

Interpretation of geological heritage on nature trails and geotrails in Geopark Banská Štiavnica and their online information availability

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Abstract

The inherent link between the mining history and culture in the region of Banská Štiavnica (Slovakia) and the unique geological and morphological heritage offers significant potential for the development of geotourism and educational trails, thus presenting the heritage to a wide spectrum of visitors. In recent years, online availability of information about such trails has become very important for the digital society that uses the internet and social networks daily. This article focuses on the development and online information availability of geotrails located in the territory of the first Slovak geopark, Banská Štiavnica Geopark. Results show that there are very few geoscience-based trails with limited online information available. By investing in effective on-site heritage interpretation and proper online promotion, the territory can become a premier geotourism destination.

Keywords

Geopark, Geotrail, Geoheritage interpretation, Nature trails, Geopark Banská Štiavnica.



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Introduction

The Banská Štiavnica Geopark is the oldest geopark in the Slovak Republic, built between 2000 and 2005. It covers an area of 206.32 km², which boasts a long and rich mining history, as well as a volcanic unique such as the Štiavnica stratovolcano, in which caldera today's city of Banská Štiavnica is located. The first mentions of the mining of precious metals in the territory of Banská Štiavnica probably date back to the period of the Celts. However, the area experienced more significant development in the 12th century, when mining in Banská Štiavnica made significant technological progress and later became one of the most important mining centres in Hungary, eventually in the whole of Europe (Novák, 2001). The occurrence of gold, silver, and other metals is directly related to the location of the city in the caldera of a former stratovolcano, whose hydrothermal processes caused the formation of ore mineralisation (Lexa, Štohl, & Konečný, 1999). The remains of the Štiavnica stratovolcano represent a unique geological heritage and one of the largest stratovolcanoes in the Carpathians (in the Neogene period, it could reach a height of up to 4000 m, with a caldera diameter of approximately 20 km) (Konečný, 2008; Lexa, Štohl, & Konečný, 1999).

The natural connection between the mining culture in the region and the unique geological heritage represents a huge potential for developing geotourism and educational trails about geology and geomorphology. However, this potential is largely unused due to the weak activity of the geopark in recent years, lack of know-how and examples of good practice, as well as insufficient communication towards tourists. At present, when education about the Earth, its history, and processes is an increasingly discussed topic, the activity of the geopark as a centre of informal education would be more than welcome. Unfortunately, countries today are facing a decline in interest in geosciences globally (UNESCO, 2019; UNESCO, 2023). In general, there is limited understanding of the origins of everyday materials, natural hazards, and even basic concepts such as the water cycle (Justice, 2018). Several surveys have already addressed the need to popularise earth sciences and educate young people about them (Libarkin et al., 2005; UNESCO, 2019; Georgousis et al., 2021). However, Earth science education should not only focus on traditional formal education in schools (at various levels of study) but also on extracurricular and recreational activities provided by organisations such as museums, interactive science centres, national parks, geoparks, and others (UNESCO, 2019). Tourism forms that include education in geosciences thus represent a suitable tool for increasing knowledge about the Earth and processes related to it within the framework of recreational activities. The form of tourism that primarily deals with this issue is geotourism. Although geotourism is still considered a relatively new form of tourism, especially among the general public, based on its principles, geotourism is (a) based on geology, (b) educational, (c) satisfying the needs of tourists, (d) sustainable (environmentally, socio-economically), and (e) bringing benefits to the local population (Newsome & Dowling, 2010). This makes geotourism an ideal tool for educating the general public about the geological processes that have shaped geological heritage and documenting Earth's history. As an informal educational centre for geotourism, a geopark offers countless opportunities to present geology to non-expert tourists. One of the most widespread educational mediums in the field of tourism is the educational trail, which, following the principles of geotourism, is described in foreign literature as a geotrail.

This article focuses on geotrails in the territory of the first Slovak geopark, Banská Štiavnica Geopark, which combines exceptional geology with unique cultural-historical monuments documenting the historical importance of the city of Banská Štiavnica in the field of mining and related fields. Nowadays, various tourist destinations can be explored thanks to technological development (Martín-Martín et al., 2023). Thus, the online availability of information about the existence of such routes is very important in today's digital society using the Internet and social networks daily because it represents communication with tourists even before the trip itself and thus also acts as a promotional tool that can significantly affect its image and competitiveness (Leung et al., 2013; Armutcu et al. 2023; Štefko et al., 2023). According to the authors' knowledge, such an approach has not yet been adopted in the territory of any Slovak geopark.

Theoretical framework

Geotourism, geosites and geoheritage

Newsome and Dowling (2010) define geotourism as tourism centred on geological elements, promoting tourism to geosites, preserving geodiversity, and fostering understanding of geosciences through appreciation and learning. This can be achieved through visits to these geological features, the use of geotrails and viewpoints, guided tours, geo-activities, and visits to geosite visitor centres (Newsome & Dowling, 2010). Geosites represent places that are part of geological heritage (Hose, 2012), which can be defined as a set of geotopes, forms, and processes forming the geological history of regions (Carcavilla et al., 2009) and, at the same time, which is part of the world's natural heritage fulfilling a key role in understanding the origin and history of the Earth (Wimbledon & Smith-Meyer, 2012). Geological heritage is also characterised by UNESCO (UNESCO, 1999; Zafeiropoulos et al., 2021), according to which it represents a set of the most interesting geological sites that are scientifically, didactically, historically, aesthetically, or culturally important for preservation.

Geopark

Geopark is a territory with defined boundaries that includes relevant geosites supporting economic and regional development through sustainable tourism and achieving conservation and education goals (Herrera-Franco et al., 2021). The largest and, at the same time, the most prestigious geoparks network, which currently includes 213 geoparks from 48 countries in the world, is the Global Geoparks Network (GGN), operated under the umbrella of UNESCO (unesco.org/igpp). UNESCO defines its global geoparks as unique geographical territories with clearly defined boundaries, characterised by remarkable geological heritage and internationally recognised sites that promote the importance of protecting the Earth's geodiversity through the active involvement of local communities (Pérez-Romero et al., 2023). Pérez-Romero et al. (2023) mention the following four reasons or purposes for the creation and operation of geoparks: (a) conservation and protection of the environment, (b) support of education in the field of geosciences, (c) support of sustainable economic development at the local level, and (d) dissemination and supporting a better understanding of geological heritage in ecosystems for their rational use. Geopark networks are defined also at the national level. In Slovakia, there is a Network of Geoparks of the Slovak Republic (SG), which includes four geoparks, namely Banská Štiavnica Geopark, Banská Bystrica Geopark, Malé Karpaty Geopark and the Slovak-Hungarian cross-border Novohrad-Nógrad UNESCO Global Geopark. The last one mentioned is also the only geopark from the territory of Slovakia, which is a member of the GGN (Návrh koncepcie geoparkov v SR, 2008) (Aktualizácia Koncepcie geoparkov SR, 2015). Besides these four geoparks, Geopark Zemplín, located in the southeastern part of the country, is one of the proposed Slovak geoparks and is recently under preparation (Fig. 1).

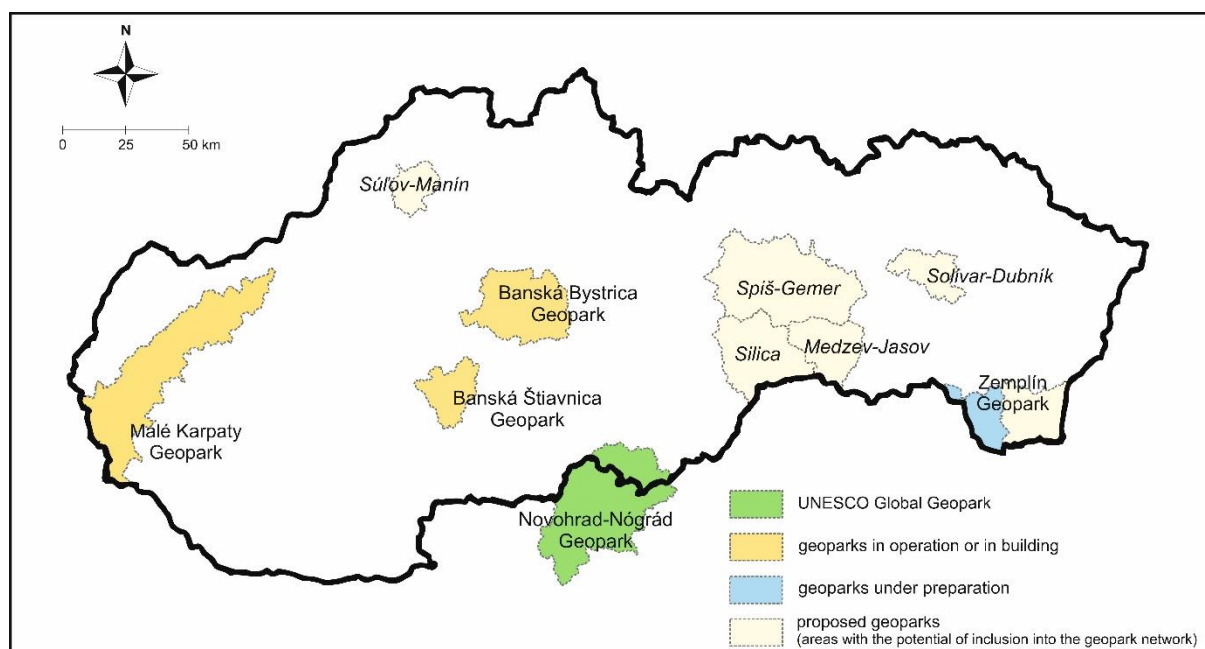


Fig. 1 Map of Slovak geoparks and proposed geopark areas

Geoheritage interpretation

Communication in the field of Earth science within geotourism is one of the main topics of the UGGp (Justice, 2018). This communication can be found under the term geological heritage interpretation (geo-interpretation), which Hose (2012) defines as the art or science of determining and then communicating the meaning or importance of a geological or geomorphological phenomenon, event, or place. However, geo-interpretation in geotourism is more than just communicating facts (Hose, 2012). It represents the presentation of geological heritage as an educational activity that provides not only professional information but also creates a relationship between the tourist and the interpreted object, and at the same time, represents a management, promotion, and conservation tool for the given location (Farsani, Neto de Carvalho, & Xu, 2018; Migoń, 2018). This communication takes place between the tourist as the subject of the communication system and the interpretation channel as a tool that conveys information about geological heritage to him in a way that leads to understanding and, at the same time, brings experience and fulfils the tourist's expectations (Ren, Simonson, & Pan, 2013).

Geotrails and their interpretation

A suitable tool for mediating the interpretation of the geological heritage, often through several interpretation channels (such as information boards, hands-on expositions, activities, games, views, interpretation of guides, etc.), is a geotrail. The Geotrail is an educational trail focused on education about earth sciences, which should be based on the principles of geotourism and thus not only fulfil the geoscience focus in terms of content but also

achieve the education of the general public, who at the end of the day should acquire new knowledge and create a positive relationship and attitude to the given information, which is usually achieved by the attractiveness and entertainment of the given interpretations and consideration of sustainability. However, geotrails are not limited only to geoparks and are often found outside them (Stolz & Megerle, 2022). At the same time, they are relatively easy to set up, considering that they can be built around a route already used by tourists (Lewis, 2023).

The problem of interpretation of geological heritage and geotouristic educational trails, so-called geotrails or geo-footpaths is a significantly undersized topic not only within Slovak geoparks but also within the UNESCO Global Geoparks Network (UGGp). The number of articles on geotrails in the Web of Science Core Collection database (open access, as of 23.5.2024) is 31, even if we include several terms in the search, namely "geotrail"; "geotouristic trail"; "trail" and "geopark"; "trail" and "geotourism". If only the terms "geotrail" and "geotouristic trail" are considered, the number of articles is 14. Articles that do not relate to the territory of the geopark predominated with a share of 64%. Articles devoted to geotrails in the UNESCO geopark accounted for 26% and in the National Geoparks 10%. The problem is also the insufficient marking of the articles within their keywords or titles. At the same time, the search in the WoS database via the "topic" attribute is also debatable since it was possible to find articles in magazines belonging to the WoS, which were devoted to geotrails or geo-pedestrian, but they were not found in the WoS search. Given that the UNESCO network of geoparks with its criteria represents a certain standard, know-how, and examples of good practice, it is considerably limiting for the further development of geo-trails if it is possible to draw information from only 10 articles that deal with geotrails in the territory belonging to the network UNESCO geoparks. The mentioned facts indicate that minimal attention is paid to this issue within the professional (scientific) community. This finding is surprising, especially because the interpretation of knowledge about geological heritage through geotrails can be an effective tool for its presentation and popularisation with the general public.

As examples of good practice and know-how sharing in UNESCO geoparks, a few publications, such as by Stolz & Megerle (2022), which deal with geotrails in the Swabian Albs UNESCO Geopark in Germany, can be mentioned. The detailed evaluation of existing geotrails, which is dealt with in the publication, based on previous SWOT analyses, comprehensive literature, and sample geotrails, points to shortcomings in the field of geo-interpretation, as it reached an average of only 28 out of a total of 72 points, only approximately 40% used tools of geo-interpretation to an acceptable extent. The authors also saw geo-education as an area for improvement. However, current geotrails are doing much better in the Swabian Albs than they were in the past, which is due to research projects on the effectiveness of geotrails, visitor motivation, design, publication of manuals, implementation of training events and quality assurance of geoparks. "Persuasion and Know-how transfer are therefore necessary in such cases. There is still a need for research on the effectiveness of geotrails on the awareness of the users (to what extent is awareness created for geodiversity and geoconservation), but also with regard to the potential demand (how can new target groups be acquired, which groups are interested in which geotopics, etc.) and the media used (which reports on opportunities and potentials, but also which obstacles, if any, are associated with the use of new media)." (Stolz, & Megerle, 2022). Other suitable examples of good practice include the UNESCO Geopark Mixteca Alta in Mexico, where Palacio Preto, Fernander de Castro Martínez & Rosaldo González (2019) described several geotrails on its territory and evaluated them as "a teaching resource that can be adjusted to the expectations of visitors at all educational levels and that contributes to the evaluation of natural resources from a social perspective". They further pointed out their importance in the context of the relationship between geological heritage and the value of human development when residents with minimal work opportunities are involved in the activities (Palacio Preto et al., 2019). The article by Jeon, Koh & Soutcott (2023), which deals with geotrails in the Jeju UNESCO Geopark in South Korea, also points to the significant economic benefit of geotrails when data from participant surveys, provincial statistics, and interviews with local residents indicated an increase in local income from tourism. Other benefits include increased local pride, awareness of the geological heritage, and willingness to protect it. Geotrails are described in the article as the most active part of the "Geobranded project", which also includes activities such as Geohouse, Geoacademy, Geofood, etc. Among other things, the article also mentions two surveys of visitors, namely on Suwolbong geotrails and Gyorae geotrails, which represent "best examples" based on the positive changes they have brought about in the respective villages (Jeon, Koh, & Southcott, 2023). Lewis (2023) mentions geotrails in the UNESCO Geopark Kanawinka in Australia and, above all, points to the importance of their connection to culture and mentions an innovation of Australian geotourism - integration of geotrails with ICOMOS (International Council on Monuments and Sites) cultural routes, benefiting both parties (Lewis, 2023). However, interesting geotrail concepts are also established outside the UNESCO geoparks, for example, the virtual geotrails in Liberec in the Czech Republic (The Story of Liberec Granite) (Drápela, 2023) or at the Mt. Etna volcano in Italy (Pasquaré Marioto et al., 2022), which are both QR code based.

Analysis of the availability of online information on the nature trails of the Banská Štiavnica geopark

Since the Banská Štiavnica geopark does not have a website, the availability of information about the geopark is very limited. Based on this, it was necessary to search for information on other websites, then evaluate them and choose the one that provides the most information about educational trails or geotrails.

Website of the Slovak Geoparks Network

Information on the educational trails directly linked to the geopark could only be found on the promotional material on the website of the Slovak Network of Geoparks (geopark.sk) consisting of a map and selected educational trails marked on it, which were visited to compile an unnamed methodological manual (probably the manual "Náučný chodník: príprava, realizácia, starostlivosť"). 11 educational trails (ET) are marked on the selected promotional flyer: 1) ET Milana Kapustu po žile Terézia, 2) Geological ET Paradajs, 3) Kysihýbeľ ET, 4) Banská Štiavnica Geopark educational geological exposition (mining museum in nature), 5) ET Horná Roveň – Richňavské Tajchy, 6) Chodník obcou Sv. Anton ET, 7) ET Pozerajme očami o srdcom, 8) Žibritovský ET, 9) ET Sitno, 10) ET Banský jarok, 11) Piargsky vodohospodársky ET. Information about the aforementioned nature trails is no longer available. There is also a map available on the website with marked geosites (i.e. as geotopes) of the Geopark Banská Štiavnica, but their connection to educational trails is absent. The publication "Geotopes of the Banská Štiavnica Geopark – Volcanism and the construction of the territory" (Konečný & Pachinger 2023) is dedicated to geosites in the geopark, which includes information on them and their geological heritage, but does not include information on educational trails and does not mention in the description of individual geosites whether they are situated on any educational trail. Among other things, to whom the publication is dedicated is highly debatable. Due to its form and the style in which it is written, it is not intended for the general public (the target group of geoparks) or the professional public. It can be used by a very narrow group of people, such as students of geosciences or geological enthusiasts, but this is too narrow a group of people for the geopark to represent a relevant tool for the sustainable development of the area, not to mention a contradiction with the very principles of geotourism. This publication is accessible to the public online at geopark.sk.

Regional Tourism Organisation's website

Information can be found on the website of the Regional Tourism Organization Banská Štiavnica Region named Supervolcano Štiavnica (supervulkanstiaavnica.sk), which, however, does not mention the term geopark or geolocation at all. This website provides mainly practical information about activities, accommodation, meals, and places to visit. On the site, it is possible to find articles about certain geosites in categories such as "world uniques", "gold and silver mines", "taiches, nature, and tourism" and others, where, after clicking on the category, the site visitor will see several article titles about the selected sites. The articles themselves are often oriented to educational trails, such as "3-hour journey along the gold ore - Educational Trail Milana Kapustu po žile Terézia", but the article does not provide information on individual stops or sites that can be seen on the route. At the moment, due to the current arrangement of information on the website as well as its lack, it is impossible for a tourist to know information about geosites before the visit itself, and at the same time, he will not even access many geological heritage sites on this website. Thus, the website cannot, in any case, replace the geopark website, which does not exist.

Website of the State Geological Institute of Dionýz Štúr

Another website that provides information on geosites and their geological heritage in the BŠ geopark is the State Geological Institute of Dionýz Štúr (ŠGÚDŠ) website (geology.sk). The site provides geological educational maps that are publicly available. In the Educational Geology category, there are geological-educational maps, which the following assets are mentioned: (1) development of tourism and geotourism; (2) general development of the knowledge of the residents about the geological setting of the region; (3) popular-scientific, promotional and awareness-raising goals; (4) teaching aids for primary and secondary schools in visual teaching of science subjects in nature, in the preparation and implementation of school excursions and excursions into the countryside (ŠGÚDŠ, 2024). In the Educational Geology category, a map of important geological sites or Geological Educational Maps and geoparks can be considered relevant online information sources for the geopark territory studied in this paper. The site also contains several geological educational maps of specific geoparks, such as the Geopark Banská Bystrica or the geological-educational map of the Zemplín Mts. (Zemplín Geopark). However, there is no geological-educational map for the Banská Štiavnica Geopark, the importance of which is all the greater as the geopark does not have a website. Basically, the tourist does not have any comprehensive resources for geosites, educational trails, or educational materials for the geological heritage of the defined area. Geosites in the Banská Štiavnica Geopark can, however, be observed on the general map "Geological Educational Maps and Geoparks" at the smallest scale of 1:500000 and the map "Important geological sites" (VGL) where the tourist does not see the boundaries of the geopark and the number of locations and information is significantly lower than with a map focused on one specific geopark (as in the case of Banská Bystrica). At the same time, it is important

to point out that the geology.sk site is not a tourist site, and therefore 1) tourists do not represent the site's primary visitors, 2) the geological characteristics of a geosite are written for the professional public (incomprehensible to tourists), and 3) the selected geosites are rather geological (than geotouristic) and therefore do not represent the most attractive ones for tourists. ŠGÜDŠ also provides access to the VGL database (http://apl.geology.sk/g_vgl/?jazyk=en), where it is possible to manually search for these sites according to several attributes, e.g., based on the site name ("Banská Štiavnica" is mentioned in three names of sites included in the database), but it is not possible to search based on a specific geopark territory. However, all the options mentioned so far are oriented only to the geosites of the territory themselves. There is no information on the educational trails on the site or a map on which they would be marked, even in the case of the geosite that is located on the educational trail and could be (yet it is not) also described in the VGL database as part of the description of the locality in which it is situated (e.g., Tanád Locality – andesite porphyry).

Websites of municipalities and associations

While analysing the available information on the Internet about this issue, it was possible to find several "less prominent" websites dedicated to the Geopark Banská Štiavnica and geotourism on its territory.

The first page is www.regionsitno.sk, which is managed by the MAS Zlatá cesta Association of Municipalities and is intended to present a multimedia geotourism guide intended to promote the geotourism attractions of the region defined by the municipalities that are members of the MAS Zlatá Cesta association and the Región Sitno association. Apparently, the page should contain a map, which is absent there. Subsequently, through the filter, it is possible to select a city or village (49 options) and a category of objects (33 options), where there is also a category of Educational hiking trails. After filtering any category, the page shows an "error", and thus, despite the interesting idea and potential, the page is unusable.

Another page is the Štiavnické Bane website (www.obecstianickebane.sk), which, within the category Geopark Banská Štiavnica, also contains the subcategory geological sites (geotopes) available in Slovak language only. However, apart from the images of the five information boards, it does not contain any other information. The Montanist locality category also includes listed tunnels and shafts but also without a description. Information about the educational trails can be found outside the geopark category, namely in the Tourism category. This subcategory Educational tourist routes focuses on the ET in the territory of the municipality, including three ETs (O ekológii Piargských Tajchov, Piargsky ET, Piargsky Vodohospodársky ET). For each trail, there is also an orientation plan in the form of a leaflet with the geopark logo, information about its stops, and all information boards with the geopark logo on their route. Thus, for the first time, the tourist can meet the educational material of the geopark itself online, which, however, is more difficult to find and inappropriately interpreted for the general public. At the same time, in the information under this category, there is also a redirection to more detailed information at www.geoparkbs.sk, which should probably be the official site of the geopark. However, this site does not exist, and it is therefore questionable whether it existed in the past or never really existed.

Personal and other websites

When searching for "Educational trails in the Banská Štiavnica geopark" in the Google search engine in Slovak language, the first link is the website www.minerally.sk referring to the article educational trails in the Banská Štiavnica Geopark. However, the article contains only very brief information on four educational trails, of which three are identical to those found on the Štiavnické bane website, and one is located in the inner village of the village. A link to the trail on the geopark.sk website is also assigned to the individual ET, but it is not working in all cases.

The second link from the search on Google links to a specific educational trail (Paradajs) on the site naucnehodniky.eu, which is covered in the next paragraph.

The third link leads to an article on the website slovakia.travel, the fourth link to the article "Educational trails - CHKO Štiavnické vrchy" on the website of State Nature Conservancy chkostiavnickevrchy.sopsr.sk, which is very brief and exclusively informative, the fifth link to the sme.sk website and the sixth link to the article on the Štiavnické bane municipality website, which was mentioned in the previous paragraph.

The link to the geopark.sk website was the eleventh and referred to promotional and presentation materials, where information on ETs in Banská Štiavnica Geopark is missing. The other links were not about the geopark or nature trails, often coming from commercial sites.

The website of Educational Trails of Slovakia

The website that at least partially covers the lack of information on educational trails in the territory of the Banská Štiavnica Geopark is site naucnehodniky.eu, although it is only available in Slovak. It provides visitors with the opportunity to search for educational trails on the map according to a) natural units and b) regions. After clicking on the marking of the educational trail on the map, a window will open for the user with information about the trail related to its practical data (e.g. location, route length, crossing time, etc.), content data (for instance, direction of the trail, text guide, if any, what are worth seeing on the route, names of information boards, etc.) as

well as photos. On the site, it was possible to find up to 18 educational trails, which by their location should belong to the territory of the core zone of the geopark compared to 11, which are mentioned in the promotional material available on the geopark.sk site, where, however, there is additionally a geological exposition in Banskó museum, which is not on the naucnehodniky.eu website. For some selected educational trails, interpretation panels in PDF versions or text guides are also available on the website. The website naucnehodniky.eu provides the most information about nature trails out of all sources so far, even though it is not oriented in any way to the geopark. The information is mainly practical. On the other hand, with some ET, it is also possible to observe information about geosites on the route or in its vicinity. Another advantage is the fact that all educational trails are marked on the map by mapy.cz, which automatically includes the attractions of the area.

Results and discussion

Of all the mentioned websites, the website naucnehodniky.eu provides the most relevant information about educational trails in the geopark. To evaluate the geoscientific focus of as many educational trails as possible, the site naucnehodniky.eu was selected, although it does not focus on geoparks or geotourism as such. The page for the individual educational trails also provides information about their stops, but usually only in the form of the title of the interpretation panel at the given stop or its topic. However, photo documentation, online text guides and information boards in pdf version (if available), or comments on some stops contribute to a better determination of the topic of the interpretation panels on the selected trail. Based on this information, it was possible to determine the total number of panels (stops) on one educational trail and to define the number of panels whose topic falls under the category of geosciences. Based on the percentage share of geoscience-based interpretation panels (Tab. 1, Fig. 2), nine out of 18 educational trails had 0%, and two educational trails had a 100% share of geoscience interpretation panels. If we were to divide nature trails into categories based on the proportion of their geoscience interpretation panels, 83% (15 out of 18) of trails have 0-25% geoscience panel coverage. Only one trail, the educational trail Paradajs, falls into the 26-50% category. There are no trails in the third quartile (51-75% geoscience panel coverage), while two trails, ET Farárova Hôrka-Richnava and Žibritovský ET, have 76-100% geoscience content panels.

However, determining whether or not the selected educational trails are geoscientific is difficult due to the absence of any objective categorisation. A geoscience-based educational trail major focus should be to present and educate in the field of geosciences. In that case, the majority (more than 50%) of its information boards should be oriented in this direction, even assuming its potential as a geotrail that uses the ABC concept (connecting non-living nature with living nature and the culture of the given locality or territory). With certainty, only two from the last category d), can be determined as geoscience-based educational trails, and one educational trail can be considered debatable since it is in category b) but has a relatively high percentage of geoscience-based panels, namely 46%, which means the ET partly geoscience-based certainly is. On the website naucnehodniky.eu, it is further stated that approximately 4 ETs also have a text guide, but only two ETs (ET Cestujeme v čase v Banskej Hodruši - virtual trail; Žibritovský ET) have it available online. The site also provides individual interpretation panels for many ETs in an online PDF version. Interpretation panels are thus published online at 6 educational trails out of a total of 18.

Educational trails such as Žibritovský ET or Farárova Hôrka-Richnava are the only 100% geoscience-oriented, where Žibritovský trail even has a text guide in both printed and online form. However, what looks like an ideal situation at first glance may be at odds with what a geotrail should look like and what principles it should uphold. With a 100% share of geoscientific panels, there is a situation where signs on the biotic nature and culture of the region are completely absent on the trail. In addition to the content issue, however, there is also a contradiction with the primary goal, which is the education of the general public. If the geopark visitor is to gain knowledge from the information provided, it is more than important that the information is correctly interpreted. Interpretation thus represents the cornerstone, which means that if geoscientific information on the ET Žibritovský and Farárova Hôrka-Richnava (with 100% share of geoscientific panels) is interpreted inappropriately, and on the contrary the interpretations, for example at ET Andreja Kmeťa, are effectively and appropriately chosen, the visitor will acquire knowledge from ET Andreja Kmeťa, even though he has only 25% share of geoscience panels. In short, this means that it is simply not enough that the educational trail is geoscientific or specifically geological if it cannot educate the general public in this area. This issue was also discussed by Palgutová et al. (2023), in which the information board at the ET Farárova Hôrka-Richnava was evaluated. The assessment consists of 36 evaluation questions divided into six primary recommendation categories for interpretation (Štrba & Palgutová 2024), including:

- 1) it was simple and clear without losing scientific meaning,
- 2) educated creatively and memorably, 3) provoked a reaction and aroused interest,
- 4) was connected to people's daily life or other areas,
- 5) invited questions and activities to increase fun and enjoyment,
- 6) reported on sustainability and protection.

As part of the assessment, the interpretation panel on the Farárova Hôrka-Richnava ET lagged behind the interpretation panel at ET Sitno (also located in the geopark, but outside of geopark management) and significantly behind the interpretation panel at ET Lai Chi Wo in UNESCO Geopark Hong Kong. Farárova Hôrka received positive assessments ("yes") in only four cases, "partially" in five cases, and negative assessments ("no") in up to 24 cases (three questions could not be answered). Compared to Farárova Hôrka, the interpretation panel at ET Sitno had a 27.3% higher overall positive rating (12 times "yes", six times "partly"). The information board of ET Lai Chi Wo, located in the UNESCO geopark, represented a 58.48% higher overall positive evaluation compared to Farárova Hôrka (24 times "yes", five times "partly", and five times "no") (Palgutová et al., 2023). Notably, Farárova Hôrka-Richnava is not the only educational trail with inappropriately interpreted panels. This trend is evident on all the original trails built by the geopark and bearing its logo.

Tab. 1 Level of geoscientific focus of educational trails in the core area of the geopark

Nature trail (ET)	Share of geo-interpretation panels on ET	Is ET mainly based on geosciences?	Text guide available	Online text guide available	Interpretation panels online
ET Andreja Kmeťa	25%	no	no	no	no
ET Po stopách banskej činnosti vo Vyhniach	0%	no	yes	no	no
ET Žakýlske pleso	11%	no	no	no	yes
ET Kysihýbel	21%	no	no	no	yes
ET Paradajs	46%	partly	no	no	no
ET Glanzenberg	22%	no	no	no	no
ET Milana kapustu po žile terézia	13%	no	no	no	no
ET Horná Roveň - Richnavské jazero	0%	no	no	no	no
ŠB-01 Farárova hôrka - Richnava	100%	yes	no	no	no
Historical ET Piargaska špacírka	0%	no	no	no	no
ŠB-09 ET O ekológii piargských tajchov	0%	no	no	no	yes
ŠB-06 Piargsky vodohospodársky ET	0%	no	no	no	yes
ET Pozerajme očami i srdcom	0%	no	no	no	no
Forestry ET Počúvadlo	0%	no	no	no	no
ET Sitno	14%	no	yes	no	no
ET Cestujeme v čase v Banskej Hodruši – virtual trail	0%	no	yes	yes	yes
BŠ-06 Žibritovský ET	100%	yes	yes	yes	yes
ET Okolo Sitna	0%	no	no	no	no

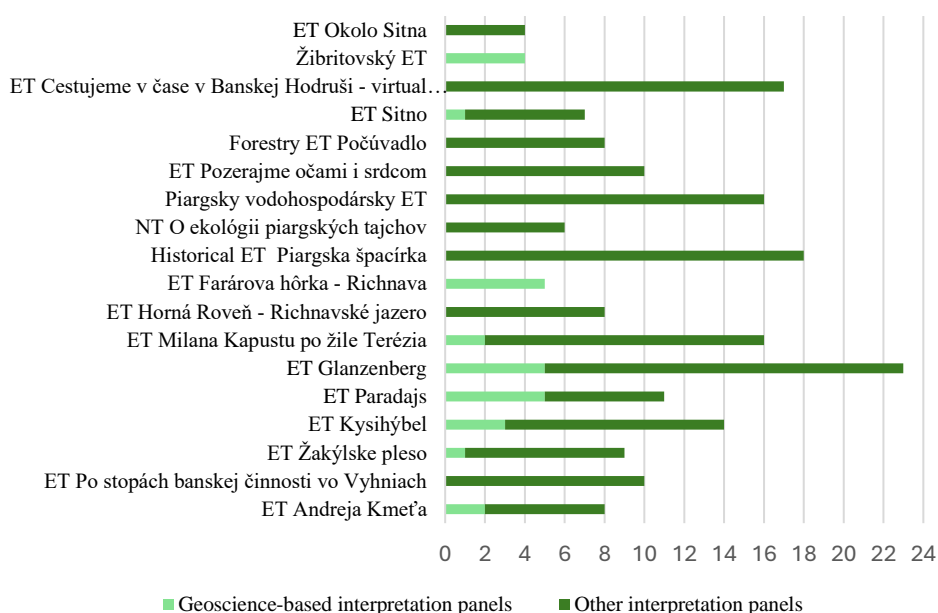


Fig.2 The number of geoscience-based interpretation panels compared to the number of non-geoscience-based panels on ET

A methodological manual for creating educational trails in geoparks from 2016 (Pachinger et al., 2016) is also available to the public and published on the geopark.sk website, whose suggestions were directly applied within the Banská Štiavnica geopark. In the manual, the authors describe the interpretation panel as an essential element of the educational trail, but despite this, only two pages of the entire methodical manual (46 p.) are devoted to its methodology and content. Quite suitable and relevant recommendations can be observed within these pages. Subsequently, an example of adherence to the unifying principles in making the educational interpretation panel graphic design in the Geopark Banská Štiavnica is published, where the individual principles of the design are not fulfilled in the end. The problem probably lies mainly in the lack of objectivity and exactness of implementing the given recommendations. The appropriateness of the panels and the decisions about which recommendations are the right ones were decided by one group of experts who also worked on creating the boards. Before their installation, panels are not assessed by non-interested parties, either by geopark entities from other areas of interest, local actors, residents, or visitors. Another problem is insufficient information about how the general public reacts to certain interpretations and how much they can understand them.

The number of geoscience-oriented interpretation panels is also problematic. Although it was mentioned above as Žibritovský or Farárova Hôrka-Richnava ETs, they have a 100% share of geoscience panels (Fig. 3), but their number is much lower than in other ETs in the geopark. For example, the Žibritovský ET has only four panels, and the Farárova Hôrka – Richnava ET has five. This is the same number as, for example, ET Glanzenberg (five geoscience-based panels), whose geoscience panels represent a share of only 22% of all panels on its route. As can be seen in Fig. 2 and 4, geoscience-based educational trails represent only a very small fraction of geoscience panels compared to all information panels on all geopark educational trails. Geoscience interpretation panels thus represent only 14% of all interpretation panels, which is very little considering the nature of the geopark territory. Geoscience-based educational trails represent 11% of all ET, and partly geoscience educational trails represent 6%. If we also consider that the current geoscience trails are not properly interpreted, the coverage of geoscience topics for the general public on the educational trails in the first and thus the oldest geopark in Slovakia is almost zero.

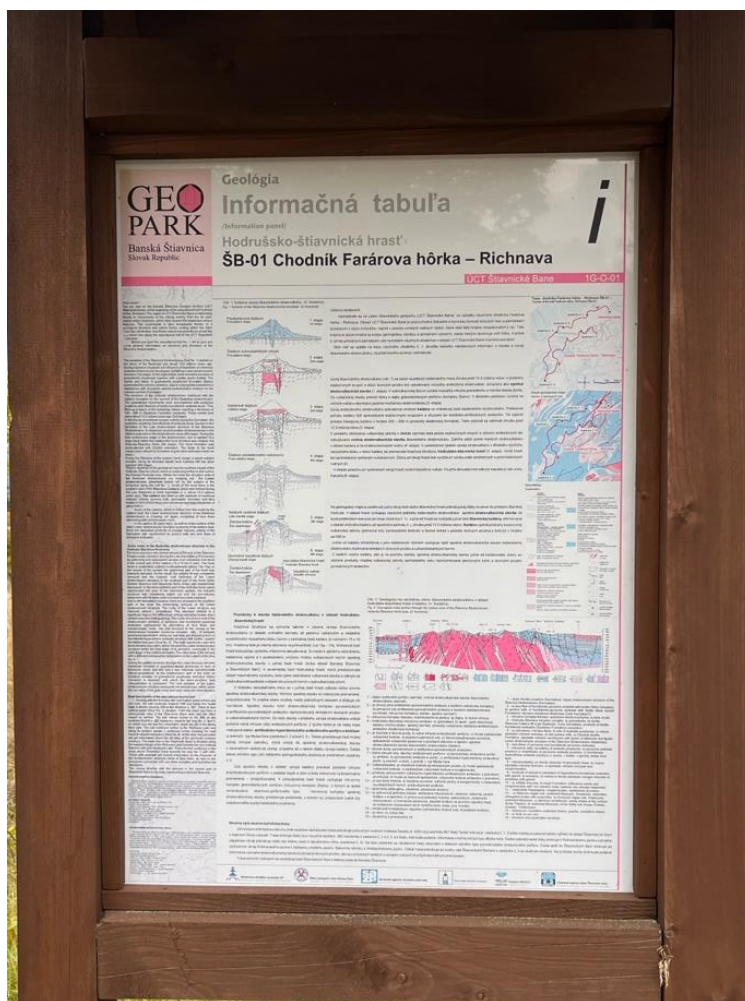


Fig. 3 Interpretation panel on the Farárova hôrka – Richnava educational trail (source: Palgutová)

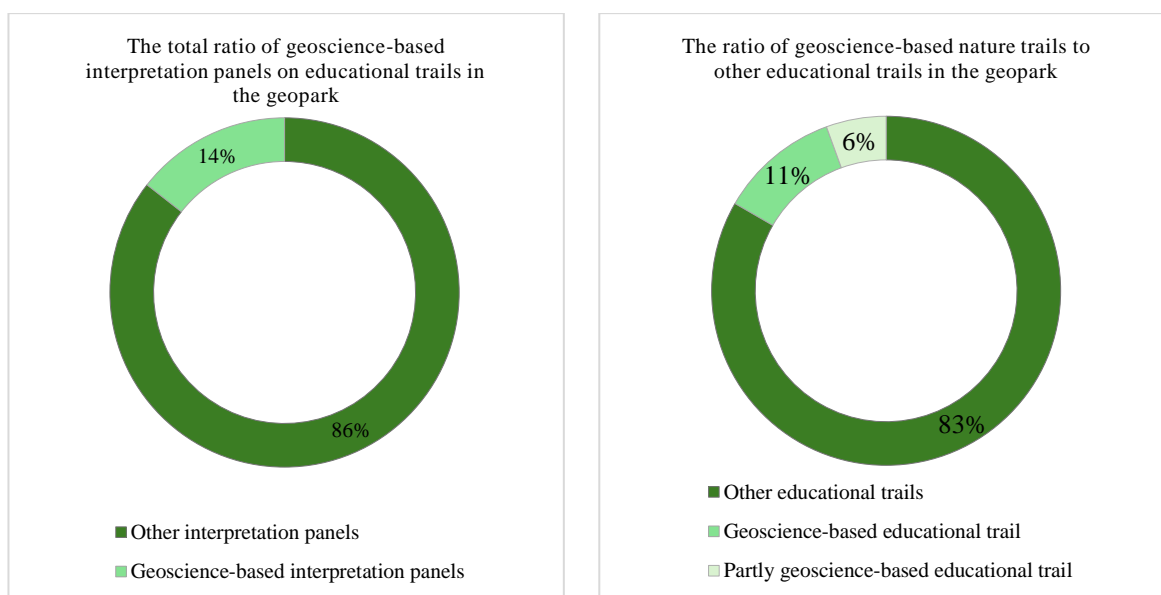


Fig. 4 (left) The total ratio of geoscience-based interpretation panels on educational trails in the geopark/ Fig. 4 (right) The ratio of geoscience-based educational trails to other educational trails in the geopark

Conclusion

In today's digital age, the online presence of all relevant information is an irreplaceable tool for attracting visitors to various types of destinations. Potential visitors increasingly use the Internet to search, plan, and book trips. Available and sufficiently detailed online information allows potential visitors to explore options, make plans and decisions, and manage expectations. In addition, it enables spontaneous travel planning and encourages social sharing, which can greatly increase the popularity and attractiveness of any (geo)tourist site.

As observed in the Banská Štiavnica Geopark, there are only two geoscience-oriented educational trails and one that is partially geoscience-oriented. Results show that only 14% of interpretation panels located in the area of Banská Štiavnica Geopark are geoscience-based, and only two trails can be considered 100% geoscience-based. However, access to and online availability of information about the trails is very limited in Slovak, and relevant information in a foreign language (for instance, English) almost does not exist.

Considering the definition of a 'geotrail' and its direct relationship with geotourism and its principles, it's crucial to realise that for an educational trail to be labelled as a geotrail, it's not enough for it to be primarily focused on geoscience content. It needs to be presented to tourists in a way that they understand the information being interpreted and can develop a certain change, whether in their attitude, opinions, or feelings towards the information. Only then can it be said that the educational trail fulfils its primary function of providing informal education. By investing in research, education, innovative interpretive techniques, and proper online presentation, the Banská Štiavnica Geopark can transform itself into a leading and recognised destination for geotourism, driving economic growth while preserving its invaluable heritage.

References

- Aktualizácia Konceptie geoparkov SR, UV-46027/2014, Úrad vlády SR 140, UV 15/2015 (2015). <https://rokovania.gov.sk/RVL/Material/11526/1>
- Armutcu, B., Tan, A., Amponsah, M., Parida, S., Ramkisson, H. (2023). Tourist behaviour: The role of digital marketing and social media. *Acta Psychologica*, 240, 104025. <https://doi.org/10.1016/j.actpsy.2023.104025>
- Carcavilla, L., Durán, J. J., García-Cortés, A., & López-Martínez, J. (2009). Geological Heritage and Geoconservation in Spain: Past, Present, and Future. *Geoheritage*, 1(2-4), 75-91. <https://doi.org/10.1007/s12371-009-0006-9>
- Drápela, E. (2023). Using a Geotrail for Teaching Geography: An Example of the Virtual Educational Trail "The Story of Liberec Granite". *Land*, 12(4), 828. <https://doi.org/10.3390/land12040828>
- Farsani, N. T., Neto de Carvalho, C., & Xu, K. (2018). Education as a key tenet of geotourism. In *Handbook of Geotourism*. Edward Elgar Publishing.
- Georgousis, E., Savelides, S., Mosios, S., Holokolos, M.-V., & Drinia, H. (2021). The Need for Geoethical Awareness: The Importance of Geoenvironmental Education in Geoheritage Understanding in the Case of Meteora Geomorphes, Greece. *Sustainability*, 13(12), 6626. <https://doi.org/10.3390/su13126626>

- Herrera-Franco, G., Montalván-Burbano, N., Carrión-Mero, P., Jaya-Montalvo, M., & Gurumendi-Noriega, M. (2021). Worldwide Research on Geoparks through Bibliometric Analysis. *Sustainability*, 13(3), 1175. <https://doi.org/10.3390/su13031175>
- Hose, T. A. (2012). 3G's for Modern Geotourism. *Geoheritage*, 4(1–2), 7–24. <https://doi.org/10.1007/s12371-011-0052-y>
- Jeon, Y., Koh, J.-G., & Southcott, D. (2023). A case study of Geopark activation through Geobranding and Geotrails at the Jeju Island UNESCO Global Geopark, Republic of Korea. *Episodes*, 46(2), 211–227. <https://doi.org/10.18814/epiugs/2022/022024>
- Justice, S. C. (2018). UNESCO Global Geoparks, Geotourism and Communication of the Earth Sciences: A Case Study in the Chablais UNESCO Global Geopark, France. *Geosciences*, 8(5), 149. <https://doi.org/10.3390/geosciences8050149>
- Konečný, V. (2008). Etapy vývoja štiavnického stratovulkánu. *Enviromagazín*, 13(6), 18–19.
- Konečný, V. & Pachinger, P. (2023). *Geotopes of the Banská Štiavnica Geopark – Volcanism and the construction of the territory*. SAZP, Banská Bystrica, 282 p.
- Leung, D., Law, R., van Hoof, H., & Buhalis, D. (2013). Social Media in Tourism and Hospitality: A Literature Review. *Journal of Travel & Tourism Marketing*, 30(1–2), 3–22. <https://doi.org/10.1080/10548408.2013.750919>
- Lewis, I. D. (2023). Evolution of Geotourism in Australia from Kanawinka Global Geopark and Australian National Landscapes to GeoRegions and Geotrails: A Review and Lessons Learned. *Land*, 12(6), 1190. <https://doi.org/10.3390/land12061190>
- Lexa, J., Štohl, J., & Konečný, V. (1999). The Banská Štiavnica ore district: Relationship between metallogenetic processes and the geological evolution of a stratovolcano. *Mineralium Deposita*, 34(5–6), 639–654. <https://doi.org/10.1007/s001260050225>
- Libarkin, J. C., Anderson, S. W., Science, J. D., Beilfuss, M., & Boone, W. (2005). Qualitative Analysis of College Students' Ideas about the Earth: Interviews and Open-Ended Questionnaires. *Journal of Geoscience Education*, 53(1), 17–26. <https://doi.org/10.5408/1089-9995-53.1.17>
- Martín-Martín, J. M., Guaita-Martínez, J.M., Solano-Sánchez, M.A., & Prados-Castillo, J.F. (2023). Virtual tourism: A new way of travelling and a new traveller profile. *Journal of Competitiveness*, 15(4), 134-153. <https://doi.org/10.7441/joc.2023.04.08>
- Migoń, P. (Eds.). (2018). Geo-interpretation: How and for whom?. In *Handbook of Geotourism*. Edward Elgar Publishing.
- Návrh Konceptcie geoparkov v SR, UV-22415/2008, Úrad Vlády SR 117, UV 740/2008 (2008). <https://rokovania.gov.sk/RVL/Material/19930/1>
- Newsome, D., & Dowling, R. (2010). Setting an agenda for geotourism. In *Geotourism: The tourism of geology and landscape*. Goodfellow Publishers Limited. <http://www.goodfellowpublishers.com/academic-publishing.php?promoCode=&partnerID=&content=story&storyID=231>
- Novák, J. (2001). Baskoštiavnicko-hodrušský región—Najvýznamnejšie stredisko baníctva v Európe v minulosti. *Mineralia Slovaca*, 33, 225–228.
- Pachinger, P., Cimermanová, I., Skubinčan, P., Vačoková, L., & Králik, A. (2016). Náučný chodník—Príprava, realizácia, starostlivosť. Slovenská agentúra životného prostredia. <https://www.geopark.sk/wp-content/uploads/2018/12/Naucny-chodnik.pdf>
- Palacio Prieto, J. L., Fernandez De Castro Martínez, G., & Rosado González, E. M. (2019). Geosenderos en el Geoparque Mundial UNESCO Mixteca Alta, Oaxaca, México. *Cuadernos Geográficos*, 58(2), 111–125. <https://doi.org/10.30827/cuadgeo.v58i2.7055>
- Palgutová, S., Podoláková, M., Varcholová, L., Kršák, B., & Štrba, E. (2023). The issue of geo-education on nature trails in the first Sloval Geopark Banská Štiavnica. In *RaOP – Hand in Hand (conference proceedings)*, pp. 321–325. <https://doi.org/10.11118/978-80-7509-904-4-0321>
- Pasquaré Mariotto, F., Bonali, F. L., Tibaldi, A., De Beni, E., Corti, N., Russo, E., Fallati, L., Cantarero, M., & Neri, M. (2022). A New Way to Explore Volcanic Areas: QR-Code-Based Virtual Geotrail at Mt. Etna Volcano, Italy. *Land*, 11(3), 377. <https://doi.org/10.3390/land11030377>
- Pérez-Romero, M. E., Álvarez-García, J., Flores-Romero, M. B., & Jiménez-Islas, D. (2023). UNESCO Global Geoparks 22 Years after Their Creation: Analysis of Scientific Production. *Land*, 12(3), 671. <https://doi.org/10.3390/land12030671>
- Ren, F., Simonson, L., & Pan, Z. (2013). Interpretation of Geoheritage for Geotourism – a Comparison of Chinese geoparks and National Parks in the United States. *Czech Journal of Tourism*, 2(2), 105–125. <https://doi.org/10.2478/cjot-2013-0006>
- Stolz, J., & Megerle, H. E. (2022). Geotrails as a Medium for Education and Geotourism: Recommendations for Quality Improvement Based on the Results of a Research Project in the Swabian Alb UNESCO Global Geopark. *Land*, 11(9), 1422. <https://doi.org/10.3390/land11091422>

- ŠGÚDŠ. (2024, April 20). Educational geology. <https://www.geology.sk/maps-and-data/mapovy-portal/educational-geology/?lang=en>
- Štefko, R., Nastišin, L., Nebeský, L., & Fedorko, R.(2023). Consumers' Online Brand-Related Activities on Facebook as a Competitive E-Commerce Channel. *Journal of Competitiveness*, 15(1), 91-112. <https://doi.org/10.7441/joc.2023.01.06>
- Štrba, L., & Palgutová, S. (2024). Geoheritage interpretation panels in UNESCO Global Geoparks: recommendations and assessment. *Geoheritage*, 16, 96. <https://doi.org/10.1007/s12371-024-01012-1>
- UNESCO. (1999, April 15). UNESCO Geoparks Programme: A new initiative to promote a global network of geoparks safeguarding and developing selected areas having significant geological features. UNESCO. Executive Board, 156th, 1999. <https://unesdoc.unesco.org/ark:/48223/pf0000115177>
- UNESCO - American Geophysical Union. (2023). Geoscience in action: Advancing sustainable development. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000384826>
- UNESCO IGGP. (2024, April 22). List of UNESCO Global Geoparks and Regional Networks [UNESCO official website]. UNESCO Global Geoparks. <https://www.unesco.org/en/iggp/geoparks?hub=67817>
- UNESCO Office Montevideo and Regional Bureau for Science in Latin America and the Caribbean. (2019). Geoscience in primary and secondary education, volume 2; Results of expert's opinion survey 2018. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000371311?posInSet=42&queryId=f3d8bcf2-e3d0-4b48-8daf-fe520c8aef07>
- Wimbledon, W. A. P., & Smith-Meyer, S. (Eds.). (2012). Geoheritage in Europe and its conservation. ProGEO.
- Zafeiropoulos, G., Drinia, H., Antonarakou, A., & Zouros, N. (2021). From Geoheritage to Geoeducation, Geoethics and Geotourism: A Critical Evaluation of the Greek Region. *Geosciences*, 11(9), 381. <https://doi.org/10.3390/geosciences11090381>