

The Natural climatic conditions for the economic activity in mountain areas (in the case of the Altai Republic)

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Abstract. The work is devoted to detecting the state of the natural climatic aspect of the Altai geographic complexes. The ecological and climatic typing of the mountain landscapes for the population activity and the leading sectors of the Altai Republic economy has been carried out. The natural potential of the republic has been compared with the level of the regional industrial development using the evaluation matrix. Differentiation has been determined and four levels of the production potential compliance with the natural potential have been identified. The trends in developing the Altai natural resource management and the opportunities for the ecosystem services of the mountain terrain have been represented.

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Introduction

Nowadays great importance is attached to the issue of developing the mountain terrain [1-3]. The mountain ecosystems are defined by the global community as one of the most important ecosystems on the planet, at the same time the mountain environment is considered to be essential for survival of all the mankind [4-5, 8]. It is necessary to develop the programs of its sustainable development in order to preserve this terrain. Hence, it is essential to detect the state of the natural climatic aspect of the mountain areas, on the one hand [5-9], and on the other hand, to identify the compliance of the current standards of utilizing the natural resources with its ecological potential.

The Altai Republic is situated at the interface between four countries - Russia, Mongolia, Kazakhstan and China, and is a cross-border mountain terrain, which performs the important Central Asia's function of forming the river flows. Altai is characterized by a high concentration of various natural resources, including the climatic, water, mineral, forest ones, etc. Under the current conditions, an interest in Altai, as a region of a high recreational potential, has been especially steeply risen.

One of the main resource types of the Republic is the landscape and climatic one. The inescapable fact is that assessing the climate is of fundamental importance for the population activity,

the agricultural needs, and studying the bioclimatic features of all the recreation types from mountain climbing to the health resort development of the terrain.

Methods

While assessing the Altai bioclimates we have extensively used the landscape-indication method, as the landscape structure reflects the climatic differentiation of the terrain. The major criterion of assessing the bioclimate is determining its comfort level [9-11], for the integrated assessment of which we have combined the weather types into four groups: of the favourable, relatively favourable, unfavourable and marginal weather. In this case the favourable weather conditions correspond to the most optimal climatic treatment, recreation and working outdoor conditions. Under the weather conditions of this group tension of the thermal control system varies from minimum to medium. The relatively favourable weather conditions result in the medium tension of the thermal control systems. The unfavourable weather conditions include the weather conditions, which cause a high level of tension. The marginal weather conditions predetermine the excessive tension of the thermal control systems in the human body.

For the purpose of rating the comfort levels for the mountain landscapes, it seems worthwhile to select the following parameters: the lack of heat in

the human body in July, the level of the atmospheric pressure, the conventional temperature in January, the index of favourability of the bioclimatic conditions for the solar winter (December - January) and summer (June - August) periods.

For the purpose of detecting the state and the degree of involvement in the economic activity of the natural climatic aspect of the examined terrain we have made an integrated assessment of the natural resources for each administrative region of the Altai Republic.

One of the approaches to assessing the natural and production potential of the terrain is the so-called point method. This method, unlike, for example, the valuation belongs to the relative assessment. It is about that each type of the natural resources or its groups is assigned a definite point. Various factors, which are considered while assessing could be also assigned points. Thus, the potential was calculated by the following algorithm: 1) the difference between the maximum and minimum indicator (criteria) values for the examined terrain was determined; 2) a stepwise value of each indicator was calculated as the difference between the maximum (max) and minimum (min) values divided by 5; 3) the intervals, which had been assigned the scores according to the indicators were composed; 4) for each area a score sum for all kinds of the natural and production potential indicators was calculated.

Body

As a result of the factor-integrated assessment, it has been found that the climates of the Altai landscapes vary from extreme to comfortable [9-10]. The extreme living conditions are peculiar to high-mountains. The acutely uncomfortable conditions are in the upper belt of the mountain forest landscapes, as well as in wintertime on the floors of the semiarid intermountain basins. The uncomfortable bioclimatic conditions are the most typical for the intermountain basin landscapes. The precomfortable conditions prevail in the forest steppe and steppe valleys of the low-hill terrain. The comfortable bioclimates are associated with the steppe and forest steppe landscapes of the shallow steeply-sloping foothills and valleys of the low-hill terrain (Fig. 1).

In Altai it is possible to practice agriculture in the areas of the comfortable, precomfortable and moderately uncomfortable bioclimate. Depending on the heat and humidity amount and its relation a range of the industrial crops varies significantly.

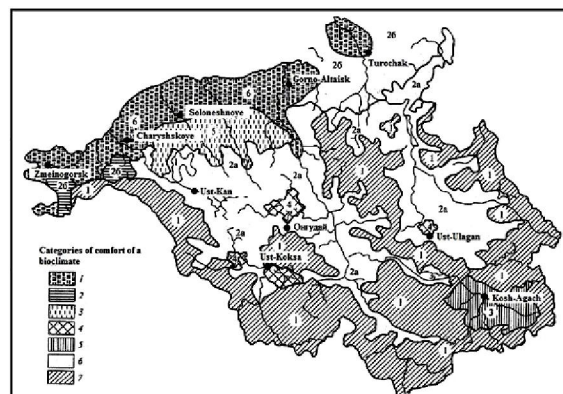


Fig. 1. Assessing the bioclimates of the Altai landscapes for the population activity [11]

Legend: 1-7 – categories of bioclimatic comfort (1 – precomfortable and comfortable, 2 – moderately comfortable, 3 – moderately uncomfortable in winter, uncomfortable in summer, 4 – uncomfortable in winter, moderately uncomfortable in summer, 5 – acutely uncomfortable in winter, uncomfortable in summer, 6 – acutely uncomfortable, 7 - extreme). The landscape types are enumerated on the map: 1 – glacial nival, tundra, Alpine, subalpine meadow high-mountain, 2 – mountain forest, mountain taiga (2a – mid-mountain, 2b – low-mountain), 3 – semiarid and dry steppe intermountain basin, 4 – steppe intermountain basin, 5 – forest steppe mid-mountain, 6 – steppe, forest steppe, forest low-mountain.

The nature and extent of the rock failure, which compose this terrain, depend on the climatic features. The petrochemical compositions of rocks, the temperature, humidity, terrain determine the nature of the soils formed. Along with the climate they determine a vegetation cover, what eventually affects the human activity. For example, the agricultural soil utilization in the vast areas of the Altai Mountains is possible only in the low-hill terrain (on the gentle slopes, foothill trains and in river valleys). In the mid-mountains the land ploughing is associated with the river valleys and basins.

Rocks do not only determine the nature of the soil cover. The geological structure of the terrain affects the landscape features of this terrain. Establishing the mining industry sectors is closely related to the proven mineral resources. It should be noted here, that the extraction of minerals has a maximum impact on the environmental situation in the mining area. The operation of the mining enterprises will irreversibly change the fragile mountain ecosystems as it is. The Altai natural territorial complexes have been historically devolved as the self-organizing systems, enabling people,

settled within it to survive. The more careful a person was the nature, the more clearly he understood what, where and how much he could dig, graze and adapt for his needs. When removing the anthropogenic load or its reducing the natural systems could be restored. The extraction of minerals does not belong to this category. Nowadays the ancient "mines" on the satellite images are interpreted. How many years should pass before the scars of the current mine openings will close? Therefore, nowadays while developing the mineral deposits the required environmental activities are 30-50% of the capital investments for constructing an industrial facility.

Today, no one economic sector could exist without being connected to nature. Some sectors are based on nature as a source of resources, the other ones use it as a prerequisite for their location. The sectors, which are indirectly (through the resource sectors) connected to nature, as well as the sectors, which process, use and redistribute the raw materials and fuel, are identified. In this case, while locating the production the key argument is the assessment of the terrain ecological capacity.

In the Altai Republic mining is due to the mineral construction materials and rare metal resources. The gold-bearing ore and distribution of the rare metals and iron are of the greatest industrial importance.

The feature of the sectors, which are oriented on the primary processing of the raw materials, is the non-renewable nature of a factor, which has stipulated their location. However, once they have been established, the respective productions themselves become the factors of developing the terrain and production system, drawing into the use the remote raw material sources. In the territory of the Republic the Aktash mine could be an example of such enterprise.

However, in the Altai Republic instead of the mining sector the dominant position has been achieved by agriculture, which main resource are the renewable sources. Thus, for example, it could be the land, water resources, and within the forest complex - it could be the biological, water and land ones.

It is necessary to turn the attention to an important object of the natural climatic conditions - the water. Altai has vast fresh water resources, besides that there are also mineral waters. In the Republic there is a rich and complex river system. There are about 20 thousand water courses. Most rivers belong to the basins of the rivers Katun, Biya and Irtysh. There is a great number of lakes, which are over 6400 in number. The largest lakes are Teletskoe and Marka-Kul. In terms of the hydropower resource stocks Altai is the richest area.

All this creates mostly favourable conditions for the human living and their economic activity. Nowadays the significant water bodies with the unique landscapes have allowed extending the human activity, what is positive for the social and economic development of the Altai Republic. It should be noted, that reviving the economy, extending the economic activity, and the production, etc. are followed by the increase in the energy consumption [12]. In this case, the attention is drawn to the rivers of the Altai Mountains as the energy source. But also in this field one should not be guided by the human needs reckoning. Building the power plants will result in changing the climatic conditions in the areas of these plants. Then the social and economic indicators will be also changed.

The regional water resources are significant in both the surface and sub-surface water flows. The regional water intake does not exceed 1% of the available water. In the centre of the Republic the ground water supply prevails due to the surface source contamination. In case of the further increase in the groundwater production, there will be a need for developing the special environmental activities.

The biological resources - are primarily the forest resources. At the same time more than half an area of the forest lands is occupied by the coniferous forests. In the northern and north-eastern parts of the Republic the forest cover indicators and the allowable annual cut are notably higher, than the mean one in the Republic. Numerous companies are involved in forest harvesting, most of them are not interested in the forest regeneration. Therefore, in more accessible areas forest is intensively cut over, and in the remote areas there are problems concerning the forest quality. The land resources meet the forestry needs by 40% and the agricultural ones by 28%, the rest of resources belong to the reserve lands and SPNT. In the last decade the farmland area has been mainly reduced due to the plough-land withdrawal from the circulation.

The fields of the landscape use include the cultural and recreational activity, tourism and organizing the recreation, water sports, the preservation and environmental, as well as other activity types. All these fields are united by the fact, that they use the natural resources as a prerequisite for their location, which contributes to their development in a particular place. In the territory of the Republic such conditions for developing the landscape use are almost everywhere. However, the absence of the energy sources and investments is a deterrent to the development.

Thus, each group of the natural resource sectors has its specifics of the development and the terrain organization. Accounting for these specifics -

is the condition required for improving the production management on the area basis, as well as the entire regional human environment.

On the basis of the evaluation matrix, which includes more than 100 parameters, we have got a chance to compare the natural potential with the level of the regional industrial development (Fig. 2, 3), three groups of the administrative regions have been identified as a result of it: with a predominance of the production potential over the natural one (Ust-Kansky and Ust-Koksinsky); with a predominance of the natural potential over the production one (Chemalsky, Choysky, Turochaksky and Ulagansky); the areas, where the production and natural potentials are approximately on the same level (Mayminsky, Shebalinsky, Ongudaysky, Kosh-Agachsky).

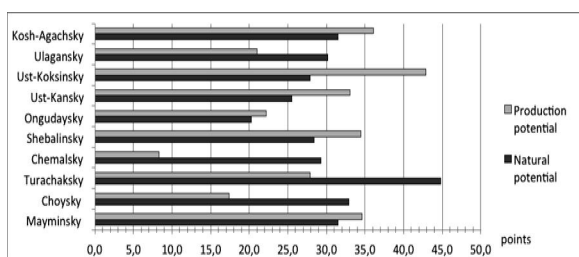


Fig. 2. Relation between the natural and production potentials

The specified compliance level is of the greatest interest, as it is a compliance measure for two potentials. The higher the compliance level is, the more hopeful prospects for the social economic growth of the terrain are.

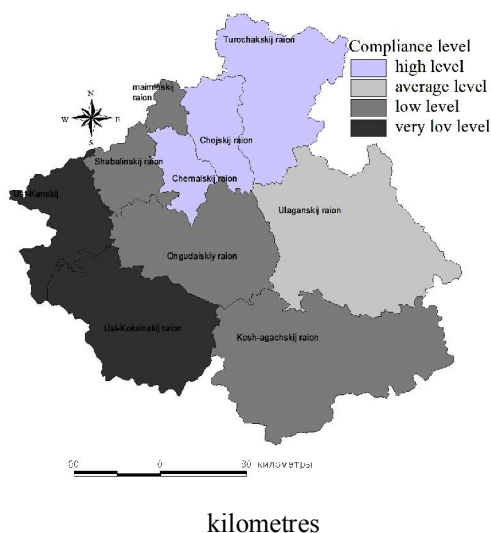


Fig. 3. The sketch map of the Altai Republic natural potential compliance with the production one (according to the administrative regions)

However, in the regions of the first group the environmental stress occurs inevitably, therefore the natural resource management improvement should go along the resource-saving and intensification road while improving the production efficiency.

The second group of the regions while possessing a high natural potential is on the low industrial development level. For the purpose of realizing the available potential it is necessary that in addition to the capital-raising for the production the investment policy should be carried out subject to the problems of the social sector in the countryside what will allow improving the living standards.

Conclusions

1. The contours of the current Altai Republic natural resource management are determined by the natural conditions and to a large extent correspond to the ecosystem features, which ensure the required range of "services".

2. In some administrative regions the rate of the natural territorial complexes "depreciation" approaches the maximum permissible one.

3. In the areas of the Altai Republic, where the development level approaches the maximum value of the natural potential the geocological terrain stability approaches a critical point.

4. In the areas, where the priority of one or two resource types are traced, the minimum technical equipment standards could be seen.

5. It is necessary to make an assessment using the large-scale maps and a large bulk of the statistical data with the creation of the natural resource management models for each administrative unit in order to work out the strategy for developing the Altai Republic to the level of municipal units.

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