Ecological barriers to tourism development (a case study of the Baikal region)

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Abstract. We examine results of recreation-geographical investigations in the Baikal region, where in Irkutsk oblast and Republic of Buryatia different measures are implemented, aimed at tourist flow increase. An analysis is made of the leading natural-ecological and socio-economic factors for the territorial organization of tourist and recreational activity. This study is based on theoretical-methodological approaches of recreation geography using the landscape planning, zoning and mapping approaches. It is confirmed that the development of the tourist system limits its capacity, which is determined by the natural properties of the natural environment and the state of the basic infrastructure of tourism and the associated infrastructure complexes - transport, social, household, environmental protection. Three types of ecological barriers to tourism development are identified: the existing legislatively established standards regulating recreational pressure on them; the resilience of ecosystems to tourism-related anthropogenic impacts, and the present status of natural ecosystems under recreational pressure. Territorial features of the system are determined by the tourist-recreational zoning, it is proposed to allocate eleven tourist-recreational zones. Based on the results of the research, it is planned to develop the Rules for tourism and recreation adjustment in the Baikal region.

1. Introduction

Tourism as a multicomponent and hierarchical ecological-economic system and, at the same time, a large-scale socio-cultural phenomenon has an active influence on nature, the economy, politics and culture. The development of the world’s tourism system reflects the exponential growth of the tourist flows, the annual volume of which barely reached 100 thousand tourists in the mid-20th century, and in 2012 it exceeded 1 billion for the first time. Furthermore, the existing entities of tourist activity, with their continued efforts to increase the tourist flows, must also preserve natural ecosystems, which is not always possible.

An illustrative example at the regional level is provided by the Baikal region with a full-fledged Baikal-centered model of tourism. On the shores of this World Natural Heritage site, over the course of many years two federal subjects of Russia (Irkutsk oblast and Republic of Buryatia) have implementing measures aimed to increase tourist flows amounting to almost 2.5 million tourists per year to date. The web of legislative-legal restrictions introduced within the Baikal Natural Territory (BNT) with a special modality of nature management, coupled with the explosive growth of the tourist flow and recreational pressures on Baikal’s shores as well as the accumulated problems with land use and infrastructure deficits have led to an exacerbation of ecological-economic contradictions.
2. Models and Methods
The investigations are based on theoretical-methodological approaches of recreation geography including the scientific views of territorial recreational systems, recreational properties of the natural environment, tourist-recreational functions of territories, and a combination of ecological, economic and social priorities of their development [1]. A number of approaches of landscape planning (ecologically oriented land use planning) were used, which open up possibilities for decision-making concerning the development, improvement or non-use of particular areas of Baikal’s shores [2]. Data processing and interpretation used key methods of geographical research: mapping and geoinformation modeling.

The development of the tourism system limits its capacity which, on the one hand, is determined by the natural properties of the natural environment and, on the other, by the state of the basic infrastructure of tourism and accompanying infrastructure complexes: transport, social amenities and environmental protection [3].

Territorial characteristics of the system are determined by tourist-recreational regionalization. Consideration is also given to the priority of the possible kinds of tourism and recreation, and to the current and future development level of the recreational, transport and ecological infrastructure. In the Central Ecological Zone (CEZ) of Irkutsk oblast, it is suggested that eleven tourist-recreational zones be identified (table 1).

| Table 1. Tourist-recreational zones of CEZ BNT of Irkutsk oblast |
|-----------------------------------------------|-----------------|----------------|-----------------|
| Municipal entity | Tourist-recreational zones | Area, thou ha | Number of places in accommodation facilities, thou, as of 2017 | Population size, thou, as of 2017 |
|------------------|-----------------|-----------------|-----------------|-----------------|
| Listvyanskoe     | Listvyanskaya   | 1.8             | 2.6             | 2.1             |
|                  | Bol’shekotskaya | 0.067           | 0.2             | 0.05            |
| Goloustnenskoe   | Goloustnenskaya | 2.6             | 1.8             | 0.6             |
|                  | Ol’khonskaya    |                 |                 |                 |
| Bugul’deskoie    | Bugul’deskieya  | 1.7             | 0.1             | 0.9             |
| Shara-Togotskoie | Malomorskaya    | 9.7             | 6.5             | 0.9             |
| Khuzhirskoe      | Ol’khonskaya    | 1.7             | 3.6             | 1.5             |
|                  |                 |                 |                 |                 |
| Kultukskoe       | Kultuksko-      | 6.1             | 0.9             | 18.4            |
|                  | Slyudyanskaya   |                 |                 |                 |
| Slyudyanskoe     |                 |                 |                 |                 |
| Utulikskoe       | Utuliksko-      | 1.8             | 3.2             | 14.1            |
|                  | Baikal’skaya   |                 |                 |                 |
| Baikal’skoe      | Portbaikal’skay| 0.1             | 0.1             | 0.4             |
|                  | Murinskaya      | 1.1             | 0.1             | 0.2             |
| Snejzninskoe     | Snejzninskaya   | 2.5             | 0.3             | 0.4             |

3. Results and Discussion
Our investigations determined three types of ecological barriers to tourism development on BNT: 1) the existing legislatively approved standards meeting the natural properties of natural ecosystems and regulating recreational pressure on them; 2) the naturally conditioned resilience of ecosystems to anthropogenic tourism-associated impacts, and 3) the present state of natural ecosystems undergoing real recreational pressures. The parameters of these barriers are closely linked and, taken together, determine the restrictions to tourism development.

A complex of legislative-legal restrictions aimed to preserve the unique ecosystem of Lake Baikal defines the frame conditions for the tourist-recreational development of CEZ BNT. They may be characterize as complicated and strict. The key provisions are defined by the Federal law “On the protection of Lake Baikal” (of 5/1/1999 no. 94-FZ) and associated legislative legal acts [4]. However,
some regional documents show substantial differences in approaches to governance of recreational activity between Irkutsk oblast and the Republic of Buryatia. To reconcile the legal framework requires developing the unified Rules for tourist-recreational activity on BNT aimed to form and improve agreed actions for the preservation of the unique ecosystem of Lake Baikal.

For assessing the stability of landscapes and separate components of the natural environment to recreational impacts as well as the tourist-recreational potential of using them, M.V. Tsygankova and E.A. Istomina developed the 1:500 000 landscape-typological map of CEZ BNT, using the landscape cartographic basis at a scale of 1:1 500 000 [5]. The fact that CEZ BNT is located in the Baikal rift zone represented by the Baikal basin and the mountains surrounded it is responsible for a high landscape diversity. In particular, for the Irkutsk part of CEZ: goletz landscapes – 3%, subgoletz – 11%, mountain-taiga – 62%, submontane and subtaiga – 9%, and steppe landscapes over 10%.

The water bodies, soil, vegetation cover and fauna were assessed according to the criteria of recreational resilience reflecting their sensitivity to recreational impacts and capacity for self-recovery; after that, an integral assessment was made. Low-mountain landscapes of pine, larch-pine and Siberian stone pine-larch forests, pine steppizated forests and light- and dark-coniferous valleys were identified as the most stable landscapes. The least stability is characteristic for goletz and subgoletz landscapes as well as dark- and light-coniferous and steppe landscapes occurring on steep mountain slopes, including those facing Lake Baikal.

The study of existing recreational pressures and their consequences is essential. Landscape-ecological investigations of the locations of tourist activity provided a preliminary averaged assessment of the capacity and allowable pressure on terrestrial natural ecosystems in different parts of the shores of Lake Baikal [6]. For instance, 5–6 pers/ha for the southern (within the Slyudyanskii district) and western (Irkutskii district) shores of Lake Baikal, 6–7 pers/ha for the shores of Maloe More (figure 1), and 2 pers/ha for Olkhon Island.

![Figure 1. Recreational pressure on the shores of Maloe More of Lake Baikal](image-url)
The analysis of the current ecological-economic problems and conflicts in environmental management aimed at the preservation of landscapes and sustainable development of the ecological-social-economic space in CEZ BNT identified today’s overwhelming challenge of waste handling. Tourism development, coupled with an appropriate establishment of the “industry of cleanliness”, is a necessary condition for the preservation of the basic tourism product, i.e. attractive landscapes and favorable residential territories. The modern approach to waste handling on the scientific-methodological basis of social geography builds upon sectoral principles through the environmental protection infrastructure (EPI). The environmental protection infrastructure is the territorial system of works, production facilities and enterprises for waste utilization (recycling, regeneration and recuperation), disposal and neutralization (including the institutional as well as normative-legislative accompaniment for monitoring and management of waste flows) [7]. By coping with the identified upgrading deficits (of the environmental protection infrastructure), it will be possible to preserve a favorable human habitat and a rational use of spatial combinations of resources and natural environment in CEZ BNT (table 2).

Table 2. Infrastructural upgrading deficits (exemplified by the environmental protection infrastructure)

| Deficits                                                                                                                                                                                                 | Suggested solutions                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Environmental costs imposed on tourist business and local authorities that are declared but not reimbursable.                                                                                         | 1. Accounting of expenses connected with nature conservation and environmental protection in the financial balance for the purposes of their subsequent reimbursement (development of legislative and normative-legal mechanisms for reimbursement of environmental costs for CEZ BNT). |
| 2. Continuing problems with the handling of municipal solid waste (MSW) and liquid domestic waste (LDW).                                                                                                | 1. Implementation of investment projects of the creation of environmental protection infrastructure facilities and the introduction of environmentally friendly technologies. |
| 2. Remoteness of existing and planned MSW disposal areas (up to 100 km) and unreasonably high cost of environmental protection measures, etc.                                                                | 2. Formation of modern logistic territorial schemes for the handling of MSW approved, including with municipal entities of district and settlement status, etc.          |
| 3. Mainstreaming of the uniqueness of the natural site, Lake Baikal, and of the equally significant necessary infrastructure facilities on its shores, the central ecological zone. | 3. Development of the environmental protection infrastructure on the basis of medium- and long-term planning of territorial schemes of ecological-social-economic development of CEZ BNT. |

4. Conclusions
By analyzing the natural and socio-economic conditions on the territory of the Baikal region, and primarily on Baikal’s shores, in the context of tourism issues, it was possible to identify the driving factors behind the territorial organization of tourist-recreational activity in the presence of different types of ecological barriers. Some of these issues are long overdue and are to be immediately dealt with, namely the problems of improving the legislative-legal framework, optimizing recreational pressures with due regard for the resilience of landscapes, and determining the territories for priority tourism development and the measures for reconstruction of the environmental protection infrastructure. It is only within the suggested and approved (in territorial general plans) tourist-recreational zones that tourist-recreational activity becomes legitimate and regulated. On the basis of the findings of this investigation, it is planned to develop and implement the Tourism and Recreation Rules in the Baikal region.
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