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Prospects for Sustainable Tourism in Mountain Protected Areas: A Case Study of Southeastern Serbia

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This research analyzes the factors that influence tourist experiences in the mountainous protected areas of southeastern Serbia. Tourism encompasses all aspects of a destination that can

attract visitors and affect their satisfaction during their stay. The study examines the demographic characteristics of visitors, their preferences, the quality of infrastructure, and the tourist resources that the regions offer. A total of 570 visitors were surveyed, of whom 526 completed valid questionnaires that focused on the mountain areas of southeastern Serbia, particularly the foothills of Vlasina. The questionnaire placed particular emphasis on specific elements that affect tourist

satisfaction. Key findings indicate positive correlations between elements essential for sustainable tourism, determined using Spearman's correlation. A chi-square test showed that environmental awareness and local community engagement were strongly associated with higher levels of overall tourist satisfaction, and a Kruskal-Wallis test revealed that older visitors, on average, expressed a greater level of satisfaction with infrastructure elements compared with younger groups. By focusing on the mountainous protected areas of southeastern Serbia, this research provides valuable insights for managers aiming to enhance visitor satisfaction and improve the quality of future experiences in the region.

Keywords: sustainable tourism; mountain protected areas; tourism development; infrastructure; tourist satisfaction.

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Introduction

Tourism plays a vital role in the economic, social, and environmental sustainability of mountain regions, where effective management of protected areas is crucial (Čerović et al 2016; Kruger et al 2017; Pavlović 2020; Bhammar et al 2021; Vimal et al 2021; Zeng and Li 2021; Hoffmann 2022; Címbaljević et al 2023; Trišić et al 2023). This research focuses on sustainable tourism in mountain protected areas of southeastern Serbia, particularly on tourists' attitudes, their satisfaction with infrastructure, and their demographic characteristics. The aim of the research is to provide insights into key elements of sustainable tourism and the importance of ecological sustainability in tourism development. A better understanding of tourists' needs will contribute to improving sustainable tourism strategies in these areas.

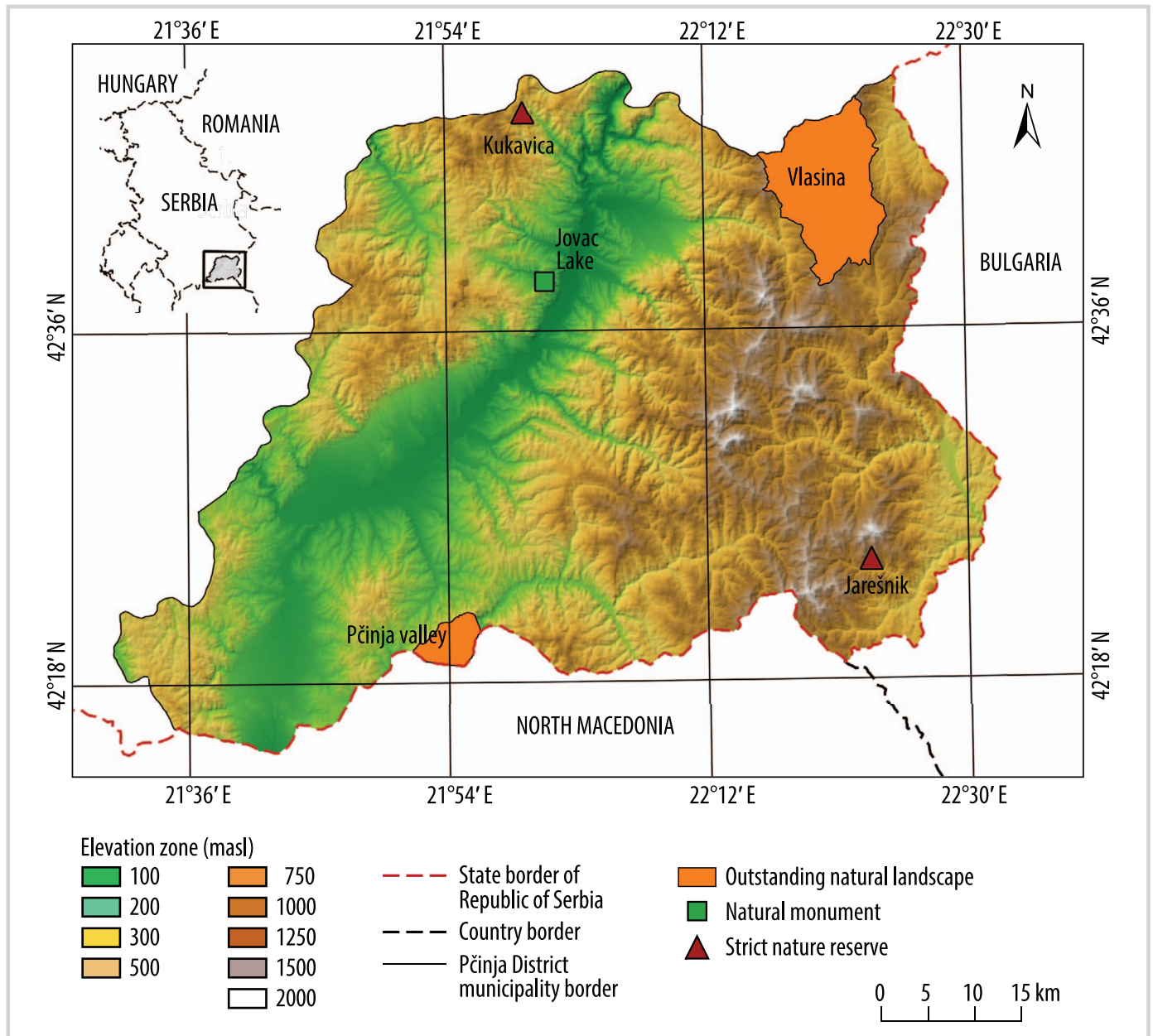
Recent studies indicate that many protected areas operate as isolated entities, preserving nature while facing increasing demands for natural resources. Growing ecological awareness highlights the importance of maintaining pristine landscapes and restoring degraded ecosystems. For instance, Gurung et al (2022) used collaborative modeling to address the degradation of high-elevation pastures in Bhutan, while Mendoza-Ato et al (2023) presented a conceptual model for

rehabilitating socioecological systems in grassland savannas in Peru. These examples emphasize the crucial role of ecosystem restoration in enhancing biodiversity resilience against climate change. Moreover, research also suggests that strengthening the local economy by developing local value chains can help to position remote mountain areas as niche tourism destinations (Stettler and Mayer 2023).

While previous research underscores the necessity of ecosystem restoration in mountain areas to combat degradation and protect biodiversity (Makino et al 2020; Luminati and Rinallo 2021; Gurung et al 2022; Holterman et al 2023; Mendoza-Ato et al 2023; Stettler and Mayer 2023), the specific challenges facing tourism development in southeastern Serbia, including organizational issues and community marginalization, have not been clearly established.

This paper analyzes key elements that shape the tourist experience in southeastern Serbia: the demographic characteristics of visitors, their preferences, the quality of infrastructure, and the tourist resources available. These elements are investigated to better understand tourist profiles and needs and to assess the current state of infrastructure and resources. Through empirical research, the study evaluates tourists' attitudes and satisfaction with tourism infrastructure in these mountain protected areas.

FIGURE 1 The location of mountain protected areas in southeastern Serbia. (Map by authors)



Research methodology

Through the following methodology, this study examines the attitudes of visitors regarding some aspects of sustainable tourism, a complex phenomenon.

Location of study area

Southeastern Serbia, on Highway Corridor X linking central Europe with Greece, harbors critical biodiversity within the Serbian–Macedonian mountain system, which lies adjacent to Bulgaria and North Macedonia. This region includes protected areas such as Vlasina and Pčinja Valley outstanding natural landscapes; Kukavica, Ostrozub, and Jarešnik strict nature reserves; and Jovac Lake natural monument (Figure 1) (Avramović et al 2005; Institute for

Nature Protection of Serbia n.d.). Recognized under the Law on Nature Protection, Official Gazette of the Republic of Serbia, these areas, rich in endemic flora, fauna, and thermal springs at high elevations, hold significant tourism potential. The elevation of the case study area ranges from 840 masl in the Pčinja Valley to 1200 masl at Vlasina Lake in the protected area.

Methodological approach

The study used an anonymous survey questionnaire, informed by prior research (Stamenković 2017; Dalimunthe et al 2020), specifically tailored for southeastern Serbia's mountainous protected areas. The questions were designed to address key elements that influence tourist experiences. They focused on spatial characteristics, ecological values,

and socioeconomic factors that shape travel motivations, organization, and tourism infrastructure. The questionnaire consisted of 4 main parts: sociodemographic data, trip information and organization, assessment of satisfaction with 12 tourism development elements, and opinions on 9 tourist infrastructure elements. Each of these components was carefully chosen to align with our research questions and to reflect the unique context of sustainable tourism in Serbia.

1. Sociodemographic data: Understanding the demographics of respondents allows us to analyze how different groups perceive and engage with tourism. This information is critical for developing targeted strategies that promote inclusivity and ensure that tourism benefits a diverse population.
2. Trip information and organization: This section captures how tourists plan their visits, which is essential for identifying patterns in travel behavior. Insights gained here can help stakeholders improve trip organization and enhance the overall tourist experience, thereby fostering repeat visits and sustainable practices.
3. Assessment of satisfaction with tourism development elements: The 12 elements assessed provide insight into specific aspects of the tourism experience, such as accommodation, accessibility, and natural attractions. Evaluating satisfaction in these areas is vital for understanding tourists' needs and expectations. High levels of satisfaction can indicate successful tourism practices, while areas with lower satisfaction scores can highlight opportunities for improvement, essential for sustainable development.
4. Opinions on tourist infrastructure elements: This part focuses on critical infrastructure components that support sustainable tourism, such as transportation, waste management, and recreational facilities. Understanding respondents' opinions of these elements helps identify improvements and investments that could enhance the sustainability of tourism operations in the region.

Respondents evaluated satisfaction using a 5-point Likert scale (Blešić et al 2014), where 1 denoted complete dissatisfaction and 5 indicated complete satisfaction. This methodological approach ensures comprehensive data collection, enabling the diverse factors that influence tourist experiences and perceptions in the region to be analyzed. By focusing on these specific elements, our research contributes to empirical understanding and informs future sustainable tourism strategies tailored to the unique characteristics of southeastern Serbia. Ultimately, although this approach does not directly enhance the tourist experience, the findings can contribute to the development of responsible tourism offerings and practices that will have a positive impact on the local community and the environment.

Data collection

Empirical research was conducted from 1 July to 31 December 2021. Data collection was conducted in the field using a written questionnaire that visitors voluntarily completed. The respondents for the survey were selected based on predetermined locations in the research area. Researchers attempted to approach every visitor, but not all

visitors were willing or able to participate in the survey. Because of time and resource constraints, this approach cannot be considered random. Despite these challenges, we surveyed a sufficient number of tourists, which enabled us to gather relevant and high-quality data. While visitors answered the questionnaire, researchers were present to explain the importance of fully completing the survey but gave respondents the freedom to fill it out voluntarily. The questionnaire was designed to be clear and easy to understand, minimizing the likelihood of skipped questions. If respondents had any doubts, researchers provided explanations, further ensuring that all questions were answered. Although respondents had the option to skip questions, all selected participants completed the entire survey.

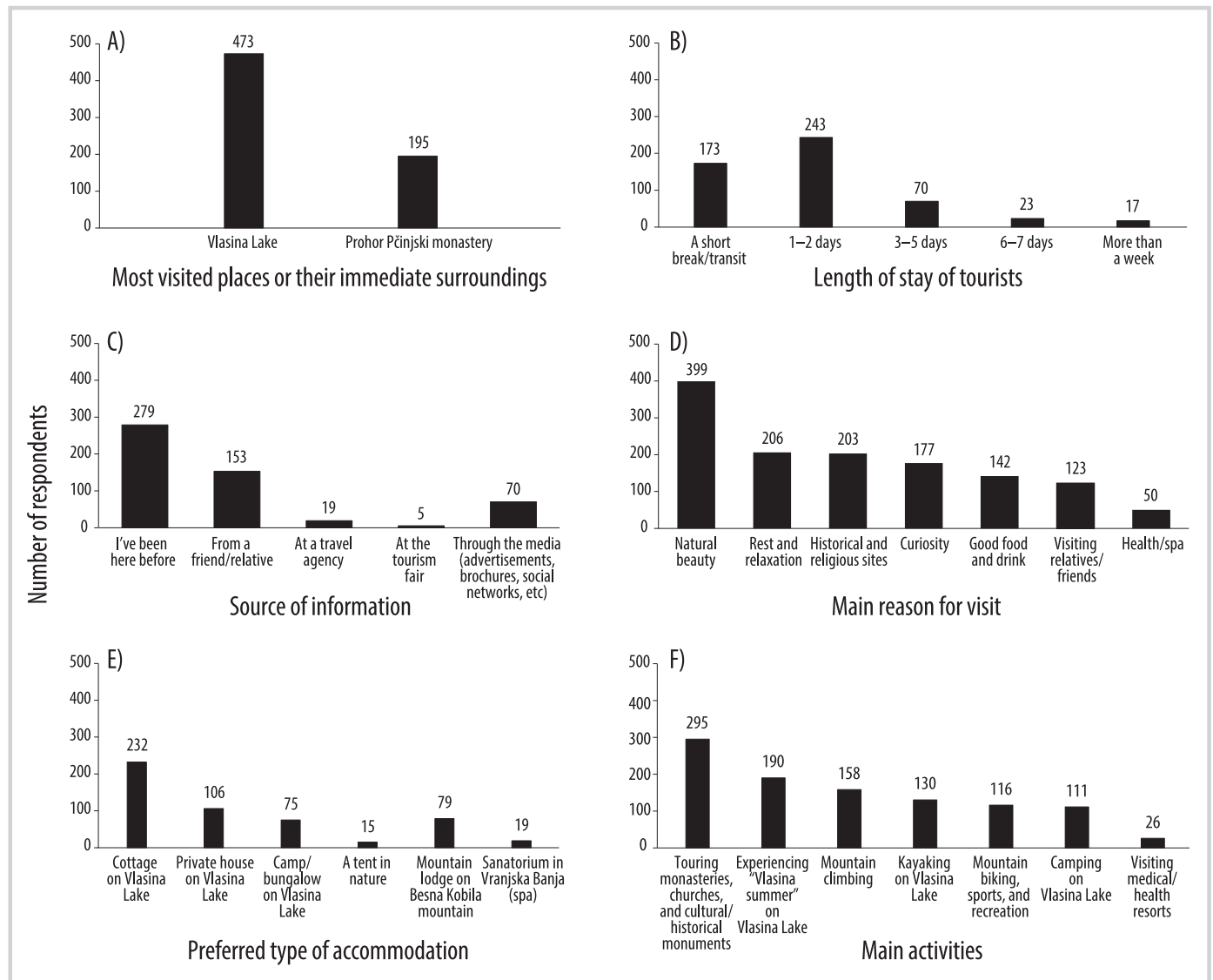
Analysis

The data were analyzed using IBM SPSS Statistic 20.0 software with a significance threshold of $P \leq 0.05$. Descriptive analysis of sociodemographic data identified influential factors shaping tourism in southeastern Serbia's mountain protected areas.

Three main hypotheses were formulated, as follows: (1) Tourists are satisfied giving a positive correlation between the elements that are key to sustainable tourism. This hypothesis is based on the assumption that various aspects of sustainable tourism, such as ecological awareness, service quality, and infrastructure, interact with one another. For example, increased ecological awareness among tourists may lead to greater demand for environmentally sustainable services, which in turn can encourage the development of such services in the region. By exploring this correlation, our goal was to identify key areas for improving and developing sustainable practices in tourism. (2) Ecological aspects and tourist habits, in our case travel intensity, are interdependent. This hypothesis examines how factors such as nature conservation and ecological initiatives influence tourists' frequency of visiting the region. For instance, if tourists are aware of ecological issues, they are more likely to choose destinations that implement ecofriendly practices. Understanding this interdependence can help shape policies that promote sustainable tourism habits and the preservation of natural resources. (3) Tourist satisfaction with infrastructure is influenced by the age of tourists. This hypothesis focuses on how the age structure of tourists can influence expectations and satisfaction with infrastructure. Younger tourists may prefer more modern and technologically advanced amenities, while older tourists may seek comfort and accessibility. By examining this aspect, the goal was to better understand the needs of different demographic groups, which can help develop tailored offerings that enhance the satisfaction of all visitors.

We used Spearman's correlation coefficient to analyze the first hypothesis. The second hypothesis was evaluated with a chi-square test. A Kruskal-Wallis test was used to investigate the influence of the ages of tourists on satisfaction with infrastructure. This latter analysis was restricted to 4 elements (see below), because only these elements showed enough variability among the groups of respondents to exert a significant effect.

FIGURE 2 The (A) main locations of the visit; (B) duration of stay; (C) sources of information; (D) motivation factors; (E) type of accommodation; and (F) main activities mentioned by respondents.



Results

A total of 570 respondents were surveyed, of whom 526 provided complete responses that were included in the analysis. The analyzed sample showed a predominance of women (71.8%). The higher number of women than men surveyed can be explained by specific interests and activities that attracted more women to the surveyed locations, as well as various social factors that influence their participation in tourism. The remaining 44 questionnaires were not included in the analysis because of incomplete responses. In terms of age structure, the largest number of respondents was between 19 and 49 years old (93.6%). The educational status of the respondents indicated that those with a higher education degree were the most numerous (44.6%). The nationality of visitors to the mountain protected areas of southeastern Serbia was homogeneous, with the largest share being domestic tourists (87%).

Respondents were asked to highlight the locations they visited, the duration of their stay, sources of information

and factors that motivated the choice of destination, type of accommodation, and dominant activities that motivated their choice. The results are presented in Figure 2.

The analysis revealed that a large share of respondents (90%) had visited Vlasina Lake or its immediate surroundings, whereas fewer respondents (37%) had visited Prohor Pčinjski monastery or its immediate surroundings (Figure 2A). As many as 46.3% of respondents planned a stay of 1-2 days, while 33% visited briefly while transiting to North Macedonia and Greece (Figure 2B). Most respondents (53%) visited the mountain protected areas in southeastern Serbia because they had been there before, highlighting the significance of repeat visits. Friends or relatives (29%) were the next most common source of information about the area, while travel agencies (3.6%) and media or fairs (0.9%) were mentioned far less (Figure 2C). Main motives for visiting were natural beauty (76%), rest (39.2%), and historical/cultural landmarks (38.7%) (Figure 2D). Preferred types of accommodation were cottages (44%), private houses (30%), camps/bungalows (14.3%), tents by Vlasina

TABLE 1 Tourist satisfaction with elements important for sustainable tourism development (using a Likert scale: 1 = complete dissatisfaction, 5 = complete satisfaction).

| Elements important for sustainable tourism development | Likert value (M) | Range of Likert values (min–max) |
|---|------------------|----------------------------------|
| Climatic and weather conditions | 4 | 4 (1–5) |
| Beauty of nature | 5 | 4 (1–5) |
| Clean air, water, and land | 5 | 4 (1–5) |
| Ecological garbage disposal | 4 | 4 (1–5) |
| Wealth of cultural experiences | 4 | 4 (1–5) |
| Option of excursions | 4 | 4 (1–5) |
| Cultural wealth (monasteries, churches, archaeological sites) | 4 | 4 (1–5) |
| Local gastronomy | 4 | 4 (1–5) |
| Tourism destination marketing | 4 | 4 (1–5) |
| Courtesy of tourist staff | 5 | 4 (1–5) |
| Quality of accommodation | 4 | 4 (1–5) |
| Accommodation prices | 4 | 4 (1–5) |

Note: N = 526 for all elements; min, minimum; max, maximum.

Lake (2.9%), the mountaineering lodge on Besna Kobila (15%), and the sanatorium in Vranjska Banja (3.6%) (Figure 2E). Activities favored included visiting monasteries, churches, and cultural–historical sites (56%); activities such as mountain biking, hiking, and sports in the Vlasina protected area were also popular (30%) (Figure 2F). Some visited for health reasons.

The study investigated tourists' satisfaction with the touristic characteristics and infrastructure of the protected areas in southeastern Serbia. Tourist satisfaction was analyzed using a Likert scale, ranging from complete dissatisfaction (value 1) to complete satisfaction (value 5), and the ratings (median [M] and range) are presented in Tables 1 and 2. By using Likert scale data, the study delved into tourists' satisfaction levels during their visit.

The results of the analysis presented in Table 1, by M and range, revealed that respondents were generally satisfied with the elements important for sustainable tourism development. Among the 12 elements analyzed, respondents expressed complete satisfaction with “beauty of nature” (M = 5) and “clean air, water, and land” (M = 5). Following these, elements such as “courtesy of tourist staff” was also rated highly (M = 5). Conversely, the elements with M ratings of 4 (M = 4) included “tourism destination marketing,” “ecological garbage disposal,” “wealth of cultural experiences,” “option of excursions,” “cultural wealth (monasteries, churches, archaeological sites),” “local gastronomy,” and “accommodation prices.” The value of 4 on the Likert scale indicates that respondents were “partially satisfied.” Accordingly, these ratings indicated that, while tourists were to some degree satisfied with these elements, they also saw some room for improvement.

Rather high satisfaction was noted with “quality of the road network” and “tourist signage” (M = 4), while “recreational trails” (M = 3), “ski resorts” (M = 3), and “ordered banks of rivers and lakes” (M = 3) showed lower satisfaction. These areas are intended for families, with

satisfactory ratings for “children’s recreational facilities” (M = 3) (Table 2).

The relationship between sustainability elements and tourist infrastructure for enhancing visitor experiences and ensuring sustainable tourism development in the region was examined using Spearman’s correlation (Horvat and Mijoč 2019). The analysis separated the 2 groups of elements: sustainability-related elements and infrastructure-related elements. The intention of the analysis was to investigate the relationships within each of these groups independently. Specifically, Table 1 presents tourists’ satisfaction with various aspects of sustainable tourism, while Table 2 focuses on satisfaction with infrastructure elements.

As shown in the tables, Spearman’s correlation was used to explore the relationships between selected pairs of elements within these 2 groups (sustainability and infrastructure), but not to analyze the interaction between sustainability-related and infrastructure-related elements. This provided insights into the strengths and weaknesses within each group separately, contributing to a more targeted approach for improving sustainable tourism and infrastructure.

The results in Table 3 indicate strong correlations between all analyzed pairs, confirming a positive relationship between key aspects of sustainable tourism. The highest correlation was between “quality of accommodation” and “accommodation price,” with a coefficient of 0.807. This suggests that if respondents rated the quality of accommodation positively, they are also likely to have rated the price of accommodation positively. This highlights the importance of both factors for overall tourist satisfaction.

Table 4 shows similar strong correlations regarding tourism infrastructure. For instance, the correlation between “children’s recreation facilities” and “sports courts” is 0.841, indicating a close link between satisfaction with these facilities and the availability of sports fields. In

TABLE 2 Tourist satisfaction with elements of tourism infrastructure (using a Likert scale: 1 = complete dissatisfaction, 5 = complete satisfaction).

| Tourist infrastructure | Likert value (M) | Range of Likert values (min–max) |
|---|------------------|----------------------------------|
| Tourist signage | 4 | 4 (1–5) |
| Arrangement of the parking lot, stops, and viewpoints | 3 | 4 (1–5) |
| Ski resorts | 3 | 4 (1–5) |
| Ordered banks of rivers and lakes | 3 | 4 (1–5) |
| Recreational trails (exercise and cycling trails, health trails, etc) | 3 | 4 (1–5) |
| Facilities for observation of natural values | 4 | 4 (1–5) |
| Quality of the road network | 4 | 4 (1–5) |
| Children's recreational facilities | 3 | 4 (1–5) |
| Courts for basketball, indoor football, tennis, etc | 3 | 4 (1–5) |

Note: $n = 526$ for all elements; min, minimum; max, maximum.

summary, high correlations imply that satisfaction ratings are interrelated, emphasizing the significance of an integrated approach to developing sustainable tourism in this region.

The study examined connections between tourist offerings in southeastern Serbia's protected areas using a chi-square test, correlating offer elements (12 from Table 1) with tourists' "travel intensity." The levels of the "travel intensity" variable were "short break/transit," "I travel once a year," and "I travel several times a year." Significance was determined at $P \leq 0.05$ (asymptotic significance 2-sided) (Turjačanin and Čekrlija 2006; Pallant 2010) (see Table S1, *Supplemental material*, <https://doi.org/10.1659/mrd.2024.00012.S1>). This analysis indicated significant connections between 7 out of 12 observed elements of the tourist offers in the destination and the intensity of the trip, namely "clean air, water, and land" ($P = 0.35$), "ecological garbage disposal" ($P = 0.13$), "option of excursions" ($P = 0.009$), "wealth of cultural experiences" ($P = 0.009$), "local gastronomy" ($P = 0.004$), "courtesy of tourist staff," ($P = 0.010$) and "quality of the road network" ($P = 0.016$). We found that tourists who traveled more frequently were more likely to rate certain elements of the tourist offer as satisfactory. This means that the more often a tourist travels, the more likely they are to value factors such as "clean air, water, and land," "ecological garbage disposal," and "local gastronomy." In simple terms,

frequent travelers place higher importance on these aspects when choosing a destination.

Table 5 presents the results of the Kruskal–Wallis test, which evaluates the statistical significance of differences in perceptions of various elements of the tourist offerings across different age groups. The results indicate the significance of the following elements: "ecological garbage disposal" ($P = 0.007$), "wealth of cultural experiences" ($P = 0.047$), and "local gastronomy" ($P = 0.035$). These P values suggest significant differences in how age groups perceive these elements. Specifically, younger respondents (<18 years) and those aged 50–69 years gave higher ratings for ecological "garbage disposal," indicating its greater importance to them. Younger respondents and those aged 50–59 also rated "wealth of cultural experiences" more highly, highlighting its importance for these groups. "Local gastronomy" was rated higher by respondents aged 30–39 and 50–69. In contrast, "quality of the road network" had a P value of 0.224, indicating no significant differences in how this element is rated across age groups, suggesting that the importance of road quality is perceived similarly across all age categories. Assumptions of the Kruskal–Wallis test were tested, including the similarity of distribution within age groups. In the cases where the distributions have a similar shape, the M values were compared; otherwise, the ranks were compared. These results help to better understand tourist satisfaction across the age groups and can contribute

TABLE 3 Spearman's correlation of tourist satisfaction with elements important for the development of sustainable tourism in the mountain protected areas of southeastern Serbia.

| Elements important for sustainable tourism development | | Correlation coefficient (r) |
|--|---|---------------------------------|
| Climatic and weather conditions | Beauty of nature | 0.681 |
| Option of excursions | Cultural wealth (monasteries, churches, archaeological sites) | 0.699 |
| Clean air, water, and land | Ecological garbage disposal | 0.706 |
| Wealth of cultural experiences | Tourism destination marketing | 0.745 |
| Courtesy of tourist staff | Local gastronomy | 0.781 |
| Quality of accommodation | Accommodation prices | 0.807 |

TABLE 4 Spearman's correlation of tourist satisfaction with elements of tourism infrastructure in the mountain protected areas of southeastern Serbia.

| Tourist infrastructure | | Correlation coefficient (<i>r</i>) |
|--|--|--------------------------------------|
| Quality of the road network | Arrangement of parking lots, stops, viewpoints | 0.643 |
| Tourist signage | Arrangement of parking lots, stops, viewpoints | 0.731 |
| Ski resorts | Ordered banks of rivers and lakes | 0.744 |
| Recreational trails (exercise, cycling, etc) | Facilities for observation of natural values | 0.839 |
| Children's recreational facilities | Courts for basketball, indoor football, tennis | 0.841 |

to the improvement of sustainable tourism strategies targeting specific visitor groups in this region.

Discussion and conclusion

This study provides empirical evidence on sustainable tourism in the mountain protected areas of southeastern Serbia, with a particular emphasis on visitor satisfaction regarding the quality of infrastructure, ecological aspects, and the demographic characteristics of tourists. The research offers valuable insights into the development of sustainable tourism practices in this region, highlighting visitor satisfaction as a key factor for enhancing the tourism offering. The results confirm positive correlations between key elements of sustainable tourism. Specifically, the quality of accommodation and accessibility of tourist attractions significantly influence overall tourist satisfaction and would contribute to the development of sustainable tourism. The effective management of infrastructure and high-quality service are essential for enhancing the tourist experience and preserving the long-term appeal of the destination.

Statistical analysis showed strong relationships between visitors' satisfaction with essential elements for sustainable tourism in the mountain areas of southeastern Serbia, supporting the hypothesis of positive correlations among

tourists' satisfaction with these factors. The findings align with existing research on accessibility and tourist satisfaction (Chin et al 2018; Biswas et al 2020; Amisshah et al 2022; Dumitracu et al 2023), emphasizing that accessibility of attractions and quality of related infrastructure, including accommodation, play a crucial role in shaping overall satisfaction and tourist experience.

Additionally, the study confirmed a significant relationship between ecological aspects and tourist satisfaction. Preserving the natural environment—including air, water, and soil quality—not only enhances the tourist experience but also contributes to biodiversity conservation and ecological balance. This supports the hypothesis that ecological factors are closely related to the evaluation outcomes of the study, underscoring the need to integrate ecological practices into tourism strategies.

Although overall satisfaction levels were found to be similar among different demographic segments, the study indicates that specific needs within age groups must be taken into account to improve the tourist experience for all visitors. Research conducted in Bangladesh (Sahabuddin et al 2021) and Seville (Sanchez del Rio-Vazquez et al 2019) shows that commitment to environmental conservation and effective management of natural resources significantly contribute to increased tourist satisfaction. Moreover, well-

TABLE 5 The results of the Kruskal–Wallis test at the $P \leq 0.05$ (α) level of significance for differences in elements important for the development of sustainable tourism in the protected mountain areas of southeastern Serbia among the age categories of respondents.

| Element | Likert value | Age (years) | | | | | | Total (<i>n</i> = 526) | <i>P</i> value |
|--------------------------------|-----------------|---------------------|-------------------------|-------------------------|------------------------|------------------------|-----------------------|-------------------------|----------------|
| | | <18 (<i>n</i> = 4) | 19–29 (<i>n</i> = 118) | 30–39 (<i>n</i> = 289) | 40–49 (<i>n</i> = 85) | 50–59 (<i>n</i> = 22) | 60–69 (<i>n</i> = 8) | | |
| Ecological garbage disposal | Median | 5 | 4 | 4 | 3 | 5 | 5 | 4 | 0.007 |
| | Range (min–max) | 2 (3–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | |
| Wealth of cultural experiences | Median | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 0.047 |
| | Range (min–max) | 2 (3–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 3 (2–5) | 4 (1–5) | 4 (1–5) | |
| Local gastronomy | Median | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 0.035 |
| | Range (min–max) | 1 (4–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 3 (2–5) | 4 (1–5) | 4 (1–5) | |
| Quality of the road network | Median | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 0.224 |
| | Range (min–max) | 2 (3–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | 4 (1–5) | |

Note: min, minimum; max, maximum.

managed spatial and ecological elements, including green landscapes and sustainable infrastructure, have a positive impact on overall tourist satisfaction (Han et al 2024).

The study highlights that recommendations from friends and previous visits are the main sources of information about the mountain protected areas of southeastern Serbia, while media, travel agencies, and tourism fairs play a lesser role. This lack of promotion by tourism stakeholders represents a barrier to visits. Tourists prioritize recommendations from personal experiences and online reviews when selecting accommodation, consistent with findings from other studies (Popesku 2011; Vujović et al 2012; Golob et al 2014; Štetić et al 2014; Mojić 2016; Pandžić 2017; Stamenković 2017).

Statistical analysis revealed that the motives for visiting these protected areas include natural beauty, relaxation, and cultural attractions, with health benefits also attracting visitors. Similar studies elsewhere (Franceschinis et al 2021; Jeelani et al 2022; Khan et al 2022; Gong et al. 2023) show a strong preference for natural values, suggesting potential for tourism development based on the region's natural beauty. However, the limited diversity in tourism offerings reflects low interest in business, sports, and accommodation facilities.

Regarding the perceived shortcomings, the results clearly indicate key areas for improvement in marketing, accommodation, and tourist attractions. Statistical analyses confirmed these findings, as elements related to infrastructure received lower ratings. We considered that elements rated 4 and above reflected tourist satisfaction and further analyzed these. However, ratings are subjective and respondents may have based their views on different factors. Further analysis is needed for a comprehensive understanding of tourists' perceptions, particularly regarding accommodation quality.

Addressing identified issues—such as enhancing the beach at Vlasina Lake, developing a tourist center, and improving training for tourism staff—is crucial for increasing tourist satisfaction and thus the region's competitiveness. By enhancing these areas, the region can be more effectively marketed as meeting tourist needs and offering high-quality amenities, making the destination more attractive despite its distance from major cities.

In conclusion, the study suggests that sustainable tourism in the mountain protected areas of southeastern Serbia is strongly associated with infrastructure quality, ecological standards, and the demographic characteristics of tourists. Effective management of infrastructure and ecological practices can significantly improve the tourist experience and preserve natural values. Further research and the development of strategies that integrate these aspects are recommended to achieve sustainable and responsible tourism.

Limitations and recommendation

We encountered obstacles in our study, notably the absence of literature and statistical databases on tourist traffic. Field research during the COVID-19 pandemic hindered data collection (Trišić et al 2023), as some tourists were reluctant to participate, and certain facilities were closed. These

limitations underscore the need for longitudinal research to revisit and compare findings.

USE OF GENERATIVE ARTIFICIAL INTELLIGENCE

When preparing this work, the authors used ChatGPT in translation of certain phrases from Serbian to English. After using this tool, the authors carefully reviewed and edited the content as needed. The authors take full responsibility for the content of this article.

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Supplemental material

TABLE S1 Correlation of travel intensity with elements for potential tourism development.

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