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Assessment of Consumer and Aesthetic Parameters of Environment at the Regional Level

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Abstract: The study deals with the current issues of estimating consumer and aesthetic environmental parameters of townships by way of example of the Belgorod region. It considers the methodological approach and the system of criteria and indicators to assessing the consumer and aesthetic parameters of the natural environment of the population of the territory in the area of placement of mining enterprises of the Kursk Magnetic Anomaly (KMA). The coefficients of the representation of the environment, the radii of recreation have been determined; recreational load has been calculated. The need and the key results of the study, the demand for their expansion in designing ecological framework of the territory have been shown.

Key words: Method of socio-geographic studies, environmental aesthetics, damaged mining areas, coefficients of environmental representation, recreational load, nature management

INTRODUCTION

In modern conditions the raised demands are made for the study of social and geographic aspects of nature management, appreciation of aesthetic properties and resources in terms of the broad scientific debate (Bunting and Gueelke, 1979; Carlson, 1994; Linton, 1968; Nikolaev, 2006; Tricart, 1979; Vedenin and Philippovich, 1975; Frolova, 1994; Eringis and Budryunas, 1968). This trend is reflected in a number of works by well-known scientists K.I. Epingis, R.A. Budryunas, A. Mellum, K.N. Gorba, M. Yu. Fpolova, L.I. Mukhina, V.A. Nikolayev, D.A. Timofeyev, E.A. Likhacheva, Yu. A. Vedenin and others. A substantial part of the research works at that concerns the exploration of more or less known and popular local areas while the known works represent the regional background poorly. Currently there is no specialized methodology of studying the aesthetic characteristics and resources of "landscapes" of a certain "ordinary" village or their system. Accordingly, we can offer a combination of methods of qualitative description and the public opinion poll, respectively two-level research and evaluation of consumer and aesthetic parameters of environment (it is treated as a value that characterizes any aesthetic and consumer property of environment) (Genenko *et al*., 2009).

MATERIALS AND METHODS

We point out in our study that the aesthetic perception may occur at different scales and at any distance, thus reflecting face (visual image) of the village as a whole and its parts. The landscape is able to combine the different images, therefore not only a separate scenery but also a kind of environment are subject to assessment. At that one explores those parts of living space, medium (natural habitats) which include the territory of the village and its immediate environment. In addition, as a result of the study one establishes several images differing in varying degrees of the space described (the process of conscious selection of the elements of the perceived reality "representation"). The result of such scientific model formulation should be quantitative indicators (coefficients) of consumer and aesthetic medium parameters (they are understood as quantities characterizing any aesthetic and consumer medium properties). Given the currently existing major theoretical developments of domestic and foreign scientists, we have proposed a variant of assessment techniques of consumer and aesthetic properties of the environment at the regional level (Genenko *et al*., 2009). The research methods involve calculation of a series of informative and representative parameters of spatial areas including:

- Evaluation of frequency of occurring representations of the object on three selected space-time forms and representations of natural objects on the ith township
- Evaluation of satisfaction of the observed scenery within the spatial area of the ith township
- Evaluation of preference of recreational use of the ith object in the ith township
- Evaluation of preference using objects within the range of future activity
- Estimation of recreational load on the spatial areal

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RESULTS AND DISCUSSION

The main part: Currently, our research is developing towards the constant deepening of the study of consumer-aesthetic parameters of the environment of townships (Lopina *et al*., 2015). An example of such "deepening" can be executing such works in relation to the territories in the area of placement of mining enterprises of the Kursk Magnetic Anomaly (KMA) that are of important economic and social value and require a special approach in designing recreation areas.

The researches on the consumer and aesthetic parameters of the environment of the regional system of township carried out by the authors in recent years, as well as the results of the exploration of the area of distribution of mining KMA, suggest the characteristic features of the latter in the context of the studied objects.

Table 1 represents the results of the study consumer and aesthetic parameters on one of the space-time forms (recreational use). In addition to the illustrated example, one could give a considerable number of examples of such heterogeneity, both on all settlements of the Belgorod region and in the group placed in the KMA area. In this case, "problem-oriented" characteristics of the settlements of the KMA district are not opposed with their consumer and aesthetic parameters of the environment to "traditional" ones.

Using mathematical statistics enabled to carry out a search of statistical correlations between the size, the type of locality, the nature of environment, consumer-aesthetic parameters and other indicators. For example, some of the differences in aesthetic evaluations were noted when establishing dependence of the coefficient of positive representation of the observed landscape on the percentage of indigenous people in the township ($r = 0.4795$; $p = 0.00040$). In the course of analysis we succeeded in tracing a certain (moderate) connection between the rate of positive representation of the landscape observed on the duration of residence in the township ($r = 0.5783$; $p = 0.00002$). Connections between such indicators as level of education, social status, on the one hand and aesthetic evaluation of the observed landscape, on the other hand are virtually absent.

The results of the analysis of the landscape-forming role of individual landscape elements do not differ from those generally accepted and confirm that the most attractive and at the same time the most memorable from the aesthetic point of view are the vegetation and water bodies. The amplitude of the oscillations of the importance of some elements is negligible: woodland, river, pond/lake while the role of other objects varies considerably in different localities which is especially characteristic of the park to be divided into urban and large rural areas and fields/meadows (Table 1).

Thus, we can note the differences of bidirectional character: intra-component and intra-regional differences determined by geographical conditions of residence and consequently, the level of representation of the objects; by quantitative characteristics of the studied townships; by socio-demographic characteristics, etc.

It is worth putting forward that for the townships located in the area of distribution of mining enterprises of the KMA, it is necessary to introduce additional characteristics of somewhat different plan, for example, the distance from the township to the mining enterprise, the number of people working at the mining enterprise, etc. In the considered group of the townships the

Table 1: Fragment of the table "frequency of mentioning by the respondents the environmental elements. Recreational use"

	The coefficient of recreational use (expressed as a decimal fraction)						
The name of township	Woodland	River	Pond/lake	Field/meadow	Park, garden	Nature	Cu_i^2
The examples of townships of the KMA area							
The town of Gubkin	0.10	0.10	0.04	0	0.12	0.16	0.52
The town of Stary Oskol	0.19	0.07	0.02	0	0.03	0.37	0.68
The village of Melavoye	0.22	0.01	0.28	0.01	0.17	0	0.69
The village of Bobrovy Dvory	0.33	0.06	0.23	0.01	0.01	0.03	0.67
Average for all group*	0.21±0.09	0.06±0.04	0.14±0.13	0.05±0.05	0.08±0.07	0.14±0.15	0.64±0.08
The examples of other townships							
The town of Belgorod	0.24	0.17	0.07	0.02	0.16	0.12	0.78
The town of Alekseevka	0.17	0.14	0.05	0.02	0.08	0.25	0.71
Average for towns	0.25±0.07	0.18±0.07	0.07±0.03	0.02±0.01	0.09±0.04	0.12±0.10	0.72±0.07
Krutoy log	0.22	0.03	0.03	0.02	0.11	0.16	0.57
Kazatskoye	0.18	0.33	0.12	0.03	0.11	0.06	0.83
Average for villages	0.21±0.08	0.14±0.11	0.09±0,08	0.02±0.02	0.06±0.05	0.13±0.10	0.65±0.15
Average for all group	0.21±0.08	0.14±0.11	0.09±0.08	0.02±0.02	0.06±0.05	0.13±0.10	0.66±0.14

Cu_i^2; coefficient of recreational use of ith of natural object; *Towns and villages average for the first group are not presented because of the small number of the units of general population

representation coefficients as if are pushed to the sidelines and there is basis is a kind of the key issues that define the most common features of their socio-economic, demographic, geography and the unique features of their specific and individual social and geographical peculiarity. Thus, "quality" and "quantity" of the population may predetermine the difference in the consumer and aesthetic appreciation and importance of the analysis of relationships in this complex system.

In addition, the classification of townships was made which allowed for detailed and scientifically substantiated data for designing of population living space. The most effective method of assessing the results of socio-geographical research at that is the cluster analysis.

When analyzing the data array consisting of 50 townships, each of which was characterized by 8 features-consumer and aesthetic parameters of the environment: the coefficient of representation of forest, park/garden, water bodies, field/meadow; the total rate of representation of natural objects; the coefficient of positive representations of observed objects; the coefficient of preference of the observed scenery; the total coefficient of recreational use of natural objects.

All townships were divided into six clusters characterized by different values of the parameters underlying clusterization. The calculations and analysis revealed that the consumer and aesthetic parameters of the environment have significant intraregional differences determined, first of all, by geographical living conditions, and accordingly, the level of representation (occurrence frequency) of landscape-forming elements; quantitative characteristics of the studied townships (land area) and socio-demographic characteristics (number of inhabitants, population density, the proportion of indigenous inhabitants and visitors, the average age of the inhabitants, the duration of residence in the village and the frequency of change of place of residence, lifestyle), etc.

Table 2 represents the examples of calculation of the recreational load on the areas of townships located within the area of the KMA and not included in it. The calculation algorithm can be expressed by the following equation:

$$R = \frac{\sum_{i=1}^{n} N_i \times T_i}{S_i}$$

Where:

R = Ryear/ha (km^2)

N_i = Number of the ith group of recreants, a person (the category of the population that does not use the area for recreation is not taken into account)

T_i = Number of leavings of the ith group of recreants per year; (the number of opinions of the possible recreational use)

S_i = Area of the range of the real recreational use, ha (km^2) (the initial data for calculation the results of the study of the spatial and temporal characteristics of public nature management)

n = The number of groups

A significant array of information base processed in the course of study provides formulation and solution of the problem of calculation of the regularities in dependencies of the frequency of visits on distances and consumer and aesthetic parameters, including preference monitoring, recreational use. That is, the frequency of visits and recreational load are the function of both distance and parameters that reflect the consumer properties: y = f (r; m; n), where r-radius of the public environmental management, m-preference ratio between the elements of the environment; n-coefficient that takes into account the additional attraction (the presence of a resource, a recognized attraction of the place, etc).

Table 2: The calculation of load on recreational areas of townships

	The number of opinions of the possible recreational use in groups (number of leavings)				
The name of township	1-4 times per month ($N_1 \times T_1$)	3-4 times per 6 months ($N_2 \times T_2$)	1-2 times per year ($N_3 \times T_3$)	Total $\sum_{i=1}^{n} N_i \times T_i$	Recreational load on the areal, people-leavings per year/ha
The examples of townships of the KMA area					
The town of Gubkin	619800	220906	34437.0	875143.0	14.22
The town of Stary Oskol Oskol	3061776	326284	25779.0	3413839.0	55.47
The village of Melavoye	624	966	277.5	1867.5	0.03
The village of Bobrovy Dvory	6552	3724	453.0	10729.0	0.17
The examples of other townships					
The town of Belgorod	1900032	820771	171430.5	2892234.0	46.99
The town of Valuyki	429480	62636	8944.0	501060.0	8.14
Sevryukovo	3960	581	42.5	4583.5	0.07
Radkovka	12624	1337	432.0	14393.0	0.23

On the basis of the representation factors identified during the approbation of the above methods, it is possible to carry out mapping of a recreational load, which involves the following stages:

- Revelation of the areas of preferred availability around townships, including the zones of both occasional and intentional visits, the calculation of their average radii of the areas-mapping of recreational load for each area (creating a layer of an intentional visit for a particular township)
- Linkage between the identified areas of intentional visits and aesthetically significant objects on the basis of estimates (coefficients of representation). Based on landscape preferences of the respondents, the most recreationally important objects can be determined and recreational load per unit of area can be calculated
- Layup, as a result the creation of an integral layer for close townships. The resulting polygons of availability zones (areas) being in different layers are sequentially juxtaposed
- Isoline mapping of background recreational load
- Recreational load calculation of aesthetically significant objects (knowing the coefficient of recreational use of the objects and total recreational load on the area, one can calculate the recreational load on the object under study)

One can say definitely that such approach to mapping of a recreational load in the future may become a real basis for regional forecast mapping of recreational load and obtaining the scientific basis when projecting recreational complexes.

CONCLUSION

The long-felt need for researching into aesthetic properties and resources across regions is associated with the ability to touch upon a problem of studying the aesthetic parameters of the environment of a particular "ordinary" township or their system.

The calculations and analysis based on the established system of indicators allowed to reveal that the consumer and aesthetic parameters have significant intraregional differences due to, first of all, the peculiarities of the territory and geographical living conditions of the population. Studies conducted by Belgorod State National Research University in 2016 in the framework of the state order of the Ministry of Education and Science of the Russian Federation, the project code-185, allowed to establish the reasons of differences in aesthetic and consumer conditions in the settlements of region of KMA mining enterprises accommodation within the research area. It is especially important for the KMA area to establish the relationship between the history of landscape formation, the dynamics of types of nature management and the history of populating. The revealed spatial differences and factors of territorial differentiation of the parameters are reflected in the corresponding classification of townships and used as a basis for mapping recreational load.

SUGGESTIONS

One can definitely say that the approach suggested by the researchers and the results obtained could be an important indicator of sustainable development of the region. However, the traditional systems of indicators of sustainable development do not, unfortunately, provide it (Kornilov and Petin, 2008). Obvious are the demand and key results, the need for their expansion when designing and creating better regional environmental systems, aimed at protecting natural objects, rehabilitating highly damaged ecosystems to which the territory of placement of mining enterprises of the KMA, i.e., creating a single ecological framework.

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