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Nature-Based Tourism and Geosite Conservation in a Post-Socialist Mountain Region: Evidence from Berovo, North Macedonia

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Abstract

In peripheral mountain territories of Southeast Europe, tourism is often viewed as one of the few viable avenues for economic activity outside agriculture and limited public employment. The Berovo region in eastern North Macedonia represents such a context. It combines notable geodiversity and largely preserved forest landscapes with restricted accessibility and modest institutional integration of conservation into tourism planning.
This study investigates whether geological heritage in Berovo acts primarily as a limiting factor or as a structuring element that defines realistic development pathways. The research design combines geosite inventory work, stakeholder-based survey research (N = 142), GIS-supported spatial assessment, and strategic evaluation. Quantitative analysis includes descriptive statistics, reliability testing, correlation analysis, and one-way ANOVA in order to examine variation across stakeholder categories.
Results indicate broad agreement regarding the importance of geological value and conservation priority, while infrastructure adequacy and inter-institutional coordination receive more critical evaluations. Spatial assessment shows that many high-value geosites are located outside primary transport corridors, creating a patterned separation between resource concentration and tourism infrastructure. The findings suggest that conservation does not hinder tourism development in this setting; instead, it delineates the spatial and administrative parameters within which development can plausibly unfold. The Berovo case illustrates how the practical conversion of geodiversity into tourism activity depends on governance capacity and accessibility conditions in post-socialist mountain settings.

Keywords: nature-based tourism, geosite conservation, SWOT analysis, GIS, Berovo, sustainable regional development

1. INTRODUCTION

In many mountain regions of Southeast Europe, economic restructuring and demographic contraction have narrowed the range of viable development trajectories. Industrial production has weakened, agricultural employment has declined, and public-sector absorption capacity remains limited. Yet the presence of attractive landscapes or geological formations does not automatically translate into sustained tourism growth. Whether natural resources become operational assets or remain territorially latent depends on how they are articulated through governance arrangements, infrastructure networks, and planning coherence.
Eastern North Macedonia reflects this broader regional pattern. National tourism policy has historically privileged lake destinations and urban cultural centers, while mountainous territories in the eastern part of the country have occupied a peripheral position within strategic frameworks. The Berovo region, situated within the Malesevo mountain system, embodies this asymmetry. It contains fluvial geomorphological formations, erosion structures, diverse lithological compositions, and extensive forest cover. These features provide a substantial foundation for nature-based and geotourism-oriented development. At the same time, tourism activity remains modest in scale, spatially concentrated around settlement cores, and only loosely connected to site-specific conservation or interpretative planning.

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The key question concerns how existing natural value is embedded within territorial governance and infrastructure systems. Geological and ecological assets may be widely acknowledged, yet their developmental implications depend on accessibility patterns, administrative coordination, and investment priorities. In peripheral mountain contexts, conservation can be interpreted in two contrasting ways. It may be perceived as a regulatory constraint that restricts infrastructural expansion and visitor access. Alternatively, it may function as a structuring framework that defines the limits and modalities of sustainable tourism practice.

The Berovo region provides an appropriate case for such analysis. Its landscape exhibits pronounced geodiversity alongside relatively low levels of industrial disturbance. Forest ecosystems remain largely intact, and several geomorphological sites possess scientific and educational relevance. However, infrastructural provision is uneven. Primary transport routes follow valley corridors and connect settlement clusters, whereas numerous high-value geosites are accessible only through secondary roads or informal paths. Institutional responsibilities for tourism promotion, environmental oversight, and spatial planning are administratively separated. Although strategic documents acknowledge rural and eco-tourism potential, conservation-sensitive integration into tourism policy is not systematically operationalized.

Within this configuration, tourism feasibility cannot be assessed solely through resource inventory. Development outcomes are shaped by the interaction between geological value, accessibility conditions, governance capacity, and stakeholder perception. Appreciation of natural heritage may coexist with skepticism regarding institutional coordination. Similarly, recognition of conservation priority does not automatically clarify whether protection measures enable or impede tourism practice. Empirical evidence is required to understand how these dimensions intersect in a territorially specific setting.

2. THEORETICAL FRAMEWORK: NATURE-BASED TOURISM AND GEOSITE CONSERVATION

Nature-based tourism is typically associated with environmental quality and experiential engagement with landscapes (Newsome, Moore, & Dowling, 2013). Within this broader category, geotourism emphasizes geological heritage and geomorphological features as primary interpretative anchors (Dowling & Newsome, 2018).

Geosites differ from many other tourism resources in that they are non-renewable. Geological formations embody long-term Earth processes, and their degradation is effectively irreversible (Gray, 2013). For this reason, conservation is not an external addition to tourism planning but a condition upon which long-term viability depends.

In geopark settings, conservation, interpretation, and visitor management are coordinated through formal governance structures (UNESCO, 2017; Pásková & Zelenka, 2018). Peripheral regions lacking such frameworks often rely on decentralized administrative systems in which tourism promotion, environmental oversight, and spatial planning are institutionally separated. Under these circumstances, development trajectories are shaped less by intrinsic resource quality than by governance coherence.

A geosite located beyond established transport corridors or without interpretative infrastructure remains functionally peripheral, even if scientifically significant. Tourism circulation thus reflects infrastructural distribution and administrative capacity as much as geological value.

In peripheral mountain regions, structural economic marginality and limited institutional resources frequently influence investment priorities (Meyer, 2004; Rinaldi & Cavicchi, 2020). Mobility constraints and land-use patterns compound these effects (Hall & Müller, 2004; Nepal & Saarinen, 2016).

3. STUDY AREA: SPATIAL AND GEOLOGICAL CONTEXT OF THE BEROVO REGION

The Berovo region lies within the Malesevo mountain system in eastern North Macedonia, near the border with Bulgaria. Elevations exceeding 1,500 meters create marked variation in slope and exposure. Settlements are concentrated in valley corridors, while upland plateau zones remain sparsely populated.

Geologically, the region contains diverse lithological formations and fluvial geomorphological features, including river terraces and erosion landforms. Limited industrialization has preserved both geological structures and forest ecosystems to a considerable extent.

Infrastructure, however, follows settlement axes. Primary roads connect valley settlements, whereas several high-value geomorphological sites are accessible only through secondary routes or informal paths. Accommodation facilities cluster near populated areas rather than near many scientifically significant formations. This spatial arrangement shapes visitor circulation and limits spontaneous inclusion of certain geosites within tourism itineraries.

Institutional responsibilities for tourism, environmental management, and spatial planning are administratively distributed. Although tourism potential is acknowledged in planning documents, geosite-specific conservation and interpretative strategies are not systematically embedded in development frameworks.

4. METHODOLOGICAL DESIGN

The research combines stakeholder perception analysis with spatial assessment in order to examine how geological assets intersect with accessibility and governance conditions. Tourism feasibility is approached as an outcome influenced by conservation thresholds and territorial organization.

Geosite identification relied on geological literature, cartographic materials, and field reconnaissance conducted during the spring and summer season. Sites were selected according to scientific relevance, geomorphological distinctiveness, landscape visibility, and conservation sensitivity (Štrba et al., 2015; Bento et al., 2021).

The survey included 142 respondents representing local residents, tourism operators, and municipal or institutional actors. Purposive sampling ensured inclusion of participants familiar with regional environmental and tourism conditions. The questionnaire measured perceived geosite value, conservation priority, infrastructure adequacy, and institutional coordination using five-point Likert scales.

Internal consistency was assessed through Cronbach’s alpha, yielding values between 0.73 and 0.81. Statistical analysis included descriptive measures, Pearson correlation analysis, and one-way ANOVA with effect size estimation.

Spatial assessment employed vector overlays of geosite locations, road infrastructure, settlement distribution, and elevation data derived from a 30-meter digital elevation model. Buffer analysis was used to examine proximity to primary transport corridors. The purpose was to identify patterned discrepancies between resource concentration and infrastructural alignment rather than to produce predictive models.

Strategic synthesis was conducted through an empirically grounded SWOT framework.

4.1. Geosite Identification and Classification

Geosite identification was based on a review of existing geological literature, topographic and geological maps, and field reconnaissance conducted during the spring and summer season. Sites were selected according to scientific relevance, geomorphological distinctiveness, landscape visibility, and conservation sensitivity.

Each geosite was preliminarily categorized according to four criteria:

- scientific significance
- accessibility level
- interpretative readiness
- conservation vulnerability

This classification provided the basis for subsequent spatial and strategic analysis. The procedure did not attempt to produce a formal quantitative geosite ranking index; instead, it aimed to establish a structured inventory suitable for spatial overlay and policy evaluation.

4.2. Survey Design and Sampling

The empirical survey component comprised 142 respondents drawn from three stakeholder categories central to tourism development in the Berovo region: local residents, tourism operators, and municipal or institutional actors engaged in planning, environmental management, or tourism promotion. These groups were selected because they represent distinct yet interconnected positions within the territorial development structure.

Purposive sampling was employed in order to ensure inclusion of participants with direct familiarity with local environmental conditions and tourism activity. While the sample does not claim statistical representativeness of the entire regional population, it captures the principal actor categories whose perceptions influence development trajectories. The focus of the survey was therefore analytical differentiation rather than demographic generalization.

The questionnaire operationalized four evaluative constructs: perceived geosite value, conservation priority, adequacy of tourism-related infrastructure, and institutional coordination. Each construct was measured using five-point Likert-type items ranging from strong disagreement to strong agreement. The instrument was designed to capture perception-based assessment rather than objective infrastructural measurement, recognizing that development feasibility is shaped not only by material conditions but also by how these conditions are interpreted by relevant actors.

Survey administration took place in situ during the spring and summer field season. Conducting the survey within the regional context minimized recall bias and ensured that responses reflected recent and directly experienced environmental and infrastructural conditions.

4.3. Reliability and Construct Coherence

Internal consistency was assessed using Cronbach’s alpha. Values ranged between 0.73 and 0.81, indicating acceptable reliability for perception-based constructs in environmental and tourism research contexts.

Construct coherence was evaluated through alignment between survey items and the theoretical dimensions defined in the framework section. Items measuring geological

value and conservation priority reflect geodiversity and heritage literature, while infrastructure and coordination items correspond to spatial planning and governance considerations.

The inclusion of multiple stakeholder categories allowed cross-group comparison, reducing the risk of single-perspective bias. Mountain regions exhibit distinctive mobility patterns, governance constraints, and land-use dynamics that directly influence tourism circulation and accessibility structures (Hall & Müller, 2004; Nepal & Saarinen, 2016).

4.4. Statistical Procedures

Quantitative analysis was structured to clarify both the internal coherence of stakeholder perceptions and the extent to which these perceptions diverge across actor categories. Descriptive measures provided an overview of central tendencies and dispersion. Pearson correlation analysis examined the association between geological valuation, conservation priority, and development support. One-way ANOVA, followed by Tukey's HSD post-hoc testing where appropriate, assessed perceptual differences across stakeholder categories. Effect sizes were calculated using eta squared to evaluate substantive magnitude beyond statistical significance.

4.5. Strategic Integration through SWOT

The final stage synthesized survey findings, statistical results, and spatial analysis into a SWOT matrix. SWOT categories were constructed from patterns identified in the survey results, spatial assessment, and field observations, ensuring that strategic conclusions reflect observed territorial conditions. This integrative approach ensured that strategic recommendations emerged from territorially grounded evidence rather than abstract policy templates.

Table 2. Strategic SWOT Analysis of Nature-Based Tourism and Geosite Conservation in Berovo

Strengths	Weaknesses
High geodiversity with scientifically valuable geosites recognized by local stakeholders	Limited transport accessibility to key geosites
Preserved forest ecosystems and low levels of urban and industrial disturbance	Lack of interpretative infrastructure and visitor guidance
Strong local awareness of conservation importance	Fragmented institutional responsibilities between tourism, environment, and spatial planning
Landscape authenticity suitable for low-impact nature-based tourism	Insufficient coordination between municipal authorities and tourism actors
Favorable environmental conditions for educational and scientific tourism	Limited marketing visibility and absence from national tourism circuits
Opportunities	**Threats**

Strengths	Weaknesses
Growing demand for nature-based and geotourism experiences at regional and international levels	Risk of unregulated visitation leading to geosite degradation
Integration into geotourism networks and geopark-oriented initiatives	Institutional undercapacity for monitoring and management
Cross-border cooperation with neighboring regions and scientific institutions	Potential landscape degradation due to informal access and lack of control
GIS-supported spatial planning enabling targeted infrastructure investment	Climate variability affecting sensitive geomorphological features
Development of conservation-led tourism strategies aligned with sustainability policies	Short-term economic pressures overriding conservation priorities

The SWOT analysis synthesizes empirical survey results, spatial GIS findings, and field observations into a coherent strategic assessment of nature-based tourism development in the Berovo region. Identified strengths, particularly high geodiversity and preserved ecosystems, correspond closely with the high mean values recorded for perceived geosite value and conservation priority among respondents. These strengths confirm that the region's natural capital constitutes a credible foundation for conservation-oriented tourism development rather than a latent or speculative resource.

Conversely, the weaknesses highlighted in the analysis reflect statistically supported concerns regarding infrastructure adequacy and institutional coordination, which received the lowest evaluation scores across stakeholder groups. The ANOVA results demonstrate that tourism operators express significantly lower satisfaction with accessibility and interpretative infrastructure than local residents, reinforcing the strategic relevance of infrastructural and governance deficiencies identified in the SWOT matrix.

Opportunities identified in the analysis align with broader trends in nature-based and geotourism demand, as well as with the spatial potential revealed through GIS mapping. The observed mismatch between high-value geosites and existing infrastructure suggests that targeted, conservation-led planning interventions could unlock tourism potential without compromising geological integrity. At the same time, the threats outlined in the SWOT analysis underscore the risks associated with unmanaged visitation and limited institutional capacity, emphasizing that development without governance strengthening could undermine both conservation and tourism objectives.

Overall, the SWOT analysis confirms that geosite conservation in Berovo functions simultaneously as a structural constraint and a strategic development asset. Effective nature-based tourism development therefore depends on institutional integration, spatially informed infrastructure planning, and governance mechanisms capable of aligning conservation priorities with tourism valorization.

5. RESULTS

5.1. Stakeholder Evaluation

Respondents express high recognition of geosite value (M = 4.41) and conservation priority (M = 4.28). Agreement across groups suggests that geological heritage is broadly acknowledged as territorially significant.

Infrastructure adequacy (M = 2.67) and institutional coordination (M = 2.54) receive comparatively low evaluations. These results indicate dissatisfaction with operational conditions rather than with natural resource legitimacy.

Table 1. Descriptive statistics of key survey constructs (N = 142)

Construct	Mean	SD
Perceived geosite value	4.41	0.58
Conservation priority	4.28	0.62
Tourism infrastructure adequacy	2.67	0.71
Institutional coordination	2.54	0.76

GIS analysis was conducted to map the spatial distribution of identified geosites in relation to road infrastructure, settlements, and existing tourism facilities.

5.2. Correlation Patterns

Correlation analysis reveals a consistent internal structure in stakeholder evaluations. Perceived geosite value is strongly and positively associated with conservation priority ($r = 0.62$, $p < 0.001$), indicating that appreciation of geological heritage is accompanied by support for its protection. Recognition and conservation are therefore conceptually aligned rather than positioned in tension.

Perceived geosite value also shows a moderate positive relationship with support for tourism development ($r = 0.48$, $p < 0.001$). This association suggests that stakeholders who attribute higher importance to geological assets are not inclined toward restrictive attitudes; instead, they tend to endorse development that remains compatible with conservation principles. Conservation priority itself is positively correlated with development support ($r = 0.36$, $p < 0.01$), reinforcing the interpretation that protection is not perceived as incompatible with tourism activity.

The strongest association emerges between infrastructure adequacy and development support ($r = 0.53$, $p < 0.001$). This finding underscores the practical dimension of feasibility. While geological value and conservation awareness establish normative legitimacy for tourism, perceived infrastructural capacity more directly shapes expectations regarding whether development can be realized in practice. Accessibility and facilities thus operate as decisive mediating conditions between resource recognition and economic activation.

5.3. **Inter-Group Differences**

No statistically significant differences emerge across stakeholder groups regarding geosite value or conservation priority. Divergence appears in infrastructure adequacy ($F(2,139) = 6.42$, $p = 0.002$, $\eta^2 = 0.08$) and institutional coordination ($F(2,139) = 5.87$, $p = 0.004$, $\eta^2 = 0.07$). Tourism operators report lower satisfaction than residents, suggesting that those directly engaged in tourism activity encounter structural constraints more directly.

The analysis reveals a clear spatial mismatch between high-value geosites and accessible infrastructure, particularly in forested plateau zones.

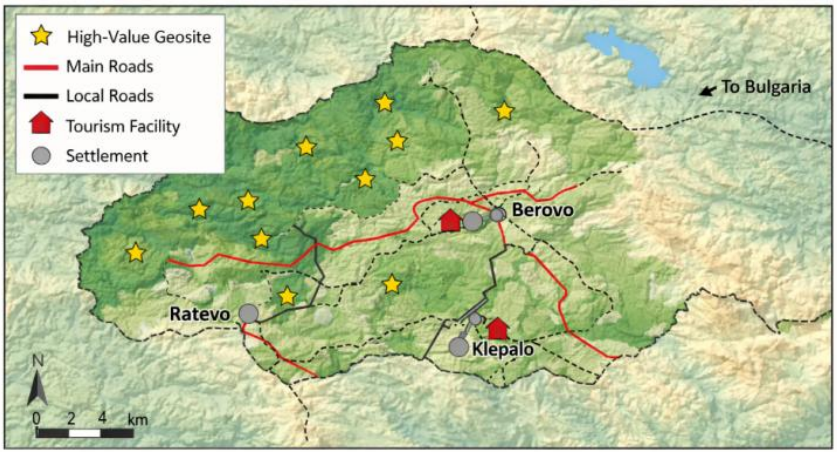

Figure 1. Spatial distribution of geosites and tourism infrastructure in the Berovo region

Source: Author's GIS-based spatial assessment using OpenStreetMap infrastructure data and regional geospatial layers.

6. SPATIAL ANALYSIS

Approximately 63 percent of high-scientific-value geosites are located beyond a 500-meter buffer from primary road infrastructure. Many are situated in plateau or fluvial settings accessible only through secondary routes. Accommodation facilities cluster in valley settlements. This configuration creates a spatial imbalance between areas of high geological concentration and zones equipped with visitor infrastructure.

Slope analysis indicates that several sites are located on gradients exceeding 20 degrees, complicating access and increasing conservation sensitivity. The spatial configuration therefore narrows the range of development options, favoring controlled and small-scale interventions over extensive infrastructural expansion.

7. SYNTHESIS OF EMPIRICAL FINDINGS

The combined statistical and spatial analysis indicates a consistent development pattern. Geological value is consistently acknowledged across stakeholder categories, and conservation priority aligns with development-oriented attitudes rather than opposing them. At the same time, dissatisfaction with infrastructure and inter-institutional coordination signals that the principal constraints do not originate in resource legitimacy. Instead, they are embedded in accessibility structures and governance performance. Spatial asymmetries between high-value geosites and primary transport corridors further condition tourism circulation, shaping which locations become functionally integrated into visitor itineraries. Development feasibility in Berovo depends primarily on infrastructure accessibility and institutional coordination.

8. DISCUSSION

The evidence from Berovo suggests that conservation and development are not positioned in direct opposition. Geological value and protection priorities are not

contested among respondents. Instead, the friction emerges at the level of implementation. Infrastructure remains unevenly distributed, and institutional responsibilities are administratively separated in ways that complicate coordinated action.

Spatial configuration reinforces this condition. High-value geosites frequently lie beyond the most accessible corridors, which reduces their spontaneous inclusion in tourism flows. Without targeted planning, such sites remain outside dominant tourism flows. The observed positive association between conservation priority and development support suggests that stakeholders do not perceive environmental protection as prohibitive. Rather, conservation appears compatible with tourism provided that access, interpretation, and coordination are coherently structured.

Similar patterns have been observed in other Balkan mountain settings where geological potential exists but infrastructural alignment and governance integration remain incomplete (Stankov et al., 2019; Milanović Pešić & Jovanović, 2017).

The Berovo case therefore contributes empirical evidence to geotourism governance debates by demonstrating how conservation operates as a spatial filter rather than a prohibitive constraint.

8. CONCLUSION

The Berovo case demonstrates that geosite conservation does not inherently restrict tourism development. Rather, it defines the parameters within which development can proceed sustainably. High recognition of geological value coexists with dissatisfaction regarding infrastructure and coordination.

Spatial mismatch between resource concentration and transport networks conditions tourism circulation. Governance coherence and targeted infrastructural alignment therefore emerge as prerequisites for translating geodiversity into structured visitor experience.

Geological assets become economically relevant only when supported by accessible infrastructure and coordinated planning.

9. References

Bätzing, W. (2015). The Alps: A European cultural landscape between urban pressure and rural marginality. Mountain Research and Development, 35(3), 238–245.

Bento, J. P., Pereira, P., & Pereira, J. A. (2021). Geodiversity assessment methods and their relevance for geotourism development. Geoheritage, 13(4), 1–15. https://doi.org/10.1007/s12371-021-00605-2

Buckley, R. (2009). Ecotourism: Principles and practices. CABI. https://doi.org/10.1079/9781845934576.0000

Dowling, R. K., & Newsome, D. (Eds.). (2018). Handbook of geotourism. Edward Elgar Publishing. https://doi.org/10.4337/9781785368868

Farsani, N. T., Coelho, C., & Costa, C. (2011). Geotourism and geoparks as novel strategies for socio-economic development in rural areas. International Journal of Tourism Research, 13(1), 68–81. https://doi.org/10.1002/jtr.800

Ghorbani, A., Ranjbar, N., Seyedmohammadi, M. R., & Aghamohammadi, R. (2015). SWOT analysis of sustainable tourism development strategies. Tourism Management Perspectives, 16, 290–297. https://doi.org/10.1016/j.tmp.2015.09.004

Gray, M. (2013). Geodiversity: Valuing and conserving abiotic nature (2nd ed.). Wiley-Blackwell. https://doi.org/10.1002/9781118658592

Hall, C. M., & Müller, D. K. (Eds.). (2004). Tourism, mobility and second homes: Between elite landscape and common ground. Channel View Publications.

Meyer, D. (2004). Tourism as a tool for development? A critical analysis of peripheral destinations. Tourism Geographies, 6(3), 316–339. https://doi.org/10.1080/1461668042000249633

Milanović Pešić, A., & Jovanović, A. (2017). Geosite evaluation and geotourism development in Southeast Europe: Evidence from Serbia. Geoheritage, 9(4), 523–535. https://doi.org/10.1007/s12371-016-0207-3

Nepal, S. K., & Saarinen, J. (2016). Political ecology of tourism in mountain regions. Annals of Tourism Research, 61, 94–105. https://doi.org/10.1016/j.annals.2016.10.002

Newsome, D., Moore, S. A., & Dowling, R. K. (2013). Natural area tourism: Ecology, impacts and management (2nd ed.). Channel View Publications.

Pásková, M., & Zelenka, J. (2018). Sustainability management of UNESCO Global Geoparks. Sustainability, 10(6), 1807. https://doi.org/10.3390/su10061807

Rinaldi, C., & Cavicchi, M. (2020). Rural tourism and territorial development in peripheral regions. European Countryside, 12(4), 511–527. https://doi.org/10.2478/euco-2020-0026

Stankov, U., Petrović, M., & Dragićević, V. (2019). Geotourism in the Balkan Peninsula: Development perspectives and regional challenges. Geoheritage, 11(3), 987–1002. https://doi.org/10.1007/s12371-018-0336-4

Štrba, L., Baláž, B., Lukáč, M., & Muchová, Z. (2015). Geosite assessment methods: Comparative analysis and application. Geoheritage, 7(3), 235–248. https://doi.org/10.1007/s12371-014-0136-9

Tomljenović, R., & Kunst, I. (2014). Sustainable tourism development in Croatia: The role of rural and mountain destinations. Tourism Planning & Development, 11(2), 150–167. https://doi.org/10.1080/21568316.2013.876097

UNESCO. (2017). UNESCO Global Geoparks: Celebrating Earth heritage, sustaining local communities. UNESCO.

UNWTO. (2021). Tourism and rural development. World Tourism Organization.