Unesco Global Geopark. Educational Priorities

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Abstract

Geopark is an area characterized by a special geological heritage, whose economic development is sustainable. This area must have a relatively uniform character, clearly defined boundaries and sufficient space to act as a stimulator of local economic development. Within the geopark, there should be a network of geological sites with significant values from the point of view of geotourism, education and science, as well as representing other, non-geological aspects (biotic, archaeological, cultural), making up the specificity of a given area as a region distinguishing in terms of nature and culture. An important aspect of the geopark's operation is a coherent strategy for the protection of geological sites, in accordance with the legal regulations in force in a given area. The idea of preserving the geological heritage for future generations and the concepts of creating Unesco Global Geopark in the Świętokrzyskie region have extensive assumptions. Indirectly, they are based on clear, historically documented relationships between man and inanimate nature, expressed in the traditions of ore and rock mining.

Keywords: *park, education, protection of inanimate nature*

Introduction

From the beginning of laying the foundations for environmental protection, the idea of protecting inanimate nature areas as an Earth heritage that has practical and spiritual value for present and future generations has been part of this program. A good example of the implementation of these assumptions is the creation of the world's first national park - Yellowstone in the United States, in which elements of geological heritage played a particularly important role, both from the point of view of nature protection and from the perspective of tourism development.

In later years, mainly in Western European countries, but also in Poland, a number of initiatives appeared, based on similar assumptions relating to areas with a special geological heritage. An example of these activities on a broader European scale were:

- adopting the Declaration of the Earth's memory rights in 1991,
- creation in 1993 of the European Association for the Protection of Geological Heritage ProGeo,
- UNESCO's development of the concept of geological parks (geoparks) by UNESCO in the late 1990s. The idea of creating a network of geoparks implementing a joint strategy for the protection, promotion and geotouristic use of geological heritage in the context of supporting sustainable economic development of the regions covered by them found its final in June 2000 on the Greek island of Lesvos, where the boards of four founding geoparks from France, Greece, Germany and Spain signed an official declaration on the creation of the European Geopark Network (EGN) [1]. The document prepared at the time: the "European Geopark Charter" is a set of main criteria defining the term "geopark" and guidelines for new members (geoparks) applying to EGN. According to the records of "Charter...", the geopark is an area characterized by a special geological heritage, whose economic development is sustainable. This area must have a relatively uniform character, clearly defined boundaries and sufficient space to act as a stimulator of local economic development. Within the geopark, there should be a network of geological sites with significant values from the point of view of geotourism, education and science, as well as representing other, non-geological aspects (biotic, archaeological, cultural), making up the specificity of a given area as a region distinguishing in terms of nature and culture. An important aspect of the geopark's operation, as defined in the Charter, is a coherent strategy for the protection of geological sites, in accordance with the legal regulations in force in the given area.

Concepts of creating geological parks (geoparks) in the Świętokrzyskie region

The idea of preserving the geological heritage for future generations and the concepts of creating geological parks (geoparks) in the Świętokrzyskie region have extensive assumptions. Indirectly, they are based on clear, historically documented relations between man and inanimate nature, expressed inter alia traditions of ore and rock mining. Scientific research on these issues undertaken for many years as part of the statutory activities of the Polish Geological Institute, Polish Academy of Sciences and academic institutions indicate the key importance of protection and conservation of post-mining facilities as objects documenting the mentioned relationships, as well as having significant significance due to the aspect of deposit protection [2]. Excavations of old quarries located in the Chęciny-Kielce area, apart from scientific

Fig. 1. Kadzielnia amphitheater located in the southern part of the Kadzielnia quarry (photo: Geopark Kielce)
Fig. 1. Amfiteatr Kadzielnia w południowej części kamieniołomu Kadzielnia (fot. Geopark Kielce)

Fig. 2. Wietrznia quarry in Kielce (Poland) (photo: M. Poros)
Fig. 2. Kamieniołom Wietrznia w Kielcach (Polska) (fot. M. Poros)

and didactic values directly related to abiotic elements (exposing valuable geological profiles documenting characteristic rocks, fossils, minerals and geological phenomena) are also characterized by high biodiversity resulting from natural plant and animal succession this type of area. In connection with the unique landscape values, all of the above-mentioned conditions make the places associated with the former exploitation of rock raw materials and ores constitute valuable natural objects requiring appropriate legal protection and conservation measures. The high density of this type of objects in the Chęciny-Kielce area as well as their connection with other components of the natural environment required a comprehensive approach to the problem of protection and conservation of geological and mining heritage as an integral element of the natural and cultural landscape.

The concept incorporating this idea was initiated in the 1970s by the Świętokrzyski Branch of the Polish Geological Institute [3]. A practical manifestation of this activity were the activities initiated in 1991 aimed at creating the first geological park in Europe: the Chęcińsko-Kielecki Geological Landscape Park, finally established in December 1996 as the Chęcińsko-Kielecki Landscape Park [4]. The value of the newly created landscape park as an informal geopark was underlined in 2003 during an international conference under the patronage of the Polish Geological Institute in Krakow and the Center for Excellence in Abiotic Environment Research (REA) [5], devoted to the issue of conservation and legal protection of geological heritage in Central Europe.

An important problem that has been raised since the beginning of the propagation of the concept of geoparks in the Świętokrzyskie region was the administration of geological sites and large-scale forms of protection in the form of landscape parks, as well as the appropriate use of their values in geoeducation and geotourism [6, 7]. Initiatives in this area have taken place in several stages since the mid-1990s. The idea of building a Geological Education Center was sustained: in 1995 a project was created to establish such a unit, and in 2000 on the initiative of the Świętokrzyskie Department of the Polish Geological Institute in agreement with the Department of Protection The environment of the City Hall in Kielce developed its concept, [8]. Among the basic assumptions of this document were the development and promotion of the city's geotourist assets using:

- networks of geological reserves: Kadzielnia (Figure 1), Wietrznia and Ślichowice,
- the existing geological museum at the Świętokrzyskie Branch of the PGI,
- planned cubature in the Wietrznia reserve [5].

These efforts led to the establishment of a budget unit in 2003 – the Geoeducation Center, which in 2007 was renamed Geopark Kielce. Currently, the administration and geoturistic use of post-mining areas (including Kielce geological reserves located within the closed quarries Kadzielnia, Wietrznia and Ślichowice) are included in the broader strategy of establishing a UNESCO Global Geopark in the Chęciny-Kielce area operating in an international network gathering geoparks of unquestioned rank.

Protection and conservation of mining and geological heritage in the geopark area

Valuable natural areas associated with excavations of former quarries and ore mining sites located in the Chęciny-Kielce area operate in the vicinity of urbanized and indus-

Fig. 3. Documentation stand. Ślichowice (photo: Ł. Zarzycki)
Fig. 3. Stanowisko dokumentacyjne. Ślichowice (fot. Ł. Zarzycki)

Fig. 4. Documentation stand. Rzepka mountain (photo: Ł. Zarzycki)
Fig. 4. Stanowisko dokumentacyjne. Góra Rzepka (fot. Ł. Zarzycki)

trial areas. Therefore, the main factors affecting the Geopark area are various anthropogenic threats to the natural environment and the cultural landscape resulting from direct or indirect human pressure on valuable natural areas. Natural factors that have a negative impact in the context of the protection of geological and mining heritage are associated primarily with the succession of vegetation and mass movements within the slopes and slopes of quarries. Both of these natural factors acting in conjunction lead to lowering the scientific and didactic value of exposures, as well as their availability and geotourism attractiveness [9, 10].

The most important factors are specified in the Protection Plan of the Chęciny-Kielce Landscape Park and conservation plans or conservation tasks established for smaller forms of nature protection covering a total of almost 70% of the area covered by the geopark initiative.

The possibilities of implementing protective and maintenance measures eliminating or reducing the negative impact of the above factors depend in turn on formal, legal, administrative, technical and technological as well as budgetary conditions. The first of these include, first of all, ownership issues related to land and conditions resulting from the conservation status and existing documents specifying the possibilities and scope of conservation, maintenance or investment activities (conservation tasks or protection plans, study of conditions and spatial development and spatial development plans).

Administrative conditions primarily refer to the nature and status of the entity administering post-mining area. In the case of land managed entirely by a local government unit (commune) with ordered land ownership status, conservation and conservation measures may be financed under annual budgets and multi-annual investment programs. Such areas may additionally be covered by projects financed from external sources, including, apart from conservation activities, investment tasks related to the creation of small tourist infrastructure and/or large cubature facilities for education, tourism, science or recreation and cultural purposes [11]. An example of such scenarios in the last 20 years were closed quarries located in Kielce: Kadzielnia, Wietrznia and Ślichowice (Figure 3).

Technical and technological conditions are mainly associated with the quasi-permanent features of mining excavations remaining after mining of rock materials. These conditions most often decide on the adopted direction of reclamation and revitalization, also determining the scope and technique of maintenance operations related to cleaning the most valuable fragments of rock profiles from vegetation.

In the case of natural plant succession in post-mining areas subject to legal protection as nature reserves, undertaking conservation measures related to displaying rock profiles encounters the problem of plant cover protection (including rare and valuable taxa) resulting from the relevant provisions of the Nature Conservation Act. This problem is particularly important in protected areas related to excavations remaining after the exploitation of carbonate raw materials: Kadzielnia, Wietrznia, Ślichowice, Zelejowa, Miedzianka, Rzepka Peak (Figures 4, 5).

The morphologically diverse subsoil composed of carbonate rocks (mainly limestone and dolomite) is in many cases the site of the occurrence of valuable and protected plant species associated with the so-called xerothermic grasslands. The violation of the ecological balance of such habitats through ill-considered, incorrectly carried out conservation measures or their total abandonment is one of the main problems caus-

Fig. 5. Documentation stand. Red mountain (photo: Ł. Zarzycki)
Fig. 5. Stanowisko dokumentacyjne. Czerwona Góra (fot. Ł. Zarzycki)

ing conflicts in the context of conservation and preservation of the abiotic and biotic heritage. This problem requires appropriate regulation through the development of plans for the protection of nature reserves, preceded by a detailed inventory and valorisation of biotic and abiotic elements developed by interdisciplinary scientific teams.

Inventory, valorisation and development of protection plans is the starting point for further activities related to the regulation of ownership issues, planning conservation and maintenance activities together with securing financial resources enabling their long-term, cyclical implementation. The example of the "Kadzielnia" and "Wietrznia" nature reserves shows that only permanent conservation measures, combined with investment activities making post-mining areas available as geotourism facilities, are able to bring measurable effects.

Conclusions

The effectiveness of activities related to the protection and conservation of geological and mining heritage in valuable natural areas remaining after opencast mining of rock raw materials or ores is the resultant of formal, legal, administrative, technical, technological and economic and economic conditions. The issue of managing such areas by entities capable of permanent, cyclical financing of conservation, conservation and investment activities is of key importance for the effectiveness of such activities. In addition to the aforementioned factors, a detailed, comprehensive inventory and valorisation of abiotic and biotic elements is a necessary condition, which is the basis for the development of protection plans determining the scope and direction of conservation and investment activities.

Examples of various conservation and investment activities carried out in post-mining areas under legal protection in the Chęciny-Kielce area also show that there is an urgent need to develop a model of good practices, constituting a specific set of guidelines for the entities administering the abovementioned areas. A good example in this respect is provided by the British model, presented comprehensively in the study "Geological coservation - a guide to good practice" from 2006. In Poland, model examples of the protection, conservation and development of mining and geological heritage, in addition to the Kadzielnia and Wietrznia discussed above, are primarily: Krasiejów (Science and Entertainment Park) and Jaworzno (Geosfera Jaworzno cCnter).

Author Contributions:

Michał Poros did the data collection, wrote the paper and result analysis. Wiktoria Sobczyk conceived, designed the search, wrote the paper and result analysis. Both authors have read and approved the final manuscript.

Conflict of interest statement:

The authors declare no conflict of interest.

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Światowy Geopark Unesco. Priorytety edukacyjne

Geopark to obszar o szczególnym dziedzictwie geologicznym, którego rozwój gospodarczy powinien być zrównoważony. Obszar ten musi mieć jednolity charakter, jasno określone granice i odpowiednią przestrzeń, aby działać jako stymulator lokalnego rozwoju gospodarczego. W obrębie geoparku powinna istnieć sieć stanowisk geologicznych o znaczących walorach z punktu widzenia geoturystyki, edukacji i nauki, a także reprezentujących inne aspekty niegeologiczne (biotyczne, archeologiczne, kulturowe), składające się na specyfikę danego obszaru jako regionu wyróżniającego się pod względem przyrodniczym i kulturowym. Ważnym aspektem działalności geoparku jest spójna strategia ochrony stanowisk geologicznych, zgodna z obowiązującymi na danym terenie przepisami prawnymi. Idea zachowania dziedzictwa geologicznego dla przyszłych pokoleń oraz koncepcja utworzenia Światowego Geoparku Unesco na terenie województwa świętokrzyskiego mają szerokie założenia. Pośrednio opierają się na klarownych, historycznie udokumentowanych związkach człowieka z przyrodą nieożywioną, wyrażonych w tradycji górnictwa rud i skał.

Słowa kluczowe: *geopark, edukacja, ochrona przyrody nieożywionej*