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GEOECOLOGICAL EVALUATION OF NATURAL POTENTIALS OF ŠAVNIK (MONTENEGRO) FOR THE PURPOSES OF RECREATIONAL TOURISM USING V-WERT METHOD IN GIS ENVIRONMENT

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Abstract: The geoecological assessment of the natural potentials of the Montenegrin municipality of Šavnik for the purposes of recreational tourism is carried out in this work using the quantitative diversity method (V-Wert method). The main criteria used in this evaluation method are natural elements (forests, water areas, relief, climate) and land cover. For the evaluation, the whole procedure was implemented in the environment GIS (Geographic Information Systems) using the software QGIS 3.14. The evaluation results show that unfavorable areas occupy 247 km^2 (39%), conditionally favorable 185 km^2 (30%), favorable 141 km^2 (22%) and very favorable 54 km^2 (9%). Despite the significant natural potential, which is partially recognized by this method with certain advantages and disadvantages, recreational tourism and all forms of tourism are underdeveloped in the municipality.

Keywords: tourism, quantitative diversity method, V-Wert method, GIS, geoecological assessment, recreational tourism.

Introduction

Geoecology, i.e. landscape ecology, is an applied science of the landscape (as a living and working space for humans and other organisms), the aim of which

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is to define the ecologically optimal spatial organization of the use and protection of the landscape (Troll, 1939; Miklos, 1994). Geoecology offers a range of theories, models, and experiences in the study of landscapes (Pecelj et al., 2015). The multidisciplinary approach to modern spatial planning has rightly generated increased interest in its geoecological aspect, especially in professional studies and analyzes, making this subject area a research field in its own right. Geoecological content has long been systematically represented and modeled in this field through various forms of geoecological mapping (Nikolić, 2016).

One of the practical geoecological methods suitable for planning optimal spatial management is geoecological assessment. Geoecological assessment is the process of evaluating whether and to what extent a space or some of its geocomponents correspond to a certain type of use (Crnogorac & Spahić, 2012). Through geoecological assessment, it is possible not only to determine the suitability of space for a particular type of use, but also to identify illogicalities in the use of space by comparing the results with the current type of use (Čirjak & Mamut, 2017).

As a relatively independent element of the natural environment, landscape assessment is a rather difficult task. Landscape can be considered as a prerequisite for the nature of influence of all other natural components in space, and as such it affects the qualitative characteristics of the surface and surface part of the lithosphere, climatic conditions, soil, vegetation, etc. For the above reasons, it is often impossible to determine the value of the landscape, as the theory of valuation has not fully defined the principles and criteria of valuation (Lješević, 1992).

Geoecological assessment is important for future tourism planning, design, protection and management, which implies further development and promotion of tourism-recreational activities (Pecelj et al., 2016). There are several methods for geoecological assessment of mountain areas for recreational tourism needs, of which the quantitative diversity method (V-Wert method) is the most commonly used. This method was formulated in 1967 by the German geoecologist Hans Kiemstedt (Golijanin, 2015).

Geoecological assessment using this method has been the subject of intensive research in recent years in the urban areas of Belgrade, Novi Sad, Loznica, Trebinje, Niš (Pecelj et al., 2016; Pecelj et al., 2017; Pecelj et al., 2018; Lukić et al., 2018; Manić et al., 2019), as well as in the mountains of Romania and Kozara National Park (Pecelj et al., 2018; Popović et al., 2018). The method proved to be advantageous for the analysis of mountainous regions, with certain advantages and disadvantages.

In this paper, the V-Wert method will be applied in the surroundings of GIS to determine the extent to which the natural components of Šavnik, which has mountain character, are favorable for the purposes of recreational tourism.

Research Area

The research object of this work is the municipality of Šavnik, whose natural diversity offers great potential for the development of leisure tourism. Šavnik is located in the northern region of Montenegro, in the high mountain zone of the Dinarides, between 42°52'31" - 43°7'30" N and 18°52'47" - 19°22'31" E (Figure 1). The area of the municipality is about 553 km². According to the 2011 census, Šavnik municipality has the lowest population (2077 inhabitants) and population density (3.74 inhabitants/km²) in Montenegro. The area is located on the slopes, in the valleys and on the surfaces of the mountain massifs: Durmitor in the north and northwest, Sinjajevina in the north and northeast, Moračke Mountains in the east and southeast, Krnovo Plateau in the south and Vojnik Mountains in the south and southwest. The municipality borders: Žabljak to the north, Mojkovac to the northeast, Kolašin to the east; Nikšić to the south and Plužine to the west and northwest (Šuntić, 2012; IBI-CAU, 2014).

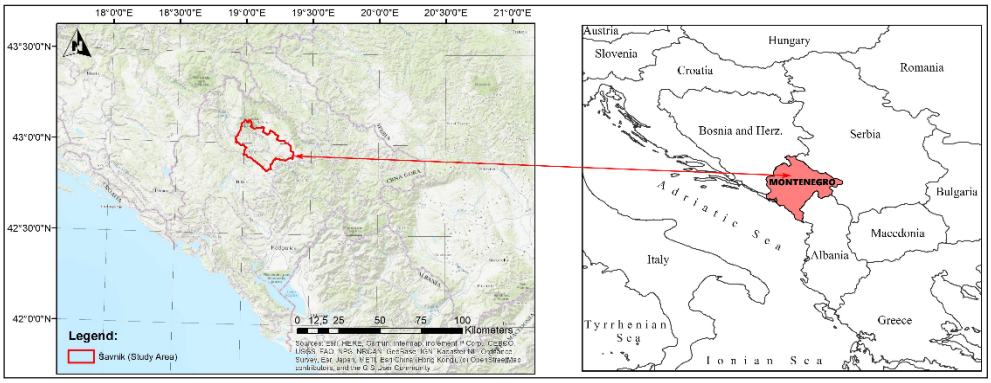

Figure 1. Map of the position of the municipality of Šavnik

Materials and methods

For the evaluation, the entire process was implemented in the GIS environment using QGIS 3.14 software.

For the evaluation, a vector GRID polygon vector network of dimensions 1000x1000 m was formed at the beginning of the study, covering a larger study area of the municipality of Šavnik with 627 cells or an area of 627 km².

The geoecological assessment was performed by the method of quantitative diversity (V-Wert method) using a cartographic algebra tool according to the following formula (Kiemstedt, 1967):

$$V = \frac{W + G * 3 + R + N}{1000} * K$$

Where: W - forest edges (m/m²), G - water edges (m/m²), R - relief energy (-), N - land cover (-), K - climatic criteria (-).

After applying the cartographic algebra according to the defined formula, the obtained values were divided into four diversity categories according to Table 1, based on which a map of the degree favorable for recreational tourism was created.

Table 1. Categories of diversity by Hans Kiemstedt

Categories	Classes	Span
I	Unfavorable	V<3,72
II	Conditionally favorable	3,72 < V < 7,44
III	Favorable	7,44 < V < 11,16
IV	Very favorable	V > 11,16

Source: Kiemstedt, 1967

The first criterion used in this method is the length of forest edges (W). According to Pecelj et al. (2015), forest edges are carriers of contrasts and spatial changes that influence the senses of the observer and represent typical elements of the cultural landscape. A crucial role in assessing the tourist value of a landscape is played by green spaces, which greatly contribute to the movement of tourists and are the basis for the development of sustainable tourism (Mihajlović et al., 2016; Đukin et al., 2018; Pecelj et al., 2018). Data from the Copernicus Forest type product digital spatial database for 2018 were used to determine the forest edge (Figure 2). Spatial analysis was performed by measuring the edge length for forest classes for each cell separately.

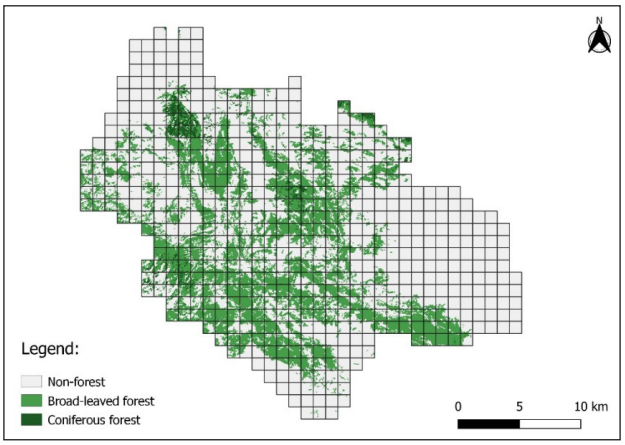

Figure 2. Map of forests

Another criterion used in this method is the water edges (G). Water edges significantly increase the tourist value of the area and make it more attractive from the recreational point of view, as they favor the development of a greater number of recreational and tourist activities (Pecelj et al., 2016; Pecelj et al., 2017; Popović et al., 2018). The data source for this criterion is data from the Open Street Map database, which was improved based on a publicly available 2018 orthophoto from the former Ministry of Sustainable Development and Tourism (Fig. 3). As with the first criterion, the edge length for this criterion was measured individually for each cell.

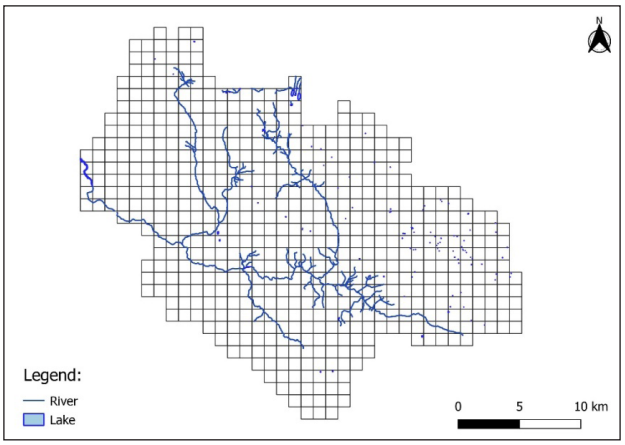

Figure 3. Map of waters

As a third criterion, this method uses relief energy. Relief energy represents the potential energy of a given part of the topographic surface defined by the difference in elevation between the highest and lowest points (Dragićević & Filipović, 2016). The impact of relief on the development and spread of tourism is reflected in three basic types: recreational value, aesthetic value, and locational value (Kadušić et al., 2018). This criterion was obtained by applying zonal statistics using EU-DEM 25m model data (Fig. 4). Then, the obtained values were ranked according to the scale for the obtained values as shown in Tab. 2.

Table 2. The scale of relief energy values

Altitude difference (m)	Values of the relief
10-20	220
20-30	300
30-60	400
60-100	590
100-250	860
250-500	1200

Source: Kiemstedt, 1967; Hoffman, 1999

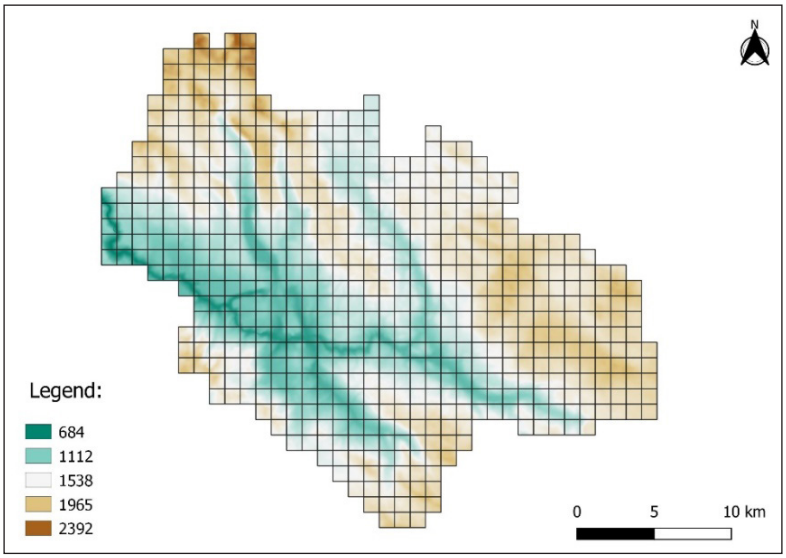

Figure 4. Map of elevation

Land cover is indispensable in this analysis to determine the potential of different landscape elements to meet the needs of recreational tourism (Lukić et al., 2018). The criterion related to land cover was determined based on the percentage in the cell and multiplication by the appropriate weighting factor from Table 3. Data from the Copernicus CORINE Land Cover 2018 database were used as the data source for this criterion (Figure 5).

Table 3. Weight factors for land cover

Land cover type	Weight factors
Cultivated fields and gardens	6
Meadows and pastures	15
Orchards and vineyards	8
Forests	19
Heath	21
Swamps	10
Barren land	21
Rivers	50
Lakes	50
Streams	20
Canals (main)	10

Source: Kiemstedt, 1967; Hoffman, 1999; Pecelj, 2017

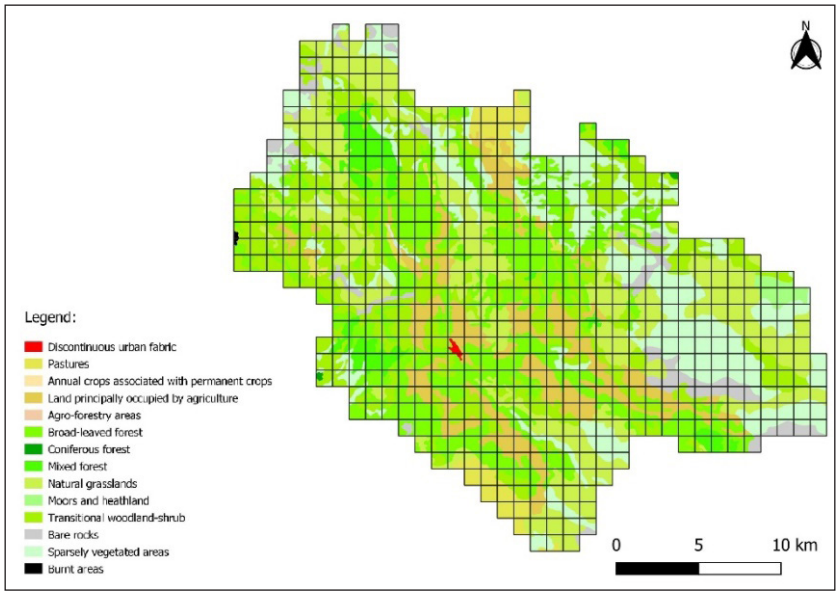

Figure 5. Map of Corine Land Cover

The climate criterion is the last element to apply this method. Kiemstedt (1967) proposed values for this criterion for the study area in Germany. Since the values were proposed for the area of Germany, it is difficult to establish values for other areas. In reviewing the proposed climatic values from Table 4 in this document, a value of 1.4 was assumed for the entire study area based on the Koeppen classification (Burić et al., 2014).

Table 4. Weight factor for climate types in Germany

Climate type	Weight factors
Urban climate	0.62-0.80
Climate of basin	0.70-0.90
Climate of North - Germany lowland	0.90-1.10
Coastal climate (Baltic and North Sea)	1.10-1.20
Climate of sub mountainous zone	1.20-1.40
Climate of high mountains	1.30-1.50
Climate of central Alps	1.30-1.80

Source: Kiemstedt, 1967

Results and discussion

The assessment was carried out in a slightly larger area than the administrative boundaries of the municipality of Šavnik and includes border areas with other

municipalities, so instead of an area of 553 km^2, an area of 627 km^2 was assessed. The reason for this is the size of the vector polygon unit GRID of 1000x1000 m, so for a correct evaluation the parts of the area located in other municipalities were not cut off.

The results of the evaluation were presented based on the degree of favorability of the different parts of the considered areas for recreational tourism based on the V-Wert diversity categories (Figure 6). The degree of favorability (Table 5) shows that unfavorable areas occupy 247 km^2 (39%), conditionally favorable 185 km^2 (30%), favorable 141 km^2 (22%) and very favorable 54 km^2 (9%).

According to the Šavnik Municipal Spatial Plan until 2020, the natural beauties of mountains, gorges, forests, rivers and lakes, as well as the diversity of flora and fauna are the main tourist recreational potential of Šavnik. The mountain area with the Durmitor massif, Sinjajevina, Vojnik, Lola, Morača and Javorje is rich in favorable areas for mountain adventures. Komarnica valley with Nevidio gorge and Boljske degree is also considered a very favorable area. The gorge itself is the axis of tourist development in the municipality of Šavnik, because it is a world-class natural attraction. The village of Pošćenje is also recognized as a favorable area, with the Great and Small Lakes of Pošćenje having exceptional potential (IBI-CAU, 2014).

The results can be considered relatively good, as most of the areas in the "favorable" and "very favorable" categories are recognized as part of the Spatial Urban Plan of Šavnik until 2020 (IBI-CAU, 2014). According to this document, the exceptions are parts of the mountain area that are considered to be conditionally favorable or favorable and are placed in an unfavorable category using this method.

The potentials of mountain landscapes in winter and summer seasons have been insufficiently exploited economically in the function of tourism development, although the Spatial Plan of Montenegro until 2020 and the Strategy for the Development of Tourism in Montenegro until 2020, the Municipal Spatial Plan of Šavnik, the Strategic Development Plan of the Municipality of Šavnik 2012-2017, give them a high priority and include them among the priority development centers (Montenegroinženjering et al, 2008; Ministarstvo turizma et al., 2008; Opština Šavnik, 2011; IBI-CAU, 2014).

In these planning and strategy documents, it was pointed out that the accommodation capacities are of poor quality, and the quality of accommodation and infrastructural facilities are insufficient. Tourists visiting Šavnik are mostly transients whose final destination is the Montenegrin coast or Žabljak. The current developments do not correspond to the actual possibilities and potentials that exist. Despite the significant natural potential that is partially recognized by this method, all forms of tourism in the municipality are underdeveloped, which is confirmed by the analysis of objective indicators of tourism development in Montenegro (Milošević, 2017).

In Šavnik, the construction of a hydroelectric power plant and the reservoir "Komarnica" is planned. If the construction takes place at all, the detailed spatial plan for the area of the multipurpose reservoir on the Komarnica River indicated that the construction will not endanger the Nevidio Gorge and the town of Šavnik, as well as the development of tourism. However, it is important to say that negative impacts are still possible and the construction could endanger the development of tourism (Jovanović et al., 2019).

Today's tourism trends show that such non-valorized destinations with preserved and diverse nature attract the interest of tourists of different categories. Tourism based on passive and active recreation is an effective tool for local and regional development in many European countries such as Austria, Germany, the Netherlands, and France, as significant socioeconomic benefits can be achieved with minimal investment (Panfilov, 2020).

For the development of leisure tourism, Šavnik lacks synergies with accompanying economic activities, experienced workforce, quality accommodation, a good offer throughout the year and a unique identity that would promote natural resources, valorization and demand orientation while respecting the principles of sustainable development.

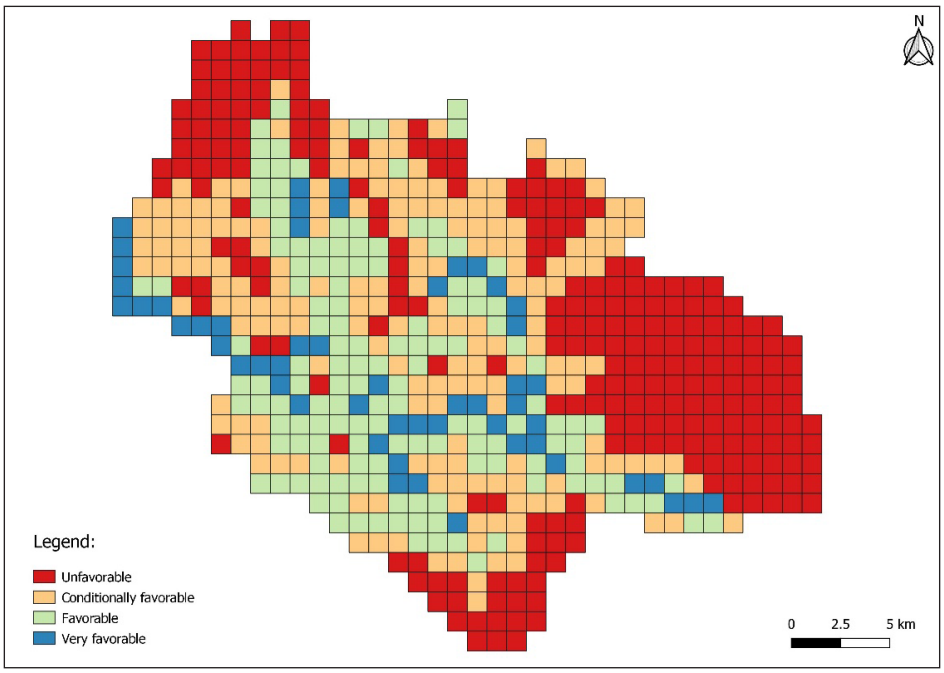

Figure 6. Map of favorable areas for the purposes of recreational tourism

Table 5. Categories of diversity by area and percentage in Šavnik

Classes	Area (km^2)	Percentage (%)
Unfavorable	247	39
Conditionally favorable	185	30
Favorable	141	22
Very favorable	54	9
Total	627	100

Conclusion

This work confirms the complexity and importance of geoenvironmental assessment. The V-Wert method of evaluation in terms of recreational tourism development, like other quantitative methods, has its advantages and disadvantages. The main advantages of this method are the rapid searchability for a large area, the availability and the possibility of using open geodata, the ease of data processing, analysis and presentation of the results at GIS. The input data for most of the criteria used in this work have certain deficiencies in terms of resolution and quality, so much better results could be obtained with LiDAR technology. However, this method also has drawbacks in that it did not detect some of the favorable surfaces. Perhaps these shortcomings could be addressed in future geoecological research by adding more criteria and correcting the values for the climate criterion. Validation of the obtained results is difficult for an unknown area and a large studied area, since data from the field are needed.

Despite the significant natural potential of the municipality of Šavnik for the development of recreational tourism, which the method used in this study partially recognizes, all forms of tourism in the municipality are underdeveloped. This potential for the development of recreational tourism needs to be upgraded and focused on demand, while respecting the principles of sustainable development.

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NEW CENSUS – OLD PROBLEM: CONTINUATION OF NEGATIVE DEMOGRAPHIC TRENDS IN SERBIA

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Abstract: Given the initial results of the 2022 Population, Household, and Housing Census, the question is not whether the demographic situation in Serbia is bad, but how bad it is. Serbia has been struggling with depopulation and other demographic problems for decades, which, while not surprising, worries us. At first glance, there are no positive indicators, but some isolated areas can be identified that are characterized by somewhat more favorable demographic trends, but this should be taken with a grain of salt. The objective of this paper is to look at and analyze the municipalities that have been most affected by the decline in total population between the last two censuses. This is done by analyzing the most threatened municipalities by examining the relationship between depopulation and the eleven parameters presented. Since the municipalities are very diverse in terms of population size, a percentage rather than an absolute decrease has been considered. Since depopulation occupies a significant place at the top of Serbia's demographic problems, the method of correlation and multiple regression is used to create a model that can be used to predict, to some extent, the future state of the most threatened parts of Serbia.

Keywords: depopulation, 2022 census, Serbia, red demographic zones, multiple regression.

Introduction

The trend towards urbanization means that more and more people are living in urban areas, while rural areas are losing population, leading to depopulation of rural areas or, in the worst case, to the extinction of villages. The occurrence of depopulation is not territorial, as it affects both urban and rural areas (Rodríguez-Soler et al., 2020). Depopulation can be described as a territorial and demographic phenomenon that affects the reduction of the population of a given area or population

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core in a given period of time, and it is extremely unfavourable when it affects rural areas (Pinilla & Sáez, 2017).

However, depopulation also affects cities. This phenomenon occurred in Serbia in response to the loss of demographic vitality, although there were certain regional differences (in the Vojvodina region, the process began in the 1970s, in central Serbia in the 1990s). The socio-economic changes that accompanied war events and crises left their mark on the demographic development of cities in Serbia. At the beginning of the 21st century, migration flows from smaller cities to leading urban centres intensified, resulting in demographic polarization of cities into zones of demographic concentration and zones of depopulation (Djurkin et al., 2021).

Depopulation has significant and profound implications for many areas of human life. Many countries are already facing the problem of depopulation, but in some cases the comprehensive impact of this process is not considered. It is believed that the importance of the depopulation process is not sufficiently discussed. It is true that this issue has been studied in various ways, but not at the national level, since its extent is mainly related to either rural or urban areas, separately. There is a need for many countries to gather comprehensive knowledge on a wide variety of depopulation impacts (Inoue et al., 2022).

Science clearly states that we are facing a demographic catastrophe as a result of depopulation. Regardless of certain advantages and disadvantages of the depopulation process, the fact is that it is progressive and is usually accompanied by a significant aging of the population. In the absence of effective mechanisms for reversing negative demographic trends, it is better to stop trying to change them irrevocably and focus on preparing the organizational structures of territorial units for the consequences of depopulation. It has been proven that in some cases it is impossible to reverse the trend of population decline. Strategies aimed at increasing the birth rate as well as increasing the influx of migrants cannot compensate for demographic losses. Policy solutions that are at least assumed to be implemented in several countries and aim to increase the birth rate with certain economic or social incentives generally do not lead to satisfactory results (Janicki, 2017).

Numerous authors have dealt with the problem of depopulation, and some of them have presented metaphorical formulations, which, however, are clearly interpreted. Thus, we find in the contributions the comparison of depopulation with a ticking bomb (Janicki, 2017) or a typhoon that devours everything in front of it (Inoue et al., 2022). It is clear, then, that high levels of depopulation pose a significant threat to the country as a whole, which is exacerbated if the population loss is permanent (López-Sanz et al., 2021).

The term “new census” refers to the results of the recent population, household, and housing census in Serbia, and “demographic problem” is a complex

concept, a phenomenon that intensifies over time. With each new census, Serbia is confronted with worse and worse demographic statistics. Depopulation, heavy emigration, reduction in the number of inhabitants of settlements and their complete extinction are just some of the modern demographic features of this country.

Serbia's neighbouring countries, which are members of the EU, also face the problem of depopulation. In the period 1989-2018, Bulgaria lost over 20% of its population, Romania 16%, Croatia 11% and Hungary 8%. The depopulation in these countries is in stark contrast to the trends observed in most other EU member states, where the population is increasing despite a slight decline in the Mediterranean countries. Both components of depopulation have contributed significantly to the population decline in these countries. However, in three of the four neighbouring countries, the migration component was more significant than the natural component. Only in Hungary was positive net migration able to compensate for the excess of deaths over births or at least slow down the depopulation process (Fihel & Okólski, 2019). What distinguishes the depopulation process in Serbia from that in neighbouring EU countries is the dominance of the natural component in the overall population loss.

As we can see, Serbia is not the only country facing this problem, but the situation in certain municipalities, districts and regions is worrying, to say the least. It can be assumed that most municipalities in Serbia are still facing a decrease in the total number of inhabitants, which is not conducive to overall social development. Over time, from census to census, Serbia is becoming more and more depopulated. The most specific example and synonym of depopulation of Serbia was the municipality of Crna Trava, and it can be assumed that in this case not much has changed in the last period between censuses. This municipality has been an example of sharp population decline for decades.

In the period from October 1 to 31, 2022, with the extension of field data collection in some municipalities until November 7, a new census was conducted, the first results of which were recently published (РЗС, 2022a). According to the adopted regulation, this census was to be conducted in 2021. However, it was postponed due to the COVID -19 pandemic. According to the announcement (РЗС, 2022a) of the Statistical Office of the Republic of Serbia (SORS), 6,690,887 inhabitants were registered in Serbia, which is 6.9% less than in the previous census.

The aim of this article is to determine the most demographically vulnerable parts of Serbia and to analyze whether there is a connection with certain demographic indicators, which will be discussed later. We can call these parts of Serbia critical or red demographic zones. They are intensively affected by negative indicators of natural and migratory movements. In addition, we will also present the parts of Serbia that are characterized by somewhat more favorable demographic conditions,

but as I said, this should be taken with caution. The question is to what extent the natural component is responsible for the increase in the number of inhabitants in these areas, and to what extent the migration component.

Literature review

Many authors (Pušič, 2003; Вељовић, 2016; Krstić, 2017; Лесковшек, 2017; Jelić & Kolarević, 2021; etc.) have addressed the problem of depopulation of certain municipalities and regions of Serbia, and the following is an overview of certain red demographic zones in accordance with the available literature.

The decrease in the number of inhabitants of the municipality of Boljevac is due to negative natural increase and continuous out-migration. The outflow of the working age population and the unfavorable economic conditions prevailing in the area influence the depopulation of this municipality (Лесковшек, 2017). Lukić (2011) studied depopulation in the Carpathian Serbia region and concluded that the municipalities of Negotin and Boljevac lost the most inhabitants until 2002. Even in the last census period, these municipalities lost over 20% of their population, and besides that, the situation was similar in the municipalities of Žagubica, Kučevo and Majdanpek.

The municipality of Rekovac had a continuous decrease in the number of inhabitants during the entire post-war period. A negative natural increase was recorded on its territory as early as 1962 and has been declining since then, making it one of the municipalities with the longest and most severe depopulation. The absence of an urban settlement on its territory has meant that the municipality has never had functions that would have allowed it to create a point of attraction for the population. The process of population decline progressed rapidly and led to a significant transformation of this municipality. In the first two census periods of the post-war period, the population decreased mainly due to emigration, which led to an increase in the number of the old population. In the following intermediate census periods, a natural depopulation followed, due to the inherited age structure. Due to the unfavourable age structure and the previous out-migration of the working-age population, there was a disproportion between the old and the young population. Parallel to the significant outflow of population from less developed municipalities, the population expansion of large urban centres progressed (Veljović, 2016). The municipality of Rekovac as such continues to record negative demographic trends.

The demographic development of Bosilegrad municipality is characterized by unfavourable demographic processes. The most important demographic feature is depopulation caused by years of negative natural growth and population out-

migration. Continuous out-migration has damaged the age structure of the population in its most important part, which is reflected in the total number of inhabitants, but also in the natural movement. As the demographic stocks for emigration are mostly exhausted, the reproductive characteristics of the population will increase and out-migration will decrease, leading to depopulation (Golubović et al., 2017).

Negative demographic processes in the municipality of Crna Trava led to a continuous decrease in the number of inhabitants in the post-war period. This municipality is one of the few that faced the depopulation process immediately after World War II (Krstić, 2017). After its completion, it experienced a strong demographic change, so there are no opportunities for demographic and economic revitalization.

Since depopulation is also influenced by the migration component, it should not be neglected. A survey conducted in 2003 on the territory of Vojvodina showed that the inhabitants of the North Banat region expressed the strongest emigration aspirations (Pušić, 2003). This area has been characterized by a continuous decrease in the number of inhabitants since 1961 (Stojšin, 2014).

Correlation and regression analyses are now used in numerous scientific fields, including geography. Vaš (2011) gave an interesting example of the use of multiple regression in the field of demography. The subject of the analysis was the prediction of life expectancy based on the number of televisions per 100 people, the number of people treated by a physician, and GDP. The selected predictors may seem unexpected at first sight, but appropriate or less appropriate models can be built on their basis. Đorđević (2008) used the above method to study changes in the average size of Serbian households in the second half of the last century. Sixteen parameters were introduced into the analysis to test the dependent variable, and it was shown that this method can be used to build a reasonable predictive model.

Methodology

For the purposes of this study, the method of descriptive analysis was used, as well as statistical methods: Correlation and multiple regression.

The spatial scope of the research refers to the municipalities in Serbia, and the municipalities most at risk of depopulation were analysed in more detail. The temporal scope refers to the period from 2011 to 2022 in terms of change in the number of inhabitants, with reference to the demographic indicators of the entire post-war period (World War II), as the manifestation and intensification of negative demographic indicators lasted much longer than eleven years.

After the recalculation of the indicator, the municipalities are mapped according to the obtained results. The selected territorial units are divided into four groups, namely municipalities that recorded a decrease in the number of inhabitants of up to 10%, then those with a decrease of 10-20%, municipalities with a decrease of more than 20%, and those with an increase in the number of inhabitants in the period 2011-2022. Zdravković (2016) proceeded similarly, with the difference that this author divided the municipalities into five groups. The classification of depopulated municipalities is maintained, but his classification of municipalities where the number of inhabitants increased in the period 2002-2011 referred to municipalities with a population increase of up to 10% and those above this value. In this paper, this classification is changed, as municipalities with population increase are only mentioned, but not analysed in more detail.

The aim of the classification of the municipalities is to study the spatial distribution and possible polarization of the most affected critical zones, as well as the medium and less vulnerable zones. The observed indicator, which is the focus of this research, is the percentage change in the number of inhabitants of Serbia in the period 2011-2022 and was determined according to the following form:

$$X = \frac{-(S_{2011} - S_{2022}) * 100}{S_{2011}}$$

where X is the percentage change in the number of inhabitants between the last two censuses, S2011 is the number of inhabitants according to the 2011 census, and S2022 is the number of inhabitants according to the 2022 census.

Problems arose in the methodology of the last two censuses due to certain limitations, administrative or political:

1. due to the boycott of the 2011 census in the municipalities of Bujanovac and Preševo (Pčinja region) by the Albanian population, we do not have sufficient data on the number of inhabitants;
2. the municipality of Sevojno was not included in the 2011 census (it belonged to the municipality/city of Užice);
3. the municipality of Petrovaradin was not included in the last census (it belonged to the municipality/city of Novi Sad);
4. the analysis was conducted without data for municipalities in the Kosovo and Metohija region, as the political situation did not allow for censuses in the 21st century due to the unilateral declaration of independence of the southern Serbian province. After classifying the municipalities according to the percentage change in the number of inhabitants between the last two censuses, the most demographically vulnerable municipalities are analyzed in more detail, i.e.

those that experienced a decrease in the number of inhabitants by at least 20% between the two censuses. To this end, eleven parameters are included in the analysis. Correlation is used to determine how each of the aforementioned parameters is related to the decrease in the number of inhabitants, but also to each other, while the multiple regression method is used to create a model on the basis of which it is possible to predict the future state of certain municipalities in terms of depopulation as a function of certain variables. Every day phenomena occur between which there are certain relationships, so that the change of one phenomenon entails the change of some others. For the case when phenomenon A has an influence on the change of phenomenon B, i.e. when the functional expression A=f(B) holds, it is called a regression model. However, there are also cases when there is a reciprocal relationship, i.e. when A=f(B) is the same as B=f(A). In this case, one speaks of a correlation model, i.e. a correlation analysis (Kero, 2003).

To study whether there is dependence between two or more parameters, we need to talk about the concept of correlation. For this purpose, we use the correlation coefficient between the parameters x and y. The value of this coefficient can be found exclusively in the interval [-1, 1]. Its positive value clearly indicates that with an increase in the value of the variable x, the corresponding values of the variable y also increase or vice versa. Similarly, when the value decreases. A negative value of the correlation coefficient indicates that when the value of variable x increases, the corresponding values of variable y decrease or vice versa, while when the value of variable x decreases, the values of variable y increase or vice versa. The closer the coefficient is to the limits of the interval, the stronger the linear relationship between the two parameters (Trajković, 2020), and the more meaningful the correlation analysis is.

For qualitative data, the rank correlation coefficient is used, because in this case the properties of the variables must be ordered according to a certain criterion. For these purposes, Spearman and Kendall coefficients are used (Dumičić & Bahovec, 2011). However, in this research, Pearson's correlation coefficient was used because quantitative indicators were used. Correlation analysis and later regression were performed using Microsoft Office program Excel, so this coefficient can be easily recalculated using Pearson's function.

Correlation analysis is performed to determine the dependence of those pairs of indicators for which there is significance of measurement, i.e., meaning. The statistical significance of the Pearson coefficient is greater than that of the Spearman coefficient, so it should be given preference. The Spearman coefficient can be used instead of the Pearson coefficient if the data are ordered by size (Vuković, 2013).

Regression is a statistical method used to determine the relationship between different phenomena. The importance of regression is reflected in the ability to predict the outcome of the selected phenomenon based on the available real knowledge about other phenomena. Phenomena that predict a value (x1, x2, ..., xk) are independent (deterministic) variables (Vaš, 2011) or explanatory variables or predictors (Trajković, 2020). The phenomenon that depends on them (y) is called dependent (stochastic) variable (Vaš, 2011) or response variable (Trajković, 2020).

Regression analysis is used to determine the statistical relationship between the dependent variable and one or more independent variables. A model containing only one independent variable is called simple linear regression, while a model containing two or more independent variables is called multiple linear regression. The goal of regression analysis is prediction and inference (Trajković, 2020).

In contrast to the coefficient of determination, the adjusted or corrected coefficient of determination takes into account the number of independent variables and the sample size. It is calculated according to the following formula:

$$\bar{R^2} = 1 - \frac{n-1}{n-2}(1-R^2),$$

where n refers to the number of municipalities (21) and R2 is the (ordinary) coefficient of determination.

The value of the adjusted coefficient of determination can only be less than or equal to the value of R2. Therefore, $\bar{R^2}$ can take a negative sign if the regression model is poorly representative. The importance of the adjusted coefficient of determination comes to the fore in multiple linear regression because a larger number of independent variables are included in the model (Dumičić & Bahovec, 2011). It was observed that in multiple regression the addition of each new predictor, even an insignificant one, increases the coefficient of determination. Therefore, the number of predictors and the sample size were considered to allow a better evaluation of the model. The same considerations apply here as for the coefficient of determination. The higher the adjusted coefficient, the better the regression model (Vaš, 2011).

To simplify the existing multiple regression model, the most useful predictors are selected from the set of all predictors. Many multiple regression models contain variables characterized by insufficient p-values. They do not represent statistically significant predictive ability and should be removed from the model. When testing the significance of predictors, we must also consider possible randomness. In any model, there will be certain independent variables that are better predictors than others. If several of them predict the outcome equally well, it does not mean that they are all equally good, but it may be a product of chance. This is precisely why we need

a procedure to determine which are truly better predictors than those that just happen to appear that way. Unfortunately, this procedure does not exist, but the closest one that can be used is the step-by-step procedure, which includes forward selection, backward elimination, and stepwise regression. (Šunjo, 2014).

In backward elimination, we start modelling with all predictors. Then, step by step, the variable with the highest p-value is removed from the model. In each subsequent step, the variable with the highest value is removed from the model until the variables with p-values below 0.05 are included in the model (Šunjo, 2014). In this work, backward elimination is applied.

Results and discussion

The processes of depopulation and demographic aging cause many problems and therefore require serious analysis and a long period of scientific research. Throughout the second half of the 20th century, Serbia faced negative demographic changes, which continued in the first decades of the 21st century. Depopulation and population aging processes are one of the most important problems facing Serbia, and certainly one of the causes of regional disproportions. Both processes are long-term and have a tendency to reinforce already existing inequalities. It is concluded that there are extremely unfavourable demographic conditions that dictate the continuation of unfavourable trends in the demographic development of our country (Krstić, 2017).

At the beginning of the 21st century, a short-term interruption of the unfavourable demographic trends was recorded. After the end of the warlike conflicts in the 1990s, a short-term balancing period followed, but the negative demographic changes soon continued. The aforementioned events left their mark on the immigration of residents to Serbia. When the influx of refugees finally ceased, the period 2002-2011 showed that Serbia's population was actually shrinking and shrinking sharply. Under such unfavourable conditions, the possibilities for the country's demographic recovery are limited (Penev & Predojević-Despić, 2019). This is supported by the fact that the population decline continued after 2011, which can be clearly seen in Table 1.

Table 1[2] refers to the initial part of the results of this research and it presents

[2] data on the number of inhabitants of the municipality of Petrovaradin for 2011 were added to the data for Novi Sad, in order to obtain more realistic data on the population growth of today's Novi Sad. For the municipality of Užice, data on the number of inhabitants in 2011 without Sevojno were used, although this settlement was then part of the same municipality, again with the aim of assessing more realistic changes.

the values of the percentage change in the number of inhabitants between the two last censuses, by municipality. It is noticeable that most of Serbia is still facing the process of depopulation, and that only a few municipalities recorded an increase in the number of inhabitants in the analysed period. This is the case in only 9 municipalities (5.4%), out of a total of 166 taken into account. Seven municipalities recorded an increase due to a positive migration balance, while only the municipalities of Novi Pazar and Tutin recorded an increase due to positive natural growth (Zdravković, 2016). Thanks to the function of the capital city, i.e. an important regional center, the Belgrade municipalities of Voždovac, Zvezdara, Zemun, Palilula and Surčin, then the municipality of Pantelej and the municipality of Novi Sad are recording an increase in population.

Table 1. Percentage change in the number of inhabitants between the last two censuses, by municipalities[3]

municipality	%	municipality	%	municipality	%	municipality	%
Barajevo	-1.87	Kanjiža	-19.03	Loznica	-7.87	Malo Crniće	-17.67
Voždovac	10.66	Kikinda	-16.42	Ljubovija	-15.18	Petrovac na Mlavi	-16.23
Vračar	-1.00	N. Kneževac	-22.27	Mali Zvornik	-7.39	Zaječar	-18.23
Grocka	-0.56	Senta	-22.32	Čačak	-7.70	Boljevac	-20.17
Zvezdara	13.25	Čoka	-24.43	G. Milanovac	-11.62	Knjaževac	-19.15
Zemun	6.66	B. Topola	-20.11	Ivanjica	-13.13	Sokobanja	-16.83
Lazarevac	-5.30	Mali Iđoš	-15.86	Lučani	-18.22	Leskovac	-13.40
Mladenovac	-7.68	Subotica	-11.92	Jagodina	-9.29	Bojnik	-14.97
N. Beograd	-2.19	Žitište	-19.58	Despotovac	-18.83	Vlasotince	-13.53
Obrenovac	-4.34	Zrenjanin	-13.62	Paraćin	-15.00	Lebane	-16.96
Palilula (Bg)	5.27	Nova Crnja	-19.91	Rekovac	-25.70	Medveđa	-13.44
Rakovica	-3.42	Novi Bečej	-16.09	Svilajnac	-12.67	Crna Trava	-35.90
Savski venac	-6.88	Sečanj	-19.94	Ćuprija	-16.26	Medijana	-4.20
Sopot	-5.50	Inđija	-7.75	Kruševac	-11.20	Niška Banja	-10.82
Stari grad	-7.72	Irig	-13.71	Aleksandrovac	-15.77	Palilula (Niš)	-5.04
Surčin	4.05	Pećinci	-6.50	Brus	-16.20	Pantelej	1.82
Čukarica	-2.84	Ruma	-9.89	Varvarin	-19.95	Crveni krst	-7.67
Apatin	-19.17	S.Mitrovica	-8.62	Trstenik	-15.89	Aleksinac	-16.04
Kula	-16.61	Stara Pazova	-4.78	Ćićevac	-16.71	Gadžin Han	-29.26

[3] without data for municipalities within the Kosovo and Metohija region, Bujanovac, Preševo and Petrovaradin.

municipality	%	municipality	%	municipality	%	municipality	%
Odžaci	-16.56	Šid	-17.51	Kraljevo	-11.15	Doljevac	-13.51
Sombor	-16.74	Užice	-10.20	Vrnjačka Banja	-8.52	Merošina	-13.73
Alibunar	-14.25	Sevojno	-8.89	Novi Pazar	7.42	Ražanj	-22.69
Bela Crkva	-16.83	Arilje	-8.72	Raška	-12.23	Svrljig	-23.57
Vršac	-11.64	B. Bašta	-8.98	Tutin	7.44	Pirot	-13.87
Kovačica	-14.95	Kosjerić	-15.05	Kragujevac	-4.34	Babušnica	-25.39
Kovin	-16.13	Nova Varoš	-18.42	Aranđelovac	-9.80	Bela Palanka	-17.78
Opovo	-9.23	Požega	-12.07	Batočina	-12.64	Dimitrovgrad	-20.19
Pančevo	-6.08	Priboj	-12.32	Knić	-16.85	Smederevo	-8.81
Plandište	-20.60	Prijepolje	-11.77	Lapovo	-15.55	Velika Plana	-12.56
Novi Sad	7.46	Sjenica	-5.46	Rača	-15.15	S. Palanka	-15.50
Bač	-19.34	Čajetina	-0.47	Topola	-13.92	Vranje	-9.05
Bačka Palanka	-12.36	Valjevo	-8.60	Bor	-15.09	Vranjska Banja	-20.40
B. Petrovac	-13.32	Lajkovac	-10.37	Kladovo	-12.72	Bosilegrad	-24.09
Beočin	-10.92	Ljig	-15.82	Majdanpek	-21.53	Bujanovac	
Bečej	-17.09	Mionica	-15.84	Negotin	-21.57	Vladičin Han	-15.69
Vrbas	-12.20	Osečina	-20.14	Požarevac	-7.40	Preševo	
Žabalj	-8.03	Ub	-11.04	Kostolac	-11.12	Surdulica	-16.36
Srbobran	-11.27	Šabac	-8.47	V. Gradište	-9.44	Trgovište	-13.67
S. Karlovci	-9.43	Bogatić	-14.18	Golubac	-19.39	Prokuplje	-13.80
Temerin	-8.33	Vladimirci	-16.91	Žabari	-12.76	Blace	-16.94
Titel	-10.34	Koceljeva	-14.32	Žagubica	-22.63	Žitorađa	-14.83
Ada	-20.84	Krupanj	-15.76	Kučevo	-21.85	Kuršumlija	-17.22

Source: recalculated by author based on SORS, 2014. & P3C, 2022a.

Most of the country continues to be affected by depopulation. During the period in question, 94.6% of the municipalities registered a decrease in the total number of inhabitants. In terms of individual categories of decline, most municipalities are in the orange category. They have lost 10-20% of their population in percentage terms, and as many as 56% of the municipalities are classified in this category. The municipalities with the smallest decline (up to 10%) account for about a quarter of the total (25.9%), and the municipalities most affected by depopulation account for 12.7%.

If we look back to the period between the 2002and 2011 censuses, we see that only five municipalities experienced a population decrease of more than 20%, namely Babušnica, Majdanpek, Medveđa, Trgovište and the inevitable Crna Trava

(according to SORS, 2014; Zdravković, 2016). Today, Babušnica, Majdanpek and Crna Trava belong to this group, and eighteen other municipalities are connected to it. Of particular interest is the somewhat more moderate depopulation on the territory of the municipalities of Medveđa and Trgovište (in both municipalities a decrease of about 13.5% was recorded) in the last intermediate census period. The conclusion is that these two municipalities have significantly lost their depopulation potential, but that the depopulation process in Serbia has further intensified after 2011. This is also indicated by the fact that in the previous intermediate census period, according to SORS (2014) and Zdravković (2016), population growth was a characteristic of the municipalities of Kragujevac, Jagodina, Kraljevo, Vrnjačka Banja, Niška Banja, Medijana, Palilula, Crveni krst, Požarevac, Kostolac, Temerin, Petrovaradin (now part of Novi Sad), Barajevo, Grocka, Mladenovac, Lazarevac, Obrenovac, Rakovica, and Čukarica. All these municipalities have depopulated in the period from 2011 to 2022.

Demographic conditions are most unfavourable in peripheral, transport-isolated and economically less developed municipalities with a very unfavorable biological structure and unsatisfactory demographic potential (Đokić et al., 2014). In Figure 1, we see the territorial distribution of municipalities based on the change in the number of inhabitants in the period 2011-2022. It can be said that the theory about the periphery of municipalities is correct to a significant extent, as currently nine border municipalities are facing a decrease in total population of more than 20%. From north to south, these are the municipalities of Novi Kneževac, Čoka, Plandište, Majdanpek, Negotin, Dimitrovgrad, Babušnica, Crna Trava and Bosilegrad. Among the red demographic zones, only the municipalities of Rekovac and Ražanj are located in the deeper interior of Serbia. The yellow and orange zones are characterized by a slightly lower degree of depopulation. The orange zones are located at the transition from one zone to another, and the yellow zones are mainly concentrated in the gravitational zone of Belgrade and Novi Sad, in addition to some municipalities in the two regions of Serbia South for which data are available. Three of the four isolated green zones are the result of migration, and only one (along the southwestern border) is the result of predominantly positive natural growth.

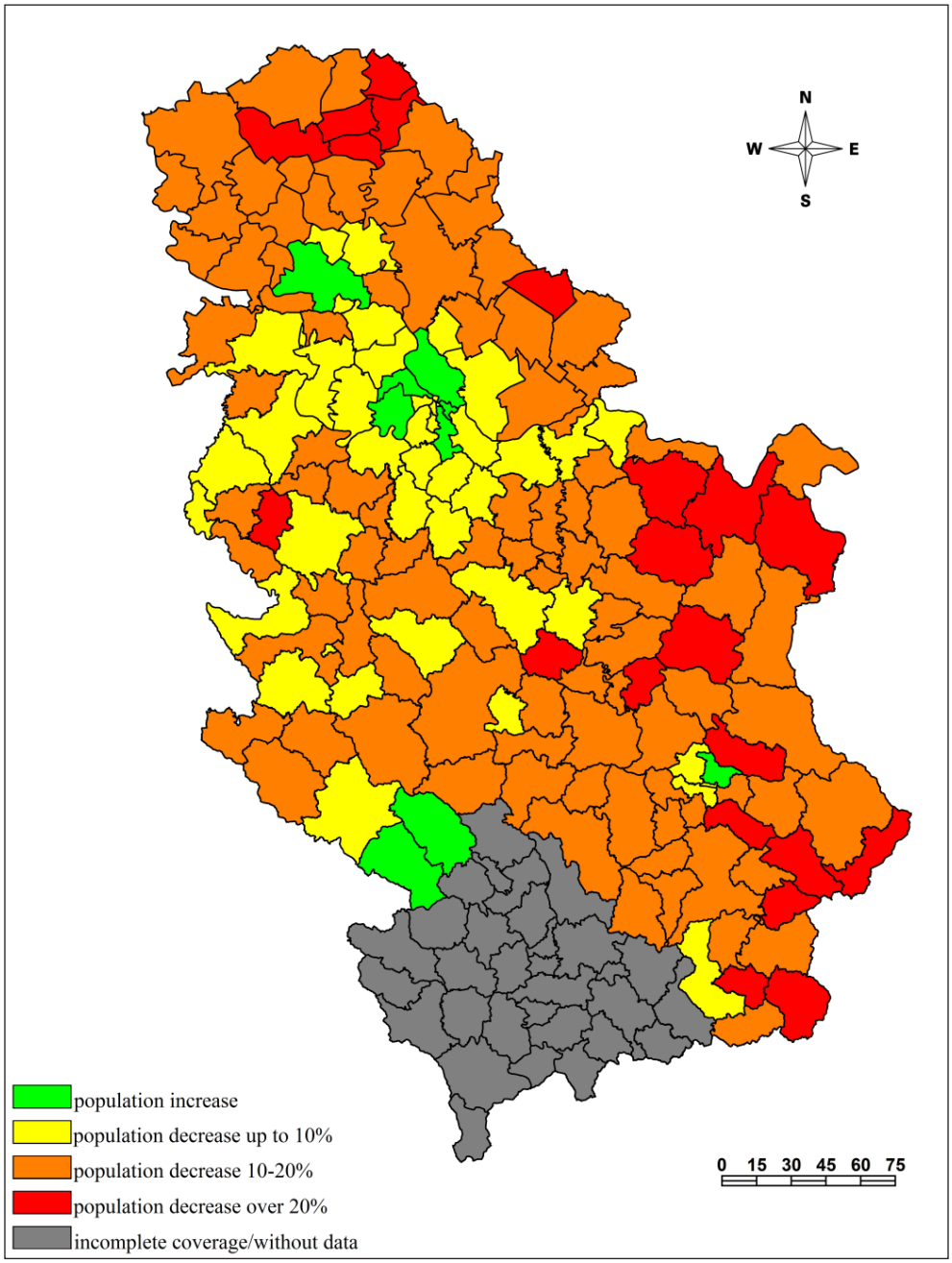

Figure 1. Percentage change in the number of inhabitants between the last two censuses, by municipalities.

The aging process of the Serbian population began in the late 1960s, and since 1992 mortality has outweighed the birth rate. Together with a low fertility rate and negative net migration, Serbia is one of the countries with significant depopulation. Depopulation in Serbia is significantly influenced by negative natural increase and much less by emigration. The most affected are the municipalities with an older population, a low number of women of childbearing age (15-49 years), high mortality and out-migration (Zdravković, 2016).

Problems at the global level since the 1980s and at the regional level since the early 1990s contributed to the occurrence of declining demographic trends in Serbia. This promoted the postponement of births and the reinforcement of biological depopulation, which today has created the fear of population extinction. At the same time, there was an increasing concentration of people capable of working, reproducing and educated in Belgrade, which is referred to by the term Belgradeization of Serbia (Spasovski et al., 2012).

Table 2 shows the data on the basis of which the correlation and later the regression analysis were performed. All the selected parameters can be associated to a greater or lesser extent with the intensification of the depopulation process in the selected municipalities. With the help of downloaded and derived demographic parameters from official publications and announcements of the SORS, a correlation was carried out and the creation of a correlation matrix necessary for further regression analysis was started.

The aging index represents the ratio between the population aged 60 and over and the population aged 19 and under. An index value above 100 indicates that the number and proportion of the elderly exceeds the number and proportion of the young population. This unfavorable ratio results in numerous problems, such as unfavorable reproductive (demographic) and labor force (economic) potential. Among the municipalities with an unfavorable aging index, the leading ones are Ražanj, Svrljig, Gadžin Han (Đokić et al., 2014), Babušnica and Crna Trava.

In demographic theory, it's assumed that the threshold for aging of a given population is 30 years, so we can say that all selected municipalities are in an advanced stage of aging. The aging process has numerous consequences, such as an increase in the general mortality rate, a decrease in the birth rate, deterioration in the population structure by age and sex, and the aging of the working contingent. Depopulation reflects changes in the age structure, the decline in the proportion of young people, and the decline in the working-age population. As the elderly population increases as a share of the total population, increased pressure on social security and health insurance structures can be expected. A larger proportion of older people may lead to financial strain, confrontation between the active and inactive populations, and greater overall social tension (Đokić et al., 2014).

Table 2. Percentage decrease in the number of inhabitants 2011-2022 and selected independent variables by municipality

municipalityty	y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
	% decrease of population	% of illiterate persons	live birth rate	death rate	natural increase rate	% of one-person hsh in the total nbr of households	avr nbr of members in the household	% change in the nbr of households	aging rate	average age	marriage rate	divorce rate
Plandište	20.60	3.31	6.0	24.1	-18.1	26.90	2.7	-13.09	210.6	46.7	4.1	1.1
Ada	20.84	0.97	8.2	23.2	-15.0	25.73	2.5	-10.92	158.7	44.1	4.6	2.7
Novi Kneževac	22.27	2.23	9.0	25.6	-16.6	27.39	2.6	-16.06	143.3	43.5	4.2	0.2
Senta	22.32	1.37	7.7	21.3	-13.6	27.84	2.5	-15.33	154.1	43.8	4.5	2.3
Čoka	24.43	1.33	6.6	25.7	-19.1	29.14	2.4	-17.31	164.3	44.5	3.0	0.2
Bačka Topola	20.11	1.75	7.8	22.3	-14.5	27.11	2.5	-12.84	171.5	44.7	4.4	3.5
Osečina	20.14	5.24	6.3	25.5	-19.2	21.32	3.0	-10.90	218.9	47.5	2.3	1.1
Rekovac	25.70	3.87	5.0	36.3	-31.3	29.25	2.7	-13.92	332.7	51.4	2.9	0.9
Majdanpek	21.53	3.71	7.6	23.9	-16.3	25.67	2.6	-12.71	196.4	46.0	4.6	1.2
Negotin	21.57	3.46	5.6	30.5	-24.9	26.33	2.7	-4.56	251.0	48.5	4.3	2.5
Žagubica	22.63	5.75	5.6	26.5	-20.9	24.71	3.0	-7.23	254.9	48.8	3.8	0.9
Kučevo	21.85	4.87	6.3	29.6	-23.3	26.78	2.8	2.10	254.1	48.5	2.9	2.2
Boljevac	20.17	2.90	4.8	33.7	-28.9	24.74	2.9	-5.92	240.7	48.2	2.6	1.2
Crna Trava	35.90	7.58	3.8	41.1	-37.3	40.93	2.1	-28.59	580.2	55.8	1.0	0.0
Gadžin Han	29.26	7.28	5.9	54.0	-48.1	33.32	2.3	-24.55	361.5	53.1	2.4	1.1
Ražanj	22.69	3.78	7.0	33.7	-26.7	22.00	3.1	-13.51	273.1	49.6	2.9	0.9
Svrljig	23.57	2.71	5.6	27.8	-22.2	24.84	2.6	-19.86	298.2	51.0	3.6	2.1
Babušnica	25.39	5.69	4.4	32.7	-28.3	30.11	2.4	-15.38	279.3	49.7	2.4	1.3
Dimitrovgrad	20.19	1.75	4.0	27.7	-23.7	25.76	2.5	-12.22	245.3	48.3	3.1	1.0
Vranjska Banja	20.40	5.27	5.9	22.9	-17.0	16.47	3.2	-8.15	165.8	44.3	3.1	1.4
Bosilegrad	24.09	3.72	5.2	25.5	-20.3	25.12	2.7	-3.55	205.9	46.6	3.8	0.4

Source: author's recalculation based on SORS, 2014 & РЗС, 2022a for y; SORS, 2013 for x_1; SORS, 2022 for x_2, x_3, x_4, x_6, x_8, x_9; author's recalculation based on SORS, 2022 for x_5; author's recalculation based on SORS, 2014 & РЗС, 2022a for x_7 and РЗС, 2022b for x_{10}, x_{11}.

The region of South and East Serbia is affected by the most intense process of demographic aging in Serbia (Krstić, 2017). In this context, it is important to mention that 13 of the total 21 municipalities belong to this region, which are the subject of more detailed analysis in this paper. These are Majdanpek, Negotin,

Žagubica, Kučevo, Boljevac, Crna Trava, Gadžin Han, Ražanj, Svrljig, Babušnica, Dimitrovgrad, Vranjska Banja and Bosilegrad. The mentioned municipalities are characterized by a lower level of development, and according to Jelić & Kolarević (2021), Babušnica, Bosilegrad and Svrljig are devastated areas, i.e. local self-government units with the lowest level of development. The municipalities of Dimitrovgrad and Majdanpek were also devastated, and the municipalities of Žagubica and Kučevo were less developed (Lukić, 2011).

Considering the occurrence of negative natural growth on the territory of 21 selected municipalities, the municipality of Negotin recorded negative values for this indicator already in 1962. The next year, the municipalities of Rekovac and Ražanj were added, in 1964 Kučevo and Boljevac, in 1967 Novi Kneževac and Bačka Topola, in 1969 Dimitrovgrad and in 1970 Plandište, Ada, Senta, Žagubica, Gadžin Han and Svrljig. Six years later, the municipality of Žagubica faced negative natural growth, and in 1978 Osečina and Crna Trava were added. In the ninth decade of the last century, only the municipality of Bosilegrad was added, right at the beginning. The municipality that resisted the negative values of this parameter the longest was the municipality of Majdanpek, until 1996 (according to SORS, 2012).

This analysis was also performed by Spasovski et al. (2012), but the period when the trend of negative natural increase started was observed. In the period 1961-1965, the trend was observed in the municipalities of Negotin, Kučevo and Boljevac, 1966-1970 in Plandište, Čoka, Rekovac, Gadžin Han and Svrljig, 1976-1980 in Novi Kneževac, Senta, Bačka Topola, Žagubica, Crna Trava, Babušnica and Dimitrovgrad. In the period from 1981 to 1985, the municipalities of Ada, Osečina and Bosilegrad reached the trend of the mentioned indicator.

When analysing negative demographic indicators, it is important to analyze people's attitudes toward leaving their permanent residence. Two decades after the above-mentioned research in the Vojvodina region, there were four municipalities in this area (Ada, Novi Kneževac, Senta and Čoka) that lost a significant percentage of their population in a period of eleven years. The municipality of Bačka Topola (North Bačka region) should also be mentioned here, as it is the fifth critical demographic zone in Vojvodina, bordering the municipalities of Ada and Senta. Together they form a negative demographic pole in the extreme north of the country. The sixth and last red demographic zone of Vojvodina is the municipality of Plandište, a peripheral municipality on the border with Romania.

From the data in Table 2, Crna Trava is the most affected by unfavorable demographic indicators. It is characterized by the largest percentage decrease in the number of inhabitants, the percentage of illiterates, the largest percentage of single-person households in the total number of households, the percentage change in the

number of households, the aging index, and the average age. Another characteristic is the lowest birth rate, the lowest average number of household members and the lowest marriage rate among the studied municipalities. Gadžin Han municipality is the leader in terms of death rate and negative rate of natural growth. Finally, the Bačka Topola municipality is known for the highest divorce rate.

Table 3. Correlation coefficients of the dependent variable y and independent variables and correlation strength

independent variable	correlation coefficient with the dependent variable y	strength of correlation
x_1	0.608	medium positive
x_2	-0.416	weak negative
x_3	0.708	medium positive
x_4	-0.716	medium negative
x_5	0.836	strong positive
x_6	-0.613	medium negative
x_7	-0.687	medium negative
x_8	0.855	strong positive
x_9	0.739	medium positive
x_{10}	-0.632	medium negative
x_{11}	-0.460	weak negative

Source: author, using Microsoft Office Excel.

Table 3 shows the correlation coefficients between the dependent variable and the independent variables introduced in the analysis, as well as the strength of the correlation relationship according to Vuković (2013). Prior to the actual calculation, the following correlations were hypothesized between the percentage change in the number of inhabitants between the last two censuses and each of the mentioned independent variables. The greater the decrease in the number of inhabitants, or rather depopulation, the greater or smaller a given variable is, depending on the sign of the correlation coefficient.

If the value of the coefficient is positive, it can be said that as the depopulation increases, the proportion of illiterates, the mortality rate, the proportion of one-person households in the total number of households, the aging index and the average age also increase. Due to depopulation in the settlements of the mentioned municipalities,

what remains is mainly the elderly population, whose average age is higher than the national average, as well as the aging index (there are more people over 60 than under 19). In addition, the elderly population is often completely or at least partially illiterate. In these communities, the percentage of illiterates is certainly higher than in communities where there are more people of younger age. We can also attribute to them a higher mortality rate and a higher proportion of one-person households.

On the other hand, a negative value of the coefficient means that when depopulation decreases, the rate of live births, the natural growth rate, the average number of household members, and the marriage rate also decrease. These initial results are reasonably logical, and correlation analysis has shown that they are also relevant to some extent.

What contradicts the initial hypothesis is the negative value of the correlation coefficient between the percentage decline in population and the divorce rate. Originally, it was assumed that the more intense the depopulation process is to some extent, the higher the divorce rate, but the calculation showed the opposite. However, since the value of the coefficient is medium, we can say that it justifies the absence of a significant relationship between the change in the number of inhabitants and the aforementioned independent variable.

There was also a variable included in the analysis that hypothetically we cannot say how it is related to the percentage decrease in population, but for this very reason correlation analysis was an interesting method to study the relationship. We are concerned with the percentage change in the number of households over the period 2011-2022. Hypothetically, imagine a territorial unit permanently inhabited by 5 households, each with four members. Over the eleven-year period, each household lost two members, either through out-migration or death. The conclusion is that the number of inhabitants has decreased, but the number of households has remained the same. In some territorial units, the process of reducing the number of inhabitants may be accompanied by a reduction in the number of households, while in others the number of households increases in parallel with the process of depopulation. Among the spun-off municipalities, this was the case only in the municipality of Kučevo. In the mentioned period, in the territory of this municipality there was a decrease in the number of inhabitants and an increase in the number of households. Correlation analysis (k=-0.687) showed that the dependent variable and the selected independent variable are moderately negatively correlated, i.e. they are inversely proportional. The final conclusion from this relationship would be that the larger the percentage decrease in the number of inhabitants, the smaller the percentage decrease in the number of households and vice versa.

Table 4. Correlation matrix of independent variables

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
x_1	1										
x_2	-0.498	1									
x_3	0.644	-0.452	1								
x_4	-0.671	0.579	-0.989	1							
x_5	0.307	-0.272	0.584	-0.578	1						
x_6	0.027	0.093	-0.333	0.320	-0.862	1					
x_7	-0.208	0.064	-0.463	0.434	-0.634	0.650	1				
x_8	0.693	-0.651	0.755	-0.799	0.696	-0.389	-0.522	1			
x_9	0.702	-0.699	0.820	-0.866	0.569	-0.270	-0.426	0.949	1		
x_{10}	-0.674	0.667	-0.661	0.715	-0.395	0.122	0.358	-0.740	-0.717	1	
x_{11}	-0.361	0.334	-0.304	0.333	-0.244	0.038	0.306	-0.331	-0.284	0.505	1

Source: author, using Microsoft Office Excel.

Table 4 shows the correlation coefficients between the selected independent variables. All coefficients with values above ±0.7 (indicated in blue) show a significant relationship between certain combinations of independent variables, so some must be excluded from consideration.

We refer to this as multicollinearity. This difficulty is defined as the interdependence of two or more independent variables. In reality, it rarely happens that there is no correlation between independent variables (Vaš, 2011), as in the studied case. In order to obtain more accurate results and a better model, the variables are discarded. The variables whose Pearson correlation coefficient with the percentage decrease in the number of inhabitants is lower are gradually excluded from the analysis until the desired model is obtained.

The percentage of illiterates and the average age are characterized by k=0.702, so the independent variable percentage of illiterates is excluded from the further procedure because the coefficient between this variable and the percentage decrease in the number of inhabitants between the last censuses (-0.608) is smaller (absolute observed value) than the coefficient between the dependent variable and the average age (-0.739).

The same principle is used to reject the death rate. This variable is significantly correlated with the natural growth rate (-0.989), the average age (0.820) and the aging index (0.755), and the correlation coefficients of the three independent variables individually with the decrease in the number of inhabitants (0.716, -0.739 and -0.855, respectively) are higher than the correlation coefficient between the change in the number of inhabitants and the death rate (-0.708).

The natural growth rate is strongly correlated with the average age and moderately correlated with the aging index and the marriage rate. In this set, the natural growth rate initially excludes the marriage rate (kyx4 > kyx10), but then the natural growth rate is rejected due to the lower correlation coefficient with the dependent variable (0.716) compared to the correlation coefficients of the dependent variable and the aging index (-0.855), i.e., the average age (-0.739).

The correlation analysis also shows that the share of one-person households in the total number of households and the average number of household members are strongly negatively correlated (-0.862). The correlation coefficient between the dependent variable and the share of one-person households in the total number of households is -0.836, while the correlation coefficient between the dependent variable and the average number of household members is 0.613. For this reason, the second independent variable is excluded from the analysis.

The aging index is strongly positively correlated with the average age and moderately negatively correlated with the marriage rate. The marriage rate has already been excluded from the analysis, so its significance will not be reassessed. The correlation coefficient between depopulation and the aging index (-0.855) is higher than the coefficient between the dependent variable and average age (-0.739), so the average age will be excluded.

Average age and marriage rate are moderately negatively correlated (-0.717), but both independent variables are already excluded from further analysis. The live birth rate (x_2), the percentage change in the number of households between the last censuses (x_7) and the divorce rate (x_{11}) are not individually significantly correlated with any of the other variables, which is clearly seen in the correlation matrix. Based on this, these variables will not be excluded from further analysis for the time being.

In the end, from the initial eleven variables, five of them were retained for further consideration: the live birth rate, the percentage share of one-person households in the total number of households, the aging index, the percentage change in the number of households between the last censuses and the divorce rate. It is important to note that the independent variables are ordered on the basis of the correlation relationship with the dependent variable y (from the strongest to the weakest) and that in the case of exclusion, e.g. the third independent from the first equation, its place in the second equation will be taken by the fourth independent from the first equation, etc. When these five variables were introduced into the regression analysis, it was shown that the percentage change in the number of households, the live birth rate and the divorce rate were not statistically adequate. Although the corrected coefficient of multiple determination ($\overline{R}^2$=0.86) and standard error (1.39) are satisfactory, the obtained p-values of these variables are higher than

allowed (p>0.05). This value for the first variable is 0.33, 0.39 for the second and 0.0577 for the third. The multiple linear regression equation in this case would have the following form:

$$y_1 = -8{,}704 - 0{,}211x_1 - 0{,}285x_2 + 0{,}064x_3 + 0{,}788x_4 - 0{,}302x_5.$$

We could go back for a moment to the divorce rate p-value of 0.0577, which at the time of examination of five independent variables on the percentage decrease in the number of inhabitants, was slightly more than the threshold value. We could remove this variable immediately from the analysis, which is confirmed by the correlation coefficient between the percentage change in the number of inhabitants and this variable. It amounted to 0.46, which tells us that this parameter is not so important. However, instead, guided by backward elimination, it will be retained and even the percentage change in the number of households. The equation obtained by including the four independent variables would look like this:

$$y_2 = -10.7 - 0.017x_1 - 0.3x_2 + 0.085x_3 + 0.7x_4.$$

R^2 is now 0.86, standard error 1.38; p-values of the percentage change in the number of households and the divorce rate are over the allowed 5% (16.7% for the first and 7.5% for the second independent). The first will be excluded, and now the aging index, the percentage share of one-person households in the total number of households and the divorce rate will be introduced into the analysis. A slightly smaller corrected coefficient of multiple determination ($\bar{R}^2$=0.85) and a slightly higher standard error value (1.42) were obtained, which is still statistically correct. Unlike the previous model, the p-values of all three introduced independent variables are less than 0.05 (0.001 for the % share of one-person households in the total number of households, i.e. the aging index and 0.049 for the divorce rate). Also, we can say that 85% of the total variance is covered by this model. Accordingly, the multiple regression equation would read:

$$y_3 = -9.98 - 0.018x_1 - 0.366x_2 + 0.793x_3.$$

It could be said that an appropriate prediction model has been achieved. However, we have already discussed the inclusion of an insignificant variable in the model, so the adequacy of the equation will also be tested in case of exclusion of this independent variable. In this case it would be the divorce rate, with the already mentioned correlation coefficient with the dependent variable of 0.46. If we now exclude the divorce rate, the multiple regression equation would have the following form:

$$y_4 = -8.24 - 0.02x_1 - 0.37x_2.$$

The corrected coefficient of multiple determination would now be slightly lower than in the case of the inclusion of three independent variables (R^2=0.826), and the standard error slightly higher (1.555). Based on this, we note that to a certain extent it is better to include the independent variable divorce rate. If we were to look at its impact on depopulation logically, its importance to the entire process would be meaningful to some extent. So, we can imagine the following relation: high divorce rate ? more divorced marriages ? fewer children ? depopulation. But it doesn't always have to be like that, because the correlation coefficient of 0.46 tells us otherwise, so we could say that the divorce rate is not essential for the intensification of depopulation, because children are also born out of marriage.

Conclusion

Depopulation is one of the most important demographic problems faced by many countries, including Serbia. Within the framework of this work, all municipalities were analysed and it was concluded that most of them have been depopulated for several decades and that this process has intensified in the last census period. Based on the available data and analysis, it was found that there are currently 21 municipalities in Serbia that are affected by the most severe depopulation, i.e. where the number of inhabitants decreased by more than 20% in each of the periods 2011-2022. The bottom of the group of red municipalities or critical zones is Bačka Topola with a decrease of 20.11%, and Crna Trava is already at the top with a decrease of 35.9%. This municipality is also the only one that recorded a decrease in the number of inhabitants by more than 30%, while all other municipalities recorded a decrease between 20 and 30%.

It was necessary to conduct an additional analysis of these municipalities because they had the most significant demographic changes. Through a correlation and regression analysis with the introduction of eleven independent variables (demographic parameters), it was found that the depopulation of these municipalities could be modelled based on the quantitative values of three demographic indicators, namely the aging index, the percentage of one-person households in the total number of households, and the divorce rate.

First, a correlation analysis was performed to examine the relationship between the depopulation of these communities and each of the variables introduced, as well as between the independent variables using the "each with each" principle. This analysis showed the extent to which there was a statistical relationship between depopulation and each of the independent variables, and whether or not the original hypotheses about their relationships were correct. They were found to be mostly

true. The correlation between the independent variables according to the principle already mentioned was carried out in order to create a correlation matrix, which was an important tool in the development of the regression model.

Finally, the multiple regression method using backward elimination was used to obtain a satisfactory model that could be significant for predicting the dependent variable based on the known values of the three independent variables. By rating, i.e. comparing the obtained results with the actual values of the percentage decrease in the number of inhabitants, it was found that the multiple regression equation y = -9.98 - 0.018x1 - 0.366x2 + 0.793x3 is appropriate.

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TOURISM AND TRAVEL AT DIVČIBARE

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Abstract: The nature of Serbia is a first-class tourist value, which is based, among other things, on a large number of mountains, which have different types and times of formation, tectonic structure, geological composition, extent, height and rise of the mountain mass, i.e. tourist attractions. Mountains of Serbia are often mentioned in tourism propaganda. They appear individually and in groups. They contribute to the development of various types of domestic and foreign, seasonal and year-round tourism, in organized and infrastructural well-equipped centres, which over time have formed appropriate contractive tourist zones and confirm with appropriate accommodation and catering facilities, the number of tourists, their overnight stays, health-recreational function and the corresponding manifestations. This is the mountain Maljen. This is its tourist center, Divčibare. Divčibare is less than an hour's drive from Valjevo and Požega and can be reached without difficulty. Tourist traffic in Divčibare has been observed for a long time. It is characterized by significant changes between individual years and longer periods. In the years with the best visitor numbers, more than 50,000 tourists and more than 330,000 of their overnight stays were registered in Divčibare. Domestic tourists were always more numerous than foreign ones.

Keywords: Maljen Mountain, Divčibare, domestic tourists and overnight stays, foreign tourists and overnight stays, accommodation facilities.

Introduction

Mount Maljen and its tourist center Divčibare are located in the western part of Serbia, south of Valjevo and Mionica, north of Požega and Kosjerić, east of Ljubovija and west of Ljig and Gornji Milanovna. Access to Maljen, a mountain over which the Roman road from Užice and Požega to Valjevo passed in ancient times, is now possible by train and road. Access by train is from the direction of Belgrade by the Belgrade-Bar railroad line to Valjevo and then continue by bus to Divčibare or by transit bus that goes to Požega and further to Kosjerić or Užice. You can take the train to Valjevo and from Užice to Požega, and the journey continues with a regular bus line. Particularly interesting is the Lastra station on the Belgrade - Bar railroad

Figure 1. Hotel Maljen, Divčibare

line, from which Divčibare is only 18 km away. From the direction of Kragujevac, Stalać, Kraljevo and Čačak, it is possible to travel by train through the Ovčarsko-Kablar gorge of the western curve to Požega, from where the journey continues by a regular bus line.

Mountain tourism in Serbia has a long tradition and history, filled with significant events that deserve to be studied and appreciated. Part of it belongs to Divčibare, which for decades was the tourist center of the Maljen Mountains. Based on the insight of the past, it is necessary to properly shape modern tourism in the sense that over time there is a clear competition, the structure of visitors changes, they demand better accommodation conditions, a more meaningful stay and more affordable prices. Moreover, special attention must be paid to the protection of nature and anthropogenic heritage. Due to relief and mountains of different formation type and time, complex tectonic, hydrological, morphological, climatic, biogeographical and settlement structure peculiarities, anthropogenic heritage, traditional and contemporary manifestations, mountain tourism in Serbia is characterized by a number of peculiarities. They should be researched and known in detail, and on this basis the tourist offer should be designed, with the possibility of developing two seasons, summer and winter, i.e. year-round operation of tourist reception (Stanković, Vujić, 2020)[1].

[1] Some existing reports, projects and studies are interesting for understanding the efforts to develop tourism in Divčibare. Almost all of these materials are very voluminous, often theoretical, difficult to apply and inadequate to the realities on the ground and the willingness of institutions and individuals to invest resources in the development of the material base of tourism. They are also characterised by covering a large area of Divčibare and Maljen, several municipalities and problems, which makes them cumbersome. Here are some studies that were produced in only a few copies and mostly ended up in the drawers of the clients: In 1966, the Republican Institute for Nature Protection from Belgrade presented a study entitled On the Protection, Development and Tourist Use of Divčibare and Maljen (280 pages). Within this study, the part of the authors from the Balneo-Climatological Institute of the University of Belgrade stands out under the title Climatic Resort Divčibare. In 1982, the Institute for Urban Planning, the Institute for the Improvement of Trade and the Institute for Nature Protection, all from Belgrade, elaborated the Programme for the Development of Tourism in the Valjevski Mountains (175 pages). In 2011, the National Tourist Development Society from Belgrade prepared a study on the justification of the declaration of Divčibar as a tourist area (170 pages).

Mountain tourism in Serbia

From the point of view of mountain tourism, Serbia can be recognized by Zlatibor, Kopaonik and Tara, with the highest ranking being Maljen Mountain with the tourist center Divčibare. With a number of peculiarities, Maljen and Divčibare form a basic feature of mountain tourism in western Serbia, especially in the area of Podrinjsko-Valjevo Mountains, which are also called Valjevo and Golubinjska Mountains in the literature.

In the mountains of Serbia, tourist recreation takes place, sports competitions are held, ethnographic, gastronomic and cultural events are organized, people stay for recreation, treatment and general recovery, children and youth schools are organized in nature, business, professional and congress meetings, sports and research camps are held. Hunting and photo safaris are organized, as well as stays in rural households. Our mountains are a versatile tourist value with numerous attractive features, landmarks, endemics, relics, special habitats and areas with flora and fauna, monuments, historically and ethnographically significant places, personalities and events. At the same time, there are many non-transferable, non-reproducible, unique objects, phenomena and processes that are particularly valued in tourism. Mountains enable year-round tourism traffic, which requires good organization of numerous measures and activities, especially care for nature conservation, monument protection and folk traditions, as well as improvement of habitats, territories and biocenoses, i.e. the ecosystem and habitat as a whole (Stanković, 2022).

Table 1. Tourist arrivals and overnight stays in the mountain centres of Serbia

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
1970.	192.000	23.000	214.000	704.000	28.000	732.000
1975.	317.000	14.000	331.000	1.136.000	22.000	1.382.000
1980	409.000	19.000	428.000	1.978.000	32.000	2.010.000
1985.	449.000	18.000	467.000	2.592.000	56.000	2.648.000
1990.	459.000	39.000	498.000	2.594.000	136.000	2.730.000
1995.	372.000	7.000	379.000	2.082.000	48.000	2.129.000
2000.	348.000	11.000	359.000	1.984.000	46.000	2.030.000
2005.	398.900	2.100	401.000	1.696.000	70.000	1.766.000
2010.	334.351	42.297	376.648	1.337.776	129.131	1.466.907
2015.	366.829	79.360	446.189	1.419.156	242.331	1.661.487
2019.	468.089	119.733	588.542	1.839.829	343.158	2.182.987

Statistics as an indicator of turnover

The mountain tourism areas of our country are characterized by frequent and sharp changes in the number of tourists, their overnight stays and accommodation and catering facilities. This situation is the result of a number of factors, including political, economic, demographic, business, war, multi-year sanctions, frequent unsuccessful changes of ownership of tourist and hospitality facilities, insufficient supply, insufficient tourist propaganda, as well as the lack of qualified personnel in tourist services.

In 2019, 468,089 domestic tourists and 119,733 foreign tourists (total 588,542) were registered in mountain tourism centres in Serbia. The domestic tourists had 1,839,829 overnight stays and the foreign tourists had 343,158 overnight stays (total 2,182,987). The share of mountain tourism in the total tourism in Serbia is 17% in terms of the number of tourists and 23% in terms of the number of overnight stays. Of the total number of rooms (48,190) in all tourist facilities in Serbia and the total number of beds (114,771), 8,509 rooms or 17.6% and 25,013 beds or 21.7% are in mountain tourism centres. Of the total number of beds in mountain tourism centres in Serbia (25,013), Divčibare accounts for 7.6% with 1,924 beds. The condition is satisfactory. It is felt that new facilities are not so much needed, as it is important to increase the annual occupancy percentage of existing facilities, as currently it is 35% for four-star hotels, 30% for three-star hotels, 25% for two-star hotels and 20% for hotels %, private rooms and resorts 5 to 10% on an annual basis.

Actions of interest for Divčibare tourism

Since 1822, when the Serbian Prince Miloš Obrenović stayed in Divčibare for business and health reasons, and a little later the Timoč Bishop Melentije Vujić, there were popular meetings and fairs held on August 9, the Christian vacation of St. Panteleimon, gathering a considerable number of people, one could see the outlines of tourism. Much later, some teachers from Valjevo stayed in shepherd huts during the summer and initiated important measures for the development of tourism by founding the Divčibare Health Association in 1925. Years and decades, wars and peace, stagnation and growth alternated. Some buildings were built, but also disappeared. Owners and tourists changed. A tourist complex was created, which can be seen today in numerous tourist and hospitality facilities, sports fields, weekend houses, apartments, cafeterias, summer guest gardens, the transit of people, an increasingly attractive winter season, well-kept ski slopes and cable cars, children's recreation areas, a church and a parish, an August fair, a market and a children's amusement park (Loma B. 2004).

After the establishment of the Divčibare Health Association, this mountain centre attracted a certain number of visitors from Valjevo and the wider area. In 1930, there were 35 buildings here. The health centre had 11 rooms. A butcher's store, a bakery and a restaurant were open. This situation led to the declaration of Divčibare as a climatic health resort in 1932. Before the beginning of World War II, there were more than 1,000 beds in Divčibare, intended for tourists. Almost all the buildings were destroyed during the war. Reconstruction began in 1947, and two years later Divčibare received the status of a tourist place of republican importance, recognizable by the Maljen Hotel, the first in Divčibare, which is still in operation today after several reconstructions and extensions.

According to the legal criteria, Divčibare is an urban settlement, but in tourism it should not be understood that way, because here there are no congested streets, streetcars and trolley busses, noisy squares, full of stores, workshops and large economic facilities. Here there is only a factory of fresh air and greenery for the benefit of tourists, for which several hotels, resorts, villas, boarding houses, restaurants, apartments, lodgings and sports fields have been built. Divcibare has less than 150 permanent inhabitants (group of authors, 2011).

Figure 2. Hotel Divčibare

A particular contemporary feature of Divčibare is the existing settlements and the numerous weekend houses in these settlements. Among the weekend settlements, Beogradsko, Obrenovačko, Stevan Filipović, Ljuti krš, Stari grad, Crni vrh, Kamenica and Kraljev sto stand out. The Program for the Development of Tourism in the Valjevo Mountains states, among other things: "The basic functions of Divčibare as the core of this large unit would therefore be general, sports and health recreation." General recreation, mostly passive, covers the needs of a wide clientele of all ages and status and includes walks, easier mountain hikes, various types of entertainment, etc. Sport recreation refers mainly to the younger population and includes hikes,

bivouacs, ski tours, small sports, etc., and health recreation serves mainly for the rehabilitation of patients who have undergone primary recovery. In order to fulfil the above functions, a whole complex of accommodation, accompanying and sports/recreational facilities was created in Divčibare, which informally make Divčibare the main centre of the Valjevo Mountains due to its scale and abundance" (Group of authors, 1982). Little of what was planned was realized on the ground. The climate-therapeutically, medical function of Divčibare is not significant to this day because there is no suitable health centre, although the need has been repeatedly emphasized.

Tourists and overnights in Divčibare

There is no data for 1951, because at that time the buildings were being restored, the access roads were weak, and there were few people on the road to Maljen and Divčibare. Of course, there were no foreign tourists for a long time either. They were registered only since 1969. Throughout the period of tourism development in Divčibare, domestic tourists were always more numerous than foreign ones. Such a situation is typical for other mountain tourism centres in our country, which until recently had no offer to enter the foreign tourism market, especially for the winter recreation and winter competition season in snow sports.

Table 2. Tourist arrivals and overnights in Divčibare 1952-1972.

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
1952.	380	–	380	7.300	–	7.300
1953.	450	–	450	11.500	–	11.500
1954.	500	–	500	12.400	–	12.400
1955.	500	–	500	12.500	–	12.500
1956.	940	–	940	11.919	–	11.919
1957.	1.721	–	1.721	17.085	–	17.085
1958.	3.038	–	3.038	28.587	–	28.587
1959.	3.696	–	3.696	45.825	–	45.825
1960.	5.377	24	5.401	61.178	572	61.750
1961.	11.644	66	11.710	157.681	1.312	158.993
1962.	15.942	279	16.221	122.249	3.076	125.325
1963.	7.457	5	7.462	80.333	10	80.343
1964.	9.197	26	9.223	108.880	230	109.110
1965.	15.882	22	15.924	111.880	67	111.947
1966.	14.178	5	14.183	121.527	32	121.559
1967.	17.319	38	17.357	128.158	50	128.208
1968.	12.549	51	12.600	92.137	5	92.212
1969.	14.121	11	14.132	130.265	14	130.279
1970.	10.481	37	10.518	91.202	462	91.664
1971.	17.800	75	17.875	141.319	136	141.455
1972.	21.705	255	21.960	156.903	485	157.388

During two decades (1952-1972) tourism in Divčibare was modest, but it had an increasing tendency. The lowest number of domestic tourists (380) was recorded in 1952, and the highest number (17,800) in 1971. The fewest overnight stays by domestic tourists (380) occurred in 1952, and the most (157,681) in 1961. The first foreign tourists were registered in 1960, but they were very few. Good results were achieved in 1982, when 45,548 domestic tourists were registered and 291,552 of them stayed overnight. The average length of stay of domestic tourists was six days. Then, as now, domestic tourists outnumbered foreign tourists many times over. The highest number of foreign tourists (662) and their overnight stays (3,710) were registered in the mentioned period in 1976. The average length of stay of foreign tourists was five days. The indicated years represent the period of unionized subsidized domestic tourism, i.e. tourism of workers and students who stayed in corresponding resorts for free or at preferential prices. As part of the complementary facilities, the Divčibare spas were in operation two to three months a year. Their operation depended on the general economic situation and the amount of vacation allowance for children and workers.

Table 3. Tourist arrivals and overnights in Divcibare 1973-1982.

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
1973.	23.703	510	24.993	161.119	2.359	163.478
1974.	24.650	426	25.076	173.442	2.285	175.727
1975.	34.054	561	34.615	226.122	3.170	229.292
1976.	41.558	662	42.180	269.611	3.710	273.321
1977.	37.689	428	38.117	243.786	2.034	245.820
1978.	42.430	495	41.925	289.551	2.426	292.977
1979.	38.193	438	38.631	265.707	1.441	267.148
1980.	41.561	202	41.763	253.698	541	254.239
1981.	41.522	327	41.849	240.053	1.408	241.461
1982.	45.548	345	45.893	291.522	1.824	293.346

By showing the possibilities and needs of tourism development in Divčibare from the perspective of 1984, we conclude that in Divčibare there are favourable conditions for the development of various types of tourism. It is important to involve private households willing to provide a certain number of beds for tourists. This will provide a more complete offer and enable wider participation of the population in tourist trips to Divčibare and Maljen.

Since 1960, Dvčibare, which until then territorially and administratively belonged to the Municipality of Mionica, was annexed to the Municipality of Valjevo, which was important for better trade supply, construction and maintenance of access

roads and traffic on them. Significant investments in material resources were also made in the following years. Interested investors for new buildings came from Belgrade, Zemun, Valjevo, Pancevo, Veliki Crljeni and other places. For example, the company PTT from Belgrade started building a resort for its employees. The People's Committee of the Municipality of Pancevo started the construction of a day care center for children. The company Remont from Valjevo built two weekend houses with 12 beds for its employees. Two weekend houses were also built by the company Jablanik from Valjevo. In 1959, Motor and Tractor Industry from Belgrade, Thermal Power Plant Kolubara from Veliki Crljeni, Agricultural Cooperative from Valjevo and Komunalna banka from this town built facilities for their remaining employees and their families. In 1961, the companies Krušik and Agrotrgovina from Valjevo built facilities for the vacation of their workers and employees. The Tourist Association of Serbia built a villa in 1962. The Zmaj Company from Zemun put up mobile homes and opened a restaurant.

The reconstruction of the Maljen Hotel took place in 1969, when the conditions for the winter stay of tourists were created. The Municipality of Valjevo commissioned the Belgrade commercial company Balkanija to build a category B hotel in the centre of Divčibare. It was suitable for year-round reception of tourists and for a while was one of the best equipped and most visited mountain tourism facilities in Serbia. Extensive works were carried out on the Mionica - Divčibare road, which was opened to traffic on December 25, 1971.

Table 4. Tourist arrivals and overnights 1983-1989.

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
1983.	40.100	120	40.220	275.000	300	275.300
1984.	41.065	140	41.205	288.987	294	289.281
1985.	42.100	200	42.300	291.406	800	292.206
1986.	46.000	100	46.100	317.800	200	318.000
1987.	43.300	300	43.600	294.900	1.100	296.000
1988.	44.400	200	44.600	294.400	600	295.000
1989.	43.400	-	43.400	293.00	-	293.000

After 1976, the number of tourists in Divčibare amounted to a little more than 40,000 per year for more than a decade. The number of overnight stays varied widely, from 241,000 in 1981 to 318,000 in 1986, and the number of foreign tourists and their overnight stays remained low. This situation confirmed the insufficient percentage of annual use of lodging establishments, some of which ceased operating or, like some spas, operated for only two summer months. The winter season, i.e. skiing on groomed slopes with corresponding cable cars, was almost non-existent.

In 1995, there were more than 2,100 beds in resorts, villas and hotels in Divčibare. The social and societal component of tourism is expressed by the free or subsidized stay of workers and their family members in resorts, caravans, villas and hotels. This situation has contributed to a significant visitation of tourists, especially during the summer months. The financially subsidized vacation of workers and the use of their own facilities proved to be justified. The situation changed after the economic crisis, the unfinished economic reform, the war events and the disintegration of Yugoslavia.

Since 2010, tourism in Divčibare has regained its former importance. There are new facilities, especially private rooms, villas, cottages, apartments and hotels. There are two ski slopes with corresponding ski lifts. At the end of 2019, the modern built and luxuriously equipped hotel Crni vrh with associated outdoor and indoor sports facilities was opened. At the same time, the renovation of the rooms and suites of Hotel Divčibare, the pride of tourism in Divčibare for decades, which was not in operation from 2000 to 2007, was carried out. It is also about the new Hotel Heba, suitable for a family vacation in the tranquillity of the mountain environment, built not far from the famous Belgrade weekend resort. At the end of 2021, the Royal Mountie Hotel was opened. From 2019, dozens of weekend houses and apartments will be built, which raises doubts about the possibility of environmental damage due to urbanization of the area.

In 2018, 468,089 domestic tourists and 119,733 foreign tourists were in the mountain tourism resorts of Serbia, which equals a total of 588,542. Domestic tourists had 1,839,829 overnight stays and foreign tourists had 343,158 overnight stays, for a total of 2,183,987. Of the total number of tourists registered in our mountain towns, Divčibare accounted for 7.8% and 8.5% of the total number of overnight stays, placing it behind Zlatibor, Kopaonik and Tara and ahead of Stara Planina, Zlatar and Mokra Gora.

Table 5. Tourist arrivals and overnights in mountain tourism centres in 2018

Mountain centre	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Zlatibor	158.723	58.588	217.311	616.742	147.125	763.867
Kopaonik	105.760	26.320	132.080	423.999	111.595	535.594
Tara	58.356	5.000	63.356	229.229	12.415	241.707
Divčibare	41.327	1.328	42.655	179.584	4.609	284.293
Stara planina	16.381	4.236	20.517	56.089	13.095	69.289
Zlatar	14.240	1.916	16.156	46.561	3.868	50.429
Mokra gora	7.090	7.475	14.565	16.498	10.525	27.023

A good insight and adequate presentation of statistical data on tourist traffic in Divčibare made it possible to draw certain conclusions that point to the need for a comprehensive overview of phenomena, processes and events relevant to tourism in this mountain centre, which according to some indicators has been stagnating for several years. In 2016, 133,148 tourist nights were registered in Divčibare, less than in 2001, and such a situation shows the need to take measures to stop these negative trends. According to the available data, the lowest number of tourists (16,881) in Divčibare in the last five decades was in 2014 and the highest (51,902) in 1998, which makes a difference of 35,021. The fewest tourist overnight stays (71,030) occurred in 2014 and the most (333,329) in 2000, which makes a difference of 262,039.

The existing accommodation capacities of Divčibare are occupied from 15 to 33% during the year, which is insufficient for more profitable economic operation and better business. The existing hotels are characterized by a higher percentage of annual occupancy, while the other accommodation capacities, especially resorts and private rooms, are significantly lower. This condition does not allow to employ a larger number of people in tourism and hospitality and to achieve greater economic, dinar and foreign exchange effects. The data on accommodation establishments in game farms are particularly interesting. There were years when 2,499 beds were counted (2005), but also years with 1,290 beds (1983), 1,290 less. There are also large differences between two neighbouring years, which is a consequence of the lack of statistical recording. In 2012 there were 2,160 beds and in 2013 there were 1,620 beds, i.e. 540 less.

The total number of tourist and gastronomic facilities and weekend houses in Divčibare is difficult to determine and classify, as they range from log cabins and log houses with only a few square meters, to richly furnished villas and apartments, to upscale hotels. In addition, there are complexes with an unusual micro-location, almost hidden among tall trees, often without the necessary infrastructure, especially without sewage treatment plants and sewage drainage, which is the problem of Divčibare as a whole. Several high-rise buildings in several localities disrupt the ambience in some way, suggesting that the aesthetics of the space have not been given the necessary attention.

Variety of tourist and hospitality facilities

From the available written documents and knowledge of the situation on the ground, we know that in 1982 commercial tourism and hospitality in Divčibare consisted of the Maljen (168 beds), Divčibare (250 beds) hotels and the Tourism Development Organization resort (122 beds in 30 uncomfortable houses in poor

condition that cannot be renovated). At that time, there were the following resorts of Belgrade workers' organizations: Self-government community of social insurance 8 beds, Community for recreation and leisure of workers Sava Veljković 54 beds, Factory Zmaj 105 beds, Engine and tractor industry 100 beds.

Modest facilities with a small number of beds were in Divčibare Kristal-import 10 beds, PTT 8 beds, Valjevska enterprises and institutions Krusik 72 beds, Agrosirovine 16 beds, SUP 20 beds, Termovod 10 beds, Penitentiary 10 beds, Hospital of the Central Prison 20 beds, Valjevo put 12 beds, trading company Divčibare 6 beds, self-government association of health insurance 15 beds in three houses, Basic Bank 10 beds, Remont 6 beds, company Gradac 6 beds, Municipal Assembly 5 beds, REIK from Vreca 22 beds, Vojvodina from Bač 10 beds. In addition to the above, there were also the following children's resorts: 25 May Stevan Filipović from Valjevo and Belgrade with 228 beds, Izletnik from Pancevo with 120 beds and DO Valjevo with 120 beds.

For the personnel employed in the tourist and hospitality facilities, who were not permanent residents of Divčibare, the Narcissus and Srbija villas were available with 10 beds each, and eight houses of the May 25 resort with 16 apartments were also used. A certain number of employees in Divčibare came from the surrounding villages, but also from Požega, Mionica and Valjevo.

Figure 3. Resort of Pančevo in Divcibare

Table 6. Beds number in Divčibare

Year	Beds no.	Year	Beds no.	Year	Beds no.
1941.	1.116	2004.	2.161	2012.	2.160
1947.	23	2005.	2.499	2013.	1.620
1985.	1.847	2006.	2.498	2014.	1.434
1990.	1.810	2007.	2.430	2015.	1.255
1995.	2.107	2008.	2.080	2016.	1.611
1999.	2.083	2009.	1.974	2017.	1.825
2001.	2.172	2010.	2.171	2018.	1.924
2002.	2.172	2011.	2.139	2019.	2.200

In literature and statistical publications there are interesting data about Divčibare accommodation capacities, varying in size, type, category and ownership. Typical for the eighties of the last century, there are the following facilities in Divčibare: Children's facilities (three facilities, 528 beds), facilities of labour organizations (21 facilities, 194 beds), commercial catering facilities (32, with 540 beds). Particularly interesting is the information, based on an estimate, that there are 670 private houses with 2,580 beds.

The reasons for the development of the number of beds over time, as well as for the differences between individual years, are manifold and cannot be easily captured statistically. For example, Hotel Divčibare was not in operation from 2002 to 2007, which was reflected in the number of beds. At the end of 2019, Hotel Crni vrh was opened, which means an increase in the number of beds by 250. At the end of 2021, the Hotel Royal Mountain opened, and the number of beds in Divčibare increased by another 80. When the apartments and hotel (Planinsko srce, Divčibarski izvori, Borovi, Wind resort, Diamond Hill) are added, the number of beds will increase significantly.

In 2020, Divčibare became a big construction site. People from Belgrade, Novi Sad, Valjevo and other cities buy plots of land and build there not only vacation homes for their own use, but also hotels, apartments and villas for rent and sale. According to some information, in 2021 there were 20 active construction sites in different parts of Divčibare. It is the construction of five hotels and 15 buildings with apartments. Due to the limited space, it is necessary to take into account the construction density of tourist, gastronomic and other facilities to avoid excessive urbanization. Unfortunately, the modern construction is insufficiently accompanied by the establishment and equipment of transport and utility infrastructure. It is more than necessary to improve the supply of electricity to buildings. It is even more important to solve the problem of normal water supply. The establishment of a sewerage network and a sewage treatment plant is particularly topical and urgent, since the current system of septic tanks does not even remotely meet the

necessary requirements. The establishment of the market has been completed, and the construction of two parking lots is planned.

Data on the number of tourists, their overnight stays and the number of beds in Divčibare can be found in several articles and books describing the development of tourism. For the period after the 1950s, the data were published in the Statistical Yearbook of Yugoslavia, printed in Belgrade and published by the Federal Statistical Office, and then in the Statistical Yearbook of Serbia, published by the Statistical Office of the Republic. It does not include excursionists, most of whom travel on summer weekends, state and religious holidays, and transit travellers who stay for only one day. The number of those staying overnight in their weekend homes is also not recorded.

The number of tourists and their overnight stays is important for assessing the efficiency of the use of the existing material base of tourism, determining the average length of stay of tourists, the level of daily and total consumption, the need for labour and suitable personnel. The fact that a small number of foreign tourists participate in mountain tourism in Serbia is fully valid for Divčibare, which has a local, regional and republican contraction zone. In order to conquer the foreign tourism market, it is necessary to design a targeted tourist offer and tourist propaganda.

Figure 4. Hotel Crni Vrh, Divčibare

Years of progress and stagnation

The volume of tourist visits and overnight stays in the years listed below is considered satisfactory. The number of tourists and their overnight stays was due to the presence of several workers' and children's resorts, which were well filled, especially during the summer months. From 1960 to 2000 it was a period

of subsidized tourism with emphasized social elements. Workers and their family members belonging to workers' organizations, which had their own ice rinks in Divčibare, stayed for free or at symbolic prices far below commercial prices, which was also true for children's stays in suitable resorts.

The hotels in Maljen and Divčibare were well occupied in the absence of other hotels that did not represent competition. The year 1982 was characterized by exceptional numbers of visitors (45,546 tourists, 291,522 overnight stays), with Divčibare ahead or on par with Zlatibor and Kopaonik. The average length of stay of tourists was five to seven days.

The data in the Great Geographical Atlas of Yugoslavia, published in 1987 by Liber College Press from Zagreb, appear particularly interesting. From the text part of the atlas, which refers to tourism in the mountainous regions of Yugoslavia, it is clear that Divčibare occupies a high place. The data for 1965, 1975 and 1984 show that this tourist centre was well visited and was ahead of several well-known mountain tourism destinations in Macedonia, Bosnia and Herzegovina, Slovenia and Croatia.

Figure 5. Hotel Heba, Divčibare

Table 7. Tourist stays and overnights according to Great geographical atlas

Tourist destination	1965.		1975.		1984.	
	Arrivals	Overnights	Arrivals	Overnights	Arrivals	Overnights
Divčibare (SR SRB)	15.800	112.000	34.600	229.000	41.200	289.000
Jahorina (SR BIH)	11.500	64.200	12.100	62.600	13.500	55.700
Jezersko (SR SLO)	4.700	29.900	5.100	21.800	8.200	22.800
Delnice (SR CRO)	5.100	10.100	11.400	28.300	9.000	20.600
Mavrovo (SR MK)	–	–	7.800	23.500	14.400	73.600
Tjentište (SR BIH)	–	–	52.700	99.700	39.200	53.500

The number of foreign tourists in Divčibare, as in other mountain resorts of Yugoslavia and Serbia, has always been small. In 1976 there were 662 foreign tourists registered in Divčibare, in 1980 there were only 202. The fewest overnight stays of foreign tourists were in 1980 (514), significantly more in 1975 (3,710). These were some travellers passing through, businessmen of some companies from the surrounding towns, for whom overnight stays with a short stay were intended here, as well as those who participated in the work of the international scientific, professional and business meetings organized at that time (Stanković, 2012).

The period between 1900 and 2000 is particularly relevant, as numerous events took place in our country, some of which had an extremely negative impact on the tourist movements of the local population and foreigners, and thus on the operation of tourist reception. In 1993, 25,032 domestic and foreign tourists came to Divčibare, less than in 1982. In 1990, the total number of overnight stays in Divčibare was 1.9 times lower than in 1973 and 3.5 times lower than in 1982. In the mentioned period, the number of domestic tourists was the highest in 1998 (51,392), and the number of overnight stays was also the highest (322,152). The number of tourists and their overnight stays in 1998 was not reached by 2021, which indicates a certain stagnation of traffic and, consequently, the corresponding economic impact, as long as new facilities have not been built and the tourist offer has not been modernized. The percentage occupancy rate of existing lodging and hospitality facilities has declined, resulting in a decrease in the number of employees and total tourism traffic revenue.

Similarly, the number of foreign tourists was almost non-existent between 1990 and 1999. In 1995, there were only 35 of them and the same number of overnight stays, which is a statistical error and a consequence of the sanctions, political turmoil and war events. The situation improved only in 2000, when 2,311 foreign tourists and 14,763 overnight stays were registered. This was the result of the arrival of a large number of people from the former Yugoslav republics and several professional and scientific meetings with participants from abroad organized in hotels in Divčibare. Also during the Covid 19 pandemic, there were no foreign tourists in Divčibare, except for a small number of people from the former Yugoslav republics, who are statistically counted as foreign tourists.

Table 8. Tourist arrivals and overnights on Divčibare 1990-2000.

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
1990.	33.721	114	33.835	83.017	484	83.500
1991.	30.520	53	30.573	205.977	1.234	207.111
1992.	43.580	40	43.620	311.753	93	311.856
1993.	20.702	57	20.759	155.644	244	155.888
1994.	33.600	35	33.645	238.199	95	238.294
1995.	38.378	35	38.413	306.337	35	306.372
1996.	41.628	956	42.584	283.261	7.024	290.285
1997.	45.994	133	46.027	298.137	479	298.616
1998.	51.391	511	51.902	322.152	4.808	326.960
1999.	37.922	250	38.172	238.777	1.337	240.114
2000.	48.506	2.311	50.817	318.566	14.763	333.329

The period from 1900 to 2000, in a number of economic activities in Serbia, so also in tourism, as a whole, as well as in Divčibare, is well known. From the statistical data it is clear that the number of overnight stays of domestic and foreign tourists in Divčibare was two times lower than in 1973 and three times lower than in 1982. After 1995, the situation has certainly improved. The most tourists in the mentioned period (51,902) came in 1998, and the most overnight stays (333,329) came two years later. Such a volume of tourists was not reached until 2021.

Dominance of domestic tourists

The number of domestic and foreign tourists, as well as the number of their overnight stays in Divčibare, shows significant differences in the multi-year statistical monitoring of traffic. This situation has an unfavourable effect on the business of receiving tourists, as the number of tourist and accommodation establishments was previously without major changes or even slightly higher. At the same time, as in other mountainous regions of Serbia, the number of domestic tourists and their overnight stays was always several times higher than the number of foreign tourists and their overnight stays.

As far as accommodation facilities are concerned, the total number of beds intended for tourists was over 2,000 between 1985 and 1999, which was also the case in 2002, due to the absence of new buildings and the closure of some workers' lodgings. It is particularly interesting that the projection of the development of tourism in Divčibare for the year 2010 foresees a number of 82,000 tourists and

the number of their overnight stays of 648,000. The opposite was the case. In 2010, 28,935 tourists were registered in Divčibare, which is 53,065 less than predicted. The tourists spent 117,215 nights, i.e. 530,785 less than predicted (Pjevač, 2002).

Figure 6. Hotel Mountain Royal, Divčibare

Table 9. Tourist arrivals and overnights on Divčibare 2001-2010.

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
2001.	39.500	1.200	40.700	257.500	8.500	267.000
2002.	27.100	200	27.300	179.600	600	180.200
2003.	22.000	–	22.000	134.000	–	134.000
2004.	22.00	1.000	23.000	133.000	4.000	137.000
2005.	21.042	200	21.242	120.067	1.000	121.067
2006.	20.776	361	21.137	113.673	1.650	115.323
2007.	24.500	500	25.000	134.000	1.000	135.000
2008.	34.000	1.000	35.000	159.000	2.000	161.000
2009.	29.161	1.642	30.803	135.270	3.795	139.165
2010.	27.899	1.036	28.935	114.397	2.818	117.215

The current state of travel

The number of domestic and foreign tourists as well as the number of their overnight stays did not change significantly after 2000. Thus, in 2006 there were 27,730 fewer domestic tourists than in 2000, and in 2000 there were 208,479 fewer overnight stays than in 1998. In the period between 2001 and 2009, the number

of tourists and their overnight stays in Divčibare stagnated. This was a result of the closure of almost all workers' settlements and the fact that the Divčibare Hotel was not in operation for six years during this period. The average length of stay of tourists was 6.5 days in 2001 and 4 days in 2010, which was not enough for more profitable economic operation of tourism and catering establishments.

Statistical indicators of the number of tourists and their overnight stays in Divčibare confirm that the existing accommodation and catering facilities are underutilized. This is especially true for complementary facilities (resorts, private rooms, private houses, apartments), whose average annual occupancy rate is between 10 and 13%, or 40 to 60 days per year. In contrast, hotels are occupied 30 to 35% or 120 to 140 days per year. Thus, it seems that it is not necessary to build many new buildings, but to better utilize the existing ones, which is neither simple nor easy, as it depends on a number of factors. The increase in the number of tourists and overnight stays would contribute to the activation of some resorts, in the renovation of which significant financial resources must be invested. All this requires a detailed analysis of a series of causes, phenomena and consequences from the field of initiative, absorption capacity and investment.

Table 10. Tourist arrivals and overnights 2011-2020.

Year	Arrivals			Overnights		
	Domestic	Foreign	Total	Domestic	Foreign	Total
2011.	28.952	1.475	30.427	124.132	4.766	128.897
2012.	27.776	945	28.721	112.844	2.789	115.633
2013.	21.962	1.517	23.479	98.463	3.303	101.766
2014.	14.960	1.921	16.881	68.253	2.777	72.030
2015.	22.180	948	23.128	97.272	2.522	99.793
2016.	29.700	673	30.393	156.816	1.631	159.447
2017.	37.356	949	38.305	156.816	1.631	158.447
2018.	41.327	1.128	42.655	178.584	4.609	184.193
2019	41.095	935	42.130	169.615	3.018	172-633
2020.	44.775	602	45.377	158.210	1.723	159.993

Conclusion

Among the Serbian mountains that are better known on the domestic tourism market than on the foreign one, in terms of the number of tourists and their overnight stays, Zlatibor, Kopaonik, Tara, Stara planina and Maljen with the tourist center Divčibare stand out. Organized tourism in Divčibare began in 1925 on the initiative of some teachers from Valjevo, who founded the Divčibare Health Association because they knew about the beneficial effects of the Divčibare climate based on their

experiences. Although since then until today there are several studies confirming the climate-therapeutically values of Divčibare, there are still no organized medical facilities and adequate medical services here. Divčibare is developing into a mountain tourism center with several tourist attractions, both for summer and winter tourism.

A century of tourism development in Divčibare was accompanied by ups and downs, stagnations and setbacks, which had and still has a particular impact, both positive and negative, on the utilization of accommodation and catering facilities, the number of employees, tourism revenues, i.e. the number of tourists and their overnight stays. Almost all accommodation and catering facilities, most of which had been built on a modest scale by 1940, were destroyed and burned during the Second World War. The accelerated reconstruction thereafter began with the construction of the Maljen Hotel, one of the symbols of tourism in Divčibare, which is still in operation today. Over time, several children's and workers' settlements were built, but some of them were neglected for years until they finally collapsed.

Today Divčibare is a large construction site for tourist and hospitality facilities. Weekend houses and apartments for rent and sale dominate. In the period 2021-2022, there were 20 active construction sites. The general regulatory plan for the Divčibare tourist centre was amended three times in a short period of time. In this context, the issues are water supply, sewage treatment and drainage, regular electricity supply, bypass road, parking lot, justification for the expansion of the construction area and a clearer definition of the existing legally protected natural complexes. There are more than 2,000 registered beds here for the needs of tourists. The larger number of domestic tourists compared to foreign ones shows that Divčibare represents a regional and national tourist value. In some years, more than 50,000 tourists and more than 333,000 of their overnight stays were registered here.

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APPLICATION OF THE FLASH FLOOD POTENTIAL INDEX IN TORRENTIAL FLOODS RISK ASSESSMENT (FFPI): A CASE STUDY OF SVILAJNAC MUNICIPALITY

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Abstract: This paper analyses areas at risk of torrential floods in the municipality of Svilajnac. Flash floods are very important from the aspect of environmental protection and disaster management, considering that they can have serious consequences. Damage caused by floods results in the destruction of homes and infrastructure, as well as the displacement of people and loss of agricultural land, alteration of ecosystems and landscapes. For the purposes of this analysis data about geological structure, terrain slope, land cover and bare soil index were processed in the GIS environment. Flash Flood Potential Index (FFPI) was used to calculate the predisposition for flash flood occurrence in the study area. The obtained results indicate a high vulnerability to flash flood occurrence and they are classified into five vulnerability classes.

Keywords: torrential floods, disaster management, Flash Flood Potential Index (FFPI)

Introduction

Every year, numerous countries in the world are affected by floods, which unfortunately claim many innocent lives and leave catastrophic scenes and consequences. World Health Organization (WHO) estimates for the European Region, based on a combination of Emergency Event Database (EMDAT) and Dartmouth Flood Observatory (DFO) data, that more than 2,000 people were killed and 8.7 million people were affected by flooding during the period 2000-2014. (https://www.eea.europa.eu/data-and-maps/indicators/floods-and-health-1/assessment/#_edn1).

Between 1998 and 2017, more than 2 billion people worldwide were affected by flooding. People living in floodplains who do not have warning systems and awareness of the risk of flooding are most vulnerable, and in the last 10 years,

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80-90% of natural disasters were the result of floods, droughts, and severe storms (https://www.who.int/health -topics/floods#tab=tab_1).

Floods occur when water levels rise above normal due to heavy rainfall or snowmelt (Marchi et al., 2010; Dragićević et al., 2016). Flash floods are hydrological natural disasters characterized by sudden occurrence of maximum water volumes and intensive transport of floating and dragging sediments in the beds of torrents (Gavrilović, 1981; Petrović, 2021). There are over 12,000 torrent basins on the territory of Serbia (Petrović, 2021). Depending on the main cause, in our country there are floods caused by rain and snowmelt, ice floods, floods caused by the coincidence of floods, flash floods, floods caused by landslides, and floods caused by the collapse of dams (Gavrilović, 1981). Torrential floods can lead to long-term risks, such as the spread of water-borne diseases, increased risk of landslides, and severe erosion of the land. Flash floods are difficult to predict, but there are some warning signs to look for to prepare for a possible flood. These include monitoring for heavy rain, thunderstorms, and rapid snowmelt.

As one of the municipalities flooded in 2014, Svilajnac is an interesting example. For research purposes, the Flash Flood Potential Index (FFPI) was used. The data used in this work was processed using open-source software "QGIS". The aim of the research in this paper is to obtain a map of spatial distribution of flash flood hazard on the territory of municipality of Svilajnac. In addition to the hazard map, it is necessary to emphasize the importance of preventive measures and evacuation protocols in order to mitigate and, in the best case, prevent the consequences of such disasters.

Materials and methods

Study Area

The study area (Figure 1) is located in the northern part of Pomoravski district, between 44º19'10'' and 44º03'20'' north latitude and 21º08'' and 21º25'' east longitude. It is bordered to the north by the Municipality of Žabari, to the east by the Municipalities of Despotovac and Petrovac, to the south by the Municipality of Jagodina and to the west by the Municipalities of Batočina and Velika Plana. The area of the municipality is 326 km^2, and according to the 2022 census it has 25,802 inhabitants, while the average population density is 79.15 persons/km^2 (Republički zavod za statistiku, 2022). There are a total of 22 settlements in the municipality.

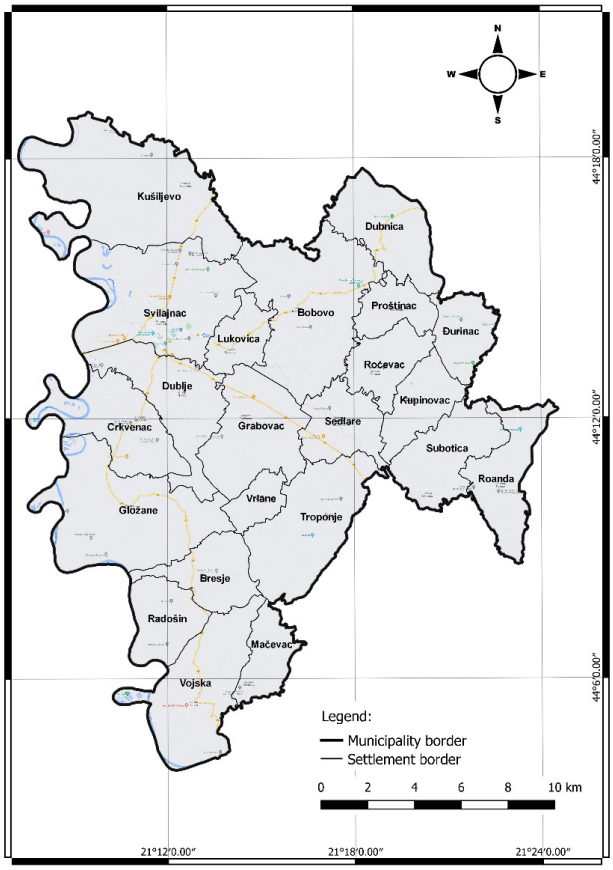

Figure 1. Position of the municipality of Svilajnac
Source: QGIS Quick Map Services plugin - Google maps

An administrative, economic and cultural center of the municipality is the village of Svilajnac with 9128 inhabitants (Republički zavod za statistiku, 2011) and an area of 27.78 km^2. The most important roads on the territory of the municipality are the state road of the second A-level with markings 160 and 162 (JP "Putevi Srbije", 2022a), the state road of the first B-level with number 27 (JP "Putevi Srbije", 2022b) and the state road of the second B-line with number 383 (JP "Putevi Srbije", 2022c).

On the territory of the municipality there are six immovable cultural properties (Zavod za zaštitu spomenika kulture, 2022): Zlatenac Monastery (cultural monument), Miljkov Monastery (cultural monument), Resava Library building in Svilajnac (cultural monument), old hospital building in Svilajnec (cultural monument), the building of the old high school in Svilajnac (cultural monument) and St. Nikola Church (cultural monument).

Methodology

A method for identifying flash flood potential areas (FFPI) was developed by Smith (2003) as part of the "West Region Flood Project", in the United States (Tincu et al., 2018). For research purposes, the FFPI was applied, which is calculated according to the formula (Smith, 2003):

$$FFPI = \frac{M+S+L+V}{4} \quad (1)$$

where *M* -, is the slope coefficient of the terrain, *S* -, is the coefficient of the geological base, *L* -, is the coefficient of land use and *V* -, is the coefficient of bareness of the terrain. The values of the coefficients of the parameters range from 1 to 10, i.e., from the terrain that is the least to the one that is most threatened by flash floods. This is the most commonly used method in the region (Minea et al., 2016; Ticnu et al., 2018; Marković et al., 2021).

The slope of the terrain (Table 1) is expressed by the size of the slope angle, which is the vertical angle that intersects the surface of the terrain with the horizontal plane and is expressed in degrees. The terrain slope coefficient (*M*) is calculated based on a digital elevation model with a resolution of 25 m and is expressed as a percentage, after which the formula is applied:

$$M = 10^{\frac{n}{30}} \quad (2)$$

where *n* – terrain slope in percent, and if *n* > 30%, then M is always equal to zero.

Table 1. Surfaces of terrain slope classes

Slope [°]	Area [km^2]
0 - 5	47,58
5-10	55.90
10 - 15	80.23
15 - 20	38.01
>20	99.20

Source:author

To determine the coefficient of the nature of the geological subsurface as a basis for digitization, geological base maps or open data on the representation and nature of the rocks in the area in question can be used. In order to determine the coefficient of the type of geological bedrock, in this work the geological base map - sheet L34 - 127 Lapovo, published by the Savezni geološki zavod in 1975, was used as a basis for digitization, using an interpreter for the analysis of the map content. Different coefficients were assigned to the represented rock types depending on their properties (e.g. strength, permeability, etc.), which were rated from 1 to 10 (Table 2).

Table 2. Display of coefficient values for the type of geological bedrock

Geological formation	The value of the coefficient
Alluvial sediments	2
Deluvium - Proluvium	7
Bedload sediments	4
Igneous rocks	3
Metamorphic rocks	6
Clastic sediments	7

Source: author

The land use coefficient is determined based on data from the European Environmental Protection Agency database - CORINE Land Cover (2018) or other relevant sources, and can also be determined for working purposes based on satellite imagery and existing land use documents. Land cover data can be used to identify areas of land that may be susceptible to natural disasters or other risks, such as flooding or landslides. The type of land use is very important from the point of vegetation, which can mitigate soil leaching and further erosion. Since trees root much deeper than grass and shrubs, densely vegetated areas were subjectively rated according to the class they represent. Vegetation also helps to improve water quality. Plants help to filter and absorb pollutants and contaminants, thus improving the water quality downstream. This is especially important in areas prone to torrential floods, as the amount of water flowing can increase the amount of pollutants and contaminants in the water. The coefficients are shown in Table 3.

Table 3. Display of the value coefficient for the land use

CORINE Land Cover class		The value of the coefficient
112	Settlements	4
121	Industrial and commercial areas	3
131	Mineral extraction sites	2
211	Non-irrigated arable land	5
221	Vineyards	8
231	Meadows	6
242	Complex agricultural areas	8
243	Agricultural areas with a significant proportion of natural vegetation	6
311	Deciduous forest	4
324	Transitional woodland-shrub	6
411	Inland marshes	1
511	Water courses	1
512	Water bodies	1

Source: author

The Bare Soil Index (BSI) is determined by analysing multispectral satellite images. BSI is calculated using the following formula (Diek et al., 2017):

$$BSI = \frac{(SWIR+R)-(NIR+B)}{(SWIR+R)+(NIR+B)} \quad (3)$$

where SWIR is the value of the shortwave infrared portion of the spectrum, R is the value of the red portion of the spectrum, NIR is the value of the near infrared portion of the spectrum and B is the value of the blue portion of the electromagnetic radiation. For easier calculation of the value without negative sign, the number one (+1) is added to the displayed formula. Shortwave infrared and red spectral channels are used to quantify mineral composition of the soil, while blue and near-infrared channels are used to highlight the presence of vegetation (https://www.geo.university/pages/spectralindices-with-multispectral-satellite-data).

Considering that the values for the coefficient of bare soil range from 1 to 10, to determine these values, the dependence between the values was determined and the following formula was established:

$$V = 7{,}68 * ln(BSI) + 8 \quad (4)$$

After determining the value of each coefficient, the FFPI index is calculated. Then, based on the analysis of the obtained values, a classification is made within the hazard classes, i.e., the susceptibility to the occurrence of flash floods. The results obtained in this way reflect the spatial arrangement of the phenomenon when it occurs, rather than the temporal intensity. Whether it will really happen depends on a variety of factors, which is why we talk about the predisposition, i.e., the susceptibility of the area to the occurrence and development of this natural disaster (Novković, 2016).

One of the main advantages of the FFPI is its ability to quickly assess the potential threat of flooding in areas that may have limited data or resources available. The FFPI can be applied to any location, regardless of whether or not it has access to high-resolution topographical data or sophisticated weather modelling. Additionally, the FFPI can be used to make comparisons between multiple locations, helping emergency managers to determine which areas are most likely to experience flooding. Additionally, the FFPI can be used to compare the relative risk of flooding in different regions, making it possible to prioritize emergency response and evacuation plans.

The basis of the calculations in the work is a raster digital elevation model with a resolution of 25 m, on the basis of which the data on the slope of the terrain were obtained, multispectral images of the Landsat 8 satellite downloaded from U.S. Geological Survey (USGS), on the basis of which the data on the bare soil index were obtained, the geological map from which geological formations were digitized,

and then for the needs of the analysis were rasterized and land use downloaded from Corine Land Cover database that have been converted from vector to raster data type.

Results and discussion

Based on the applied formula, the FFPI index was determined with the values of ranging from 1.5 to 8.8 (Figure 2).

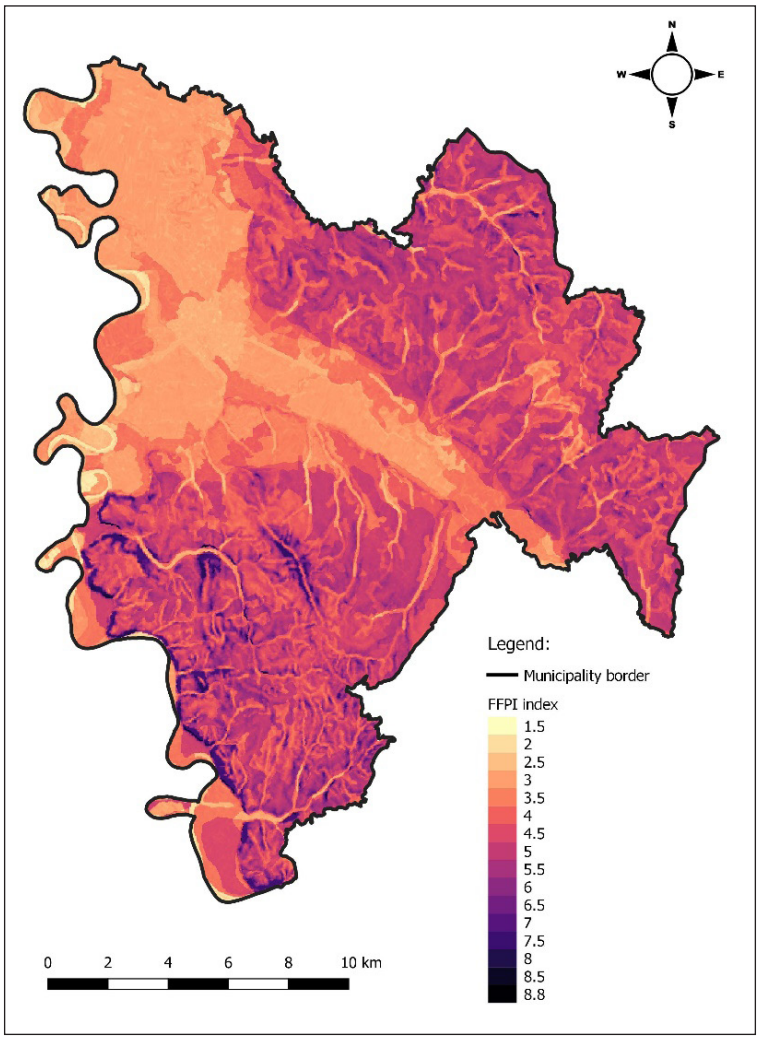

Figure 2. FFPI index
Source:author

The potential for flash flooding can be quite severe in some areas, and the index can help to inform both emergency response personnel and everyday citizens alike. By looking at the index, people can know what areas are more likely to experience flash flooding and can better plan for potential flooding events. The index also helps to inform the public of the potential risks associated with flash flooding, so that they can take any necessary precautions to protect themselves and their property. The FFPI index is an important tool for meteorologists, hydrologists and emergency response personnel because it provides information about the probability of flash floods occurring in a given area. This index can be used as a decision support tool for warning systems, emergency and evacuation plans and it is an essential tool for predicting the severity and likelihood of torrential flooding in an area.

FFPI can provide valuable insight into the factors which cause flash floods to occur. Terrain data is used to assess the slopes of the land and the amount of water that can flow through the area. Geological structure, land use and bare soil index data are used to determine how quickly water will be absorbed or runoff into the watershed.

After determining the index value, the classification was made into five vulnerability classes (Figure 3).

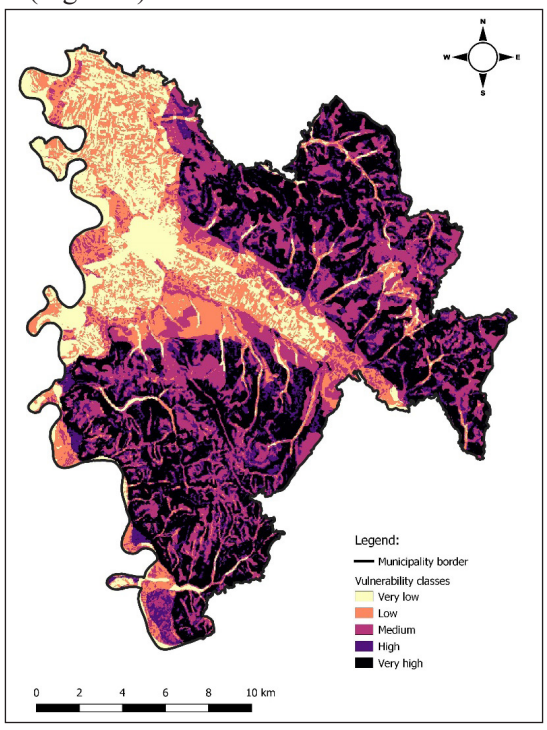

Figure 3. Vulnerability classes
Source: author

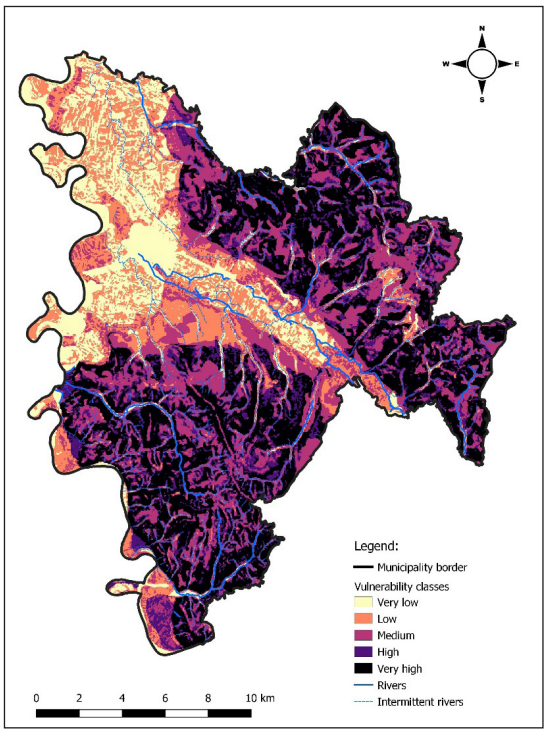

Figure 4. River network in vulnerability classes
Source: author

Areas classified as very low are unlikely to experience flash flooding, while areas classified as very high are at a greater risk of flash flooding.

Low vulnerability indicates that the area is relatively safe from flash floods, as the terrain, hydrology, and land cover are not conducive to flash flooding. Moderate vulnerability indicates that the area is partially at risk for flash flooding. The terrain, hydrology, and land cover are more conducive to flash flooding than those of low vulnerability areas. High vulnerability indicates that the area is very much at risk for flash flooding, as the terrain, hydrology, and land cover are all conducive to flash flooding. Areas in all vulnerability classes should be monitored closely and additional precautions should be taken in the event of a severe storm.

The spatial distribution is such that the north-eastern, eastern and southern parts of the study area are the most at risk because very high potential indicates the highest possibility of flash floods. The areas in the very low and low classes are located along the major river reaches, while the medium, high, and very high classes are found around the intermittent rivers (Figure 4). Moderate potential indicates that flash floods are possible, but unlikely, while high potential indicates that flash floods are likely to occur. These results can be used to make decisions related to land use and flood control measures such as levees or dams to reduce flood risk in sensitive areas, as well as in land use planning for construction of structures in the area.

Table 4 shows the areas by vulnerability classes. In the very low class, there are 44.58 km^2, which is 14.83% of the territory of the municipal area. The low class occupies 17.42% of the area, the medium class 25%, the high class 11.84% and the very high class 30.91%. It can be deduced that the largest part of the municipal area belongs to the low and medium class of vulnerability (57.25%). The smallest area is occupied by the high class and the largest by the very high class. Such a calculation

could help municipalities to identify areas that are more vulnerable to flash floods and to take the necessary precautions to protect their inhabitants and infrastructure.

Table 4. Areas in vulnerability classes

Vulnerability class	Area [km^2]
Very low	44,58
Low	55.90
Medium	80.23
High	38.01
Very high	99.17

Source: author

From the obtained results it can be concluded that within the very low class there was a spatial overlap of the smallest coefficients of the parameters of the formula. Figure 5 shows the mean FFPI index by settlements.

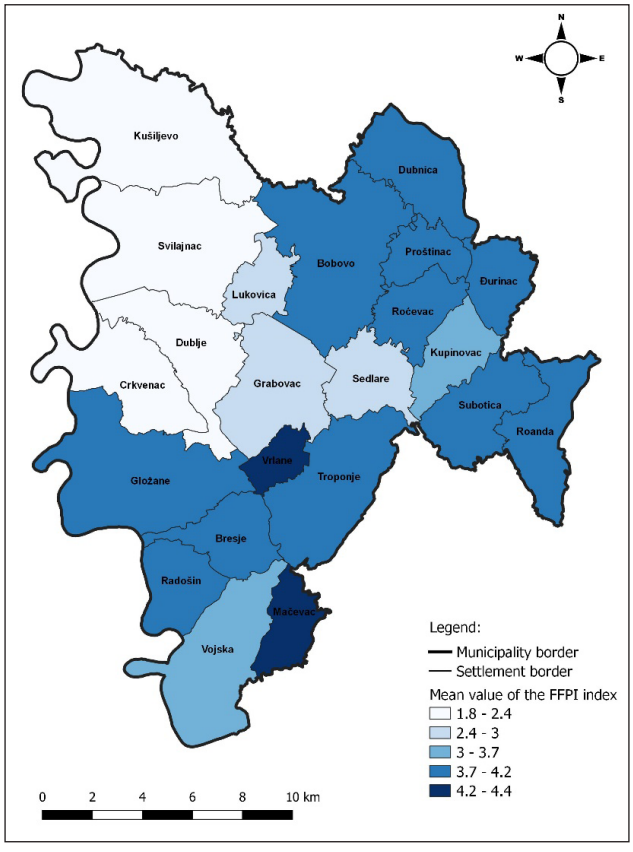

Figure 5. Mean value of the FFPI index by settlements

Source: author

This spatial arrangement of mean values should indicate places where it is necessary to strengthen precautionary measures and pay more attention to all factors preceding the occurrence of flash floods. The highest mean values were measured in the settlements of Mačevac and Vrlane (above 4.2), the lowest in the settlements of Svilajnac, Kušiljevo, Dublje and Crkvenac.

Conclusion

The flash flood risk analysis was performed using the Flash Flood Potential Index (FFPI) and showed that the probability of this natural disaster occurring in the territory of the Svilajnac municipality is significant. Although flash floods are usually triggered by heavy rainfall or sudden snowmelt, which cannot be influenced by humans, human negligence also plays a role in worsening the consequences of such a disaster. Precautionary measures should be strengthened, dams should be rebuilt or raised where needed, and a plan should be developed that includes prevention and remediation measures in the event of a flood.

The FFPI index can serve as an early warning of potential flash flooding so that communities can prepare in a timely manner. It also helps identify areas at risk of this disaster and allows for timely allocation of resources to mitigate potential damage.

According to the analysis, most of the municipality, more precisely 14.83% of the area, belongs to the very low vulnerability class, 17.42% to the low vulnerability class and 25% to the medium vulnerability class, and these areas are mostly located in areas where the low coefficients overlap within each member of the formula. In the high class there are 11.84% and in the very high 30.91% of the municipal territory. The most threatened settlements are Mačevac and Vrlane, which have the highest mean value of FFPI index, and the least threatened settlements are Svilajnac, Kušiljevo, Dublje and Crkvenac, while the mean coefficient of threat of flash floods for the whole municipality is 4.23.

Considering the changes in natural and anthropogenic factors relevant to these processes, it would be best to establish a system for occasional or permanent monitoring and control of the situation on the ground. With the help of new technologies, it is possible to collect detailed data from the surface that need to be analysed, and the use of GIS then allows data processing and the creation of a model of the future state. This type of analysis can prevent potential disasters, or at least mitigate their effects, and is therefore an important component of space analysis.

The FFPI index does not take into account other factors such as the amount of debris in riverbeds or landslides, which can also lead to flash flooding, nor does

it take into account the effects of climate change, which can lead to more extreme weather events and increased potential for torrential flooding. Therefore, it is necessary to conduct analyses on a high-quality data set and use a combination of methods to compare results.

Each method has its advantages and disadvantages, but this does not preclude its importance for research. Using different methods can be a good way to achieve the desired goals. With so many methods available, it is important to find the one that is best suited for the task at hand. Different methods can be used in different situations and help increase efficiency and productivity in finding the optimal solution to the given problem, in this case, assessing the risk of flash flooding.

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STATISTICAL ANALYSIS OF THE MEAN RELATIVE VARIABILITY OF MONTHLY, SEASONAL AND ANNUAL PRECIPITATION AT THE MAIN SYNOPTIC STATIONS IN THE SOUTH MORAVA SUB-BASIN TO THE KORVINGRAD HYDROLOGICAL STATION

Milan Miletić[1], Jovana Vuletić[2]

Abstract: The aim of this work is to determine the variability of precipitation in the area of the sub-basin of the South Curve up to the hydrological station Korvingrad. Data from the synoptic stations Leskovac, Vranje and Kuršumlija for a period of 30 years (1991-2020) were used. The mean relative variability of monthly, seasonal and annual precipitation and their ten-year values were used to compare the results of all synoptic stations in the sub-basin. The results showed that the highest mean variability of precipitation in the studied period was recorded at the Vranje synoptic station (22.4%) and the lowest value at the station in Leskovac (18.4%). The comparison of ten-year values showed that the lowest values of mean relative variability of annual precipitation in the period 2001-2010 were recorded at all synoptic stations. The study showed that the extreme values of mean relative variability of precipitation occurred earlier or later during the second and third ten-year periods compared to the first ten-year period. The study showed that the values of mean relative variability of monthly precipitation were lowest in months with high precipitation.

Keywords: Precipitation, sub-basin of the South Morava, mean relative variability of precipitation, climate changes

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Introduction

One of the biggest problems of our time is global climate change. Special attention is paid to the analysis of precipitation as one of the most important climate elements. It is believed that the change in precipitation in recent years is taking place on a global scale. In recent decades, precipitation has been concentrated in intense events where a large amount of precipitation can fall in a short period of time (Iwashima and Yamamoto, 1993; Karl et al., 1995; Suppiah and Hennessy, 1998; Trenberth, 1999). In all models of global precipitation circulation, the degree of evaporation has been shown to increase with an increase in global air temperature (Hense et al., 1988; Genfo et al., 1991; Ross and Elliot, 1996; Pierrehumbert, 1999). In some regions, evaporation is low, which is a consequence of low moisture in the soil. In such areas, droughts occur more frequently. Climatic changes are also noticeable at the regional level. Especially in the region of southern Europe, which is a climatic transition area between dry and wet areas, climatic changes can have the greatest impact (Lavorel et al., 1998). Родић and Павловић (1994) point out that the regional distribution of precipitation is uneven and irregularly distributed under the influence of factors such as latitude, longitude, distance from the sea, relief structure, and altitude. Measurement of precipitation and its analysis at monthly and annual scales is important for many economic sectors such as agriculture and water management (Дукић, 1998).

The sub-basin of the South Morava River up to the Korvingrad hydrological station is mostly located on the territory of Serbia and a smaller part on the territory of Northern Macedonia. The area of the sub-basin is 9396 km2 (Miletić, 2022). As a result of the development of the Pannonian basin, the sub-basin has a meridian extension direction (Павловић, 2019a).

The South Bend sub-basin belongs to the temperate-continental climate area. The highest areas of the sub-basin belong to the type of alpine climate (Павловић, 2019b). Томислав Ракићевић (1980) carried out the climatic regionalization of Serbia. The area of the South Curve sub-basin up to the hydrological station Korvingrad includes the climatic regions Gnjilanski, Vranjski, Vlasinski, Niško-leskovački and Kopaonički. There are three important (synoptic) meteorological stations in the sub-basin. These are: Vranje (432 m above sea level), Leskovac (230 m above sea level) and Kuršumlija (362 m above sea level). The average annual precipitation in the period 1991-2020 at the synoptic stations is: Vranje (606 mm), Leskovac (661 mm) and Kuršumlija (670 mm) (Hydrometeorological Service of the Republic of Serbia, 1991-2020).

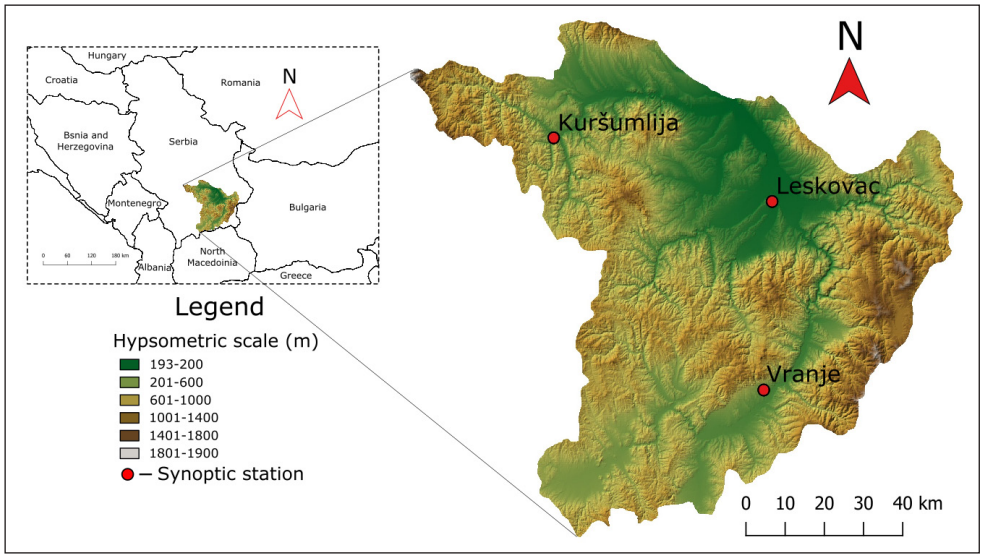

Figure 1. The position of synoptic stations on the territory of the South Morava sub-basin up to the Korvingrad hydrological station

The main task of the work is to determine the mean variability of precipitation at the synoptic stations in the sub-basin. In the work, data from the thirty-year period from 1991 to 2020 were used. The variability of precipitation is determined by the method of deviation from the mean of monthly and annual precipitation. Ten-year values of mean relative variability of seasonal precipitation were compared in the study. Precipitation variability has been highly variable in recent decades as a result of global temperature changes and evaporation (Šegota and Filipčić, 1996). The main objective of the work is to apply certain statistical methods to estimate the mean relative variability of monthly, seasonal and decennial precipitation in the analyzed period 1991-2020 at the synoptic stations Leskovac, Vranje and Kuršumlija.

Materials and methods

To determine the variability of precipitation in the sub-basin area, mathematical formulas were used to determine the mean absolute variability of annual precipitation, the mean relative variability of precipitation, and the coefficient of variation. According to Šegota and Filipčić (1996), precipitation variability is the mean deviation of annual precipitation from the multi-year average. To determine the variability of precipitation, the mean value of annual precipitation must first be determined. The difference between the amount of precipitation and the mean value

of precipitation in a multi-year period represents the degree of variation (Šegota, 1969). For the analysis of the values, it is important to point out that a greater difference indicates a greater variability of precipitation and vice versa. Šegota and Filipčić (1996) presented the mean absolute variability of annual precipitation with a formula:

$$\overline{V_a} = \frac{1}{n}\sum_{i=1}^{n} |P_i - \overline{P_g}|$$

Where P_i represents the value of precipitation in the i-th year of the analyzed period, P_g the mean value of precipitation. In order to compare data from several meteorological stations that have different amounts of precipitation, it is necessary to use the formula for determining the mean relative variability of precipitation (Šegota and Filipčić, 1996):

$$\overline{V_r} = \frac{100\ \overline{V_a}}{\overline{P_g}}\ \%$$

The variability of precipitation for the three synoptic stations was determined using the standard deviation and coefficient of variation. Standard deviation is the average deviation of precipitation from its average. It is represented by absolute values. The coefficient of variation was determined as described by Maradin (Maradin, 2007). It represents the ratio of the standard deviation and the arithmetic mean by the formula:

$$V_k = \frac{100\ \sigma}{\overline{P}}\ \%$$

In which σ represents the value of the standard deviation and $\overline{P}$ mean value of the amount of precipitation for the analyzed period. Values of mean relative variability and coefficient of variation are expressed in %.

Results and discussion

The paper analyzed the variability of precipitation at three synoptic stations in the South Morava sub-basin up to the Korvingrad hydrological station in the period 1991-2020. Three ten-year periods (1991-2000, 2001-2010 and 2011-2020) were distinguished in this investigation. At the beginning of the study, the average monthly and annual precipitation had to be calculated. Figure 1 shows the mean monthly precipitation values at the synoptic stations in the sub-basin. The highest

average monthly precipitation was measured in May at all three synoptic stations during the studied period. The determined values are: 69.4 mm in Leskovac, 63.1 mm in Vranje and 71.5 mm in Kuršumlija.

Analysing Figure 2, we conclude that there are two precipitation maxima at all three synoptic stations. The precipitation maximum in April, May and June is more pronounced than the maximum in October and November. The monthly average value of precipitation measured in Kuršumlija in July is 68.9 mm. It is a consequence of the geographical position and the morphology of the terrain. The lowest average values of monthly precipitation are measured in July, August and September at the meteorological stations Leskovac and Vranje, in Kuršumlija in August. In January and February, all three meteorological stations recorded the lowest precipitation amouns.

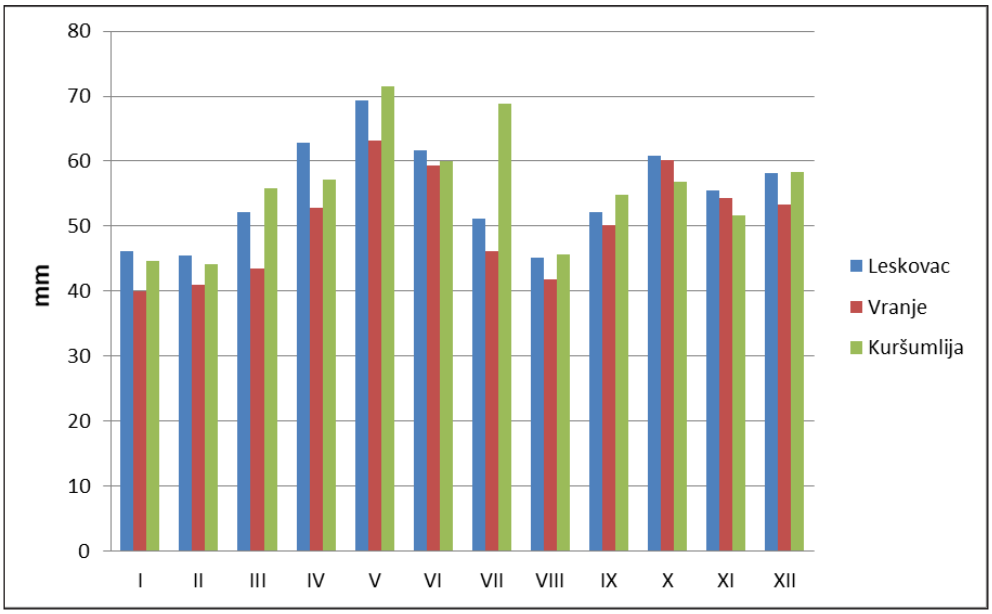

Figure 2. Average monthly rainfall at the synoptic stations Leskovac, Vranje and Kuršumlija in mm (1991-2020)

The average annual precipitation for the studied period is: 660.8 mm in Leskovac, 605.7 mm in Vranje and 669.6 mm in Kuršumlija. Kuršumlija has the highest average annual precipitation, although it is not located at the highest altitude. The morphology of the terrain is prominent, i.e. it is surrounded by mountains. Vranje, which is located at the highest altitude, has the lowest average annual precipitation. As a result, relief barriers from the north and west prevent the penetration of humid air during most of the year.

The variability of precipitation during the studied period shows different values at all synoptic stations (Table 1). The highest annual precipitation variability is recorded at the synoptic station in Vranje with 22.4%, and the lowest at the synoptic station in Leskovac with 18.4%. At the synoptic station in Kuršumlija the annual variability of precipitation is 20.4 %.

Table 1. Seasonal and annual mean relative variability of precipitation (%) at synoptic stations Leskovac, Vranje and Kuršumlija (1991-2020)

Station	Winter	Spring	Summer	Autumn	Year
Leskovac	30.9	30.1	40.2	42.5	18.4
Vranje	31.2	34.6	47.5	41.7	22.4
Kuršulija	32	31.6	43.6	41.1	20.4

In Table 1, in addition to the mean annual values of precipitation variability, seasonal values of the mean relative variability of precipitation for the analyzed period are presented. The greatest mean seasonal relative variability of precipitation is during summer and autumn. The highest seasonal variability of precipitation at the synoptic stations of Vranje and Kuršumlija is during summer (47.5% in Vranje and 43.6% in Kuršumlija), while in Leskovac it is during autumn and amounts to 42.5%. The lowest seasonal values of precipitation variability are during winter and spring. The lowest value of seasonal variability of precipitation in Leskovac (30.1%) and Kuršumlija (31.6%) is during spring, while in Kuršumlija during winter it is 31.2%.

By analyzing the mean relative variability of monthly precipitation (table 2), we can conclude that the highest values of precipitation variability are during the summer months. The highest values are recorded in August and amount to: 87.3% in Leskovac, 86.3% in Vranje and 71.6% in Kuršumlija.

Table 2. Monthly mean relative variability of precipitation (%) at synoptic stations Leskovac, Vranje and Kuršumlija (1991-2020)

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Leskovac	60	46.4	61.9	59.4	41.2	55.2	50.9	87.3	70.3	62.3	65.4	53.3
Vranje	62.6	56.3	71.7	60.7	46.2	55.9	71.6	86.3	67.4	63.7	69.1	54.4
Kuršumlija	58	55.9	63.6	52.8	35.9	54.8	66.4	71.6	67.2	67.5	65.5	58.2

The lowest values at all three synoptic stations were recorded in May and are: 41.2% in Leskovac, 46.2% in Vranje and 35.9% in Kuršumlija. The values of mean relative variability of monthly precipitation can be explained by the presence of maximum and minimum precipitation. In periods when the mean monthly precipitation is higher, the mean relative variability of precipitation decreases. In contrast, the mean relative variability of precipitation increases during the periods of the year when precipitation is low, i.e. during the periods of the first and second precipitation minimum.

From Table 2 it can be concluded that there are two maxima and two minima of the mean relative variability of monthly precipitation. The maxima of mean relative variability of monthly precipitation coincide with the minima of precipitation during the year. The primary maximum of the mean relative variability of monthly precipitation is in the summer months, while the secondary maximum is in the winter months. The lowest mean relative variability of monthly precipitation occurs in May, which can be referred to as the primary minimum of mean relative variability of monthly precipitation. Here the primary maximum of annual precipitation comes to the fore. As the amount of precipitation increases, the mean relative variability of monthly precipitation decreases and vice versa.

The mean relative variability of seasonal precipitation in ten-year periods varies. In the first ten-year period 1991-2000. (Table 3) the mean relative annual precipitation variability had the lowest value in Kuršumlija (19.4%) and the highest in Vranje (23.3%). In the same period, the lowest relative variability of seasonal precipitation was measured at all synoptic stations in spring. The lowest value of relative variability of seasonal precipitation is 25.3% and was measured in Leskovac. The low values of relative variability of seasonal precipitation in spring can be explained by the higher amount of precipitation coinciding with the primary precipitation maximum in April and May. The highest values of relative variability of seasonal precipitation were measured at synoptic stations Vranje and Kuršumlija in summer and in Leskovac in winter (TTable 3). The high values of relative variability of seasonal precipitation in summer months can be explained by the lower amount of precipitation and high temperatures. In Leskovac, the mean relative variability of seasonal precipitation was significantly lower during summer, which can be explained by a slightly higher amount of precipitation during this period.

Table 3. Seasonal and annual mean relative variability of precipitation (%) at synoptic stations Leskovac, Vranje and Kuršumlija presented in ten-year periods

Period	Station	Winter	Spring	Summer	Autumn	Average anual
1991-2000. year	**Leskovac**	41.3	25.3	36.3	36.7	21.1
	Vranje	37.6	26.5	54.8	37.4	23.3
	Kuršumlija	43.8	30.9	47.1	34.9	19.4
2001-2010. year	**Leskovac**	26.1	21.1	42.4	39.7	11.3
	Vranje	27.4	29.8	40.4	35.5	15.1
	Kuršumlija	23.7	27.8	33.9	38.5	12.8
2011-2020. year	**Leskovac**	25.4	35	41.8	54.2	20.6
	Vranje	25.4	39	47.7	52.4	24.7
	Kuršumlija	28.9	32.8	50.3	49.9	23.7

In the second ten-year period 2001-2010. year (Table 3), the mean relative variability of annual precipitation at all three synoptic stations had significantly lower values compared to the first ten-year period 1991-2000. years. The lowest mean relative variability of annual precipitation was recorded in Leskovac 11.3%, while the highest was recorded in Vranje 15.1%. Analyzing the results from Table 3, we can conclude that the mean relative variability of seasonal precipitation during winter and spring in the analyzed period had significantly lower values. The lowest mean variability of seasonal precipitation in Leskovac in the second ten-year period was recorded during spring, while in Vranje and Kuršumlija during winter. The highest values of the same parameter were recorded in Leskovac and Vranje during summer, and in Kuršumlija during autumn.

In the third ten-year period 2011-2020. year (Table 3), the mean relative variability of annual precipitation at all synoptic stations records high values in relation to the first and second ten-year periods with only one exception. This is the case with Leskovac, where the mean relative variability of annual precipitation amounts to 20.6%, which is 0.5% less compared to the first ten-year period 1991-2020. years. It is significant for the research that the mean relative variability of seasonal precipitation had the lowest values at all synoptic stations during winter. The mean relative variability of seasonal precipitation increases linearly at all synoptic stations during spring, summer and autumn. The highest values of the same parameter at the synoptic stations Leskovac and Vranje were recorded during autumn, while in Vranje the highest value was recorded during summer. This phenomenon can be explained by extremely dry periods that in the last ten-year period were pronounced in the summer and autumn months when there was little precipitation.

From Table 2, we can conclude that there are two maxima and two minima of mean relative variability of monthly precipitation. The maxima of the mean relative variability of monthly precipitation coincide with the minima of precipitation during the year. The primary maximum of the mean relative variability of monthly precipitation is during the summer months, while the secondary maximum is during the winter months. The lowest mean relative variability of monthly precipitation is during May, which can be characterized as the primary minimum of mean relative variability of monthly precipitation. This is where the primary maximum of annual precipitation comes to the fore. With an increase in the amount of precipitation, the mean relative variability of monthly precipitation decreases and vice versa.

Conclusion

For all three synoptic stations located in the territory of the South Morava sub-basin up to the Korvingrad hydrological station, the continental type of annual precipitation flow is characteristic. One of the proofs is the increase in the amount of precipitation in late spring and early summer. That period can be characterized as the primary maximum of precipitation. The secondary maximum of precipitation occurs in the period from September to December. The least precipitation is recorded during winter and summer, so these periods are characterized as minimum precipitation.

The synoptic station Leskovac has the lowest mean relative variability of annual precipitation for the analyzed period and it is 18.4%. The weather station Vranje has the highest value of the mentioned parameter, which is 22.4%. In the same period, the mean relative variability of seasonal precipitation at the synoptic stations of Vranje and Kuršumlija has the highest values during the summer, while in Leskovac the highest value of the same parameter was recorded during the fall. The lowest values of the mean relative variability of seasonal precipitation at Leskovac and Kuršumlija stations were recorded during spring, while in Vranje the lowest value of the same parameter was recorded during winter.

The mean relative variability of seasonal precipitation in 10-year periods was subject to change. In the first ten-year period (1991-2000) the mean relative variability of seasonal precipitation at all synoptic stations had the lowest values during spring, while the highest values were recorded during summer and winter. In the second ten-year period (2001-2010) the maximum values of the mean relative variability of seasonal precipitation were highest during the summer. At the synoptic station in Kuršumlija, the maximum value of the same parameter was recorded during autumn. It is significant that the minimum values of mean relative variability of precipitation in the second ten-year period in Vranje and Kuršumlija were recorded during winter. It was during this period that the seasonal occurrence of the minimum seasonal relative variability of precipitation changed. In the same period, there was a shift in the maximum value of the mean relative variability of seasonal precipitation from the summer period to the autumn period, with the exception of the Kuršumlija synoptic station, where the highest value is recorded during the summer. In the last ten-year period (2011-2020) extreme values of the mean relative variability of seasonal precipitation occur at the beginning and end of the calendar year.

In the analysed period, the mean relative variability of monthly precipitation has the lowest values in the months in which the amount of precipitation is high and vice versa. We come to the conclusion that months in which there is more precipitation over a longer period of time do not have a large fluctuation in precipitation in contrast to months that have little precipitation. In the months with little precipitation, most

often during the summer months, it is common for no precipitation to be recorded in them, or in some extreme cases for more precipitation than the multi-year average.

In the period 1991-2020. year numerous precipitation fluctuations were recorded both on a monthly and an annual level. In most cases, a decrease or increase in precipitation can explain the change in the mean relative variability of precipitation. As one of the proofs of climate change on the territory of Serbia and the sub-basin of South Morava up to the Korvingrad hydrological station is the change in the period of occurrence of minimum and maximum values of mean relative variability of precipitation. Based on the data, we can conclude that changes in the values of mean relative variability of seasonal and annual precipitation and changes in their occurrence can affect the state of water in the sub-basin. Global climate changes, which are manifested through rainfall variability, influence the worsening of water management problems in the South Morava sub-basin. Knowing the amount of precipitation and its variability on a monthly and annual level is very important for further research, which must be in the direction of the interdependence of precipitation with certain climatic elements.

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THE IMPACT OF THE COVID-19 PANDEMIC ON TOURIST MOVEMENTS IN THE AREA OF EXCEPTIONAL CHARACTERISTICS "GREAT WAR ISLAND"

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Abstract: Due to the global pandemic caused by the covid-19 virus, tourism as an activity has experienced a sharp decline worldwide over the past three years. The impact of the pandemic was felt in all activities and sectors, and the consequences for tourism in Serbia are only now being remedied. In 2020, most countries in the world have taken measures in the form of entry bans and border closures to prevent the spread of infection. The measures taken in 2020 and the following two years had a very negative impact on the hospitality industry and tourism. During this period, the development of many forms of tourism slowed down or came to a complete halt. The area of exceptional features (hereinafter PIO) "Great War Island" represents a significant tourist resource of Serbia and a preserved natural space within the urban area, so it is suitable for the development of urban ecotourism, as a special form of ecotourism. Ecotourism, which attaches importance to the people, environment and culture in this area, was already in development before the pandemic. The main objective of the work is to assess whether and to what extent the pandemic has influenced the tourist movements towards the PIO "Great War Island". For this purpose, a questionnaire was formulated and surveys were conducted. It is important to point out, based on the research results obtained, as well as the data collected in the years preceding the pandemic, the implementation of specific activities aimed at continuing the development, especially the harvested ecotourism, in the area. The results obtained through the advantages and disadvantages presented can be used by those working in the tourism sector and receptive travel agencies to overcome the crisis more easily and to design a better tourist offer.

Keywords: tourist movements, urban ecotourism, Great War Island, Covid-19 pandemic, Belgrade

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Introduction

Nature conservation is both an organized and a social activity aimed at preventing the increasing destruction and endangerment of the human environment. Tourism, as an activity based on the movement of people, depends largely on the quality of the environment in which it takes place. For tourism, the issue of conservation of nature is very important, so on the one hand, tourism is treated as a complementary activity, but on the other hand, it can act as a factor that affects the protection of the natural environment (Nikolić, 1998). The quality of the environment and natural and cultural values condition the positive development of tourism more than any other long-term activity (Jovicic, 2010).

The predominant form of tourism movements today is leisure tourism, which mostly occurs as a need in urbanized and polluted urban areas, while the places where these needs are satisfied are mostly natural environments with diverse ecosystems and landscapes. Such landscapes are often protected and should be preserved and improved rather than destroyed, which would have a positive impact on both the environment and tourism. Besides recreational tourism, such landscapes are very important for the development of urban ecotourism, as a special form of tourism in urban, urbanized areas (Nikolić, 1998).

Hector Ceballos-Lascurian, an international ecotourism consultant and Mexican ecologist, first defined the term ecotourism. His definition was improved by the International Union for Conservation of Nature (IUCN) and adopted at the World Congress in Montreal in 1966. The definition of ecotourism adopted by the IUCN is as follows: "Ecotourism is an ecologically responsible excursion and visit to relatively protected areas to enjoy nature, with the enhancement of conservation, low negative visitor impacts, and a positive active influence on local communities" (www.ecotourism .org; https://www.iucn.org). From this definition, we can conclude that ecotourism can be considered as a phenomenon opposed to mass tourism, in which the responsible behavior of visitors towards the natural environment in which it takes place plays an important role. Certain specific activities related to this form of tourism take place in the form of organized hikes, bicycle tours, photo safaris and many others that involve the active participation of tourists in the idea of respect and protection of the natural environment.

One of the areas that meets the conditions for the development of urban ecotourism in the urbanized area of the City of Belgrade is the PIO "Great War Island". At the confluence of the Sava and Danube rivers, between Belgrade and Zemun, there are two Danube islands, Malo and Veliko Ratno, which are natural pristine oases separated from the urban part of Belgrade by the Danube (Amidzić, Krasulja, Belij, 2007). Today, the protected natural asset "Great War Island" in

Belgrade consists of two river islands, it was placed under protection to protect the nature that makes it up and represents an area with exceptional characteristics, covering an area of 211.38 ha, which depends on the water level of the Sava River and the variable Danube (Malinić, 2016). In summer, the Area of Exceptional Qualities "Great War Island" becomes a real oasis for Belgrade citizens who, in addition to ecotourism, come to this area for recreation and swimming, which is connected to the famous Lido beach on the northeast side of the island. The protection regulations in this area define the boundaries and delimit the recreation and tourism zone as well as the nature protection zone (Figure 1).

Figure 2. Protection zones on the AEQ "Great War Island"

The nature protection zone, which has the character of a special nature reserve, includes part of the forest complex AEQ "Great War Island", wetlands and water bodies. The recreational zone on the territory of the AEQ "Great War Island" is limited to the inner part of the island and is connected with the tourist zone of the island. In this way, visitors are offered more opportunities to spend time in this area without endangering the nature protection zone. However, even in this protected area there are several illegally constructed buildings that threaten the environment of protected species as well as further development according to the principles and ideas of ecotourism (https://www.zzps.rs/).

One of the biggest problems facing the AEQ "Great War Island" is the lack of an adequate material base for the development of all forms of tourism. Only in the summer season is the AEQ "Great War Island" connected to the city center by a pontoon bridge, through which citizens and tourists can reach the Lido beach and the island, which is not the case during the rest of the year. In 2005, the area we are talking about was declared an Area of Outstanding Character, when certain measures were taken to protect nature and develop tourism. Within the island there is an unpaved road that citizens and tourists can use to explore the island on foot or by bicycle, and information boards have been set up to familiarize people with the island's characteristics and the rules of conduct for staying on the island. Beyond that, there is no further investment or building of a material base for the development of tourism on the island. There are no legal facilities built on the island in line with sustainable development and nature conservation, but mostly illegal facilities that operate only during the summer season, without sanitary facilities and access to electricity and water throughout the year (Malinić, 2016). It is often heard that the tourism sector can adapt to all situations and phenomena and that it has great resilience and can recover quickly from unexpected events, which unfortunately was not the case in the fight against the global pandemic (Romagosa, 2020). The increase in economic and social progress and the rise in living standards at the global level in the years leading up to the Covid 19 virus global pandemic led to a greater awareness of tourism trends (Page & Connell, 2020). However, in recent years, the entire world was hit by a global pandemic that negatively impacted all industries. During this time, measures were taken in more than 200 countries around the world to contain and prevent the spread of infection in the form of border closures, protective equipment, and travel bans. While these measures had a positive impact on preventing the spread of infection caused by the pandemic, the negative impact was felt in activities aimed at the free movement of people, such as tourism. The World Tourism Organization (hereafter WTO) noted in its report that "international travel has never been so extremely restricted in history" (www.unwto.org). In May 2020, the WTO published a World Tourism Barometer showing the impact of the global Covid 19 virus pandemic on the tourism industry (Chart 1). Numerous scholars (Goessling, Scott & Hall, 2020) have highlighted the significant impact of the pandemic, including the transformation of tourism and hospitality, as well as the drastic changes in people's behavior during the global pandemic, and predicted a completely new and different situation after the pandemic (Choe, Kim & Choi, 2022) .

In the past three years, the authorities of all countries affected by the virus have lifted protective measures several times, and people have been advised to stay outdoors and in nature for prevention. Unable to travel to meet their tourism and recreation needs, residents of urban areas have been forced to move to protected natural areas within urban centers, such as the AEQ "Great War Island". This paper

will examine whether and to what extent the global pandemic of Covid-19 influenced the movement of people to the AEQ "Great War Island".

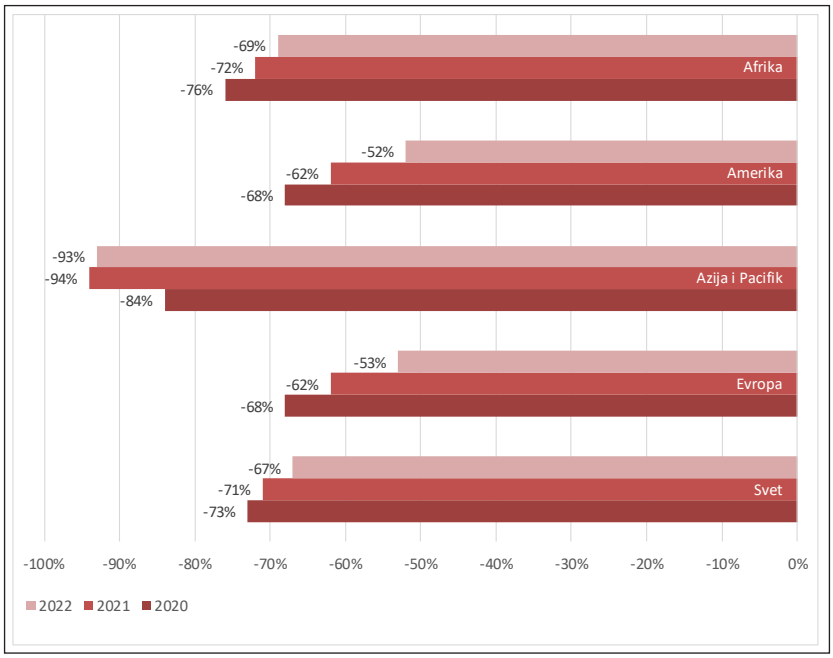

Figure 2. International tourism rate in numbers 2020-2022
Source: WTO (2022), World Turism Barometer

Literature review

In the last two years, numerous studies have been conducted around the world to address the impact of the global pandemic caused by the Covid-19 virus on tourism. Through these studies and researches conducted in different parts of the world, we can see how and to what extent the global pandemic has affected the forms of tourism and what consequences it has left in different parts of our planet.

We know that the development of mass tourism and the presence of a large number of tourists in destinations with a vulnerable natural environment is not conducive to the development of ecotourism. In line with this statement, Lecchini et al. (2021) showed in their study the impact of human activities on tourist areas in French Polynesia. They estimated that the number of fish increased significantly in the absence of tourists during the Covid 19 pandemic. Their research therefore focused on the impact of tourists on natural communities in tourist destinations and showed the negative impact of mass tourism on nature. Jovanović et al. (2021)

believe that the outbreak of the global pandemic caused by the Covid-19 virus has severely threatened the tourism sector, especially ecotourism, due to the decrease in income and employment, which are crucial for community development and wildlife conservation. They believe that the positive effects of the pandemic on ecotourism are more numerous than the negative ones, since the restriction of contact with humans and industrial activities had positive effects on the environment. However, other researchers believe that the pandemic caused by the Covid-19 virus has had a negative impact on the development of ecotourism, especially on the conservation of wildlife habitats, as incomes have decreased and unemployment has increased. Taking into account the different studies that have been carried out, dealing with the impact of the global pandemic on ecotourism and wildlife habitats, we can state that a large number of researchers have presented the negative consequences of this pandemic. Cherkaoui et al. (2020) note that ecotourism in Morocco has been severely damaged by the global pandemic. As a result of the global pandemic of the Covid 19 virus, there was a large loss of income from illegal hunting, wildlife smuggling, and deforestation in rural areas of Morocco. Local organizations that rely on ecotourism to fund projects for endangered species and critical habitats may be forced to close, according to environmental groups in Morocco, after conservation measures and travel restrictions around the world drastically reduced revenues in the country. In another study, Buckley (2021) notes that the ecological impact of reduced tourism varies by countries' level of development, as visitor numbers and environmental impacts have largely declined in developed countries. This refers to wildlife and plants in particular, although public budgets and park conservation have continuously helped endangered species to successfully reproduce. However, the pandemic caused by the Covid 19 virus has led to detrimental environmental effects such as poaching on endangered species, lower environmental costs, deforestation, and the like in developing countries where the costs of conservation are covered by revenues from tourism and nongovernmental organizations. In addition, Goretti et al. (2021) highlighted some solutions to improve the status of tourism in Asia and the Pacific during the Covid 19 pandemic, the most important of which are strengthening health systems, changing sustainable tourism models, investing in new technologies, diversifying economic investments to avoid dependence on one sector such as tourism, and the like. Vesić et al. (2021) concluded in their research on rural tourism in the tourism region of Western Serbia that although rural areas and natural environments were expected to be more visited than before the global pandemic, there was no increase in tourist movements. Their research also showed that service providers in rural areas were prepared to work in such conditions and took all possible health protection measures to ensure the safety of tourists. Vasić and Radović (2021) believe that ecotourism is a growing market within the industry and has the potential to be one of the most important means for sustainable

development. The goals of ecotourism are not only to generate economic profits, but also to preserve the environment and achieve sustainable growth and development. Although Serbia has resources, in their opinion, ecotourism is still in its infancy and is very weakly represented in the tourist offer of our country. The insufficient existence of ecotourism products and services, as well as the lack of motivation of tourism operators to create such products, are only part of the reasons for the low participation and development of the mentioned type of tourism in the Republic of Serbia. Therefore, it can be said that the pandemic of the new virus is a systemic crisis, which is a great warning to humanity that the lack of care and endangerment of the environment can put in question the survival of the entire human race. One of the few positive effects of the pandemic, perhaps the only one, is the recovery of nature after a long time.

Methods and materials

In this work, the method of analysis of the results collected on the basis of research through a questionnaire was used. The questionnaire included questions about the views of the tourist population on the development of ecotourism and the movements of people directed to the territory of the AEQ "Great War Island" during the period of the global pandemic with the Covid-19 virus. The questionnaire consisted of three groups of questions, and respondents were asked to express their views and thoughts about the movements directed at the AEQ "Great War Island", as well as about the risks to which said area may be exposed.

The first group of questions refers to the socio-demographic characteristics of the respondents themselves, and in this group the respondents provided information about themselves.

In the second group of questions, respondents were expected to select one of the five answers offered. This group of questions used a Likert scale where the respondent could indicate the extent to which they agreed or disagreed with the written statement on a linear scale of one to five. In this section, respondents were able to express their opinion on eight written statements related to the impact of the Covid 19 pandemic on tourism development in the AEQ "Great War Island" area, as well as their opinion on the risks the area may face.

The third group of questions provides us with data on respondents' habits related to movements towards the AEQ "Great War Island", as well as respondents' habits of spending time in and preserving nature. For four questions about habits, respondents had the option of choosing only one of the three answers offered in the form of "yes" or "sometimes not".

In formulating the questions and collecting data, we were guided by the basic principles of ecotourism. We mentioned in the introduction that ecotourism is an ecologically responsible trip and a visit to relatively protected areas, and accordingly there are principles that tourists and organizations must adhere to. The principles state that physical, social and psychological impacts on the environment must be minimized and that ecological and cultural awareness must be built and implemented among people and respect for the environment. Through the principles and principles on the basis of which tourism is developed, positive experiences must be offered to visitors and hosts of a given area, but also direct financial support must be provided for the preservation of the environment, as well as for the local population and the private sector. In the development of tourism and in accordance with the principles of ecotourism, it is necessary to design, build and manage facilities that have a low impact on the environment and do not threaten the natural habitats in which they are located. Ecotourism development should recognize the rights and spiritual beliefs of indigenous people and work in partnership with them to create a self-reliant community that acts in pursuit of common goals.

The survey was conducted in July and August 2022. Respondents were randomly selected and asked to answer three sets of questions, for a total of seventeen questions within the online questionnaire. In the continuation of the work, the analysis of the obtained results of this survey is presented.

Results and discussion

With the first set of questions, related to the sociodemographic characteristics of the respondents, we obtained information about the respondents' place of residence, gender, and age, as well as their level of education and employment (Tables 1 and 2). A total of 55 respondents participated in the survey.

Table 1. Sociodemographic data of respondents

Sociodemographic data		Percent of respondents (%)
Place of residence	Bavanište	5
	Beograd	66
	Ćićevac	3
	Kruševac	20
	Negotin	3
	Subotica	3
Sociodemographic data		Percent of respondents (%)
Sex	Male	26
	Female	74

Source: Auhtor's survey

From the comments received on the question about place of residence, we can conclude that respondents from different parts of Serbia participated in the survey, as well as respondents of both genders. The majority of respondents who participated in the survey indicated Belgrade as their place of residence, while the city of Kruševac was second in terms of the number of respondents. Almost three times as many respondents were female, while only 26 percent were male.

Table 2. Sociodemographic data of respondents

Sociodemographic data		Percent of respondents (%)
Age profile	Less than 20 year old	14
	21- 30	66
	31 - 40	14
	41 - 50	0
	51 - 60	6
Education profile	Primary school	0
	High school	34
	College – Higher school	20
	College – Faculty	40
	College – Postgraduate	6
Employment status	Employed	34
	Non-employed	66

Status: Author's survey

Responses to the question about the age of respondents indicate that the majority of respondents are between 21 and 30 years old, and that most of them have completed higher education, undergraduate academic studies. The respondents who have only primary education were not included in the research.

The results, based on which the respondents gave their answers in the form of a Likert scale, give us an insight into their views on the subject of the impact of the global pandemic with the Covid-19 virus on the tourist movements towards the AEQ "Great War Island".

The first observation is related to the development of ecotourism and the protection and conservation of the natural environment in urban areas (Table 3). From the responses of the respondents, it can be concluded that most of them believe that ecotourism and its development in urban areas are very important for the protection and conservation of the natural environment. The results of the responses of the surveyed population show a highly developed awareness of the importance of nature conservation and its significance for urban areas. Based on research conducted by other authors, we were able to determine the importance of protecting the natural environment and the extent to which it recovered during the global pandemic due to the absence of tourists in mass tourism destinations.

Table 3. The importance of the development of ecotourism for the protection and preservation of the natural environment in urban areas

Conclusion: The development of ecotourism is important for the protection and preservation of the natural environment in urban areas.	
I agree	0 %
Don't agree	0 %
Conclusion: The development of ecotourism is important for the protection and preservation of the natural environment in urban areas.	
I don't have opinion	0 %
I agree	11 %
I agree completely	86 %

Status: Author's survey

The following statement refers to the impact of the global pandemic caused by the Covid 19 virus on the development of ecotourism in the Belgrade region (Table 4). From the answers of the respondents who participated in the survey, we can conclude that 43 percent of the respondents have no opinion and do not think about this statement, while the rest agree with the opinion that the global pandemic of Covid-19 has affected the further development of ecotourism in the area of urban units, such as the city of Belgrade. In urban areas and large cities, the protection of natural habitats and the environment should be the main focus in the organization and planning of tourism.

Table 4. The impact of the global pandemic caused by the Covid-19 virus on the development of ecotourism in the area of Belgrade

Conclusion: The global pandemic of COVID-19 has greatly affected the development of ecotourism in the area of Belgrade.	
I disagree at all	0%
I disagree	0%
I don't have opinion	43%
I agree	23%
I agree completely	34%

Status: Author's survey

The third statement concerns the development of ecotourism in the AEQ "Great War Island" before the Covid 19 pandemic (Table 5). From the respondents' answers to this statement, it can be concluded that not all respondents think in the same or similar way as the previous two statements. Most of the respondents have no opinion on this statement, while 20% of the respondents do not think that ecotourism has been developed enough in the area. The problem with this statement

and the reason why 60% of respondents have no opinion on this statement is the lack of information about tourism in the Belgrade region, as well as the insufficient promotion of such areas in the city area. Besides the reasons mentioned above, the biggest problem with these results, as we have already noted, is that tourism in the area was not sufficiently developed even before the global pandemic. As we could see from the research of other authors, ecotourism was already developing in most countries before the global pandemic and had both positive and negative impacts on it. The basis for ecotourism development, the natural environment and wildlife habitats in some destinations, recovered during the pandemic due to the reduced number of tourists, but the further development of ecotourism was halted due to the economic losses caused by the pandemic.

Table 5. Development of ecotourism in the area of AEQ "Great War Island" before the Covid-19 pandemic

Conclusion: Ecotourism, as a form of tourism in the AEQ "Great War Island" area, was sufficiently developed before the global pandemic of COVID-19.	
I disagree at all	6%
I disagree	14%
I don't have opinion	60%
I agree	9%
I agree completely	11%

Status: Author's survey

The following statement relates to opinions about the extent to which the global pandemic caused by the Covid 19 virus has slowed further development of all forms of tourism in the Great War Island area (Table 6). From the responses of respondents to this statement, we can conclude that most of them agree that the global pandemic has had a very negative impact on the development of tourism in the last three years. Regarding the Great War Island, we have already mentioned that even before the global pandemic there was no material basis for the development of ecotourism, except for a well-developed pedestrian and bicycle path and a pontoon bridge used exclusively in the summer season. In this area, there were and are no legally established facilities, information desks for tourists or various organized tours, neither before the global pandemic nor today. We can say that the global pandemic has slowed down the development of ecotourism on the AEQ "Great War Island". This is mainly reflected in the economic resources required to invest in this type of tourism in a given area, as was the case in other destinations in the world, where the development of ecotourism is still in its infancy.

Table 6. The impact of the global pandemic caused by the Covid-19 virus on the further development of all forms of tourism

Conclusion: The global pandemic of COVID-19 has slowed down the further development of all forms of tourism in the area of AEQ "Great War Island".	
I disagree at all	3%
I disagree	3%
I don't have opinion	26%
I agree	42%
I agree completely	26%

Status: Author's survey

The fifth result of this group of questions refers to the importance of the AEQ "Great War Island" for the development of bathing and recreational tourism in the area of the City of Belgrade (Table 7). Respondents gave their opinion on how important the AEQ "Great War Island", which includes Lido Beach, is for the development of other forms of tourism in the area of the City of Belgrade. Most of the respondents agree that the two mentioned areas are very important for the development of beach and leisure tourism in this area of the city. From the previous sentence, it can also be concluded that regular maintenance and preservation of the natural environment in these areas is very important for further successful development and other forms of tourism. Considering the fact that a large number of respondents live in Belgrade, we cannot say that they visit these areas in the context of bathing or recreational tourism, but rather for swimming or to spend their free time in nature.

Table 7. Importance of AEQ "Great War Island" in the development of bathing and recreational tourism

Conclusion: AEQ "Great War Island" and Lido beach are important areas for the development of bathing and recreational tourism in the area of Belgrade.	
I disagree at all	0%
I disagree	3%
I don't have opinion	3%
I agree	34%
I agree completely	60%

Status: Author's survey

The next statement from this group of questions was about the risks faced by the development of ecotourism in the area of the AEQ "Great War Island" in addition to the pandemic caused by the Covid 19 virus (Table 8). In the previous statement, we saw that the majority of respondents believe that this area is very important for the development of bathing and recreational tourism, as well as it is

an area that Belgraders visit during the summer season, but we were interested in whether these forms of tourism could pose a risk to the development of ecotourism. in protected areas. The opinion of the respondents on this statement is divided and most of them have no opinion on this issue or joins the position that other forms of tourism may pose a threat to the development of ecotourism in the area. Accordingly, we have concluded that the development of other forms of tourism in areas where ecotourism is also developing at the same time may pose a risk if they are not developed in accordance with the principles and ideas of conservation of nature and the environment. The researches of other authors in the chapter "Literature Review" have shown that mass tourism, as well as tourism that is not in accordance with the principles of ecotourism and sustainable development, can greatly affect the natural environment and destroy it through its actions. We observe that the natural environment and biodiversity recovered during and after the global pandemic because such areas were less visited. This shows us the extent to which mass tourism and unscrupulous tourists can affect the natural environment and irrevocably destroy it through their actions.

Table 8. Risks faced by the development of ecotourism in the AEQ "Great War Island" area

Conclusion: In addition to the COVID-19 pandemic, the growing development of bathing and recreational tourism is also a risk for the development of ecotourism in the area of AEQ "Veliko ratno ostrvo".	
I disagree at all	3%
I disagree	9%
I don't have opinion	31%
I agree	26%
I agree completely	31%

Status: Author's survey

In the seventh statement, the respondents were asked about their attitude to the way and conditions for the development of other forms of tourism in the area of the AEQ "Great War Island" in relation to the principles and ideas for the development of ecotourism in the same area (Table 9). In the previous statement, we concluded that other forms of tourism may pose a risk if the ideas and principles followed by ecotourism are not taken into account in planning. Based on the responses to this statement, we can see that the majority of respondents agree with the view that other forms of tourism must be developed in connection with the development of ecotourism. Therefore, we can conclude that in such protected areas, the preservation of the natural environment is a priority in the planning and development of tourism.

Table 9. Ways and conditions of development of other forms of tourism in the area of AEQ "Great War Island"

Conclusion: Other types of tourism in the area of the AEQ "Great War Island" should be developed in accordance with the principles of eco-tourism.	
I disagree at all	0%
I disagree	3%
I don't have opinion	8%
I agree	20%
I agree completely	69%

Status: Author's survey

The last statement from this set of questions and the answers to it confirm our previous opinion that other forms of tourism must develop in connection with the development of ecotourism (Table 10). The majority of respondents affirmed the statement that other forms of tourism should be developed in the area of the AEQ "Great War Island" in accordance with the principles of ecotourism. In the further recovery from the pandemic caused by the Covid-19 virus, as well as in the planning and development of tourism in this area in Belgrade, all sectors should take into account these results, so that other forms of tourism develop sufficiently and do not have a negative impact on the development of ecotourism in the area of the AEQ "Great War Island". In this way, the authenticity and diversity of the space, as well as the quality of time spent with each type of tourism included in the tourist offer of the place, will be ensured.

Table 10. Method of development of other forms of tourism in the area of AEQ "Veliko ratno ostrvo"

Conclusion: Ecotourism should have an advantage in the development of the urban area compared to other forms of tourism in the form of preservation of the natural environment.	
I disagree at all	3%
I disagree	3%
I don't have opinion	3%
I agree	20%
I agree completely	71%

Status: Author's survey

The last group of questions of the questionnaire refers to the habits of the respondents themselves. Through four questions from this group we obtained information about their stay in nature, but also about their movements towards the AEQ "Great War Island" (Table 11). The first question was related to the

respondents' habit of spending time in nature. From the answers, it appears that half of the respondents usually spend their free time in nature, while the other half sometimes do so. From the research conducted by Vesić et al. (2021), we can see that the number of visitors to rural, natural environments was not higher than before the global pandemic. Thus, we can conclude that the global pandemic, as well as the recommendation to spend time in nature and outdoors during these years, did not significantly change the profile of tourists visiting natural, rural environments, but that they were tourists who practiced this type of tourism even before the global pandemic. .

Table 11. Habits of respondents regarding spending leisure time in nature

Question: Do you have a habit of spending your free time in nature?	
Yes	52%
No	0%
Sometimes	48%

Status: Author's survey

The second question refers to the visit and movements to the Lido beach in the area of the AEQ "Great War Island" as part of bathing tourism (Table 12). Half of the respondents indicated that they do not visit the Lido beach and do not practice bathing tourism in this area. These data are consistent with what we have already noted in the introduction of this paper. The insufficient material base for the development of any kind of tourism, the pronounced seasonality and the lack of organized tours lead to the fact that this area is very little visited.

Table 12. Visit to Lido beach on AEQ "Great War Island" as part of bathing tourism

Question: Do you visit Lido beach and AEQ "Great War Island" for swimming?	
Yes	14%
No	52%
Sometimes	34%

Status: Author's survey

The next question from this set of questions follows on from the previous one. Respondents were asked to answer whether they visited the beach Lido on AEQ "Great War Island" to a lesser extent during the pandemic caused by the Covid-19 virus. Since the majority of respondents did not have the habit of visiting this area before the Covid-19 pandemic, it can be expected that they did not have such a need during the pandemic either. On the territory of the City of Belgrade there are several other areas where bathing and recreational tourism is more developed compared to the AEQ "Great War Island" (e.g. Ada Ciganlija, Avala, etc.). It is assumed that the

reason for this result is the insufficient presentation of this area in the promotional materials for tourism in the city of Belgrade, as well as a better and more diverse tourist offer of other attractions.

Table 13. Visit to the Lido beaches on the AEQ "Great War Island"

Question: During the COVID-19 pandemic, did you visit the Lido beach and AEQ "Great War Island" to a lesser extent for swimming?	
Yes	34%
No	55%
Sometimes	11%

Status: Author's survey

The last question of the questionnaire refers to compliance with the rules and principles of ecotourism in the area of the AEQ "Great War Island". Respondents were expected to give an answer related to their habits of staying on the AEQ "Great War Island", as well as compliance with the rules that constitute ecotourism. The majority of respondents answered this question in the affirmative, which leads us to the conclusion that they respect or would respect the rules and principles of ecotourism during their stay in the AEQ "Great War Island". This information should be taken into account in the further development of ecotourism in protected urban areas, as it shows the awareness of the population about the natural environment and its importance in urban centers, which would have a positive impact on its preservation in the development of other types of tourism.

Table 14. Respect for the rules and principles of ecotourism in the AEQ "Great War Island"

Question: Do you respect the rules and principles of ecotourism in accordance with the preservation of the natural environment in the area of AEQ "Great War Island"?	
Yes	94%
Neo	3%
Sometimes	3%

Status: Author's survey

Conclusion

Tourism as an activity is a very important part of the development and progress of any country. In order for tourism to have a positive impact, especially in economic terms, it must be carefully and strategically planned, guided by the principles it represents and, above all, it must not endanger nature and the environment.

We observe an increasing destruction of the natural environment through the construction of illegal gastronomic establishments in areas that can offer pristine nature, preserved ecosystems or protected species. By degrading and exploiting these areas in this way, we can only achieve short-term results and irrevocably destroy the natural environment. Ecotourism, with its ideas and principles, protects protected areas by putting nature and people first. The development of ecotourism in the area of the AEQ "Great War Island" was very weak until 2020. In most cases, visitors to the island stayed in the area to swim at Lido Beach, while only a very small number visited the AEQ "Great War Island" to participate in the development of ecotourism. Most of the visits to the nature reserve are of a research nature or are collective scientific visits in the form of one-day excursions. One of the main reasons for this result is the very low number of propaganda materials, as well as the low participation in the promotion of these areas. However, the pandemic caused by the Covid-19 virus stopped the development of all forms of tourism for some time. When the restrictions on movement were lifted as a protective measure by the state, residents of the city of Belgrade were advised to spend time outdoors and in nature to prevent the spread of the infection. In this situation, ecotourism in the area of AEQ "Great War Island" was able to develop further, while other places in Belgrade continued and supplemented their tourist offer adapted to the new situation. This year, at the beginning of the summer season, a pontoon bridge was installed connecting AEQ "Great War Island" with the city center, making it easier for visitors to cross the Danube and access the Lido beach. In addition to the pontoon bridge, this year the Zemun Municipality Tourism Organization organized free walking tours to the AEQ "Great War Island", which attracted visitors to see the nature in this area and actively participate in the development of ecotourism. Unfortunately, the scale of these visits was not even close to what it could be when it comes to the AEQ "Great War Island".

The conclusion and answer to the question whether and to what extent the pandemic caused by the Covid-19 virus has influenced the development of ecotourism in the area of the AEQ "Great War Island" is not easy. There is no doubt that the global pandemic had an impact not only on the development of ecotourism, but also on other types of tourism practiced in the area in the years before the situation. However, based on the questionnaire and the responses of the interviewees, we got the impression and concluded that the development of ecotourism in this area in the last three years was not only and exclusively affected by the pandemic caused by the Covid 19 virus. Insufficient involvement of scientific staff, lack of strategic planning and respect for the ideas and principles of ecotourism, low number of organized events and propaganda materials, and lack of material base on this island in Belgrade lead to poorly developed tourism and too few visitors throughout the year.

The AEQ "Great War Island" has a number of features that are crucial for planning tourism in such protected areas. With good organization and strategically planned approach in such protected areas, different types of tourism can be developed without endangering each other.

As mentioned earlier, the global pandemic has had a negative impact on tourism, leading to a decrease in the number of tourists and trips, as well as economic revenues. In addition, the virus has impacted the environment, resulting in less monitoring by environmental organizations during the pandemic and creating more opportunities for illegal hunting and logging in areas where ecotourism is developing. However, not all of the effects of this pandemic were negative; there were also a number of positive effects on the environment, as fewer tourists were in vacation areas during the pandemic and nature that had been destroyed by tourists could be restored.

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WAR - THE NEW (IN)NORMALITY AND DARK TOURISM

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Abstract: In the introductory part of the paper, in the context of the new present, a brief overview of the direct impact of the war in Ukraine on tourism of both parties to the conflict is given, which once again empirically confirms that war is the antithesis of tourism and is capable of completely destroying it, as well as everything else that gets in its way. It also looks at some of the basic factors behind the slowdown and disruption of tourism development in the context of the general geopolitical situation and the global "clash of civilizations," as well as possible short- and long-term scenarios in Europe and the world. However, the focus of the analysis is not the war in Ukraine per se, but rather an attempt to test the provocative thesis that "war and tourism have certain similarities and interpenetrate each other." Indeed, if one thinks deeper and broader, beyond the usual theoretical frameworks and well-trodden empirical paths, certain analogies can be identified, as well as market niches for which war in particular is a key tourist attraction. With this in mind, the following arguments are analyzed in turn in support of this arguable thesis: mobility of tourists and soldiers; interruption of the usual path and rhythm of everyday life; intrusion of surprise, unpredictability and improvisation into life; "conquest" of new territories; war as total adventure; killing and destruction without end; fascination with foreign and own death; the heaviest form of dark tourist spectacle; motives of visitors, observers, and volunteers; morbid curiosity, madness, and pathological desire to kill; patriotic, masculine-erotic self-affirmation; and the intensity of danger in war zones.

Keywords: war, dark tourism, motives, consequences

Introduction

In the context of considering the "new present of global tourism" in the next decade, the war in Ukraine suddenly appeared as the main issue, along with global warming and drought, as an abnormal historical event with long-term negative

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effects. The causes and goals of the conflict are still not entirely clear. One of the possible explanations is that it is a "clash of civilizations" (Huntington, 2000), but this theory falls short in this particular case, since Russia and Ukraine belong to the same civilizational and racial corpus. Another theory, according to which there are cyclical periods when a dominant world power in decline (the U.S.) wants to suppress other emerging great powers (China and Russia), seems more likely. Then the conditions are in place to start a war to change the world order and establish its own dominance. In this sense, Harari (2009) assumes that as soon as states consider war inevitable, they reinforce the army, enter into an increasingly rapid arms race, reject compromise in any conflict, and suspect gestures of goodwill as traps. The outbreak of war is thus guaranteed. In this case, Russia fired the first shot because it has long been arming and preparing for war, waiting for the right time and place. However, in the absence of a universal ideology (such as communism), according to Harari, Russia propagates its own civilization, conservatism, nationalism, traditional values, and superior moral order as a universal counter to the liberal, permissive, and "decadent" West. A number of similarly authoritarian states rally around this ideology. Ukraine, a large country of 44 million people, was targeted because, in Moscow's view, it did not want to be included in the circle of these countries, but was too close to the European Union and the NATO pact, so it was declared a Nazi state and a potential threat. Therefore, a preemptive war, i.e., a "special operation," was launched with the aim of allegedly "denazifying" a sovereign country, replacing its legitimate government, and annexing large parts of the east of the country. Given that the entire West has sided with Ukraine economically, politically, and militarily, the duration of the war, its cost, and its outcome are uncertain.

However, the focus of the analysis here is not on the causes of the war, but on its consequences for tourism. Therefore, it is necessary to examine the impact of the war in Ukraine on tourism movements within Europe and beyond. Given the catastrophic impact of any war on tourism, it is necessary to provide a brief overview of the short- and long-term impact of the war in Ukraine on tourism movements in relation to the immediate belligerents, Europe, and the rest of the world: Russia is among the top ten producers of global tourism demand, with tourism-related foreign exchange outflows of about $14 billion. Due to the flight ban, direct access to European airports is already impossible (with the exception of Belgrade and Istanbul). If the announced complete ban on Russian tourists entering Europe comes into effect, it will lead to a significant drop in tourism revenues in many European countries, as well as a detour of these flows to other destinations. However, the number of Russian tourists and revenues in some of their favorite destinations such as Cuba, Indonesia, Thailand, Turkey, Maldives, Seychelles, Mexico, Sri Lanka, Egypt, Syria, Tunisia, Cyprus, Greece, etc. have already decreased significantly. The flow

of foreign tourists to Russia has decreased drastically and will continue to decrease as long as the war continues. Tourists from Ukraine have almost disappeared from the map of international tourism, turning overnight into millions of unfortunate refugees (mostly women and children) seeking asylum in Poland and Western countries. Cases have been reported of a few Ukrainian tourists verbally clashing with Russian tourists at certain destinations. Due to the state of war, general danger and destruction of cities and civilian buildings, welcoming tourism in Ukraine has almost completely disappeared, with the exception of so-called high-level "political tourism" when representatives of some Western countries and the UN come to Kyiv, Lviv and Odesa to provide moral and material support to Ukraine in the struggle to liberate the occupied territories. After the war, Ukraine is likely to become an attractive destination for tourists from the West and other countries. The fans of "dark tourism" who want to see all the destroyed and ruined cities and buildings (Mariupol, Kramatorsk, Nikolaev) will probably appear first. They will soon be followed by the mass tourists who want to see the preserved cities (Odesa, Lviv and Kiev), which they have reported daily in the mass media, as well as other natural and created attractions. Europe is also indirectly affected, because due to the fear of war and the relative proximity of Ukraine in the minds of potential tourists, as well as the large number of refugees in the countries of Eastern and Central Europe, the number of tourists from Western European countries, the United States, as well as from the rest of the world has decreased significantly, especially in Poland, the Czech Republic, Slovakia, Hungary, Romania, Lithuania, Latvia and Estonia. . Finally, this war has worldwide economic, political, and even tourist consequences. Already, the restrictions imposed on Russian airlines and the ban on overflights of European airspace, as well as Russian retaliatory measures, are having a negative impact on global air traffic, lengthening flight times, and increasing ticket prices. Higher fuel prices will further increase the cost of air travel. This will deal a severe blow to traveler confidence and affect disposable travel budgets (discretionary income), which will impact the gradual decline in demand. Given the many unknowns, it is difficult at this point to predict all the possible negative consequences for global tourism. If the war continues (in conjunction with global warming, drying up of rivers and lakes, spread of new mutations of mad cow disease and various other epidemics), the whole world and even the most developed Western countries may be plunged into a deeper and deeper environmental and economic crisis (inflation, Recession), which will inevitably lead to social upheaval and general political instability, both in the world and in underdeveloped countries, which may be on the verge of famine and the outbreak of mass uprisings. In this context, tourism will certainly not be a priority for the impoverished population, so it can be said that the medium- and long-term prospects for the development of global tourism are very unfavorable, unless there is a quick end to the war in Ukraine, the withdrawal of Russian troops from the

occupied territories and the conclusion of a stable peace agreement, the restoration of economic, transport and political relations between the West and Russia, which is unlikely from today's point of view. Some analysts even do not rule out a long-term simmering "Third World War" without the use of nuclear weapons, in which tourism will coexist geographically asymmetrically and temporally in parallel, adapt to the situation, become a nuisance, or die out altogether in certain countries.

Similarities and interpenetration of war and tourism

War and tourism seem to be incompatible phenomena. It is not easy to see the connection between destruction, violence, mass killings of soldiers and civilians, and war crimes and recreational and hedonistic activities when travelling to foreign countries. In fact, common sense and experience suggest that these two phenomena are strictly separated, that is, that modern mass tourism strictly avoids zones of violence in order to ensure maximum safety and satisfaction in the places where visitors spend their vacations. Theoretically and practically, therefore, tourism and war appear as opposing categories, they represent the antithesis of each other, where tourism does not threaten the development of war, but war prevents the very existence of tourism in conflict zones. Tourists want to enjoy safety and comfort and avoid exposing themselves to danger and risking their lives in war zones. Warriors go to war for ideological, national or religious motives and do not think of engaging in tourism.

But just as nothing in life is black or white, just as every ying contains a grain of yang and vice versa, so too it can be said that the relationship between tourism and war, both in theory and in practice, is not so clear-cut and firm. In this context, the astute observation of Bora Ćosić (1970), who linked tourism, adventure, and war, is very relevant: "Both war and vacation prohibit the habitual, well-rehearsed way of life and, in return, offer many surprises, irregularities, and improvisations. War and vacation cooperate fully with the inversions of all forms of existence, which are hardly recognizable in vacation or war. Not only do you no longer go to school or work on a fixed schedule, but the other rhythms of life generally change. It is common to say that one is going away (to war, on vacation), which gives the impression that one is going into a new, extraordinary space that is meant for the occasion. There, as in a reserve, having left (ordinary) life or, more precisely, having stepped out of it, we get the opportunity to express all our essayistic abilities, breaking through a particular way of existence that is not guaranteed by anything: while in war we cannot be sure not only how the battle will turn out, but not even whether we will survive it, in vacation no one can provide us with a plan and a strict scheme of our schedule (and this is our intention). Released from the capital integrity

of everyday life, we find ourselves here, in both cases, in a radically new situation which, even at the price of the greatest dangers (trench warfare on the one hand or breakneck alpinist excursion on the other), preserves the general tone and freedom of a Sunday afternoon. This circumstance of liberation from life at the expense of an almost artificially created situation explains the young men's unrestrained entry into the war as a kind of exciting and dangerous journey, which cannot always and only be explained by the degree of their social consciousness and patriotic courage. Vacation - War thus becomes a kind of blank space, a blank page, a notebook without rows and columns, where any initiative and invention is possible. Vacation - War betrays the social timetable only in the outlines of a planned disorder, within which I can exhaust all forms of my improvised, essayistic behavior, for the sake of such a one. Personalities with a special tendency to an indeterminate and in many ways creative attitude to reality, with an aversion to a strictly predetermined and planned future, showing during war leave an abundance of new, witty and capital creative solutions, survive on their return to the established schedule (peacetime situations and established work activities) something like a personal defect, the lack of ability to cope even in conditions surmountable even for the most average people."

Taking the above into account, a whole series of common features of war and tourism can be identified. First and foremost is mobility, for both tourists and warriors travel somewhere, leave their homes, and intend to return, only in the case of the latter this is much less likely. Tourists, by definition, travel to see landscapes, nature, cultural and historical heritage, but also to pursue various activities such as swimming, skiing, sightseeing, shopping or sex. In contrast, the mission of soldiers is to conquer territories, kill enemy soldiers, destroy nature, cultural and historical heritage, infrastructure, industry and cities along the way. The conquering soldiers, riding on their tanks, in combat vehicles or trucks, have the opportunity to see something of the beauty of a foreign country on the way, they see half-destroyed churches, palaces, museums, galleries, opera houses, as well as ordinary homes, and occasionally they have the opportunity to stop somewhere, have something to eat or drink, or look at an intact monumental building, an ancient temple, cathedral or monastery. All of this, in a sense, puts them in the position of observers who, like tourists, view the landscape before them, whole or destroyed. Moreover, according to Ćosić, war and tourism interrupt the usual everyday life, the rhythms of life generally change, and life is full of surprises, unpredictability and improvisation.

War as total adventure - killing and destroying without end

War can be considered a special form of "adventure travel." In a sense, it is a continuation of "hunting tourism," however, in this case, the hunter-warrior

receives "permission" from society "to kill" other people, i.e., those who are designated as enemies. In this sense, Washburn and Lankester (1968) are quite clear: "Until recently, war was equated with hunting" Other people were simply the most dangerous prey. War has been of too great importance in human history to have been anything but a pleasure to the men who engaged in it. Only in recent times, with all the changes in the nature and conditions of war, has war been questioned as a normal part of national politics or as a recognised path to social glory" In this context, Freud (2001) believes that:

"Towards the death of another, a stranger and an enemy, we adopt radically different attitudes than to our own death: The death of another suit us...The original man was a passionate creature, more ferocious and malignant than many other animals. He loved to kill as if it were in the nature of things. There is no instinctive aversion to bloodshed in us: We are the descendants of an endless line of murderers. The lust for murder is in our blood, and we may soon discover it elsewhere. In our unconsciously today we are still a gang of murderers. In our secret thoughts we eliminate everyone who stands in our way, anyone who has offended or hurt us. The softened cry of "Damn him!" which so often escapes our lips, and which, actually means "Let death take him!", to our unconscious it is extremely serious. Yes, our unconscious kills even for trifles. It is very fortunate that all these evil desires have no power. Otherwise mankind would have perished long ago; neither the best nor the wisest men and the loveliest and most virtuous women would no longer exist. No, let's not fool ourselves anymore, we are still murderers, just like our ancestors were in the original community"...

War frees us from all cultural strata and makes the original man reappear among them, it forces us again to let ourselves be made heroes who do not believe in our own death, it marks our enemies as strangers (Russian propaganda discourse on the alleged "denazification of Ukraine") whose death must be brought about or wished for, and advises us to put our loved ones on the other side of death. He thus renders our entire cultural attitude toward death untenable." Numerous wars, cruel tortures, mass and individual murders across human history confirm Freud's position.

Playing with the death of others and one's own

War is a dangerous gamble, a game with high stakes and risks. Kayoa (1979) also writes about this within the framework of "game theory" applied to society and history. The author believes that unlike the complementary pair agon - alea, which prevails in modern civilised societies, there is always a danger that the repressed regressive principles of mimicry - ilinx will emerge at a certain moment, especially

in times of war. Although they are suppressed in modern society, they will probably never be finally annihilated in man. Since they are constantly present in the dark areas of the human subconscious, they represent the human monster that can be released at any moment. In normal times, as Kayoa points out, they only appear to be cooled down, domesticated, as evidenced by the abundance of various phenomena that are subdued and harmless. And yet their driving force remains strong enough to whip the crowd into a monstrous frenzy at any moment. History provides us with many such strange and terrifying examples, from the Crusades to the Nazi crimes of the Third Reich and the Stalinist purges to the monstrous public executions in the Islamic State or the bombing of civilians in Ukraine. All this points to the possibility of a complete reversal of the prevailing system of values and moral principles, their negation and temporary abolition. A civilizational order, which was thought to be the only possible one, is replaced by a completely different, inverted order, which can be called anti-civilizational. It can also function "normally" for a long time and be accepted by the majority of the manipulated masses, such as fascism, Nazism and Stalinism, but also numerous other populist and authoritarian systems based on the cult of personality.

The heaviest form of dark tourism

War tourism has boomed in Western countries in the last decade. It is attracting increasing numbers of curious adventurers and wealthy travelers to areas where armed conflicts are being fought. Against this backdrop, war tourism can be placed within the broader category of adventure tourism, which includes individual and organized travel (package arrangements) to war zones and countries where political crises and armed conflicts are taking place. This is also, as Brones (2014) suggests, specifically "dark tourism." Travel to war zones and other areas associated with death has become so common that efforts to study the phenomenon academically have been institutionalized (The Dark Tourism Institute). A team of experts has launched a five-year project to study the impact of war tourism on cultural attractions around the world. This type of tourism does not only refer to war zones, as "modern dark tourism" is also associated with places where suffering and death once occurred. For tourists, these places were later turned into memorials such as battlefields, camps, dungeons, prisons, cemeteries, etc. Although the exact number of these tourists cannot be determined, it can be stated that adventure tourism in a broader sense, which includes travel to politically unstable and conflict-ridden areas, is experiencing strong growth. Over the past decade, there have been an increasing number of specialized travel agencies catering to the needs of the market segment looking for exciting and risky trips to dangerous parts of the world. For example,

in 2010, tourist trips to Baghdad cost up to $40,000, and in 2014 there was also a significant increase in war tourism to Israel, Syria, Iraq (at a cost of $3,500 to $20,000 for a trip of 5 to 14 days) and Ukraine (priced from £50 to £400). For most people, it seems absurd and illogical to associate the aforementioned active war zones with the concept of tourism and vacation, as a combination of the incompatible, i.e., a morally unacceptable activity that trivializes human tragedy and reduces it to an entertaining spectacle. In this context, the aforementioned morbid voyeurism of certain groups of tourists who take selfies, photos of destroyed buildings and houses, columns of refugees, wounded or corpses, is particularly critical. Images have already appeared in various media of Israeli tourists making themselves comfortable on plastic chairs and watching the bombardment of Gaza from afar like a theatrical performance, often taking photos with their cell phones.

In this context, certain forms of tourism, such as "crisis tourism," can offer interested visitors a glimpse of the ruins (half-destroyed buildings from the civil war in Beirut are tourist attractions), i.e. they can even make it possible to witness the destruction of war on the spot, to observe how districts and cities are turned into ruins (the destruction of Grozny in Chechnya or Aleppo in Syria, Mariupol or the Azov Steelworks in Ukraine), which few people are interested in for understandable reasons. After the end of the destruction of war and the removal of the immediate danger, there remain numerous "fresh ruins" that attract certain categories of tourists (the appeal of "ruin esthetics"). However, since ruins do not last forever because they are cleared, reconstructed, or new buildings are erected in their place as part of the reconstruction process, tourists crowd to visit the destroyed sites before they are rebuilt. The famous Point Zero - the site in New York where the "twin towers," i.e., the World Trade Center (WTC), collapsed in a terrorist attack - was a major temporary tourist attraction until the ruins were cleared to make way for the Memorial Center and new buildings nearby. However, there are also places where certain objects are left in a half-destroyed state as a kind of memorial and tribute to the victims, i.e., as a reminder of the war so that such a thing never happens again. Chernobyl has also become a major tourist attraction in Ukraine, the popularity of which has been boosted by the HBO-produced television series of the same name. Chernobyl is a prime example of "dark tourism," where visitors can see destroyed and abandoned buildings on the territory of an entire city, the surrounding irradiated nature, and the actual core of the accident - a nuclear power plant buried in a concrete sarcophagus. Finally, there are some "fresh" ruins left in Belgrade after the bombing of NATO in 1999. Some buildings have already been rebuilt or demolished, while two large General Staff buildings remain in a ruinous state, as they were immediately after the bombing. These half-destroyed buildings are visited by foreign tourists coming to Belgrade: "Admittedly, it also happens that tourists visit for a few days on their

way to Western European countries. Often, though not necessarily organized and accompanied by a guide, they visit the relics of the bombing and even call a cab to take them directly from the hotel to the destroyed buildings" ("Politika," August 6, 2004). In this sense, Belgrade may be attractive as the only capital in Europe that was bombed after World War II. A propaganda slogan could be "Visit the ruins of Belgrade before they are gone" In this sense, perhaps some of the buildings should be left in a semi-destroyed state, as the cities mentioned above have done. This would constitute a permanent reminder of the bombing, a dramatic memorial to the victims, but also a special "dark tourist attraction".

Motives of the visitors and observers

Critics wonder why people behave this way. Why do some tourists want to spend their vacations in dangerous areas with armed conflicts? To most "normal people" this behaviour seems "sick," "twisted," and "immoral." Therefore, the question arises about the hidden psychological causes, i.e. the inner motives of people who decide to go on such risky trips. There are various answers to this, such as.: pure curiosity, pathological voyeurism; the desire to see war with one's own eyes, first hand, and not through the media; the desire to communicate with people involved in conflict; the desire to experience war personally; Self-affirmation and social validation (posting photos, clips, and war anecdotes on social media for all friends and acquaintances to see); a dark game with death; escaping the monotony of everyday life and seeking adventure and excitement; collecting war memorabilia and souvenirs, etc.

Since ancient times, people have attached epic significance to wars as "major events in collective and individual history." Conflicts changed borders and played an important role in (re)shaping numerous countries and changing national culture through cross-cultural contact (forced acculturation). Wars are firmly linked to collective psychology as factors shaping history and mythology, and represent deeply rooted symbols in various cultures that serve as important tools for the construction of social identity. War is also an important "time marker," so that populations often divide history into periods "before," "during," or "after" the war. Moreover, identifying individual motives and demystifying such activities can help illuminate the psychological aspects of this type of tourism. Occasional accounts of the adventures of war tourists usually point to voyeuristic motives and morbid curiosity about thrills. Foley and Lennon examined the phenomenon of travellers being attracted to regions and places where "inhumane events" take place. They believe the motives are fueled by media coverage of armed conflict and people's desire to see with their own eyes, photograph, and experience war events in person.

There is also a symbiosis between attractions and visitors, whether in death camps, places where celebrities have died or been buried, or in war zones where conflicts are being fought.

Despite the tragic consequences of the great world wars and numerous national, regional, and local armed conflicts, there are still people who are fascinated by wars and weapons of mass destruction. However, since today we live in a "consumer society" where everything is commercialized, even war events are turned into commodities (market for specific services) that are sold with a reasonable price to interested market segments and niches. Considering that armed conflicts are constantly taking place somewhere in the world, it is clear that the supply does not lack a corresponding range of products that can satisfy the growing demand. Wars, of course, have a negative impact on general tourism, but at the same time they promote "war tourism", which includes nationalistic, emotional, military, political and religious dimensions. Travel agencies that organize trips to war zones, as well as tourists who participate in such trips, are often criticized by the media, which accuse them of engaging in ethically highly unacceptable activities. The moral condemnation of this practice refers to the fact that tourists spend large financial resources to travel to war zones with the aim of observing and photographing the suffering of the local population. This is a kind of morbid voyeurism that ultimately aims to take one's own pictures in the war zone and post them on Facebook, Twitter or Instagram, as well as to describe one's own experiences and war situations in order to achieve a certain form of public self-affirmation, i.e. recognition and admiration by friends, acquaintances and followers on social networks.

Motives of war volunteers

In the study of "dark tourism," warriors whose motives are unrelated to any religion or ideology have gone relatively unnoticed. Their motives are purely personal and related to the need to satisfy aggressive urges that are socially unacceptable at home, including the desire to kill other people. In this sense, Lesle (2000) poses the question, "Do volunteers go to war solely to fight for their ideals or beliefs in foreign lands, or do they have a desire to have an adventure?" The author believes that this second assertion may seem "ridiculous or even insulting," but that there is nonetheless a strange connection between war and tourism. Considering the growing popularity of war tourism, it is obvious that there is a "secret connection" between these two opposing phenomena, especially when it comes to war volunteers who come to war zones from all over the world. There is no doubt that most of these people come for certain political, patriotic, ideological or religious reasons. But are there other, hidden and less moral motivations? One of the possible reasons to go

to war is the desire for adventure, which is constantly promoted by the mass media. Research has shown that excessive media exposure to war photos and videos, war and documentary films, reports, daily news, video games, and the like desensitizes (numbs) people to violence. Moreover, now more than ever, war has become an exciting media spectacle that captures the public's attention. Faced with such scenes, some people can no longer remain seated in their comfortable armchairs and sofas, but want to be on the scene themselves, to become personally involved in the war, either as observers or as participants. In this way, they feel they are participating directly in the most important world events, living a more intense and exciting life than their compatriots sitting at home in their slippers. This longing is especially present among young people on the fringes of society who live a monotonous, sedentary life in the suburbs of Western metropolises. They are bored at home, they do not have a job, they do not find meaning and their own identity in daily life. They also do not have sufficient financial resources for expensive travel and tourist arrangements to remote and exotic destinations, nor the ability to pay for organized tourist trips to war zones. Against this background, it can be assumed, and there is certain empirical evidence, that a certain number of young people use an ideology, religion, or other "socially acceptable reason" to disguise their true motives, which are curiosity and the desire for extreme adventure to satisfy some of their dark, long-suppressed intimate needs (desire for violence, killing, rape, robbery) that are acceptable and desirable in war. It is true, says Čolović (1994), that a normal person can participate in war atrocities only if other members of his community decide to do so and encourage each other. But everyone participates of his own accord. Everyone has an unconscious subjective motivation to do so. This is indicated by some real-world cases. Bennett (2013), for example, lists several cases, of which I pick out one that is most telling.

It is about a group of American teenagers who, inspired by media reports, travelled to Syria in search of an adventure. They wanted to personally experience this war, which involves extreme jihadists, foreign volunteers, an army loyal to the Assad regime, soldiers from various allied countries, numerous journalists, reporters, photographers, and so on. The motive was also the desire to prove to themselves and others that they are able to enter and get out of the vortex of war, only on the way they mentioned humanitarian reasons related to helping the local population. By the way, one of the young men, who comes from a Catholic family, converted to Islam on the second day of his stay in Syria. They also wanted to fight and shoot, but their superiors in the rebel brigades did not allow them to do so. One of the young men was also photographed kneeling with his hands in the air while an insurgent allegedly pointed his Kalashnikov at him. Under that picture, which he posted on Facebook, he wrote the following message, "I think this is a good postcard to send home." Upon

their return to America, these young men eventually devoted themselves to public appearances to convince the public that the rebels were in fact the "good guys" But one of these adventurers eventually admitted, "I hate to say it, but it was almost like war tourism." The fact that the rebels did not give them weapons to fight and shoot robbed this trip of its real meaning, which was to engage in war activities, which was their greatest desire, regardless of the humanitarian aspects they occasionally mentioned. All in all, this war trip seems to have been a dangerous boy's game that did not quite fulfil the wishes of the self-proclaimed warriors, but ended happily as everyone returned home safe and sound.

Curiosity, madness or desire to kill?

In both cases presented, tourism is cited as the main motive or justification for travelling to war zones. The Japanese photographer considers himself safer than the others because he is "just a tourist," and the American young men, upon returning from the trip, admit that all the motives they mentioned earlier served to disguise the main motive: "It was all like war tourism." Idle young men, bored at home, looking for excitement, war games, a challenge to prove their own courage and manhood, usually join this kind of "tourist war adventure" as volunteers. However, the same people who are seemingly peaceful and harmless in peacetime can become callous torturers, brutal murderers and robbers overnight under war conditions. Man is already motivated enough for war by his unconscious aggressiveness directed against external objects, for otherwise he risks imploding and becoming a self-destructive force. It is not just a matter of lifting the ban on robbery, torture and killing. A person can always desire to lift this prohibition. He has, as Freud (1956) says, "the need to satisfy his aggressiveness at the expense of his fellow men ... to torture and kill them" A soldier generally does not perceive killing as the realisation of a long-awaited freedom, as the satisfaction of a hidden desire, but sees it as a task, a sacrifice, a heroic act. In war, the aggressiveness accumulated in each individual is no longer antisocial because it is directed against objects outside the society to which it belongs. Love of one's own is fatally inseparable from hatred of others. The mythical valorization of our warlike aspirations and the deification of the leader imply the satanization of the enemy, which decisively opens the way to the violation of the prohibition of killing. Satanizing the enemy means, in fact, excluding him from the human world, so that the laws governing human relations are no longer applicable to him. On the contrary, his elimination becomes a highly valued act of courage. Thank you to the dehumanisation of the enemy, the war against him becomes much more than a patriotic duty, because it appears the embodiment of the danger that threatens us as human beings, so that our resistance acquires the meaning of a struggle for

universal humanistic values. The general tendency to reduce the enemy to the level of "Nazis," "savage beasts," "monsters," "barbarians," or "zombies" reveals not only the intention to humiliate them. There is something else in it, the pursuit and destruction of opponents in whom there is nothing human, become heroic deeds of mythical heroes, saviours of humanity, fulfilling the task received from the highest moral authorities, that is, the task in accordance with the superego. Separated from the blind power of the animal, according to Bataille, war has developed a cruelty of which the animal is not capable. Of particular note is that after battle, often followed by the killing of the enemy, prisoners are usually tortured. These cruelties are what is specifically human about war. Countless mutilations of still living victims, cruel behaviour, merciless torture of prisoners, sexual experiences and humiliations made suicide more acceptable than going into slavery.

Patriotic male erotic adventure

The mythology of war as an exclusively masculine and patriotic adventure, in which the lives of others (the lives of hated enemies) are mercilessly destroyed, but in which one's own life is also at stake at every moment, is always accompanied by a strong, complementary erotic dimension. It involves erotic adventures with other women, the conquest and rape of enemy women as a source of special sadistic and vengeful pleasure, the symbolic or real rape of captured soldiers as a climax of humiliation and degradation. For certain groups of people, therefore, war can be primarily an "erotic trip," analogous to sex tourism but spiced with the constant presence of violence and death. To illustrate the interpenetration of Eros and Thanatos on a war trip, we do not have to go far back in time, nor beyond the region in which we live, as the civil wars in Croatia and Bosnia offer numerous examples. In this sense, Čolović (1994) points out in "The Warrior's Brothel" that war is "sexy." This extravagant idea, which he believes became unusually popular during the war in Croatia, became a common site for the representation and interpretation of this war. Until yesterday, Eros and Thanatos were the heroes of scientific debates about the paradoxes of human nature, and today they are in the arsenal of popular scholarship, along with the signs of the zodiac... Man was born in the sign of Eros - Thanatos. That is why hatred is sweet. That is why death is irresistible... We believe that man finds his erotic account, happiness and dark pleasure in destruction and slaughter. Nenad Čanak, who was forcibly mobilized and spent some time at the front, wrote roughly similar thoughts in his diary:

"We watched some bad movie on television, American graduates, cars and Coca-Cola. Volunteer Ljuba (refugee from Osijek) says: - Change this shit, it's not for us. Punishing and killing is for the army. - We switch to some kung fu. Chastising and killing. I have never heard a more concise and complete explanation of the thanatos-eros principle of these areas" (Vreme, December 23, 1991).

However, the idea that the army consists of a group of lovers of "fighting and killing" is not only the fruit of pacifist irony and argumentation, but also quite acceptable for war propaganda. Participation in the fire of war is readily presented by nationalist propaganda as a masculine affirmation, because the appeal to participation in combat with this erotic argument, i.e. incentive, proves more acceptable and effective than the appeal to the values of heroism and patriotism and their contrast to the immoral cowardice and national callousness of the "traitors to the country." . War is offered as a kind of great "brothel." The erotic wonders of the war couple will forever be denied to mama's boys, pacifists, and deserters, and according to the logic of the erotic argumentation of this kind of war propaganda, it is a big question whether they will ever become the first men. The man is the man with the gun. This is a lesson that sexual neophytes should understand, young men on the cusp of a man's world that is just ripe for guns and women. Those unfortunate enough to have come to this age during the tepid peacetime finally have the opportunity to enrich their pale peacetime experience with real experience that is only possible under arms in color. More specifically, on the eve of color. This is the moment when sexual excitement takes on a particularly dramatic intensity, if Nebojša Jevrić, the Dubrovnik besieger and journalist, is to be believed, who told the readers of "Duga" magazine, among other war stories, a war love story: "The best fucking is before the battle," he says. In the beginning like this. Brutally, in English. Then in a more moderate translation, "Love is best before the battle." Before, but also after, because later he says: "Fucking after the battle is nothing worse"...". In another situation, the author and protagonist of this story feels the crossed fingers of Eros and Thanatos: in the risky mining of mines. "Only old lechers will understand" - says Jevrić - "a mine, if you mine it, is like mining women" (Duga, December 23, 1991).

The intensity of the danger in war zones

When it comes to "war tourism", it is very important to make a risk assessment from the tourist's point of view. In this sense, some authors (Baldwin 2011 and Piekarz, 2014) deal with the typology of the intensity of danger, ranging from "very hot" to "cold". Very hot war tourism is closely related to "thanatos" or "dark" tourism. It includes travel to sites of killing, violence, and destruction,

including war zones, sites of mass killings, and war crimes. These are still active conflict areas with high levels of instability and conflict throughout the country or in specific parts of it. There is a very dangerous war situation or a constant threat of terrorist attacks (Afghanistan, Iraq, Syria, Ukraine). Hot war tourism includes visiting the tragic consequences of war such as destroyed buildings, skeletons of people and animals. It also involves some risk, especially considering the remains of unexploded mines and bombs. These are people who want to see the aftermath of war while the conflict areas are still hot, and their motivations range from morbid curiosity to a desire to broaden and enrich their own life experience in this way. Cold War tourism involves the process of gradual cooling and commercialization of war zones and sites. Here the danger is non-existent or minimal, and war veterans and their families whose purpose is commemoration and pilgrimage (Cambodia, Vietnam, Bosnia, Kuwait) often appear as visitors. Thus, the most radical form of "dark tourism" is "very hot war tourism," that is, travel to countries and regions where armed conflicts are taking place. Some travel there just to "observe," wanting to see the suffering, the mutilations, the refugee columns and camps, the dying and the corpses up close and with their own eyes.

However, there is also a small "market niche" of those who feel the need to actively "participate" in combat, who want to temporarily assume the role of a warrior, regardless of the costs and risks. War is a phenomenon of total death, combining the destruction of objects, buildings, and entire cities, the death of domestic and wild animals (whether they suffer from bombs and explosions, or are slaughtered en masse to feed the population and the army), killing the enemy, watching other people die en masse, and finally, increased risk to one's own life and possible death. Moreover, war is also a specific journey outside the usual space and time, which brings it closer to tourism. Although the boundaries between war and tourism may seem permeable and blurred, they cannot be equated, as there are also significant differences. Since the tourism industry cannot offer its customers legal opportunities to participate in armed conflict, shoot live flesh, and kill people, as hunting tourism does when it offers the killing of animals, people who want to do so must find the black market for these services and other illegal ways and means. First of all, they cannot and will not declare themselves as tourists. Most often they are presented as "war volunteers," but they can also be placed in the additional category of "tourist-warriors." This is about volunteers fighting in a war that is not just their own. Although political, ideological, or religious motives may be at the forefront, they can only be a convenient and "socially acceptable" justification for the male adventure, which includes activities ranging from pure curiosity and voyeuristic pleasure to robbery, rape, learning, and killing. The Spanish Civil War of 1936 is a good example, but the involvement of foreign states in more recent conflicts such as Bosnia, Libya, Iraq, and Syria can also

be used as parallels. In this context, Sontag (2004) believes that there are warriors whose motives and behaviour resemble those of tourists: "Those directly involved in wars and armed conflicts may occasionally engage in behaviour that resembles that of tourists." Photographing combatants in war is not a new phenomenon, but the increasingly easy way to take photos (cell phones) has contributed to a flood of unfocused images. Combatants are also filming an act of violence that they see as another wartime attraction that they want to immortalise and remember. At the same time, they treat the killed and slaughtered victims the way hunters treat killed wild animals, which is completely unacceptable from an ethical perspective.

Conclusion

Tourism and war are thus an asymmetrical pair of opposites, in which war excludes and destroys tourism, while tourism, as a weaker element, is unable to interrupt or end war. As we have seen, however, the dividing line is not always so clear and sharp in practice. Indeed, certain common features link war and tourism, which on the one hand gives tourists room to experience war as a spectacle and adventure, while soldiers can occasionally force war travel through new territories, liberated or conquered countries, to be perceived as a kind of tourism (the American soldiers who liberated Italy and France from German occupation were usually in Europe for the first time, which allowed them to see completely different cultures from their own, as well as different landscapes, art, architecture, cities, and people). A similar phenomenon occurs in all other wars, from the conquests in ancient Rome to the recent Russian conquest of parts of Ukraine. This latest war is certainly not good for mass tourism, which began to recover successfully after the Corona virus and experienced a boom this year. Now its growth is being slowed or halted again because of the war, and it will take a long time to recover, as an end to the war and a lasting peace agreement are not yet in sight. There will probably be only a handful of pathologically curious or adventurous tourists who are interested in the dark side of war tourism, as mentioned above. They are willing to risk their own lives to experience the ultimate thrill of near mass destruction and collective death.

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AGRARIAN POTENTIAL IN THE FUNCTION OF ECONOMIC DEVELOPMENT OF THE MUNICIPALITY OF VARVARIN

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Abstract: The paper analyzed the agrarian potential at the level of settlements in the municipality of Varvarin. This work aims to identify the most significant factors that affect agrarian potential. The following methods were applied: the method of successive dividers for determining the direction of agricultural land use, the weighting method for obtaining a reference value for calculating the agricultural potential, and the correlation coefficient for the analysis of cause-and-effect relationships between the value of the agricultural potential by settlements and used parameters. The paper provides an overview of the key problems in agriculture at the local, regional, national, continental, and global levels, including programs implemented by certain developed countries to revitalize agriculture.

Keywords: land use change; deagrarization; depopulation; perspectives of agriculture.

Introduction

Agriculture plays an important role in the overall economy at the level of the state and individual settlements. It represents the basis of the population's life because it ensures its food security. However, there are many examples of irrational agricultural land use, to obtain the highest possible yields in a short period. Intensification of agriculture can lead to the degradation of arable land due to the tendency to obtain higher yields and to an increased area under cultivation due to higher profitability (Villoria et al., 2014). Numerous pieces of evidence indicate that agricultural land abandonment is widespread worldwide, driven by several factors, and has strong implications for biodiversity, ecosystems, and living standards (Prishchepov, Schierhorn & Flöw, 2021). Abandonment of agricultural land has negative effects (possibility of fire spread, increasing population emigration) and

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positive effects (reduction of erosion, forest expansion, regulation of heat and moisture, preservation of habitats, stabilization of the hydrological cycle) on the environment (Pazúr et al., 2014).

Agriculture is directly related to the location of the area. There is a difference between rural areas that are part of an urban zone, rural areas that are well connected to urban centers and are part of the urban network, and remote rural areas that are weakly connected to any type of urban entity (Viñas, 2019). The rural area of the central part of Serbia was divided on rural centers on the axes of Serbia's development (such as Corridor X) and sparsely populated and underdeveloped villages in mountainous, peripheral, and border areas (Martinović & Ratkaj, 2015).

The relationship between agricultural production and the environment is complex and multifaceted (Baaken, 2022). Agriculture affects soil structure and fertility, geochemical and hydrological cycles, soil salinization, and pollution of underground and surface water (Милинчић, Туцовић & Мандић, 2013). Agricultural activity is affected by numerous physical-geographical factors, phenomena, and processes: soil erosion (Abdelsamie et al., 2023; Bogunovic, Telak & Pereira, 2020; Krstić & Paunović, 2022), climate changes (Michler et al., 2019), soil quality (Zhichkin, Nosov & Zhichkina, 2021) and soil degradation (Kertész, Nagy & Balázs, 2019).

Demographic and socioeconomic factors are considered the most significant factors in the abandonment of agricultural land (Negese, 2021). Human resources are considered one of the key factors of agricultural production (Раткај & Сибиновић, 2012). The process of deagrarization in the rural areas of Serbia is connected with the processes of depopulation and senilization of the rural population (Manojlović et al., 2022). The depopulation process is partially the result of emigration and is accompanied by a significant aging of the population (Pénzes, Pásztor & Tátrai, 2015; Horvat & Žiberna, 2020), which makes it even worse the possibility for the revitalization of agricultural activity. Agriculture plays an important role in rural development because it provides and manages the life of the rural population (Rajczi, Vörös & Dajnoki, 2017). In the last three decades, Serbia has lost about 1/3 of its agricultural land, most of which is arable land (Dašić & Labović, 2020).

The processes of industrialization in the post-war period, migration between the countryside and the city, and urbanization in conditions of inadequate traffic connections between urban and rural areas intensify deagrarization and deruralization (Bubalo-Živković et al., 2018; Mićković et al., 2020). The problem of rural abandonment and deagrarization in the villages of Eastern and Southern Europe is the result of post-industrial changes (Vaishar et al., 2021). The process of transformation of agricultural areas is the result of the relationship between urban and rural lifestyles and the effect of globalization has a further influence (Sibinović, 2012). The process of urbanization affects the transformation of agricultural areas and forests into urban zones near cities

(Bogunović et al., 2020). Some authors dealt with the conflict between the development of tourism and changes in agricultural land (Ghadami et al., 2022).

Politics played a major role in changes in land use and abandoned in countries that had a socialist system until the 1990s (Živanović et al., 2022), such as Poland (Gruchelski & Niemczyk, 2020) and Czech (Zagata, Hrabák & Lošťák, 2020). The post-socialist transformation of the land led to the fragmentation of large agricultural areas, which resulted in the fragmentation of plots and the increase of uncultivable land (Manojlović et al., 2021). The economic recession and reduced agricultural production in Serbia at the end of the last century were the results of foreign political factors, such as the disintegration of the SFR Yugoslavia, economic sanctions, and NATO aggression, but also internal factors such as the democratic revolution in 2000 (Sibinović, 2015).

Based on the mentioned factors that affect agriculture, three starting hypotheses are distinguished in the paper: 1) Agricultural activity in the territory of Varvarin municipality is concentrated mainly in the lower hypsometric zones and in the river valleys; 2) Agriculture is dominant in the territory of Varvarin because most of the settlements are concentrated in the valleys; 3) Agrarian potential is most closely related to population aging.

The analysis of the agricultural potential of Varvarin municipality has multiple scientific and practical significance: indicating the natural potentials that the mentioned municipality has for the development of agricultural activities in accordance with the concept of sustainable development; emphasizing the demographic problems that led to the demise of agriculture; identifying the key processes that cause the marginalization of agricultural activity, which causes the economic recession of the municipality; indicating the importance of inter-municipal cooperation for the development of agriculture and the revitalization of rural areas; systematization of positive practices and programs that are implemented in more developed countries of the world, with the aim of considering the possibility of implementing them in the case study of the municipality of Varvarin; overview of advantages, disadvantages, potentials and threats for the development of agriculture in the municipality of Varvarin based on natural resources, demographic potential and economic situation.

Study area and research methodology

The municipality of Varvarin (246.47 km^2) is located in the Rasina region, in the central part of the Republic of Serbia. The location at a distance of 10 kilometers from Corridor X and good traffic connections with Paraćin, Kruševac, and Jagodina

indicate a favorable traffic-geographical and economic-geographical position. The geological structure of Varvarin municipality is dominated by Neogene sediments since fertile soil suitable for agricultural activities is formed on them. The following soil types are represented on the territory of Varvarin: fluvisol, eutric cambisol, rankers, vertisol, and regosol. The mentioned area geotectonically belongs to the Serbian-Macedonian massif (Pavlović et al., 2017). According to Keppen, Varvarin has a moderately warm and humid climate (Cfb) (Milovanović, Stanojević & Radovanović, 2022), in a zone with an average annual temperature of 11-12°C (Bačević et al., 2021) and 590-670 mm of precipitation (Radaković et al., 2018). According to the flood risk map (Новковић, Драгићевић и Ђуровић, 2022), Varvarin municipality is located in the medium flood risk zone, with 226 registered flash floods in the immediate catchment of Velika Morava (Петровић, 2021), which is an important factor for agriculture. During the disintegration of Yugoslavia, wars, great crises, sanctions, and NATO aggression, Varvarin municipality became an emigration zone. Varvarin has recorded a continuous decline in the number of inhabitants since the 1953 census, but it has intensified since the end of the last century (Varvarin municipality had 23,821 inhabitants in 1991 and 17,966 inhabitants in 2011). Depopulation, population aging, and economic backwardness are the key processes that affect agriculture and the development of the municipality of Varvarin.

The micro-location of the settlement has a great influence on the possibilities of engaging in agricultural activities. The largest number of settlements in the municipality of Varvarin are concentrated on the banks and valley sides of the largest rivers of the municipality because the most productive soil (fluvisols) is found in that area. Settlements at higher altitudes are predominantly oriented toward fruit growing, viticulture, and pig farming, due to the lower fertility of the soil. Based on the differences in natural conditions, it is possible to distinguish the following types of micro-locations of settlements in the municipality of Varvarin:

- in the foothill of Juhor (Bačina, Gornji Krčin, Izbenica, Suvaja and Orašje),
- On the slopes of Blagotin (Bačina, Karanovac, Mala Kruševica and Orašje),
- On the banks of the rivers (Zalogovac river - Zalogovac, Parcane potok - Parcane, periodic flow of Suvaja - Suvaja, Cernica potok - Cernica),
- On the left bank of the rivers (Velika Morava - Varvarin selo, Varvarin and Gornji Katun, Kalenić river - Donji Krčin, Pajkovac, Varvarin),
- On the right bank of the rivers (Velika Morava - Donji Katun, Kalenić river - Varvarin selo, and Karanovac),
- On the valley floor of Zapadna Morava (Bošnjane),
- On the valley sides of the rivers (Kalenić river - Bačina and Toljevac, Bošnjane river - Bošnjane, Marenovo potok - Marenovo, periodic Izbenica stream - Izbenica),

- On the left valley side of the rivers (Kalenić river - Gornji Krčin, Kruševica potok - Mala Kruševica, Zapadna Morava - Maskare),
- Between Velika Morava and Juhor (Obrež) (Стаменковић, 2001).

Map 1. Network of settlements of Varvarin municipality

In the paper, during the data analysis, the method of successive divisors was applied, which represents a mathematical model for the matrix calculation of the ratio of the values of the variables, in this case, the basic groups of plant production. The reference values of the variables are grouped in 6 rows, in which each row indicates the result of dividing the variable with a common denominator (from 1 to 6). The highest 6 scores in the matrix determine the representation of plant crops in the structure of production.

The comparative method was used to compare rural settlements based on numerical values of absolute and relative indicators. A comparative analysis of this type is possible only if conditional units are established (reduced area, conditional head, grain unit) whose diversity is reduced to comparable values by the method of weighting. The use of the comparative method in this study implied an interweaving with the geographical method - the spatial aspect (Сибиновић, 2014).

Demographic and economic indicators that affect the agricultural potential of Varvarin municipality are discussed in the paper. Among the selected indicators, using the Pearson's correlation coefficient (r), the mutual connection between the agrarian potential by settlements and the most significant factors influencing it was differentiated, based on the degree of correlation. The calculation of the correlation coefficient (r), based on the data which were processed by years, is performed using the formula (Bluman, 2009):

$$r = \frac{n\Sigma XY - (\Sigma X) * (\Sigma Y)}{\sqrt{[n\Sigma X^2 - (\Sigma X)^2] * [n\Sigma Y^2 - (\Sigma Y)^2]}}$$

The correlation was also calculated between individual parameters (number of inhabitants and average age, number of inhabitants and number of the agricultural population, etc.) to consider in more detail the causal relationship between the factors that have influence on the mentioned processes. The following parameters were considered:

- Number of inhabitants (B_s)
- Population density (G_n)
- Number of households (B_d)
- Average number of members per household (B_{dp})
- Average age of the population (S)
- Number of the agricultural population (S_{polj})
- Population Change Index (I_{bs})
- Index of change in household number (I_{bd})
- Population Aging Index (I_{ss})
- General agricultural population density (AGN)
- General reduced agricultural population density (AGN_r)
- Actual specific agricultural population density (AGN_{ss})
- Actual reduced agricultural population density (AGN_{sr})
- Agricultural land (P_p)

Agrarian potential is used in geographical surveys of agricultural activity to determine the degree of use of agricultural space. It is calculated according to the following formula (Раткај & Сибиновић, 2012):

$$Ap = \left(\frac{\check{Z}_{in}}{U_{\check{z}io}} + \frac{U_{gn}}{U_{go}}\right) \div 2 \times 100$$

Which Ap represents agricultural potential; *Zin* – the number of grain units in the settlement; *Užio* – the sum of grain units of all settlements of the studied territory; *Ugn* – conditional heads in the settlement; *Ugo* - the sum of conditional heads of all settlements in the research territory.[2]

Research results

The largest expanse of agricultural land in the municipality of Varvarin is occupied by arable land and gardens (8,851.75 ha), followed by orchards (503.56 ha) and vineyards (354 ha). Meadows occupy 340 ha surfaces and pastures are significantly less. The smallest area covers fishponds, puddles, and reeds. The topography of the terrain favors the development of arable land and gardens. Fruits are mainly grown in the hilly areas on the slopes of Juhor, which is the highest mountain of the Varvarin and the Blagotin slopes. Meadows and pastures are located in the higher terrain of Temnić, and the largest areas belong to the settlements of Karanovac, Bošnjane, and Bačina. Apart from limitations in agricultural production, an additional problem in livestock breeding is the small share of meadows and pastures in the total area of the territory of the municipality of Varvarin.

In the category of vegetables, melons, and strawberries, on a total area of 546 ha in 2012, the largest crops were pepper (188 ha), strawberries (184 ha), and fruit trees (93 ha). In 2012, plantings of other crops occupied a significantly smaller area. The total area under fodder crops was 1,072 ha, which represents the largest agricultural area after grain. Of the mentioned 1,072 ha, the largest area was occupied by alfalfa (513 ha) and clover (424 ha). In 2012, 504 ha of Varvarin municipality were under fruit species. Therefrom, the largest part was planted with plums (249 ha), blackberries (79 ha), and apples (47 ha). Other fruit species occupied a significantly smaller area of land. About 10% of the used agricultural land was under irrigation systems (План развоја општине Варварин 2021 – 2028).

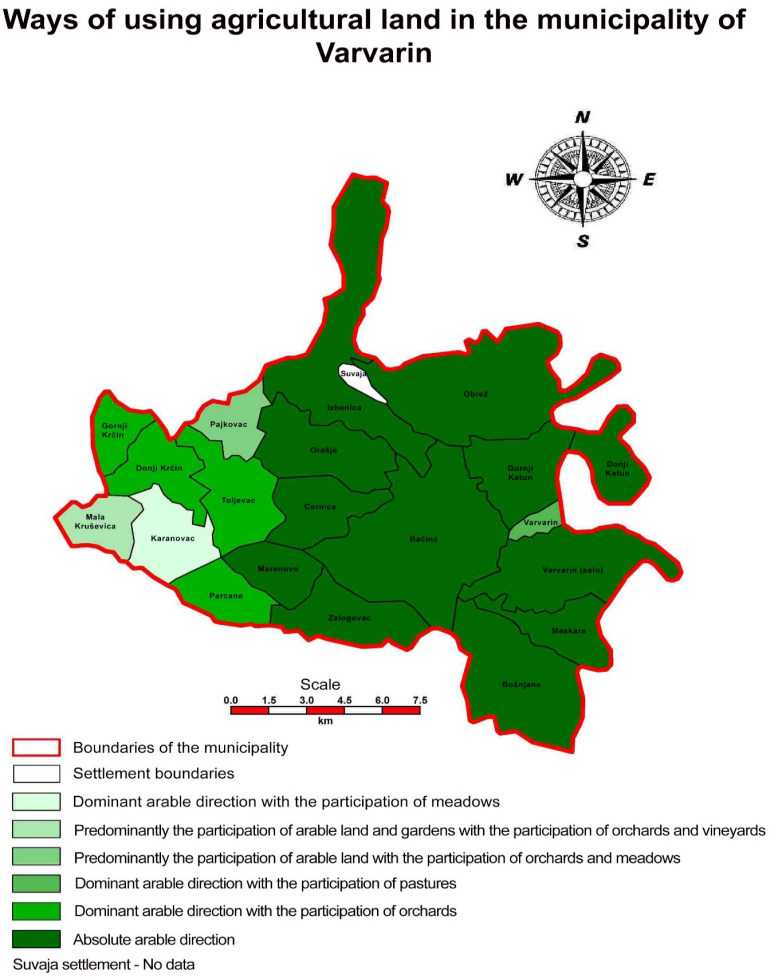
The method of successive dividers was used to analyze land use trends in the territory of Varvarin municipality. It is suitable for determining the agricultural orientation of settlements based on agricultural areas under arable land, orchards, vineyards, meadows, and pastures. The settlements of Varvarin municipality have an

[2] Cereal units (wheat units) are determined on the basis of protein and starch content. The coefficient for wheat is 1 (1= 100 kg of wheat), while the coefficients for other plant production and livestock products are determined based on it. The number of grain units per 100 ha of arable land is usually used as an indicator. A large livestock unit (conditional head) is used in livestock breeding. It is a cattle (beef) of 500 kg weight, which has a coefficient of 1. Coefficients for other types of livestock are calculated based on it. The number of conditional heads per 100 ha of agricultural land is usually used as an indicator (Степић и Јаћимовић, 2006).

absolute, dominant, and a smaller number of them predominantly arable directions. As many as 12 settlements have the code O_6, which shows that the absolute arable direction is represented, and this is a consequence of the location of these settlements in the valleys of the large rivers of Temnić (Velika Morava, Zapadna Morava, and Kalenić river). Typical representatives are Obrež, Bačina, and Bošnjane. Other settlements with O_6 land use direction are Varvarin (selo), Gornji Katun, Donji Katun, Zalogovac, Izbenica, Marenovo, Maskare, Orašje, and Cernica. Settlements located on the hilly terrain of Varvarin municipality have slightly less arable land, and there are also orchards. These are the settlements that have a dominant arable direction with the participation of orchards (O_5 Vo_1) and these are Gornji Krčin, Donji Krčin, Parcane, and Toljevac. The dominant arable direction with the participation of meadows (O_5 L_1) had Karanovac, while the dominant arable direction with the participation of pastures (O_5 P_1) had Varvarin (varoš). The most heterogeneous settlements are Mala Kruševica, in which orchards and vineyards participate and which belongs to the direction of predominantly arable land and gardens with the participation of orchards and vineyards (O_4 Vo_1 V_1), and Pajkovac, where orchards and meadows are equally represented.

The analysis of agricultural potential determined the most productive settlements in agricultural production in the territory of the municipality of Varvarin. This indicator refers to the possibility of agricultural development, based on two parameters: grain units and conditional heads. Obrež (15.22%), Bošnjane (13.69%), and Bačina (12.78%) have the greatest agricultural potential because they have the number of grain units and conditional heads, i.e. head of livestock, which is significantly above the municipal average, which improves agricultural production. These three settlements are traditionally agricultural due to the small dissection of the relief and the fertile soil on which quality yields are achieved. In Obrež, which is positioned between Juhor and Velika Morava (Стаменковић, 2001), the largest areas are planted with cereals (corn - 623.48 ha and wheat - 611.84 ha) and fodder plants (alfalfa - 51.97 ha). The highest yield is achieved by cereals (corn – 2,560.13 t and wheat – 1,088.90 t), and potatoes (918.77 t) from vegetables. According to the number of probationers, Obrež is in third place among the settlements of the Varvarin municipality, behind Bošnjane and Bačina. In Bošnjane, which is located on the valley floor of the Zapadna Morava and the valley sides of the Bošnjane river (Стаменковић, 2001), the largest areas, as in Obrež, are under cereals (corn - 286.47 ha and wheat - 247.39 ha) and forage plants (alfalfa - 39.27 ha), while they achieve the highest yield (corn – 1,176.30 t, potatoes – 1,133.21 t and wheat - 440.28 t), and these crops also have the most grain units, as in Obrež. Of all the settlements in the Varvarin municipality, Bošnjane has the largest number of livestock, (poultry - 203,411), which is evidenced by numerous poultry farms and, therefore, the highest number of conditional livestock. Poultry is less demanding than cattle, sheep, pigs,

and goats, so it is more numerous. Chicken meat is in great demand on the market, it has a good price, which has a positive effect on the population of the Temnić region to engage in poultry farming. In Bačina, which is located on the valley sides of the Kalenić river and the slopes of Blagotin (Стаменковић, 2001), the largest areas are where corn (366.6 ha), wheat (332.1 ha) and grapes (56.88 ha) are grown. The mentioned crops achieve the highest yield (corn – 1,505.33 t, wheat - 591.04 t, and grapes - 553.05 t) and have the most grain units. Cereals are grown in Bačina at the bottom of the Gornjovelikomoravska basin, in the valley of the Kalenić river, while the areas under grapes are mostly located on the slopes of the Blagotin hill. Bačina is in second place after Bošnjane in terms of the number of conditional heads of livestock, poultry farming (5,604 heads) and pig breeding (4,060 heads) dominate.



Map 2. Ways of using agricultural land in the municipality of Varvarin

On the other hand, the settlements of the mountainous terrain of Gornji Temnić (western part of Varvarin municipality) such as Pajkovac (0.77%), Donji Krčin (1.25%), and Gornji Krčin (1.55%) have the lowest agricultural potential due to greater fragmentation relief and harsher climatic conditions that affect the limited yield of crops, especially cereals, so the population mainly resorts to fruit growing (plums, apples, apricots), viticulture and cattle breeding. Therefore, it is observed that the settlements of the Varvarin municipality, which are located at the bottom and the rim of the Velika Morava basin, have the greatest agricultural potential. It should be emphasized that arable land covers an area of 10,384.11 hectares or 42% of the area of the municipality. Obrež, Bačina, Bošnjane, and Varvarin (selo) have the largest areas of arable land. Primacy is held by Obrež with 1,668.14 ha of arable land. The distribution of arable land is determined by the geological base, which is mainly composed of Neogene sediments. The most fertile soil is in the alluvial plain of Velika Morava, which used to often overflow and deposit silt.

In contrast to them, the settlements of Gornji Temnić have much less arable land due to their specific hilly and low-mountainous micro-location with a greater slope of the terrain, which favors the intensification of erosive processes. The geological base here is old crystalline slates and gneisses, and there are shallow skeletal soils of limited fertility. Pajkovac has only 89.15 ha, and Donji Krčin, which is the center of Gornji Temnić in the Krčin basin and the Kalenić river valley, has 188.48 ha of arable land.

In table no. 2 shows the relationship between agricultural potential and demographic and economic indicators at the level of settlements in the municipality of Varvarin. The values of agricultural potential in the settlements of Varvarin municipality are positively correlated with most of the analyzed parameters. Exceptions are the parameters of the average age of the population, population aging index, and population density. The aging of the population hurts the possibility of engaging in agricultural activities, as indicated by the low negative correlation between the agricultural potential of the municipality of Varvarin with the average age of the population by settlement ($r = -0.31$) and the index of change in the average age of the population ($r = -0.29$). No correlation was established between agricultural potential and population density, as its value is $r = -0.03$. The population density in the territory of Varvarin municipality is positively correlated with the agricultural population ($r = 0.59$), the number of households ($r = 0.54$), the number of the population ($r = 0.44$), the index of population change ($r = 0.41$) and the index of change in the number of households ($r = 0.4$).

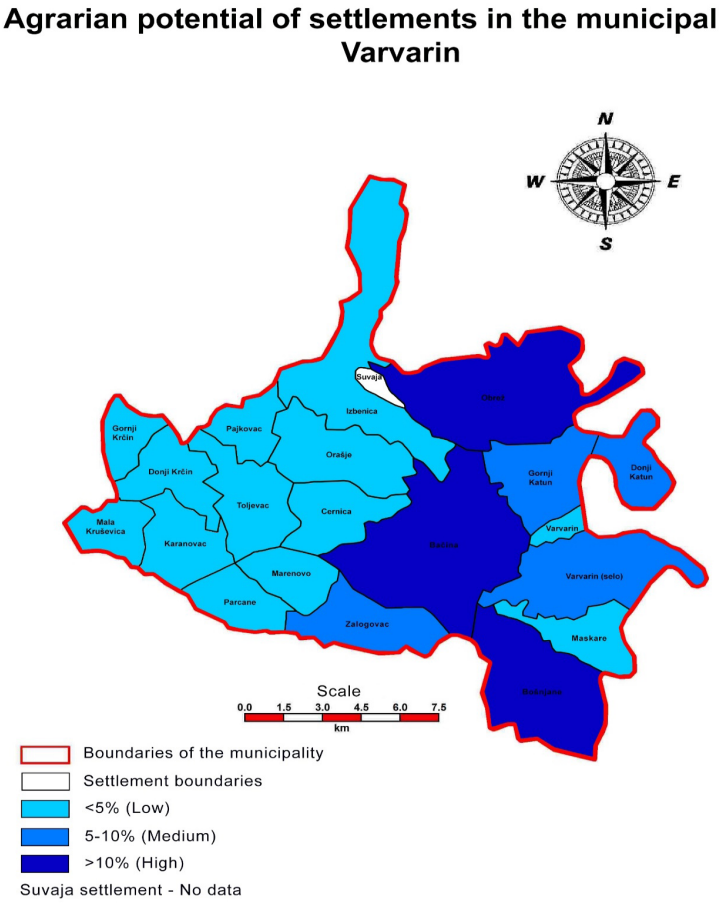
Table no. 1: Agrarian potential of settlements in the municilapity of Varvarin

Settlement name	Grain units	Conditional heads	Agrarian potential (%)
Obrež	42,529.45	1,436.88	15.22
Bošnjane	21,694.37	2,189.61	13.69
Bačina	25,218.99	1,774.02	12.78
Varvarin (selo)	19,253.29	1,369.78	9.82
Donji Katun	15,428.27	731.73	6.38
Gornji Katun	15,142.27	719.92	6.27
Zalogovac	13,818.59	556.68	5.31
Parcane	10,761.97	366.12	3.86
Orašje	7,729.99	484.67	3.68
Marenovo	8,162.49	428.42	3.54
Maskare	6,908.89	362.93	3
Varvarin (varoš)	7,052.7	275.86	2.68
Mala Kruševica	7,424.36	225.43	2.55
Karanovac	5,956.86	208.02	2.16
Izbenica	4,035.99	299.83	2.11
Toljevac	4,552.46	215.57	1.88
Gornji Krčin	3,124.64	211.63	1.55
Cernica	2,981.31	207.39	1.5
Donji Krčin	2,832.44	154.8	1.25
Pajkovac	1,998.51	82.01	0.77
Suvaja			
Municipality of Varvarin	226,608	12,301.25	100

Source: Agricultural census, 2015

The agrarian potential is highly dependent on the number of inhabitants per settlement and the number of the agricultural population. A very high correlation was established between the agricultural potential of the Varvarin municipality settlements and the agricultural population per settlement (r = 0.92). The largest settlements in the municipality of Varvarin with the largest population also have the most inhabitants engaged in agriculture: Obrež (525 agricultural inhabitants), Bačina (388 agricultural inhabitants), and Bošnjane (335 agricultural inhabitants). The number of agricultural population has a high correlation with the number of population per settlement (r = 0.76) and the number of households per settlement (r = 0.7), a medium-high correlation with the average number of households (r = 0.49)

and a low correlation with the index of the change in the number of inhabitants (r = 0.29) and the index of the change in the number of households (r = 0.31).



Map 3. Agrarian potential of settlements in the municipality of Varvarin

The same rank of correlation (very high correlation) was established between the agricultural potential and the number of inhabitants per settlement (r = 0.85). Settlements with a larger number of inhabitants have a very high correlation with agricultural areas (r = 0.95) and a high correlation with the agricultural population (r = 0.76). The number of inhabitants of the settlements of Varvarin municipality has a negative correlation with the average age of the population by settlement (r = -0.49) and the population aging index (r = -0.44), which further complicates the possibility for agricultural development.

A high correlation was also established between the agricultural potential in the settlements of Varvarin municipality and the number of households (r = 0.79).

The larger number of households is directly related to the number of inhabitants (r = 0.99) and the agricultural area per settlement (r = 0.97). Obrež with 3,062 inhabitants has over 2,000 ha of agricultural land, as does Varvarin (2,169 inhabitants) with over 2,208 ha of agricultural land. The number of households has a negative correlation with the average age of residents per settlement (r = -0.49) and the population aging index (r = -0.44), because the elderly population mostly remains living alone. In most settlements of Varvarin municipality, a drastic decrease in the number of households was observed between 1991 and 2011, from 6,328 households in 1991 to 5,544 households in 2011. Their number increased in Bošnjan (from 520 to 530) and Varvarin (from 739 to 780). This increase is due to the division of larger families into smaller ones. Also, a small percentage of the population moves to Varvarin, which is the municipal center and functionally the most significant settlement of the entire municipality, especially from the settlements that gravitate to it, which contributes to the increase in the number of households. In contrast, Suvaja (from 110 to 42 households) and Cernica (from 109 to 64 households) had the largest decrease in the number of households between 1991 and 2011. These changes are a consequence of the closing down of nursing homes. In Suvaja, emigration trends were most intense in the last two decades of the 20th century and the first decade of the 21st century. The population mostly emigrated to Germany and Austria. In 1981, 1,033 inhabitants lived in the mentioned settlement. The share of young people was high. After the economic crisis, sanctions, and NATO aggression, in the period between 1991 and 2002, this settlement at the foot of Juhor was left without 346 inhabitants due to negative natural growth and migration. According to the census data from 2011, it had 105 inhabitants, which makes it the smallest settlement in the territory of the municipality of Varvarin.

A high correlation (r = 0.74) was established between agricultural areas and the agricultural potential of settlements in the municipality of Varvarin. The agricultural areas of the municipality of Varvarin have a very high correlation with the number of households and the number of inhabitants (r > 94), a medium-high correlation with the population density, the index of the change in the number of inhabitants, and the index of the change in the number of households (r = 58-59). Agricultural areas are negatively correlated with the average age of the population and the population aging index (r < -40).

A high correlation was established between agrarian population density and agrarian potential (r = 0.63). A medium correlation was established between the agricultural potential and the index of change in the number of households, which has the highest correlation with the index of change in the number of inhabitants (r = 0.96), while it has a medium-high correlation with the number of households (r = 0.53) and the number of inhabitants (r = 0.52). Agrarian potential achieves a moderate correlation with the index of population change (r = 0.42). The mentioned

parameter has a borderline value between low and medium-high correlation with the actual specific agrarian population density (r = 0.40), low correlation with the actual reduced agrarian population density (r = 0.37), and very low correlation with the general reduced agrarian population density (r = 0.14).

The average age of the population of Varvarin municipality is increasing, which may pose a threat to the development of agriculture in the future. The settlements of Gornji Temnić have the highest average age: Karanovac (52.7 years), Mala Kruševica (49.7 years), and Donji Krčin (49.4 years). The most depopulated are the settlements in the western part of the municipality of Varvarin, the number of economically inactive populations (dependent population) is increasing, which adversely affects the economy of the municipality of Varvarin.

Table no. 2: Correlation between agricultural potential, demographic and economic indicators of the municipality of Varvarin

	B_s	G_n	B_d	B_{dp}	S	S_{polj}	I_{bs}
Ap (r)	0,8457	-0,03	0,79	0,4122	-0,31	0,92215	0,41935
	I_{bd}	I_{ss}	AGN	AGN_r	AGN_{ss}	AGN_{sr}	P_p
Ap (r)	0,44356	-0,29276	0,63378	0,13739	0,4065	0,36876	0,74054

Source: Statistical Office of Serbia

An important segment of agricultural development in the territory of Varvarin municipality is the level of mechanization applied in this activity. According to the agricultural census from 2012, in the territory of Varvarin municipality, agricultural households owned a total of 4,971 tractors, of which 4,940 tractors are older than 10 years. This means that the average farm owned less than two tractors (План развоја општине Варварин 2021 – 2028).

Discussion

Low-paid work in agriculture, unavailability of non-agricultural products and services, and high unemployment are the key problems of deagrarization and abandonment of rural areas (Wojewódzka-Wiewiórska, 2019). In many countries of the European Union, there is a tendency to reduce the share of expenditures for agricultural activities at the state level (Bachev, 2019). Eurostat conducted a farm structure survey and found that 55.8% of European farmers are over 55 years old, 31.4% are over 65 years old, and only 6% are under 35 years old. This points to the challenge of future rural development, i.e. the "problem of young farmers", which implies low population renewal rates in the agricultural sector in the European Union (Plana-Farran & Gallizo, 2021). Production potential is manifested in the country's resources and labor force, but its rational use is hindered by structural deficits,

such as the fragmentation of the agrarian structure and poor soil quality (Pawlak, Smutka & Kotyza, 2021). The number of employees in agriculture is decreasing in Serbia (Stojanović, 2022). Mechanization and modernization of agriculture have led to less need for labor in that activity (Babović, Lović-Obradović & Prigunova, 2016). By applying modern technology in agriculture, yields increase significantly, but this leads to a drop in the price of agricultural goods on the market (Раткај & Сибиновић, 2012). One of the reasons for abandoning agricultural activity in Serbia is the low selling price of agricultural products (Dašić & Labović, 2020).

In the context of the prospective development of agriculture, as a potential solution to the economic, social, and ecological challenges of the 21st century, the "Precision Agriculture" program is being imposed, which would apply the most modern technology (Yarashynskaya & Prus, 2022). Guth M. et al. (2020) analyzed the economic viability of farms under the common agricultural policy of the European Union member states. In developed countries, the idea is to first solve demographic problems through population policy measures (encouraging the birth rate) and then to activate those areas economically (Wegren, 2016). The measures applied to prevent depopulation in rural areas are related to agriculture and mostly refer to support for farmers (Tianming, Ivolga & Erokhin, 2018). Among the priorities of rural development in the European Union, some concern agriculture, namely: encouraging the spread of knowledge and innovation in agriculture, forestry, and rural areas; strengthening the sustainability and competitiveness of all types of agriculture, promoting innovative farming technology and sustainable forest management; risk management in agriculture; restoration, preservation and improvement of ecosystems in connection with agriculture and forestry (Diaz-Sarachaga, 2020). The project "Smart and competitive rural areas" among the key issues for the progress of rural areas emphasizes the importance of the modernization of agricultural business, which would enable the development of new products and the penetration of new markets (Battino & Lampreu, 2019). The funds of the European Agricultural Fund for Rural Development encourage rural entrepreneurship, especially for young entrepreneurs in the early stages of business, as part of the measures of regional and national rural development programs (López, Cazorla & Panta, 2019). Some European countries focus on organic agriculture (Zagata, Hrabák & Lošťák, 2020).

According to land, climate, and water resources, Serbia has the potential for agricultural development, but it is not fully utilized (Ljubojević, Blanuša & Petrović, 2022). During the transition period, around 27,500 jobs in agriculture in Serbia were abolished. This is a problem not only for agriculture and agricultural management policy but also for the entire concept and strategy of development after the post-transition period (Milanović, Stevanović & Dimitrijević, 2016). Abandonment of settlements and abandonment of arable land in Serbia is most pronounced south of 43° 53' N i.e. south of the parallel that crosses Užice, Čačak and Paraćin (Joksimović

& Golić, 2021). According to World Bank data, the share of agriculture in Serbia's GDP was 17.8% in 2001, 8.5% in 2010, and 6.3% in 2020 (Ljubojević, Blanuša & Petrović, 2022). On the territory of Varvarin municipality, a process of population concentration and agricultural activity was established at lower altitudes and in river valleys. This process is in agreement with the Jablanica River Basin, where in the zone up to 500 m the share of arable land is 68.2% (Gocić, 2020), while in the Nišava River Basin in the same zone, it is 55.4% (Manojlović et al., 2017).

The most promising agricultural potential of Varvarin municipality is a fertile land. This fact is the basis for the development of intensive agriculture, which can positively affect the economy of the municipality of Varvarin. It is also important to take care of the preservation of agricultural land, that is, to implement measures to protect the pedological cover. Agriculture must be complementary to other sectors of activity. In this sense, it is necessary to invest in the construction of additional plants for the processing of agricultural products, to obtain finished products and increase the competitiveness of the municipality of Varvarin on the domestic and foreign markets. The economic orientation of the largest settlements of the municipality of Varvarin located at the bottom and rim of the Gornjovelikomoravski basin (Obrež, Bošnjane, Maskare, Varvarin selo, Gornji Katun, Donji Katun, Cernica, Suvaja, Izbenica, Orašje, and Bačina) is oriented towards farming, vegetable growing, growing roses and seedlings material.

The settlements in Gornji Temnić (Donji Krčin and Gornji Krčin, Pajkovac, Toljevac, Karanovac, Mala Kruševica, Zalogovac, Marenovo, and Parcane) are located in the zone from 200 to 350 m above sea level, which favors the development of fruit growing (strawberries, blackberries, raspberries), viticulture, but also livestock breeding. There are several cold stores on the territory of Varvarin municipality, but it is necessary to expand the capacities (ЈУГИНУС, 2009).

The most promising settlement in terms of viticulture is Bačina, where the famous winery "Bačina vino" is located, which markets its products on the Swedish market. Of the vegetable crops, peppers are grown the most, but an increasing number of farmers plant gherkins due to pre-contracted purchases, and there are also tomatoes, cabbage, and cauliflower. Livestock breeding also has the potential for development. The "Broiler" slaughterhouse, which has been in bankruptcy for a long time, was successfully operating on the territory of Varvarin municipality. However, it is important to mention the Bošnjane settlement, which is known for its poultry farms. The production of laying hens dominates, and there is also the production of broilers, i.e. chickens weighing two to two and a half kilograms. The population of the municipality of Varvarin is mainly engaged in agriculture as a supplemental activity, and its products are used for personal consumption, sold at the market in their settlement, in Varvarin, where the market day is Sunday, or in larger cities such as Kruševac, Paraćin, Jagodina, and Kragujevac.

Picture 1. Vineyards in the Bačina atar. (photo: N. Josifov, 2022)

Considering the fragmentation of agricultural holdings and the weak economic power of agricultural producers, of great importance for the development of agriculture and the overall economic development is the association of farmers in agricultural cooperatives, in which the administration of the municipality of Varvarin provides support. At the meetings of the working teams, it was stated that the existing associations and cooperatives in the territory of Varvarin municipality do not have sufficient capacity to support the development of agricultural producers, especially bearing in mind that a certain number of these associations are not even active. That is why it is necessary to intensify efforts in the coming period on the association of agricultural producers, to influence the increase in productivity and volume of production, and to improve their joint position on the placement market. In this way, better purchasing conditions will be ensured, as well as conditions to achieve cooperation with some of the larger business systems that would process agricultural products (План развоја општине Варварин 2021 – 2028). In 2019, the municipality of Varvarin allocated 20 million dinars from the budget for agricultural production subsidies. The idea is to educate farmers so that they know how to use these new funds. The municipality of Varvarin also organizes farmer's trips to agricultural fairs in Novi Sad and Belgrade.

Problems and limitations regarding the development of agriculture in Varvarin municipality are droughts, decrease in the number of inhabitants, fragmentation of plots, and obsolescence of mechanization. Bearing in mind the unfavorable educational structure of agricultural producers, that is, members of agricultural holdings, programs aimed at raising the level of knowledge of agricultural producers about professional services are of great importance for the further development of

agriculture. The municipality of Varvarin, given its size, does not have its service, but belongs to the area of work of the Kruševac Agricultural Expert Service, which performs a wide range of different activities, from introducing modern technologies, giving recommendations for fertilization, various controls, providing expert advice, applying expert measures, up to the activity of helping with the preparation of calculations, business plans, investment programs, etc. However, despite numerous activities, the capacities of PSSS Kruševac are not sufficient to independently lead to the development of agricultural production in the territory of Varvarin municipality. It is necessary to organize educational programs at the level of the territory of the municipality, which would help agricultural producers to improve their products and raise the level of processing (План развоја општине Варварин 2021 – 2028).

Varvarin mostly uses groundwater on the farm for irrigation purposes (86.5%). Therefore, the preservation of the quality of underground water, the application of adequate methods of fertilization, and through construction of a sewage network, and the purification of wastewater, are extremely important for the provision of quality and healthy agricultural species. In the future, Varvarin could look for a solution in the direction of developing organic agriculture.

The Moravian Corridor (Pojate - Preljina highway) will be of vital importance for the municipality of Varvarin when it will be built, as it partly passes through its territory. It will improve the traffic-geographical position of the municipality and make it available for investments, while at the same time enabling faster and easier transportation of agricultural products. In this way, Varvarin will be functionally more significantly connected with the cities in Zapadno Pomoravlje (Kruševac, Trstenik, Kraljevo, Čačak), which are known for being strong economic centers.

Conclusion

By applying the agricultural potential method, it was established that the settlements in river valleys and at lower altitudes (Obrež, Bačina, Bošnjane) have the greatest agricultural potential because the processes of depopulation and deagrarization are more intense at higher altitudes. The second hypothesis, that agriculture is dominant, was also confirmed. The last hypothesis is disputed because the agricultural potential at the settlement level is not most correlated with the average age of the population, but with the number of the agricultural population and the number of inhabitants (very high correlation $r = 0.92$ for the correlation with the number of agricultural population per settlement and $r = 0.85$ for the number of inhabitants per settlement). The main factor on which the state of agriculture in the municipality of Varvarin depends is anthropogenic influence. It manifests itself in the form of demographic characteristics of the population (number, economic

structure, population age), which are not favorable due to depopulation and aging of the population, and ways of managing space and available resources, which for now are not only not used by the available possibilities, but are also marginalized and ignore.

The main limitation of this study is contained in the absence of temporal continuity of the database, to be able to see long-term trends in the analyzed processes and apply models for projections in the future. It is also necessary to consider the time dimension in which the processes of deagrarization took place and intensified. Another shortcoming in this work is the absence of a systematic approach and analysis of the agriculture of the Varvarin as part of the area, region, and state, i.e. its role and importance at different levels (local, regional, national). By applying the comparative method (comparison of the agricultural potential of the municipality of Varvarin with neighboring municipalities and its ranking at the regional and national level), one would gain an insight into its position about the environment, advantages and disadvantages about neighboring municipalities, as well as the potentials that make it unique and which could be used for the revitalization of agriculture.

In future research, the development of agriculture and the agricultural potential of the municipality of Varvarin could be linked to the quantification of physical-geographical conditions and processes (the relationship between agricultural production and altitude, terrain slope, terrain exposure, erosive processes, soil types, and quality, dry/wet years, natural disasters) and population structures (economic, educational, gender-age population structure). In addition to the mentioned segments, the plan is to use satellite images for a longer period, with the help of which it would be possible to see the changes that have occurred.

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WINE ROUTES IN THEORY AND PRACTICE OF THE DEVELOPMENT OF RELIGIOUS AND WINE TOURISM OF SERBIA: A CASE STUDY OF FRUŠKA GORA

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Abstract: In the last two decades, wine tourism has become increasingly important in the development plans for tourism in the Republic of Serbia, especially considering that it is very profitable. Among the key subjects of wine tourism, wine producers in the regions of Srem, Aleksandrovačka Župa and Šumadija stand out. The tourist products also become recognizable products of the wine-growing regions, as the wineries have tasting rooms where wine and homemade food are combined for visitors. In this way, the identity of the geographic region is defined through the promotion of wine. Before the outbreak of the pandemic, several hundred busses came every year to the wineries in the above-mentioned regions of Serbia, so that almost 40% of the wine production was sold practically on the doorstep during weekends and holidays. The work analyzes in particular the wine roads of Fruška Gora, which have always had great potential and an important role in Serbian viticulture. The research focused on the complementarity of wine and religious tourism, with special attention to the production of monastery wines in own economy.

Keywords: wineries, viticulture, monasteries, wine routes, wine and religious tourism

Introduction

Wine tourism, as one of the types of thematic tourism, has experienced significant growth worldwide in the last two decades (Jovanović, 2015; Dogulas et al., 2015). Until recently, there have been relatively few systematic studies in the literature on wine tourism, i.e., on how its development and marketing are managed,

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and on the people who visit wine regions and want to experience the wine tourism product (Carseln, 2004).Contemporary research has confirmed that the foundation of wine tourism is the visitor experience (Alant & Bruwer, 2010; Cho at al., 2014), hedonic needs for pleasure and leisure (Bruwer et al., 2018), from which it follows that quality winery managers must have accurate knowledge of the motivations of potential tourists, as well as information about their lifestyles, attitudes, and shared values (Grybovych et al., 2013).

It is developing most intensively in the famous wine-growing regions of Europe (Joksimović, 2022). Wine tourism continues to grow rapidly worldwide (Muntean & Nistor, 2017), with the top eight wine-producing countries reporting more than 40 million wine tourists (Mintel Group, 2017). Wineries report that, on average globally, 19.5% of their revenue comes from wine tourism (Remenova et al., 2019). The beginnings of wine tourism development can be found in Germany in the late 1920s, when the construction of modern roads and the development of the automotive industry intensified (Deutsches Weininstitut, 2019). The formal beginnings of the development of wine tourism are in the 1950s and 1960s and were characterized by the construction of wine roads and the marking of trails in vineyards. All over the world, interest in wine began to grow, thanks to its popularization through thematic programs on radio and television (UNWTO, 2016; Gomez, Prat & Molina, 2018). At the beginning of this century, wine tourism became a global trend (Sun & Drakeman, 2020). In addition to the very favorable conditions for viticulture, wine production in Serbia is significantly lower than in countries with similar natural conditions (Sekulić et al., 2016). Wine production in our country varies from year to year depending on climatic conditions. For example, in 2022, 30 million liters of wine were imported, while exports amounted to 12 million liters. The data of wine producers registered in the wine register show a lower production, as a certain amount of wine is reserved for own consumption. There are 430 registered wine producers in Serbia, which are market-oriented. Serbia has very favorable natural and other resources to achieve a much larger, more stable, higher quality, structurally more appropriate and more suitable for the market wine production (Petrović et al., 2015).

Wine tourism can be defined from different aspects, with most definitions referring to motivation and experience. According to (Getz & Brown, 2006), wine tourism is defined as a journey associated with the attractions of wineries and wine growing areas through various types of marketing to the wine industry. Hall et al. (2002) define wine tourism as visiting vineyards, wineries, and wine festivals where experiencing the characteristics of the vine is the main motive for visitors. According to O'Neill & Palmer, "wine tourism has evolved over time into a form of special importance to world tourism and is now considered a very important component of the tourism product in many wine-producing countries" (2004, 270). Manila (2012)

defines wine tourism as all activities for tourists in wine producing areas: Visiting wineries, accommodation, restaurants, and activities related to the wine products of the "terroir" and local traditions. In our literature, wine tourism could be defined as a tourist trip that includes visits to vineyards, wineries, wine events and wine exhibitions, with the main motive of wine tasting, experiencing the wine growing region and enjoying the locally produced food and specialties of the region (Pivac, 2012).

As wine tours are combined with the cultural and historical sites of the region, wine tourism and religious tourism complement each other (Alant & Bruwer, 2010). In contrast to the numerous definitions for wine tourism, there is no clearly defined definition for religious tourism in the scientific literature (Radović, 2017). From several interpretations and explanations of this term (Stamenković, 2006; Šećibović, 1995), it appears that religious tourism is one of the oldest forms of travel by people, with the aim of visiting a specific shrine, for the purpose of pilgrimage. According to Krstić, the main segment of religious tourism consists of the faithful who, while travelling to monasteries, "live a completely Christian life for those few days and consider this as a compensation for all the faults in the other days of their daily life" (2012, 170). In the 18 destinations defined in the Strategy for the Development of Tourism in the Republic of Serbia 2016-2026, monasteries as the backbone of religious tourism development are mentioned only in a small number of the listed attractions for each of the destinations (MTTT RS, 2016). In most cases, after visiting monasteries, tourists leave without staying long, precisely because of the lack of accompanying facilities. The fact is that these accompanying costs should be in contradiction with the modern life in the cities (Ćirić, 2010).

Viticulture has a long tradition on the territory of Serbia (Sekulić et al., 2016). The roots of viticulture date back to the Roman Emperor Probus, who in 232 allowed viticulture outside the territory of present-day Italy (Marco-Navaro, Pedraja-Iglesias, 2010). Since vineyards are a feature of the rural environment, this would be an ideal opportunity for complementary development of wine and religious tourism (Simišić, 2021). According to Joksimović (2022), winegrowers in rural areas are among the most important subjects of wine tourism. Apart from them, monasteries have always been great producers, but also consumers of wine. Great importance was attached to this beverage in both spiritual and secular life. The inseparable connection between viticulture and monasteries in Serbia is also shown by the fact that in the areas where most monasteries were present, there are also the largest and best vineyards, i.e. wine-growing areas. This is the case with the Fruška Gora wine-growing region, which is also the subject of study in this paper. The Fruška Gora wine region dates back to the time of Marcus Aurelius Probus, who planted the first vines in this area (Rabotić, 2012). Over the centuries, monks from Champagne came to this region and brought their own varieties. The period of Turkish rule is characterized by stagnation in the

development of viticulture and wine production (Terzić & Spahić, 2021). The aim of the paper is to present, through comparative analysis and research, the possibilities and prospects of the combined development of wine and religious tourism using the example of the Fruška Gora wine region.

Material and methods

Study area

On the territory of Serbia, according to the data from 2022, there are 18 wine regions (https://www.vino.rs/vinarije.html). The wineries of Fruška Gora are located in the Srem wine region, which covers an area of 86,715 ha. In terms of the number of registered wineries, this is the largest wine region in Serbia. According to the Tourism Organization of Serbia from 2021, there were over 100 wineries here. The vineyards of the Srem region are located on the slopes of Fruška Gora, bordering the Danube to the north and the Sava River to the south. The wineries of the Srem region are located in rural areas and the production is mainly focused on white wines. Wine growing was already practiced by the Romans on the gentle slopes of Fruška Gora. During the reign of Emperor Probus, vineyards were allowed to be planted in the Roman provinces. In the 18th century, the Renaissance personality Zaharija Orfelin, author of specialized literature on viticulture, claimed that the wines of Fruška Gora were not inferior in quality to the best Italian wines (Pivac, 2008). With the development of vineyards, grape varieties were also improved, modern wine cellars were built and experts were trained to produce quality wines. Among the best wines of Fruška Gora are Karlovac and monastery wines. Sremski Karlovci is considered the center of wine production in Fruška Gora. One of the oldest and most famous wine cellars in Serbia is located in this climate, namely Mozer's Cellar from 1848 (Josipović et al., 2020).

Sacral buildings, especially monasteries, were important for the development of viticulture in the Fruška Gora region. Most of them are concentrated in one place here in Serbia, which is why Fruška Gora is popularly called the "little Serbian Holy Mountain" Since this area is well connected by transport, it is ideal for combining wine and religious tourism (Živković et al., 2022). Visitors are offered the opportunity to combine a visit to wineries with a tour of the complex of Orthodox monasteries, churches and other famous buildings. The monasteries Kovilj, Novo Hopovo and Vrdnik (Ravanica) are located near the wine house "Kovačević" in Irig. The wine house "Deurić" is located near the monastery Mala Remeta. The monasteries Šišatovac, Petkovica and Divča are located near the wineries "Banoštor" and

"Erdevik". The monastery wines are mostly produced in a traditional way, without excessive use of chemical means in the cultivation of vines and without technological processing in the wine production, which is why they carry a wild note of strong and lively wines. These wines serve the economic independence of the monastery and, in addition to commercial sales to tourists, are used mainly for communion and liturgy. It is paradoxical but true that the highest quality monastic wine of the Fruška Gora vineyard, produced in the Fenek monastery, is called "Metohija wine barik". The fact that the labels of the wines with Fruška Gora origin are of exceptional quality was also proven by the prestigious award that came from Italy last year. At the Emozioni dal Mondo competition, held in the city of Bergamo on October 16, 2022, with the participation of wineries from 30 countries around the world, the Srem winery "Probus" won the double gold medal for the wine Magis 2017 in an extremely strong competition. This wine, by the way, is a blend of Cabernet Sauvignon, Merlot and Vranac, which has already won a significant medal at the Asia Wine Trophy 2019 (www.vino.rs).

Methodology

The main research tool in this work is the interview method conducted by the authors of this work among the participants of the first major wine route realized on July 18, 2022 on Fruška Gora. The host of this event was the young family winery "Verkat" from Čerević, founded in 2018, and the organizer of this event is the association of wine lovers "Dionysus Experience" from Belgrade. Their mission is to gather in the so-called "divine adventure" all wine and hiking lovers, offering them a hike in the wine-growing areas of Serbia, combined with wine tasting and getting to know the natural and cultural features of the area, a lot of fun outside the neighborhoods (https://dionysusexperience.com/). The research involved 40 people, 36 of whom were participants of the wine route, while four respondents are owners of the most famous wineries in Fruška Gora. The questionnaire consists of three parts:

- the first one, related to the socio-demographic characteristics of the Wine Route participants (Table 1);
- the second part contained several questions also addressed to the tourists, concerning their views on the offer of the wineries in the Srem region, the reasons for deciding to participate in the Wine Route, the type of information about the Wine Route, the importance of the wineries' offer segments for the overall local experience, and the visitors' interest in participating in the next Wine Routes in Serbia. One question related to the study of the views of the participants of the Wine Route on whether their stay in Srem includes only a visit to the winery and wine tasting with entertainment with other participants of the event, or whether

it also includes a visit to the sacred objects of Fruška Gora, then the number of days of stay, the type of accommodation they choose when they stay overnight, the company with which they visit the wineries and the means of transportation they use for the trip.

- the third, which refers to questions intended for the owners of the wineries, namely their views on the importance of certain product characteristics for the image and reputation of the wineries, on the importance of the wine routes for the promotion of wine and the increase of sales, on the existence of catering and accommodation facilities in the wineries, on the most consumed types of wine by color and quality.

When studying the importance of wine tourism for the overall development of tourism in Serbia and especially in the Fruška Gora region, the approach of comparative analysis was used. That is, the individual segments of wine tourism offer and marketing activities for the visitors of the wineries and participants of the first realized wine route on the one hand and the winery owners and wine producers on the other hand are presented. The methodological approach in this work consists primarily in determining the characteristics and peculiarities of wine tourism, analyzing the offer of wineries in the Fruška Gora region and the importance of marketing for the development of this type of tourism, as well as defining its advantages and disadvantages in the form of an SWOT analysis (Table 2).

Results and Discussion

Based on the results of the interviews from the area of the first mass wine route on Fruška Gora, obtained from interviews with winery owners, i.e. promoters of the development of wine tourism, three levels of facilities can be distinguished:

- the first level are private, family wineries that offer wine for tasting or in smaller quantities bottled for sale;
- the second level are private wineries that offer the same, but in addition to tasting, can offer tourists smaller accommodation (bed & breakfast);
- the third level are the federations, i.e. the associations of wine producers. Their activities include joint promotion and joint projects, with which they apply to development funds to obtain certain benefits for their work. One of their current initiatives is the organization of wine routes, which are discussed in this paper. This networking of wine producers is necessary for a joint appearance on the tourist market, the introduction of new technologies and the orientation of the tourist offer.

The experience of the wine producers shows that the tourists who are most interested in the wine and food of the region they visit participate the most in the cultural program of the route, which certainly multiplies consumption. In their opinion, the profile of the modern wine tourist is such that he usually needs accommodation with breakfast, a restaurant with local cuisine, a resort and a terrace overlooking the vineyard. These accompanying services are certainly a way to generate additional revenue for the winery hosting the route, which certainly gives it significant market advantages over the competition.

Since the tourist's income is one of the decisive factors for wine consumption, the offer is therefore mainly aimed at wine tourists with high incomes (Joksimović, 2022). They require a high level of gastronomic services and well-designed wine routes with oenologically trained tourism and hospitality staff (Dodd & Beverland, 2001). These conditions do not leave room for strategic planning of wine tourism in Serbia, considering that our wineries are still in the pioneering stage of their development and that their visitors are mainly domestic tourists. Today's challenges in the tourism market have ushered in a new era, with numerous changes in supply and demand, both on a global and national level.

Figure 1. The wineyards of the "Verkat" (left) and part of participants of the first wine route on Fruška Gora, june 2022 (photo: D. Nedić - organizer)

The survey was conducted in July 2022. Of the total number of respondents, the percentage of men (52.8%) is slightly higher than that of women (47.2%).

Looking at the age structure, the largest share of respondents is between 25 and 44 years old (66.3%), followed by respondents between 45and 55 years old (22.2%). The smallest percentage is accounted for by people older than 55 and younger than 25 (5.6%). In terms of educational structure, the largest number of respondents has a college degree (52.8%), while those with a high school diploma account for 27.8% and those with a secondary school diploma account for 19.4% of the sample (Table 1).

As the main motive of the trip, they mention visiting wineries (38.9%), tasting wine and learning about the process of wine production, packaging and storage, and buying wine directly from the producer (27.8%). In addition to enjoying wine, wine route enthusiasts also emphasize the educational aspect of the trip as a secondary motive. This means, first of all, a quality time spent in the natural environment, with getting to know the cultural and religious objects of the visited region (5.6%), through rest and relaxation (19.4%). The shortcoming mentioned is the lack of a sufficient number of accommodations that could host such major wine tours, that is why not at night (75%).

When analysing the answers to the question of how they found out about the Wine Route, it turned out that it was the recommendation of a friend to spend the weekend in a natural environment (55.6%), and that they received the information about the Wine Route through the existing social networks (30.6%). In a conversation about the interest of visitors to participate in wine routes in other regions of Serbia, we received a positive assessment. In this context, only three months after the Fruška Gora wine route, at the beginning of October of the current year, the same association "Dionysus Experience" introduced participants to the still undiscovered wine region of Central Serbia. Namely, about a hundred participants, after a three-hour hike in the mountainous regions of the Venčac Mountains, enjoyed the vineyards of the winery "Tarpoš" near Orašac with a Dionysian tasting and entertainment.

Table 1. Socio-demographic characteristics of the participants of the Fruška Gora wine route

		□	%
Gender	Male	19	52,8
	Female	17	47,2
Age	<25	2	5,6
	25-34	11	30,6
	35-44	13	36,1
	45-55	8	22,2
	>55	2	5,6
Education	Secondary school	7	19,4
	High school	10	27,8
	University degree	19	52,8
Revenues	<50.000	0	0,0
	50.000-100.000	7	19,4
	100.000-150.000	14	38,9
	>150.000	15	41,7
Reason for visit	Visit wineries	14	38,9
	Tasting and buying wine	10	27,8
	Recreation and relaxation	7	19,4
	Visit to sacred object	2	5,6
	Tasting local food	2	5,6
	Family time	1	2,8
Duration of visit	No overnight stay	27	75,0
	1-3 days	9	25,0
	>3 days	0	0,0
Way of informing	Recommendation	20	55,6
	Facebook, Instagram	11	30,6
	Website of wineries	5	13,9
	Youtube	0	0,0
Type of accommodation	Hotel	10	27,8
	Apartment	24	66,7
	At cousin	2	5,6
Type of transportation	Bus	6	16,7
	Car	19	52,8
	Motorcycle	11	30,6

Source: Authors research

Table 2. SWOT of wine tourism in Srem wine region

S (Strengths)	W (Weaknesses)
- Favorable traffic possition - Rich cultural and historical heritage of immediate enviroment - Proximity to big cities - Traditional and gastronomic specialties - Close to the Danube - Indigenous grape varieties - A lot of number manifestations dedicated to wine - Indications of geographic origin of wineries - Hospitality of the service provider	- Not interesed travel agencies in the develoment of wine tourism - Insufficient promotion of wine tourism in the Srem region - Not uniform offer in wineries - Unrealistic high pricies for wines - Orientation to the domestic market
O (Opportunities)	**T (Threats)**
- Connecting wine and religious tourism at Fruška Gora - New development plans at the national level - Greater openness and presence on the foreign wine market - Investment in promotion - Cooperations with travel agencies - Educations of winemakers of marketing field - Connecting wine and river tourism using the Danube - Wine sales through foreign tourists who visit wineries	- Pandemic COVID-19 - Economic crisis - Competention from neighboring countries (Hungary, Croatia) - Weak investment in the road infrastructure (bad local roads toc wineares) - Orientation to travel agencies on more profitable types of tourism (e.g. city tourism)

From all this we can conclude that wine tourism in Serbia is much more than visiting wineries and wine cellars. This form of tourism allows the participants of the wine routes to get acquainted with the culture and traditions of the visited wine region, in addition to wine tasting. Winery owners are advised to adjust their accommodation capacities to their business objectives. This opportunity could also be used for other additional facilities, such as tasting rooms for organized wine routes. The alignment of the offer with the standards existing in the European Union market is a priority direction for the development and improvement of wine tourism in our country.

Conclusion

One of the conclusions of this research is that wine tourism, as a relatively young branch of the tourist offer, has excellent potential for improving the overall tourist offer in Serbia. The limiting factor for its development has turned out to be

the fact that marketing opportunities are not yet sufficiently used by winery owners. This can become a threat to the survival and development of a form of tourism that is still pioneering in our country. For this reason, one of the priority directions for improving wine tourism in Serbia, including in the Srem wine region, should be proper training of personnel. This means a higher level of training for guiding wine routes and their connection with monastery visits. This requires a better knowledge of the structure of wine tourists, which would certainly help to achieve the desired position in the tourism market. The elaboration of a unique marketing plan by the wineries and other subjects involved in wine tourism is one of the first steps to improve the development of this type of tourism in Srem. Since the travel agencies are one of the most important links between the consumers (tourists) and the producers (winegrowers), they must be additionally motivated to properly promote wine tourism.

From the research results it can be concluded that the area of Fruška Gora is very rich both in terms of wine and religion. In a relatively small area, there are over 100 family wineries and wine cellars, which, together with the 16 preserved monasteries, represent a good potential for the complementary development of wine and religious tourism. The selected grape varieties grown here provide the raw material for the production of all types of wine. The quality of Fruška Gora wines has been confirmed by numerous awards received by local winemakers at prestigious wine fairs. Another advantage is the fact that this region is very easily accessible from all directions, as international road and rail connections of international importance pass through its borders. This was also a decisive factor in offering potential tourists several wine routes, where they can combine visits to wineries and sacred buildings. It is a fact that monastery complexes are increasingly used for tourist purposes mainly because of their beauty and artistic value. Since wine tourism in Serbia is still in the initial stage of development, it is necessary to use the positive experience of neighbouring countries in some further strategies, but also to additionally motivate tourism agencies to include a combination of wine and religious tourism in their programs.

In today's world, where digital technologies have developed significantly, it has been shown that the activities carried out by consumers of tourist services after the trip, such as the use of social networks (Facebook, Instagram, Twitter) to share photos and videos with friends, have a decisive impact on the visit to these places. Based on the finding of the importance of promotion for the development of wine tourism, one of the recommendations for winemakers and other establishments is to improve promotion through social networks. The research has shown that wine tourists make extensive use of smart devices and applications, as well as the opinions of bloggers (wine gurus), when identifying and selecting new wine routes.

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SERBIA AND THE BALKANS ON THE OLD GEOGRAPHICAL MAPS OF EUROPEAN CARTOGRAPHERS FROM THE 2ND TO THE 20TH CENTURY BY THE AUTHOR MIRKO GRČIĆ, LJILJANA GRČIĆ

- Book review -

Mira Mandić[1]

The geographical-scientific public is enriched by a complex and extensive scientific work (720 pages) of exceptional technical and graphic-illustrative design, characterized by high-quality encyclopedic editions. This extensive and diligent work is a kind of temporal evolution of cartography, but also a spatio-temporal analysis of the historical-geographical development of the Balkan Peninsula, presented through faximiles of 260 maps and their parts and 74 photographs selected from European and other libraries and archives. Carefully extracted were the works of the well-known maps by representatives of the most famous schools of cartography from antiquity to modern times, which depicted the Balkan Peninsula and Serbia on their maps.

Mirko Grčić and Ljiljana Grčić again before the readers and the scientific public amounts to interesting scientific reading, for the presentation of which several years of studio work on archival research of documentation of cartographic and other materials, especially historical-geographical character, was necessary. Decades of scientific experience of the authors have enabled a complex presentation of 18 centuries of the history of the Balkan Peninsula through the selection of maps, some of which are rights artificial works. Interpretations of the historical context of the maps, their symbolic elements and purposes required, as well as the knowledge of cartography, as a historical and political context of the maps in a particular time. Thus, the book before us is a kind of cross-section of geographic-historical and cultural development, political history, demographic, economic and other occasions in the Balkan Peninsula and its links with the rest of the world. The incorporation of extensive material facilitates the thematic consolidation in 12 chapters: theoretical-

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methodological introduction to the interpretation of ancient geographical maps; Geographical ideas about the Balkans in antiquity; Geographical ideas about Serbia and the Balkans in Arab maps in the Middle Ages; Serbia and the Balkans on medieval monastic maps of the world; Serbia and the Balkans on medieval portolan and other maps; Serbia and the Balkans on military-themed maps from the XV-XVI century; Serbia and the Balkans on geographical maps from the Renaissance period; Serbia and the Balkans on geographical maps from the 17th century. Serbia and the Balkans on geographical maps from the 18th century; Serbia and the Balkan Peninsula on geographical maps in the XIX and the beginning of the 20th century; Geographical maps of Serbian geographers in the XVIII - XIX century and geographical maps of Serbian cartographers at the end of the XIX and in the first half of the 20th century.

In conclusion, the authors point out that the Balkan region, including Serbia, is depicted as an integral part of the European cultural and geopolitical space on all maps from II until the 20th century. Kosovo and Metohija were always depicted as part of Serbian territory. The overview of selected maps forms the basis for future studies not only for geographers and historians, but also for other readers interested in social sciences on the historical-geographical, political and territorial development, as well as on the changes in the natural and cultural landscape of the Balkan Peninsula. The volume and relevance of the literature and sources used (902 bibliographic units) speak for a professional and sound approach to the topics studied. Easy to navigate in extensive maps and documentary material, the analysis and partial use of which at the end of the book provides a map index, the geographical terms and the index of names. The authors have not overlooked any aspect in facilitating the cartographic content, understanding the historical context of a map, components of geospotal and their purposes to the relevant sources, easier to find the desired time, cartographer or toponym. Before the eyes of the reader takes place the development of geographical maps from vješina to science. The complex political and cultural changes of the geographical space in the multi-layered historical-geographical development is presented in a textual analysis, which explains the cartographic and pictorial representation.

With this historical time history through the geo-space of the Balkan Peninsula, the readers were led through the actions of 366 cartographers since the first attempt of mapping the Balkan Peninsula in ancient times (Ptolomey) to the first survey of the Serbian cartographers. The analysed maps were presented from representatives of the known maps from Venice, Genoa, Rome, Antwerp, Amsterdam, London, Paris, Nurnberg, and Vienna to the Arabic, Russian and Serbian cartographies. The development of Serbian cartography is traced from the first original Serbian map "Grunt Monastery Orfelina", which dates back to the 18th century, through cadastral and geodetic surfaces in the second half of the 19th century to the first survey of

the Military Geographical Institute in Belgrade. The review of the development of Serbian cartography ends with the development of thematic cartography in the Kingdom of Yugoslavia, Jovan Cvijić and his collaborators, including the Department of Geography, from which the Faculty of Geography of the University of Belgrade emerged. The comparison of the Balkan area and the maps of Serbia shows the geopolitical importance of this area, the emergence and disappearance of individual states, the interpenetration of various political and cultural influences. The continuity of the population and the complexity of the processes of assertion are reflected in the toponymy of the space.

The authors deconstruct the context of the maps on display, but as they note its hidden messages, "so the reader recalls that the map presented complex and looks for content and messages that are present and a careful observer visible". The book "Serbia and the Balkans on the old geographical maps of European cartographers" Mirko and Ljiljana Grčić is a kind of journal of the past for researchers, both individual aspects of the historical development of space and the development of cartographic knowledge and opportunities in the cartographic knowledge and opportunities in the era Modern technologies give a new phase of development and application.

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