

ORGANIZATIONAL, DESIGN AND TECHNOLOGY ISSUES IN THE PROCESS OF PROTECTION OF UNDERGROUND HISTORIC MONUMENTS

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Abstract

Underground historic monuments constitute the immanent part of the cultural and natural heritage. Protecting and opening underground historic objects, as the investment aim, is a process of renewed actions taken in objects that are degraded or out of order, contributing to improvement of quality of life of residents, restoring new functions, reconstruction of social bonds. Underground historic buildings should be subjected to processes of protecting and revitalization. Determining the state of a given building and the adjustability of its spatial structure to introducing a new function or making it available to tourist purposes are the basis for these actions.

Keywords: underground historic monuments, protection policy, technologies, renovation, cultural heritage, sustainable development

1. INTRODUCTION

Underground historic monuments constitute the immanent part of the cultural and natural heritage. They are the manifest of technological development in the process of exploiting of natural environment and the symbiosis example of human interaction with geological environment. Many among them are now classified as a world cultural and natural heritage, constitute nature reserve, hold status of historic monument. Built in the distant past, they are objects of

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considerable historical, aesthetic and social value. In many cases, their location and formation determined the social and spatial development of urban complexes, industrial centres and settlements. Their existence is a testament and image to the development of engineering and technology ideas.



Fig. 1. XIII-century shaft Sutoris in KS Bochnia, functioning until now –picture from early XX c. (KS Bochnia archives)

Methods of work organization - collective cooperation, mutual trust, etc.- created specific social bonds (e.g. mining traditions), which constitute an integral part of the cultural environment. Currently, in many instances, these objects are located in urban areas, which have been shaped by mining operations for centuries.

2. SOCIAL AND LEGAL ISSUES IN THE PROCESS OF PROTECTION AND REGENERATION OF UNDERGROUND HISTORIC MONUMENTS

Underground historic buildings should be subject to protection and regeneration processes. The basis for these actions is to determine the conservation status of specific object the possibility of adapting the spatial structure to implement a new feature or made available for tourism.

2.1. Cultural product development strategy

An essential element associated with the provision for social purposes of underground monuments is to provide a strategy for the development to introduce cultural product. In the process of decision-making and investment, this element is often overlooked, which in turn, leads to the realization of the voluntary nature, not prepared financially, without the marketing concept.

Underground historic buildings are often located in areas districts and towns with budgets which do not allow for the comprehensive preparation of investments. Therefore, it is important to raise funds outside the budget. Great support in the implementation of these projects are EU subsidies to protect cultural and natural heritage of the area. An example of such implementation was to raise funds for the protection of, among others, old adits in Kamienna Góra and Bedzin, medieval collector in Przemyśl and historic excavation voids in Tomaszów Mazowiecki (Groty Nagórzyckie) [3, 4].

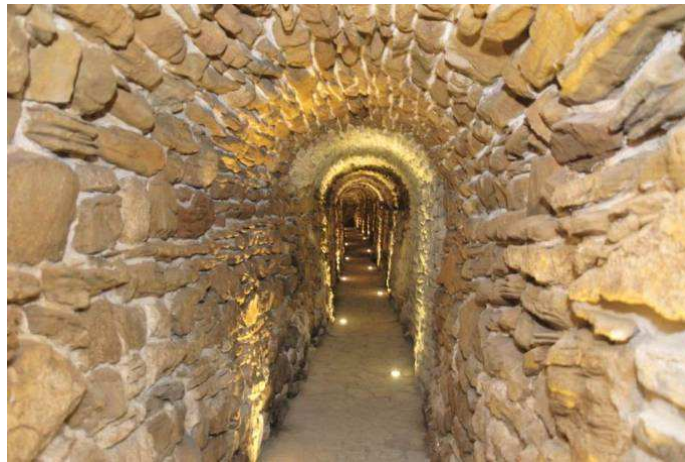


Fig. 2. Made available for tourists medieval sanitary collector in Przemyśl (photo by J. Krużel)

Element of the developed marketing strategy is to determine the methods of protection and revitalization of the historic underground facility. The proposed strategy of revitalizing must be long-term. Its main feature is the interdisciplinary nature, large variety and staging investments. An integral part of the developed strategy for protection and revitalization is also managing the project. This concerns mainly to monitor the results of the work, risk identification, anticipation of prevention systems and developing emergency plans.

2.2. The principle of sustainable development in the process of organizing and sharing historic underground

The principle of sustainable development is an immanent part of the preparation and provision of social underground monuments. Securing and adaptation of historic underground allow for preservation and development of processes: aesthetic, ecological, urban, natural and social. Declaration of ICOMOS-in from Xi'an on the maintenance of the environment of objects, places and areas states

that the protection and conservation of World Heritage is a component of sustainable development of civilization. In art. 12 states that 'the cooperation and involvement of local communities is an essential part of the implementation of sustainable strategies for the preservation and management of the surrounding (monuments)'. Scientific disciplines of the underground heritage include the corresponding architecture, spatial and landscape planning, engineering science, maintenance of monuments, anthropology, history, archaeology, ethnology, museology and in archiving [5]. Cooperation of institutions and specialists in the field of natural heritage must be included as an integral part of good practice in the identification, conservation, display and interpretation of objects, places and historic sites and their surroundings (fig.3). This means in practice that the organization of cultural products, which are underground historical buildings, must be implemented in a social context.

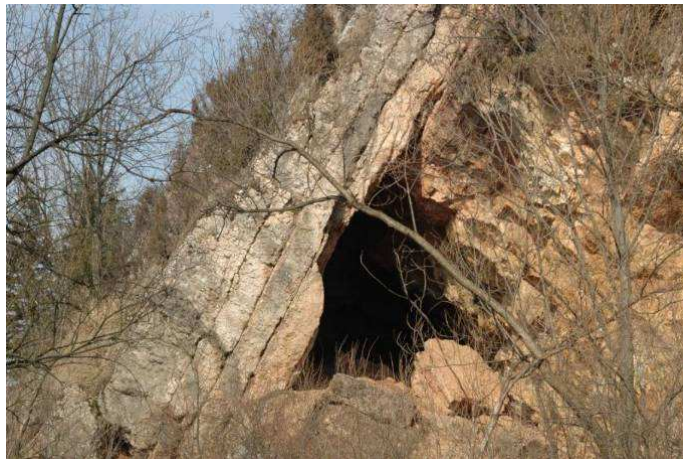


Fig. 3. The entrance to the Paleolithic sanctuary in Oblazowa (near Nowy Targ) protected in order to conduct archaeological exploration (photo by J. Chmura)

It includes the following social processes:

- social participation (public consultation in decision-making, active presence in the process of product creation and operation of local citizen groups and NGOs),
- reactivation of traditional cultural behaviour (restoration of the traditional techniques and crafts, environmental organizations, regional cultural forms),
- integration of the local environment (acceptance activities of local authorities of a relational nature),
- social promotion (identification with the local community around the completed project).

2.3. Legal issues in the investment process of securing the historic underground

Polish legal standards on the protection and sharing of underground monuments, are a collection of many laws and regulations, often conflicting, or not covering all the technical problems [6]. This increases the elongation during the reconciliation process of design documentation which can cause irreparable damage not only in the substance of culture and nature but also withdrawal or devaluations of funds. In the case of objects with natural beauty of nature, in order to use and preserve them, there are regulations on the protection of the environment, i.e. particularly the law of 31 January 1980. 'The protection and management of the environment'. In the case of objects that are the result of human activity subjected to protection because of the historical and cultural values, there are regulations of the Act on the Protection of Cultural Property of 15 February 1962. 'Geological and Mining Law' is also essential here, relating to running business, which involves carrying out geological work and mining of minerals from deposits, including the protection of mineral deposits, groundwater and other components of the environment in connection with geological works and extraction of minerals . However, the provisions of this Act have been supplemented by the Decree of the Minister of the Environment of 16 December, 2014 r. On determining the liquidated underground mines which determine which historic mines are covered by the provisions of the Act 'Geological and Mining Law', to which one applies all the provisions resulting from this Law [2]. The list included the historic salt mines of Wieliczka, Bochnia, coal mines "Guido" and "Louise" in Zabrze. In contrast to all other historic underground above provisions do not apply. It is worth to pay attention to the Law 'Construction Law' dated July 7, 1994, which also may be affected to a limited scope of work relating to the protection and provision of underground monuments, especially concerning the ground elements. The only exception is Cabinet of Ministers regulations, dated 9 July 1997 on the inclusion of the provisions of geological and mining laws running specific underground works using mining techniques.

3. DESIGN AND TECHNOLOGICAL ISSUES IN THE PROCESS OF PROTECTION AND SHARING OF UNDERGROUND HISTORIC BUILDINGS

The process of protection and adoption for social purposes of historic underground is the process of high level of technical complexity, where you should take into account the many hazards of underground, as well as the specific requirements relating to the protection of cultural and natural heritage.

3.1. Mining methods for protecting underground monuments

Individual underground facilities generally have a unique and unrepeatable character. Research and realization process for the protection and adaptation of underground facilities has an omnidirectional program and includes::

- the non-destructive study of the substrate and construction,
- recognition of geotechnical and hydrogeological conditions,
- calculation of the geostatic excavations,
- analysis of the stability and strength of individual technical solutions to stabilize and strengthen the protected objects,
- reconstruction and rebuilding elements of underground ways (fig. 4),
- elimination of unnecessary underground space, threatening the stability of protected objects,
- the study of land and building construction materials,
- stability program of structure and substrate, the study of dynamics of the object,
- definition and valorisation of threats.



Fig. 4. Protected chapel of St. Kinga in Bochnia mine (photo by J. Chmura)

The implementation of these tasks is essential to compile a project of underground vintage protection, in which one can determine: security in the process of protection and adaptation of old excavations and underground facilities, rules for the selection of security methods in the context of heritage preservation of the underground, methods of securing orogen, technologies of conducting security works, comprehensive protection of natural and cultural structures and monitoring of underground workings along with the environment

[1]. Security and access to historical excavations also requires, in the last phase of this work, to draw up a plan for the safe use of underground monuments.



Fig. 5. Przemyśl – implementation of the underground rotunda - the entrance to the underground tourist route (photo by UM Przemyśl)

This plan includes entry and exit points, directions of sightseeing, determination of evacuation routes, guides duties, recommendations of anti-fire and aerological conditions in the underground (Fig. 5). For underground facilities it is also necessary to determine the technical conditions in the process of usage. These problems include:

- adjustment of underground objects to the requirements of the ‘Regulation of the Minister of Infrastructure on the technical conditions to be met by buildings and their location’
- the regulations of fire protection,
- aeration and ventilation systems,
- monitoring.

3.2. Aspects of conservation in the protection and safeguarding of historic underground

Problem of conservation protection of transformed historic underground into public buildings is a difficult and complicated. Introduction of a new utility function (touristy route, exhibition halls, restaurants, museums or recreation) determines strong interference in the scope of the work carried out for adaptation and modernization [4].



Fig. 6. XVII-c. chamber "Mysiur" in KS Bochnia secured In accordance with conservation requirements (photo by J. Chmura)

Particular importance in the design of underground revitalization has so called 'creative conservation'. It includes creative intervention in the historic structure. Creative conservation is carried out in facilities where the original design, or architectural detail is preserved in fragments, where there is a lack of historical sources and of iconographic materials [7]. The main goal is to introduce, to the existing structures, spatial elements highlighting the contribution of human activities in the exploration of the environment, or the plastic exposition of the original remnants of artistic activity in situ. (carving, joinery and carpentry items) (Fig.6). The basis for the creation of conservation should be prepared readable script of scenes in the process of dynamic change in the position of the observer. The end result should be presentation of a balanced, formal relationship between the environment and cultural heritage. The basis of elaboration should be the following hierarchy of values:

- 1) affirmation of underground space (priority)
 - exhibition of geodiversitital values
 - technology of exploitation (traditional methods, historical pieces of equipment and securing the orogen)

- 2) dramatization of underground space (addenda)
 - the urban tradition (reactivation of traditional cultural behaviour - restoration of the traditional techniques and crafts, the introduction of regional cultural forms)
 - amusement park (light-sound performances, theatre performances, fixed and mobile exhibitions).

4. CONCLUSIONS

Old undergrounds are an integral part of the cultural and natural heritage of each country. These objects are of great historical, social, but also sentimental value associated with our technical heritage. Created and operated for centuries, undergrounds demonstrate the high technical culture of human, bearing witness to his extraordinary skills, in the absence of modern tools and technologies. Therefore, security and access to these facilities are extremely valuable task for preserving the most valuable underworlds. This problem is a complex and interdisciplinary issue serving to restoring objects their original values and quality of life, adapting them to new functions. This article eminently shows interdisciplinary and complex design and protective problem of the historic underground.

REFERENCES

1. Tajduś T. Mikoś T. Chmura J.: *Problemy techniczne adaptacji i zabezpieczania podziemnych obiektów zabytkowych – doświadczenia Wydziału Górniczego AGH w Krakowie*, Kraków, Międzynarodowa Konferencja Konserwatorska ICOMOS, (2000) 163-164.
2. Chmura J. Wieja T.: *Metodologia prac projektowych i organizacyjnych przy adaptacji zabytkowych wyrobisk na podziemne trasy turystyczne*, *Górnictwo i Geoinżynieria*, 3, 1 (2009) 445-454.
3. Chmura J. Mikoś T.: *Średniowieczny kolektor sanitarny w Przemysłu jako element podziemnej trasy turystycznej*, *Górnictwo i Geoinżynieria*, 3, 1 (2009) 65-74.
4. Chmura J. Wieja T.: *Konstrukcje górnicze jako element projektowanej podziemnej trasy turystycznej „Groty Nagórzyckie”*, *Budownictwo Górnicze i Tunelowe*, 2 (2011) 37-44.
5. Chmura J. Mikoś T. Kinasz R.: *Zabytkowe wyrobiska górnicze jako przestrzeń dla muzeów i skansenów podziemnych w Polsce*, *Międzynarodowa Konferencja Naukowo-Techniczna*, 2 (2010) 104–106.

6. Chmura J.: *Zabezpieczające prace górnicze w obiektach archeologicznych – zabezpieczenie jaskini w Obłazowej*, *Górnictwo i Geoinżynieria*, 3, 1 (2009) 59–64.
7. Chmura J. Czaja P.: *Problemy techniczne i legislacyjne w procesie zabezpieczania i adaptacji wyrobisk na podziemne trasy turystyczne*, *Muzeum Żup Wielickich*, 3, 1 (2010) 61–70.
8. Chmura J. Wieja T.: *Detal architektoniczny i budowlany w projektowaniu podziemnych tras turystycznych*, *Budownictwo Górnicze i Tunelowe*, 2 (2013) 39-48.

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PROBLEMY ORGANIZACYJNE, PROJEKTOWE I TECHNOLOGICZNE W PROCESIE ZABEZPIECZANIA ZABYTKOWYCH PODZIEMI

Streszczenie

Zabytkowe podziemia stanowią immanentną część dziedzictwa kulturowego i przyrodniczego. Zabezpieczenie i udostępnienie podziemnych obiektów zabytkowych, jako zamierzenia inwestycyjnego, jest procesem ponownych działań podejmowanych w zdegradowanych lub nieczynnych obiektach, przyczyniając się do poprawy jakości życia mieszkańców, przywrócenia nowych funkcji, odbudowy więzi społecznych. Podziemne obiekty zabytkowe powinny być poddane procesom zabezpieczenia i rewitalizacji. Podstawą tych działań jest określenie stanu zachowania danego obiektu oraz możliwości dostosowania jego struktury przestrzennej do wprowadzenia nowej funkcji lub udostępnienia w celach turystycznych. Zasadniczym problemem jest, na etapie organizacyjnym, brak jednolitego ustawodawstwa prawnego dotyczącego procesu zabezpieczania podziemnych obiektów. W artykule przedstawiamy zasadnicze problemy organizacyjne, projektowe i technologiczne występujące w procesie inwestycyjnym zabezpieczania podziemnych obiektów zabytkowych. Efektem tych prac jest transformacja podziemnego obiektu w strukturę przestrzenną o nowej funkcji użytkowej.

Słowa kluczowe: podziemne obiekty zabytkowe, dziedzictwo kulturowe, zrównoważony rozwój, technologia, strategia ochrony

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