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Summary (description) of the PhD dissertation
Transformation of post-mining areas in Świętokrzyskie
and the possibility of their multi-aspect use

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The PhD dissertation consists of two parts. The first one is a commentary (description) introducing the topic of the thesis, which presents the structure of the dissertation, the current state and the reasons for the selection of research issues. It also shows the scientific and application purpose of the dissertation, the area and methods of research, a synthetic approach to the results, conclusions and a references. The second part is a collection (cycle) of nine thematically coherent publications: seven scientific articles from national journals, one chapter in a Polish monograph and one article from a foreign journal.

The presented subject of the PhD dissertation, together with its application part, is an attempt at a comprehensive approach to the problem of changes taking place in post-mining areas, both caused by natural and anthropogenic factors. This applies to both natural changes and socio-economic functions of these areas. These issues are particularly relevant in the Świętokrzyskie (Holy Cross Mts.) region, where there is a very large number of such places. The problem of their transformation has so far been poorly understood.

The aim of the study was to identify the changes taking place in selected post-mining areas of the Świętokrzyskie region and to determine the role of natural and anthropogenic factors in their transformation. During the research, were identified and analyzed historical and geological deposit conditions of the mining activity, as well as the diversity and changes in the relief at selected study sites. Also geotouristic values and the current state of development of selected post-mining areas was analyzed. An assessment of the possibilities and a model for the development and access to post-mining areas for the purposes of educational and tourist was elaborated.

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This dissertation used interdisciplinary research methods that allowed to achieve the assumed goals. One of the basic ones was field survey, during which the existing forms of relief, geological structures, the presence of interesting minerals, rocks and fossils, mining technology monuments, the current development of the object and present-day morphogenetic processes taking place in the studied area were documented. Archival sources, both published literature and historical documents, and historical cartographic materials were queried. The Kohonen's artificial neural network method was used to classify anthropogenic forms. The inventory consisted in the description of the geotouristic values of the site according to a previously defined pattern. Valorisation was carried out both in the field and during small-scale studies and analysis of the collected data for selected sites. The inventory and valorisation made it possible to prepare an assessment of the site in the context of its development possibility and making it available for educational and tourist purposes.

The research area is located in the Kielce Upland and covers two physic-geographic mesoregions: the Holy Cross Mts. and the Suchedniów Plateau, while administratively it is located in the Świętokrzyskie Voivodeship in the Sitkówka-Nowiny, Chęciny, Miedziana Góra, Morawica, Stąporków and in Kielce communities. The geological structure of the area includes the centrally located the Palaeozoic core of the Holy Cross Mts, consisting of two units (zones): the Łysogóra region in the north and the Kielce region in the south, which are separated by the Holy Cross Mts. dislocation. The core is surrounded to the north and south-west by the Mesozoic margin. Detailed, interdisciplinary research was carried out in selected post-mining areas, both in the core area (14 sites in its western part) and in the Permian-Mesozoic margin (1 site each in the north-west and south part).

As a result of the realized field research, historical query and intimate works, historical and geological-deposit conditions of mining activity in selected post-mining areas were identified. Particularly important is the complete and detailed inventory of the historic Devonian limestone mines and the sites of exploitation of rocks in the Sitkówka region against the background of geological formations outcrops, carried out for the first time. The second significant work is an article presenting the very little known topic of uranium searching in Miedziana Góra and Kielce and its exploitation in the Holy Cross Mts. area. It may be the basis for further historical and geological-deposit studies of these issues. The historical Szewce quarry, where the Holy Cross Mts. marble was mined, has been in detail identified.

During the field research and statistical analysis with the method of artificial neural networks, the differentiation and changes in the relief in the historic mining field of Osicowa Góra were identified. A comparative study was also carried out using the above method between Osicowa Góra and the Ardennes site (Belgium). It should be noted that the Kohonen's method was used for the first time in geomorphologic studies of post-mining areas. In both regions, there are clear post-mining changes in the relief, which were conditioned by the geological structure, forms, period and technology of mining, as well as the rate of morphogenetic processes (denudation) after the end of mining activities. The comparison of these areas with the DEM use and statistical methods allowed to capture a number of similarities of the forms preserved in these post-mining fields, resulting from similar technologies used at the same time. This allowed to date these remains based on morphometric features.

An inventory and detailed diagnosis of geotouristic values of selected post-mining areas was made. They covered all the post-mining areas of the Sitkówka-Nowiny community and selected three areas of the Chęciny community. The valorisation of post-mining areas of the Sitkówka-Nowiny has been prepared and, for the first time in the Świętokrzyskie region, an attempt was made to comprehensively present the complex issues related to the development of post-mining areas throughout this industrial community. This area has been largely anthropogenically transformed as a result of centuries of mining activity, and today there is an urgent need for socio-economic changes in the post-mining areas.

The application goal of the PhD dissertation was achieved by assessing the possibility of using the post-mining areas for educational and tourist purposes in the Sitkówka-Nowiny community. A concept for the development of the post-mining area has been prepared for each site, which is part of the sustainable development strategy of the commune, setting the further direction of nature protection, revitalization of post-mining areas and the development of tourism in this area. A model of post-mining area revitalization, based on the example of the Szewce quarry, has also been developed and implemented in practice.

Conclusions

In historical scope, the surface and underground mining of rock, ore and iron ore resulted in anthropogenic transformations of the Holy Cross Mts. area and the emergence of many concave and convex forms resulting from this activity. However, the problem of transformation of post-mining areas in this region has been poorly

understood so far. The results of the author's interdisciplinary research indicate that changes occur in them as a result of natural factors (e.g. present-day morphogenetic processes, especially mass movements; secondary plant succession) and anthropogenic, both planned (reclamation, development, access, adaptation and revitalization of post-mining areas) and unplanned (uncontrolled effects of tourist traffic, wild dumps). In undeveloped post-mining areas, natural factors and littering of facilities play the main role in their transformation, while in developed areas anthropogenic factors dominate.

The post-mining fields and facilities of the Holy Cross Mts. region are the high scientific, educational and landscape value areas. The best opportunities for their multi-aspect use are education, landscape, tourism and recreation, and economic fields. The directions of development of these areas proposed in the work may complement each other, and the decision to select the leading one should take into account, i.e. target functions they are to perform in the future.

The complexity of the issues related to the development and revitalization of post-mining areas requires a comprehensive study of all elements that make up the exploration of the area, such as geological structure, topography, landscape values, history of mining activities, remains of buildings and mining works, accessibility and development, condition of the facility or area. Such a study was prepared for the Sitkówka-Nowiny community, which is a whole example of a post-mining area with historical remains of rock and ore mining of lead. On the example of the revitalization of the Szewce quarry, a model of geotouristic management and access was developed and implemented, which can be used for other similar post-mining facilities in Poland.

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