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# ASSESSMENT OF ANTHROPOGENIC LANDFORMS FOR THE GEOTOURISM PURPOSES (CASE STUDY: VELKÉ OPATOVICE FORTIFICATION SITE, ARCHDIOCESE OF OLOMOUC, CZECH REPUBLIC)

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## **Abstract**

The human impact on the relief is often very devastating: natural landforms are modified, damaged or destroyed and the intensity of human-induced processes even surpasses the natural ones. However, people also create new landforms which are interesting from geoconservation, educational, cultural and historical points of view. Thanks to these aspects, they also have a potential for geotourism, geoeducation and recreation. For the assessment of anthropogenic landforms (respectively anthropogenic geosites and geomorphosites), a method based on the concept of geomorphosities and taking into account the holistic approach to geotourism, is proposed. The article presents an example of anthropogenic landforms on geo-cultural site “Velké Opatovice fortification site” situated in the western part of the Archdiocese of Olomouc. Based on the detailed fieldwork, the inventory of landforms and other features, the assessment and some proposals for geotourist use of the site are presented.

**Key words:** geo(morpho)sites, geoeducation, recreation, cultural heritage, Archdiocese of Olomouc

## **Introduction**

People have always influenced the landforms and landscapes and the impacts of human activity are often very destructive (Szabó, Dávid, Lóczy eds. 2010). However, people also create new, interesting landforms (e.g. quarries, communication cuttings or water management landforms) which are attractive from scientific, educational, cultural and historical point of view and which show geoscience features that would normally remain hidden (Osborne, 2000) or which allow to trace the evidences of human impact on the relief in the past.

These landforms (which are displayed within particular geomorphosites) are important from the geoconservation point of view, they contribute to the extension of Earth-science knowledge and also, they reach high geohistorical values (landforms as witnesses of landscape changes and development, cultural, architectural, artistic and technical aspects related to the landforms etc.). Due to these and other aspects, they have a potential for geotourism, geoeducation and recreation as discussed in various papers (e.g. Lóczy 2010, Petersen 2002, Hose 2017, Kubalíková et al. 2017, Evans et al. 2018).

Thanks to the high geohistorical and cultural values and thanks to the existence of these values together with natural ones at one simple site, anthropogenic landforms can be considered a part of cultural heritage too (Kirchner et al. 2017). Thus, anthropogenic landforms lie on the border of natural and cultural heritage as they

are related both to the natural (geological, geomorphological, ecological, pedological, hydrological features) and cultural aspects (mining history, relations to industrial development, land use).

Within the article, a method for assessing the potential of anthropogenic landforms (respectively anthropogenic sites) for geotourism and recreation purposes is presented and applied on the example from Archdiocese of Olomouc (Czech Republic).

### **Conceptual background**

Anthropogenic landforms can be viewed as particular examples of secondary geodiversity (Kubalíková et al. 2016) which is defined as “the range/diversity of the man-made/anthropogenic landforms, including their assemblages, relationships, structures and systems”. This definition is based on the definition of natural geodiversity presented by Gray (2013) and it presents geodiversity as a value-free entity; those elements of geodiversity that are of significant value to humans, are called “geoheritage” (Sharples 2002, Dingwall 2005) which is represented by specific geological and geomorphological sites (Cleal 2007), respectively geosites and geomorphosites. Anthropogenic landforms (together with anthropogenic processes and other issues) are displayed (or represented) just within these sites.

For the ensemble of anthropogenic landforms (respectively anthropogenic geosites and geomorphosites) which form a part of geoheritage, a term “anthropogenic geoheritage” can be used.

As indicated in the Introduction, anthropogenic landforms can be considered a part of cultural heritage as there are strong links between geoheritage in general and culture (Panizza and Piacente 2005). The origin and formation of the distinctive anthropogenic landforms is often related to the driving forces of particular cultural periods, war events or technical and scientific development. Identification, assessment, monitoring and explanation of the anthropogenic landforms form an indisputable part of the knowledge of the landscape relief and they are a subject of geomorphological mapping. Important anthropogenic landforms form the part of material cultural heritage, which includes the sites with man-made features or features of combined origin (both natural and man-made) that have exceptional world value from the historical point of view. The detailed research of these landforms is necessary for the complex perception of natural and cultural heritage and they help to understand the role of secondary geodiversity features within the landscape diversity. Significant and remarkable anthropogenic landforms are often a part of the sites of tourist interest (particular geosites, geomorphosites) which possess the potential for geoconservation and geotourism activities.

### **Methods**

To assess the potential of the anthropogenic landforms for the geotourism purposes, the specific procedure is carried out. Particular steps were discussed in various papers (e.g. Coratza and Giusti 2005, Pralong 2005, Reynard et al. 2007, Pereira and Pereira 2010, Fuertes-Gutiérrez and Fernández-Martínez 2012, Kubalíková 2013, Reynard et al. 2016, Kubalíková and Kirchner 2016, Brilha 2016, 2018, Rypl et al. 2016, Štrba et al. 2015). Generally, the assessment comes out from the concept of geomorphosites (Panizza 2001, Panizza and Reynard 2005).

The assessment is based on the identification and description of the particular site where the anthropogenic landforms and processes can be observed. The criteria come out from already used methods and concerning the specific character of

anthropogenic landforms, some of the criteria are modified (especially the scope of “cultural values” is significantly extended).

The proposed method represents an integrated approach and it takes into account wide spectrum of possible values of the site according to the currently accepted holistic concept of geotourism (Dowling and Newsome eds. 2010, Dowling 2013). The complexity of the assessment method is important for understanding the landscape development, it helps to recognize and appreciate the role of landscape memory and understand the relations between natural aspects of the landform and its geohistorical and cultural importance. Based on the assessment, particular management measures can be proposed which can contribute to the rational use of the natural and cultural heritage in the future.

The method is designed as a set of questions (qualitative assessment) and it can be used as a simple tool for the assessment of the geotourist potential of specific sites. The specific values and criteria/questions are proposed in Table 1 (see below) together with inventory/description and assessment of the particular site.

Based on this assessment, the last step (synthesis) is done – it includes particular proposals for the rational use of geotourism potential and management measures.

### **Study area: Archdiocese of Olomouc**

The Archdiocese of Olomouc covers most of the Moravia region (area of 10 018 km<sup>2</sup>). It is linked to the Morava River which represents an axis of the study area and it lies within its basin. The study area is enlarged in the NNW-SSE direction from the source area of Morava River within the mountainous relief of Kralický Sněžník up to the plain or slightly rugged relief of Dolnomoravský úval Graben near Hodonín.

Within the study area, nearly all the types of the relief of the Czech Republic are represented (mountains, highlands and hillylands both on the crystalline rocks of the Bohemian Massif and sedimentary flysch rocks of the Outer Western Carpathians) to the flat relief of the Hornomoravský úval Graben and Dolnomoravský úval Graben and other depressions (e.g. Moravská brána Gate).

Prehistorically and historically, the area was settled and cultivated, thanks to its position and relief, it had an important passage function as it connected the North and South of Europe (Amber Route) and West and East as well (respectively Bohemia and Moravia). Thanks to these circumstances, the relief of the study area was strongly influenced by human activity, which left the traces in the numerous anthropogenic landforms of various genesis and age.

As an example, the Velké Opatovice fortification site is presented. It lies in the NW part of Archdiocese of Olomouc in the Svitavy Deanery within the Moravskotřebovská pahorkatina Hilly land (Demek and Mackovčín eds. 2014).

### **Results: Inventory, description and assessment**

Velké Opatovice fortification site (area of 1,8 ha) is situated near Velké Opatovice municipality at 514 m. a.s.l. on the remarkable sandstone ridge. Besides the natural and anthropogenic landforms, there are features that are important from historical, cultural and artistic point of view (Figure 1).



Fig. 1: Morphologically significant rampart of Velké Opatovice fortification site (left photo). The relief of J. B. Foerster composer head on the natural sandstone outcrop near Velké Opatovice fortification site - right photo (Photo: K. Kirchner, 2017).

Detailed inventory/description and assessment is presented in Table 1. It is based on the study of literature (Demek et al. 1991, Vitek 2005) and maps and detailed field survey.

**Discussion and conclusions: Proposals for the geotourist use of the anthropogenic landforms, respectively anthropogenic geo(morpho)sites**

The example of Velké Opatovice fortification site shows that anthropogenic landforms are important both from the Earth-science and historical point of view. There are strong links between geomorphology and historical aspects (remarkable sandstone ridge was suitable for the construction of the hillfort) and the anthropogenic landforms (ramparts and ditches) very well illustrate the shape of the hillfort and function of the fortification systems. In addition, natural sandstone features near hillfort represent typical examples of the sandstone weathering mezoforms and microforms with considerable scientific and educational value. The presence of springs and spas offer an evidence of using the natural resources in the past. The engravings by K. Otáhal represent important and attractive added value of the site.

As there are numerous different natural and historical features at one site, Velké Opatovice fortification site has undoubtedly the potential for geotourism development according to the present holistic concept of geotourism. In addition, the site has a high value for understanding the landscape memory and historical evolution of the surrounding area.

Tab. 1: Inventory, description and assessment of the Velké Opatovice fortification site

1) Scientific value	
a) Diversity and uniqueness: What is the diversity of specific Earth-science features? (anthropogenic landforms, natural landforms). Is the site unique or is it current within study area?	Remains of banks, ramparts and trenches (horse-shoe shape), remarkable sandstone ridge and sandstone outcrops (e.g. Rýbrcoulovo srdce) with typical weathering mezoforms and microforms (honeycombs, rock niches). The site is not unique (there is Mařín fortification site nearby with similar landforms, the sandstone mezoforms and microforms are common), but it is important from the historical point of view.
b) Educational value: Are the landforms recognizable and visible? Are there any educational facilities?	Both anthropogenic and natural landforms on the site are recognizable and visible, there is an information panel on the site and educational trail „Hanýsek“ is leading through the site.
c) Other natural features: Are there any other important natural (ecological, hydrological, pedological) features on the site?	The area is covered with mixed forest, on the western slope, there are several springs (e.g. Františkův and Antonínův pramen) and abandoned spa in Velká Roudka.
2) Tourist value	
a) Accessibility: Is the site accessible or is the access limited?	The site is accessible on foot (marked path), there are no limitations.
b) Safety: Is the site safe for the visitors?	The site is safe, there are no significant risks.
c) Presence of infrastructure: Is the site and its surroundings equipped with tourist infrastructure? (marked paths, catering and accommodation services, tourist shelters etc.)	Complete tourist infrastructure can be found in Velké Opatovice (cca 5 km north of the site).
3) Cultural value	
a) Age of the anthropogenic landforms: How old are the landforms or when the human impact on the site began?	The site was probably influenced by human activities already during the Early Bronze age (Věteřov Culture).
b) Historical and archaeological aspects: Are there any of them?	Significant traces of settlement and archaeological findings from the Bronze Age (Věteřov Culture, Urnfield Culture) and the Iron Age (Hallstatt Culture). Later, the site was used by Slavs (in the 9 <sup>th</sup> century). The site is one of the most important within western Moravia.
c) Artistic aspect: Is the site present in the artistic expression? (e.g. paintings, poetry, myths)	On the rock outcrops, there are engraving of the poet Petr Bezruč and composer Josef Bohuslav Foerster – both by Moravian sculptor Karel Otáhal – created in 1952. Also, there are several myths about the site.
4) Conservation value	
a) Existing legislative protection: Is the site legally protected? (declared as monument, reservation)	The site is not legally protected or declared as a monument or reservation.
b) Current threats: Are there any threats that can endanger the site, respectively anthropogenic landforms on the site? Are these threats predicted or managed?	There are no natural threats to the site, anthropogenic landforms on the site are covered with vegetation, however, they are still well visible.

Source authors



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### Souhrn

Antropogenní tvary reliéfu doplňují geodiverzitu krajiny a jsou označovány jako sekundární geodiverzita. Identifikace, hodnocení, pozorování a vysvětlení těchto antropogenních tvarů jsou nezbytnými kroky ke komplexnímu vnímání přírodního i kulturního dědictví a pomáhají pochopit význam sekundární geodiverzity v rámci geodiverzity krajiny. Antropogenní tvary společně antropogenními procesy a jejich výsledky jsou často základním reprezentačním znakem geo-lokalit. Pro soubor

antropogenních tvarů (tedy antropogenní geo-lokality a geomorfo-lokality), které jsou součástí dědictví neživé přírody může být použit termín antropogenní geo-dědictví. Tyto lokality mohou být vhodně využity při směřování geoturismu, včetně poznání kulturního dědictví krajiny

Předložený příspěvek prezentuje příklad antropogenních tvarů na geo-kulturní lokalitě Opatovické hradisko v západní části Arcidiecéze olomoucké. Na základě terénních průzkumů, inventarizace tvarů a dalších vlastností krajiny bylo provedeno hodnocení lokality s ohledem na geoturistické využití.

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