

# On the Assessment of the Recreational Capacity of the Projected Natural Park "Teriberka" in the Context of Sustainable Development of the Murmansk Region

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**Keywords:** Recreational Capacity, Specially Protected Natural Areas, Standards for Allowable Recreational Loads.

**Abstract:** The results of the assessment of the ecological and economic balance and the recreational capacity of the territory of the projected natural park "Teriberka" in the Murmansk region are presented. The ecological and economic balance was determined on the basis of land exploitation data using the equation proposed by B.I. Kochurov (1999). Recreational capacity was calculated using the methodology for assessing the current capacity developed by A.D. Kalikhman and T.P. Kalikhman. The territory under consideration is one of the leading tourists spots by popularity visiting the Murmansk region. According to the results of the study, it was found that the current load does not exceed the calculated recreational capacity of the projected natural park. Regular updating of data of the recreational capacity and current load is the basis for making decisions on the regulation of the tourist flow and a condition for the effective functioning of Specially Protected Natural Areas.


## 1 INTRODUCTION


When planning the socio-economic development of the regions of the Russian Federation, the growth of domestic tourism shall be increasingly cited as one of the leading factors of such development. The Murmansk region is no exception. So, in the state program "Economic Potential", approved by the Decree of the Government of the Murmansk region dated 11.11.2020 No. 780-PP, as the main activities for the development of tourism next events are listed: promotion of the Murmansk region as an attractive region for tourists, state support of the subjects of the tourism industry, the formation of a tourist and recreational cluster. Specially protected natural areas (SPNA) of regional significance shall be actively involved in the recreational development of the territory.


At the moment, the Government of the Murmansk region has prepared materials to justify the creation

of the state natural park "Teriberka" in the vicinity of the village of Teriberka, Kola region. This area is one of the most visited tourist destinations in the region. The fast rise in popularity was associated with the release of the film "Leviathan" by Andrey Zvyagintsev. The tourist potential of the territory consists from: the opportunity to visit the shores of the Arctic Ocean, walks during the polar day, watching the northern lights, snowmobile tours, diving, sports and recreational fishing, birdwatching, historical sights. Thereby, the village of Teriberka environs shall be visited by tourists all year round.

Recently, the sustainable development of territories shall be associated, among other things, with the development of tourism (Shedenov et al, 2019), because it is generally accepted that this sector of the economy does not cause significant damage to nature and human health. At the same time, many authors note that an increase in tourist traffic not only creates a high load on ecosystems, but can also lead to the destruction of natural objects that attract

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tourists and a sharp decrease in the number of tourists in the future (Petrosillo et al, 2006; Lacitignola et al, 2007). In this connection, there is a need for a detailed assessment of the value of tourist areas (Liangping et al, 2019).

According to the materials of the justification for giving the territory the legal status of SPNA, the tourist flow shall be currently estimated at 40 thousand people per year (Report ..., 2021; book 2). Исходный текст Thus, the anthropogenic load on the natural complexes of the environs of the village of Teriberka has significantly raised. The negative consequences of this impact shall be aggravated by the lack of a developed infrastructure for tourism purposes and mechanisms for regulating the flow of tourists. So, in the environs of the Teriberka village, the flow of road transport has increased in the absence of organized parking spaces, which leads to uncontrolled parking of cars, destruction of the ground cover, threats to the existence of rare plant species included in the Red Book, and disturbance of animals living on the territory. The lack of accommodation facilities in the village and the lack of organized tourist camps cause spontaneous recreational development, the appearance of new bonfires, which threatens the loss of the properties of valuable natural objects, a deterioration in the recreational qualities of the territory, and sometimes the outbreak of fires, especially dangerous in the tundra zone.

The materials for the justification of the SPNA creation contain an assessment of the factors of negative impact that threaten natural complexes. Excessive tourist flow shall be cited as one of these factors. The assessment of the ecological and recreational capacity of the territory was not carried out at the design stage of SPNA. At the same time, the availability of such data could increase the efficiency of decisions made on the zoning of the territory of the natural park, the development of a management plan for SPNA. In the context of recreational development of the Arctic territories, this is of particular relevance.

Recreational capacity, as a rule, means the maximum number of visitors that can simultaneously be on the territory without threats to its condition. To determine the capacity, such an indicator as the standard of allowable recreational loads, expressed in the number of people per unit area, shall be used. Such standards have been developed and shall be widely used for forest areas (Temporary methodology, 1987; Plotnikova, Vasilyeva, 2019). The temporary methodology, which has not lost its relevance now, contains the norms valid for the zone

for mixed coniferous-broad-leaved forests and also the requirement to reduce these norms by 2.5 times when calculating the recreational capacity of territories located in the northern taiga subzone. For landscaped areas of settlements, the estimated number of one-time visitors to parks, forest parks, forests, green zones were established by SP 42.13330.2016 with the requirement to reduce the norms by 20% in the zone of deserts and semi-deserts. Work to establish standards for permissible recreational loads was carried out in the SPNA of Kamchatka (Chizhova, 2006), in the Volga river delta (Chizhova, 2007), in the protected areas of Central Altai (Yashina, Sharavina, 2005).

For the tundra zone of the Murmansk region, the standards of permissible recreational loads have not yet been developed. With that, a significant share of the tourist flow falls on the outskirts of the Teriberka village (Semenov, 2019) and the Rybachy and Sredny Peninsulas Natural Park (Petrova, Borovichev, 2019), located in the forest-tundra and tundra zones.

## 2 MATERIALS AND METHODS

In this work, the assessment of the recreational capacity of the territory of the projected natural park "Teriberka" shall be carried out on the basis of the approaches proposed by a team of authors under the leadership of D.Yu. Zemlyansky (2020) and also the methodology for assessing the current capacity (Kalikhman A.D., Kalikhman T. P., 2014).

Preliminarily, the determination of the ecological and economic balance of the territory was carried out using the equation proposed by B.I. Kochurov (1999). This methodological approach has been repeatedly used to assess the ecological and economic balance of various territories of the Russian Federation: in the Penza region (Tkachuk et al., 2020), the Saratov region (Vasilchenko, Khavanskaya, 2020), the territory of the Ob-Tomsk interfluvium (Panchenko, Dyukarev, 2016), Republic of Tyva (Chupikova et al., 2020).

To determine the capacity of linear objects, the physical current load (FTN) and the maximum allowable number of visits (PTE) were calculated by the following formulas:

$$FTN = A * V / a * R_f \quad (1)$$

where A - is the area available for public use;  
V - is the number of visitors;  
a - unit of area;  
R<sub>f</sub> - rotation factor (number of visitors per day).

$$PTE = FTN - Cf1 - Cf2 - \dots Cfn \quad (2)$$

where Cf - correction factors, %.

As corrective factors, the calculation takes into account the share of the part of the route located within the boundaries of the projected natural park from the total length; the share of habitats of plant species included in the Red Data Book of the Murmansk Region, located on the route and in the immediate vicinity of it, of the total number of known habitats (for the summer period); percentage of days when the travel to the Teriberka village is limited due to weather conditions.

As the initial data, we used materials to justify the creation of protected areas in the natural park "Teriberka" (Report..., 2021; book 1, book 2), from the website of the Ministry of Natural Resources, Ecology and Fisheries of the Murmansk Region.

### 3 RESEARCH RESULTS AND THEIR DISCUSSION

#### 3.1 Ecological and Economic Balance of the Territory

The calculation results are shown in tables 1 and 2.

According to the explication of the lands of the projected natural park, the main part of the territory is

made up of undistributed lands with a low degree of anthropogenic load, that makes it possible to preliminarily assess the ecological and economic situation as favorable.

The obtained value of the coefficient of absolute ecological stress, which reflects the ratio of areas that have undergone a strong anthropogenic transformation and low-disturbed areas, also indicates a relatively favorable state of the environment. The value of the coefficient of relative ecological stress is very different from 1, which excludes the assessment of the ecological and economic state of the territory as balanced. The area of land forming the ecological fund is 1774.6 hectares.

In accordance with the methodology of B.I. Kochurov, the value of the coefficient of natural protection less than 0.5 is interpreted as a critical level, indicating land congestion with economic activity. For the territory under consideration, the value of coefficient of natural protection was 0.57, which slightly exceeds the critical level and allows, at the current level of anthropogenic load, to assess the natural protection as satisfactory. Nevertheless, it should be understood that the determination of the ecological and economic balance of the territory solely according to the explication data is formal, since the land management materials do not always fully reflect the scale of the economic development of the territory.

Table 1. Determination of the degree of anthropogenic load (AL) of the lands of the projected natural park "Teriberka".

Land category	Area, hectares	Proportion, %	Points	Degree of AL
Undistributed lands	2156.7	69	2	Low
Lands for industry, energy, transport, communications, radio broadcasting, television, informatics, land for space activities, land for defense, security and other special purposes	849.2	27	6	Highest
Agricultural land	123	4	4	High
Total	3128.9			

Table 2. Determination of the parameters of the ecological and economic balance of the territory of the projected natural park "Teriberka".

The name of the parameter	Calculation formula (Kochurov, 1999)	The Value
Coefficient of absolute environmental stress (Ka)	$Ka = AL6 / AL1$	0.39
Coefficient of relative environmental stress (Ko)	$Ko = (AL4 + AL5 + AL6) / (AL1 + AL2 + AL3)$	0.45
Total area of land with environment and resource stabilizing functions (Ref), hectares	$Ref = R1 + 0.8 R2 + 0.6 R3 + 0.4 R4$	1774.6
Coefficient of natural protection (Ke3)	$Ke3 = Ref / Ro$	0.57

### 3.2 Assessment of Recreational Capacity

The assessment of the recreational capacity of the territory of the projected natural park and its protected area was carried out using the methodology where the recreational capacity of the protected areas is equal to the sum of the capacities of individual recreational zones (Zemlyansky et al., 2020).

At the capacity assessing, it is important to take into account that the recreational load on the territory is uneven. The maximum load falls on a number of attractants located along the sea coast, which are the most attractive for tourists, as well as on the territory of the Teriberka village, which is included in the protected area of the natural park.

The recreational capacity of the territory was set for the most popular route, taking into account the seasonal characteristics of staying on the territory (Fig. 1).

The route passes through the territory of the first cluster and the protected area of the projected natural park. During the recreational capacity calculating, the area of the protected areas of the projected park was not excluded from the total area of clusters within the boundaries of which there are tourist sites, since the draft regulation on the natural park does not contain prohibitions and restrictions in terms of the implementation of recreational activities in protected areas.

The conditions of stay of tourists on the territory vary significantly by season. During calculating the duration of the summer period was taken equal to 122 days (June-September), winter - 244 days (October-May).

Summer time the route is open 24/7. In winter, due to weather conditions, the road to the Teriberka village is periodically closed, which excludes the possibility of delivering tourists to the route.

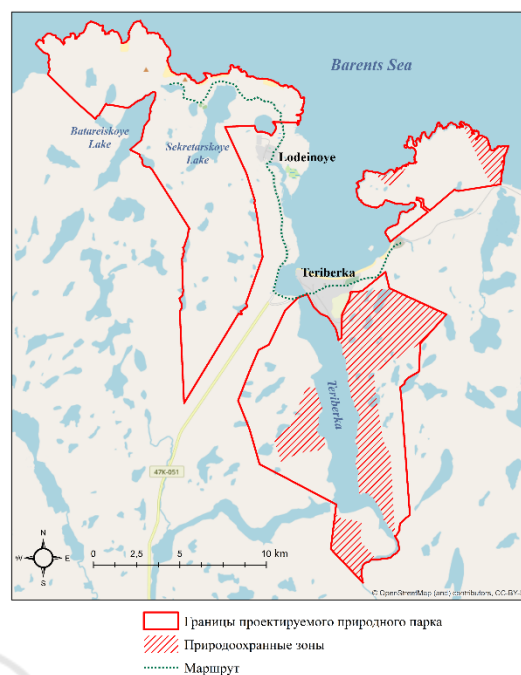


Figure 1: Schematic map of the location of the projected natural park "Teriberka".

Some parts of the territory may become inaccessible in winter, so the length of the route during this period can be significantly reduced. The size of the groups according to the data presented on the websites of fifteen different travel agencies offering tours in the vicinity of the Teriberka village is from 4 to 30 people. The average group size shall be used in the calculation. The results of calculating the recreational capacity of the route are shown in Table 3.

Based on the obtained values of the maximum allowable number of visits, it is possible to calculate the maximum capacity of the route by season and also the annual recreational capacity:

$$304 * 122 + 90 * 244 = 59106 \text{ person per year.}$$

Table 3. Recreational capacity of the route calculation.

Indicators	Unit of measurement	Route	
		Summer	Winter
Route length	m	10000	4000
Route visit time, total	hour	1	1
Tourist flow direction	unit	24	4
Average time to pass the trail, hours.	hour	4	4
Group size	person	11	11
Minimum distance between tourist groups	m	500	300
The size of the nature trail per visitor (1m * 1m)	sq.m.	1.5	1.5
Number of groups on the route	unit	20	13
Number of visits per day	unit	6	1
Physical Current Stress (FTN)	person per day	1980.00	214.50
Maximum allowable number of visits (PTE)	person per day	304	90

Thus, the scale of the existing tourist flow to the territory does not exceed the calculated recreational capacity. At the same time, mechanisms for regulating recreational loads are not implemented at this stage. The Government of the Russian Federation has approved a regulatory act that allows you to collect fees for visiting SPNA. If a checkpoint is established, the possibility of visiting the territory of the projected natural park "Teriberka" may be limited by the operating mode of such a checkpoint. As a result, despite the polar day, tourists will not be able to walk on the route around the clock, which will increase the one-time load on the territory.

## 4 CONCLUSION

The recreational capacity of the route established in the framework of this study on the territory of the projected natural park "Teriberka" and its protective area should be regularly adjusted taking into account new data on the nature of tourist development of the territory, the results of monitoring the state of natural complexes of the most popular areas, as well as protected objects. This will make it possible to make informed decisions on the regulation of recreational loads, this is a condition for the effective functioning of SPNA.

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