Centre for Research on Settlements and Urbanism

Journal of Settlements and Spatial Planning

Journal homepage: http://jssp.reviste.ubbcluj.ro

# Landscape Recreational Resources Assessment. Current Situation and Prospects (on the Example of River-Valley Landscapes)

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**Keywords:** *recreational assessment, river-valley landscapes, values, coefficients*

**ABSTRACT**

This paper approaches the issue of landscape recreational resources assessment. The authors outline the necessity of assessing the nature-related recreational resources in response to the evolution of landscape perception, the increasing number of recreational requirements, and the anthropogenic transformation of landscapes while retrospectively considering the results of the investigations on recreational potential and their application in landscape research. We discuss on the key trends and peculiarities of the assessment process and distinguish the quantitative parameters of the most noticeable landscape features for recreational activity. The scoring method is then chosen as most suitable for converting values into points and for the differentiation of the quality of resources. We suggest a scheme for assessing the recreational potential of a landscape region. This contains ten components, each of whom being maximally evaluated up to 100 points. The results are argued by an assessment of landscape-related recreational features and space differentiation on the example of recreational landscape regions within the Middle Dniester valley.

## 1. INTRODUCTION

The importance of the landscape approach in recreational geographical studies is accounted for by the variety of types and forms of recreational activities and the multiplicity of tourism requirements to local natural conditions. The noospheric process of cultural evolution, of perceiving landscape as a vital space for modern people increases the value of recreational assessment (according to V. Vernadsky, the noospheric process is a new type of scientific thinking and human labour changing biosphere into noosphere) [20]. Furthermore, landscape is an essential part of ethnogeobiocenosis (in response to V. Krool, homogeneous ecosystem filled with certain ethnic groups and their heritage for centuries) that defines to a great extent ethnic identification [11]. In this respect, the exploration of non-utility nature values with recreational significance becomes of great importance. Besides, we can observe the constant impoverishment of nature heterogeneity, putting the environment out of ecological balance and the deterioration of its optimal parameters as well as the inevitable appearance and prevalence of low-aesthetic anthropogenic modifications in some landscapes.

## 2. THEORY AND METHODOLOGY

The issue of the nature basis as a dominant prerequisite and framework for recreational organization and development is highlighted in the majority of national studies in late 20th century. The first problem setting and projects of solution of nature-related recreational issues date back in the 1960's-

1980's and are connected with the names of W. Preobrazhenskyi (1988) [15], Y. Vedenin (1969) [3], N. Mironynenko (1990) [13], B. Lihanov (1981), [14], and N. Ignatenko (1980) [8]. The main task of landscape studies for recreational needs involves, as O. Isachenko (1980) outlines, measuring the recreational potential of landscapes and investigating the influence of recreational pressure upon them [9]. P. Kavaljauskas (1974) is convinced that the essence of recreational analysis consists in the comparison of real and optimal properties of landscapes for the modelling and functioning of recreational territorial systems and thus the identification of the recreational potential of landscapes [10].

Assessing the recreational peculiarities of land in modern foreign studies is discussed in the context of environmental assessment and land use planning or in the evaluation process of certain territories for recreation needs. For example, the appraisal of several environmental resources such as water, cultural, biological, scenic, and visual resources, wild and scenic rivers are involved in the US federal land use plans [19]. Specific recreation assessments are presented in the investigations of P. Lattera and F. Weiland (2014) [25], J.-P. Pralong (2005) [23], Nuruddin and Ali (2013) [22], and J. Priskin (2001) [24]. Most of them stress on the essential role of natural factors and their variations in response to human activity.

The experience of successful and appropriate complex assessment of the recreational resources of landscapes can be also found in the physical-geographical studies of P. Kavaljauskas (1974) [10], V. Efros (2004) [7], I. Uliganets (2007) [16], and S. Dutchak (2004) [6]. Their majority have dealt with the assessment of landscape appropriateness for certain recreational activities.

In particular Efros (2004) believes that the selection of criteria for the recreational assessment of landscape (on the example of Moldova) is based on the direct dependence between the natural conditions and the types of recreational activity that are practiced in certain landscapes [7]. The most recent studies of recreation value types of river-based landscapes held by Nuruddin and Ali (2013) in Malaysia are based on the inventorization of geographical, physical, biological, aesthetic, and anthropogenic characteristics of river areas [22].

One of the latest complex methodologies in the national recreational studies is suggested by O. Beidyk (2001). It approaches a general assessment of recreational and tourist resources of Ukraine within administrative regions [1].

However, we consider the methodology of assessment of V. Matsola (1997) to be the most complex [12]. In this case the nature block is represented by the aesthetic evaluation of land, mineral water, forests, climatic conditions, water, and nature conservation areas. Maximal values of features within the territory of Ukraine are used as the basis for our own assessment. But the 3-point scale suggested by Matsola (where 3 points are assigned to the territories which are the most suitable for recreation, 2-medium, 1- unsuitable) does not fully describe all the regional and local differences of nature-related recreational potential. Thus, we suggest transferring the representative quantitative parameters of nature-related recreational properties into a 100-point scale.

In general, by analyzing the nature-related recreational components and the complex assessment studies in Eastern Europe, we have observed four trends of research. First, while assessing nature components, the main attention is paid to separate landscape features: heterogeneity, climate comfort, volume and features of balneological resources, convenience of water bodies, nature conservation and its variety. Furthermore, air temperature is considered to be a key value for defining comfort climatic conditions. The third tendency is connected to the emphasis on aesthetic landscape peculiarities as vital non-utility resources. And, finally, the fourth trend, mostly in Ukrainian studies, consists in the industrial assessment of faunistic resources.

The majority of modern assessment studies in recreational geography apply the method of score assessment. Thus, taking into account what has been analyzed before, we suggest that when assessing the nature-related recreational resources of landscapes, one should pay attention to the aesthetic traits, anthropogenic transformation, surface characteristics, climatic conditions, hydrological, balneological, forest resources, and nature conservation aspects.

Surface characteristics tend to be the basic and common for the majority of recreational evaluation works. Lattera and Weiland (2014) apply landscape metrics and campsite density for recreation potential assessment at large spatial scales in Argentina [25]. Elevation and surface criteria are used by Pralong (2005) to score scenic value of tourist potential and the use of geomophological sites in France and Switzerland [23]. It should be noted that the basis for the analysis of bio-meteorological conditions includes the recurrence of weather types that define a certain level of pressure on human thermoregulation mechanisms. Thus we should take into consideration a special classification of weather types known as the ASHRAE scale by De Freitas et al (2004) [21], which coincides with the Russian scales of Candror, Ratner, and Danilova (1980) [5]. According to the scales, in addition to comfort weather conditions, cold and hot subcomfort weather conditions also belong to the favourable recreational period.

The studies on the aesthetic value of landscapes, carried out by Zh. Buchko (2002) for the Chernivtsi Region [2], suggest that the highest aesthetic

value is characteristic to landscapes within areas with a very high level of landscape heterogeneity that include a combination of different local landscape types, different landscape regions. Well suitable for the identification of such places of nature heterogeneity concentration is the methodology of typological landscape heterogeneity [4], the map model of which identifies optimal territories for aesthetic contemplation. According to the previous studies of recreational water resources [12], [13], [16], [17], the biggest recreational value is attached to warm seas, lakes, large rivers with a water temperature of +17° C during 2-4 months. In the majority of recreational geographical studies, it is water temperature that is considered to be the key parameter for measuring the recreational comfort of water bodies. Forests, as the most favourable type of vegetation for recreation as well as nature conservation sites, are among the most important biotical recreational resources. We suggest that the recreational value of the resources should be defined by such parameters as woodiness, species structure and growth class, aesthetic properties, and marshiness. The high level of nature conservation influences the aesthetic quality, uniqueness, and naturalness of a territory. Thus, it is one of the most recognizable components of recreational attractiveness. Besides, nature conservation areas become marked places of recreational choice. Based on the above mentioned, we suggest a complex assessment of nature-related recreational potential of a territory which is the sum of scoring points of some quantitative parameters described above (for the components of complex assessment, see Table 1).

Table 1. The scheme of recreational assessment for landscapes (on the example of the Middle Dnister valley).

| No. | Components of complex assessment | Quantitative parameters | The value of 1 point | Maximal (including possible) values of parameters in the landscape regions of Ukraine |
|---|---|---|---|---|
| 1 | Anthropogenic transformation (Aa) | Coefficient Ka.t. | 0.1 | 10 |
| 2 | Assessment of aesthetical features (Aae) | Landscape heterogeneity | 0.25 of local landscape types | 25 |
| 3 | Territories with steepness of 0-5o (Ast) | The percentage of territories with steepness of 0-50 | 1% | 100 |
| 4 | Assessment of climate, resources (Ac) | Duration of favourable period | Every additional day of the minimal period for the territory of Ukraine (100 days) | 200 days |
| | | Duration of comfort period | The half of the every additional comfort day to the minimal duration for the territory of Ukraine (50 days) | 100 |
| 5 | Assessment of water for bathing and beach recreation (Aw) | Duration of period with water temperature higher than 17°C | Every additional day to the minimal period for the territory of Ukraine (70 days) | 170 days |
| 6 | Accessibility to water (Aac) | The percentage of open bank line | 1% | 100 |
| 7 | Assessment of mineral resources (Am) | The number of deposits and waterflows of mineral waters | 1 deposit or waterflow | 50 |
| | | Discharge flow | 20 $m^3$ per day | 1000 $m^3$ per day |
| 8 | Assessment of forest resources (Af) | Foresting | 0.5% of foresting | 50% |
| 9 | Assessment of nature conservation (An.c.) | The percentage of protected areas | 0.5% of territories with protected areas | 25% |
| | | The number of protected objects | 1 object | 50 |

## 3. RESULTS AND DISCUSSION

The first criterion to start the assessment of the recreational potential of a territory is the anthropogenic land transformation represented by the coefficient of anthropogenic transformation $C_{a.t.}$. The latter was suggested by P. Schyschchenko (1988) and varies from 0 to 10 [18]. Before starting the measuring

of the volume of nature-related recreational resources in any territory, it is necessary to establish the level of anthropogenic influence on them.

Consequently, it is reasonable to establish the level of transformation of natural landscapes, which either does not contribute to the growth of nature-related recreational potential (if $C_{a.t.}$ goes toward 10), or, on the contrary, enhances it (if $C_{a.t}$ is close to 0). Hence, the maximal values of the coefficient $C_{a.t}(10)$ will correspond to the minimal number of points (0) and the minimal hypothetic value of $C_{a.t}(0)$ will coincide with the largest score (100). Thus, in the conversion, 0.1 of $C_{a.t}$ will be equal to 1 point of assessment of anthropogenic transformation of any territory.

We use the values of typological landscape heterogeneity on the local level for conducting aesthetic landscape assessment. We consider the identification of landscape heterogeneity to be the key task of aesthetic recreational analysis of river-valley landscapes.

The method of a "swimming circle" with the radius of 10 km is applied. Taking into account the maximal amount of local landscape systems in the Carpathians – 25 (in general 100 points), we shall get the ratio of 1 type of local landscape being equal to 4 points of aesthetic value. It is obvious that not every river valley can be used for recreational activity. Valley landscapes should have the full set of parameters, one of which is steepness of banks.

The territories with slopes of 0-5° are the most convenient for recreational pastime. In particular, the relative size of areas with the defined optimal land steepness will be relevant in the assessment. For example, if along a river valley the bank slopes do not exceed 5° for 100% of the bank lines, such river landscapes will receive 100 points in the nature-related recreational potential assessment. In other words, 1% of the territory by 0-5° steepness (for the entire basin) is equal to 1 point score. Thus, the steeper the slopes (>5°), the lower the recreational potential (in points).

We consider the duration of the comfortable and the favourable period for the main parameters for the assessment of climatic resources. With reference to previous biometeorological studies [5], [18], we consider it appropriate to assess separately the duration of both periods using the 100-point scale.

Taking into account the national climatologists' assessments [5] and the latest climate trends, it should be noted that the number of days with comfort weather in Ukraine varies from 50 days in the Polissia lowland to 100 days in the Crimea, and the average duration of the favourable period – from 100 to 200 days. Correspondingly, every additional comfort day to the minimal value will be assessed by two points, and each day of the favourable period, starting from 101, by 1 point.

Since we have singled out the aesthetic properties as a separate block of assessment, it is reasonable to analyze separately the hydrological peculiarities for bathing and beach recreation, and mineral waters and springs as balneological resources, for a more detailed evaluation of landscape regions within river valleys. In particular, we consider water temperature to be an important parameter that determines the duration of the bathing season. Healthy people can bathe in water with a temperature not lower than +17°C.

The duration of the bathing season for a region under research is determined on the basis of the data of the State Water Cadastre and of the Ukrainian Hydrometeorological Institute. According to the latter, the number of days with a water temperature higher than +17°C in Ukraine varies from 70 to 170. Thus, each day of this difference should be evaluated by 1 point, reaching the maximum of 100 points.

Besides, we consider the openness of the bank line for visitors to be an important additional condition (provided the one described above). Thus, there is a need for the assessment of accessibility of water, which includes absence of anthropogenic obstacles (fences, buildings, agricultural land) and natural ones (forested, marshy areas, inflow of rivers) or of their location at no less than 10-15 m away from the water. If the bank line is fully accessible for visitors all along the valley (100% openness), such a bank territory will get 100 points. As the inaccessibility of banks grows (the accessibility of water goes towards 0%), the scoring value of accessibility will decrease (with meticulous measuring it will reach 0 points).

As for balneological resources, we suggest evaluating the deposit, the waterflow of mineral water and its discharge flow rate. So, every deposit and waterflow of mineral water will be awarded 1 point (with the maximal amount of 50) and springs with a discharge flow rate of 20 $m^3$ per day will also get 1 point. In case of a maximal discharge of 1,000 $m^3$ per day and more such a spring will achieve 50 points.

When investigating foresting, we take into account that maximal foresting in Ukraine reaches 50% in the Carpathian Mountains and it is scored with 100 points in the recreational assessment of forest resources.

That will represent the maximal value of forests in landscape regions of any local territory. So 1 point of recreational assessment will be equal to 0.5 % of foresting. We have also used the value of nature conservation and the number of protected areas as parameters of recreational attractiveness. In particular, if 25% of a territory is under protection, it is supposed to be maximal (optimal value for European countries). Taking into account such a value, 1 point will be equal to 0.5 % of territory under protection.

The remaining 50 out of 100 points of assessment will correspond to the number of nature conservation units (1 point – 1 unit).

Therefore, to summarize the above mentioned, it should be emphasized that the maximal possible total score of complex assessment of nature-related recreational potential with the above suggested components for river valleys will be of 1000 points.

We used the following formula for the mathematical visualization of the assessment:

$$A = A_a+A_{ae}+A_{st}+A_c+A_w+A_{ac}+A_f+A_m+A_{n.c.}$$

where:

$A_a$ – assessment of anthropogenic transformation;

$A_{ae}$ – assessment of aesthetic traits;

$A_{st}$ – assessment of territories with a steepness of 0-5°;

$A_c$ – assessment of climatic resources;

$A_w$ – assessment of water for bathing and beach recreation;

$A_{ac}$ – assessment of accessibility to water;

$A_f$ – assessment of forest resources;

$A_m$ – assessment of mineral waters;

$A_{n.c.}$ – assessment of nature conservation.

We applied the methodology of assessment of landscape-related recreational properties, evaluating 7 of them on the example of 10 recreational landscape regions within the Middle Dniester valley in Ukraine [16].

The fulfilled detailed recreational analysis of landscape components and of all landscapes as the nature-related conditions and resources reveals recreational comfort, uniqueness, heterogeneity of not only the entire landscape region of the Middle Dnister valley, but also spatial differences of the features within the region.

Based on the achieved total assessment score of the most important landscape-related recreational resources, we defined that nature-related recreational potentials of physical-geographical regions within the valley differed in both quantitative and qualitative parameters. Besides, when analyzing some landscape components, we noticed that their recreational properties differed in spatial and time scales.

The above mentioned assessment enables us to fulfil the spatial differentiation of the nature-related recreational potential not only for regional but also for local territories. The acknowledged differentiation of recreational traits of the Middle Dnister landscapes determines the main peculiarities and specific conditions of recreation organization and its infrastructure.

Furthermore, such an evaluation makes possible to suggest prospective ways of nature-related recreational utilization as the leading issue in the regional economy.

## 4. CONCLUSION

The analysis of the particularities for component-based and complex methodologies of assessment of recreational landscape resources enables us to distinguish the several key tendencies. First of all, heterogeneity, climate comfort, volume and features of balneological resources, water body comfort for bathing and beach recreation, the extent of nature conservation and its heterogeneity are evaluated in most of nature-related recreational studies. Secondly, air temperature is considered and still used in the Eastern-European studies as the only parameter for the assessment of climate comfort features. The most detailed attention to the aesthetic properties of landscape is paid in landscape studies, whereas industrial assessment of fauna and flora resources is still an important issue in national economic-geographical studies.

We consider climatic and hydrological resources, structure and heterogeneity of vegetation, aesthetic properties and nature conservation as non-utilitarian human resources to be the most important components of a complex recreational assessment of landscapes. The key quantitative parameters of the above mentioned features are converted into points. 100 is the maximal score for every component, that is equal to the maximal values within the territory of Ukraine. The suggested methodology can be applied to any landscape region of Ukraine or of another country.

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