

Evaluation of the efficiency of development of specially protected natural areas in the Republic of Komi*



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Abstract. The article presents an algorithm for the management of specially protected natural areas in the region. This algorithm consists of the following procedures: assumption of the obligation to preserve biodiversity; planning and implementation of activities to preserve natural complexes; evaluation, analysis of results and development of recommendations to improve management. According to this algorithm the procedures were tested on model objects – specially protected natural territories of federal and regional importance. In the course of implementation of these activities the sources of funding of specially protected model objects were identified: the funds of budgets of all levels; grants and charitable contributions; funds received from the provision of recreation and tourism services. The financial strategies of development were provided, and the business plans were analysed for seven natural reserves. The results of a sociological survey concerning the effectiveness of implementation of business plans show that positive effects from the existence of protected areas are much more pronounced than the limitations experienced by local residents. This refers to the opportunities and forms of cooperation and contribution to socio-economic development in the region. The activities for the organization of recreation for residents in the region are proposed. Recreation at the weekend, the costs of which amount to two thousand rubles/person, is most interesting to the region's residents, especially to urban residents. This type of recreation can organize a flow of 200 thousand people per year, if the necessary range of services, especially children's leisure, is provided. Leisure tourism, on the contrary, requires the maximum reduction of cost (five thousand rubles/

* The article was prepared in the framework of the Program for integrational fundamental research of the Ural Branch of RAS, project 12-I-7-2070 "Tools and mechanisms for the implementation of socio-economic policy in the northern territories".

person for the route), and the provision of minimum number of services; the annual flow of this category of tourists may reach 40 thousand people. Establishment of conventional natural parks can be another way to improve the condition of protected areas. The possibility of rational nature management carried out along with recreational activity that promotes the development of these areas is shown on the example of model objects of specially protected natural areas.

Key words: specially protected natural areas, biodiversity, ecosystem services, recreational resources, ecological tourism, business plan.

At present it is apparent that the objectives of environmental conservation and economic development are interrelated, because it is impossible to ensure sustainable economic development when nature is destroyed and depleted.

Preservation of areas with undisturbed ecosystems must become one of the most important tasks on the way to sustainable development. The system of specially protected natural areas (SPNA) established in Russia is one of the measures that aim to solve this task.

The principles of sustainable development of the territory should be observed, on the one hand, through the multi-aspect use of forest resources, including timber harvesting and processing, recreation, harvesting of wild herbs, forest quotas trading and so on; on the other hand – through the use of natural resources in the amounts which do not interfere with the resilience of ecosystems and the opportunity to preserve nature for future generations.

Profound experience of experimental investigations on the territory of the Russian Federation [1, 2, 3, 4] helped formulate a general algorithm for making management decisions on resource and environmental issues, which comprises several continuous and successive actions:

- assumption of the obligation to preserve biodiversity;
- planning and implementation of activities to preserve natural complexes;
- evaluation, analysis of results and development of recommendations to improve management.

The main purpose of the algorithm consists in the continuous improvement of effectiveness of control to prevent depletion of resources and ecosystem services provided in the territories. The scheme of such actions is a common strategy for sustainable development in the context of territorial development; it is set out in international standards such as ISO 14001 (*tab. 1*).

Benefits from the use of the algorithm are as follows: improvement of institutional environment for conservation of biological resources; creation of an information database; promotion of greater benefits from the use of resources and environment. Let us present the main findings based on the experience of the UNDP/GEF Komi Project “Conservation of Virgin Forest Biodiversity in the Pechora River Headwaters Region”.

The fund of nature reserves of the Republic consists of 240 SPNA, 238 of which are of national importance. The most significant of them – Pechora-Ilych Nature

Table 1. Algorithm for management of biodiversity preservation in SPNA

No.	Stage	Procedure	Basic tools
1.	Assumption of the obligation and adoption of a strategy to preserve biodiversity	Detection of main problems and threats	Sociological surveys data, field research
		Assessment of social and environmental importance	Research according to the methodology of environmental-economic accounting (UN)
		Determination of main directions for improving environmental policy	Regulations, instructions, institutional and financial support
2.	Planning of activities to preserve biodiversity	Identification of flows of natural resources and ecosystem services and identification of groups of their users	Field research
		Estimation of economic value of resources and services	Economic assessment of natural resources and ecosystem services
		Analysis of distribution of benefits from their usage	
		Analysis of financial expenses on biodiversity preservation	Business plans for development of SPNA
3.	Implementation of activities to preserve biodiversity	Development of tools to implement the chosen directions of activity	
		Consideration of nature management traditions	
4.	Assessment of results	Assessment of efficiency	Control activity, sociological surveys
5.	Analysis and improvement of management	Analysis of the trends in the economic value of natural resources and ecosystem services and the development of measures and recommendations	Forecasting the dynamics of the state of natural resources, ways and specifics of their use

Reserve (NR) and Yugyd Va National Park (NP) – were included in 1995 in the UNESCO World Natural Heritage List under the title “the Virgin Komi Forests”. Protected objects of regional significance occupy a significant fraction of the total area of SPNA (about 2.7 million ha). With regard to the possibility of their exploitation, almost all the objects are used by the local population and region’s residents.

Assumption of the obligation and adoption of a strategy to preserve biodiversity

Problems of biodiversity conservation can be defined by analyzing the population survey data and the expert data on the results of field research. Inventory of SPNA in the region began in 2005 under

the supervision of the Ministry of Natural Resources of the Komi Republic. The introduction of the UNDP/GEF Komi Project in 2008 made it possible to complete the inventory by 2013; as a result, the significant volume of materials of field research into both biological and social issues was accumulated. Surveys of residents living in the areas adjacent to SPNA were conducted in 2006 and 2013. The survey of local residents in 2013 (504 persons) included rural and urban residents, tourists, persons working in SPNA, and local authorities. According to a sociological survey of the local population, main threats to the biodiversity of natural systems in SPNA in the region include: poaching on the part of “corrupt elite

and business” (62% of the respondents), poaching on the part of “unemployed local population of neighboring villages” (36%), and also “negative impact of industrial facilities” (27% of the respondents) [5]. The low standard of living of rural residents, especially of native and long-term residents, becomes a driving force of poaching if there is a demand for these resources.

Actual impunity for excessive use of natural forest and water resources leads to the emergence of organized groups of poachers among urban residents and employees of enterprises located in close proximity to SPNA.

The identified threats to the ecosystems and biodiversity of SPNA in the Republic of Komi include: illegal logging, unregulated harvesting of non-timber products, poaching, including illegal hunting and fishing, the penetration of invasive species, unregulated tourism, oil and gas, mining, construction of roads and linear structures, and forest fires.

Social and environmental importance of protected areas consists in the sustainable use of natural resources and ecosystem services. In accordance with the methodology of environmental-economic accounting (UN), the stream of benefits from the use of natural resources and ecosystem services is the main value of the territory. Therefore, environmental policy should seek *to maintain and increase this value* in strict compliance with environmental regimes. In this regard, in the initial stages it is necessary to carry out an economic evaluation of resources and services, as it was presented in previously published articles [6, 7].

The aesthetic value of SPNA can be the most attractive factor in creating the conditions for ecotourism and recreational activities in the region for its residents. The “Strategy for development of tourism in the Russian Federation for the period up to 2020” provides for the establishment of incoming tourism in SPNA and creation of necessary conditions and infrastructure. According to the surveys of the whole territory of the region aimed to assess the state of SPNA, it is proposed to make a number of integrated nature reserves and nature monuments into nature parks that will make it possible to focus on recreation and ecotourism [8]. These objects include Belyi and Beloborsky integrated nature reserves. It is necessary to provide the Ministry of Natural Resources of the Komi Republic with the right to determine the specifics of the use and protection of SPNA of regional importance, to control access to these areas and to charge a sliding scale fee for the use of natural resources and benefits. In this case the region will be the absolute owner of all its resources located in protected areas.

Planning for preserving biodiversity

Natural resources and complexes, which are actually in demand, are identified on the basis of field studies and observations, review of documentation, and analysis of statistical information; this helps to form the flows of use. For example, according to the data on thirteen sites in the region with a total area of approximately 1.367 million hectares, there has been conducted an evaluation of *the flows of natural resources and ecosystem services*. They included: forest resources – fuel wood, non-timber resources

(berries, mushrooms, medicinal plants, nuts), hay (hay making); resources for recreation, fishery and hunting; resources for reindeer pastures; absorption of carbon by forests and water bodies; water management of wetlands, and purification of water by forest and aquatic ecosystems. The main users of these flows are local population, tourists, international community and business [9, 10, 11].

Economic evaluation is carried out in accordance with the methodology of environmental-economic accounting (UN) and the use of market and non-market methods of assessment:

- direct market assessment (wood and non-wood forest resources, hunting and fishing resources);
- indirect market assessment (carbon sequestration);
- assessment of economic damage (reindeer pastures);

- transport and travel costs (recreation and tourism resources);
- compensation costs (water regulation and water purification).

The results of these assessments and their analysis have been published in the articles [6, 12] and are summarized in *table 2*.

Thus, the specific indicators of the average annual economic assessment of SPNA are different: for the far northern taiga – from 190 to 310 rubles/ha per year; for the northern taiga – from 8 to 220 rubles/ha per year; for the middle taiga – from 200 to 993 rubles/ha per year. At that, large SPNA have greater share of global functions of ecosystems (carbon sequestration and water regulation). Groups of users of natural resources and ecosystem services are identified in the course of field research, their size is determined in the course of their economic assessment. Thus,

Table 2. Results of economic assessment of SPNA of regional importance

SPNA	Area, thousand ha	Economic value, million rub/year	Specific indicator, rub/ha/year
<i>Far northern taiga</i>			
Usinsky Integrated Reserve	179	33.765	188.6
Ocean Marsh Reserve	139	43.561	313.4
<i>Northern taiga</i>			
Sebys' Integrated Reserve	175	37.192	212.5
Udorsky Integrated Reserve	242	52.272	216.0
Podchersky Cedar Reserve	1.3	0.051	39.2
Soplyassky Cedar Reserve	0.6	0.039	65.0
Pechorskoye Marsh	6.4	0.054	8.4
Natural Water Monument "Paraskiny Lakes"	0.02	0.377	188.5
<i>Middle taiga</i>			
Ilychsky Ichthyological Reserve	532.4	108.556	203.9
Un'inskii Integrated Reserve	32.4	22.455	693.1
Beloborsky Integrated Reserve	9.0	8.940	993.3
Belyi Integrated Reserve	7.8	2.68	343.6
Verkhne-Lokchinsky Integrated Reserve	42.4	10.2	240.6

the distribution of benefits varies depending on SPNA. Due to the fact that the world community is the recipient of benefits from absorption of carbon by forests, and the local population is the recipient of benefits from water regulation, it is business entities and tourists that become a more mobile category. Therefore, their share increases to 50–70% in those SPNA that are used for active recreation (and also for the implementation of business projects) or that are subject to poaching [12].

Currently, none of the protected areas of regional importance receives funding to implement concrete environmental protection measures. At the same time, inspectors and forestry officers are unable to control such vast sites located in remote areas of the region. That is why it is only this remoteness and the availability of similar resources in other, more nearby, areas that helps preserve many SPNA from inevitable poaching. These problems can be solved only with the participation of local population and more significant financial investment in the protection of natural resources. The main goal in the development of business plans for SPNA is to streamline the uncontrolled flow of people, to provide employment of local population, to provide security measures at the expense of funding from the implementation of financial strategies.

The choice of model SPNA for business planning depends on their significance and location. The first two sites – Pechora-Ilych Nature Reserve and Yugyd Va National Park – are the most important for the region, and they also protect biodiversity and provide recreational activities on a nationwide scale. Other

sites (Belyi Integrated Reserve, Beloborsky Integrated Nature Reserve, Natural Water Monument “Paraskiny Lakes”) are located near the region’s largest cities (Ukhta and Syktyvkar), which promotes the possibility of organizing recreation, celebrations and educating programs at the weekend. Un’inskii Integrated Nature Reserve is located in the buffer zone of the reserve, and the development of its business plan is focused on the redistribution of the flow of tourists visiting the nature reserve and on the simultaneous protection of natural resources. The analysis of actual financial costs involves identification of all the revenues that are spent on biodiversity conservation. This information becomes the basis for development of business plans, at that it is necessary to take into account that the funds allocated from the federal and regional budget to BZ and NP are spent on control and supervisory functions and on the inventory carried out in the last decade. Charitable funds and foreign grants are not a constant source of funding and they are generally used at the initial stage of implementation of business plans for establishing infrastructure (guest houses, summerhouses, parking lots, waste disposal, etc.). it is also necessary to take into account the fact that most of the districts in the region have programs for tourism development, according to which the funds are annually transferred to the organization of tourism, and in particular, to the support of SPNA (Ust-Vymsky, Knyazhpogostsky, Udorsky and other districts). Allocation of finance from different sources of funding of SPNA, for which business plans were developed, are presented in *table 3*.

Table 3. Sources of funding of SPNA

Sources of funding	BZ	NP	Beloborsky	Belyi	Un'inskii	Paraskiny Lakes
Federal budget	+	+				
Regional budget	+	+	+	+	+	+
Local budget		+				
UNDP/GEF projects	+	+	+	+	+	+
Foreign grants	+	+				
Charitable funds	+	+				
Own activity	+	+		+		

Due to underfunding, the management of SPNA is forced to rely on tourism as a source of income, but without a developed infrastructure (specifically designed to reduce environmental impact) the pressure on nature systems is critical and it causes their degradation; it is also the reason for irresponsible use of resources and nature conservation areas by external business entities.

The shortage of skilled workers, for which SPNA offers low remuneration and is no competitor in the labor market, is only a

consequence. Due to the same reasons (SPNA does not develop local communities that are often detached from the labor market) the residents living close to SPNA and visitors are engaged in poaching. In this situation, we use the method of pre-selection of financial strategies (mechanisms), which is performed on the basis of data collected by means of interviews of the management and heads of SPNA, organization of round tables, questionnaire surveys of target groups, and reviews of reports of previous research (figure).

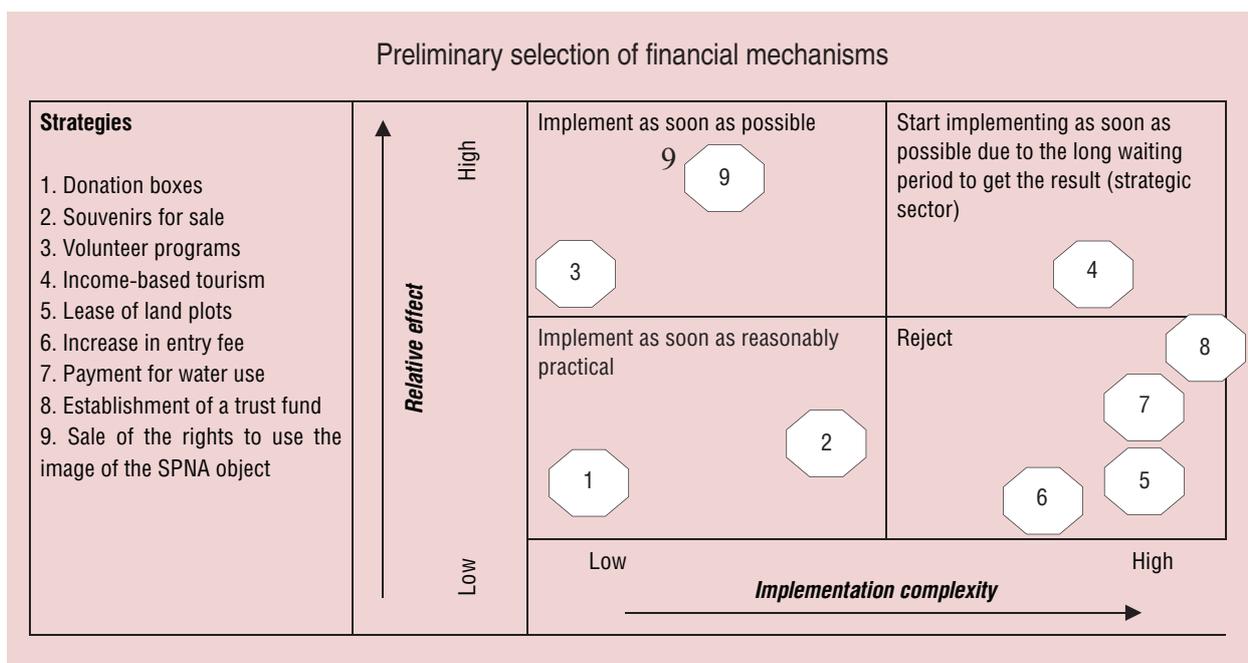


Table 4. Financial strategies of business plans for development of SPNA

Strategies	BZ	NP	Beloborsky	Belyi	Un'inskii	Paraskiny Lakes
Federal budget	+	+				
Regional budget			+	+		+
Local budget			+	+	+	+
Foreign grants	+	+	+	+	+	
Charitable funds	+	+	+	+	+	+
Tourism	+	+	+	+	+	+
Lease of territory and facilities		+	+	+		+
Images, printed products, promotional advertising	+	+				
Multimedia encyclopedia	+	+				
Visitor center		+	+	+		+
Contribution of volunteers			+	+		

Different financial strategies are defined depending on the specifics of business planning objects (*tab. 4*).

So, the receipt of funds for “trademark” SPNA, apart from the receipts from tourism can be achieved through the creation of multimedia information sources, sales of printed images and advertising, installation of boxes for donations.

For “suburban” protected areas it is expedient to involve volunteers; to organize fishery production, processing of berries and mushrooms; to establish visitor centers with outreach activities.

Implementation of activities for conservation of biodiversity

The business plan of SPNA is a flexible financing tool of the programs for management of SPNA and their systems (*tab. 5*).

According to the business plans, tourism services included: sports tourism (cycling, walking, skiing, kayaking, boating), family and corporate recreation, educational practices for students and schoolchildren, observations of animals and birds (video

filming), celebrations of holidays and sporting events such as dog sledding, orienteering, paintball), amateur fishing, tourist routes through historical places.

The traditions of nature management are taken into account in the involvement of local communities in the programs for development of SPNA. For instance, it was envisaged that almost all protected areas had jobs for local residents in the sphere of tourist guidance, security, maintenance of guest houses, organization of leisure. A sociological survey of the population (504 people), who live near SPNA, shows that they are willing to cooperate in the field of maintenance, construction, manufacture of boats, souvenirs (56%). Thus, the respondents fall into the following categories: local rural population of Pechorsky District – 22%; local rural population of Vuktylsky District – 100%; local rural population of Troitsko-Pechorsky District – 68%; urban residents of the region – 52%; tourists from the region – 57%; representatives of local authorities of these districts – 50% [5]. The social factor is very important for socio-economic

Table 5. Programs of business plans for SPNA

Program	BZ	NP	Beloborsky	Belyi	Un'inskii	Paraskiny Lakes
Management and technical support	+	+	+	+	+	+
Security of the territory	+	+	+	+	+	+
Restoration of disturbed areas		+	+			
Scientific research	+	+	+	+	+	
Environmental education	+	+	+	+		+
Reorganization of security system	+	+	+			
Support of funding	+	+	+	+	+	+
Preservation of traditional lifestyles and culture of the population	+	+	+	+	+	+

Table 6. Information on the social factor in business planning of SPNA

	BZ	NP	Beloborsky	Belyi	Un'inskii	Paraskiny Lakes
Number of visitors, persons/year	1 900	4 840	17 000	8 100	100	1 000
Number of jobs, units	24	20	14	12	23	7

development of the region's territories; that is why the provision of jobs, equipment for protection of SPNA, control, and personal interest of the population in the sustainable use of resources should be included in the business plan on a mandatory basis (*tab. 6*) [9, 10, 11, 12, 14].

Evaluation of the results

The performance of activities is assessed from the perspective of ecological and economic efficiency, when a reduction in the quality or a degradation of natural systems cannot be compensated by investments in other types of capital. Thus, along with the implementation of business projects it is necessary to maintain or increase the value of natural resources and ecosystem services. It can be done in the most acceptable way through the implementation of control activity that monitors the use of natural resources and services and traces changes in natural sites. This helps to carry out a monitoring and comparative analysis of human-induced

impact and an analysis of how natural environment reacts to this impact.

The combination of tourism and educational and scientific activities in the same territory should ensure the rational use of resources and monitor its changes. The state-financed institution of the Komi Republic the Center for SPNA under the Ministry of Natural Resources of the region should carry out external monitoring in the form of reports on paper and visits to the territories of natural sites on a quarterly basis. The head of protected SPNA exercises internal control in the form of reports.

Taking into account a short implementation period (2–3 years) for business planning projects in the territory, only two nature sites (Pechora-Ilych Nature Reserve and Yugyd Va National Park) were subject to a survey.

Five hundred and four respondents participated in the sociological poll that was conducted among the local population of rural (15 villages) and urban communities (towns of Vuktyl, Inta and Pechora).

The following data were obtained: the level of accessibility for the population, opportunities for cooperation, and the role of protected areas in the socio-economic development of surrounding communities (*tab. 7*). Despite the administrative and financial restrictions, 54% of all the respondents consider the protected areas accessible, and 32% considers them inaccessible. Access restrictions are explained by high costs of petroleum, oil and lubricants, equipment, poor condition of roads and tourist infrastructure. Willingness to cooperate is reflected to the same extent, especially for those residents who want to get a job. Local tourists are

ready to make the greatest contribution to volunteering (20%), this accounts for 8% of the respondents on average [5].

The table shows that various positive effects due to the existence of SPNA greatly exceed the limitations experienced by local residents.

However, the activities aimed to attract residents who live near Pechora-Ilych Nature Reserve and Yugyd Va National Park, are not sufficient; as a result, the change in estimates of services is also insignificant. The projects for effective use of non-timber forest resources (organization of their processing on site) have not been implemented so far.

Table 7. Information about the interaction between local residents and SPNA

Categories of respondents	Contribution to the region's socio-economic development				Nature of interaction	
	Important for maintaining the quality of life, %	Promotes local economic development, %	Provides jobs, %	Hinders regional development, %	Restricts traditional activity, %	Restricts visiting, %
Rural residents of Pechorsky District (98 persons)	35	29	4	6	30	47
Rural residents of Vuktylsky District (8 persons)	100	no				
Urban residents (162 persons)	53	28	11	16	31	46
Rural residents of the settlement of Yaksha (39 persons)	62	36	31	no		28
Rural residents of Troitsko-Pechorsky District (25 persons)	52	44	40	no	12	36
Tourists in the region (60 persons)	50	40	10		30	53
Teachers and students (61 persons)	69	20	20		38	21
Heads of local authorities (40 persons)	50	53	23	3	18	45
Employees of SPNA (11 persons)	64	45	27	no	18	no
Total (504 persons)	52	32	15	7	30	38

Analysis and improvement of management directions

Analysis of improvement should concern all the directions of activity of SPNA – natural resources conservation, and financial and social indicators. Recreation and tourism generates financial receipts and provides employment for the local population; consequently, we carried out a sociological survey of residents in five municipal formations (Syktyvkar, Inta, Pechora, Usinsk and Ukhta) and seven municipal districts (Izhemsky, Ust-Vymsky, Ust-Kulomsky, Troitsko-Pechorsky, Knyazhpogostsky, Priluzsky and Koygorodsky).

Six hundred and four people have taken part in the survey; the number of urban residents is 83%. The number of young respondents (aged 20–25) prevails (42%), other age groups are represented equally on equity participation (aged 25–35 – 15%; aged 35–50 – 26%; aged 50 and more – 17%). The goal of the questionnaire survey was to identify preferences by type of recreation, services required and the amounts of eligible costs necessary for its arrangement. The analysis resulted in the following conclusions:

- residents of the region have good knowledge of SPNA and have extensive experience of visiting protected areas for recreation and tourism (56% of the respondents, of which 18% visit SPNA every year and more frequently; they visit protected areas for recreation (60%) and sports tourism (16%); only 8% of the respondents visit SPNA for business purposes);
- preferences for organizing recreation are divided into two categories – outside

the region (41% of the respondents) and inside the region (53% of the respondents); at that, the rest of the latter is perceived as a desire of aesthetic pleasure and quietness;

- the most desirable services for the *weekend recreation* are as follows (arranged by decreasing importance): excursions, baths, fishing and sports equipment rental, organization of campsites;

- the list of the most important services for recreation in the form of *tourist routes* include: baths, organization of campsites, tourist routes guidance and sports equipment rental;

- hypothetical costs of the respondents for the organization of the *weekend recreation* are distributed evenly: up to one thousand rubles/person (22%); 1–2 thousand rubles/person (37%), 2–5 thousand rubles/person (30%);

- expenditures of the respondents on the organization of tourist recreation are classified as being 2–5 thousand rubles/person (35%) and 1–2 thousand rubles/person (29%).

- respondents suggested the following types of services as additional: organization of leisure for children, expansion of recreational areas with the provision of services for the whole family; winter sports – ice swimming, snowmobiling, dog sledding.

The majority of the respondents (87%) prefer recreation in the region and, at the same time, a more extensive recreation outside the region. The survey shows that the region's residents, particularly urban dwellers, find the weekend recreation (the cost of which amount to two thousand rubles/person) more preferable. A significant proportion of the respondents (30%), who

are ready to spend from two to five thousand rubles/person on the weekend recreation, taking into account the fact that they prefer family recreation, expect to receive good quality services. This type of holiday can arrange a flow rate of 200 thousand people per year, provided that the necessary range of services, especially related to children's leisure, is available. Leisure tourism, on the contrary, requires the maximum reduction of costs (five thousand rubles/person per route), provision of minimum services (bath, accompanying routes and sports equipment rental); at the same time, the annual flow of this category of tourists (residents of the region) may be 40 thousand people. It is necessary to create comfortable conditions for the recreation of regional residents, thereby providing employment for the population; to expand the scope of services and their quality; to form an image of "healthy recreation" especially for young people.

Another direction to improve the condition of SPNA can be the establishment of nature parks of traditional orientation. The most suitable nature sites and territories include Sebys' Integrated Reserve (Izhemsky District), Udorsky Integrated Reserve (Udorsky District) and an area of 25 hectares near the village of Eremeevo and the settlement of Priuralsky (Troitsko-Pechorsky District). Given the centuries-old experience of the inhabitants of these territories (reindeer herding, fishing and hunting of the Izhma-Komi and the Udorans – ethnographic groups of Komi people), their traditional way of life, skills, the diversity of natural resources (animals, birds, mushrooms and berries), the experience of organizing tourism, and

various holidays, these areas can sustain themselves through the implementation of environmental and socio-economic development programs. An important step in this direction is the zoning of nature sites by spheres of activity and the limitation of resources extraction. Outside the specially protected areas it is suggested to organize cognitive, agricultural, event, hunting, fishing, environmental and sports tourism with special events to preserve fauna and flora.

These events can include: mandatory monitoring of resources, establishment of feeding sites, feeding troughs, forage fields and salt licks, etc. it is expedient to establish horse breeding in some nature reserves to minimize negative impacts on the environment. This can provide additional types of recreation such as horse riding and hiking. Employment for the local population can be provided through the development of fish farming, beekeeping, keeping game animals in open-air cages, etc. Thus, the organization of territories of traditional nature management will not only help to preserve biodiversity, but it will also improve economic condition of the local rural population and preserve the culture and traditional forms of nature management.

Reduction of funding is the most acute problem of biodiversity conservation in the Komi Republic. This is a system-wide, rather than a regional, problem; it indicates the need to change approaches to the management of SPNA. The accumulated management experience can be used not only for this region, but also for other areas with similar natural and socio-economic conditions.

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