PROPOSAL FOR A GEOTOURISM TRAIL TO ENHANCE THE OFFER OF THE MALÉ KARPATY GEOPARK

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Abstract
This paper proposes a geological educational trail in the Malé Karpaty Mountains, in the village of Kuchyňa (Slovakia). It focuses on identifying, evaluating, and interpreting natural and cultural heritage to support geotourism and environmental education. The trail incorporates key geological, geomorphological, hydrogeological, and historical features, including fluvial landforms, sedimentary structures, and remnants of historical mining. It is designed for diverse audiences, including school groups, families, and recreational visitors, offering both a shorter educational route and a more challenging hike. The emphasis is on experiential learning, interdisciplinary links, and effective communication of scientific knowledge through interpretative materials. The trail can help promote geotourism, raise environmental awareness, and strengthen regional identity within the Malé Karpaty Geopark. The study underscores the importance of combining scientific research with practical approaches to sustainable landscape management and education.

Key words: geopark, geotourism trail, geoeducation, geointerpretation, proposal

Introduction

Geology as a scientific discipline is not limited by administrative boundaries, as it studies processes and structures that transcend territorial divisions. In contrast, a geopark is defined as a specific area with clearly delineated boundaries that holds significant geological, natural, and cultural value. Its primary aim is to support regional development through conservation, environmental education, and sustainable tourism. The concept of a geopark is based on the preservation of geological heritage through active cooperation with the local community (UNESCO, 2026). Such development should be mutually beneficial for both residents and visitors, while respecting the natural environment and its values.

There are currently four established geoparks in Slovakia: the Novohrad–Nógrád Geopark, the Banská Štiavnica Geopark, the Banská Bystrica Geopark, and the Little Carpathians Geopark. The latter is among the youngest and represents an important step in the development of geotourism and environmental education in the western part of the country (SAŽP, 2025).

This paper focuses on the identification, characterisation, evaluation, and interpretation of the natural and cultural heritage of a selected part of the Malé Karpaty Mountains, with the aim of proposing a potential educational trail in the central part of this region, specifically in the village of Kuchyňa, which is characterised by a rich mining history. The proposed route includes selected sites with high natural, geological, and cultural potential that could significantly contribute to tourism development in the region.

Materials and methods

The geology of the Malé Karpaty Mountains exhibits considerable diversity. It includes mountain terrains suitable for hiking, watercourses and reservoirs with recreational potential, as well as wetlands with distinctive ecological and aesthetic characteristics. This diversity creates favourable conditions for the development of geotourism, environmental education, and the protection of natural heritage in cooperation with local communities.

- The following methodological approach was applied in the design of the educational trail:
- Field survey and geoheritage analysis – identification of geologically, ecologically, and culturally significant sites, including the collection of data on rocks, geomorphology, and hydrogeological features.
- Assessment of the area's potential – evaluation of the attractiveness of the locality for different target groups (tourists, schools, families, and other interest groups), including accessibility, safety, and infrastructure, as well as opportunities for interdisciplinary integration (geology, biology, history, environmental science).
- Design of educational content – development of information panels, posters, leaflets, and

interactive elements; adaptation of specialised information into an accessible form for the general public; and alignment with school curricula through suggested field-based activities.

- Route and stop planning – logical organisation of the trail with respect to thematic units, selection of stops based on their significance, visual attractiveness, and accessibility, and consideration of different modes of use (walking, cycling, families with children).
- Sustainability and nature conservation – minimisation of interventions in the natural environment.
- Community and stakeholder engagement – consultation with local residents, schools, municipal authorities, and experts; support for local crafts, entrepreneurship, and cultural heritage; and creation of opportunities for volunteer and community activities.
- Graphic and technical design – preparation of visualisations, maps, and panel designs; development of signage and trail infrastructure; and preparation of technical documentation for implementation.

Results

The route leads through a forested area, passing a forester's lodge and stopping at a former quarry, with the final destination at the Kuchynská priehrada reservoir (or vice versa).

The proposed trail (Figure 1) is designed to enable the application of theoretical knowledge in a real natural environment through an educational and experiential approach. It focuses on developing observational skills, supporting critical thinking, and enhancing environmental awareness. By incorporating local geological, biological, and cultural-historical features, the trail connects theoretical learning with practical landscape exploration and promotes a deeper relationship with nature and its conservation.

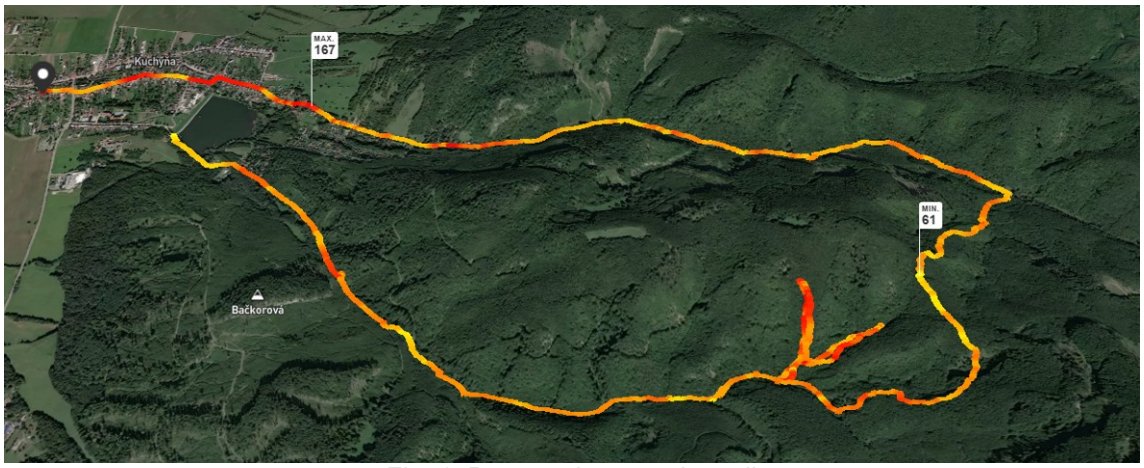

Fig. 1: Proposed geotourist trail

The route begins in the village of Kuchyňa near a hydrological gauging station. It continues through a scenic forest landscape along the Malina stream. Throughout the route, visitors can observe various geologically significant features. The trail leads from the gauging station towards the Köberling 2 adit (or to a nearby crossroads, if the short detour is omitted), then continues across Kerečnatá (also referred to as Korečnatá on some maps). It passes former quarry sites and ends at the Kuchynská priehrada reservoir.

The total duration of the full route is approximately 6 to 7 hours, depending on terrain conditions and breaks. A shorter version takes approximately 2 to 3 hours (from the water source to Köberling 2 and back). The educational trail includes a total of eight stops.

The total length of the route is approximately 13 km, corresponding to about 4 hours and 40 minutes of walking at a steady pace with short breaks, excluding interpretation stops. The route can be shortened by using an unmarked path, reducing the duration to approximately 4 hours and 30 minutes and the length to about 12.5 km. The shorter educational route (from the water source to Köberling 2 and back) takes approximately 2 hours.

The trail focuses on geological structure, rocks and minerals, fluvial processes (river sections, meanders, waterfalls, alluvial deposits, bank erosion, and slope undercutting), sedimentation, folding, mining activity and its environmental impact, quarrying, and practical geological observation (e.g. use of a geological hammer).

The route can be adapted for educational purposes, particularly for kindergarten and primary school

groups. In such cases, it is recommended to use the first third of the route, from the water source to Köberling 2 and back, covering approximately 3.1 km (6.2 km return). Alternatively, starting from the reservoir, the distance is approximately 5.1 km (10.2 km return). This section is relatively undemanding and offers a high concentration of observable geological features, allowing for interdisciplinary teaching.
The section passing through Kerečnatá towards the former quarry is more physically demanding, with an elevation gain of approximately 300 metres.
The proposed educational trail consists of eight main stops, arranged logically along the route and reflecting the most significant natural and anthropogenic features of the area. The first stop is the hydrological gauging station in the village of Kuchyňa, which serves as the entrance to the forest environment and the starting point of the trail. The second stop is located at a water source near Modranská Skala, an important hydrogeological site where karst–fissure groundwater accumulates in carbonate rocks. The third stop is situated along the Malina stream, where visitors can observe the dynamics of a mountain watercourse, including meanders, erosion, alluvial deposits, and small waterfalls. This is followed by two stops focused on the Köberling 1 and Köberling 2 mining adits, which represent historical pyrite mining sites and illustrate past mining activities in the area. The sixth stop is located in the Kerečnatá area, representing a more demanding section of the route with visible geological outcrops. The seventh stop is situated in a former quarry below Mešťánková hill, where various rock types and remnants of mining activity, such as spoil heaps and mining pits (pinga), can be observed. The final, eighth stop is the Kuchynská priehrada reservoir, which serves as the endpoint of the trail and provides an opportunity to summarise the acquired knowledge.

Discussion

The educational trail is divided into two parts – an educational section and a more demanding hiking section – thereby accommodating different types of potential geopark visitors (Amaro et al., 2023; Drápela et al., 2021)
The educational section is designed to be accessible to school groups, families with children, and individuals interested in geology who prefer less physically demanding activities. It allows direct observation of geological phenomena such as karst features, sedimentation processes, and tectonic deformation. The trail also enables interdisciplinary connections, linking geology with geography, biology, history, and art education. The educational panels are designed to be clear and engaging, making them accessible to a broad audience without requiring specialised knowledge.
The hiking section offers a more immersive natural experience. Although physically more demanding, it provides close contact with the natural environment. The route passes through forest paths also used by wildlife, allowing visitors to observe species such as roe deer, deer, and birds. It is also suitable for mushroom foraging, particularly in autumn.
A notable feature is the quarry, which initially appears as a stone field. However, with the use of a geological hammer, visitors are able to discover intriguing rock samples, potentially appealing to geotourism enthusiasts.
The entire trail is designed with a strong emphasis on environmental education, encouraging visitors to reflect on the relationship between humans and the landscape, the impact of human activity on nature, and the importance of conservation.
From a tourism perspective, it is important to consider the needs of different visitor groups. For families, kindergartens, and primary schools, simplicity and clarity of interpretation are essential. Educational panels should be visually clear, concise, and interactive, supporting experiential learning.
Another important group consists of mushroom foragers, who frequently visit the area. An interesting approach is to link mushroom occurrence to geological conditions, explaining the relationship between fungi, bedrock, soil types, and microclimate. This can enhance understanding of geological processes.
Cyclists experience the trail differently from pedestrians – more dynamically, with an emphasis on clarity and visual readability. Therefore, information must be presented in a concise and visually accessible manner.
Effective interpretation connects geological phenomena with everyday experience, such as the relationship between bedrock and vegetation, the influence of streams on landscape formation, or differences in fossil and mineral occurrence. Such connections make geological concepts more accessible and engaging for the general public.

Conclusion

The proposed geological educational trail follows the courses of the Javorinka and Malina streams, which have significantly shaped the local landscape. Along the route, visitors can observe geomorphological features such as meanders, cascades, small waterfalls, and fluvial karst, illustrating

the dynamic processes of erosion and deposition.
The area around the village of Kuchyňa is characterised by a diverse geological structure, including sedimentary and metamorphic rocks, providing suitable conditions for environmental education and field observation.
The proposed trail represents an effective tool for linking theoretical knowledge with practical experience and can serve as a valuable resource for field-based education. It also has the potential to support the development of geotourism, strengthen local identity, and increase environmental awareness within the Malé Karpaty Geopark.

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Souhrn

Článek se věnuje návrhu geoturistické naučné stezky na území Geoparku Malé Karpaty na Slovensku, propojením environmentálního vzdělávání, geoturistiky a regionálního rozvoje. Hlavní zaměření je na identifikaci a interpretaci přírodního a kulturního dědictví v okolí obce Kuchyňa, která se vyznačuje výraznou geologickou diverzitou a historickou těžební činností. Metodologicky práce vychází z terénního výzkumu, analýzy geologického dědictví a hodnocení potenciálu území z hlediska turismu a vzdělávání. Návrh respektuje principy udržitelnosti a minimalizace dopadů na přírodní prostředí a zdůrazňuje význam zapojení místní komunity. Navržená trasa sleduje významné krajinné prvky, zejména vodní toky Malina a Javorinka, které formovaly reliéf území. Na trase lze pozorovat geomorfologické jevy, jako jsou meandry, kaskády, menší vodopády a projevy fluviálního krasu. Tyto prvky dokumentují erozní a akumulační procesy a poskytují vhodný základ pro terénní výuku. Součástí stezky je osm tematických zastavení zaměřených na klíčové aspekty geologického a kulturního dědictví. Důraz je kladen na srozumitelnou interpretaci odborných poznatků prostřednictvím informačních panelů a interaktivních prvků. Stezka je navržena pro různé cílové skupiny, včetně školních kolektivů, rodin s dětmi i individuálních návštěvníků. Navržená koncepce ukazuje, že geologické dědictví lze efektivně využít pro vzdělávání i rozvoj cestovního ruchu. Stezka má potenciál posílit geoturistiku v rámci Geoparku Malé Karpaty a zvýšit povědomí o ochraně přírodního prostředí.

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