Journal of Geology, Geography and Geoecology

Journal home page: geology-dnu.dp.ua

ISSN 2617-2909 (print)
ISSN 2617-2119 (online)

Journ. Geol. Geograph. Geology, 31(4), 749-760.
doi:10.15421/112270

Methodological scheme of qualimetric assessment of recreational clusters

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Received 21.01.2022;
Received in revised form 22.08.2022;
Accepted 09.09.2022

Abstract. The article deals with the application of qualimetric methods for assessing recreational and tourist potential on the example of an ecotourism cluster developed for natural and geographical and socio-economic conditions and resources of the Ukrainian Black Sea region. The properties of recreational and tourist potential can have different nature, different definitions, and be qualitative-descriptive, verbal, or quantitative (numerical). In qualimetric developments, properties should be comparable in the form of representation and magnitude of evaluation scales. The **aim** of the study is to develop a methodology for qualimetric assessment of recreational clusters. The theoretical and methodological basis is the fundamental principles and developments of recreational geography, tourism studies and qualimetry, as well as the author's own developments. In the process of writing, general geographical methods were used, such as descriptive, comparative geographical, and qualimetric assessment methods. Characteristics and properties presented in verbal form can be shown as structural combinations and compounds of simpler indicators. Factors that form the recreational and tourist potential have different weights (significance), which requires an appropriate assessment. The overall assessment of recreational and tourist potential is a weighted average value of all its components, taking into account their weight. The available absolute natural indicators of conditions and resources of recreational and tourist potential are also transformed into qualimetric estimates. The general methodological scheme for assessing recreational clusters, specified according to the conditions and resources of ecotourism of the Black Sea region is represented by seven stages – from structuring a recreational cluster according to its components and levels of hierarchical organization, calculating indicators of the weight of properties and calculating criteria for properties that form the corresponding quality, calculating qualimetric estimates for all primary units of recreational and tourist potential; a meaningful interpretation of the assessment of the recreational and tourist potential of a recreational cluster based on the criteria of properties and scales of the corresponding features and characteristics, as well as indicators of the weight of properties in the formation of recreational and tourist potential. The developed scheme should be considered as a methodological approach for the practical application of qualimetric assessments of recreational and tourist potential in recreational geography and tourism studies.

Keywords: recreational cluster, recreational and tourist potential, qualimetric assessment methods, weighting indicators.

Методична схема кваліметричної оцінки рекреаційних кластерів

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Анотація. У статті розглянуто питання застосування кваліметричних методів оцінювання рекреаційно-туристичного потенціалу на прикладі кластеру екологічного туризму, розробленого для природно-географічних та соціально-економічних умов і ресурсів регіону Українського Причорномор'я. Властивості рекреаційно-туристичного потенціалу можуть мати різну природу, різні розмірності, бути якісними – описовими, вербальними (словесними) чи кількісними (числовими). У кваліметричних розробках властивості повинні бути співставними за формою представлення та масштабністю оцінних шкал. **Метою** дослідження є розробка методики кваліметричного оцінювання рекреаційних кластерів. Теоретико-методологічною основою виступають фундаментальні положення та розробки рекреаційної географії, туризмознавства та кваліметрії та власні

напрацювання авторського колективу. В процесі написання були використані загально-географічні методи, такі як описовий, порівняльно-географічний, кваліметричні методи оцінювання. Характеристики і властивості, представлені у вербальній (словесній) формі, можна показати як структурні поєднання та комбінації більш простих показників. Чинники, що формують рекреаційно-туристичний потенціал, мають різну вагомість (значущість), яка потребує відповідної оцінки. Загальна оцінка рекреаційно-туристичного потенціалу являє собою середньозважене значення усіх його складових з врахуванням їх вагомості. Наявні абсолютні натуральні показники умов і ресурсів рекреаційно-туристичного потенціалу також трансформуються у кваліметричні оцінки. Загальна методична схема оцінки рекреаційних кластерів, конкретизована за умовами і ресурсами екологічного туризму Причорномор'я представлена сімома етапами – від структурування рекреаційного кластера за його складовими та рівнями ієрархічної організації, обчислення показників вагомості властивостей та розрахунки критеріїв властивостей, що формують відповідну якість, обчислення кваліметричних оцінок для всіх первинних ланок рекреаційно-туристичного потенціалу; змістовну інтерпретацію оцінювання рекреаційно-туристичного потенціалу рекреаційного кластеру за критеріями властивостей та шкалуванням відповідних ознак і характеристик та за показниками вагомостей властивостей у формуванні рекреаційно-туристичного потенціалу. Розроблену схему слід розглядати як методичний підхід для практичного застосування кваліметричних оцінок рекреаційно-туристичного потенціалу у рекреаційній географії та туризмознавстві.

Ключові слова: рекреаційний кластер, рекреаційно-туристичний потенціал, кваліметричні методи оцінювання, показники вагомостей.

Introduction

The transformation of tourism from leisure activities to the industry and even the sphere of economy raise the problem of economic assessment of its resources. Modern tourism science already considers the assessment of conditions and resources of recreational and tourist activity (RTA) as a mandatory component of the tourism economy, as a sector of the industry. At the same time, the lists of RTA factors are becoming more and more complex. Conditions and resources of recreation and tourism are characterized by a very large list of indicators that have different nature, different definitions and dimensions, can be quantitative (numerical) and qualitative (descriptive). For example, how to combine the value of archaeological artifacts and mineral water sources, the capacity of a beach, and indicators of the life quality the population and their income. Sometimes it seems that this problem cannot have a clear solution in principle. Although, this is not entirely true: requests for recreational and tourist activities indicate the need to develop it again and again. Comprehensive and integrated assessments of recreational potential are both necessary and possible. Almost the only promising way to solve this problem is a qualimetric assessment of RTA conditions and resources.

The problem of presenting qualitative characteristics and properties in quantitative form has a general scientific status. Since the middle of the last century, a new scientific direction has been developed – qualimetry as a study of the principles and methods of quantitative expression of qualitative indicators (Azgaldov & Kostin, 2011). Qualimetry methods are most widely used in psychology, sociology, merchandise, and recently have gained popularity in socio-economic research, physical education, and sports, as well as in assessing the quality of education (Annyenkova, 2012; Borysenko, 2018; Dmytrenko et al., 2016; Grygorash, 2014; Martynets', 2020). There are well-known examples of using qualimetric methods to assess the quality of tourist services, the attractiveness of regional tourist products, and the image of a tourist destination (Dzherelyuk, 2021; Ivchenko et al., 2008; Mel'nychenko, 2012; Puzikov, 2014; Serhyeyeva, 2013). Regarding the assessment of recreational and tourist potential, it can be noted that the few known researches of various authors present the assessment of RTA conditions and resources in fragments and scattered, without a general methodological justification and methodological schemes (Grinasjuk, 2017; Hudz', 2008; Vedmid', 2013).

Recreational and tourist potential (RTP) is a complex multi-component and multi-level (hierarchical) concept. The components of the RTP – its conditions and resources, consistently form integrative (intermediate) and integral (general) characteristics and indicators of its quality, according to the rules of the qualimetric hierarchy: the properties of the initial (base) level with their combinations determine the properties of the next level, and this integration of properties continues at all available hierarchical levels up to the zero level representing the overall quality of the RTP (Topchiev et al., 2022a). At the same time, specific RTP studies usually characterize and evaluate the typical combinations of different types and forms of recreation and health recovery of the population, along with the conditions and resources that ensure their functioning. Such combinations of several types of recreational and tourist activities, together with the conditions and resources they need, are called recreational clusters (Sych, 2019). In other words, recreational and tourist potential is a basic concept of the theory and methodology of tourism science, and the recreational cluster is its constructive and applied invariant.

In the development of recreational and tourist activities, the functional taxonomy of available and possible types and forms of RTA and the corresponding conditions and resources that ensure them is constantly compared. We are not talking about a general methodological scheme for assessing recreational and tourist potential, but about partial and fragmentary studies of its components. Similar to complex integral calculations, where mathematicians use «piecemeal integration», this direction is an estimate of RTP by its components. This direction is termed by the authors as an assessment of recreational clusters (Topchiev et al., 2021). Therefore, the aim of the study is to develop a methodology for qualimetric assessment of recreational clusters.

Materials and methods of research

The theoretical and methodological basis is the fundamental positions and developments of recreational geography, tourism studies and qualimetry, as well as the own developments of the author's team (Azgaldov & Kostin, 2011; Lobanov, 2013; Dmytrenko et al., 2016; Stafiychuk, 2007; Sych, 2019; Topchiyev et al., 2021; Topchiyev et al., 2022b; Tsyba, 2005; Velychko et al., 2015). In the process of writing, general geographical methods were used, such as descriptive, comparative geographical, and qualimetric assessment methods. When preparing the article, a systematic analysis was used, based on the principles of interrelation of all objects, phenomena, processes, and the stages of their research. The information base of the study was data from the National Atlas of Ukraine (National'nyy atlas Ukraininy, 2007), scientific publications on this topic by Ukrainian and foreign authors.

Results and their discussion

To obtain an appropriate quality assessment recreational and tourist potential it need to be formalized. The RTP graph («property tree» or «tree of goals» in qualimetric studies) is a complex hierarchical (multi-level) structuring of conditions and resources of recreational and tourist activities. Characteristics and properties presented in verbal form can be shown as structural combinations and junction of simpler indicators. The factors that form RTP have different weights (significance), which requires an appropriate assessment. The overall assessment of RTP is a weighted average value of all its components, taking into account their weight. The available absolute natural indicators of RTP conditions and resources are also transformed into qualimetric estimates.

With the introduction of the concept of «recreational cluster», it becomes possible to designate its initial formalization, which can later be considered as a primary structural unit, as an object of basic structuring and evaluation of RTP. As a basic unit of formalization and evaluation of RTP, we propose to consider the primary (elementary) cluster. It is represented by the corresponding graph, which shows a separate qualitative characteristic of RTP, compiled by several of its properties. In other words, the primary cluster is the simplest component of the RTP in the form of a separate qualitative indicator of the RTP and a set of properties of the underlying level that form it. According to this approach, the assessment of a recreational cluster is a purposeful and consistent assessment of its primary clusters, and the determination of the total potential of RTP is a qualimetric assessment of all its components – recreational clusters.

The methodology of qualimetric assessment of RTP of recreational clusters is considered on the example of an ecotourism cluster developed for the natural geographical and socio-economic conditions and resources of the Ukrainian Black Sea region. The general methodological scheme for assessing recreational clusters, specified by the conditions and resources of ecotourism in the Black Sea region, is represented by the following sequence of characteristics and actions.

1. At the **first stage**, determine the target guidelines for evaluating the recreational cluster, the available factual material and a set of methodological tools for solving the tasks set.

2. At the **second stage**, the cluster composition is characterized by the properties that form its RTP. The cluster should be structured according to its components and levels of hierarchical organization. Develop cluster formalization in the form of an RTP graph.

3. At the **third stage**, the RTP graph denotes elementary clusters that are subject to qualimetric evaluation; we are talking about identifying formalized combinations of properties and qualities of RTP according to the following norm: all features of RTP except initial (primary) are a combination of properties of the underlying level; the formalized structure that has such a composition – quality (level n-1) is formed by a set of properties (level n), in the future we consider as the ***primary link of evaluation (elementary cluster)***, and all calculations of the RTP assessment are developed according to such links.

4. At the **fourth stage**, for each elementary cluster, indicators of the weighting (significance) of properties that form the corresponding quality are calculated; indicators of weighting can have different numerical scales – fractions of a unit, scores of five -, ten – or hundred – point scales, but for qualimetric developments they must be standardized on a relative

scale – in fractions of a unit with a mandatory norm: the sum of all weights is equal to one.

5. **The fifth stage** is focused on calculating the criteria of properties that form the corresponding quality. Characteristics and indicators of RTP properties have different natures, different dimensions, can be quantitative (numerical) or qualitative (verbal, descriptive); at the same time, all properties have certain quantitative and qualitative gradations, which determine their greater or lesser participation in the formation of qualitative indicators of RTP. In practical developments of qualimetric estimates, they are terminated by ***evaluation criteria*** or ***property criteria***. The goal of this stage is to determine qualitative and quantitative gradations or intervals for all characteristic that form the qualities of RTP, and develop an appropriate scale of evaluation criteria. Note that this procedure is necessary for all primary links that make up the RTP graph.

6. At the **sixth stage**, it becomes possible to calculate qualimetric estimates for all primary RTP links using the formula:

$$O_к = W_1 K_1 + W_2 K_2 + ... + W_n K_n, \quad (1)$$

$O_к$ – the RTP estimate of the primary cluster;
W_i – the property weighting coefficients;
K_i – property criteria; n – number of composite property.

7. The **seventh stage** aims to provide a meaningful interpretation of the assessment of the RTP of a recreational cluster according to the criteria of property and scales of the corresponding features and parameters, as well as indicators of the property weighting in the formation of RTP. Estimates of recreational clusters can be ***individual*** – for specific clusters, or ***typological*** – for clusters of different types.

Formalized representation of the ecotourism recreational cluster. Graph of the RTP of the ecotourism cluster (Fig. 1) shows the interaction of its eight constituent properties. The choice of factors that form the RTP of such a cluster is determined by the authors working hypothesis, which takes into account the available scientific and practical developments of the corresponding properties and features of this cluster (Sych et al., 2018). It is clear that this example should be considered a primary element of the overall RTP of the region. In other words, the recreational and tourist potential of the ecotourism cluster is one of the many components of the overall RTP of the region, on the one hand, and it itself is composed of a certain set of properties of the underlying levels of RTP formalization. Assessment of a recreational cluster is carried out according to its position at a certain hierarchical level of the general RTP of the region, followed by taking into account its connections with relatively higher and relatively lower levels of RTP organization. On the RTP graph (Fig. 1) such relationships are shown by dashed arrows up – to the level of n-2, and down – to the level of n+1.

It should be noted that criterion indicators of properties are calculated on the corresponding scales, which translate qualitative (verbal) and absolute (physical) properties and features into relative qualimetric estimates.

Properties that form a recreational cluster are subject to qualimetric processing, which is carried out by various methods. The simplest method of ordering properties is ranking. Properties are distributed by rank – ordinal numbers provided by experts. According to the simplest approach, the estimates of various experts are averaged. According to the rank of properties, researchers develop appropriate gradations and scoring scales.

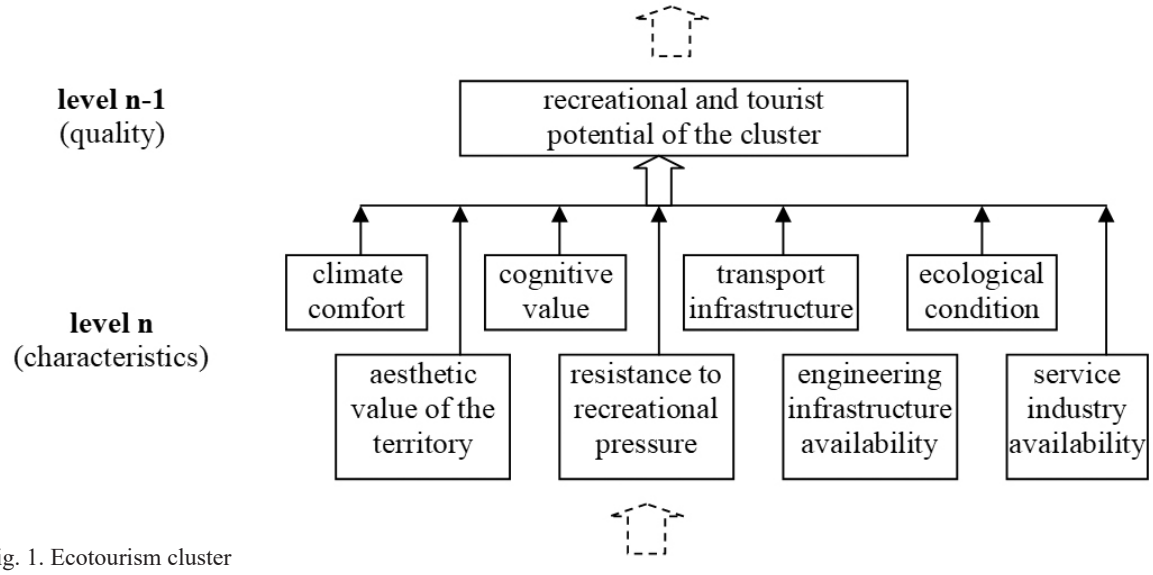

Fig. 1. Ecotourism cluster

The recreational and tourist potential of this cluster is calculated using the following formula:

$$O_к = W_1K_1 + W_2K_2 + ... + W_8K_8, \quad (2)$$

$O_к$ – qualimetric evaluation of the cluster;
W_i – weighting coefficients of i-th properties;
K_i – criteria parameter of properties.

According to the given example (Fig. 1) properties of the ecotourism cluster (climatic comfort – R1, aesthetic value of the territory – R2, resistance to recreational pressure – R3, cognitive value – R4, transport infrastructure – R5, availability of engineering infrastructure – R6, ecological condition – R7, availability of service industry – R8), received the following ranks from each of the experts:

Expert 1: R2> R4> R7> R3> R5> R6> R1> R8
Expert 2: R2> R7> R4> R3> R1> R8> R5> R6
Expert 3: R7> R3> R2> R4> R1> R6> R8> R5
Expert 4: R2> R4> R3> R7> R1> R8> R6> R5.

According to the generalized (ordinary) expert ordering, the property ranks are as follows:

R2> R7> R4> R3> R1> R6> R8> R5.

They can be considered as rating indicators of the significance of the corresponding properties of a given cluster. To quantify the weights of properties, it is necessary to compare this distribution with the Harrington scale and present the corresponding relative indicators of statistical significance of the properties. According to our example, such a comparison has the following form (Table 1).

Table 1. Indicators of statistical significance and ratings of properties of the ecotourism cluster

Properties	Rating	Statistical significance
R2	I	0.20
R7	II	0.18
R4	III	0.17
R3	IV	0.16
R1	V	0.10
R6	VI	0.07
R8	VII	0.06
R5	VIII	0.06

Using the direct ranking method, experts can determine the weight of characteristics and «directions» by assigning appropriate relative coefficients (weights) or points to different properties.

It is more meaningful to determine the weights of properties by **methods of qualimetric advantages**. Experts set ranks – ordinal numbers of properties of a given recreational cluster, which are represented in the form of a ranking matrix (Table. 2).

Table 2. Matrix of expert ranking of properties (R_{ij}) of the ecotourism cluster

Experts (*n*)	Properties, features (*m*)							
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	2	8	5	7	4	3	6	1
2	4	8	5	6	2	1	7	3
3	4	6	7	5	1	3	8	2
4	4	8	6	7	1	2	5	3
Sum of ranks ($\sum_j$)	14	30	23	25	8	9	26	9
Weight of ranks (W_i)	0.10	0.21	0.16	0.17	0.05	0.06	0.18	0.06
Deviation from the average sum of ranks (18)	-4	12	5	7	-10	-9	8	-9
Deviation squares (∑560)	16	144	25	49	100	81	64	81

The weight of properties is determined by the following algorithms:

- to calculate the sum of the ranks of each properties ($\sum_j$);
- to calculate the squares of deviations of such sums $(\Delta^2 j)$ from the average; to determine the sum of squares of deviations $(\sum_j \Delta^2 j)$;
- calculate properties weighting coefficients (W_i) as the ratio of the sum of ranks of an individual feature to the total sum of squares $(\sum_j R_{ij})$ to the total sum of squares of relations $(\sum_i \sum_j R_{ij})$;
- control of calculations – $\sum_i W_i \equiv 1{,}0$;
- evaluate the statistical consistency of expert opinions using the concordance coefficient (K):

$$K = \frac{12 \times S}{n^2\left(m^3 - m\right)}, \quad (3)$$

S – sum of squares of deviations,
m – number of properties,
n – number of experts;

In our example, the coefficient K=0.83, which indicates sufficient consistency of expert judgments and assessments. A common direction for ordering RTA conditions and resources is **the method of pairwise comparison** of properties, which for our example has the following algorithm for calculations:

- = a matrix of preferences for recreational cluster properties is compiled (Table 3), which indicates the dominance or subordination of properties: for each pair of properties, indicators of its advantages are shown (indicated by the number of the *i*-th property) or subordination (by the number of the *j*-th property).

Table 3. Average matrix of advantages of ecotourism cluster properties (experts agreed on their opinions)

Properties *(i)*	*(j)*								Number of advantages of the *i*-th feature, N_i
	1	2	3	4	5	6	7	8	
1	x	2	3	4	1	1	7	1	3
2	-	x	2	2	2	2	2	2	7
3	-	-	x	4	3	3	7	8	3
4	-	-	-	x	4	4	7	4	5
5	-	-	-	-	x	6	7	8	0
6	-	-	-	-	-	x	7	6	2
7	-	-	-	-	-	-	x	7	6
8	-	-	-	-	-	-	-	x	2

- = weighting coefficients are calculated using this matrix (W_i):

$$W_i = \frac{1}{n}\sum_{j=1}^{n} P_{ij}, \quad (4)$$

P_{ij} – frequency of preference for the j-th expert of the i-th property:

$$P_{ij} = \frac{K_{ij}}{C}, \quad (5)$$

K_{ij}- number of advantages of the j-th expert of the i-th property;

C – total number of judgments made by one expert:

$$C = \frac{m(m-1)}{2}, \quad (6)$$

m – number of properties.

Ordering the properties of a recreational cluster can be done using the preference method using the following algorithm:

1) Each expert makes a matrix of advantages (Table 4), in which the advantage of *i*-th property over *j*-th denotes the ordinal number of the *i*-th feature;

Table 4. Matrix of advantages of ecotourism cluster characteristics (first expert's judgment *)

Properties, (features)	1	2	3	4	5	6	7	8	Number of advantages of the *i*-th feature, N_i
1	x	2	3	4	5	6	7	1	2
2	2	x	2	2	2	2	2	2	14
3	3	2	x	4	3	3	7	3	8
4	4	2	4	x	4	4	4	4	12
5	5	2	3	4	x	5	7	5	6
6	6	2	3	4	5	x	7	6	4
7	7	2	7	4	7	7	x	7	10
8	1	2	3	4	5	6	7	x	0

**Note: such matrixes of advantages are developed by all experts. The results of expert assessments are used in further calculations, and the matrices themselves are not shown in the text.*

2) the maximum possible number of advantages of a single property from a single expert is:

$$N_{\max} = m - 1, \quad (7)$$

m – number of properties;

3) to calculate the property preference frequencies (Fi) using the formula:

$$F_i = \frac{N_i}{N_{\max}} = \frac{N_i}{m-1}, \quad (8)$$

Ni – number of advantages of the i-th property;

4) to calculate the weight indicators of properties based on the expression:

$$Wi = \sum_{i=1}^{m}\sum_{j=1}^{n}\frac{F_{ij}}{C}, \quad (9)$$

W_i – weighting coefficients of i-th property;

F_{ij} – property preference frequencies in the i-th expert j-th property;

C – total number of judgments made by one expert;

5) Indicators of the weights of properties of all experts are generalized and averaged (Table 5); using the concordance coefficient, statistical consistency of expert assessments is established.

Table 5. Pairwise comparison of the dominance-subordination ratio of properties (experts agreed on their opinions)

Properties (features)	1	2	3	4	5	6	7	8	Sum of advantages	Weights of properties
1	x	0	0	0	1	1	0	1	3	0.11
2	1	x	1	1	1	1	1	1	7	0.25
3	1	0	x	0	1	1	0	1	4	0.14
4	1	0	1	x	1	1	0	1	5	0.18
5	0	0	0	0	x	0	0	0	0	0
6	0	0	0	0	1	x	0	1/2	1.5	0.05
7	1	0	1	1	1	1	x	1	6	0.22
8	0	0	0	0	1	1/2	0	x	1.5	0.05

According to this method the weighting coefficients of the properties of the ecotourism cluster are ordered as follows:

$W_2 = 0.25$; $W_7 = 0.22$; $W_4 = 0.18$; $W_3 = 0.14$;
$W_1 = 0.11$; $W_6 = 0.05$; $W_8 = 0.05$; $W_5 = 0.0$.

Monitoring the correctness of calculations:

$\sum W_i = 1.00$.

An interesting methodological approach to determining indicators of property weights is borrowed from the factor-criterion method (Dmytrenko et al., 2016). The calculations are based on a pairwise comparison of properties on a conditional 10-point scale. The results of such comparisons in our example with the ecotourism cluster are represented by a matrix of advantages (Table 6).

Table 6. Matrix of advantages of ecotourism cluster properties (factor-criterion method)

Properties	1	2	3	4	5	6	7	8	Total points	Weight of properties (W_i)
1	X	3:7	2:3	2:5	5:2	3:4	4:8	6:4	25	0.09
2	7:3	X	8:4	8:6	8:1	8:3	8:7	8:2	55	0.21
3	3:2	4:8	X	3:4	7:3	7:4	4:7	6:2	34	0.13
4	5:2	6:8	4:3	X	8:2	8:4	7:8	8:3	46	0.17
5	2:5	1:8	3:7	2:8	X	1:3	1:7	1:2	11	0.04
6	4:3	3:8	4:7	4:8	3:1	X	3:7	2:7	23	0.09
7	8:4	7:8	7:4	8:7	7:1	7:3	X	7:2	51	0.19
8	4:6	2:8	2:6	3:8	2:1	7:2	2:7	X	22	0.08
Total points	25	55	34	46	11	23	51	22	267	-
Total	33	26	30	30	40	41	29	38	267	-

For each pair of properties, the ratio of their weights according to the expert assessment is written twice: for example, the first property is more significant for this cluster than the eighth in the ratio 6 : 4; therefore, the inverse ratio of the eighth property to the first in the preference matrix will be denoted as 4 : 6. For all properties, we calculate the sum of the preference points in rows (according to the first indicators of ratios) and in columns (according to the second indicators). The sum of the point estimates in rows ($\sum_j$) shows the weights of the corresponding cluster properties. Also, the sum of points in columns ($\sum_j$) characterizes the generalized ratio of all properties to *i*-th. We translate the indicators $\sum_j$ into relative (normative) estimates of the weight of properties (W_i). Indicators $\sum_j$ - the sum of points in columns that represent the statistical distribution of the total effects of all properties on its individual characteristics (properties). In this example, this direction was not considered.

According to the factor-criterion method, significance indicators – property weighting coefficients (W_i) of a given cluster are ordered as follows:

$W_2 = 0.21$; $W_7 = 0.19$; $W_4 = 0.17$; $W_3 = 0.13$;
$W_1 = 0.09$; $W_6 = 0.09$; $W_8 = 0.08$; $W_5 = 0.04$.

Monitoring the correctness of calculations:

$\sum W_i = 1.00$.

The second, seventh, and fourth properties form about 20% of the total potential of a given cluster each, while the third, first, sixth, and eighth properties form about 10%. The lowest contribution of the fifth property is 4%.

Calculation of criteria for the properties of an ecotourism cluster. The goal of determining the criteria for evaluating recreational clusters is to develop comparable gradation scales for various properties. RTP properties can have different nature, different dimensions, and be qualitative – descriptive, verbal, or quantitative (numerical) (Topchiev et al., 2020). In qualimetric developments, properties should be comparable in the form of representation and scale of evaluation scales. Traditionally, they take the form of corresponding estimates, which are represented in fractions of units or on conditional point scales. Various indicators of properties that form a recreational cluster should be differentiated by qualimetry methods first into qualitative gradations corresponding to verbal (descriptive) estimates of consumers, and then into relative evaluation scales that already give quantitative values of properties (Topchiev et al., 2022b). For such transformations, Harrington qualimetric scales are used (Harrington, 1965) and their simplified modifications in the form of point scales, mainly five -, seven -, and ten-point. They also use point scales of other dimensions, including hundred-point scales.

The traditional Harrington scale shows the statistical distribution of consumer demand into 5-6 gradations of quality (Table 7).

Table 7. Harrington desirability scale

Qualitative signs of demand corresponding to property gradations	Statistical demand intervals	Intersecting values
very high	1.0-0.81	1.0
high	0.8-0.631	0.80
average (satisfactory)*	0.63-0.371 (0.60-0.46)	0.64 –
low	0.37-0.21	0.37
very low	0.2-0	0.2
unsatisfactory	–	–

**) This gradation was introduced by individual researchers in addition to the main one.*

Authors suggest you pay attention to the asymmetric statistical distribution of demand for quality gradations of goods and services: high and low quality groups have relatively low consumer demand, which is explained by the high price of goods and services of higher gradations and insufficient quality of lower levels. This distribution can be considered a statistical norm of consumer demand for services of various quality and should be used in the development of point scales for evaluating RTA conditions and resources.

Point scales for ranking properties are set freely. In practical developments, the most common scales are five -, seven -, and nine-point. There are known examples of using three-point and even two-point scales to evaluate RTP. In Ukrainian resource science, one-hundred-point scales are also used, provided that they have a physical (quantitative) nature. For example, on a 100-point scale, a cadastral assessment of land is carried out by crop yield. There are also known examples of using hundred-point scales to evaluate the properties of RTP, which lack a natural quantitative basis. In this case, the points do not have operational properties and are not subject to mathematical and statistical processing. Their purpose is a relative quantitative comparison of properties without further statistical processing.

Authors proposed to consider the method of qualitative property scaling on the example of evaluating the RTP of an ecotourism cluster. The following properties are subject to scaling: climatic comfort (Table 8), aesthetic value of the territory (Table 9), resistance to recreational preassure (according to Kravciv at al., 1999) (Table 10), cognitive value (Table 11), transport infrastructure (Table 12), availability of engineering infrastructure (Table 13), ecological condition (Table 14), availability of the service sector (Table 15).

Table 8. Climatic comfort (according to (Stafiychuk, 2007) with changes))

Subjective feelings	Air temperature, ^{0}C	Relative humidity, %	Wind speed, m / sec	Points	Harrington score	Score on a 10-point scale
Comfortable	20-25	30-60	до 1-4	6	0.90	10
Cool, sub-comfortable	15-20	60-80	до 5-7	5	0.75	8
Sub-comfortable, hot	26-30	60-80	до 5-7	4	0.60	6
Uncomfortable, dry, hot	above 30	30-60	less 4	3	0.35	4
Uncomfortable, humid, hot	above 30	above 80	less 4	2	0.15	2
Cold, uncomfortable	below 15	above 80	more 7	1	-	0

Table 9. Aesthetic value of the territory

Assessment of the aesthetic qualities of the territory	Points	Harrington score	Score on a 10-point scale
High degree of exoticism and uniqueness, contrast, landscape design, change of landscapes	3	1.0	10
Moderate degree of exoticism and uniqueness; lack of contrast	2	0.7	7
Low degree of exoticism and uniqueness; flat, heavily wooded areas	1	0.3	3

Table 10. Resistance to recreational preaasure (in the warm season)

Assessment of recreational preassure	Points	Harrington score	Score on a 10-point scale
Areas by the sea	5	0.9	10
Mountainous areas	4	0.8	8
Hilly, high- lying areas	3	0.6	6
Flat, low-lying areas	2	0.3	4
Riverine areas	1	0.2	2

Table 11. Cognitive value

Distance from the object of the nature reserve fund or natural monuments	Points	Harrington score	Score on a 10-point scale
0-2	5	0.95	10
2-5	4	0.75	8
5-10	3	0.5	6
10-15	2	0.35	4
more than 15	1	0.1	2

Table 12. Transport infrastructure (transport availability)

Type of transport	Points	Harrington score	Score on a 10-point scale
motor-vehicle transport and railway transport	5	0.9	10
motor-vehicle transport	4	0.8	8
railway transport	3	0.6	6
river transport and sea transport	3	0.35	4
air transport	1	0.2	2
absent	-	-	0

Table 13. Provision of engineering infrastructure

Distance from the existing electrical network and water supply source	Points	Harrington score	Score on a 10-point scale
less than 1 km	5	1.0	10
1-2	4	0.85	8
2-3	3	0.63	6
3-5	2	0.37	4
more than 5 km	1	0.15	2

Table 14. Ecological state (distance from objects of high environmental danger)

Distance from high environmental hazards	Points	Harrington score	Score on a 10-point scale
more than 50 km	5	0.95	10
30-50	4	0.7	8
20-30	3	0.55	6
10-20	2	0.3	4
less than 10	1	0.15	2

Table 15. Availability of the service sector

The degree of formation of the service sector in the place of ecotourism activities	Points	Harrington score	Score on a 10-point scale
Full range of Services (information center, guides, accommodationvf, cafe, restaurant, routes, availability of information stands, places to relax, toilets)	5	1.0	10
Satisfactory set of services (there may be no information center or guides)	4	0.75	8
Reduced set of services (there may be no information center, equipped routes)	3	0.5	6
Minimum set of services	2	0.25	4
Single services	1	0.1	2

Tables contain qualitative gradations of properties, in some cases (Table 8) – their quantitative characteristics. Gradations are indicated by the author's point scores using different scales – three-, five – and six-point. These points correspond to relative quantitative scores on the Harrington scale, which are later translated into conditional 10-point scales. The latter transition aims to make property estimates comparable, since the original author's schools had different dimensions. The use of a traditional 10-point scale is intended to significantly facilitate the use of such ratings.

In the Ukrainian Black Sea region, the ecotourism cluster being investigated has an average July temperature of 22^{0}C, relative humidity in July – up to 62%, and wind speed from 3 to 4 m / sec in summer (National'nyy atlas Ukraininy, 2007).

Assessment of the aesthetic parameters of recreational clusters should be carried out taking into account the external landscape diversity. The most attractive border zones are: 1) river, lake – forest (park / garden); 2) forest – field / meadow; 3) water – field / meadow (Grinasyuk, 2017). Assessment of the exoticism of natural complexes characterizes the contrast of the studied territory in relation to natural complexes that are characteristic of the region as a whole.

Ecotourism databases on compliance with all necessary environmental requirements can be placed either on the territories of nature protection objects (zones of regulated anthropogenic activity), or in the immediate vicinity of them. To analyze this indicator, such elementary properties as the distance of a tourist base from of nature protection objects or a natural monument are used.

At the final stage of qualimetric assessment of the recreational cluster of ecotourism we have the following results:

1) the weighting coefficients of all properties (W_i) forming this cluster (W_i) were calculated; among several variants of estimates, the result was selected for further calculations using the factor-criterion method (Table 6);
2) calculated indicators of property criteria (K_i) on conditional ten-point scales (Tables 8-15);
3) the final model of qualimetric assessment of the ecotourism cluster ($O_к$) (for the Ukrainian Black Sea region) has the following form:

$$O_к = 0.21K_2+0.19K_7+0.17K_4+0.13K_3+0.09K_6+0.09K_1+0.08K_8+0.04K_5 \quad (10)$$

This formula already defines the weighting coefficients of properties, and the evaluation criteria (K_i) for specific ecotourism sites should be defined by the researcher. The presented model makes it possible to quantify any ecotourism objects within the region covered by it (Odessa region, the Ukrainian Black Sea region, coastal zones of Ukraine, etc.).

As already mentioned, this model shows the range (amplitude) of possible estimates of objects of recreational clusters of ecotourism. The worst scores correspond to clusters with the lowest values of the property criteria, and the best may correspond to clusters with the highest criteria. In our example, the cluster for which all indicators of the property criteria are maximal can have the highest score (O_{max}), i.e.

$$O_{max} = 0.21\times10+0.19\times10+0.17\times10+0.13\times10+0.09\times10+0.09\times10+0.08\times10+0.04\times10=10. \quad (11)$$

Accordingly, the lowest score (O_{min}) will have a recreational cluster with minimal criteria scores:

$$O_{min} = 0.21\times3+0.19\times2+0.17\times2+0.13\times2+0.09\times2+0.09\times0+0.08\times2+0.04\times0=1.95. \quad (12)$$

This means that according to the model of qualimetric assessment developed by authors, the RTP of the ecotourism cluster within the Ukrainian Black Sea region can have a score of 10 to 1.95 points – on a ten – point scale, or from 100 to 19.5-on a hundred-point scale. It is clear that this is the theoretical range of qualimetric estimates of RTP, which can actually be smaller, without extreme values.

To evaluate specific recreational clusters of ecotourism in the region, it is necessary to define quantitative estimates of property criteria for each object and substitute them into the developed model.

Conclusions

The given example of a qualimetric assessment of the RTP of a recreational cluster – an ecotourism cluster, requires a meaningful interpretation. It is clear that the results obtained are partial and fragmentary in nature, and their discussion is rather sketchy and simplified.

Firstly, a significant result of this development is the general methodological scheme for qualimetric assessment of recreational clusters. It should be considered as a methodological approach for the practical application of qualimetric assessments of RTP in recreational geography and tourism studies.

Secondly, the calculation of weighting coefficients for the properties of recreational clusters by various methodological means has shown that they have certain differences in the final results, on the one hand, but at the same time provide quite comparable estimates of the qualimetric significance of expert assessments. Using this example, we have several options for assessing the properties weight of an ecotourism cluster (Table 1; Table 5; Table 6). A meaningful analysis of the relevant developments allows you to choose the most correct assessment option.

Thirdly, the criteria for RTP properties have their own gradations – from the best indicators to the worst. Individual properties can have certain absolute and quantitative indicators along with qualitative gradations. In this case, to differentiate properties, you can use their intersecting quantitative indicators corresponding to the distribution areas of these clusters (site, region, country). According to the practice of qualimetric research, such intersecting regional standards are called criteria standards and quantitative gradations of properties are developed in comparison with such standards.

In the general methodological scheme for evaluating recreational clusters, we should mention the problem of numerical representation of qualimetric assessments. Recall that qualimetry is focused on the use of relative assessments: both the weighting indicators of properties and the coefficients of their estimates are usually calculated in fractions of a unit. At the same time, in practical qualimetric developments, the use of scales of other dimensions, in particular ten – and one-hundred-point, is widespread. From a technical point of view, changing the scales is very simple, and its need is explained by a simpler perception of integer ratings and scores compared to fractions of a unit. However, it is necessary to keep in mind the extremely limited efficiency of point assessments, which lack a real basis – physical indicators. Nevertheless, the results of qualimetric assessment in many cases are presented on point scales, which significantly facilitate the practical use of such indicators.

Calculating the criteria for qualitative gradations of properties has shown numerous methodological difficulties. The initial scaling of RTP properties by different authors retains a very high diversity and multi-scale of such approaches. The absolute scales

of RTP properties remain insufficiently justified and inconsistent. Gradations of qualitative indicators of RTP properties are obviously subjective and also require appropriate justifications. The use of author's point assessments in methodological developments in most examples is too schematic and simplified. Nevertheless, the qualimetric transformation of such estimates into quantitative indicators (on the Harrington scale) currently remains almost the only constructive direction for evaluating RTP.

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