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ANALYTICAL EVALUATION OF THE PROSPECTS FOR SUSTAINABLE DEVELOPMENT OF ENVIRONMENTALLY ORIENTED TOURISM BUSINESS

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Abstract. The purpose of the article is to study the features of the development of the regions of Ukraine, the formation of a model of sustainable development of ecotourism. The bibliographic method made it possible to study the basic concepts, controversial and problematic issues, as well as the experience of solving them, proposed by scientists from different countries in this area of research. The analysis of efficiency has revealed the most competitive regions of Ukraine for conducting an environmentally oriented tourism business. The correlation and regression analysis results showed that the coefficient of determination R-square indicates a 94% correlation between the studied indicators. The growing dynamics of the number of subjects of tourist activity in Ukraine is noted. The primary data for cluster analysis were preliminarily formed, the presence of advantages and risks (anthropogenic effects) in 24 regions was determined, and promising directions for the development of ecotourism were identified. Cluster analysis, carried out using IBM SPSS software, determined the Euclidean distance and grouped the analyzed regions of Ukraine into clusters with the most similar characteristics. As a result of the study, the author's vision of the essence of ecotourism, the logic of applying the methodology of cluster analysis was substantiated. The hypothesis about the influence of cultural heritage sites on the number of tourists was refuted. Some recommendations are given for further improvement of the quality of ecotourism development as a priority direction in the formation of sustainable development. The study's practical significance lies in the fact that the results of the work carried out can be used as reference material for those studying the topic.

Keywords: ecotourism, sustainable development, business, efficiency, infrastructure, cluster model, Ukraine.

JEL Classification: H54, L83, Q55, Q57.

Introduction

The global transformations associated with the impact on the environment caused by the consequences of human activities stimulate the search for options for the preservation of ecology and biological diversity in their rational combination with the tourism sector. Ecotourism in world practice is considered as one of the promising areas of the tourism industry focused on political, environmental, economic, technological, social, and cultural potential. The main goal is to contribute to the preservation and development of protected areas, draw attention to the cultural and historical heritage, and form environmental awareness. However, ecotourism is possible only under the condition of its limited impact on the environment, which requires increased attention to the problems and the search for prospects of the development of ecotourism infrastructure, which creates an increased demand for the quality of services in the consumer preferences. Lacitignola et al. (2007) in their descriptive model of tourism-based socio-ecological systems, consider tourist resorts as socio-ecological systems and tourism as a development tool.

In turn, the developed infrastructure is the foundation of the socio-economic development of the regions and the sustainable development of the country as a whole. Ukraine, like most countries interested in the development of environmentally friendly tourism business, should use its advantages by analyzing its own prospects

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and successful experience of more developed countries. Positive dynamics of the number of subjects of tourism activity in Ukraine in 2014–2020 can serve as an assumption about an increase in demand for tourism services and a basis for studying the competitiveness of regions.

The aim of the research is to study the advantages of the regions of Ukraine for the development of ecotourism as a component of economic, social, and environmental sustainability; one of the largest sources of export, which is part of the conceptual framework for the development of the country's strategic potential.

The implementation of this goal made it necessary to solve the following tasks: to generalize theoretical approaches to defining the essence of the concept of ecotourism; to substantiate a scientific approach to the application of the cluster analysis methodology; to analyze the economic efficiency of ecotourism using correlation and regression analysis; to test the hypothesis about the influence of the number of UNESCO World Heritage sites on the number of tourists; to determine, using cluster analysis, the regions of Ukraine with the most similar qualitative characteristics for the development of ecotourism. Based on the results of the study, to form conclusions and recommendations for improving the quality of ecotourism development, taking into account national characteristics.

1. Theoretical background

In the scientific literature, you can find various opinions in the study of the prospects for sustainable development of environmentally oriented tourism business, each of which is based on national, geographic, political, and other characteristics.

Natural features, according to Farrell and Runyan (1991), provide attractiveness all over the world, and tourism managers promote ecotourism and sustainable development by encouraging tourism to help preserve and enhance the integrity and attractiveness of the environment.

Weaver (2002), Weaver and Lawton (2007) characterizes ecotourism as tourism that is based on the protection of natural habitats, is oriented towards learning, and is designed to be environmentally, economically, and socio-culturally sustainable. Butcher (2008) in his study considers ecotourism as a form of life policy focused on the social, legal, and environmental spheres of domestic policy, as well as a foreign policy that seeks to improve the lives of people in other countries and contribute to sustainable development.

Shi et al. (2019), studying the hidden potential of mass integrated ecological tourism, according to a survey among visitors to protected areas in China, mark this direction as a tool for creating an ecological civilization, relying on distinctive Chinese trends in the field of outdoor recreation and ecological tourism. In a study by Wu et al. (2020), ecotourism is the result of promoting the harmonious coexistence of man and nature, which also indicates both a new concept of tourism and ecological ideas reflected in the recreational behaviour of tourists. The authors defend an idea of enjoyment of nature without destroying the environment, which, in fact, stem from the concept of man's return to nature.

Higham and Lück (2007) consider ecotourism to be a travel phenomenon, filled with controversy and paradoxes, among which they distinguish: tourism and nature conservation, ecotourism as a form of entertainment, transportation of ecotourists to places, the incessant search for untouched areas, and much more.

Here are several opinions of researchers who study fundamentally different parts of the world, but at the same time have common assumptions. Examining the development of the ecotourism industry in Africa, Mbaiwa (2017) writes that the area is dominated by foreign safari companies and investors, leading to the repatriation of tourism revenues, lower wages for civil servants, and notes that tourism does not make a significant contribution to the development of rural areas due to the lack of links with the domestic economy. Gaston (2020) notes the growth of ecotourism in the Arctic, which poses a threat to bird reproduction due to the simultaneous interference of aircraft, liners, and people in the colonies and nesting places of birds. Mkono (2020), examining modern trends in current public debate on the environment, points to the need for increased attention to the psychological and socio-cultural dynamics of the discussion.

A number of scientists consider ecotourism from the point of view of the possibility of acquaintance with nature and places not affected by human activity and consider this direction quite attractive for investors. This position is critically assessed by researchers, who argue that the massiveness of tourist flows to protected areas of nature can harm the environment and destroy the naturalness of such zones.

González et al. (2021) define tourism as the oldest activity, with an acquired economic component in the twentieth century, while noting that for countries with a high level of an economy, tourism practice is part of the basic needs of their inhabitants, and for underdeveloped countries, it becomes an obligation for economic development. Choi et al. (2021) believe that the application of systems thinking is inextricably linked to the planning of an ecotourism system for intelligent resource management based on the principles of sustainability.

According to the authors, rational behavior should be based on the adoption of alternative solutions that satisfy all the interacting parties of the participant in the environmentally oriented tourism business, without prejudice to each of them, which requires a balanced approach towards harmonization. Summarizing the theoretical approaches, let us define the author's vision of the essence of the concept of ecotourism. Thus, ecotourism is an integral part of a civilized society, a product of evolution, including a meaningful, careful consideration, with the self-determination of the role of each individual in the preservation of biodiversity. At the same time, ecotourism is a product of market relations, with a growing demand for tourist services, which should be clearly regulated, defining the

leading economic, social, environmental role of the state, designed to bring the national economy to a differentiated high level. At the same time, ecotourism is a technology used to accumulate, form, and convert potential resources into real ones, on the way to sustainable development.

With the development of tourism activities, it becomes necessary to overcome various obstacles, especially those associated with adequate training of human resources at all levels as well as the controlled preparation of the infrastructure for the reception of tourism, the need to control the provision of adequate profitability, to maintain the socio-economic development of the country, without changing or denaturing the environment (Ruschmann, 1992).

According to a study by Kanwal et al. (2020), the perceived benefits of tourism and community satisfaction play a mediating role in comparison to the perceived positive impact of community support for tourism. Lesik (2019) notes that the implementation of development prospects is possible in close interaction between political, socio-economic, environmental, and other components. Definitely, the presence of a developed infrastructure is an undeniable priority that creates the necessary conditions for the implementation of a sustainable development strategy.

The tourist infrastructure is represented by the manufacturing sector and the service sector. Among the designated areas, as elements of infrastructure support, the following can be considered: subjects of tourism and excursion activities, objects, and the content of relations between them (transport, accommodation, food, recreation, and much more). The higher the level of infrastructure development, the more prospects the environmentally oriented tourism business has. Tourism, as a trade-in service, is one of the four largest global sources of export, and tourism development is impossible without adequate infrastructure support, therefore, the study of the prerequisites for the formation of a competitive ecotourism infrastructure in Ukraine should become one of the priority areas on the path to sustainable development.

The European Charter for Sustainable Tourism in Protected Areas (2010) is a practical management tool to enable protected areas to develop tourism sustainably. It combines the following principles: priority of protection, contribution to sustainable development, effective planning of sustainable tourism, continuous improvement.

2. Methodology

Many indicators for determining the similarities or differences between comparable objects, in the works of different authors are displayed in the application of the methodology that is able to achieve the desired result, where possible. The authors, looking at infrastructure capabilities, first conducted exploratory factor analysis (EFA) to test load factors that match scales (Mamirkulova et al., 2020). Lesik et al. (2020) assess the effectiveness of infrastructure development, using the Data envelopment analysis (DEA) method, which made it possible to assess the level of the current state of the infrastructure, which provides the industrial and social dimension of its sustainable development. Ohunakin et al. (2020) used descriptive statistics, confirmatory factor analysis (CFA), structural equation modeling (SEM) among other methods. In their study, Huertas et al. (2020) propose an LTS based classification with two components: a clustering component and an interpretation component. Edwards and Cavalli-Sforza (1965) describe a method for investigating point ratios in multidimensional space. Using the ANOVA method (analysis of variance), the points are split into the two most compact clusters, and the process is repeated sequentially to form a "tree" diagram. The SPSS software proposes a two-step clustering method. According to a study by Bacher et al. (2004) SPSS two-step clustering, which is assessed by simulation, can handle mixed-type attributes and automatically determine the number of clusters.

The cluster approach to the formation of a model of sustainable development of ecotourism has a number of advantages since in the presence of a cluster, marketing structures can be formed, created in order to implement the functions of marketing support for the activities of enterprises, taking into account the infrastructure of the tourist services market. The application of cluster analysis has found its reflection in the works of researchers studying ecotourism, problems, and prospects for its development on the way to sustainability.

Hvenegaard and Dearden (1998), when studying ecological and other types of tourism, used cluster analysis, along with other methods. To better understand the psychology of tourists, Inbakaran and Jackson (2006), used cluster analysis to examine differences in attitudes across population groups and the implications for the tourism industry. Wallner et al. (2007) in a comparative description between the UNESCO Biosphere Reserve (UBR) and the Carpathian Biosphere Reserve (CBR), consider the cluster as a potential opportunity for the development of regional ecological tourism. In his work, Yildiz (2014) assessed the economic prospects of Turkey using cluster analysis, where, to measure the similarity, between the countries under study, he compared various measurement indicators, and among others, the following were considered: the state of the environment, infrastructure, and the financial sector. The results allowed the author to identify the potential and promising growth of the country's economy. Cluster analysis, based on a cluster model, has been used to classify countries according to their statistical differences in environmental sustainability and tourism growth across country clusters (Pulido-Fernández et al., 2019).

The methodology, as a tool for analytical assessment, comparative characteristics, a grouping of objects according to various criteria, is used by many authors in the study of economic, social, environmental development prospects, but this does not exclude the possibility of their further study. The widespread use of cluster analysis characterizes it as a relevant method for studying, proposed by the authors of the data set. The scientific and practical application of cluster analysis is associated with the

transition from a static cluster to an actual cluster, taking into account national characteristics.

The non-linear impact of World Heritage properties on tourism development in China and the generation of tourism revenue, studied by Lin et al. (2020), formed the basis of our hypothesis about the influence of the number of objects on the number of tourists in Ukraine.

We used correlation-regression analysis to study the efficiency of the ecotourism sphere, with the help of which the relationship between income and expenses was determined, the accuracy of assumptions was checked using analytical data and the efficiency of individual regions of Ukraine was determined.

The dependency model is:

$$y = f(x) + u, \tag{1}$$

where y – expenses; x – income; f – a function that explains the strength and form of influence of x on y; u – other factors of influence on y.

In a linear function, the simple linear regression equation takes the form:

$$Y = b_0 + b_1 x + u, \tag{2}$$

where b_0, b_1 – are constants that determine the form of the linear equation.

One of the main indicators, which is a measure of a linear model and indicates its quality, is the R-square:

$$R^2 = \frac{\sum(\widehat{\widehat{y_x}} - \overline{y})^2}{\sum(y - \overline{y})^2}. \tag{3}$$

The linear system assumed in factor analysis is such that the user can identify the resulting covariance structure without error if the underlying factor loadings are known (Kim & Mueller, 1978).

Each individual of a multivariate sample may be represented by a point in a multidimensional Euclidean space. Cluster analysis attempts to group these points into disjoint sets which it is hoped will correspond to marked features of the sample. Different methods of cluster analysis of the same sample may assume different geometrical distributions of the points or may employ different clustering criteria or may differ in both respects (Gower, 1967). Kaufman and Rousseeuw (1990) believe that cluster analysis can be used not only to identify a structure already present in the data, but also to impose a structure on a more or less homogeneous data set that has to be split up in a "fair" way. Ferrari and Comelli (2016) provide directions to behavioral scientists dealing with clustered binary data and small sample sizes. Euclidean distance matrices corresponding to an arithmetic progression have rich spectral and structural properties (Zubaedah et al., 2020).

Euclidean distance, which acts as a measure of similarity and is, in fact, a geometric distance in multidimensional space, is determined by the formula:

$$\text{distance } \tilde{o}y = \left\{\sum_i (x_i - y_i)^2\right\}^{\frac{1}{2}}. \tag{4}$$

The K-means clustering algorithm is efficient in producing tight clusters, it requires a prespecified number of clusters as input, and the performance of this clustering algorithm mostly depends on this specification (Hasan & Duan, 2015). Among the cluster analysis methods studied by the authors, it was decided to use the Ward method, as the most optimal, which is focused on creating clusters of the same size. A hypothesis of 5 clusters was also put forward, which was tested using the K-means method, where K is the number of clusters equal to 5.

3. Results

We began an analytical assessment of determining the prospects for sustainable development of ecological tourism by studying the quantitative composition of the category of subjects of tourism activity in Ukraine (legal entities and individuals) at the beginning of 2014–2020, including tour operators, travel agents and subjects carrying out excursion activities (Table 1).

Analytical indicators for 2020 show an increasing trend in the number of tourism subjects in 15 regions of the state. Compared to 2014, the lowest rates are shown by the Donetsk region and the Luhansk region, where hostilities have not yet ceased. The largest decrease in the number of tourist activity subjects is observed in Zaporizhzhia (–39%), Chernivtsi (–35%), Kharkiv (–27%) regions. The largest increase in the number of tourist activity subjects can be observed in Sumy (+80%), Kyiv (+72%) Lviv (+54%) regions.

The quantitative advantage that remains for the Dnipro (429 units) and Lviv regions (420 units) is explained by the fact that these regions have rather large cities with a developed infrastructure, which clearly demonstrates the requests for tourist business services.

To assess the prospects for the formation of a sustainable development model for an environmentally oriented tourism business, an important indicator is economic efficiency, which can be calculated using the formula:

$$RS = \frac{NI}{AI} \times 100\%, \tag{5}$$

where RS is profitability of sales, *NI* is net profit, *AI* is all income from sales of travel services.

Let us consider the efficiency of 24 regions of Ukraine using the initial data, regions are grouped by the expenses of the subjects of tourism activity on the services of third-party organizations used in the production of a tourism product and income from the provision of tourism services (excluding VAT, excise taxes and similar mandatory payments) at the beginning of 2020 (Table 2).

According to the analysis of the data, there is a reason to conclude that the model reflects a really existing pattern. Among the 24 regions, there is not a single one in which expenditures exceed revenues, which may indicate not only the break-even of the tourism business but also its prospects. Not every region has the same performance

Table 1. Number of subjects of tourist activity, units (source: calculated by authors based on State Statistics of Ukraine: Tourism. Statistical bulletin. Tourist activity in Ukraine (2013–2019))

No	Regions	For the beginning of the year							2020 to 2014,%
		2014	2015	2016	2017	2018	2019	2020	
R1	Vinnytsia region	76	69	63	68	69	87	89	117
R2	Volyn region	85	80	68	69	66	74	96	113
R3	Dnipro region	487	324	294	322	325	416	429	88
R4	Donetsk region	355	84	23	33	42	93	96	27
R5	Zhytomyr region	58	44	47	56	47	63	68	117
R6	Zakarpattia region	82	74	67	65	63	91	87	106
R7	Zaporizhzhia region	250	231	140	161	160	188	153	61
R8	Ivano-Frankivsk region	112	99	83	107	105	128	124	111
R9	Kyiv region	134	104	90	119	116	217	231	172
R10	Kirovohrad region	70	56	46	47	43	54	72	103
R11	Luhansk region	225	15	11	19	17	29	46	20
R12	Lviv region	272	235	221	272	282	342	420	154
R13	Mykolaiv region	75	65	60	69	63	87	85	113
R14	Odesa region	302	249	245	268	264	270	292	97
R15	Poltava region	130	110	91	88	93	155	150	115
R16	Rivne region	78	69	59	66	60	93	116	149
R17	Sumy region	59	51	53	57	58	79	106	180
R18	Ternopil region	70	49	43	53	45	63	94	134
R19	Kharkiv region	358	309	264	255	263	266	261	73
R20	Kherson region	69	70	53	72	67	80	82	119
R21	Khmelnytsk region	100	84	78	89	90	89	88	88
R22	Cherkasy region	99	82	75	86	92	101	112	113
R23	Chernivtsi region	121	68	65	66	65	77	79	65
R24	Chernihiv region	59	57	55	51	51	58	58	98

Table 2. Initial data for calculating the efficiency of income and costs of tourism entities, UAH million (source: calculated by authors based on State Statistics of Ukraine: Tourism. Statistical bulletin. Tourist activity in Ukraine (2013–2019))

No	Regions	Revenues	Expenses	PS, %	No	Regions	Revenues	Expenses	PS, %
R1	Vinnytsia region	54.6	7.7	85.9	R13	Mykolaiv region	19.0	0.4	97.7
R2	Volyn region	33.2	6.3	81.0	R14	Odesa region	220.5	94.5	57.2
R3	Dnipro region	119.9	26.2	78.2	R15	Poltava region	28.8	2.5	91.2
R4	Donetsk region	23.0	11.8	48.7	R16	Rivne region	34.2	15.3	55.4
R5	Zhytomyr region	15.3	2.3	85.2	R17	Sumy region	18.0	7.8*	56.5
R6	Zakarpattia region	34.9	19.1	45.2	R18	Ternopil region	21.8	1.0	95.2
R7	Zaporizhzhia region	53.5	3.2	94.1	R19	Kharkiv region	106.3	32.1	69.8
R8	Ivano-Frankivsk region	345.0	326.5	5.4	R20	Kherson region	58.2	4.8	91.8
R9	Kyiv region	126.0	80.1	36.4	R21	Khmelnytsk region	16.5	6.3	61.8
R10	Kirovohrad region	16.6	4.8*	70.9	R22	Cherkasy region	47.4	23.2	51.1
R11	Luhansk region	12.0	7.7	36.0	R23	Chernivtsi region	28.9	25.5	11.8
R12	Lviv region	655.6	437.3	33.3	R24	Chernihiv region	13.5	6.9*	48.8

Note: *preliminary data.

indicators, which is quite logical from the point of view of the availability of initial data: geographical location, the presence of objects of historical heritage, the presence of border areas, access to the sea coast, and much more, which makes each region attractive to tourists. The indicator of economic efficiency of the business identified areas with high levels of profitability, including the Mykolaiv region (97.7%), Ternopil region (95.2%), Zaporizhzhia region (94.15), and the lowest indicators of Ivano-Frankivsk region (5.4%), Chernivtsi region (11.8%).

Table 3. Regression statistics (source: calculated by the authors using correlation-regression analysis)

Index	Value
Multiple R	0.967248022
R-square	0.935568737
Normalized R-square	0.932640043
Standard error	37.26753614
Observations	24

Table 4. Analysis of variance (source: calculated by the authors using correlation-regression analysis)

Index	df	SS	MS	F	Significance F
Regression	1	443673.0991	443673.1	319.4491	1.37747E-14
Remainder	22	30555.1235	1388.869		
Total	23	474228.2226			

We investigate the efficiency using the initial data (income and expenses) using regression analysis (Tables 3–4).

The calculated coefficient of determination R-squared indicates a 94% relationship between the studied indicators.

The coefficient "Y-intersection" indicates what the value of Y will be, with all the variables of this model equated to zero (Table 5).

The coefficient of the variable X1 indicates that the expenses of the subjects of tourism activities on the services of third-party organizations used in the production of a tourism product within the framework of this model affect the income from the provision of tourism services with a weight of 0.935. Using the final linear regression formula, we consider the efficiency of the studied 24 regions of Ukraine (Figure 1).

The data obtained clearly demonstrate the gap in efficiency indicators between the regions of the country, some of which have some advantages over others in the development of the tourism business. Lviv, Ivano-Frankivsk, Ternopil regions are part of the most densely populated, bordering territories with historical heritage and state borders with Poland and Romania, therefore their performance indicators differ significantly. Also, Ukraine has border regions with Belarus, Hungary, Moldova, Russia, and Slovakia, but none of these directions is as effective as the above-mentioned regions of Ukraine.

We continue to assess the prospects of Ukraine in the international market of tourist services, assuming that the development of the tourism industry depends on the presence and number of UNESCO World Heritage sites (Table 6).

Table 5. Linear regression result (source: calculated by the authors using correlation-regression analysis)

Index	Coefficients	Standard Error	t-statistic	P-Value	Lower 95%	Upper 95%
Y-intersection	25,05325516	8,373929287	2,991816	0,006721	7,6867	42,4197
Variable X 1	1,301980459	0,072845646	17,87314	1,38E-14	1,1509	1,4530

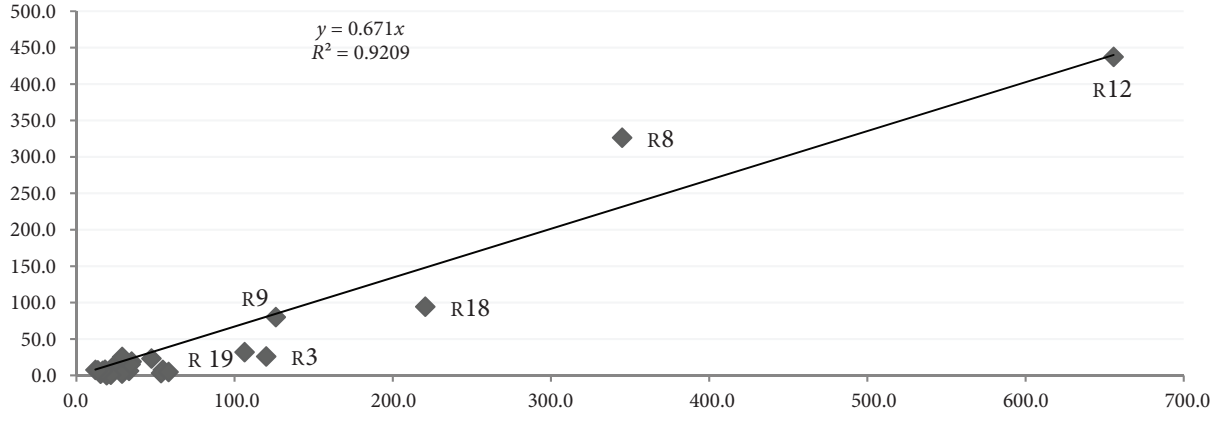

Figure 1. Final linear regression formula (source: built by the authors using graphical analysis)

Table 6. Sample TOP-100 The most popular travel countries (source: formed by the authors based on Statista (2019), WorldData (2019)

Rank TOP-100	Country	The number of UNESCO	Number of tourists (m)	Receipts (bn $)	% of GNP	Receipts per tourist ($)
5	Italy	55	61.57	51.60	2.5	838
1	France	45	89.32	73.13	2.6	819
10	United Kingdom	32	36.32	48.52	1.7	1.336
16	Russia	29	24.55	18.67	1.1	760
48	Sweden	16	7.44	14.93	2.7	2.006
12	Austria	10	30.82	25.41	5.6	825
56	Norway	8	5.69	7.10	1.6	1.248
31	Ukraine	7	14.10	2.27	1.7	161
86	Slovakia	7	2.26	3.32	3.1	1.471
72	Finland	7	3.22	5.66	2.1	1.757
94	Serbia	5	1.71	1.92	3.8	1.123
61	Slovenia	4	4.43	3.38	6.3	763
83	Iceland	3	2.34	3.13	12.15	1.335
90	Latvia	2	1.95	1.06	3.1	543

We carried out a comparative characteristic on the example of 14 countries with a different number of UNESCO World Heritage sites that could attract tourists in 2018. From the data presented, we see that France, which is the absolute leader in the number of tourists (89.3 million), has 10 UNESCO World Heritage Sites less than Italy. Also, income from tourism in France is 21.53 bn $ more than in Italy. At the same time, the tourist receipt in Austria exceeds the tourist receipt in France by $ 6. Of these countries, the largest amount is spent by a tourist in Sweden, the smallest is the number of a tourist's expenses in Ukraine. The largest percentage of GDP belongs to Iceland and it is 12.15%, the smallest one (1.1%) in Russia. Comparing the above indicators, we can conclude that the number of UNESCO World Heritage Sites does not directly affect the number of tourists.

The development of ecological tourism can be significantly influenced by qualitative indicators, therefore, to assess the prospects for its development, the authors proposed the use of positive and negative selection criteria in 24 regions of Ukraine at the beginning of 2020 for cluster analysis. The following were classified as positive: the number of cultural heritage sites of national importance (a), the number of objects of the nature reserve fund (b), negative factors that determine the risks for environmentally oriented tourism business: emissions of pollutants into the air from stationary sources of pollution (thousand tons) (c), generation of I-III hazard class waste (thousand tons) (d). The obtained results of measuring the quality indicators are listed in Table 7.

Table 7. Results of measuring indicators of influence on the development of ecological tourism (source: grouped by the authors on the basis of official data: State Register of Immovable Monuments of Ukraine (2020), Ministry of Ecology and Natural Resources of Ukraine (2020), State Statistics Service of Ukraine (2019)

Regions	Positive factors				Negative factors			
	a		b		c		d	
	units	%	units	%	thousand tons	%	thousand tons	%
Vinnytsia region	28	4.38	229	2.6	99.7	4.09	1	0.18
Volyn region	23	3.59	205	2.3	5.3	0.22	0.9	0.16
Dnipro region	24	3.75	805	9.2	576.9	23.67	31.9	5.81
Donetsk region	14	2.19	410	4.7	773.5	31.74	147.3	26.85
Zhytomyr region	16	2.50	276	3.2	12.7	0.52	1.2	0.22
Zakarpattia region	15	2.34	196	2.2	3.7	0.15	0.7	0.13
Zaporizhzhia region	12	1.88	214	2.5	173.4	7.12	16.4	2.99
Ivano-Frankivsk region	31	4.84	123	1.4	205	8.41	5.8	1.06
Kyiv region	38	5.94	443	5.1	84.4	3.46	1.9	0.35
Kirovohrad region	6	0.94	471	5.4	12.8	0.53	3.7	0.67
Luhansk region	19	2.97	219	2.5	37.4	1.53	5.8	1.06
Lviv region	39	6.09	144	1.7	88.9	3.65	4.1	0.75

End of Table 7

Regions	Positive factors				Negative factors			
	a		b		c		d	
	units	%	units	%	thousand tons	%	thousand tons	%
Mykolaiv region	30	4.69	197	2.3	12.1	0.50	18.8	3.43
Odesa region	26	4.06	640	7.3	33.1	1.36	2	0.36
Poltava region	32	5.00	757	8.7	51	2.09	79.9	14.56
Rivne region	17	2.66	126	1.4	9.9	0.41	0.7	0.13
Sumy region	37	5.78	721	8.3	21.7	0.89	139.6	25.44
Ternopil region	5	0.78	67	0.8	9.4	0.39	12.9	2.35
Kharkiv region	34	5.31	732	8.4	106.5	4.37	49.5	9.02
Kherson region	34	5.31	365	4.2	17.8	0.73	21.3	3.88
Khmelnytsk region	22	3.44	122	1.4	20.3	0.83	1.4	0.26
Cherkasy region	40	6.25	714	8.2	51.8	2.13	0.8	0.15
Chernivtsi region	18	2.81	89	1.0	2.4	0.10	0.1	0.02
Chernihiv region	80	12.50	462	5.3	27.4	1.12	1	0.18
Total	640	100.0	8727	100.0	2437.1	100.0	548.7	100

A further assessment of the potential opportunities for the development of ecological tourism will be carried out using the agglomerative hierarchical clustering algorithm, which sorts objects more sensitively using the SPSS-25 software (Table 8–9).

Table 8. Distances between end centers of clusters
(source: grouped by the authors using cluster analysis)

Cluster	1	2	3	4	5
1		545.383	532.692	787.463	282.150
2	545.383		824.264	773.306	266.644
3	532.692	824.264		456.173	656.188
4	787.463	773.306	456.173		751.981
5	282.150	266.644	656.188	751.981	

Table 9. Belonging to clusters
(source: grouped by the authors using cluster analysis)

Observation number	Cluster	Distance	Observation number	Cluster	Distance
1	2	76.281	13	2	51.167
2	2	58.956	14	1	92.147
3	3	.000	15	1	51.112
4	4	.000	16	2	61.274
5	2	113.573	17	1	91.169
6	2	55.785	18	2	112.790
7	2	129.698	19	1	57.217
8	2	159.984	20	5	74.077
9	5	49.694	21	2	57.653
10	5	54.138	22	1	53.941
11	2	51.490	23	2	95.151
12	2	48.187	24	5	49.586

Applying the K-means method, let's assume that K (number of clusters) is 5 and calculate the distance between different clusters as the average distance between all pairs of objects in them.

24 observations by the number of regions were identified as valid and grouped into clusters with the number of regions having the most similar features.

As a result of the comparative analysis optimized data, using an iterative method, the Euclidean distance between the end centers of the clusters was obtained, which reflects that the clusters have sufficient difference from each other and that the centers of the selected clusters are sufficiently distant from each other.

The number of observations in each cluster was distributed as follows: cluster 1 – 5 regions, cluster 2 – 13 regions, cluster 3, cluster 4 – 1 region, cluster 5 – 4 regions. To test the hypothesis, the Ward method was also applied, which, in terms of assessing the quality of clustering, is more effective (Figure 2).

The measure of similarity to Ward's method is the Euclidean distance. The grouping results, using the software, presented in the form of a dendrogram, graphically display a step-by-step comparison of all observations that are grouped into clusters similar to the K-means method. The results of cluster analysis by the K-means method and the Ward method confirmed the hypothesis put forward about the rational integration into 5 clusters, taking into account the proposed initial data. The clustering results need to be detailed based on the specifics of each region, which in turn can become a component of the state program for the sustainable development of ecological tourism in Ukraine (Table 10).

Separately, the first and fifth clusters can be singled out as the most promising, in which, according to our estimates, there is the greatest concentration of objects

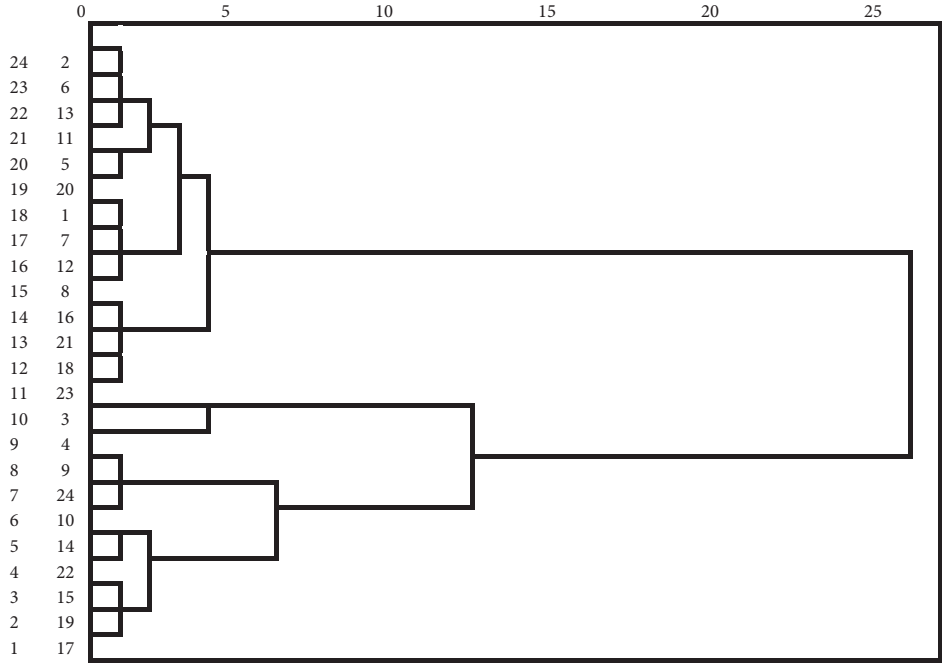

Figure 2. Dendrogram using Ward's method. Combination of cluster re-scaling
(source: constructed by the authors using the Ward method)

Table 10. Characteristic features of clustering (source: summarized by the authors based on cluster analysis)

Cluster	Brief description
1	(Odesa, Poltava, Sumy, Kharkiv, Cherkasy regions) The main emphasis of combining these regions into a cluster is made on the presence of a significant number of objects of the natural reserve fund, which in total amounts to 41.0 of all objects of the country, as well as the presence of 26.4% of the total number of cultural heritage monuments of national importance.
2	(Vinnytsia, Volyn, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-Frankivsk, Luhansk, Lviv, Mykolaiv, Rivne, Ternopil, Khmelnytsky, Chernivtsi regions) These areas were combined into one cluster, taking into account the minimum risks for the development of ecological tourism.
3	(Dnipro region) The region contains the largest number (9.2%) of objects of the nature reserve fund of Ukraine. At the same time, it is an industrial center with a negative impact of emissions of pollutants into the air from stationary sources of pollution (23.67%)
4	(Donetsk region) A characteristic feature of the allocation of this region is that it concentrates industrial facilities that have a significant amount of negative factors (emissions of pollutants into the air from stationary sources of pollution, the formation of waste of I-III hazard class), which make up one third of the total volume in the country. Influence of political and military instability also takes place.
5	(Kyiv, Kirovohrad, Kherson, Chernihiv regions) The concentration of objects of the natural reserve fund in this cluster is 24.0 of all objects of the country, as well as the presence of 20% of the total number of cultural heritage monuments of national importance.

of the natural reserve fund, as well as cultural heritage monuments of national importance. In general, we can conclude that considering each cluster as a separate unit, it is possible to determine the prospects for its development, taking into account positive factors and minimizing risks.

Considering the development of ecological tourism as one of the promising areas, we can agree with the point of view of Honey (2008) that "When poorly planned, unregulated, and overhyped, ecotourism lite, like mass tourism or even traditional nature tourism, can bring only marginal financial benefits but serious environmental and social consequences". When forming a model of sustainable development of environmentally oriented tourism business, it is necessary to make decisions focused on Sustainable Development Goals (SDGs), each of which determines the priority areas of development, both at the local and global levels (Table 11).

Thus, sustainable tourism – "Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities" (UNEP/WTO, 2005).

Global trends, calculated according to the data of various organizations, with forecasts for the short and long

Table 11. Tourism for SDGs platform (source: built on data from World Tourism Organization (2020))

SDG1 No poverty	SDG 2 Zero Hunger	*SDG3* Good Health And Well-Being	*SDG 4* Quality Education	*SDG 5* Gender Equality	*SDG 6* Clean Water And Sanitation
SDG 7 Affordable And Clean Energy	*SDG 8* Decent Work And Economic Growth	*SDG 9* Industry Innovation And Infrastructure		*SDG 10* Reduced Inequalities	*SDG 11* Sustainable Cities And Communities
SDG 12 Responsible consumption and production	*SDG 13* Climate action	*SDG 14* Life below water	*SDG 15* Life on land	*SDG 16* Peace justice and strong institutions	*SDG 17* Partnerships for the goals

term, indicate an increase in demand for ecotourism and determine its significant share in the world economy. If in 2019 the volume of the global ecotourism market was 181.1 billion US dollars, then according to forecasts for 2027 it may increase to 333.8 billion US dollars. Each of the countries, including Ukraine, integrating into the global tourism community, strives not only to establish itself but also to improve its own positions in the environmentally oriented tourism business, which means increased requirements for the implementation of a competitive strategy.

Conclusions

The theoretical aspects considered by the authors made it possible to study the diversity of opinions in defining the main categories of research, their evolution, and geography of interest in the topic by scientists from China, Lithuania, Spain, Turkey, Ukraine, the USA, and other countries. Despite the significant predominance of similar opinions in scientific circles, the relevance of the topic, which is formed under the influence of various factors, leaves sufficient space for discussion. The authors, summarizing the results of the study, identified ecotourism as an integral part of a civilized society, a product of evolution, including a meaningful, careful approach, with self-determination of the role of each individual in the preservation of biodiversity; a product of market relations, clearly regulated, with a leading economic, social, environmental role of the state, designed to bring the national economy to a differentiated high level; technology used to accumulate, form and convert potential resources into real ones, on the way to sustainable development.

The comparative characterization of the results of studies obtained by some scientists and the authors of this paper forms an idea about the distinctive features and generalizing factors of the assessment of the prospects for regional development of ecological tourism. The opinion of the authors of this study finds much in common in the works of Afroz and Mahmud (2017), Yildiz (2014), Pulido-Fernández et al. (2019), which determine a mandatory component of the development of ecological tourism state policy, focused on the formation of a competitive market of tourist services and tourist infrastructure. The application of cluster analysis is considered a promising direction for the development of tourism business and the formation of economic relations at all levels. It should also be noted that, despite the positive assessment, the practical application of the cluster concept, can be complicated by the involvement of a large number of participants, the successful implementation of which depends on the effectiveness of their interaction.

Studying the methodological approaches used in the scientific community to determine the prospects, the authors for their research have chosen correlation-regression and cluster analysis as tools for determining the effectiveness of the development of ecotourism at the regional level. Determination of patterns, regardless of the characteristics of each region, is possible when identifying their repetitions in the aggregate of regions. It is the objectivity in combining objects into clusters according to the indicators of their similarity that determined the scientific and practical application of cluster analysis, which is associated with a scientifically based strategy for the development of environmentally oriented tourism business, with progress towards the goals of sustainable development.

In the course of conducting an analytical assessment of the sustainable development of an environmentally oriented tourism business, the authors studied the main directions that determine the prospects for Ukraine. In particular, the number of subjects of tourism activity in Ukraine was considered, which, despite the instability of the economic and political situation in the country at the beginning of 2020, increased by 1,140 units compared to 2016, which may indicate an increase in demand for tourist services. In confirming these assumptions, an assessment of the profitability indicators of the tourism business in 24 regions of Ukraine was carried out, which determined its economic efficiency. The correlation-regression analysis made it possible to determine the 94% degree of dependence of the expenses of the entities of the subject of tourism activity on the services of third-party organizations used in the production of the tourism product and the income from the provision of tourism services by the entities of the subject of tourism activity. Graphical analysis of the final linear regression formula clearly demonstrated a significant gap between the efficiency of the areas, identifying the more promising ones.

Comparative characteristics of global trends in the development of environmentally oriented tourism business

did not confirm the hypothesis that the number of tourists depends on the number of UNESCO World Heritage sites, which opens up new prospects for Ukraine, with the presence of a significant number of cultural heritage monuments of national importance. The theory underlying the hypothesis about the influence of the number of UNESCO World Heritage sites on the number of tourists in Ukraine, despite similar studies conducted by Chinese scientists, in our case had the opposite result, which confirms the influence of the initial data set on the study result.

The assessment of the prospects for each area with the use of cluster analysis was carried out taking into account the indicators of positive and negative impact, which made it possible to group the most and least environmentally-oriented areas into five clusters. According to the authors, a cluster covering the following regions: Odesa, Poltava, Sumy, Kharkiv, Cherkasy, as well as a cluster including Kyiv, Kirovograd, Kherson, Chernigiv regions, with the most similar qualitative characteristics, are the most promising for the development of ecotourism. In them, according to our estimates, there is the greatest concentration of objects of the natural reserve fund, as well as monuments of the cultural heritage of national importance. The variability of quantitative and qualitative assessment factors over a certain time range can significantly affect the results. In our study, the distinctive features of the regions of Ukraine, which form the basis of the cluster model, determined the constituents of the clusters. The presence of negative factors of anthropogenic influence does not exclude development prospects for less adapted areas but determines the direction for additional strategic decisions in the formation of a sustainable development model for an environmentally oriented tourism business, among which may be: the use of alternative energy sources, virtual excursions, ecological production, processing and consumption, environmental education and increasing environmental responsibility, and many other areas focused on sustainable tourism development.

When determining the prospects, within the framework of the national strategy for the development of ecotourism, it is necessary to take into account world experience; carry out the consistent implementation of the state program for the development of ecotourism, with the introduction of current amendments for continuous improvement; provide government support for local community initiatives; regulate the export of tourism services through the optimization of financial and tax support; to form a positive image of national ecotourism. The implementation of strategic decisions requires a clear regulation of the obligations of participants in an environmentally oriented business, on the way to achieving sustainable development goals.

The results of the study can find practical application as a reference and illustrative material for interested persons and organizations studying the prospects for sustainable development of an environmentally oriented tourism business.

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