

GEOTOURISM: DEVELOPMENT BASED ON GEOHERITAGE

(CASE OF KOROSTYSHIV QUARRY)

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Abstract. *This study considers geological tourism as a means of exploring the geological resources of a certain territory. An example of the arrangement of a local abandoned quarry is presented, taking into account the recreational and tourist needs of the city's residents. The importance of geological tourism as a destination that provides tourists with the opportunity to explore the environment in synergy with culture and history will grow every year. In 2022, the share of international trips related to the environment was 25%. Geological tourism often encourages travelers to delve into the cultural heritage and traditions of little-visited regions. There are two approaches to studying this area of tourism: geological and geographical. It is the latter that provides a comprehensive description of the territory, not only through the prism of its geological significance but also an understanding of the impact of the environment on the way of life of local residents. For example, in areas where volcanoes are common, understanding their origin and the consequences of their activity has a great impact on the development of agriculture and the well-being of the population. In this article, geological tourism goes beyond the simple assessment of geological sites. After all, modern tourists who choose nature-oriented forms of leisure still want a combination of services and amenities, even in the countryside. Accordingly, the project, within the Korostyshiv quarry, combines geological research with recreational opportunities.*

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Introduction. One of the first to explain the concept of geotourism was T. Hose, who explained it as «Geotourism is tourism in which interpretation and service allow tourists to gain knowledge and understanding of geology and geomorphology beyond the level of simple aesthetic appreciation» (Hose T.A., 1995). Over the following years, this definition was modified by various scientists, but the common thread was that geotourism should not only give tourists a sense of admiration for a particular area but also enrich their knowledge of certain geological processes and phenomena. In 2011, the International Congress on Geotourism was held in Arouca (Portugal) under the auspices of UNESCO, which formed the following definition: «Geotourism is tourism designed to maintain and strengthen the identity of a territory, taking into account its geology, environment, culture, aesthetics, heritage, and well-being of its inhabitants» (Arouca Declaration, 2011). Currently, geotourism offers travelers the opportunity to explore geological formations, national parks, UNESCO World Heritage sites, and other geographically important places. It promotes interaction with local communities, supports conservation efforts, and contributes to the economic development of various regions. Geotourism has the potential to develop in any territory that has unique geographical resources and attractions.

In addition, geotourism is not limited to a specific season, as geological formations can be explored throughout the year. For example, in autumn or winter, visible geological details such as stone structures, rocks, granite formations, etc. can be seen more clearly due to less overgrowth of natural vegetation. In the spring or summer, you can observe the activities of rivers: erosion, transport,

and deposition of material. Specific examples include Yellowstone Park, a UNESCO World Heritage Site, which in winter can be of interest to tourists for its geothermal sites (geysers, hot springs, mud volcanoes) that can be seen while snowshoeing or cross-country skiing (Yellowstone National park, 2023). In the warmer months, you can visit another UNESCO site, the Plitvice Lakes National Park (Croatia), known for its interconnected lakes and waterfalls. In summer, visitors can explore the park's hiking trails, take part in geological excursions, and enjoy boat trips (Plitvice Lakes National Park, 2023). Geotourism is a market niche that allows travelers to increase their awareness of natural resources and how to preserve them through active recreation. This geotourism approach creates a synergistic effect that is not available for such types as ecological, historical or adventure tourism, as it allows attracting people with different interests. It is worth noting that there are currently two key approaches to the development of geotourism: geological (consideration of geological sites through the study of their morpholithogenic basis, collection of minerals) and geographical (comprehensive study of a geological site through the prism of culture, territory, local crafts, etc.) Currently, the development of geological tourism, with a geographical approach, demonstrates the close connection between recreation and the geological environment. Since what is meant by the modern understanding of geotourism gives tourists the opportunity to gain some knowledge about the landscape, geology and history of the Earth through recreation. Accordingly, the concept of geotourism covers many objects that may interest tourists to spend their vacation as a health and recreation destination, as well as cultural and educational. It means that thermal springs, volcanoes in Japan, Iceland or New Zealand, which can be associated with volcanic geotourism, and spa organizations at resorts, can be of value for this type of tourism.

Materials and Methods. As of today, almost 25 years have passed since the first formalized definition of geotourism was published in the journal *Environmental Interpretation*. The first professional national conference on geotourism: «Tourism in Geological Landscapes», was held in Belfast at the Ulster Museum in 1998 (Sadry B., 2020). After reviewing the scientific publications of Ukrainian scientists on the prospects of including quarries in geotourism routes, it can be noted that this issue has not yet received sufficient research. The main specialists on this topic are: V. Maniuk (2006; 2007), the representative of Ukraine in the European Association for the Protection of Geological Heritage (ProGeo), Y. Zinko (2020), Y. Kravchuk (2018). Among the researchers of Korostyshiv who study its historical component, which can be used to create excursions and familiarize tourists with the quarrying industry, it is worth noting: E. Dubivka, O. Tunik-Mozgoenko, V. Slivinskyi, O. Tarabukin (2021), Z. Weidner, V. Yershov (1994), I. Dovbysh. Thanks to them, a local history group on Facebook («Historical Korostyshiv») is functioning and articles and textbooks about its cultural and economic life are being published (Korostyshiv istorychnyi, 2023).

Among the foreign representatives it is worth mentioning R. Dowling (2010), C. Coelho, N. Farsani, C. Costa and Neto de Carvalho (2011), Slomka and Kicinska-Swidorska (2004), T. Hose (1995), E. Joyce (2006). Journals that publish professional articles on geotourism are: *Earth Heritage* (1994), *Geotourism* (2005), *Geojournal of Tourism and Geosites* (2008), *Geoheritage* (2009), *Geoconservation Research* (2018). To achieve these goals, the authors used the following methods: geographic information processing (analysis of scientific literature), mapping: Google Earth Pro, Realtime Landscaping Architect (creation of terrain, visualization of proposed measures), QGIS, and descriptive (assessment of the quarry, characterization of flora and geological features of the territory).

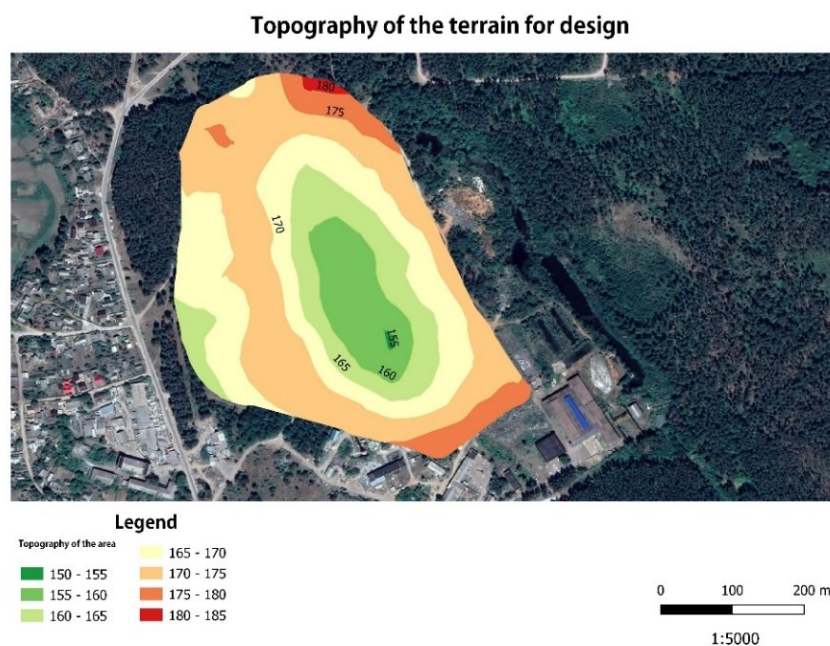
Results and Discussion. The unique geological heritage of Ukraine includes various geological formations and landscapes and attracts the attention of tourists interested in exploring and evaluating its geological monuments. According to the information and educational system Geological Dictionary: Open Educational and Scientific Web Resource, there are more than 400 geological monuments in Ukraine (Heolohichna pamiatka pryrody (b.d.) Heolohichniy slovnyk). Some famous geological sites in Ukraine: The Carpathians, a mountain range in western Ukraine, is known for its geological diversity, including spectacular landscapes, mineral deposits, and unique rock formations. The Dniester Canyon, where the Dniester River has carved out a deep and picturesque canyon over millions of years, creates opportunities for geological exploration and natural resource management. Donetsk Coal Basin: This region is known for its coal mines and associated geological formations, which provide an opportunity to explore the country's industrial heritage. Kamianets-Podilskyi Castle (or «flower on a stone») is separated by a canyon from the central historical part of the city. The geological basis of Kamianets-Podilskyi Castle is limestone rocks that were formed millions of years ago as a result of natural geological processes.

Therefore, the geological heritage of Ukraine includes numerous sites that can be included in excursions and various geotourism activities. The Zhytomyr region, with its spent granite quarries in Korostyshiv, is the basis of this study. The current situation with quarries in the Zhytomyr region is characterized by the fact that most of the land with anthropogenic heritage is not used or reclaimed. Most of the facilities are located near cities, and this proximity affects the ecology of the area. Therefore, part of the territories of quarries that have exhausted their resources should be allocated for recreation, which will have both a positive trend for tourism in the entire region and increase its budget revenues. Today, the Zhytomyr region does not have a single tourist and recreational area that is fully localized to the stone processing and granite mining industry. It is worth noting that the secondary use of granite quarries is quite interesting for both mass tourism and individual representatives. After all, granite is considered the hallmark of the planet and is found only on planet Earth. The first important rock on our planet is basalt, and the second is granite, which actually makes up our continents.

The interest in geology is noted at the international level, where the International Mineralogical Association (IMA) has declared 2022 the Year of Mineralogy, which will be held as part of the International Year of Basic Sciences for the Sustainable Development of our entire planet. The activities envisaged by this organization are scheduled for mid-2022 and will continue until mid-2023. According to the fact that the use of environmental resources, on which geotourism is based, is a rather promising tourist product. In the framework of this study, we have considered one of the flooded granite quarries in Korostyshiv for improvement as a recreation area. The appearance of the quarry is a freshwater lake surrounded by high, both steep and gentle cliffs with a pine forest around the perimeter. Approximately, the area of the lake is 48,803.58 m², 500 m long, 150 m wide, 20-40 m deep, and 10 m high. The natural vegetation is represented by pine, oak and birch trees. Vegetation cover is characterized by adaptation to special conditions of moisture (near a water body) and light (among trees). Accordingly, there are groups of biennial and perennial plants, grasses, shrubs, and trees. The specific types and extent of vegetation cover in a quarry depend on factors such as the age of the quarry, the nature of the rock formations, and the level of disturbance caused by quarrying activities. At the moment, it cannot be said that the quarry is uncontrolled and has numerous tourists. However, due to the lack of equipped trails, the vegetation is still affected by trampling. Currently, the quarry area is used mainly for summer and winter recreation, namely as a beach and ice skating

area. The granite outcrops at the quarry have a homogeneous gray color with inclusions of light gray microcline, oligoclase, quartz, and biotite. The mineral composition of the rock is as follows: microcline (28.1%), plagioclase (32%), quartz (28.1%), biotite (7.1%), magnetite (0.6%), ilmenite, apatite (0.3%) (Korostyshivske rodovyshe). Despite the inclusions, the bulk of the rock is characterized by light gray feldspar against a background of gray quartz and black biotite. Taking into account all other parameters (density, porosity, water absorption, etc.), this stone is used for the manufacture of decorative facing products, side stone, rubble, and crushed stone. The yield of blocks from the rock mass to the surface is 18.6%. Granite rocks are generally characterized by fractures, which are divided into 4 groups: transverse sub-vertical, longitudinal sub-vertical, diagonal, and strata. The social infrastructure of the quarry includes the «Domashna Kuhnja» restaurant (280 m), the «Kavyarnia» cafe (550 m), and the «Shashlychok» barbecue restaurant (350 m). The facility itself is also located closer to the entrance to the city, which contributes not only to better accessibility to infrastructure but also to the opportunity to visit other local destinations. In particular, a dam across the Teteriv River and the Korostyshiv Stone Sculpture Park is located near the quarry.

The development of solutions around the reservoir was based on State Building Regulations B.2.2-5:2011 (sections: «Improvement of the territories of water protection zones and coastal protection strips»: 8.1. Natural and artificial reservoirs within settlements and «Improvement of public areas»: 5.6. pedestrian and bicycle paths;), according to which landscaping around an artificial reservoir should be carried out only on one bank, leaving the natural base on the opposite side undisturbed (s.8.1.3); installation of garbage containers and sanitary facilities (s.8.1.4), arrangement of bicycle parking (s.5.6.6); lighting of paths (s.5.6.7.) (Planuvannia ta zabudova mist, 2011). According to this, the design solutions cover the northwestern part of the reservoir, maintaining a balance between the use and preservation of the landscape. Given the recommendations described in the document, they were followed when choosing a place for each of the activities. We also took into account the orographic features of the territory, which has a somewhat steep slope in the southern part, so the range of measures to be implemented here is limited. The other side of the lake has a wider and flatter land plot for development (see Fig. 1 a; b).



a)



b)

Fig. 1. Korostyshiv quarry:

a) terrain for design

b) height of the relief section from north to south

Source: developed by the authors using Google Earth

According to the developed project, the following activities are planned: arrangement of glamping, observation platforms, and cable railings, installation of wooden benches, arrangement of an access road to the parking lot, installation of anti-parking bollards, organization of a suspension bridge, arrangement of a children's area, installation of LED lamps, gazebos, and toilets, swings over the water, organization of a cable descent, rock climbing, organization of souvenir sales, garbage collection, installation of wooden stairs, installation of a tourist sign with a Q-code, workstations on trees, organization of a summer cinema and a beach area (see Fig. 2 a; b.)



a)



b)

Fig. 2. 3-D visualization of the preliminary design:

a) preliminary design proposal

b) preliminary design

Source: developed by the authors using Realtime Landscaping Architect

In accordance with the above measures, we have developed 6 functional zones that provide public access to both the lake and various types of recreation that do not have a threatening impact on natural resources (see Fig. 3). Thus, the following zones have been identified: a stationary recreation zone, a food court zone, an active zone, a passive zone, a water area zone, and a business



**Sketch of the idea
of arranging the territory
of the Korostyshiv quarry**



zone.

Fig. 3. Concept of the Korostyshiv granite quarry development

Source: developed by the authors using QGIS

In general, geotourism development in a former granite quarry can strengthen the environmental component of sustainable development by promoting ecosystem restoration, environmental education, sustainable infrastructure, local involvement, economic benefits, and environmental research and monitoring.

Conclusions. The study noted that the development of geological tourism is relevant for all categories of tourists, as it offers different ways to explore the territory and culture of its local residents. Thus, history and culture lovers can delve into the study of the relationship between the geological environment and its impact on people's lives. Nature lovers and outdoor enthusiasts can explore and appreciate natural attractions and resources through excursions and hiking. In order to improve recreation in the environment, a number of measures have been proposed that can increase the comfort of tourists stay. The granite quarry selected for the study is a popular place among both locals and weekend visitors. Therefore, it is worthwhile to properly organize the quantitative and qualitative parameters of their recreation, through the creation of parking spaces, hotel rooms, and various leisure facilities on the territory.

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