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## Landscape cultivation project of the «Recreation tract «Korostyshiv Canyon» and prospects for the creation of a geopark

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**Abstract.** The purpose of this article was to highlight the prospects of using the «recreational tract «Korostyshivskyi Canyon» for recreational and tourist purposes. Due to most of the world's leading countries' policies aim to manage the sustainable development of tourist destinations, preserving the integrity of the environment was the basis of the improvement measures.

By maintaining a balance between the use and protection of the landscape. Through such mechanisms as taking into account the orographic features of the area for arranging zones of active and passive activity, as well as studying the quarry's attractiveness and its possible inclusion as one of the objects in the regional geopark. The creation and operation of which could be developed based on the existing quarries of the city of Korostyshiv (Korostyshivskyi quarry, «recreational tract «Korostyshivskyi canyon», Raikhove lake, «Vysoky Kamen» quarry). In view of the fact that the object described in the article is in the communal property of the city of Korostyshiv, the interests of the local authorities regarding this place and the residents of the city were taken into account when developing the measures. As a result, functional zoning was developed, making it possible to allocate zones for certain types of activities, considering their current state of preservation. The implementation of the proposed project assumes that the territory will act not only as an additional stimulus for the local budget but will also be able to expand the range of services and change public awareness of environmental support. The perspective of the proposed project is that this area will be less burdened by tourists, due to the functioning of the infrastructure, which will ensure comfort for visitors and safety for nature. Also, one of this work's goals was to form a comprehensive image of the geological object among tourists, by installing information and reference boards and laying eco-trails. The selected quarry is an excellent site for recreation, which, with proper use of resources and presentation of the geological heritage, will make it comfortable to visit and recognizable among other places in the region.

**Keywords:** *planning, geopark, Zhytomyr region, tourism, quarry, zoning for recreation*

## Проект окультурення ландшафтів «Рекреаційного урочища «Коростишівський каньйон» з перспективою створення геопарку

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**Анотація.** Метою даної статті було висвітлення перспектив використання «рекреаційного урочища «Коростишівський каньйон» з рекреаційною та туристичною метою. Зважаючи на те, що політика більшості провідних країн світу націлена на управління сталим розвитком туристичних дестинацій, в основу заходів з благоустрою було покладено ідею збереження цілісності навколишнього середовища. За допомогою дотримання балансу між використанням та захистом ландшафту. Через такі механізми як врахування орографічних особливостей місцевості для облаштування зон активної та пасивної діяльності, а також через вивчення привабливості кар'єру та можливого його включення як одного з об'єктів до регіонального геопарку. Створення та функціонування якого могло б розвиватися на базі існуючих кар'єрів м. Коростишів (Коростишівський кар'єр, «рекреаційне урочище «Коростишівський каньйон», Райхове озеро, кар'єр «Високий камінь»). З огляду на те, що описаний у статті об'єкт знаходиться в комунальній власності міста Коростишів, при розробці заходів враховувалися як інтереси місцевої влади щодо даного місця, так і мешканців міста. У результаті було розроблено функціональне зонування, яке дозволило виділити зони, зважаючи на їх сучасний стан збереженості, під окремі види діяльності. Реалізація запропонованого проекту передбачає, що територія буде виступати не лише додатковим стимулятором для місцевого бюджету, але й зможе розширити спектр послуг та змінити суспільну свідомість, щодо підтримки довкілля. Перспектива запропонованого проекту полягає

у тому, що дана територія буде зазнавати меншого навантаження від туристів, через функціонування інфраструктури, яка забезпечить комфортність для відвідувачів та безпеку для природи. Також однією із цілей даної роботи було формування комплексного образу у туристів про геологічний об'єкт, через встановлення інформаційно-пізнавальних табличок та прокладення еко-стежок. Обраний кар'єр є чудовим майданчиком для рекреації, який за правильного використання ресурсів та презентації геологічної спадщини дозволить зробити його комфортним для відвідування і упізнаним серед інших місць регіону.

*Ключові слова:* проектування, геопарк, Житомирська область, туризм, кар'єр, зонінг з метою рекреації

## Introduction

During the XX-XXI centuries, many territories were allocated and given the status of nature conservation. The profile ministries of the countries independently determine which natural monuments have a particularly unique value and require the least human impact, and which, on the contrary, are a resource that should be used not only as the part of research activities but also to develop recreation for people's health. In the XX century lovers of nature and tourism enjoyed a vacation without elements of any infrastructure in the territories of the NRF. In 2002, under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO), a worldwide network of geoparks was created, which was based on the management of objects and landscapes of international geological significance based on a holistic concept of protection and sustainable development. A wide range of permitted functions provided for the creation of centers for scientific, educational, environmental protection, and recreational activities. According to the definition of the head of UNESCO's Earth Sciences Sector, Christoph Vandenberg: «Global geoparks are the territories where objects of the geological heritage of international or regional significance are located, as well as a strategy of sustainable development and support of local culture and traditions» (Komitet Respublyky Bashkortostan po delam UNESCO, 2020). Their bottom-up approach should combine nature conservation with sustainable development and the involvement of local communities. The international significance of objects is determined through the following criteria: they are well known among scientists related to geological sciences and others; articles have been written about the objects; included in the lists of geological heritage (for example, ProGeo) or received the status of a global stratotype (Global Boundary Stratotype Section and Point (GSSP), i.e. these must be geological objects known among specialists. In 2004, representatives from 17 European and 8 Chinese geoparks at a meeting at the UNESCO headquarters in Paris, the organization Global geoparks network (GGN) was formed, the main work of which still consists in the coordi-

nation of various projects, programs, and initiatives in the field of geological heritage, as well as the expansion of the information network of geoparks and their cooperation among themselves. In 2015, at the 38<sup>th</sup> UNESCO General Conference, 195 membering countries ratified the creation of a global network of geoparks.

## Analysis of recent research and publications

Having studied the scientific publications of Ukrainian scientists, regarding the prospects of including quarries within the scope of geotourism in excursion routes, it is possible to note the insufficient study of this issue. Considering the fact that the geography of the objects covers the industrial regions of Ukraine, the work on this subject is mostly done by scientists from Central Ukraine. In addition to a significant number of publications in Ukrainian and foreign scientific journals, as well as speeches at conferences, most researchers are the members of international organizations. Thus, for example, V. Manyuk is a representative of Ukraine in the European Association for the Protection of Geological Heritage (ProGeo) and an active speaker at congresses of leading geologists in our country. Being a part of many working groups, he was one of the first to highlight the topic of using geological heritage (Manyuk, 1999, 2006, 2007), when the first geopreservation organizations began to be created: ProGEO (1993), Union of Geologists of Ukraine (2000), etc. As a leading lecturer in geology, he also influenced the scientific research of his students, as a result of which we can single out the work of V. Fundova, who continued the study of key areas that correspond to the concept of creating geoparks in Ukraine (2016). In the same period, A. Ivchenko, one of the representatives of «ProGeo» in Ukraine, showed a significant interest in geological heritage, initiating the project «Systematization and description of geological monuments of Ukraine, development of recommendations for their popularization, use, and protection» (1998). To date, the most relevant are the works of the members of the above-mentioned organization, where V. Hrytsenko examines the topic of geoparks through the prism of ecology,

business, and society (2019). Since 2014, one of the main international scientific and practical conferences «Geotourism: Practice and Experience» has been held in our country, where not only foreign researchers but also Ukrainian scientists present their reports, among whom it is worth mentioning Y. Zinka (2020) and Ya. Kravchuk (2018). Their contribution is mainly related to the promotion of geotourism sites in Western Ukraine (Carpathian region). Considering the fact that a geopark is a new form of territory preservation, it involves taking into account the organizational and legal aspects of its design, which O. Shevchuk (2011, 2012) has considerable experience with.

Taking into account the publications of some most active figures in Ukraine, regarding research on the use of geoheritage through sustainable development. It can be noted that now there is a significant base of various approaches to the creation of geoparks. However, the issue of lack of interest on the part of local authorities remains open, as a result of which we do not have a single functioning geopark. However, the developed strategy and promotion of geotourism by specialists belonging to various international and Ukrainian organizations allows for developing territories with geological objects with the involvement of the local population, as well as stimulating business and government to preserve the natural environment. The popularization of geotourism resources, which was carried out by the above experts, through participation in various scientific events, organization of educational practices, and periodicals, stimulated other scientists to research this topic.

In particular, V. Kazakov, over the past few years, has been researching the topic of industrial tourism development and the attractiveness of man-made objects (2016). S. Sardak (2018) dealt with the European experience of organizing industrial tourism. Scientists O. Sytnyk, O. Khlevnyuk, and V. Nikolaevskii (2018) studied the features of geotourist objects. They are mainly focused on the study of anthropogenic landscapes in their area, as the existing tours are held on the territory of the Dnipropetrovsk region. However, their experience is also valuable for the Korostyshiv UTC, which has geological objects. Few works were devoted to the evaluation of the use of quarries on the territory of Polissia. The main vectors are aimed at the landscape structure of particular areas and the recreational appeal of local landforms. In particular, in the Zhytomyr region, local historians H. Mokrytskyi and M. Kostrytsia (2016) have a significant share of works on the description of recreational resources. Korbut G., Vyskushenko A., and Pamirskyi M. worked on using geological resources in nature exploration routes, and

also studied the possibilities of geological tourism in various oblasts of the region (2009). The analyzed literature allows us to determine that at the moment the main priorities are aimed at the study of geological monuments of nature with their subsequent inclusion in excursion routes. However, there are significant gaps in the availability of articles on the branding of inactive quarries as potential objects of tourist attraction, as well as the planning organization of these territories for recreation. The actual re-planning of anthropogenic relief forms is an insufficiently studied topic today, as is the study of methods for comparing the attractiveness of abandoned quarry landscapes abroad with Ukraine. Therefore, the foreign experience of such authors as Baczynska E., Lorenc M., and Kazmierczak U. can be used precisely when justifying strategies for increasing the attractiveness of inactive quarries and attracting tourists to ecological tourism (2017). Given the formation of new territorial units in Ukraine – UTC, the materials of Lee, Y., Jayakumar R. are useful, when they consider the importance of geoparks from an economic point of view, as an additional resource for replenishing local budgets (2021). An interesting experience of creating geoparks in Poland is described by J. Skibinski, K. Kultys, W. Zglobicki, and B. Baran-Zglobicka (2021). Stoffelen A., Groote P., Meijles E., Weitkamp G., a comprehensive study of the relationship between the geopark territory and residents made it possible to determine what values a person invests in a certain type of landscape (2019). The experience of defining geoparks through legal instruments operating in the EU, which is presented in detail by V. Nikolova, and D. Sinnyovsky (2019), will be useful for Ukraine.

The analysis of the studied literature on the design of geoparks, based on unique geological and geomorphological formations, allowed to confirm the expediency of improving the quarry in the city of Korostyshiv, with the subsequent creation of a geopark on the territory of the UTC. The materials used, which were published in recent years, demonstrated the significant potential of the territories of Ukraine with various geological processes and their vivid external manifestations. The cited works enable young scientists to work on the development of geological tourism in the coming years from the point of view of satisfaction of the population in learning about geological objects. Since geoparks are a new model of sustainable development of tourism for Ukraine, ProGeo members from Ukraine are actively engaged in highlighting places of concentration of geological monuments of nature through various platforms, in particular through the Facebook page, as well as the scientific journal Geoheritage.



## Methods of research

The research methods were based on general scientific methods of analysis and synthesis from information sources. In particular, considering the territory of the quarry as one of the objects of the complete system of the Korostyshiv granite quarries, the charter of the European Geoparks (as of June 5, 2000) was considered, as well as the materials of the latest conferences on global geoparks, which are held there annually. As a result, it was possible to get acquainted with examples of balanced use of natural resources based on the geopark and the role of intangible cultural heritage. The Korostysh territorial community has a distinct «geodiversity» due to its geological and geomorphological characteristics. When outlining the prospects for the use of the «recreational tract «Korostyshiv Canyon», in addition to its improvement, the territory it occupies could be included in the future geopark with the other 3 quarries (Korostyshivskyi Quarry, «Raikhove Lake», «Vysoky Kamin» quarry») community.

Considerable attention was paid to the analysis of approaches to determining the definition of zoning of the territory for recreation and tourism. Scientific publications of leading Ukrainian and foreign researchers were considered to identify the potential opportunities of Ukraine in terms of creating new forms of conservation of natural territories. Assessment of the current state of the territory for use in recreational activities was carried out using publicly available Google maps. Based on this, an algorithm of measures aimed at the sustainable development of the territory and familiarizing visitors with its natural features were developed. Functional zoning was carried out in QGIS software to determine the target audience and type of occupation within the «recreational tract «Korostyshivskyi Canyon». For this purpose, the visualization of the main design solutions was made in the Figma graphic editor. Also, to identify prospects for the improvement of this territory, the development strategy of the Korostyshiv city UTC for the period up to 2027 and the priorities for the development of tourism in Ukraine for 2022 were considered.

## Results and their analysis

At the beginning of 2022, there are 169 global geoparks in 44 countries in the world (UNESCO, 2022). The geography of their placement is mostly tied to China and Europe (Greece, Spain, Great Britain, Italy, and France). Regarding Ukraine, it is worth noting that we do not have geoparks. However, it is

planned to open the first such facility in the Kharkiv region, «Upper Prydontsovyia». It is worth noting that at the moment, there is no document in our country that interprets the definition of a geopark and its legal regime. The priority of creating geoparks relative to other territories of the NRF, for example, the NNP, assumes that the geological objects will be the basis. Of course, when creating geopractices, all approaches to the preservation and protection of the environment are taken into account by the norms of the current legislation. It's functioning according to trends according to balanced and sustainable development.

Regarding the fact that this article presents both the option of reorganizing the former quarry territory and the option of organizing a potentially possible geopark, which will include the local quarries of the Korostyshiv UTC. It is worth considering the concept of zoning for recreation. The main idea of this term is the selection of separate zones, based on natural features, with the aim of preserving ecosystems and reducing the anthropogenic load on the territory. According to the definition of M. Tavakoli, a professor at the University of Coimbra: «zoning is a tool that helps us minimize the impact on natural resources, thanks to which we can delay the destruction of the natural environment, satisfy our needs and ultimately make the necessary decisions» (Tavakoli, 2019). Harvard University professors, considering the issue of zoning in their monograph, agree that the natural environment has a limited ecological potential that can be used by humans, therefore the assessment of its stock is the core of further ecological research and a platform for ecological planning (Mahboobi, A., Naghdi, A., and Naghdi, F., 2010). Spatial planning of recreational areas has a completely individual character and depends on the authors of the project and the ability of local authorities to realize the idea. Most often, favorable and attractive natural and recreational resources are taken as a basis for the allocation of zones: climatic, landscape, hydrological, etc. Although any of the specified criteria can be chosen for zoning, the regional natural-historical specifics of the region's development will inevitably be reflected in the character and development trends of both natural ecosystems and socio-historical systems. In Ukraine, an example of experimental zoning with the simultaneous process of reclamation of a former quarry is the city of Pokrov (Dnipropetrovsk region), where a functional division of the area was carried out and a park complex (Dnipropetrovska oblasna universalna naukova biblioteka) was created. At the same time, the physical and geographical conditions of the territory with its spatial structure of landscapes were taken

into account. Currently, it can be stated that there is no general method of zoning and it is hardly possible to develop a universal scheme. The key, at the moment, is the use of combinations of tourist resources that contribute to the development of certain types of tourism within large natural complexes.

As of 2023, the travel trend for ecological tourism will continue to persist, given the fact that most people are trying to follow the trends of ecological culture, which is actively developing in many countries of the world. The right of free access to natural areas today is different from the way we imagined it before. After all, due to the growth of mass tourism, the beautiful «wild» nature needs to make ecological and planning decisions regarding its preservation. For example, the local government of Norway, to minimize the impact on popular tourist routes through the fjords, decided to expand the paths for travelers, as well as make organized parking and garbage disposal. In Israel, many canyons, which were formed due to shallowing of rivers, have hiking routes with stairs, railings, and ladders for tourists. Accordingly, the use of environmental resources for tourism and recreation should be rational and contribute to the protection of natural objects. Eco-friendly culture in tourism is supported by certification programs of various tourist business facilities. For geotourism as for one of the new directions of tourist travel, sightseeing tours of rocks, geological structures, paleontological remains, and recreation in the territory of caves, rocks and quarries are typical. Today, one of the vivid examples of the interaction between man and nature is the territories of national geoparks, in which transformative measures for the development of territories are taking place, but with the minimization of social, cultural, and ecological consequences. These include the «Rokua» geopark (Finland), where excursions are conducted through Ice Age landscapes; based on the Novohrad – Nograd geopark (Hungary) there are tourist and research centers that introduce travelers to volcanic rocks.

The main mission of geotourism, according to the non-profit national geographic organization National Geographic, is a humanitarian task, which is caused by the presence of a considerable number of places in the world that are at the stage of extinction (National Geographic, 2001). Geotourism contributes to the restoration of not only the flora and fauna of the designated areas but also restores the culture and traditions of the local population. As an example of implementation, the above-mentioned opinion can be served by the Bellwood quarry (Georgia, USA), which is currently at the stage of transformation into an area with pedestrian and bicycle paths, a playground, green

spaces, and arrangement of places with panoramic views of the grand canyon rocks (Singleton, Jacob, Feeney, and Little, 2013). The Eden Project in Cornwall (Great Britain) can be noted as an embodied idea for the beautification of a non-working quarry, as a result of which the barren landscape of a clay mine was transformed into an indoor garden with tropical plants and routes for walking and cycling (Knebel, Sanchez-Alvarez and Zimmermann, 2002). Many careers in the world are currently inactive. Most of them have been conserved for several hundred years and serve as a place for the accumulation of household waste from industrial facilities, but there are also those based on which a variety of infrastructure is created, which allows attracting tourists here and receiving additional funds for the maintenance of this area. Today, statistics indicate that the number of abandoned mines and quarries in the world has exceeded one million, in particular, there are 1,000 inactive mines and quarries in Nigeria, and more than 630 inactive coal mines in East Kalimantan (Indonesia) (Krupyna, 2021). Among the examples of the transformation of quarries into attractive natural and cultural landscapes, in addition to those mentioned above, we can note the limestone quarry of St. Margareten (Austria). Now transformed into an open-air theater with an auditorium (6,000 people) (Esterhazy Betriebe GmbH). Quarry in the city of Braga (Portugal) based on which the municipal (football) stadium functions, was built especially for the holding of Euro-2004 (Arquitectura Viva, 2004). The limestone rock in which the complex for sports events was carved can accommodate up to 30,000 people. These examples show that the quarry can either be completely modified, or excursions for tourist groups are organized on its territory. Each country itself chooses the direction of development of the area, and it is not always connected only with the tourist goal, because an important place is given to the economic sector. So, for example, Great Britain is planning to convert coal quarries (Hebburn mine) into geothermal power plants (Richter, 2020). A similar practice of using renewable electricity resources based on mining quarries is planned to be implemented in Romania, in the valley of the Jiu River.

Taking into account the best world practices, the project for the development of the «recreational tract «Korostyshiv Canyon» (Korostyshiv city, Zhytomyr district) is presented as the part of this study. The concept of the «Korostyshiv Canyon» recreation tract is its name. According to local government documents, this is an area that has reached the end of its useful life. That is why these lands can be used for recreational activities in the fresh air under the guidance and man-

agement of local self-government bodies. It is also worth noting that this object is an artificial quarry and not a canyon in the sense of this concept (valley of some river). Most likely, the name «Korostyshivsky Canyon» was established among residents earlier and took root in local usage. In particular, this construction can be found in one of the main documents of the city: «Strategy of development of the Korostyshiv urban territorial community for the period until 2027». By the way, it states that the Korostyshiv community has a large number of water bodies that are not currently used for recreational purposes. That is why the tasks include the goal of creating new tourist products. The strategic vision of the development of the Korostyshivsk UTC includes the principle of turning the city into a recreationally attractive area for residents and tourists. This repurposing of the quarry, which is owned by the city council, is expedient and will allow for the expansion of the tourist and recreational products of the community. In addition, the recreation and tourism sphere was chosen in the city's development strategy as one of the drivers of the economy, which should be aimed at serving the residents of the capital and the regional center. At the

moment, the basis of the government's efforts in the tourist direction includes the organization of festivals «Korostyshiv – the city of a thousand sculptures and murals», «KOROSTYSHIV VARENYK FEST»; association of tourist service providers along the Teteriv River; improving the promotion of tourist products of the city through Internet resources; development of the community's brand (brand book/souvenir products) and holding the «Mason's Day» holiday.

The main idea of this project involves the improvement of the recreation area on the territory of Korostyshivsky Canyon. Before beginning the description of the main design decisions, it is worth giving a general description of the Korostyshiv Canyon in geological terms. First of all, it is now a defunct facility and was flooded back in Soviet times, when granite mining stopped. The water that filled the quarry is mentioned in many sources as curative and effective for diseases of the musculoskeletal system. The quarry is a lake (140 m long; 55 m wide), surrounded by granite rocks (rocks 10 m high, up to 20 m deep with an artificial lake) (see Fig. 1) (Kovalchuk and Okholina, 2020). The area of the plot is 5610.9 m<sup>2</sup>.



a)



b)

**Fig. 1.** A flooded quarry as an area for recreation: a) summer; b) winter  
Source: authors of the paper

In their composition, quartz, plagioclase, and biotite are distinguished, which, in turn, caused the quarry walls to vary in color from light gray to rusty gray. The granite has a block structure (3-4 m in size), which makes it possible to see all its features: pegmatite veins, porphyry inclusions, and aplite-pegmatite bodies. Natural vegetation is represented by tree species of pine, oak, and birch. Vegetation is characterized by adaptation to special hydroclimatic con-

ditions and the condition of the underlying surface: overwetting of soils, glacial relief, and sod-podzolic soils. According to what is dominant here: horsetail, mosses, meadow sedum, dicotyledonous nettle, small-flowered forget-me-not, forest violet, and others. The territory of growth of most species is characterized by the presence of permanent shade, as a result of the growth of shade-tolerant plants; due to the close occurrence of surface waters and the forma-



tion of temporary watercourses after melting snow and during rains (hydrophytic plants), as well as the species composition is correlated with the type of climate of this area. Among the objects located near the quarry, the following can be noted: the hotel and restaurant complex «Magic Lake»; the first lake; the «Teteriv» recreation center, near it is the «European spring» (the medicinal properties and composition of the water are indicated on the stone near the spring); shop «Dubok». The specified facilities are within a walking distance of 1.5 km. If desired, the tourist can visit tourist locations in the city itself: the dam across the Teteriv River and the Korostyshiv stone sculpture park (3 km, 6 minutes by car), the Church of the Nativity of the Holy Virgin, the Olizar library (half-timbered style). Among the natural objects, it is also worth noting the large Korostyshiv quarry (1.5 km), the climbing sector «Raikhove Ozero» (former granite quarry, 3.6 km), and the «Vysoky Kamin» quarry (the village of Gorodskoe, 15.3 km).

During the period of granite mining, Korostyshiv was known as the «granite capital» of Ukraine, as the local stone was transported to all countries of the former USSR. Many naturalists compare the monolithic shores of Korostyshiv with Finland, a country of granite and lakes, or Banff Park (Canada). As of today, this territory is on the balance sheet of the Korostyshiv City Council, but the local authorities have not yet developed a comprehensive strategy for the development of the area. Although in the summer of 2021, a meeting of representatives of local authorities was held based on the recreational tract, which initiated certain measures to improve the infrastructure before Independence Day: the installation of a flag at the highest point of the canyon and several additional gazebos and toilets (Korostyshiv radio, 2021). However, taking into account the modern needs of tourists, such an update can be considered an initial stage. After all, taking into account the target audience of this place, it is worth zoning the canyon and arranging it not just for a comfortable and safe stay, but also for an interesting one with walking paths and bicycle paths. All this should be organically integrated into the landscape and not disturb the natural trajectory of tourists' recreation. This place has many advantages, in particular, it is a great location for organizing holiday photo sessions here, as well as a movie location for feature movies or commercials.

Currently, this facility, which is visited by thousands of tourists every year and could make a significant contribution to the local economy, is in an unsatisfactory condition. The main target audience of this place is young people and couples with children. The

geography of potential vacationers consists mostly of tourists from neighboring regions of the Zhytomyr region. The city of Korostyshiv, where the canyon is located, is located 107 km from the city of Kyiv and 27 km from the city of Zhytomyr, so for tourists, a vacation in this area is a weekend tour. Vacationers are attracted not only by convenient transport locations but also by picturesque corners of «man-made» nature: clean forest air, clear water, and rocky granite shores. However, it cannot be said that the area is incredibly popular among tourists. Although on the territory of the canyon you can meet lovers of diving and rock climbers, who arrange the rock for training even in winter. The transformation of the canyon will make it possible to develop both summer and winter recreation here because as the temperature drops, residents organize massive open-air ice skating. Considering the measures developed for this area, it can be of interest not only to tourists who like active recreation but also to so-called «geotourists». The main goals of the project are not only the creation of comfortable conditions on the territory adjacent to the lake but also the ecological and geological education of tourists, the protection of the geological object, and the formation of ecological knowledge about the state of the environment.

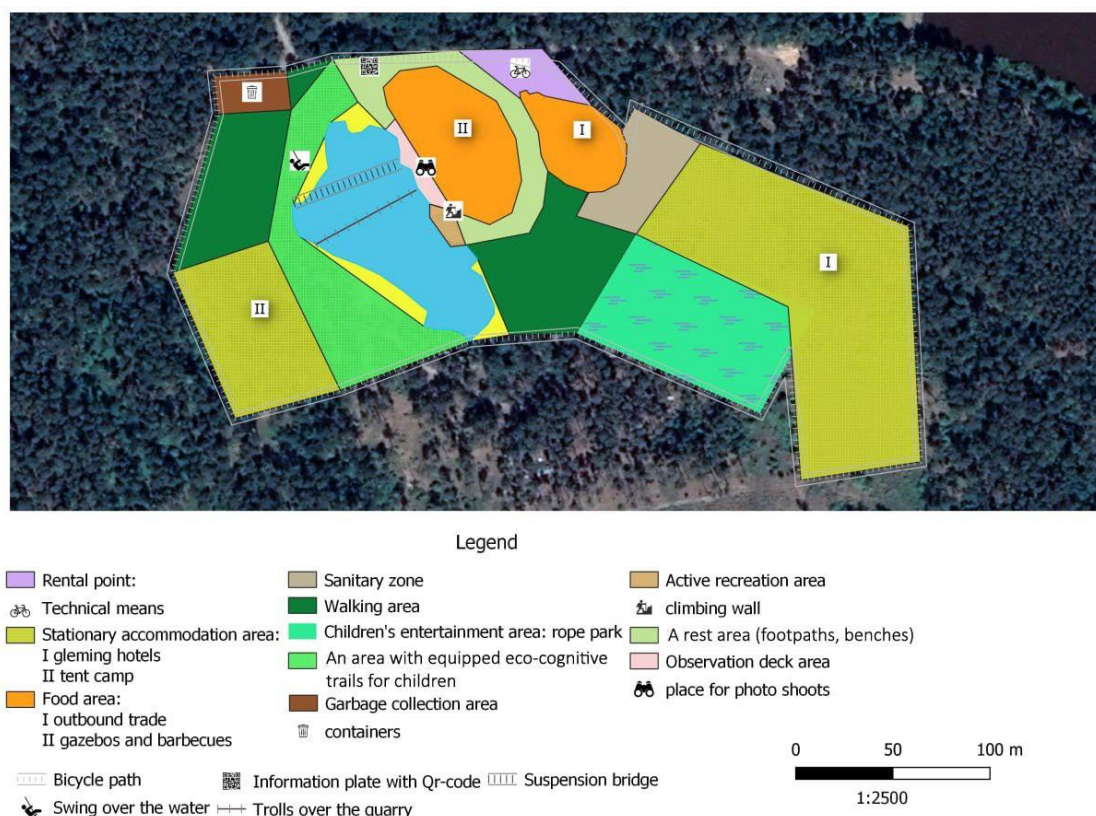
Potential geotourists will be able to learn how the canyon itself was formed, what rocks were mined at this place, as well as where you can find architectural objects from the Korostyshev quarries. The organization of excursions for such participants will be interesting because the granites are found right on the paths along which the tourist route can pass, so the mineral will be available for inspection without any difficulties, it is almost underfoot. Supporting the idea of demonstrating the territory to a different audience of tourists, the canyon can be a place for eco-hiking if suitable eco-trails are built, along which educational walks for schoolchildren can also be done. This direction is currently very relevant, taking into account the changes in educational standards that existed in school programs. It can be predicted that in 2023, the trend in tourism for «ed-ventures», that is, a combination of education and recreation for the youngest members of the family, which, according to UNWTO, was inherent in the tourism trends of the current year, will continue (Tourism trends, 2022). Following European trends, students should study naturalistic subjects in a new way, which can be implemented in the canyon through the organization of eco-workshops or phenological excursions. Local history should be the heart and soul of modern school education, which should also be correlated with health improvement

and landscape therapy. The art of learning in the fresh air is not just a subject, not a new pedagogy, it is an education that must be implemented to form a responsible attitude towards the environment. The presented activities will also be interesting for children's camps with tents that are organized in the summer. After all, conducting sports orienteering on forest trails or acquiring life skills requires practical training. The interest in the canyon as a place for various research can be judged by the fact that it became a key space visited by conference participants in 2020, organized by the state institution «Museum of Precious and Decorative Stones» (Khoroshiv).

It is also worth noting that, in addition to the canyon, there are several quarries within the city limits (Velikiy Korostyshivskyi quarry, «Raikhove Lake», «Vysoky Kamin» quarry), but at the moment they do not represent additional competition, since there are no sufficiently well-maintained, do not have spe-

cial location indicators, and access to them, in rainy weather, is difficult due to the dirt road. However, under the condition of creating a geopark and appropriate arrangement, these quarries can become one of the geotourist objects. Based on this, it can be concluded that the canyon is a promising area for the development of various types of recreation. However, to increase the number of tourists and the duration of their stay, it is necessary to improve the local infrastructure. Now Korostyshiv is a city with a population of more than 25,000 inhabitants – the organizational-economic, administrative-business, and cultural-educational center of Korostyshiv UTC. Therefore, it is important to develop projects that contribute to the sustainable development of the city and the flow of funds to the local budget.

The main design solutions provide for the organization of 10 functional zones for recreation on the territory (see Fig. 2).



**Fig. 2.** Concept of the recreation area «Korostyshivsky Canyon»  
Source: made by the authors using the capabilities of QGIS

Comprehensively covering all the mentioned activities, the canyon provides:

1. a stationary area where you can stop for the night, both for organized and for independent tourists;
2. an area for organizing a barbecue with the possibility of renting picnic equipment;
3. sanitary and household areas;
4. walking area;
5. recreation area for children (rope park);
6. an area with equipped eco-cognitive trails for children;
7. garbage collection area;



8. an area for active recreation (climbing, cliff diving, bike rides);
9. a rest area (footpaths, benches);
10. an observation deck.

The zoning of recreational facilities presented on the map is selected based on natural features that can satisfy the needs of tourists in certain types of recreation (see Fig. 3).



**Fig. 3.** Visualization of the projected quarry area  
Source: made by the authors using the capabilities of Figma

In addition, the impact on the entire ecosystem as a whole was taken into account, in particular, for the construction of glamping sites, an area with a smaller number of tree species was chosen, to preserve the maximum number of photo diversity during construction. For convenience, next to the mentioned zone, there is a place for children, who, in addition to swimming and social interaction with each other, will be able to explore the natural environment. Because the rope park proposed in the project is a natural play space that should demonstrate to children the relationship between a person and a healthy ecosystem. Along with the presented zones, which provide for the flow of people, there is a sanitary and hygienic zone, which provides for the organization of a comfortable rest for tourists. In the zoning, the territory is planned for places for seasonal trade and recreation in the barbecue area. To attract the most diverse audience, both in terms of age and interests, a sports space has been created for lovers of ordinary and extreme activities. For those who have chosen a career in water recreation and relaxation, there is also a dedicated area, along with places to take aesthetic photos and celebrate someone's birthday. Also, in

this zoning, there is a place for organizing an eco-trail and a place for excursion groups to go on foot. The specified options provide tourists with the geological heritage of Korostyshiv through the arrangement of paths that have been trampled by people. You can organize excursions to these places on ecological topics, which will differ depending on the season. Information boards with general information on the object and its morphometric parameters will be located on the paths. The outcrops of granite rocks and various groups of vegetation are the objects of the display.

In a more extended version, the following measures are justified:

1. Arrangement of glamping sites. Currently, there are no fixed stopping places for tourists within the recreational tract. The nearest means of accommodation are located either directly in the city itself or 600 m away is the «Magic Lake» hotel and restaurant complex. However, the price policy of this institution is quite high. Accordingly, in the absence of overnight accommodation, tourists mostly stay in tents or have travel trailers. Therefore, for tourists to have a comfortable rest, glamping is the best option that will minimize the

impact of people on the natural environment and avoid landfills.

2. Arrangement of viewing platforms and cable railings. Currently, there are two observation decks on the territory of the canyon: the first is near the lake, and the other is on one of the granite slopes. However, it is important to consider among groups of vacationers not only young and active people but also, for example, organized children's excursion groups and people with limited mobility. That is why promising places that can serve as viewing platforms should be properly arranged to guarantee the safety of tourists near the edge of the canyon.
3. Installation of wooden benches. Currently, there are no places for recreation or photography on the territory of the canyon. Therefore, to improve the comfort of tourists, it is necessary to provide for the installation of «panoramic» benches.
4. Repair of the access road. As of today, the road leading to the canyon needs to be upgraded from dirt to asphalt road surface. The length of the exit section from the main road to the secondary road to the canyon does not exceed 150 m.
5. Installation of anti-parking posts. At present, on the territory of the canyon, the car can be parked in any convenient place where its owner can drive out. Therefore, to maintain cleanliness near the recreation area for vacationers, it is worth introducing a limit on the permissible distance.
6. Organization of a suspension bridge across the canyon. The installation of a suspension bridge over the canyon will serve as an additional attraction. It will become another place for photo lovers, it will allow you to look at the lake from above and quickly find yourself on the opposite side.
7. Arrangement of children's area: rope park. Given the fact that most tourists visit this place with children and stay here for 1-2 days. It is important that their recreation is diverse and not limited to water recreation. Because the canyon is located in the middle of a forest massif, it would be advisable to use this resource for conducting various quests, and routes, as well as a park of rope barriers.
8. Installation of LED lights on solar batteries. Taking into account the fact that recreation in the canyon involves a recreation of tourists in the evening and at night. To improve their comfort and safety, it is advisable to install lighting near the entrance to the canyon, as well as in areas intended for walking.
9. Installation of gazebos and toilets. At the moment, the territory of the canyon, which provides comprehensive recreation in nature, has only two gazebos on the shore of the lake. Therefore, for organized recreation, increasing the number of gazebos and restrooms will make tourists' rest more comfortable.
10. Installation of a swing over the water. This element will serve as an additional attraction for tourists. This lake is a favorite among vacationers precisely because of the steep bare rocks of the canyon, which often become a picturesque setting for photo shoots, especially wedding ones.
11. Organization of abseiling. The height of the canyon is 20 m, the landscape around the lake is incredibly beautiful: pine, spruce, and birch forest, granite rocks – all this can be seen by a tourist who uses the proposed «crossing».
12. Classes on the rock massif. Nowadays, the high cliffs of the canyon also attract extreme climbers: students of climbing schools and experienced athletes from all over the region come here. Therefore, during the weekend, potential tourists should diversify their vacation by equipping rock routes for beginners.
13. Organization of the sale of souvenirs and drinks. Given that the canyon is several kilometers from the nearest store. Accordingly, on the territory of the recreation zone, the local government can organize three rental places for visiting and seasonal trade, which has the desire to prepare and sell food to vacationers. Taking into account the fact that the best souvenirs for tourists are gastronomic products, on the territory of the canyon it is possible to organize the sale of craft natural wine «Na granite», but without consuming it on the territory. Also, for barbecue lovers, it is possible to rent it in a specially equipped area.
14. Organization of garbage removal and round-the-clock security (video surveillance). To ensure the comfort of potential vacationers, this aspect is extremely important. Unfortunately, at the moment, many vacationers forget to clean up the garbage after leaving the stop, so, during a long-term vacation, it is necessary to grab garbage bags and throw the waste into the tanks near the road.
15. Reconstruction of stairs and laying of new ones. Currently, there is only one staircase on the rocky massif of the canyon. However, to improve the movement of tourists, additional structures can be laid.
16. Installation of a summer shower on solar batteries. Taking into account the fact that water recreation and active recreation are mostly carried out within this territory, an important point for increasing the



comfort of tourists is the opportunity to «refresh» on hot days.

17. Installation of a tourist sign with a QR code. To record the number of tourists, as well as so that vacationers can learn interesting information about the object, it is worth installing a modern table with a QR code and Braille font. In this way, information about the canyon will spread among recreationists faster.
18. Organization of a point of rental of equipment for active recreation. Given the development of recreation here both in summer and in winter, and to attract people to a sports lifestyle, it is possible to offer to take: bicycles, scooters, skates, skis, or Finnish sleds.
19. Arrangement of a bicycle path. To expand services for tourists, it is advisable to create a new place for the future bicycle route, which everyone can use. Cyclists have entered the canyon before, but due to the disorganization of the place, people with good physical fitness could overcome the path.
20. Installation of information boards in pedestrian zones, which familiarize tourists with the recreational area. Taking into account the diversity of the target audience of this place, as well as the purpose of their visit, it is worth it that the walk along the paths should be filled with meaning.

The estimated duration of this project is 6 months. The planned measures in the design are developed taking into account the features of the complex topography of the quarry and the minimization of chang-

es in the ecological environment, due to the absence of concrete structures in the work. The relevance of this project is reinforced by the fact that, according to the latest STDA survey, in 2021, 32% of Ukrainians travel within the borders of their state (State Tourism Development Agency, 2021). In addition, one of the priority goals of the Ministry of Infrastructure is the creation of complex recreational areas to improve domestic tourism in Ukraine.

Confirmation of the demand for trips with recreation in nature and the insufficient number of such areas could be seen already at the beginning of the COVID-19 pandemic in 2020. The quarantine introduced by the Ukrainian government showed how much city dwellers need recreation in green areas (parks, squares) of cities. If some types of recreation can be replaced (drive-in cinemas, etc.), then outdoor recreation in the city can be replaced only by going outside the city. Accordingly, a share of people who do not have country houses is looking for alternative places. Therefore, the improvement of natural areas that are actively visited by tourists should contain the necessary infrastructure in order not to put additional pressure on the environment. An example of when, due to the lack of equipped parking spaces, an additional load on transport connections was created can be the side of the Korostyshiv quarry (see Fig. 4). This model demonstrates both the poor provision of conditions for recreation to potential tourists and the dissatisfaction of residents with the state of the territory after the departure of vacationers.



a)



b)

**Fig. 4.** «Recreation tract «Korostyshivsky Canyon»:

a) lack of parking for cars; b) blocking the passage to the canyon

Source: used by authors from open informational sources

During the development of the action plan for the Korostyshiv Canyon, consideration was given to programs for the improvement of the territory of quarries in various regions of Ukraine, but a similar one,

which would not only involve the creation of a park zone or the improvement of the ecological condition of the area, was not found in the list of implemented ones. Accordingly, it is now possible to focus on the



examples that are being prepared to be implemented in the next few years. In particular, it is planned to restore the project for the improvement of the Smotrytsky Canyon «MAGNIT Park» with tourist routes, locations, and recreation areas. Aktovskiy (Mykolaiv Region), where the construction of a camping site is planned, can be among the examples of promising improvement of canyon territories. There are few implemented programs for the transformation of quarries into recreation areas in Ukraine. As an example, we can cite Radon Lake, which does not have a zoning area with fixed infrastructure, but tourists are offered a wide range of services for active recreation: rafting, kayaking, rafting on kayaks as well as hiking and cycling, with the option of renting a tent and staying for overnight stay.

Based on the title of this work, which mentions the ecological restoration of a now-defunct quarry and also based on the fact that the reservoir around the quarry is actively used by residents, precisely to ensure not only an increase in the number of vacationers but also not to cause an additional burden on the environment, the project provides for the following steps. First of all, paths will be laid along the reservoir, which currently does not exist, to provide direct access to it, as well as a system of platforms from which tourists can descend to swim, sunbathe or take a photo. Thus, reducing the impact on nature will be carried out through designated areas for hiking and recreation. Due to this, the soil and plant cover should not be trampled. To restore coastal vegetation, the reservoir will be cleaned by removing old trees. As a result of the implementation of the mentioned measures for the project, part of the funds that will be received from vacationers and tenants who wish to provide services on the territory of the quarry can be invested in the city's environmental policy programs (rational nature management; preservation of lands characterizing landscape biodiversity).

For the implementation of the presented project, the approximate cost was calculated (see table 1).

The total amount was \$34 583 (excluding services with \*), where \* means that the performance of these services involves not just the purchase of a finished product or materials, but the work of individual craftsmen or firms that provide the appropriate service.

## Conclusions

Taking into account the analysis of the zoning process for recreation, it can be noted its usefulness in solving problems with territories that are not suitable for use for economic purposes but have tourist and

**Table 1.** Estimates of the recreation tract project (prices as of 2022)  
Source: made by the authors based on the results of their research

Denomination	Estimated number	Cost (USD)
Glamping (dome tent)	10	2891 \$ (1 amt.) 28 914\$ (10 amt.)
Wooden bench	3	85 \$ (1 amt.) 254 \$ (3 amt.)
LED lamp	10	116 \$ (1 amt.) 1 164 \$ (10 amt.)
Gazebo	3	284 \$ (1 amt.) 851 \$ (3 amt.)
Dressing room	3	321 \$ (1 amt.) 963 \$ (3 amt.)
*Swing over the water	1	
*Rope park	1	
*Suspension bridge	1	
*Descent cable	1	
*Observation deck	1	
*Wooden stairs	3	
*Access road	1	
Anti-parking columns	20	36 \$ (1 amt.) 725 \$ (20 amt.)
Surveillance camera	2	148 \$ (1 amt.) 297 \$ (2 amt.)
Summer shower	2	104 \$ (1 amt.) 208 \$ (2 amt.)
Barbecue grill	3	131 \$ (1 amt.) 392 \$ (3 amt.)
QR code plate	1	123 \$
Street information stands	7	99 \$ (1 amt.) 692 \$ (7 amt.)
		Total: 34 583 \$

recreational potential. Zoning involves the inclusion of territories with recreational resources, which, in the author's opinion, have ample opportunities for their use by vacationers, but do not contain particularly valuable natural objects that require a limited number of visitors. Accordingly, combining the zoning process and, in the future, the creation of a geopark gives a new impetus to the development of the area. Due to the introduction of new forms of recreation based on the geological heritage with preservation, including the ecosystem and sustainable development of the territory.

Today, the spent quarry as a resource for the formation of a tourist offer is becoming an increasingly interesting location. The inclusion of anthropogenic landscapes in the tourism sphere makes it possible, after long-term exploitation of reserves, not to turn the territory into an abandoned space, but to start restoring the natural component. Accordingly, geoparks are a good alternative to com-

bine the interests of the authorities and the local population. As current development methods tend to deviate from the concept of sustainable development, we then have many problems for the natural environment. Geoparks, having an indirect protective or restrictive-prohibitive nature, make it possible to arrange the infrastructure here and develop the recreational direction. A positive factor is also the fact that usually the local population is reluctant to meet «wild» tourists and is wary of turning the territory into a tourist destination. Given the fact that most countries in the world follow the strategy of sustainable development. According to this, tourism using natural resources should be done rationally and not harm the environment. For this, as the part of the development of the Korostyshiv canyon, the idea was presented to include it in the regional geopark, which has a place to create by involving all existing flooded quarries in the city of Korostyshiv into a single system. In this way, the geopark can act as a unifying element that can interest local small businesses, not only for economic benefits but also to reduce the degradation of the territory.

Considering the fact that the Korostyshivskyi Canyon is a place visited not only by residents but also by many tourists. It is important to ensure the stability of the territory and its attractiveness is the development of certain ideas regarding its further functioning. As an example, this area can be developed to create a geopark in the future. The measures proposed in the publication regarding the improvement of the recreation area will help make mass tour-

ist arrivals more organized through the allocation of separate areas for recreation, the organization of barbecues, children's entertainment, and sports activities. Due to an adsense of capital buildings, the cafe is not planned, so the load on the environment, especially in the upper zone of the forests, is not foreseen. Everything that will function on the territory will be made of ecological materials and run on solar batteries. Landscaping elements will help make the quarry area safer at night. Accordingly, the proposed solutions will allow for an expansion of the service base and give the quarry the status of a geopark in the future. This project is important from the point of view that mining areas that have lost their industrial function should be restored and transformed into modern recreation areas as part of regional revitalization. Currently, the Korostyshiv Canyon as a well-known tourist location is in unsatisfactory condition. Guests of the city regularly face the following problems: piles of garbage; lack of normal conditions for recreation; lack of infrastructure. Therefore, the list of works, which is described in this study, aims at turning this recreational zone into an area where it will be possible to hold out-of-town ceremonies and weddings, as well as birthday celebrations. After all, the changes and transformations, the Korostyshiv Canyon will be able to add to the list of objects included in the «Tourist Magnets of Ukraine» project, as well as add to the list of promising territories for the network of geoparks of our state. Indeed, with proper organization and implementation of the initiative, the quarry will become a source of replenishment of the community budget.

## Referents

- Baczynska, E., Marek, W., and Kazmierczak, U. (2017). Research on the landscape attractiveness of selected abandoned quarries. [International Journal of Mining, Reclamation, and Environment](#), 32 (22), 1-19.
- Fundova, V. (2016). Perspektyvy stvorennia merezhi heoparkiv v Ukraini. [Prospects for creating a network of geoparks in Ukraine.] Dnipropetrovsk University Bulletin. Series geology, geography., Dnipro, 24,139–143. (In Ukrainian).
- Hrytsenko, V., and Reshetnyk, M. (2019). Heolohichni muzei prosto neba ta ideia stvorennia takoho muzeiu v karieri bilia s. Bernashivka (Podillia). [Open-air geological museums and the idea of creating such a museum in a quarry near the village. Bernashivka (Podillia), Proceedings of the 5 th International Conference «Natural Museology»]. Kyiv (In Ukrainian).
- Ivchenko, A. (1998). Geologichna spadshhyna Ukrai'ny: istorija pytannja. [Geological heritage of Ukraine: history of the issue.] Geography and fundamentals of economics at school. Kyiv, Pedagogical Press, 1, 12–13. (In Ukrainian).
- Knebel, K., Sanchez Alvarez, J., and Zimmermann S. (2002). The structural making of the Eden Domes. In book: Space Structures 5, 245–254.
- Korbut, H., Vyskushenko, A., Pamirskyi, M., Svesta, T., and Mikheieva, H. (2009). Heoloho-ekolohichni ekskursii yak perspektyvnyi napriamok turyzmu v Zhytomyrskii oblasti. [Geological and ecological excursions as a promising area of tourism in the Zhytomyr region, Proceedings of the All-Ukrainian Scientific and Practical Conference «Mineral resources of Ukraine: ways of optimal use»]. Khoroshiv (In Ukrainian).
- Korostyshivska radio. (2021). Retrieved from: radiokor.com.ua.
- Kostrysia, N. (1999). Pryroda i materialna kultura Zhytomyrshchyny. [Nature and material culture of Zhytomyr region]. Handbook of ethnographic local lore, Zhytomyr, 240. (In Ukrainian).

- Kovalchuk, M., Okholina, T., and Kuzmanenko, H. (2020). Heolohichna ekskursiia vykhidnoho dnia: Kyiv -Korostyshiv – Lyznyky – Khoroshiv- Irshansk. [Geological excursion of the weekend: Kyiv -Korostyshiv – Lyznyky – Khoroshiv – Irshansk, Proceedings of the 9 th All-Ukrainian Scientific and Practical Conference «Mineral resources of Ukraine: ways of optimal use»]. Khoroshiv (In Ukrainian).
- Kravchuk, Y., and Kravchuk, A. (2018). Obiekty heoturys-tychnoho interesu na marshrutakh pishykh mandrivok hirs'kymy khrebtamy ukrainskykh Karpat. [Objects of geotourism interest on the routes of hiking through the mountain ranges of the Ukrainian Carpathians, Proceedings of the 3 rd International Scientific and Practical Conference «Geotourism: practice and experience»]. Lviv (In Ukrainian).
- Krupyna Y. (2021). Vtoraia zhyzn zabroshennykh shakht y karerov — parky, kurorty, heothermalnye elektrostantsyy. Retrieved from: <https://ecosphere.press/2021/06/10/vtoraya-zhizn-zabroshen-nyh-shaht-i-karerov-parki-kurorty-geothermalnye-elektrostantsii/>.
- Lee, Y., Jayakumar R. (2021). The economic impact of UNESCO Global Geoparks on local communities: Comparative analysis of three UNESCO Global Geoparks in Asia. *International Journal of Geoheritage and Parks*, 9 (2), 189-198.
- Mahboobi, A., Naghdi, A., and Naghdi, F. (2010). Suburb of Tabriz city. Ecological capability for sustainable development with AHP, 5 National Conference on World Environment. Tehran.
- Manyuk, V. (1999). Problema zberezhenia heolohichnykh pamiatok pryrody Dnipropetrovshchyny ta yikh vykorystannia dlia kraieznavstva ta potreb turizmu. [The problem of preservation of geological natural monuments of Dnipropetrovsk region and their use for local lore and tourism needs]. Tourist and local lore research, 2 (In Ukrainian).
- Manyuk, V. (2006). Potential objects for the creation of a Network of National Geoparks in Ukraine. ProGEO Symposium «Safeguarding our Geological Heritage», Kyiv – Kamianets-Podil'sky, 30-32.
- Manyuk, V. (2007). The problem of creation of Network National Geoparks in Ukraine. Dnipropetrovsk University Bulletin. Series geology, geography., Dnipro, 15 (11), 63-67.
- Misto Ordonikidzhe. Dnipropetrovska oblasna universalna naukova biblioteka. Retrieved from: <https://old.lib.dp.ua/Region/Ordjonikidze.htm>
- Mokrytskyi, H. (2011). Tsikava Zhytomyrshchyna: v 4 t.: iliustrovana turystychna entsyklopediia. [Interesting Zhytomyr region: illust. tourist encyclical. 4 t.]. Zhytomyr, 323.
- Municipal Stadium, Braga. (2004). Arquitectura Viva. Retrieved from: <https://arquitecturaviva.com/works/estadio-municipal-de-braga-7>
- National Geographic. (2021). Retrieved from: <https://www.nationalgeographic.com/>
- Nikolova, V., and Sinnyovsky, D. (2019). *Geoparks in the legal framework of the EU countries*. Tourism Management Perspectives 29, 141-147.
- Patsiuk, V., Kazakov, V. (2016). Industrialnyi turizm yak zasib formuvannia turystychnoho obrazu promyslovykh tsentriv. [Industrial tourism as a means of forming the tourist image of industrial centers, Proceedings of X International Scientific Conference, «Geography, economics and tourism: national and international experience»]. Lviv. (in Ukrainian).
- Richter A. (2020). Transforming a coal mine into a geothermal heat source in the North East of England, UK. Think GeoEnergy. Retrieved from: <https://www.think-geoenergy.com/transforming-a-coal-mine-into-a-geothermal-heat-source-in-the-north-east-of-england-uk/>
- Sardak, S., and Vlasov, Y. (2018). Rozvytok industrialnoho turizmu v Yevropi. [Development of industrial tourism in Europe] Economy and society, 19, 81. (in Ukrainian).
- Shevchuk, O. (2011). Metodichni zasady stvorennia natsionalnykh heoparkiv v Ukraini. [Methodical bases of creation of national geoparks in Ukraine] Scientific Bulletin of Chernivtsi National University, Chernivtsi, 587-588, 82-88. (In Ukrainian).
- Shevchuk, O. (2012). Orhanizatsiino-pravovi aspekty stvorennia heoparku «Podilskyi karst». [Organizational and legal aspects of creating geopark the «Podilsky karst», Proceedings of the All-Ukrainian Scientific and Practical Conference]. Ternopil, 37-43. (In Ukrainian).
- Singleton, V., Jacob, B., Feeney, M., and Little, J. (2013). Modeling of the proposed quarry reservoir for raw water storage in Atlanta, Georgia. Journal of Environmental Engineering, 139(1), 70–78.
- Skibinski, J., Kultys, K., Baran-Zgłobicka, B., and Zgłobicki, W. (2021). Geoparks in SE Poland as Areas of Tourism Development: Current State and Future Prospects. Resources 10 (11):113. <https://doi.org/10.3390/resources 10110113>
- St. Margarethen Chuarri. Esterhazy Betribe GmbH. Retrieved from: <https://esterhazy.at/en/margarethen-quarry/the-quarry-in-st-margarethen>
- Stoffelen, A., Groote, P., Meijles, E., and Weitkamp, G. (2019). Geoparks and territorial identity: A study of the spatial affinity of inhabitants with UNESCO Geopark De Hondsrug, The Netherlands. Journal Applied Geography, 106, 1-10. <https://doi.org/10.1016/j.apgeog.2019.03.004>
- Stratehiia rozvytku Korostyshivskoi miskoi obiednanoi terytorialnoi hromady na period do 2027 roku. [Strategy for the development of the Korostyshiv city united territorial community until 2027]. Retrieved from: <https://korostyshiv-rada.gov.ua>



- Sytnyk, O., Khlevniuk, O., and Nikolaievskyi, V. (2018). Obiekty heoturyzmu Haivoronskoho raionu Kirovohradskoi oblasti yak chynnyk pryvablyvosti terytorii. [Geotourism facilities of Haivoron district of Kirovohrad region as a factor of attractiveness of the territory, Materials of the 4 th international scientific and practical conference «Theoretical and applied directions of tourism and recreation development regions of Ukraine»]. Kropyvnytskyi (in Ukrainian).
- Tavakoli, M. (2019). Zoning Dehloran National Natural Monument Using Fuzzy-AHP Method. Journal of Geography and Planning, 22(66), 117-139.
- Tourism trends. (2022). Retrieved from: <https://www.unwto-tourismacademy.ie.edu/2021/08/tourism-trends-2022>
- UNESCO Global Geoparks (UGGp). (2021). Retrieved from: <https://en.unesco.org/global-geoparks>
- Ynterviu rukovodytelia mezhdunarodnoi prohrammy UNESCO po heonaukam y heoparkam Krystofa Vandemberha. (2020). Komitet Respublyky Bashkortostan po delam UNESCO. Retrieved from: <http://unescorb.ru/ru/news/detail.php?ID=2140>
- Zinko, Y. (2020). Metodichni zasady typizatsii perspektivnykh heoturystychnykh obektiv i terytorii. [Methodical bases of typification of perspective geotouristic objects and territories, Proceedings of the 4 th International Scientific and Practical Conference, «Geotourism: practice and experience»]. Lviv (in Ukrainian).