructing a map of modern land use. In addition, it shows the territories of protected areas (Katunskii Nature Reserve and Belukha Natural Park) and areas of location of nature monuments of republican significance. The largest areas in the region are agricultural land. Forest land, specially protected areas and reserve land dominate among other categories of land. The composition of agricultural land indicates the predominance of remote pasture livestock farming at a relatively high level of crop development compared to other regions of the republic [7].

A significant part of the region is forested: larch, Siberian stone pine, fir, spruce are common here. The local population uses wood for construction and for firewood, pine nut collection and hunting are widely developed. Steppe landscapes of the Uimon, Abai, Katanda intermontane depressions are used for crop production. Due to the fact that the territory of the region is favorable for growing Siberian red deer (for the supply of deer antlers to the world market), a large number of deer farms are located here. The intensity of agricultural production in the region is relatively low, but due to irrational farming, there is a constant increase in anthropogenic pressures on the environment, leading to degradation of fodder land and soil erosion. The use of recreational, forest, medicinal and other resources in the area is quite uncontrolled, irrational and leads to an anthropogenic load on natural complexes.

A large number of natural attractions (Lakes Multinskoe, Taimenye, Akkemscoe, Rossypnoi Falls, etc.), natural monuments serves as the basis for visiting tourists from the Russian Federation and other countries of the world and determines the widespread development of tourist infrastructure in the region.

When assessing natural components in the categories of value and sensitivity, we used data on biotopes, soils, climate, hydrology, and landscapes. The assessment was made according to the contours of the landscape map [6]. Particular attention at this stage was given to the landscapes and the recreational potential of the territory. The recreational value of the territory largely depends on the landscape [8], therefore, when assessing, the saturation of landscape views and the range of visibility were taken into account. Glacial-nival, mountain-tundra landscapes of the highest parts of the mountains are classified as highly and medium-significant highly sensitive. Especially high qualities of landscape and recreation have sections of glaciers, mountain lakes and mountain-valley landscapes.

#### **4. The conception of purposes of territorial development**

On the territory of the Ust'-Koksinskii district, the upper reaches of the Katun River and the lower reaches of the Koksa River are located. The area has a high degree of water availability in the Altai Mountains [9-11]. Water slalom routes of the fifth category of complexity pass along the Katun River, and the upper course of the river, within the Uimon and Katanda basins, is inhabited by taimen, grayling, and lenok. This makes it possible to organize not only sports events, but also fishing and hunting territorial and recreational systems. There are the most beautiful mountain lakes here: Multinskoe, Kucherlinskoe and Akkemscoe, which spark great interest among tourists living not only in the Altai Republic, but also abroad. The roads to the lakes do not require great physical exertion, so they can be recommended for groups with different levels of physical fitness.

According to the variety of landscapes, the Ust'-Koksinskii district is only slightly inferior to Kosh-Agachskii, but the forest-covered mountains, steeply descending to the valleys, combined with the clear water of mountain rivers leave an indelible impression on vacationers, and therefore have a high psychological impact. On the territory of the district there is a high-mountain Katunskii Range with the highest elevation of Siberia - Mount Belukha, with a network of tourist and climbing routes. Here there is a large number of archaeological, natural (waterfalls Rossypnaya, Tegeek, Multinskii, Khosenikhenskii, Iolgo, Airy, etc.) and historical and cultural monuments, including the famous Roerich house-museum. The attitude of the indigenous population towards the development of the Altai Republic as a tourist region is twofold. On the one hand, everyone understands that this is an inevitable process, which at the same time will bring income to the population, and on the other hand, modern management must undergo some changes. Therefore, the Ust'-Koksinskii district, like many similar territories, faces a choice of development paths.

Most of the land of the district is privately owned by local people and investors, with developing tourism infrastructure and traditional nature management, high occurrence of nature management conflicts, primarily between tourism development and nature conservation. A large number of natural attractions (Lakes Multinskii, Taimen, Akkemskeye, Rossypnoi Falls, etc.), natural monuments serves as the basis for visiting tourists from the Russian Federation and other countries of the world. At the same time, in connection with intensive tourism, the paths are subjected to intense anthropogenic impact, which offers a conflict between the conservation of biotopes and the development of tourism. The level of agricultural production in the region is relatively low, but due to irrational farming, there is a constant increase in anthropogenic pressures on the environment, leading to degradation of fodder land and soil erosion. The use of recreational, forest, medicinal and other resources in the area is quite uncontrolled, irrational and leads to an anthropogenic load on natural complexes.

Based on the integration of development goals maps for individual natural components we determined the concepts of target development of specific areas of the region. High-mountain glacial-nival landscapes, mountain-tundra landscapes of the Listvyag, Katunskii, Kholzunskii, Terektinskii Ranges, where it is necessary to preserve the existing structure of geosystems, are recommended for abandonment. The preservation of the existing extensive use with the abandonment of certain types of use includes high mountain tundra landscapes with larch-Siberian stone pine woodlands. For mountain taiga landscapes, it is recommended that the existing extensive use be maintained in compliance with environmental measures, local conservation and rehabilitation of disturbed landscapes, especially in areas of massive felling and near settlements.

Regulated extensive use is recommended for mountain-valley landscapes, which in places are subject to intense anthropogenic impact (floodplain of the Katun River, valley of the Kucherla River, along which the path to Belukha Mountain passes). Areas with steppe landscapes in the Uimon, Abai, Katanda intermontane depressions are classified as regulated development of agriculture and tourism with possible intensification of activities and local improvement of disturbed areas.

## 5. Conclusion

An inventory of nature-use conflicts was carried out to plan activities to achieve the territorial development goals of the Ust'-Koksinskii district of the Altai Republic, the map shows areas with glacial-nival landscapes, areas of location of nature monuments of national significance, routes to nature monuments, areas of conflicts between tourism development and protection nature, with the preservation of historical and cultural heritage and the development of agriculture, which should be eliminated or minimized in the implementation of planned tasks.

As a result of the work carried out in the Ust-Koksinsky district, 5 types of economic zones were identified (from a complete ban on economic activity to a regulated impact on the natural environment of the region) and the creation of prerequisites for the introduction of landscape planning tools to optimize nature management.

## References

- [1] Rudsky V V 2000 *Environmental Management in Highlands (on the Example of Altai and Sayan Mountains)* (Novosibirsk: Science) p 207
- [2] Merdesheva E V 2010 *Transformation of a System of Rural Resettlement of Altai Republic at the End of the 20st - the Beginning of the 21st Centuries* (Tomsk: Publishing house of the Tomsk university) p 148
- [3] Sukhova M G 2009 *Bioclimatic Conditions of Activity of the Person in the Altai-Sayansk Country* (Tomsk: Publishing house of the Tomsk university) p 260
- [4] Semenov V A 1969 *Resources of the Surface Water of the USSR. Altai and Western Siberia* (Moscow: Hydrometeorological publishing house) p 316
- [5] *Agriculture of Altai Republic: Economic Report 2016* (Gorno-Altaysk: Territorial authority of Federal State Statistics Service in Altai Republic) p 26
- [6] Chernykh D V and Samoilova G S 2011 *Landscapes of Altai (Altai Republic and Altai Territory), Map* (Novosibirsk: FSUE Cartographic Factory)
- [7] Meretsky V A and Zhigulina T N 2016 Prospect of land management and land use of territories of mountain landscapes (on the example of the Ust-Koksinsky Region of Altai Republic) *Bulletin of the Altai State Agricultural University* **7** 92-7
- [8] Klimova O V and Oborin M P 2015 To an issue of studying of techniques of assessment and approaches to a research of recreational activity *Bulletin of the Northern (Arctic) Federal University. Natural Sciences Series* **1** 19-28
- [9] Dirin D A 2007 *Landscape and Esthetic Resources of the Ust-Koksinsky Region of Altai Republic and their Recreational Environmental Management* (Novosibirsk: SB RAS publishing house) p 206
- [10] Oborin M P and Klimova O V 2012 Natural factor as basic basis of development of recreational activity *News of the Penza State Pedagogical University of V G Belinsky* **29** 119-22
- [11] Kartashova O V 2017 Aesthetic capacity of the Ust-Koksinsky Region of Altai Republic *Scientific Almanac* **2-1** 320-4