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UNDERSTANDING TOURIST EMOTIONS TO FOSTER SUSTAINABLE DEVELOPMENT

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ABSTRACT

Introduction: *The global emphasis on sustainable development, guided by the Sustainable Development Goals (SDGs), has increased the need for strategies that protect cultural and natural resources, especially in tourism. This study addressed the challenge of integrating sustainable tourism with innovative management practices by analyzing tourist sentiments relating to the Monastery of Saint Naum, the most visited attraction in the Lake Ohrid Region in North Macedonia.*

Methods: *Methods involved sentiment analysis on online reviews from TripAdvisor collected until August 2025 to assess visitor experiences and perceptions.*

Results: *Results showed predominantly positive sentiments focused on admiration for the site's natural beauty, historical and spiritual significance, and enjoyment of leisure activities such as boat rides and local dining. Negative feedback mainly concerned crowding and long queues, which slightly impaired visitor satisfaction.*

Discussion: *The study concluded that sustainable tourism management strategies should balance visitor access with conservation efforts, including controlling peak-time visits, investing in preserving the monastery's architectural heritage and natural surroundings, and promoting eco-friendly transport. Supporting local businesses within the monastery compound was also recommended to enhance visitor services and community benefits. These findings provide practical guidance for tourism managers, emphasizing the importance of understanding tourist emotions and aligning development with sustainability goals to safeguard the site's cultural and environmental integrity for the future.*

Keywords: sustainable tourism, sentiment analysis, visitor experience, tourism development, Ohrid, North Macedonia.

1. Introduction

Today, tourism stands as one of the most dynamic forces of global economic transformation, while its sustainability hinges on responsible governance and institutional coordination. This is particularly evidenced in regions of exceptional cultural and natural heritage like Ohrid Region. The global focus on sustainable development, guided by the Sustainable Development Goals (SDGs), has raised the need for strategies that protect cultural and natural resources, especially in tourism. As such, the SDGs encourage tourism to support inclusive growth, reduce inequalities, and promote sustainable consumption. In this line, effective strategies include conserving biodiversity, preserving cultural sites, and engaging local communities to ensure tourism benefits both people and the global environment. Adopting sustainable tourism practices helps safeguard resources while fostering economic and social development aligned with the global sustainability targets.

The Ohrid Region was designated as a mixed World Heritage (WH) site, first inscribed for its cultural value in 1979 (UNESCO 1979), and extended in 1980 to include natural heritage (UNESCO 1980). The Monastery complex of St. Naum (herein as Monastery) is one of the most visited tourist attraction in the Ohrid Region. It serves as an excellent case study for researching the complex linkages between cultural heritage preservation, the aesthetic and ecological value of natural landscapes, and the multifaceted pressure provoked by contemporary tourism. Its popularity among tourists and visitors makes it suitable for applying sentiment analysis (SA) to assess their perceptions, and at the same time, to inform whether its development aligns with sustainable tourism strategies. This particularly addresses SDG 11.4 and SDG 12.b. The SDG 11.4 highlights the importance of strengthening efforts to protect and safeguard the world’s cultural and natural heritage, while the SDG 12.b encourages the development and implementation of tools to monitor sustainable tourism impacts (United Nations 2015). The importance of responsible consumption and production (SDG 12) emphasizes the necessity of sustainable resource use and minimal environmental degradation, i.e. “doing more and better with less”(United Nations 2015). In this context, sustainable tourism emerges as a vital tool to balance economic benefits with conservation efforts, empowering local communities and preserving destinations for future generations, and the application of SA is a valuable method for assessing visitor experiences and guiding sustainable strategies.

Linking sustainable tourism with innovative management practices is essential for addressing the complex challenges tourism faces today. Innovative management introduces new ideas, technologies, and approaches that reduce environmental impacts, preserve cultural heritage, and promote community involvement. By integrating sustainability principles with adaptive and data-driven management, the tourism sector can optimize resource use, enhance visitor experiences, and support local economies responsibly. This combination ensures tourism development is economically viable, socially inclusive, and environmentally sound, helping destinations achieve long-term resilience and sustainability goals.

Opinion mining based on sentiment orientation allows to understand perceptions and characteristics on groups, and to determine the credibility of content and motivations for posting reviews. In this line, this research examines the intersection of sustainable tourism and innovative management by analyzing tourist sentiments about the Monastery. The main objective is to identify tourist emotions and experiences through SA of online reviews posted on TripAdvisor. The goal is to provide practical guidelines for managers and policymakers on understanding tourist sentiments, improving service quality, and promoting sustainable tourism development. By aligning tourism growth with sustainability principles, the study also helps preserve the cultural and natural integrity of this attraction.

After the introduction, the paper presents an overview of relevant literature, followed by the methodology design. The next section details the results, along with a discussion of the findings. Finally, the paper offers the main conclusions.

2. Literature Review

Data mining and text summarization are earlier technologies than artificial intelligence (AI) that assisted to comprehend the experience of tourists after visiting a destination. Yet, with the rapid involvement of AI in all segments of everyday living, and with tourism becoming substantial part of the economy, tourism policymakers seek to understand more profoundly tourist emotional and experiential behavior. As, such, understanding opinions of tourists is important for further improvement when providing tourist services and developing other elements necessary for tourism activities. Academia has vastly explored SA as a part of a wider big data analysis approach and provided various models to interpret main factors that influence creating positive tourist image.

Ren *et al.* (2016) investigated the core attributes that lead to tourist satisfaction and found that tangible and sensorial experience, staff performance, aesthetic perception, and the location of the accommodation, are the most profound dimensions. Besides these attributes, there is research on other actions identified as dimensions that lead to tourist satisfaction (Lee and Heo 2009);(Xu and Gursoy 2015). In this line, Lee and Heo (2009) argued the importance of the corporate social responsibility practices when creating positive consumer satisfaction in hotels and restaurants. Such interrelation between responsible behavior and satisfaction is also elaborated by Xu and Gursoy (2015) who added the importance of creating and adopting sustainable practices in all aspects of tourist operating activities.

SA is also related to addressing the paradigm of sustainable development. Wei *et al.* (2025) focused on the intelligent analysis of big data and discuss the intersection of sustainable dimension and the public management innovation. They analyzed public sentiments and detected new innovative possibilities for creating powerful public management platforms that may create informative decisions based on sustainability dimensions. In this context, tourist attractions also require careful planning for sustainable and effective growth which often needs specific attention and big investments (Zakarija *et al.* 2024). These authors proposed a model that analyses sentiments of tourists that offer increase visitor engagement which can be easily replicated to other tourist destinations.

Having in mind that tourist attractions may have strong influence on the development of the destination, it is essential to acknowledge factors that provoke positive or negative opinions on tourists after the visit. SA on reviews on tourist attractions is extensively researched (An and Moon 2022); (Fang *et al.* 2022); (Luo *et al.* 2021); (Qin *et al.* 2022).

Deciding which attraction to visit, and which to avoid, is not easy for tourists when traveling for the first time to a tourist destination, and particularly when having limited time for sightseeing. In this context, Fang *et al.* (2022) provide a high-quality data set for reviews on tourist attractions that accurately provide valuable references and suggestions to assist when making a travel decision. Similarly, Luo *et al.* (2021) proposed a model to a case study on selecting tourism attractions with a multi-dimensional comprehensive evaluation system of indicators that analyzes large number of online reviews. Such SA-based model analyzes tourists' decision to visit particular tourist attraction, and at the same time ensures the effective management of tourism attraction managers.

Furthermore, An and Moon (2022) examined the contextual features of tourist attractions and designed a procedure to describe the process and offer a recommendation, which is particularly important when making final decision. The authors design a system that enables custom recommendations for tourist attractions even for supplement data that enables

various classifications. Similarly, Qin *et al.* (2022) offer a novel method based on SA, for ranking tourist attractions through online reviews. They elaborated the real feelings of the tourists after visiting and proposed a system that reduces the complexity of making a travel decision.

With regards to the case of North Macedonia, there are limited research on application of SA in tourism industry. Exception is noted in the work of Andreeski (2017) who investigated the important role to apply the SA for planning tourism development. He analyzed the guests' satisfaction with selected hotels and private accommodation in Ohrid and found much bigger satisfaction for villas. To our knowledge to this moment, there is no research on SA when investigating specific tourist attraction in North Macedonia, so this study fills this gap.

3. Methodology

Figure 1 presents the methodological approach applied for analyzing the online tourist reviews for the Monastery of Saint Naum in Ohrid (North Macedonia).

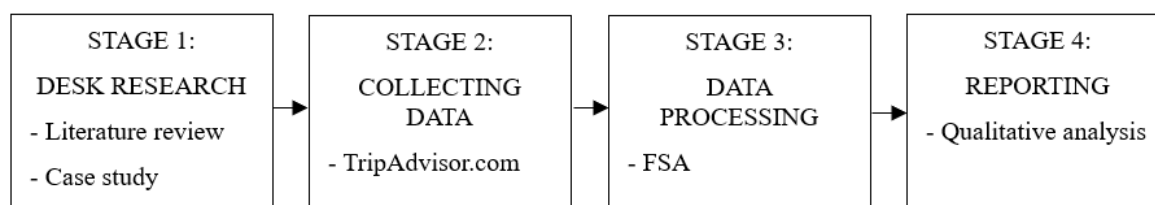


Figure 1. Research methodology

Source: Authors

Stage 1 involved desk research that incorporated review of literature on attributes that lead to tourist satisfaction, application of SA in tourism studies, and a case study background material.



Figure 2. Location of the Monastery of Saint Naum, Ohrid (North Macedonia)

Source: Google Maps (online)

Figure 2 presents the location of the Monastery, which is near the village of Ljubanista, 29 kilometers south of Ohrid, along the shores of Lake Ohrid. The Monastery was originally founded in 905 by Saint Naum himself, a disciple of Saints Cyril and Methodius. Although little remains of the original structure, the present church was rebuilt in the 16th century with frescoes dating from 1806 (Gould 2024). It is a remarkable cultural and historical site (Chausidis and Eftimovski 2023) and one of the most architecturally and historically significant religious sites in the country. Being among the earliest examples of Slavic

architecture and artistic expression in the region, the Monastery embodies the foundational legacy of Slavic literacy established by the medieval scholar and educator Naum. Having in mind that St. Naum was buried in a separate chapel on the south side of the Monastery, the site attracts many worshippers from various religions who come to pay respect to the relics of the saint. The broader environment embeds extraordinary view that evokes a profound sense of harmony between the natural landscape and the rich spiritual and tangible cultural heritage. So, the location of the Monastery exemplifies an exceptional synthesis of ecological serenity and historical significance, making it a must-see tourist attraction. Located approximately 600 meters from the border with Albania, the Monastery is geographically positioned to facilitate circular tourism routes. This makes it highly accessible for visitors entering from Albania, highlighting its role as a gateway attraction that blends cultural heritage, natural beauty, and cross-border mobility within the Ohrid Region.

Stage 2 of the research encompassed collecting data from the social platform TripAdvisor posted until August 2025. Out of total 1,057 data, only 671 were extracted as written reviews for identifying main factors that affect tourist experience and perception. This stage also involved data preprocessing and filtering. That means that the raw review text was organized before the analysis (Haddi *et al.*, 2013) and transformed into meaningful features that the model can understand. After that, all residual text elements were eliminated as noise, like emoticons, special characters, symbols, repetitive punctuation (e.g., ellipses), tags, excessive whitespace, numerical values, etc. These components were removed from further modelling to prevent potential confusion or distortion when interpreting the results.

Data was processed in stage 3 with the Google Colab. After performing factor sentiment analysis (FSA) as a natural language processing (NLP) method, the results are presented as a dendrogram of review clusters (Figure 3) and FSA heatmap (Figure 4).

Stage 4 included qualitative analysis in terms of interpretation of data.

4. Results

Figure 3 presents the dendrogram of clusters derived from 44,382 words in 671 written reviews. 12 key topics were identified and organized in three clustered factors:

- Factor 1: ‘Site’ – This includes ‘Monastery’, and ‘Lake’.
- Factor 2: ‘Service’ – This cluster includes ‘Beach’, ‘Garden’, ‘Location’, ‘Food’, ‘Clean’, ‘Parking’, and ‘Price’.
- Factor 3: ‘Surrounding’ – This consists of ‘Church’, ‘View’, and ‘Springs’.

Figure 4 presents factor sentiment heatmap which represents the scores in terms of intensity of the identified factors from the SA. The map enables discussion on how tourists that visited the Monastery perceive the attraction. Sentiment for each factor ranges from deep red color (representing strong dissatisfaction) to deep blue color (representing strong satisfaction). If the sentiment is represented with more frequencies, it means the greater intensity and influence of that factor.



Figure 3. Dendrogram of review sentiment clusters

Source: Authors

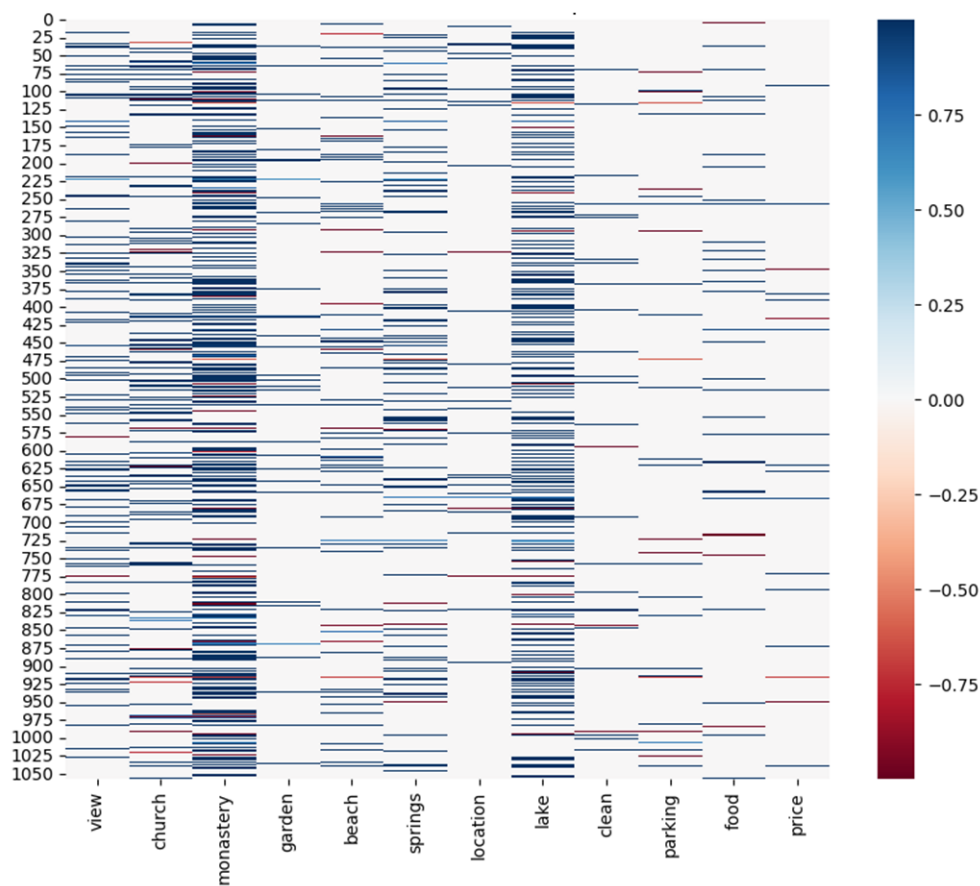


Figure 4. Factor sentiment heatmap

Source: Authors

5. Discussion and findings

The average numerical rating of 4.45 for all written online reviews is not sufficient to draw conclusions on tourist satisfaction. Therefore, SA enables more comprehensive interpretation of the results by providing more in-depth analysis. The research identified 12 factors, clustered into three main groups: ‘Site’, ‘Service’, and ‘Surrounding’, each consisted

of vectorized words as nouns representing closer insights on identified factors. It is interesting to note that all these constitutional elements refer to core attributes that lead to tourist satisfaction. Tangible and sensorial experience (‘Site’ factor), location (‘Service’ factor), and aesthetic perception (‘Surrounding’ factor) are generally discussed as the most profound dimensions of consumer comfort and enjoyment (Ren *et al.* 2016).

The ‘Site’ elicited as the most intensive factor whereas the monastery and the lake highlight the power of the nature as a precondition for sensorial and authentic experience (Wu and Yang 2023). The Monastery represents a significant cultural and educational landmark that has, for centuries, served as a spiritual nexus uniting people of diverse faiths through the veneration of St. Naum, revered as a miracle maker. Strategically situated on the shores of Lake Ohrid as the oldest lake in Europe (Leicher *et al.* 2024) and adjacent to the Galicica mountain range, both of which are protected under UNESCO, this site embodies a unique convergence of natural and cultural heritage. These attributes position the Monastery as an important tourist attraction in the country offering profound historical resonance, environmental significance, and cross-cultural accessibility.

The second most influential factor is the ‘Surrounding’ where tourists expressed strong emotions on the nearby scenery in terms of the extraordinary view and the breathtaking springs. Forming a boundary with the natural ambient describes strong relationship in the reviews, which conform with previous findings of Gu and Ryan (2008). The springs represent a rare and ecologically significant natural phenomenon, where crystal-clear karstic waters emerge from beneath the Galicica mountain and flow directly into the Lake Ohrid. The springs are protected for their ecological and spiritual value, further enhancing the site’s appeal and contributing to the spiritual and ecological identity of the Ohrid Region. They are protected for their hydrological and environmental value and are considered as one of the most pristine freshwater systems in Europe. Tourists enjoy rejuvenating experiences by an authentic boat rowing. On the other hand, the growing anthropogenic pressure caused by the increased frequency of tourists and waste pollution in compliance with the legal regulations for sustainable management of this attraction. Therefore, the National Park Galicica along with other institutional policymakers prepared a Draft Special Plan for the Management of the St. Naum site (PI National Park Galicica 2023).

Finally, the factor ‘Service’ is found as the least emotional dimension, suggesting that the beach, garden, food, parking, and price are not the priority triggers for visiting this tourist attraction. Yet, there is negative feedback mainly concerning crowding, long queues, and parking, which slightly impaired tourist satisfaction, as argued already by Xu and Li (2016). However, it is worth noting that a horticulturally landscaped pathway leads to a beach area with fine yellow sand and local restaurants as a space for relaxation and leisure. This setting complements the spiritual and cultural experience of the Monastery, enhancing the overall appeal of the site through its tranquil natural surroundings. The presence of such variations in tourist sentiments suggests further profound investigation into identifying strategic actions to safeguard the site’s cultural and environmental integrity for the future. The necessity for managing its sustainable development with responsible tourist behavior implies adoption of sustainable practices (Xu and Gursoy 2015).

The SA revealed that visitors predominantly hold a positive perception. Nevertheless, the presence of neutral and negative sentiments especially those concerning overcrowding, environmental degradation, and insufficient infrastructure highlights an urgent need for strategic planning and intervention. Key strategies include controlled visitor access during peak times, investment in preserving the monastery’s architectural heritage and natural surroundings, and promotion of eco-friendly transportation options. Supporting local businesses within the monastery compound can further enhance visitor services while benefiting the community economically. By integrating these measures into a comprehensive

sustainable tourism framework, the region can protect the site’s cultural and environmental integrity for future generations and stimulate local economic growth.

The global emphasis on sustainable development, guided by the SDGs, has increased the need for strategies that protect cultural and natural resources, especially in tourism. In that manner, strategic interventions should be aligned with the SDGs. Measures such as controlled visitor flow, preservation of cultural and natural heritage, eco-friendly transport, and support for local businesses not only address these concerns but also contribute to SDG 11 (sustainable communities) and SDG 12 (responsible consumption), ensuring long-term sustainability and community benefit.

6. Conclusion

The research undertook a SA that revealed 12 key topics grouped into three factors: ‘Site’ (‘Monastery’, and ‘Lake’), ‘Service’ (‘Beach’, ‘Garden’, ‘Location’, ‘Food’, ‘Clean’, ‘Parking’, and ‘Price’), and ‘Surrounding’ (‘Church’, ‘View’, and ‘Springs’). The factor sentiment heatmap indicated that while overall perceptions are positive particularly toward the natural and cultural setting there are notable concerns related to service quality and infrastructure. These insights underscore the need for targeted interventions that align with sustainable tourism principles, including improved visitor flow management, investment in site preservation, enhanced service delivery, and support for local businesses. Such measures not only address visitor expectations but also contribute to long-term cultural, environmental, and economic sustainability in line with the SDGs.

The study concluded that sustainable tourism management strategies should balance visitor access with conservation efforts, including controlling peak-time visits, investing in preserving the monastery’s architectural heritage and natural surroundings, and promoting eco-friendly transport. Supporting local businesses within the monastery compound was also recommended to enhance visitor services and community benefits. Such findings also provide practical guidance for tourism managers, emphasizing the importance of understanding tourist emotions and aligning development with sustainability goals to safeguard the site’s cultural and environmental integrity for the future.

The study acknowledges several limitations. The SA was conducted on a relatively limited dataset, which may affect the breadth of insights. Furthermore, the analysis focused primarily on textual reviews, thereby excluding other valuable forms of feedback such as interviews, surveys, or observational data. Future research should consider longitudinal data collection, engage a wider spectrum of stakeholders—including local residents and tour operators—and examine the long-term effects of targeted sustainability interventions. Such approaches would enable a more holistic understanding of tourist perceptions and inform the development of evidence-based strategies aligned with the SDGs. In this line, the study recommends that tourism policymakers implement sustainable management practices that effectively balance tourist flow with the preservation of cultural and natural aspects of the attraction.

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