

# The Impact of Tourism and Urban Growth on the Sustainable Development in the Kopaonik National Park

*Biljana PEJIC<sup>1\*</sup> and Miroljub MILINCIC<sup>2</sup>*

**Authors' affiliations and addresses:**

<sup>1</sup> Faculty of geography, Belgrade, Studentski trg  
e-mail: biljapejic872@gmail.com

<sup>2</sup> Faculty of geography, Belgrade, Studentski trg  
e-mail: miroljub.milincic@gef.bg.ac.rs

**\*Correspondence:**

Biljana Pejic, Faculty of geography, Belgrade,  
Studentski trg  
e-mail: biljapejic872@gmail.com

**How to cite this article:**

Pejic, B. and Milincic, M. (2024). The Impact of Tourism and Urban Growth on the Sustainable Development in the Kopaonik National Park. *Acta Montanistica Slovaca*, Volume 29 (4), 895-907

**DOI:**

<https://doi.org/10.46544/AMS.v29i4.09>

**Abstract**

This paper investigates the problem of rapid urbanization and uncontrolled construction on Kopaonik mountain in Serbia. Kopaonik is known for its natural beauty and winter sports attractions, but in recent years, it has experienced a significant increase in urbanization. The paper analyzes the current state of urbanization in Kopaonik, including the increase in the number of building permits, the number of built buildings, and the increase in tourist capacities. Environmental challenges and infrastructural problems arising from rapid urbanization are also discussed. This paper also explores the dilemmas between the economic benefit brought by tourism and the need to preserve nature. The author investigates the views and concerns of citizens regarding urbanization through a survey. The survey results provide insight into different perspectives and dilemmas regarding this topic. Also, the role of the Kopaonik National Park and local authorities in controlling urbanization is considered. Kopaonik National Park emphasizes the need to stop further construction to preserve nature, while the local self-government of the municipality of Raška advocates controlled urbanization that will support the region's economic development. Through this analysis, the paper explores the key aspects of urbanization in Kopaonik, providing insight into the complexity of the challenges and the need for a balance between economic benefit and nature conservation in this beautiful mountain area.

**Keywords**

Kopaonik, urbanization, environmental challenges, tourism, nature conservation.



© 2024 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

## Introduction

The relationship between urban growth and environmental preservation has been extensively studied in various global contexts. However, the unique dynamics present in Kopaonik, Serbia, necessitate a focused literature review to understand the specific challenges and implications of urbanization in this mountainous region. This review aims to synthesize existing research on the topic, identify gaps in the literature, and provide a foundation for further investigation into sustainable development strategies for Kopaonik. Urbanization is often accompanied by significant environmental challenges, including habitat destruction, biodiversity loss, and increased pollution (Bennett et al., 1999). Studies worldwide highlight the trade-offs between economic development and environmental sustainability. For instance, research in the Swiss Alps demonstrates the adverse effects of tourism-driven construction on local ecosystems, including soil erosion and habitat fragmentation (Keller et al., 2000). Similar patterns are observed in mountainous regions of Italy and Austria, where the balance between tourism development and environmental conservation remains a contentious issue (Bätzing, 2015). In Serbia, urban growth has been a critical driver of economic development, particularly in regions with significant tourism potential, like Kopaonik. However, the environmental consequences of this growth are becoming increasingly apparent. Studies on urban expansion in Serbia generally focus on major cities such as Belgrade and Novi Sad (Kostić et al., 2018), with limited research specifically addressing mountainous areas. Kopaonik, the largest mountain massif in Serbia, as shown in Figure 1, is a prime example of the tension between urban development and environmental preservation. The mountain's rich biodiversity, including numerous endemic species, makes it an ecologically significant area. However, the surge in tourism has led to extensive construction activities, resulting in habitat destruction and biodiversity loss (Marković, 2023). Tourism is the primary driver of urban growth in Kopaonik. The mountain's ski slopes and natural beauty attract thousands of visitors annually, necessitating the development of hotels, apartments, and other infrastructure. While economically beneficial, this development poses a significant threat to the mountain's ecological integrity. Research by Kostić (2018) highlights the environmental impacts of tourism infrastructure, including soil erosion, water pollution, and landscape alteration. Urban growth in Kopaonik also has social and economic dimensions. While tourism development creates jobs and stimulates local economies, it can also lead to social displacement and increased living costs for local communities (Milićević et al., 2019). Furthermore, the seasonal nature of tourism can result in economic instability, with peaks during the winter and summer months and downturns in between. The Serbian government has implemented various policies to regulate urban growth and preserve natural resources. However, enforcement remains a challenge, particularly in regions with high economic stakes like Kopaonik. Studies indicate that existing regulations are often inadequately enforced, leading to unchecked construction and environmental degradation (Bošković, 2019). Despite the growing body of research on urbanization and environmental impact in Serbia, specific studies focusing on Kopaonik are limited. There is a need for comprehensive research that integrates ecological, social, and economic perspectives to understand the full scope of urban growth impacts on the mountain. Additionally, there is a gap in the literature regarding the long-term monitoring of environmental changes in Kopaonik, which is crucial for developing sustainable development strategies. Addressing these challenges requires a multi-faceted approach that considers the complex interplay between urbanization, environmental sustainability, and socio-economic factors. This study aims to contribute to this understanding by providing a detailed analysis of the current state of urbanization in Kopaonik, its drivers, impacts, and potential strategies for achieving a balance between development and conservation.

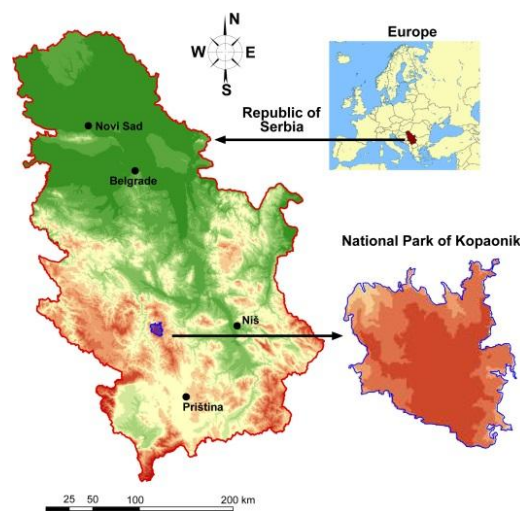


Fig. 1. Location of Kopaonik

### The Current State of Urbanization on Kopaonik

Kopaonik mountain, known for its natural beauty and winter sports attractions, has experienced a significant increase in urbanization in recent years (Taubenböck et al., 2019).

The growth in the number of buildings on Kopaonik represents a significant trend noticeable during 2018-2023. Data indicate a continuous increase in tourist infrastructure on this mountain, including hotels, apartments, and other accommodation facilities.

According to information from the Republic Institute of Statistics, a significant number of building permits issued in the municipalities covering the Kopaonik area were recorded. In May 2023, out of a total of 2,221 building permits issued in the territory of the municipality of Raška (including Kopaonik), as many as 81.8% were issued for new construction. These data indicate great construction potential and interest in investing in tourist infrastructure in this area. Over the past five years, the number of buildings built on Kopaonik has increased by 35%. This growth includes hotels, apartments, cottages, and other tourist accommodation. Currently, there are a total of 1,275 tourist accommodation facilities in Kopaonik (Stat, 2023).

On the contrary, the image shows a construction site on Pančić's Peak on Mount Kopaonik. The picture captures the erection of a building with a metal framework and a roof under construction. A concrete pump truck is present, delivering concrete, while workers are engaged in various tasks. In the background, construction materials such as bricks and sand, along with several temporary containers and vehicles, are visible. The building being constructed on Pančić's Peak violates the conditions set by the Republic Institute for Nature Protection and significantly exceeds the approved dimensions. The inspection ordered the demolition only after BIRN (Balkan Investigative Reporting Network) requested documentation from the Ministry of Construction. This case highlights issues with regulation and enforcement of environmental protection laws on Kopaonik, underscoring the need for greater transparency and stricter oversight of construction activities in the area.



Fig. 2. Illegal construction activities on Kopaonik

Most of them were built, and are currently being built, in tourist centers located along the border of the Kopaonik National Park, such as TC Brzeće (Brus municipality) and TC Vikend naselje (Raška municipality). The total capacity of these "sub" tourist centers already exceeds the accommodation capacity in Kopaonik itself. This accelerated growth of urbanization can be explained by the high price per square meter achieved by the sale of apartments and the increased interest during the winter tourist season (Raska, 2023).

It is important to note that facilities within the borders of the Kopaonik National Park are built with permits issued by the relevant ministries, specifically the Ministry of Construction, Transport and Infrastructure. This ensures the legality of construction, although the accelerated pace of urbanization within the protected area can have a negative impact on the natural environment, primarily through water and land pollution. In its Management Plan for 2020-2029, Kopaonik National Park emphasized the need to consider banning further construction, except for investment maintenance of already built facilities (NPKopaonik, 2023).

Although most facilities are built with permits, there is a problem of construction without permits in the form of temporary ski buffets. This has been the only major problem regarding construction without permits in recent years, with Kopaonik National Park regularly reporting to the Republic Building Inspection and competent inspectors in accordance with the law (Gradjevinska, 2023).

When it comes to construction outside the boundaries of the Kopaonik National Park, permits are issued by the municipalities of Brus and Raška. In the municipality of Raška, for example, a significant number of building permits were issued during 2023. While some buildings are built without permits, the building inspection issues a certain number of criminal reports and other legally prescribed administrative measures to ensure the legality of the construction (Bruce, 2023).

Despite the rapid growth of urbanization, there are plans to improve the infrastructure, including the reconstruction of the sewage network in the center of Kopaonik. The project is expected to be financed by the

Ministry of Environmental Protection and includes the construction of a wastewater treatment plant and a sewage network in the wider area of Kopaonik, which will solve long-standing environmental problems caused by urbanization (Ministry of Environmental Protection, 2023).

Regarding the tourism capacity of Kopaonik, we have noticed significant growth over the past years. Kopaonik mountain is becoming an increasingly popular destination for both winter and summer tourism, which has resulted in an increase in the capacity for tourist accommodation and accompanying services. The number of available beds in Kopaonik is increasing to meet the needs of the growing number of visitors. The total number of available beds on the mountain increased by 42% in the same five-year period. There are 15,500 beds in different accommodation units (Stat, 2023). Also, more and more hotels, apartments, and other tourist facilities have been built to offer a variety of accommodation options. In addition, the capacities of restaurants, cafes, and other catering establishments were expanded in order to meet the demands of tourists for food and drinks. This increase in tourist capacities indicates a continuous investment in the tourist infrastructure on Kopaonik, which attracts visitors and gives them a better experience of being on the mountain. These capacities represent an important economic factor for the region and contribute to developing tourism in Kopaonik (Raska 2, 2023).

Urbanization trends in Kopaonik show a significant growth in construction activities. Over the past years, the number of building permits issued has increased dramatically, indicating the mountain's accelerated urbanization. These data reflect a significant increase in the number of new facilities, including hotels, apartments and other tourist accommodation facilities (Svet, 2023).

In addition to the growth in the number of construction permits (an average annual increase in the number of buildings of 7% in the last five years), reservations (reservations increased by 15%) and tourist visits are also on the rise in Kopaonik. This increased visitation testifies to the growing popularity of the mountain as a tourist destination. Tourists are increasing in numbers, which further boosts the demand for accommodation and related services (the number of tourists visiting Kopaonik increased by 12% every year) (Stat, 2023).

The growth of urbanization is also reflected in changes in real estate prices. The prices of apartments, apartments, and houses in Kopaonik are on the rise, which indicates the economic implications of increased urbanization. These data follow trends in the growing tourism sector. (Stat, 2023).

In parallel with the construction of accommodation facilities, investments are also being made to improve the tourist infrastructure. The construction of new ski slopes, restaurants, shops, and entertainment facilities indicates continuous investment in the tourist offer of the mountain (Kopaonikonline, 2022).

However, this rapid growth in urbanization also raises questions about environmental impacts. Increasing the number of buildings can have negative effects on the natural environment, including water and land pollution. Therefore, balancing development with nature conservation and sustainable tourism in Kopaonik is important. Another paper argues that climate change is a primary concern for sustainable tourism, affecting both the environment and the viability of tourism destinations. It calls for integrating climate change mitigation and adaptation strategies into tourism planning and policy to enhance resilience and sustainability (Hall et al., 2013). An article critiques the gap between sustainable tourism research and its practical implementation. It suggests that while sustainable tourism concepts are well-researched, their application in real-world scenarios often falls short, necessitating more practical and enforceable measures (Buckley, 2012).

### **Materials and methods**

In order to analyze the results of the research on urbanization on Kopaonik, a hypothesis was formulated that reads: "There is a statistically significant relationship between the perception of the level of urbanization on Kopaonik mountain and the views of respondents on its impact on sustainable development and protection of the natural environment." This means that researchers can hypothetically assume a connection between respondents' perceptions of the current level of urbanization in Kopaonik and their opinions on its impact on various aspects of sustainable development and the natural environment. The hypothesis would be tested using statistical methods and data analysis to confirm or disprove it.

As part of this research, several scientific methods were applied to comprehensively study the issue of accelerated urban growth on the Kopaonik mountain. These methods were fundamental to generating reliable and relevant results.

The first key method in this research included surveys that were distributed to local residents of Kopaonik mountain. In this way, people's opinions, attitudes, and experiences related to urban growth and construction in that area were collected.

For a deeper understanding of ecological aspects, ecological research has been conducted to assess the impacts of urban growth on the natural world.

Furthermore, sociological research has dealt with the social consequences of urban growth, including issues related to social cohesion, quality of life, and changes in society.

It is important to note that qualitative analysis was used to understand complex contextual phenomena and that the results were compared with findings from other mountain areas to gain a deeper perspective. The results

of a qualitative analysis of urban growth on the Kopaonik mountain were compared with the findings of similar research on the Tara mountain in Serbia. Research on Mount Kopaonik shows signs of faster urban growth compared to Mount Tara, where a greater number of new construction projects and changes in land use have been observed on Kopaonik in the last 5 years. When it comes to the impact on the environment, urbanization has had a greater impact on Kopaonik, including potential problems such as deforestation, soil erosion, and threats to biodiversity. Comparisons with Mount Tara also point to differences in urban growth management strategies and policies. For example, policies on Kopaonik are less restrictive or less focused on preserving the natural environment compared to Tara. Based on the comparison with other mountains in Serbia, there is a greater need for intervention in the field of nature conservation, regulation of urban growth, or policy changes on Kopaonik mountain.

The aforementioned methods were an integral part of the research to gain a comprehensive insight into the problem of accelerated urban growth on the Kopaonik mountain and make relevant conclusions and recommendations for solving that problem.

## Results

### *Survey results*

The research included 400 respondents in Serbia during the period from October 25, 2023, to November 5, 2023. The data was collected through a questionnaire designed according to the research model on the impact of urbanization on sustainable development, inspired by the Sustainable Development Goals Agenda for 2030 and the Natura 2000 program. The questionnaire contained questions and statements prepared by experts for the respondents. The research aimed to investigate the relationship between the perception of the level of urbanization on Kopaonik mountain, which is defined as an independent variable, and the respondents' views on the impact of urbanization on sustainable development and protection of the natural environment, which represents the dependent variable. The independent variable, the perception of the level of urbanization in Kopaonik, was measured through 20 questions in the survey questionnaire, while the respondents' answers represented the data for analysis. On the other hand, the dependent variable, respondents' views on the impact of urbanization on sustainable development and protection of the natural environment, represented a measure that depends on the perception of urbanization. By analyzing this data and applying statistical methods, the researcher tried to identify and quantify possible connections between the way respondents perceive urbanization on Kopaonik and their views on sustainable development and protection of the natural environment. These results are then presented and interpreted in order to draw conclusions about the impact of urbanization on the perception and attitudes of the respondents.

Data preparation and processing for statistical analysis were performed in MS Excel 2016, while IBM SPSS Statistics v25.0 was used for analysis. The obtained data are presented tabularly and graphically. On a given sample, each provided ratings using a scale of 1 to 5 (where 1 indicates the most pessimistic and 5 indicates the most optimistic). A total of 20 questions were asked to respondents, and the data was collected over a period of seven days. Each question measured respondents' perception of the level of urbanization on Kopaonik mountain and their views on the impact of urbanization on sustainable development and protection of the natural environment.

The types of questions included in the survey were predominantly close-ended, utilizing Likert scale ratings (where 1 indicates the most pessimistic ratings and 5 indicates the most optimistic ratings) to measure respondents' perceptions and attitudes. All 400 participants' questionnaires were included in the analysis. Any incomplete questionnaires were excluded from the research to ensure data quality and reliability. A pilot survey was not conducted for this study. However, conducting a pilot survey could be beneficial in future research to refine the questionnaire, identify potential issues, and ensure the clarity and effectiveness of the questions.

The analysis of the survey results on urbanization in Kopaonik provides insight into the different attitudes and concerns among the respondents regarding this topic. When it comes to the level of urbanization on the mountain, 30% of respondents consider it low or very low, while 30% see the current level as medium. Regarding the impact of rapid urbanization on sustainable development, opinions are divided – 55% believe it has a negative impact (25% very negative, 30% negative), while 20% remain neutral on this issue.

The negative impacts of urbanization on nature, the environment, and biodiversity were also highlighted in the survey, with 65% of respondents seeing this impact as problematic. This includes 30% who expressed a "very negative" opinion, while 35% chose the "negative" option.

As for citizens' support for stricter construction regulations, there is a division among respondents. While 30% provide high support, 35% express low or very low support. Also, a larger number of respondents (55%) believe that urbanization contributes to economic development, with 30% choosing the option "positive" and 25% "very positive". However, 30% of respondents are not sure about this impact.

Concern about the loss of the natural environment on Kopaonik is high, with 65% of respondents expressing concern. This includes 30% "very concerned" and 35% "fairly concerned" respondents. Only 20% of respondents are not concerned or are neutral on this issue.

When it comes to the adequacy of laws and regulations, approximately 45% of respondents believe that they are inadequate, while 45% believe that they are good enough. Regarding support for greater transparency and public involvement in urban development planning, a third of respondents (30%) support this initiative, while 35% express low or very low support.

Furthermore, the majority of respondents (55%) believe that the current efforts to preserve nature and biodiversity in Kopaonik are inadequate. This includes 30% "very inadequate" and 25% "inadequate". As for cooperation with international partners, 45% of respondents are not positive about this type of cooperation, while 45% believe that it could improve the sustainability of development on Kopaonik.

In Figure 3, only the negative responses from the survey were considered in this analysis. This does not imply that there were no positive responses, although they were in smaller percentages.

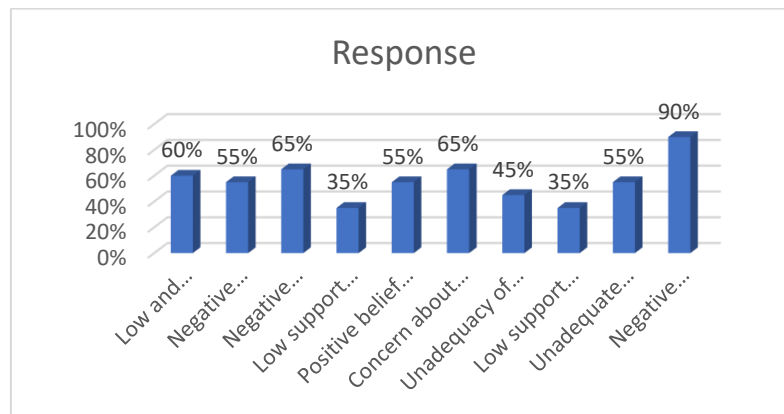


Fig. 3. Survey results on urbanization on Kopaonik mountain

This analysis clearly shows that there are different attitudes and concerns among the respondents and indicates the need for further consideration of the impact of urbanization on sustainable development and the environment in the Kopaonik region.

The results showed that the mean value of the perception of the level of urbanization was 16.2, the median was 15, and the mode was 15. These results indicate a certain level of agreement among the respondents regarding the perception of urbanization. The detailed research report includes further statistical analyses and conclusions about the relationship between the perception of urbanization and attitudes about sustainable development and the protection of the natural environment in Kopaonik.

The research results show a statistically significant positive correlation between the perception of the level of urbanization in Kopaonik and the respondents' views on the impact of urbanization on sustainable development and protection of the natural environment. Using Spearman's correlation factor, the Rho (correlation) was found to be 0.554, which is considered a moderate to good association. This association was statistically significant, with a  $p$ -value of less than 0.001. The perception of the level of urbanization positively influences respondents' attitudes about sustainable development and protection of the natural environment. This points to the need for further research to understand better the dynamics between perceptions of urbanization and attitudes towards sustainable development, which can be useful in planning future urban initiatives. When processing the data, a multiple regression analysis was conducted to investigate the influence of the independent variable on the dependent variable. In this context, the independent variable that showed a statistically significant effect on the dependent variable was considered through a linear regression model. It is important to note that linear regression requires a sufficient amount of data, which, in this case, is 28. The analysis results indicate that the analyzed regression model showed a statistically significant influence on the dependent variable. The coefficient of determination ( $R^2$ ) of 0.744 suggests a relatively good explanation of the variability. The adjusted coefficient of determination (Adjusted  $R^2$ ) of 0.756 indicates a good fit of the model, considering the number of independent variables and the sample size. The standard error of estimate (SEE) of 164,541 measures the scatter of the true values around the regression line, and smaller values suggest a better model fit. The F-statistic of 36.847 and the very low  $p$ -value of 0.000b confirm the statistical significance of the regression. These results indicate that the analyzed regression model significantly influences the dependent variable, providing a good explanation of the variability within the model.

The analysis of the coefficients of the regression model provides insight into the influence of the perception of the level of urbanization in Kopaonik on the respondents' attitudes about sustainable development and protection of the natural environment. The model includes a constant and an independent variable, "Perception of the level of urbanization in Kopaonik". The constant (-8766,333) represents the value of the dependent variable when all independent variables are set to zero. The coefficient for "Perception of the level of urbanization in Kopaonik" is 238.655, which indicates an estimated change in the dependent variable for a unit change in this independent

variable. The standard error provides an estimate of the coefficient's variability, while the  $t$ -value indicates statistical significance. For "Perception of the level of urbanization in Kopaonik", the  $t$ -value is 3.189 with a statistically significant  $p$ -value of 0.004, confirming a significant influence on the respondents' attitudes. The standardized coefficient (Beta) of 0.455 allows for comparing the relative influence of different variables, while the correlations provide information about the connection between the variables in the model. Statistical information on collinearity (Tolerance and VIF) indicates the degree of mutual connection between independent variables. These results indicate that the perception of the level of urbanization in Kopaonik significantly affects the views of respondents on sustainable development and protection of the natural environment, which emphasizes the importance of this variable in the analysis of the researched relationships.

Considering the statistical significance and the direction of the influence, we can conclude that there is no basis for rejecting the hypothesis that suggests the existence of a statistically significant relationship between the perception of the level of urbanization in Kopaonik and the views of respondents on sustainable development and protection of the natural environment. According to the analyses, the results support that hypothesis.

### ***Environmental challenges of rapid urbanization***

Rapid urbanization in Kopaonik brings significant environmental challenges that require serious consideration. Increased construction activity has the potential to impact the environment in a number of ways seriously.

One of the key environmental problems is water pollution. According to data from the Republic Water Agency, there has been increased water pollution due to the rapid urbanization of Kopaonik. The concentration of heavy metals in watercourses in 2023 increased by 1% compared to the previous year (Sepa, 2023). The increased number of buildings, roads and infrastructure can lead to more rainwater runoff and snowmelt, potentially resulting in watercourse and groundwater pollution. This pollution can negatively affect water quality, both for human use and for the conservation of aquatic ecosystems (Shiva, 2016). A study on tourism and water use highlights the significant water consumption associated with tourism activities and emphasizes the need for sustainable water management practices. It underscores the importance of balancing tourism development with water conservation to prevent resource depletion and ensure long-term sustainability (Gössling et al., 2012). A comprehensive review identifies tourism as a significant driver of global environmental change, including contributions to greenhouse gas emissions, biodiversity loss, and water consumption. The study advocates for comprehensive policies that address these impacts through sustainable tourism practices (Gössling, 2002). A study challenges traditional notions of sustainability in tourism, proposing a more holistic approach that considers broader socio-economic and environmental impacts. It calls for re-evaluating sustainability goals to align more closely with the realities of tourism development (Sharpley, 2009).

Furthermore, rapid urbanization can threaten biodiversity and natural ecosystems in Kopaonik. According to data from the RS Environmental Protection Agency, rapid urbanization in 2023 led to a decrease in habitat for local species. It is estimated that the population of autochthonous animal species has decreased by 8%, including some endemic species (Sepa, 2023). Loss of natural habitats due to construction can reduce the number and diversity of local species, which is particularly sensitive in protected nature reserves (Maloof, 2023).

Land pollution is also a worrying problem. Data from the competent Agency indicate that due to insufficient regulation of construction projects in 2023, there was an uncontrolled disposal of construction waste on the slopes of Kopaonik. This resulted in the creation of rubble dumps and the disordered appearance of the mountain, which is shown in Figure 2 (Sepa, 2023). The problem of land degradation in the area between Rudnica and Kopaonik, as well as in the Tourist Village, has several causes. First, there is soil pollution due to uncontrolled wild dumps of municipal and construction waste, as well as earthen material. This applies to the area along the road between Rudnica and Kopaonik. Another problem is the unregulated construction of infrastructure in the Tourist Village, which often includes inappropriate digging and cutting, with insufficient attention to the pedological cover and vegetation. This can cause soil erosion and degradation. Three problems that have never been solved have nothing to do with the atmosphere (Raska, 2023).



Fig. 4. Landfills on Kopaonik

A large amount of construction waste and the use of chemicals during construction work can lead to soil contamination. This can have a detrimental effect on agriculture and local flora and fauna (Barcelo et al., 2018).

Increased construction activity can also cause air pollution. Data from the RS Ministry of Environmental Protection show that the emission of harmful gases due to construction activity and traffic on the mountain increased by 12% in 2023 (see Figure 5). This resulted in poorer air quality and a negative impact on people's health (Ministry of Environmental Protection, 2023). Construction machines and vehicles emit harmful gases and particles, which can adversely affect air quality and people's health (Zavod, 2016).

In order to face these environmental challenges, careful planning and monitoring of urban development in Kopaonik is necessary. With the proper regulation of construction activities, the preservation of natural resources and biodiversity can be guaranteed, and the sustainable development of tourism on the mountain can be achieved.

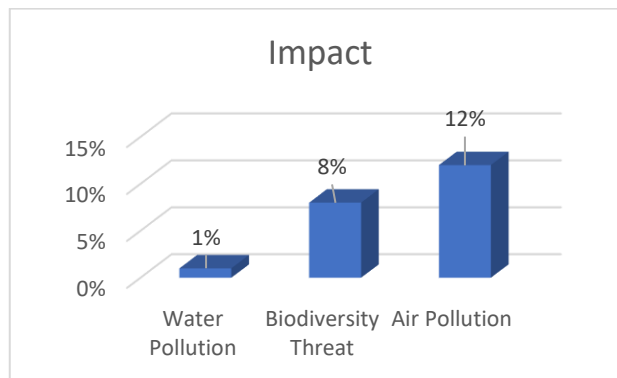


Fig. 5. Environmental challenges in Kopaonik mountain

#### **Infrastructural challenges of accelerated urban growth**

According to the available data, a large part of Kopaonik faces a lack of access to a reliable supply of drinking water (as much as 20% of the mountain population and tourists do not have reliable access to a supply of drinking water – see Fig. 6). This problem has become acute with the increase in the number of tourists and new construction projects. A constant water shortage can seriously affect residents' quality of life and the comfort of tourists (Sepa, 2023).

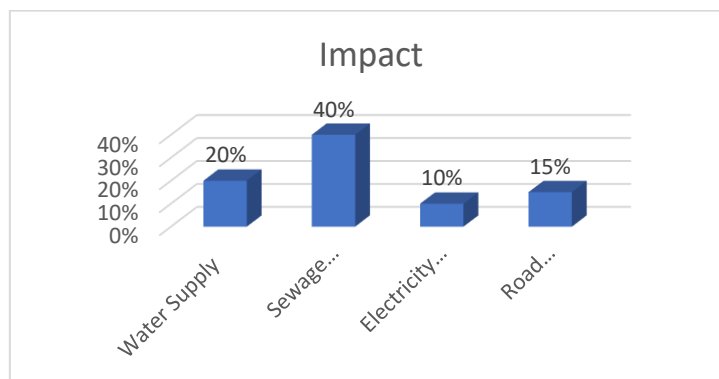


Fig. 6. Infrastructural challenges in Kopaonik mountain

The increase in the number of buildings and hotels was not accompanied by the construction of an appropriate sewage infrastructure (as many as 40% of new construction projects in Kopaonik use septic tanks instead of sewage). As a result, there is excessive use of septic tanks and problems with wastewater disposal, which can lead to water pollution and threaten ecosystems (Raska 2, 2023).

With the increasing number of new buildings on Kopaonik, the question of electricity capacity arises (the problem with the electricity grid leads to 10% frequent power outages during the tourist season.). This rapid urban growth can lead to overloading of the electricity grid, potentially causing frequent power outages and reducing the quality of the tourist experience.

The increased number of tourists and vehicles on Kopaonik brings challenges in terms of road infrastructure (15% of tourists face problems accessing certain parts of the mountain due to congestion on old and narrow roads). Old and narrow roads are often insufficient to meet the tourist center's needs, which leads to congestion and problems with access to certain parts of the mountain (Roads, 2023).

All these infrastructural challenges directly affect residents' quality of life and tourists' experience on Kopaonik (these infrastructural challenges reduce the overall quality of life by 30% of residents and tourists). The



lack of basic services, such as water and electricity, can create inconvenience and negatively affect the attractiveness of this mountain destination (Stat, 2023).

Lack of adequate infrastructure can also lead to adverse ecological effects, including water and land pollution, which can potentially harm natural ecosystems on Kopaonik.

### ***Dilemmas between economic benefit and preservation of the natural environment***

Rapid urbanization in Kopaonik brings economic benefits, including growth in tourism, new jobs and economic development. However, there are serious concerns regarding the preservation of natural resources, biodiversity, and ecosystems on the mountain. The dilemma is how to find a balance between these competing interests.

The construction of new facilities, hotels, and road infrastructure brings economic benefits but can have negative environmental effects. This includes water, land, and air pollution. The dilemma lies in how to ensure economic growth without endangering the natural environment.

Local communities on Kopaonik are often dependent on tourism for their income and employment. This further complicates the dilemma because it is necessary to meet the needs of these communities, as well as to preserve the natural environment at the same time. The question is how to achieve a balance between these interests (Vogel, 2012).

The key dilemma is how to develop sustainable tourism that enables economic benefits but also preserves the natural environment in the long term. This includes smart planning, resource management, and biodiversity conservation.

The lack of clear regulatory frameworks and policies can contribute to the mismatch between economic interests and the preservation of the natural environment. The question is how to better regulate and manage urbanization in Kopaonik.

Education and raising the awareness of tourists, investors, and local residents play a key role in understanding and solving these dilemmas. The question is how to encourage environmental responsibility and understand the importance of preserving the natural environment (Bennett et al., 1999).

These dilemmas indicate the complexity of the challenges facing Kopaonik. Finding a balance between the economic and environmental aspects of development on this mountain requires careful consideration and cooperation of all relevant stakeholders, including government agencies, local governments, investors, citizens and environmental organizations. The goal is to achieve sustainable urbanization that will enable growth, but also preserve this beautiful mountain destination in the long term.

## **Discussion**

### ***Responsibility and control of urbanization***

Kopaonik National Park, as a key guardian of the natural environment in this mountainous area, expresses deep concern about the accelerated growth of construction projects on the mountain. Their main concern is dedicated to the preservation of the unique natural environment of Kopaonik, including the rich biological diversity, endemic plants, and animal species that inhabit this mountain. The National Park considers it crucial to take serious and urgent steps to stop further construction on this fragile ecosystem. This institution believes that the ban on further construction represents a necessary and crucial step in achieving their nature conservation goals. Recognizing that rapid urbanization can significantly threaten the natural resources and ecosystems on Kopaonik, the National Park strongly advocates limiting further construction growth. Their intention is to preserve the natural beauty of this area and ensure the long-term sustainability of the ecosystem, thus guaranteeing that future generations and visitors can still enjoy the untouched nature of Kopaonik. Accordingly, Kopaonik National Park considers it essential to stop further construction to preserve this area's nature and its unique flora and fauna. Their commitment to the preservation of natural values on Kopaonik makes them a key factor in achieving a balance between economic benefits and the preservation of natural resources in this area.

The local self-government of Raška highlights its perspective, which differs from the Kopaonik National Park in terms of urbanization in the mountainous area. They recognize the need for controlled urbanism that would be in line with the demands and needs of tourists, as well as the local population. The local self-government believes that urbanization is inevitable and can be crucial for the economic development of this region. From their perspective, urbanization brings economic benefits through tourism, employment, and local economic growth. Therefore, they insist on monitoring and regulating construction projects in order to achieve a balance between economic benefit and preservation of the natural environment. Their intention is to minimize negative environmental impacts that may occur due to rapid urbanization. This local perspective emphasizes the control and regulation of construction to ensure that urbanization does not threaten the natural environment and biological diversity of Kopaonik. Their goal is to achieve economic progress while respecting nature and preserving the area's natural resources. This puts the local self-government in a position to balance tourism development and care for the environment in Kopaonik (Raska, 2023).

Namely, the urban plan related to the PGR weekend settlement Kopaonik Zones 1, 4, 6, and 10 determined that the construction of buildings and infrastructure can have a number of negative effects during the execution of works, but also during the later exploitation of those buildings. In order to prevent the degradation of sensitive surfaces, the application of preventive and final protective measures is recommended. One useful measure is forming a pool with a volume of 2-4 cubic meters next to construction sites, temporary parking lots, and roads. These basins serve as temporary storage of surface water, where sediments are deposited, and the water is freed from suspended and dragged sediment particles and pollutants. To remove sediment and drift material, it is important to clean these pools regularly, especially after heavy rainfall or snowmelt. Discarded material should be disposed of at a suitable landfill site. These measures contribute to the preservation of sensitive surfaces and the reduction of potential negative impacts of construction and exploitation (Raska 2, 2023).

A paper discusses the management of common-pool resources in the context of sustainable tourism. It emphasizes the need for cooperative management strategies and robust regulatory frameworks to prevent the overexploitation of shared environmental resources (Briassoulis, 2002).

The construction inspection plays a key role in implementing and ensuring compliance with laws and regulations related to construction projects on Kopaonik. Their main goal is to ensure that all construction projects are carried out in accordance with existing laws, urban plans, and environmental standards. This means that inspectors regularly supervise on-site, inspect construction sites, and check whether projects are carried out according to approved plans and permits. They also deal with the quality control of building materials and technical specifications to ensure the safety and durability of built structures. The construction inspection can also respond to complaints from citizens or organizations indicating irregular construction projects. If irregularities or law violations are discovered, the inspection can apply the penalties provided for by law and order corrections. In the case of Kopaonik, the role of construction inspection can be crucial in achieving a balance between tourism development and the preservation of the natural environment. Their responsibility is to ensure that construction takes place sustainably and that all laws and regulations aimed at protecting the natural environment are adhered to (Gradjevska, 2023).

Coordination between the Kopaonik National Park, the Raška local government, and the construction inspection is key to achieving a balance between economic profit and the preservation of the natural environment on Kopaonik. Achieving this goal requires carefully elaborated plans, transparency in decision-making, clear guidelines, and, above all, effective cooperation among these key actors. Only through such a coordinated effort can it be ensured that the urbanization of Kopaonik is sustainable, supporting the region's economic needs while protecting invaluable natural resources and preserving the natural environment.

### ***Comparison with previous studies***

The negative environmental effects of urbanization on Kopaonik's natural environment were prominently highlighted, with 65% of respondents perceiving significant harm. This aligns with the findings World Bank. (2023), who reported similar adverse impacts of tourism development, such as habitat destruction and biodiversity loss. Marković (2023) also discussed the detrimental effects of tourism infrastructure on the environment, including soil erosion and water pollution, which are consistent with the current study's results.

The study also noted divided opinions on the economic benefits of urbanization. While 55% of respondents acknowledged positive economic impacts, concerns about rising living costs and social displacement were also prevalent. This echoes the research by Radjenovic (2022), which highlighted the dual-edged nature of tourism development—creating economic opportunities while also potentially leading to increased living costs and social disruption.

A significant finding in the current research was the inadequacy of existing laws and regulations to manage urban growth effectively. Approximately 45% of respondents felt that the current regulations were insufficient. This finding is in line with Bošković (2019), who also emphasized the challenges in regulatory enforcement, leading to unchecked construction and environmental degradation.

The current study's results on the urban growth rate and its environmental impacts are consistent with the broader patterns observed in other mountainous regions. For example, research in the Swiss Alps by Keller et al. (2000) and in the Alps by Bätzing (2015) highlighted similar challenges where tourism-driven construction led to significant ecological impacts, including soil erosion and habitat fragmentation.

### ***Negative effects of urbanization***

Improper wastewater disposal from construction facilities and households can significantly affect water quality in rivers and lakes on Kopaonik. An increase in the content of chemical and biological pollutants can have a harmful effect on aquatic ecosystems and affect the living world that relies on these waters. Construction activities and accompanying infrastructural changes often result in soil compaction, loss of fertility, and erosion. This can have long-term effects on soil quality and the ability to support agricultural activities and natural ecosystems (Darnjanović, 2023).

The lack of a reliable drinking water supply can seriously disrupt the daily lives of residents and tourists. In addition, drought and water shortages can lead to firefighting problems, especially during dry seasons. Overloading the electrical grid can cause frequent power outages, which can be frustrating for Kopaonik residents and visitors. It can also have consequences for the safety and functionality of facilities that depend on electricity.

The increase in the number of vehicles on narrow and inadequate roads can cause frequent traffic jams, especially during the tourist season. This not only hinders the movement of residents and tourists but also the access to emergency services in the event of an accident (Bennett et al., 1999).

The arrival of a large number of new residents and tourists can lead to conflicts and tensions with the local population. Increased demand for housing and services may lead to rising property prices and living costs, which may be unsustainable for the local population.

Infrastructure overload and negative environmental effects can reduce the attractiveness of Kopaonik as a tourist destination. This can result in reduced income from tourism and make it difficult to maintain the local economy (Vogel, 2012).

These problems often interact and require a comprehensive approach to adequately solve them and achieve sustainable urbanization in Kopaonik.

### ***Solutions and recommendations***

Recent research shows that the rapid urbanization of Kopaonik is not accompanied by adequate laws and regulations that would limit the disproportionate growth of construction projects. A detailed analysis of existing laws and their compliance with nature conservation principles is recommended.

Previous research suggests that control and enforcement of construction standards are often ineffective enough in Kopaonik, leading to construction irregularities. Analyzes of inspection and penalty reports can provide insight into challenges in implementing the standards.

Studies on sensitive ecological areas in Kopaonik point to the need for additional nature protection measures, such as the creation of nature reserves and protected zones. This recommendation can be supported by data on the preservation of biodiversity and ecosystems.

Research into the roles and interests of different actors, including authorities, civil society organizations, and citizens, can provide insight into the dynamics of joint action. Analysis of compromises and initiatives in other mountain regions can strengthen this recommendation.

The study of priority infrastructure projects based on needs and economic profitability can provide a scientific basis for directing investments that contribute to sustainable development.

Examining existing educational programs and the level of awareness of the population about environmental issues can help in the development of educational campaigns and programs aimed at preserving nature on Kopaonik.

Analyzes of the current tourism sector and its impact on natural resources can serve as a starting point for developing sustainable tourism strategies. Studies of the impact of these strategies on economic and environmental aspects contribute to the scientific basis.

The creation of a time series of data and the development of appropriate monitoring indicators enables continuous monitoring of changes and assessment of compliance with sustainable development goals.

Examining the role of international organizations and institutions in supporting the sustainable development of Kopaonik can indicate potential resources and support for research and practical initiatives.

Analyzing existing practices of citizen involvement in planning and decision-making processes can provide recommendations for increasing transparency and participation based on scientific findings.

### ***Limitations/shortcomings***

In conducting this research, several limitations and shortcomings were identified that should be acknowledged. The absence of a pilot survey, which could have helped refine the questionnaire and identify issues with clarity and effectiveness, might have impacted the reliability and validity of the final survey instrument. While ensuring data quality, the exclusion of incomplete questionnaires could have introduced bias by omitting potentially important insights or trends. The survey's reliance on close-ended questions using Likert scales, while providing quantifiable data, limited the depth of responses and did not capture the full range of respondents' thoughts and feelings, which more open-ended questions could have provided. The representativeness of the sample, consisting of 400 respondents from Serbia, is uncertain and may contain demographic, socio-economic, or geographic biases that could affect the generalizability of the findings. The short data collection period, from October 25, 2023, to November 5, 2023, might not fully capture seasonal variations in perceptions and attitudes towards urbanization and its impacts on Kopaonik. Additionally, the study touches on issues with the regulatory framework and enforcement but does not explore specific policies or governmental actions in depth, which a more detailed policy analysis could illuminate. The research primarily focuses on respondents' perceptions and attitudes, lacking objective measures of environmental impact or socio-economic changes, which could have strengthened the study's conclusions if combined with empirical data. Lastly, the study's exclusive focus on Kopaonik provides

valuable insights into this specific region but may not reflect broader trends and issues related to urbanization and environmental impacts in other mountainous areas of Serbia or similar regions globally. Addressing these limitations in future research could enhance understanding of the complex dynamics between urbanization and sustainable development, leading to more robust and comprehensive findings.

### Conclusion

The research deeply analyzes the serious problem of accelerated urban growth on the Kopaonik mountain, and its importance cannot be ignored. The rapid loss of natural resources and the degradation of the environment directly threaten the ecosystem of this area, while social challenges are manifested through changes in the local population's way of life and work.

The most important scientific contribution of this research is the identification of a concrete need for stricter regulation of construction activities on Kopaonik. The research is hereby positioned as a warning and guideline for authorities and decision-makers, offering scientifically based recommendations for creating more sustainable urban planning and preserving natural and cultural heritage. Its practical value lies in the fact that it can serve as a basis for amending existing laws and rules that regulate construction activities on Kopaonik.

Additionally, the research promotes sustainable urban planning, pointing out the importance of harmonizing development with the local community's needs and preserving cultural heritage and the natural environment. These guidelines not only contribute to the protection of Kopaonik mountain, but can also serve as a model for other similar mountain areas, contributing to the creation of more sustainable urban communities worldwide.

Through educational programs and awareness raising, research also makes a practical contribution to the education of local residents and visitors. Informing about the importance of preserving Kopaonik and environmental challenges helps create awareness and change behavior, which is key to the long-term preservation of this area.

Furthermore, applying an interdisciplinary approach enables a comprehensive consideration of ecological, social, and economic aspects of the problem of accelerated urban growth. This holistic approach facilitates fact-based decision-making based on a deep understanding of complex contextual phenomena.

In conclusion, these recommendations are crucial for preserving Kopaonik as a valuable natural and cultural resource and stopping its further deterioration. Implementing these recommendations will require cooperation between different interest groups, including authorities, local communities, investors, and civil society organizations. This research also highlights the need for future research in order to understand the issue in more detail and monitor progress in solving this challenge, providing a continuous scientific and practical contribution to the preservation of Kopaonik mountain.

### References

- Barceló, Damià, Petrovic, Mira, Radjenovic, Jelena, Postigo, Cristina, Kuster, Marina, Farre, Marinella, López de Alda, Maria, Gros, Meritxell, Smital, Tvrtko, Huerta-Fontela, Martí, Ventura, Francesc, Blasco, Julián, & DelValls, Àngel. (2008). Emerging contaminants from industrial and municipal waste: Occurrence, analysis, and effects. Springer-Verlag Berlin Heidelberg. <https://doi.org/10.1007/978-3-540-74795-6>
- Bätzing, Werner. (2015). *Die Alpen: Geschichte und Zukunft einer europäischen Kulturlandschaft* (4th ed.). Verlag C.H.Beck. <http://www.jstor.org/stable/j.ctv128fn6r>
- Bennett, Martin, James, Peter, & Klinkers, Louis. (Eds.). (1999). *Sustainable measures: Evaluation and reporting of environmental and social performance* (1st ed.). Routledge. <https://doi.org/10.4324/9781351283007>
- Bošković, Nikola, Vujičić, Milan, & Ristić, Ljiljana. (2019). Sustainable tourism development indicators for mountain destinations in the Republic of Serbia. *Current Issues in Tourism*, 23(22), 2766–2778. <https://doi.org/10.1080/13683500.2019.1666807>
- Briassoulis, Helen. (2002). Sustainable tourism and the question of the commons. *Annals of Tourism Research*, 29(4), 1065–1085. [https://doi.org/10.1016/S0160-7383\(02\)00023-9](https://doi.org/10.1016/S0160-7383(02)00023-9)
- Bruce. (2023). Construction permits. Retrieved from <https://brus.ls.gov.rs/>
- Buckley, Ralf. (2012). Sustainable tourism: Research and reality. *Annals of Tourism Research*, 39(2), 528–546. <https://doi.org/10.1016/j.annals.2012.02.005>
- Damjanović, I. (2023). Sustainable tourism: Towards a future (1st ed., pp. XI, 477). Singidunum University.
- Energy. (2023). Retrieved from <https://serbia-energy.eu/>
- Gössling, Stefan. (2002). Global environmental consequences of tourism. *Global Environmental Change*, 12(4), 283–302. [https://doi.org/10.1016/S0959-3780\(02\)00044-4](https://doi.org/10.1016/S0959-3780(02)00044-4)
- Gössling, Stefan, Peeters, Paul, Hall, C. Michael, Ceron, Jean-Paul, Dubois, Ghislain, Lehmann, Lena Veronica, & Scott, Daniel. (2012). Tourism and water use: Supply, demand, and security. An international review. *Tourism Management*, 33(1), 1–15. <https://doi.org/10.1016/j.tourman.2011.03.015>

- Hall, C. Michael, Scott, Daniel, & Gössling, Stefan. (2013). The primacy of climate change for sustainable international tourism. *Sustainable Development*, 21(2), 112–129. <https://doi.org/10.1002/sd.1562>
- Institution (2016). Professional conference Dani Zavod, 26. Air quality: Monitoring, modeling, improvement.
- Keller, P., Bieger, T., Go, F., Gotti, M., Gyekye, A.B., Job, H., Johnson, C., Kurihara, S., Macchiavelli, A., Marx, S., Mihalić, T., Nethengwe, T., Ohe, Y., Oseifuah, E.K., Paesler, F., Pechlaner, H., Reuter, C., Roy, S., Scaglione, M., Shimoura, S., Smeral, E., Subhash, K.B., Trunfio, M., Turner, L.W., Vanhove, N., Weiermair, K., & Witt, S.F. (2011). *Tourism Development after the Crises*. International Tourism Research and Concepts.
- Kopaonikonline. (2022). Retrieved from <https://kopaonikonline.com/>
- Kostić, Milena, Lakićević, Milica, & Milićević, Slobodan. (2018). Sustainable tourism development of mountain tourism destinations in Serbia. *Ekonomika poljoprivrede*, 65(2), 843–857. <https://doi.org/10.5937/ekoPolj1802843K>
- Maloof, Joan (2023). *Nature's temples: A natural history of old-growth forests* (Revised and Expanded ed.). Princeton University Press, <https://doi.org/10.2307/j.ctv2z861rd>
- Marković, N. (2023). Kopaonik u srednjem veku - istorija jedne planine - Zarković Božidar, Kopaonik u srednjem veku, Filozofski fakultet univerziteta u Prištini sa privremenim sedištem u Kosovskoj Mitrovici/Institut za srpsku kulturu Priština - Leposavić, Kosovska Mitrovica/Leposavić, 2022. *Baština*, 61, 529-531. <https://doi.org/10.5937/bastina33-46891>
- Milićević, S., & Trišić, I. (2019). Economic and socio-cultural effects of tourism development in tourism destinations. *Megatrend revija*.
- Ministry of Environmental Protection. (2023). Retrieved from <https://ekologija.gov.rs/>
- Ministarstvo zaštite životne sredine Republike Srbije. (2018). *Izveštaj o stanju životne sredine u Nacionalnom Parku Kopaonik*. Beograd: Ministarstvo Zaštite Životne Sredine.
- Nonic, Dragan, Šumarac, Predrag, Ranković, Nenad, Đorđević, Ilija, & Nedeljković, Jelena. (2023). Sustainable management of the National Park Kopaonik - opportunities and challenges. *Glasnik Šumarskog Fakulteta, 2023*(Special Issue), 59–80. <https://doi.org/10.2298/GSF23S1059N>
- NPKopaonik. (2023). Management plan. Retrieved from <https://npkopaonik.rs/>
- Radjenovic, Tamara, Veselinovic, Nemanja, Vujovic, Sonja, Krstic, Bojan, & Zivkovic, Snezana. (2022). Sustainable tourism in the protected areas: The evidence from Kopaonik national park. *Journal of Economic and Social Development (JESD) – Resilient Society*, 9(2), 32–40. <https://www.researchgate.net/publication/366947052>
- Raška. (2023). Municipality. Retrieved from <https://raska.gov.rs/>
- Raška 2. (2023). Retrieved from <https://raskaturizam.rs/>
- Roads. (2023). Retrieved from <https://www.putevi-srbije.rs/>
- Sepa. (2023). Reports. Retrieved from <http://www.sepa.gov.rs/>
- Sharpley, Richard. (2009). *Tourism development and the environment: Beyond sustainability?* Earthscan from Routledge.
- Shiva, Vandana (2016). *Water wars: Privatization, pollution, and profit*. North Atlantic Books.
- Stat. (2023). Building permits. Retrieved from <https://www.stat.gov.rs/>
- Taubenböck, Hannes, Gerten, Christian, Rusche, Karsten, Siedentop, Stefan, & Wurm, Michael. (2019). Patterns of Eastern European urbanisation in the mirror of Western trends – Convergent, unique or hybrid? *Environment and Planning B: Planning and Design*, 46(7), 1206–1225. <https://doi.org/10.1177/2399808319846902>
- Vogel, Harold (2012). Tourism. In *Travel Industry Economics: A Guide for Financial Analysis* (pp. 238–256). chapter, Cambridge: Cambridge University Press, <https://doi.org/10.1017/CBO9781139198387.012>
- World Bank. (2023). *Sustainable Cities Serbia: Unlocking the transformational potential of cities for the green transition*. Washington, D.C.: World Bank. Retrieved from <https://www.worldbank.org>