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Tourism Development in Border Regions of Russia: Methodological Foundations of Typology and its Approbation

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Abstract. Peripheral Russian border regions traditionally lag behind in a pronounced differentiation in the development of regions. The search for ways to level differences is associated with options for diversifying the economy, including the development of tourism and the study of the specifics of its development in the border area, which is the reason for the relevance of the study. For a country in which more than half of all regions are border regions and the border is the longest in the world, the border itself is in a state of transformation, and the role of the border factor is only increasing, the study of the influence of the border factor on economic systems, including tourism, is a particularly relevant scientific and practical task. Border regions of Russia were the objects of the research. The purpose of the study is related to the development of a methodological approach to the typology of the border areas of Russia in the context of unlocking the tourism potential. The testing of this approach was carried out on a set of pre-Covid data, helping to test the hypothesis that tourism systems in border regions develop in connection with additional incentives created by the border. However, this positive impact may not manifest itself equally in all parts of the border. The authors substantiated and carried out a typology of border regions according to the peculiarities of tourism development. The typology was made using the cluster analysis method. As a result, the types of border regions were determined according to the parameters of the influence of the border position on the development of tourism. The approach to typology proposed in the paper contributes to the development of the theories of management of the spatial organization of regional economic systems. From a practical point of view, the proposed methodology and the results of typology take into account the knowledge of various aspects of border regions, help identify development incentives, make adjustments to the budgetary policy of border regions, and become the basis for developing management and investment decisions.

Key words: border region; border regions typology; tourism development; cluster analysis; spatial organization; regional planning.

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1. Introduction

The borderland factor can have a direct or indirect impact on the socio-economic development of border regions. It is important to mention that studies of the development features of border regions and individual sectors of the economy (including tourism) are related not only to geographical and economic sciences. These studies cover the subject areas of political science, sociology, anthropology, history, international law, etc. This explains the interest in cross-border research topics and the practice of interdisciplinary approaches.

At the same time, the study of Russian border regions can be interesting from

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different points of view. Russian border regions are noted for geographical, geopolitical and socio-economic differentiation, which is due not only to internal heterogeneity, but also to the diversity of neighbour countries. Russia's more than 60 000-km border offers potential for developing all sorts of cooperation, including the recreational sphere. The nature of cross-border interactions has changed over the past few decades: the speculative rent model was displaced by a model based on promoting the production of goods and services.

The development of tourism in the Russian regions is significant both from economic as well as social points of view. In social terms, providing high standards of living implies, among other thing, the necessity of creating of national tourist and recreational complex, capable of providing rest and recuperation for people. This has a direct impact not only on social aspects but also on the processes of human capital formation which in turn is a resource for economic development.

If we consider tourist regional systems and their development processes from the economic standpoint, it is reasonable to talk about the contribution to GDP, infrastructure development, and employment in the sphere of tourism.

For instance, according to Rostourism data by the end of 2020 the contribution of tourism to GDP was marked at 3.9% and to employment 3.5%. Furthermore, at the current stage of spatial development tourism is considered as means of diversifying regional economy which is especially relevant for Russian practice where single-industry territories are observed to have issues. In addition, the spatial aspect of tourist systems' development in the border regions is also connected with the goals of such national projects as "International Cooperation and Export" and "Tourism and Hospitality Industry".

We will test the *hypothesis* that tourist systems in border regions of the Russian Federation are developing in connection with the additional stimuli generated by the border. An important factor here is the contact and the barrier functions of the border. Because of developmental inequality between regions, these functions will be expressed to different degrees, influencing the development of tourist systems.

The authors suggest a typology which considers the knowledge of various aspects of Russian border regions and is helpful in identifying the stimuli for tourism development in the border regions. In the practical sense, the results of this typological classification can be used when working out recommendations for the regional policy planning aiming to develop the tourist system with respect to the characteristics of each of the identified groups and their respective investment priorities.

It is significant that the current geopolitical conditions are currently significantly limiting inbound tourist flows in the western section of the border. In the light of this trend, there is a particular relevance in the study of these processes, levelling the negative effects, the possibilities of redistributing tourist flows, and activating new directions.

The purpose of this study is to develop a methodological approach to the typology of Russia's border areas in the context of unlocking their tourism potential and to test this approach on a set of data from the pre-COVID period.

The output will form the footing for working out the regional policy for the development of tourism activities with respect to the actual situation in specific Russian regions. This methodological approach can be used for other border areas as well.

The scientific novelty of the work is determined by development of methodological tools for forming the spatial organization of tourist systems of the border regions of Russia based on the 2010-2019 data set. The application of the methodology allows to reveal specific features that have impact on setting goals in spatial organization and choosing ways of achieving said goals.

The structure of the work is presented in standard paragraphs: a review of the literature on thematic sections of the study (the influence of the border, methods for studying the spatial organization of regional economic systems, methods for typology of border regions), research methodology (selection of variables, information base, stages of clustering), results, discussion and conclusions.

2. Literature review

2.1. Influence of the border location

The influence of the border has been studied for quite a lengthy period by different scientific schools. Here we will present an overview of such works, aiming to make it the most comprehensive, paying the closest attention to the cases of tourism development in the border areas in Russia and abroad.

Within the framework of this study, the biggest interest is represented by works aimed at a comprehensive study of tourism in the border territories of the Russian border. At the current stage, several Russian researchers have noted that such a macroeconomic indicator as the ruble exchange rate fluctuations has a significant impact both on tourism in the country as a whole and on border tourist areas. For instance, after the crisis of 2014, the highest growth rates (178 %) in the number of tourists from China to the bordering Khabarovsk region were observed.

Mikhailova [1] shows that this process was accompanied by a redistribution of roles in the service sector, connected to an increase in the solvency of Chinese citizens, which contributed to the development of the tourism sector and other related products and services.

At the same time and in parallel with these processes, cross-border trade zones. Xiuting [2] analyzed the development of several such zones. The author concludes that, despite their prospects, when designing, it is necessary to consider engineering difficulties, which are primarily associated not with technologies, but with differences in the institutional environment on both sides of the border.

Other forms of tourist activities were also developing on the Russian-Chinese section of the border. Ying's study [3] highlights the specific features of river tourism along the communications of the Amur River.

Dolgaleva et al. [4] substantiated the prospects for the development of environmental, cultural, and educational tourism.

The special role of the cross-border route is demonstrated by Maksanova et al. [5]. Border and cross-border tourism was also developing throughout different sections of the border.

Stepanova [6] proposed an approach to study the relationship between the proximity of the territory to the border and the level of tourism development at the municipal level. The results of the study showed that for the studied section of the border (Russia-Finland), the border position is not an advantage for the development of tourism.

Kondrateva [7] developed this scientific direction and determined that if we consider the experience of implementing international projects in the field of tourism, then it is the border municipalities that have become the most active participants in this process.

Makkonen et al. [8] examining the experience of developing cross-border tourism, especially within the framework of international programs on the Russian-Finnish border, they conclude that the language barrier and differences in the institutional environment for business have a negative impact. On the other hand, the authors believe that it is the differences in the cultural environment that stimulate the development of cross-border tourism.

Some trends, such as nature, have remained throughout the history of modern interactions. Using sociological and economic tools, Hannonen et al. [9] show that it was the value of natural objects that was one of the important motives for the

popularity of this type of cross-border tourism as the ownership of a second home in the border area of a neighboring state. One of the works devoted to this topic presents the motives of the Russian owners of such houses and the opinions of the local population about this phenomenon. In the results of that study, one could already see the sprouts of the conflict that developed in the present period. Currently, changes in the image of cross-border and cross-border tourism are unpredictable and negative.

Chuchenkova et al. [10] considered a section of the border between Russia, Estonia and Latvia. There are tourist and recreational zones of the first (Ivangorod-Narva, Pskov-Tartu and Pskov-Sigulda), second (Pytalovo-Rezekne) and third order (Prichudsky and Setomaa). The results of the study carried out within the framework of the theory of transboundary tourist and recreational zoning (TTTR) showed that all the objects under study have significant historical, cultural and natural potential and a wide variety of tourist sites. For all territories, cultural and educational tourism has been identified as a promising type of tourism. At the same time, the development of certain types of tourism, such as ecological or religious, depends on the localization of the corresponding types of resources.

The patterns of tourism development in these border areas and its impact on the regional economy are also studied in the works of Kropinova [11, 12]. One of the papers [11] substantiates the creation of a single cross-border route in these territories, which will contribute to the formation of a single tourist area.

At the next stage, Kropinova [12] proposes theoretical, methodological, and applied approaches to the organization of such zoning, which is considered by the expert community as a significant contribution to the development of TTTR. significant contribution to development.

A selection of works can be put in a separate category, dedicated to the specifics of the influence that the European borders have on the development of tourism. The core of such specifics is that almost all of these countries are part of the European Union within the scope of which, on the one hand, a united economic and political space was formed. On the other hand, significant difference between the countries remains, which in turn implies that the influence of the border can also be seen here. As such, the scientific issue in this study is also relevant to the countries of Europe. The influence of the border is widely researched by the authors by the examples of European border territories.

Carril-Caccis et al. [13] reveal in the study, that firstly, for the European countries the internal tourist flow is far greater (up to 24 times) than the outbound one, and, secondly, in the period of 2012-2019 the border impact on the border tourism reduced by 13 %.

Borders can influence the tourism behavior and consumption patterns of cross-border tourists. Models of behavioral intentions of tourists are justified by Diaz-Sauceda et al. [14] based on the results of a sociological survey and multigroup analysis. Within the framework of these models, it was determined that sensation-seeking, perceived crowding, and value influence satisfaction significantly affect this behavior and, subsequently, tourist consumption.

At the same time, it is worth noting, as shown in the Sofield study [15], that it is not the physical borders of sovereign states that influence, but the typologies of political relations. A feature of the study can be considered that the approaches of cultural, anthropological, and social theories were used for assessments.

Wieckowski & Timothy [16] shows the influence of the tourism on the borders themselves, Polish-German border in this case, and their transformation. The paper deals with the fact that in the historical retrospective, the studied section of the border was transformed under the influence of the geopolitical factor. At the present stage, the

severity of the problem has been leveled, including through the creation of such institutional entities as the Schengen area and the European Union. This led to the degradation of the border infrastructure itself, which was subsequently reanimated, including to enhance the tourist experience.

In this study, we view tourism as an alternative use of natural and other resources and the tourist system as an element of the regional economy. The operation of the system results in the development of tourism as an economic activity for the region's environmental and socio-economic status.

To specify this even more, the regional tourist system is construed as a sophisticated social and health-improving complex meant to restore people's vigour and health. The core of the tourist system is tourist actors, and its target function is to satisfy tourists' needs as much as possible. These needs include demand for entertainment and other, most varied tourist services.

The usual components of a tourist system are tourist product users, natural and cultural resources (which act as production factors in this context), tourist infrastructure, service professionals, and management structures. An important remark is that tourist activity is regarded here as an essential human activity. Its mission is to enable rest, reinvigoration, and intellectual improvement. An essential characteristic of this process is its value per se, not just result orientedness.

Thus, for the terms and definitions of this study, tourism, being a category implying the recovery and maintenance of human health and working ability by means of tourism and leisure activities in and out of urban settings, combines the concepts of tourism and rest. It would be of relevance for this paper to look at the studies dealing with the specific characteristics of tourism in border regions.

The development of tourism in border regions is associated with cross-border interactions, which have been explored in some scholarly papers.

For instance, Weidenfeld [17], an author considering cross-border innovation systems defines the aspects that shape and promote innovation in cross-border activities, including tourism. The research brought him to the conclusion that many smaller and peripheral European border regions are likely to build their competitive advantage by promoting innovation in the tourist service sector.

Special conditions for the development of tourism in the territories of the exclaves. Poulaki et al. [18] identify the main geographic economic, historical, social and cultural risks using a set of mutually harmonized methods. They substantiate the dependence of the degree of manifestation of these risks on the institutional environment of the border area.

Saarinen & Wall-Reinius [19] present a study of the phenomenon of artificially created exclaves of tourist prosperity. Significantly higher standards of living and consumption than in the surrounding poor territories are fixed within the framework of such exclaves. Thus, informal boundaries are formed that create social tension.

Zaitseva & Kropinova [20] explore the problems and prospects of cross-border cooperation between Russia and European countries in the field of tourism in terms of the role of the tourism potential of the territories and its effective use. On the basis of expert assessments and statistical analysis, the authors identify macro- and meso-levels of problem areas for the development of cross-border tourism. The attractiveness of Russian and European destinations is evaluated based on the 'value for money' parameter variation.

Various aspects of tourism development in border regions have been addressed comprehensively by Stepanova in several papers [21, 22]. We shall list here some of the findings of highest relevance for our paper. Firstly, the development of tourism in Russian border regions can be important for the national security of the country [21].

Secondly, close-to-border location does not automatically imply advantages for tourism development, whereas the decisive factor is the transport infrastructure, especially an operating border checkpoint. For example, in one of Stepanova's works [22], the tourism potential of the border regions of the North-West of Russia is assessed. The author concludes that to successfully promote the potential of tourism in these territories, a set of marketing measures is needed that will advertise both the borders themselves and individual border facilities. Continuing the theme of the previous study, the same author substantiated the key role of international checkpoints based on the analysis of tourist flows [6].

There are examples of the development of border tourism in other countries, including in zones of military-political conflicts. One such example is the border between the Democratic People's Republic of Korea and the Republic of Korea. The Korean demilitarized zone, 4 km wide, dividing the entire peninsula, consists of complex military installations with adjacent mined territory (from South Korea). It was opened by South Korea for tourist visits. The main object of this territory is the Freedom House, from where you can look at the North Korean side with binoculars. In addition, the objects of display from the South Korean side are the tunnels dug by the northerners to escape from the country.

2.2. Methodological approaches to the study of the spatial organization of regional economic systems and their typology

Regional economic system management requires a practice-oriented toolkit. One such tool is the typological classification based on a comprehensive set of parameters. Typological classification is a form of scientific cognition, where the studied objects are grouped according to some essential attributes. There are typologies based on various parameters: GRP per capita, investment potential, per capita money income, etc.

However, the results of simple ranking (leaders - outsiders) do not qualify as the ground for identifying groups of objects to which certain sets of managerial decisions can be applied. Such classification should proceed from the problem-based principle of region grouping.

Kuznetsov et al. [23] relied on international experience in typological classification and research on regional inequality, in particular – what concerns the development of regional tourist systems. One of the studies on this subject investigated changes in the structure of European cities and regions. Having applied cluster analysis, its author distinguished eight regional types: metropolitan, semi-peripheral and peripheral service regions; central, semi-peripheral, peripheral and collapsed industrial regions, and agricultural regions. Heidenreich [24] formulated two key hypotheses: delocalization of simpler, labour cost-intensive activities towards the periphery, and restructuring associated with structural changes in industrial core regions and persisting marginal status in the periphery. It is concluded that neither of the hypotheses is fully corroborated by the research results, but it is safe to say that there are hardly any signs of convergence between core and peripheral regions.

Another study of interest for the methodology is the Ben-Chieh's research [25] there one that produced a comprehensive typology of US metropolitan areas. Its author employed a complex approach to statistical data processing. A system of parameters was proposed with a grouping into thematic components: economic, political, environmental, social, health and education. The primary objective of this study was to quantitatively assess the urban quality of life using more than 123 factors representing these components. Major groups were distinguished, a descriptive analysis of empirical results was carried out, important conclusions were drawn and policy

implications were identified. The need to identify the factors that determine and influence the general welfare is substantiated. The output of this typology is viewed as a practical mechanism permitting to distinguish better from worse in budgetary policy management.

In several more recent studies, territories are grouped by 'foreign direct investment'. Kuznetsov et al. [23] propose a new way of computing the FDI potential index to address the issue of FDI attractiveness at the EU regional level. Having performed a factor analysis, the author identified six major factors: economic potential, market size, labour situation, technological progress, labour regulation and competitiveness. These factors are taken into account to make adjustments to the conventional computation procedure. The results of the computations reveal considerable heterogeneity among EU regions, and a high concentration from a geographical perspective. It is concluded that the geographical location plays a key role for FDI attractiveness.

In the study Makkonen et al. [26] the hierarchy for knowledge intensive FDI into European cities are built. Based on the results of a descriptive analysis, the authors determined four types of business districts: inner city districts with a high number of firms, science and techno complex districts, office parks, and international airport districts that focus on international firms. Different planning strategies are suggested for these types of areas.

Another parameter on which a typology can be based is 'negative' regional industrial development trajectories. Blazek et al. [27] in this approach speak of path downgrading, meaning that key regional companies abandon higher value-added functions (such as R&D) and re-specialize in low-cost production. The trajectory of path contraction implies shrinkage in the size of the regional industry brought about by withdrawal from some market segments or market territories. The fundamental distinction from path downgrading is that the key companies retain their know-how and high-value-added functions. Path delocalisation encompasses relocation of key economic activities in each regional industry, often followed by further disinvestment and brain drain processes.

Of high relevance for us is the practice of research on this subject as applied to the Post-Soviet domain. In the Soviet era, a typological classification of regions was done in the framework of the district 'grid' of the USSR territorial entities (Central, Central-Chernozem, Northern, etc.). It was built upon the geographical approach, and the typology output was meant to be used in the practices of the country's administrative bodies. This typology remained unmodified for many years. After the country had broken apart, researchers were becoming increasingly interested in typologies that primarily focused on applied managerial challenges in the new transitional economy.

One of the earliest and most exhaustive studies from the modern period of Russia's development proposes a typology of regions based on three characteristics of the economic situation in the region: standard of living, investment activity, and economic potential.

Boots et al. [28] provide calculations and results on multivariate classifications with the above three economic characteristics, through which they distinguished seven types of regions in Russia with uniform (or converging) values of the indices measuring the economic situation and economic activity in the region: productionists-consumers, petroleum industrialists-consumers, poor consumers, rich investors, poor investors, the wobbly, and the depressed In the practical sense, it is worth mentioning some conclusions regarding intergovernmental fiscal relations and federal transfer payments. The results of a typological classification of Russian regions suggest that the analysis of relations between the budgets of the federal centre and regions should focus more on two types of regions – 'poor consumers' and 'depressed'. It is obvious that

these two types of Russian regions are, both as regards their current situation and their potential, in the greatest need of support from the federal budget and redistribution of funding towards them. This leads to important conclusions for the analysis of the financial aid distribution pattern, system of intergovernmental fiscal relations in general, and the fiscal incentives emerging in such a system. Supposedly, the allocation of financial aid to needy regions is based on modified rules or 146 fundamentally different criteria, this group of regions should be considered separately and analysed in a specific way.

Some papers by Aivazian et al. [29, 30] have focused on working out approaches to defining the indicators for key areas of socio-economic development from the regional differentiation perspective. The authors [29] suggested a set of five components: scope of the economy, assessment of technical efficiency, assessment of technical efficiency trend, first and second principal components in GRP structure. Indicators to be interpreted in terms of differentiation characteristics were proposed for these components. In the practical sense, such a tool can be used in project management. In another paper [30], the same group of authors employed the clustering method to identify uniform groups of Russian regions, each with its own production potential model for the dependence of GRP on asset value and employment. Here, too, the authors applied the procedures for constructing supplementary integral indicators representing the specialisations of regions in the groups.

It is worth mentioning the results of another study on the typological classification of regions. The high developmental differentiation between regions is the reason to distinguish their types based, for instance, on financial self-sufficiency.

Shakleina & Midov [31] argue this can help discern the specifics of strategising. The methods used to this end were cluster analysis, principal component analysis, and panel analysis. A system of 18 indicators of a region's financial self-sufficiency was designed. The data were processed through cluster analysis with three groups of regions formed as a result: leader regions, average regions, outsider regions. The authors suggest that the results of the typological classification can be used by authorities and administrations in the region to work out regional and sectoral development strategies.

Special consideration should be given to papers reporting the results of regional studies based on multivariate statistical analysis tools.

Abramian et al. [32] performed an inter-regional analysis to assess the human potential in Russian regions and map the correlations with the Global Goals 2030. The authors designed a system of 16 goal indicators for 85 Russian regions and carried out a correlation analysis based on these data. The results facilitated strategising for sustainable development of some individual regions.

2.3. Methodology for typology of border regions

Studies that aim to identify the specific developmental characteristics of border regions, which are then used as the basis for typological classifications, have been actively carried out also by other specialists in Russia. Some conclusions drawn by their authors are of high relevance for our study. Beneficial effects of the border on the development of border regions are minor; it was only in the early 1990s that border position produced a marked positive effect on development indices in the most active regions.

Druzhinin & Zimin [33], considering the spatial structures of the regions, revealed that, in addition to their geographical location, the development of border areas is significantly positively influenced by the presence of large universities on their territory.

On the other hand, border regions constitute a peculiar group for which recommendations are proposed based on clustering by specific characteristics. Aivazian et

al. [29] proposed to the formation of indicators of the main directions of socio-economic development in the space of characteristics of regional differentiation, the role of the implementation of federal investment projects is determined.

In a scientific article by Kuznetsov et al. [23] a spatial analysis of such an indicator as quality of life is presented. According to this indicator, the ranking of regions was substantiated, and spatial patterns were identified the influence of the geographical factor.

Various aspects of cross-border interactions influence the development processes in border regions. There is the study by Makkonen et al. [26] that explored cross-border connections of three regionally significant and interrelated spheres (forest, mining, and tourist industries together with relevant research and administrative bodies) which differ in the strategies of nature resource use in a Finnish/Russian border region. Nature management practices in the border areas were investigated by sociological tools (questionnaires and interviews). Having analysed the resultant data, the authors arrived at some important conclusions: the network is underdeveloped, company participation is low, and integration between the sectors is weak. These facts can hinder sustainable development in the border regions and affect cross-border networking.

The barrier and contact functions of the border have formed the foundation for a typology of Russian border regions. Kolosov et al. studied the changing patterns and factors for cross-border interactions in combination with the manifestation of the barrier and contact functions, which either hinder or foster contacts between neighbour areas. A comparative analysis of Interactions with neighbour regions in different Russian border areas has revealed a contradictory character of the dependence of cross-border flows on the barrier function of borders, and detected the influence of the border on the everyday life of the population [34].

Thus, we can say that the researched problems of the work are not new in the scientific field and are comprehensively studied. On the other hand, one can speak of a certain lack of work on the subject. We are talking about works that are focused specifically on the features of the development of tourism in the Russian border area, and not on its individual fragments. In addition, it can be noted that at present there is not enough scientific research on the typology of regional tourism systems, the results of which are based on significant time series and cover parameters from economic, social, environmental and infrastructure areas.

3. Methodology

3.1. Selection of variables for clustering

We have used the above experience to work out the approaches for our study. Our study objects are Russian regions that have terrestrial borders across mainland (including by rivers and lakes) and maritime borders with neighbouring states situated on the map clockwise from the USA to Norway. It is necessary to make an explanation that the study was carried out on the data of 2010-2019. That is, the regions that became part of the Russian Federation in 2022 were not considered.

In addition, for example, the Voronezh and Rostov regions are presented as border regions, which is true for the surveyed period. However, at the moment, as a result of the transformations of the Russian border area, these regions are not border regions.

Three blocks of variables were selected for the typology, and Russian border regions were clustered accordingly (Table 1).

Each variable included in the system is essential, and the system itself is sufficient for describing the development patterns in the study objects. Official statistics and departmental data covering the period from 2010 to 2019 were used.

Table 1. **Variables for the clustering of Russian border regions**

Block 1 – social, economic and environmental status of the region	Region's integral rating (V_{12})
	Climatic discomfort index (V_9)
	Environmental stress index (V_{10})
Block 2 – quantitative characteristics of the region's tourist system	Density of border checkpoints (operating freight-passenger/ passenger, motorway, air, railway, maritime, mixed, river, lake, pedestrian) per 100 km of the border (V_{11})
	Number of accommodation facilities per 1000 km^2(V_2)
	Number of tourist firms per 1000 km^2(V_1)
	Density of protected areas (V_{13})
Block 3 – economic characteristics of the region's tourist system	Contribution of fee-based services by hotels and similar accommodation facilities to GRP volume (V_3)
	Contribution of fee-based tourist services to GRP volume (V_4)
	Number of Russian citizens hosted by hotels and similar accommodation facilities (per 100 000 persons (region's residents)) (V_6)
	Share of investment in collective accommodation facilities in the total investment volume in the region (V_8)
	Number of foreign citizens hosted by hotels and similar accommodation facilities (per 100 000 persons (region's residents)) (V_5)
	Mean annual occupancy rate (%) of collective accommodation facilities (V_7)

Note. Compiled by the authors.

3.2. Data sources

Let us examine each variable in more detail. The integral rating represents the region's socio-economic position in the Russian Federation. The ratings used in this study were produced by experts of the RIA Rating agency (MIA Rossiya Segodnya media group) through aggregation of key regional development indices.

The procedure of calculating the integral rating score encompasses three stages.

At the first stage, the rating score of Russian regions was determined using individual indices, at the second – using groups of indices, and the third stage was determination of the integral rating score. This approach helps to find out where this or that region stands on the economic map of Russia, and to measure the disproportions in regional development levels[1].

The variables 'climatic discomfort index' and 'environmental stress index' were determined on the basis of cartographic and analytical materials from the Ecological Atlas of Russia created at the Moscow State University Department of Geography in 2017[2]. The Atlas evaluated the discomfort index of Russian climatic regions by scoring them from 1 to 11: extreme, very high, high, relatively high, average, and above average, moderate to average, moderate, minor, minor in winter and average in summer,

[1] RiaRating news agency official website. https://riarating.ru/

[2] Ecological Atlas of Russia, Moscow, 2017. P. 510.

highly variable in the mountains from low to average, and very low.

For the integral assessment of the environmental stress all Russian regions are divided into six groups based on pollution concentrations in the region. In the methodology suggested by the authors, all these three indices (region's integral rating, climatic discomfort index, and environmental stress index) belong to a block describing the social, economic and environmental level of the region. They give an idea about the general characteristics of the region's development, and the authors believe these parameters correlate with the potential opportunities for tourism development.

The next block of variables describes the quantitative characteristics of the economically most significant components of regional tourist systems.

The index 'density of border checkpoints' was computed for operating freight-passenger, passenger, motorway, air, railway, maritime, mixed, river-, lake-based, and pedestrian checkpoints per 100 km of the national border. Data on the infrastructural facilities were taken from the Federal Ministry of Transport website[1].

Data on the number of accommodation facilities and tourist firms were taken from the Federal Agency for Tourism (RussiaTourism) database (open data)[2]. Considering the substantial differentiation of the study objects (regions), the data were interpreted relative to the area of the regions. The density of protected areas was also determined as a relative index, with respect to the area of the regions, using data provided by the Ministry of Natural Resources and the Environment of Russia[3].

The third block of variables is associated with the economic characteristics of processes in regional tourist systems. Information about the volumes of fee-based tourism and accommodation services was also taken from the RussiaTourism database. The contribution of these services to the gross regional product was derived from a simple relationship between these values. The variables 'number of foreign and Russian citizens hosted by accommodation facilities' provide an idea about the structure of visitors to the region and the role played by the position at the border. The substantial differentiation among regions and their population densities should also be taken into account.

An important parameter of economic efficiency in this system of variables is the occupancy rate of accommodation facilities. The calculations employed the formula (1):

$$x = \frac{\frac{a}{b} \cdot 100}{c}, \qquad (1)$$

where a is the year-to-date number of nights spent at accommodation facilities in the region; b is the number of days in the year; c is the hospitality bed capacity of accommodation facilities in the region; x is the occupancy rate of accommodation facilities in the region.

Values for the parameters a, b and c were taken from the RussiaTourism database and Register of the Unified Interdepartmental Statistical Information System[4].

Another parameter included in this block is the share of investment in accommodation facilities in the total regional investment volume. This variable was calculated as a simple relationship, and data for individual regions were derived from the RussiaTourism database[5] and data tables

[1] Official website of the Ministry of Transport of the Russian Federation. https://mintrans.ru/storage/app/media/lbs/graniza_pp_14012019.pdf

[2] Russia tourism open data.http://opendata.russiatourism.ru/opendata

[3] Official website of the Ministry of Natural Resources and Ecology of the Russian Federation. http://www.mnr.gov.ru/opendata/7710256289-protected-areas

[4] State statistics: Unified interdepartmental information and statistical system. https://fedstat.ru/

[5] RussiaTourism open data.http://opendata.russiatourism.ru/opendata

Table 2. **Coefficients of correlation between variables**

Variables	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}
V_1	1												
V_2	0.8246	1											
V_3	0.1116	-0.1063	1										
V_4	0.0550	-0.0358	0.1161	1									
V_5	0.1465	0.1551	0.1894	0.0789	1								
V_6	–0.0963	–0.1393	0.6643	0.0277	0.2440	1							
V_7	0.1699	0.2871	–0.1048	0.0740	–0.0307	0.1494	1						
V_8	0.0257	–0.0981	0.6133	0.0238	0.0305	0.4639	–0.2935	1					
V_9	0.4890	0.3742	–0.2011	0.0187	–0.0385	–0.6148	–0.1225	–0.1129	1				
V_{10}	0.1129	0.0421	–0.0796	0.1228	–0.0851	–0.3717	–0.1983	0.1807	0.4874	1			
V_{11}	0.2829	0.4227	–0.1442	–0.0994	–0.0473	–0.0156	0.0668	–0.0555	0.0674	–0.0219	1		
V_{12}	0.1833	0.3535	–0.2433	–0.0420	0.0780	0.0673	0.3033	–0.2560	–0.1287	–0.2922	0.2613	1	
V_{13}	0.1565	-0.1460	0.3781	0.0633	0.1393	-0.0813	-0.4061	0.5010	0.2760	0.2590	-0.1420	-0.5310	1

Note. Compiled by the authors based on data State statistics: Unified interdepartmental information and statistical system.Retrieved from: https://fedstat.ru/, RussiaTourism open data.Retrieved from: http://opendata.russiatourism.ru/opendata, Official website of the Federal State Statistics Service.Retrieved from: http://www.gks.ru/

of the Federal State Statistics Service[1]. The authors used the method of cluster analysis for the system of variables.

3.3. Stages of clustering

The sequence of clustering steps was the following:

1. Analysis of the correlation coefficients between variables and selection of uncorrelated variables (at this point, we excluded the variable 'number of tourist firms', whose correlation with the index 'number of accommodation facilities' had the modulus of 0.82, indicating strong correlation) (Table 2).

2. Analysis of omitted data and exclusion of the regions for which data are missing (these were the Republic of Crimea and City with federal status Sevastopol).

3. Exclusion of the regions for which the values exceed standard deviations (these were the Republic of Crimea, Krasnodar Krai, Cities with federal status St. Petersburg and Sevastopol).

4. Data normalisation by z-scores.

5. Hierarchical clustering by the Ward's method using the Euclidian distance metric (Fig. 1).

4. Results

Interpretation of the tree diagram resulted in four groups of border regions:

Group I – regions with good potential for the development of tourism without utilising their borderland position.

Group II – regions actively developing tourism activities and utilising borderland position to this end.

Group III – regions lagging behind in the development of tourism and not

[1] Official website of the Federal State Statistics Service. http://www.gks.ru/

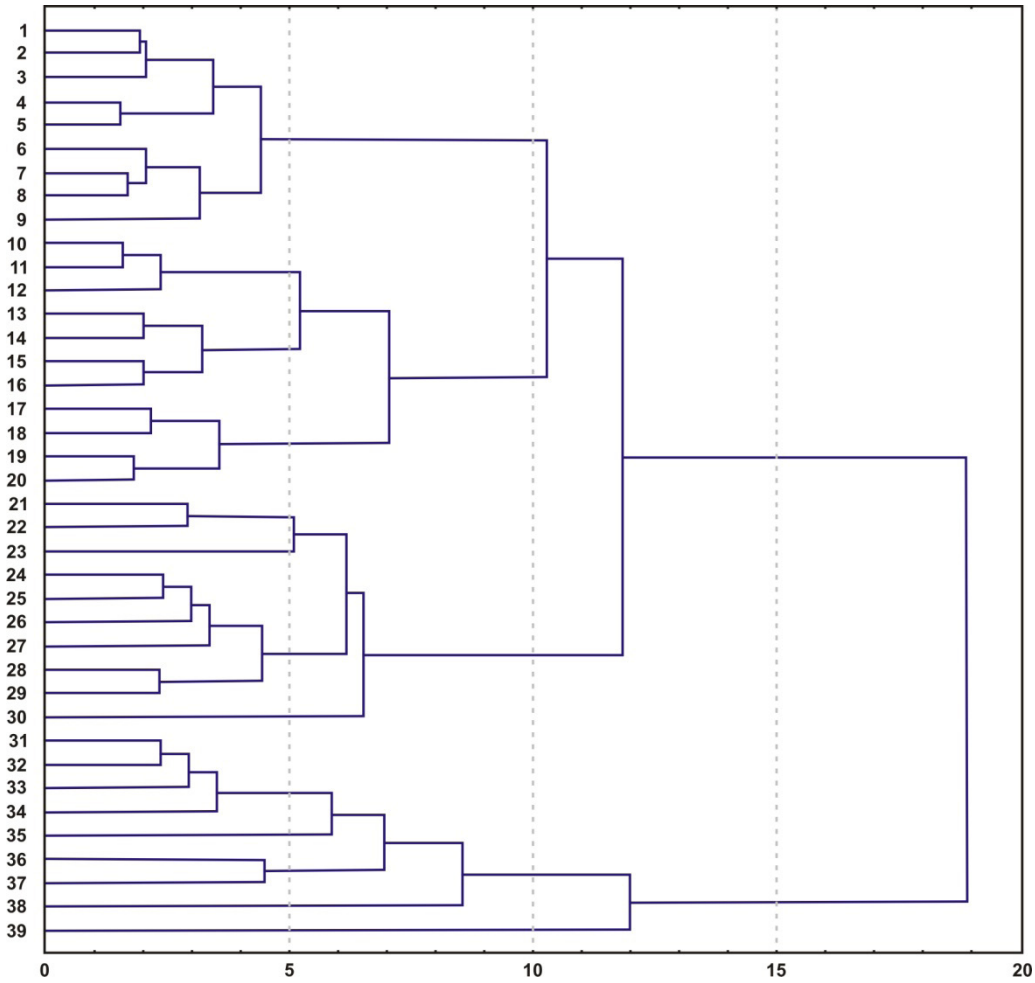

Fig. 1. Tree diagram produced by hierarchical clustering by the Ward's method using the Euclidian distance metric

Note. The name of the region can be determined by the number in the Table 3.

utilising the advantages offered by borderland position.

Group IV – regions with best-developed tourist systems, with significant contribution of the borderland position to this development.

Group V – leader-regions of tourist system development, regions excluded from the clustering procedure formed.

Group VI – regions that were not considered as border regions (Table 3).

A schematic map helps to visualise the spatial organisation of groups in the typology (Fig. 2).

Based on the results of the typological classification of Russian regions, according to the indicators of the border location influence on the regional tourist system, the following groups of border regions were formed:

Group I – regions with good potential for the development of tourism without utilising their borderland position.

Group II – Regions actively developing tourism and utilising borderland position to this end.

Group III – Regions lagging in the development of tourism and not utilising the advantages offered by borderland position.

Table 3. **Results of the typological classification of Russian border regions according to the tourist system development potential in the context of borderland location**

Group/regions	Members of the group	Characteristics of the group, conclusions
I. Regions with good potential for the development of tourism without utilising their borderland position	Republic of Kalmykia (31) Republic of Ingushetia (32) Chechen Republic (33) North Ossetia-Alania Republic (34) Karachay-Cherkessia Republic (35) Republic of Dagestan (36) Kabardino-Balkarian Republic (37) Astrakhan Region (38) Altai Republic (39)	– peripheral border regions. – belong to the Caucasus segment of the border (apart from the Astrakhan Region, which borders on Kazakhstan). – with the lowest level of socio-economic development. – with the most favourable climate. – with the most favourable environmental situation. – the highest density of protected areas (PAs). – the lowest occupancy rate of accommodation facilities. – the highest share of investment in collective accommodation facilities. –with an average relative number of accommodation facilities and an average number of border checkpoints. **Conclusions:** – possess a high tourism potential, which is currently underused, as evidenced by below average occupancy rates of accommodation facilities. A trend is observed for local resources getting increasingly involved in recreational activities. At present, this increase is mainly due to alpine skiing development. – high investments in the development of accommodation facilities confirm that investors recognise the potential of these regions. – such investment decisions can be additionally stimulated by the budgetary policy in Russia. – border on territories with a low level of socio-economic development. – minimal involvement in cross-border interactions (compared to other groups in the typology). One exception is interactions with Abkhazia, which competes with the Krasnodar Krai for Russian consumer flows. – i.e. the neighbours cannot generate significant and steady flows of tourist system's service users. Potential visitor flows are captured by the neighbouring countries, which take the upper hand in terms of recreation, specifically direct access to the sea. – affected by a situation of conflict with the partially recognised state Republic of South Ossetia and other geopolitical conflicts.

Group/regions	Members of the group	Characteristics of the group, conclusions
II. Regions actively developing tourism and utilising borderland position to this end	Republic of Karelia (21) Pskov Region (22) Kaliningrad Region (23) Murmansk Region (24) Sakhalin Region (25) Khabarovsk Krai (26) Primorsky Krai (27) Tyumen Region (28) Altai Krai (29) Chukotka Autonomous District (30)	– highly differentiated in terms of socio-economic development levels. – comprises regions in the European and Asian parts of the old and new borders. – average climatic discomfort index (apart from the Chukotka Autonomous District with its severe subarctic climate). – some regions in the group have a stressful environmental situation (Republic of Karelia, Murmansk Region, Altai Krai, Sakhalin Region). – the highest relative density of border checkpoints and occupancy rates of accommodation facilities (in a majority of regions in the group). – average level of investment in collective accommodation facilities. – the highest share of Russian and foreign citizens per 100 000 local inhabitants. **Conclusions:** – all regions in this group share the same degree of involvement in cross-border interactions – average and above average (especially in Primorsky Krai and Khabarovsk Krai). – the contact function of the border is manifest also in the tourism sphere. – development may be constrained by environmental conflicts occurring in the Asian part of the border, such as poaching or illegal logging.
III. Regions lagging behind in the development of tourism and not utilising the advantages offered by borderland position	Bryansk Region *(10) Kursk Region *(11) Smolensk Region (12) Kurgan Region (13) Omsk Region (14) Novosibirsk Region (15) Amur Region (16) Republic of Buryatia (17) Zabaikalsky Krai (18) Republic of Tyva (19) Jewish Autonomous Region (20)	– border regions with low and average levels of socio-economic development. – most of the regions belong to the Asian part of the border. – regions with an average climatic discomfort index. – the environmental stress index is average and high in all regions of the group. – the concentrations of accommodation facilities and border checkpoints are the lowest. – on the other hand, the occupancy rate of accommodation facilities is above the average for all groups. – the amount of investment in collective accommodation facilities is the lowest among all groups. – almost all regions in the group have an average density of protected areas.

Group/regions	Members of the group	Characteristics of the group, conclusions
III. Regions lagging behind in the development of tourism and not utilising the advantages offered by borderland position	Bryansk Region *(10) Kursk Region *(11) Smolensk Region (12) Kurgan Region (13) Omsk Region (14) Novosibirsk Region (15) Amur Region (16) Republic of Buryatia (17) Zabaikalsky Krai (18) Republic of Tyva (19) Jewish Autonomous Region (20)	**Conclusions:** – regions with poorly developed tourist system infrastructure. – unattractive for investors (as of now). – the degree of involvement in cross-border interactions is average and below average for a majority of the regions, but with high involvement demonstrated by the Jewish Autonomous Region, Smolensk and Bryansk Regions. – there are international protected areas in Asian segments of the border. – on the other hand, there are areas in Asian segments with environmental issues such as poaching, forest and steppe fires, illegal logging, water pollution, etc. **The presented results and recommendations are based on data from 2010-2019 and do not consider the impact of the current geopolitical situation.*
IV. Regions with best-developed tourist systems, with significant contribution of the borderland position to this development	Belgorod Region *(1) Leningrad Region (2) Samara Region (3) Voronezh Region**(4) Rostov Region **(5) Volgograd Region (6) Orenburg Region (7) Saratov Region (8) Chelyabinsk Region (9)	– borderland, but not peripheral regions with the highest level of socio-economic development (in the context of this typology). – the group happens to comprise regions with a favourable climate. – with a favourable environmental situation (apart from the Chelyabinsk Region). – the highest indices of recreational infrastructure development, specifically. – high number of accommodation facilities and volumes of their fee-based services in both relative and absolute values. – high density of border checkpoints. – the lowest density of protected areas. **Conclusions:** – high involvement in cross-border interactions has a positive effect on the development of the tourist system. – high economic performance of tourist systems which do not dominate in the overall economic structure, owing to good development levels in other spheres. – even in spite of the situation of conflict with Ukraine and a reduction in turnover between adjacent areas in this segment of the border, the share of neighbour-countries in the foreign trade turnover of these regions remains quite high. ** *Now, as a result of the transformations of the Russian border area, these regions are not border regions.*

End of table 2

Group/regions	Members of the group	Characteristics of the group, conclusions
Regions excluded from the hierarchical clustering procedure		
V. Leader regions of tourist system development	City with federal status St. Petersburg (40) City with federal status Sevastopol (41) Krasnodar Krai (42) Republic of Crimea (43)	– leader regions in terms of the tourist sector development. – with a high level of tourist activities. – tourist activities play an important or even a key role in the region's economic structure. – have traditionally held strong positions in tourism. – large-scale federal infrastructural project has been and are being implemented in the regions: construction of Olympic facilities, 2018 FIFA World Cup facilities, state programme for the development of resorts and tourism in the Republic of Crimea in 2017-2020.
VI. Regions that were not considered as border regions	Kamchatka Krai (44) Magadan Region (45)	–absence of a state border with neighbouring states.

Note. Compiled by the authors.

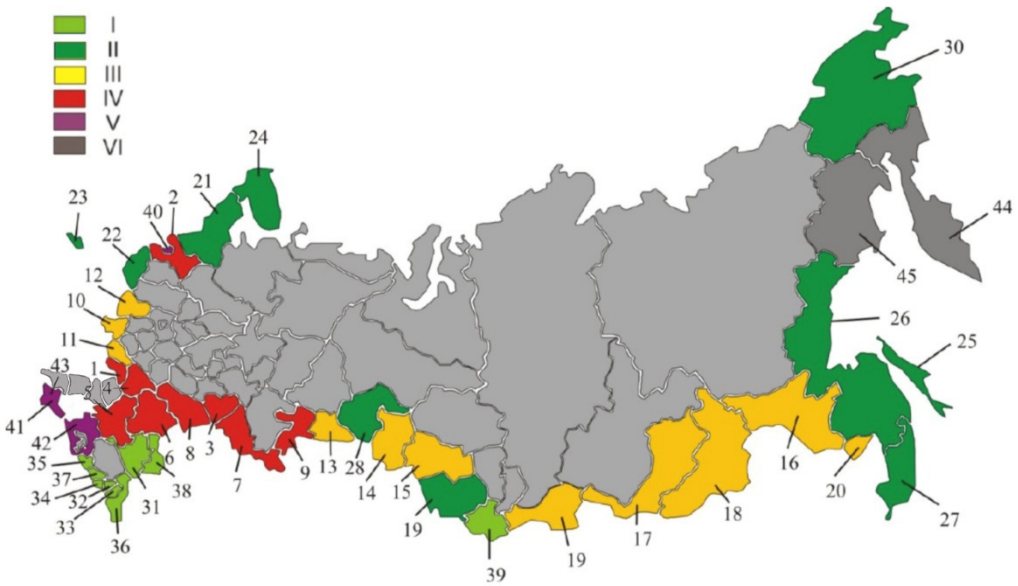

Fig. 2. Spatial organization of the groups distinguished in the typology of Russian border regions according to the tourist system development potential in the context of borderland location

Group IV – Regions with best-developed tourist systems, with significant contribution of the borderland position to this development.

The regions excluded from the clustering procedure at the sampling stage (due to the values characterizing them being beyond the boundaries of standard deviations)

made up Group V – leader regions of tourist system development, a notional Group VI is represented by regions that were not considered as border regions due to the lack of a state borders with neighbouring states.

The results of the typological classification are confirmed by and correspond with the ideas about the promising economic specializations of the regions, enshrined in the Strategy for Spatial Development of Regions until 2025.

Within the framework of the selected groups, general recommendations on the creation of infrastructure and the choice of a tourism development strategy are proposed. For example:

– for Group I, focusing on domestic tourism and taking into account the geopolitical situation.

– for Group II, developing the existing involvement in cross-border cooperation, considering the environmental conflicts observed on the Asian part of the border, such as poaching and illegal logging.

– for Group III, making efforts to attract investment, including for the development of tourist infrastructure. At the same time, the results of the study show that the limiting factor here are the environmental problems, the solution of which, in turn, would help to use the resource of international nature reserves more efficiently.

– for Groups IV and V with the best indicators of development of tourist and recreational systems, in part due to the border position, it is recommended to strengthen cross-border cooperation and use their positive trade, economic and tourist image.

5. Discussion

As a result of this study, the specific characteristics of tourist system development were determined for groups of border regions. The typology takes into account the knowledge of various aspects of border regions and is helpful in identifying the stimuli for tourism development and making adjustments for border regions in the budgetary policy.

The results can be helpful in working out recommendations for federal and regional budgetary policies aiming to develop the tourist system (in particular, build the supporting tourist infrastructure) with respect to the characteristics of each of the identified groups and the development priorities defined for them.

The output of the typological classification is corroborated by and agrees with the existing understanding of promising economic specialisations of regions as defined in the Strategy for the spatial development of the Russian Federation until 2025.

Thus, regions whose list of promising specialisations does not include the development of tourism (apart from the Chukotka Autonomous District) ended up in the third group of our typology, i.e. regions lagging behind in the development of tourism and not utilising the advantages offered by borderland position[1]. In the Strategy…, on the other hand, areas that specialise in the development of tourism activities are called regional centres of economic growth.

In addition, the results of typology correspond with the results of research by researchers studying and typifying the Russian border area. For example, the authors of this paper, in describing typological groups, conclude similar to results of Voloshenko &Voloshenko [35] that economic structures feel a positive impact from the border localization. However, the nature and extent of this influence is associated with the transport and settlement structure, border infrastructure provision, and as a result of cross-border integration. In addition, the paper [35] shows that the border has a significant impact on the economic security of border regions.

Other correspondences between the scientific results of the work and the results of research by other authors can be

[1] Strategy for the spatial development of the Russian Federation until 2025, of February 13, 2019 №207-r.Retrieved from: https://www.garant.ru/products/ipo/prime/doc/72074066/

cited. So, for example, the regions of the sections of the Russian-Belarusian border (Pskov, Smolensk and Bryansk regions) belong mainly to the third group of typology (Pskov region belongs to the second group). This means that tourism is developing in these regions without taking advantage of the border position, despite the fact that this particular section of the border is the most open and low barrier.

Kolosov & Morachevskaya [36] come to similar results. The paper shows that the processes of state building in both countries and the division of their economic and social space had a much greater impact on the border area than the openness of the border and the policy of integration. In addition, most of the border areas in this section of the border remain depressed.

As for the typology of border regions according to the specifics of tourism development, we can cite the results of Kondratieva [37]. In his work, the researcher identifies 6 groups of regions according to the level of development of international tourism. At the same time, the composition of groups with high indicators of the development of international tourism from the work of Kondratieva [37], with minor exceptions, corresponds to the groups identified in this work, which are characterized as groups using the advantages of the border position in the development of tourism.

The results obtained confirm the research hypothesis that the border location factor can have a positive impact. However, at the same time, the selected types of regions show us that the influence of this factor can be uneven and multidirectional. At the same time, the degree of contribution to the economic development of border areas from tourism varies, the differentiation is significant.

It is these differences that must be considered when developing and implementing tourism development programs at various levels for typological groups. At the same time, we can say that there is not enough research in the field of typology of regions from the point of view of the specifics of tourism, which contributes to the relevance of this study.

Considering certain adverse patterns, such as a high level of socio-economic inequality among regions, substantial lagging of some geostrategically important regions behind the national average level on key socio-economic parameters, considerable variation of socio-economic development levels within regions, including a lower living standard in rural versus urban areas as well as low entrepreneurial activity in a majority of small and medium towns and in rural areas, the way territorial economic systems are organised can significantly influence the quality of life of people in the regions and the nature of process inside the system itself.

As for the development of tourism in the border region, in the current conditions of the post-pandemic and extreme geopolitical shocks, it is difficult to make development forecasts. However, it can be assumed that it is foreign policy that will most significantly influence the nature of tourism development in the border regions of Russia. For example, in the pre-pandemic period, positive dynamics were observed in the Russian-Chinese border area. There are all prerequisites for maintaining a positive trend, provided that the risks associated with the pandemic are reduced. Other risks can also be identified. For example, for the border Republic of Karelia, which has a long border with Finland, there are risks of expanding the border zone with a corresponding tightening of the border regime, which will ultimately lead to the complete or partial exclusion of such natural tourist sites as the Kostomukshky Reserve and Paanajarvi National Park from the register of tourist resources region. The opportunities for the development of these objects as centers for the formation of cross-border tourist clusters are currently lost.

As mentioned earlier in the article, the Voronezh and Rostov regions are currently not border regions, and the Bryansk,

Belgorod and Kursk regions are more influenced by the special military operation conducted by the Russian Federation since 2022.Such transformations are now taking place throughout the border zone. The results of these transformations will be studied, including using the methodological approaches proposed in the article.

6. Conclusions

From the economic perspective, tourism contributes significantly to steady socio-economic development and social stability. It is declared at the federal government level that this sphere is important for SME, for creating jobs, including self-employment. Tourist services contribute at least 3.9% to Russia's GDP[1] and have a positive effect on quite a number of related industries. Besides, the quality of people's life is influenced by the amount of tourist services they get.

Taking into account the unevenness and the multidirectional influence of the border location factor on the development of the economic systems of the border regions as well the active transformation of the mode of operation in the border areas, the efforts of researchers should be aimed at studying new opportunities for the development of economic systems of the border regions, with the knowledge that in some of them there will appear considerable new limitations and risks for development of specific subsystems, including focusing the efforts on studying the influence of the border location factor on the development of complex systems, such as tourist and recreational subsystems and their spatial organization.

The tools developed and tested by authors for the typological classification of regional tourist and recreational systems make it possible to take into account the unevenness and multidirectional influence of this factor within the selected groups.

As part of the study, a hypothesis was tested, which consisted in the assumption that despite the risks and a high degree of inequality in a wide range of indicators of Russian regions in general and among border regions in particular, the factor of the border location creates additional incentives and has a prevailing positive impact on the development of the recreational systems in the border regions, but at the same time, there will be a difference in the level and peculiarities of development in different border regions.

To overcome this issue, authors has developed a methodology for typological classification of border regions according to the level of development of the recreational system and the influence of the border location on these processes, based on the method of multidimensional classification applied to a system of 13 indicators, including both data outlining the socio-economic development of the region, as well as groups of indicators of quantitative and qualitative aspects of the development of recreational activities in the region, natural, climatic and environmental conditions.

This study has produced scientifically novel results for working out an applied typology of border regions regarding the specific patterns of tourist system development in the border regions of Russia. The output of the typological classification can be used to substantiate the budgetary and investment policy in the sphere of tourism development in border regions, be considered in infrastructure development projects.

In this study, the typology is based on data from the period before the coronavirus pandemicandchanges in the geopolitical situation. It goes without saying that the pandemic and current geopolitical situation have affected the development of tourist systems in the border regions. In the future, the authors plan to carry out a series of experiments applying the proposed typology approach including indicators during the pandemic period and modern period.

[1] Concept note on the Federal Ad Hoc Programme "Development of domestic and inbound tourism in the Russian Federation (2019-2025)" of May 5, 2018.

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Развитие туризма в приграничных регионах Российской Федерации: методологические основы типологии и ее апробация

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Аннотация. Выраженная дифференциация российских регионов сопровождается традиционным отставанием приграничных территорий. Поиск путей нивелирования дифференциации связан с вариантами диверсификации экономики, в том числе за счет развития туризма и изучением специфики этого развития на приграничных территориях, что связано с актуальностью исследования. Для страны, в которой более половины всех регионов приграничные, граница является самой протяженной в мире, сама граница находится в состоянии трансформации, а роль пограничного фактора только возрастает, изучение влияния пограничного фактора на экономические системы, в том числе и на туризм, является особенно актуальной научной и практической задачей. Объектом исследования выступили приграничные регионы России. Цель исследования связана с разработкой методологического подхода к типологии приграничных территорий России в контексте раскрытия туристского потенциала. Апробация этого подхода проводилось на наборе данных за период до пандемии и помогает проверить гипотезу о том, что туристические системы в приграничных регионах развиваются в связи с дополнительными стимулами, создаваемыми границей. Однако это положительное влияние не может проявляться в равной степени на всех участках границы. Авторами обоснована и выполнена типология приграничных регионов по особенностям развития туризма. Для построения типологизации применялся метод кластерного анализа. В результате определены типы приграничных регионов по уровню развития туризма и параметрам влияния приграничного фактора. Предложенный в статье подход к типологии способствует развитию теорий управления пространственной организацией региональных экономических систем. С практической точки зрения предложенная методика и результаты типологии учитывают знания о различных аспектах туризма в приграничных регионах, помогают выявить стимулы развития, внести коррективы в бюджетную политику приграничных регионов, стать основой для выработки управленческие и инвестиционных решений.

Ключевые слова: приграничный регион; типология приграничных регионов; развитие туризма; кластерный анализ; пространственная организация; региональное планирование.

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