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THE GEOTOURIST DEVELOPMENT ON THE EXAMPLE OF THE AREA OF JASIENIOWA MT. (WESTERN CARPATHIANS FLYSCH, POLAND)

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Abstract: The interpretation of geo(morfo)logical phenomena and processes as well as the transmission of geoscientific knowledge to the general public are the essential tasks of geotourism. The proper development of the geotourist sites is a tool for their accomplishment. This paper presents the model of geotourist development which consists of planning and creation of infrastructure (basic and supporting) and the promotion of sites. The basic infrastructure includes the interpretative materials, geotourist trails as well as technical facilities ensuring the safety and comfort of sightseeing. The elements of proposed model are shown on the example of the area of Jasieniowa Mt. (Cieszyn Foothills). The outcrops located in the selected region represent the oldest sedimentary rocks in the Polish Carpathians Flysch, which are the Vendryne Formation and the Cieszyn Limestone Formation. Within the scope of geotourist development, the geotourist trail and information panels were designed, as well as the location of the protective and supporting facilities was proposed.

Keywords: geotourist development, interpretation, Cieszyn Foothills.

1. Introduction

For many tourists, the abiotic nature is not as valuable and worth attention as living animals or plants. Therefore, the issue of presentation and promotion of “rocky” sites is such an important task. The transmission of information linked with Earth’s history and emphasizing the significance of the geological environment are the essential roles of new branch of tourism called geotourism (Hose 2000; Słomka and Kicińska-Świdorska, 2004). The actions for proper adaptation of sites for geotourism are defined as the geotourist development. It is a part of a much broader concept which is the tourist management (see Rogalewski, 1974 for definition). The aim of this article is to propose a pattern and to characterize the individual elements of the geotourist development and then to present them on the example of Jasieniowa Mt. area. The outcrops located there are of great importance for preservation geodiversity in supra-regional scale, as well as they are distinguished by geotourist (Waškowska-Oliwa et al., 2008) and educational potential (Górna, 2009). At the moment, they are not adapted to geotourism’s aims.

2. Methodology

The main goal of the geotourist development is

creation of appropriate infrastructure that ensures the protection and proper operation of the sites, to satisfy tourists’ needs, especially in the field of geoeducation, and also sites publicity. The formation of new geotourist attractions (tourist products), as well as the encouraging people to visit them should be a result of these actions. The proposed model of geotourist development assumes the planning and creation of infrastructure and the promotion of sites (Fig. 1).

However, before the geotourist development enters into the planning stage, the inventory and valorization of sites should be carried out. The inventory includes an accurate description of sites or phenomena in terms of geology, geography and tourism. The result of valorization shows the educational usefulness of sites and their geotourist attractiveness (Alexandrowicz et al., 1992; Dmytrowski and Kicińska, 2009).

With the detailed characteristics of the selected sites, we can move forward to the planning stage. It is worth emphasizing that the scheme of geotourist development should be consistent with legal regulation and consulted with the organs of the self-government administration. The estimate of the future tourist movement and its impact on the

both biotic and abiotic nature is an important element of planning. The visits of tourists and recreationalists in the geological environment and the existence of infrastructure can result in increase of erosion, degradation of sites (friable rocks) and vegetation, acts of vandalism, littering or noise. The role of planning and the future management is to reduce the adverse impacts (Newsome and Dowling, 2006). Moreover, this assessment is helpful during selecting the appropriate infrastructure and also it may become the determinant of the profitability of investment (in the case of entrance fee).

panels, models, computer animations or displays can be rated among the group of the most common interpretative materials. Some of these components are useful for tourists on-site, other can be available only off-site, for example in information centers. It is important to note that others forms of interpretative materials, which have not permanent nature, are also popular and useful. In this case, guidebooks (rather for specialists), packet-sized booklets or site leaflets, videos or slide shows should be considered as the most crucial. The on-site outdoor panel is the most often used form of interpretative materials so it is worth to devote

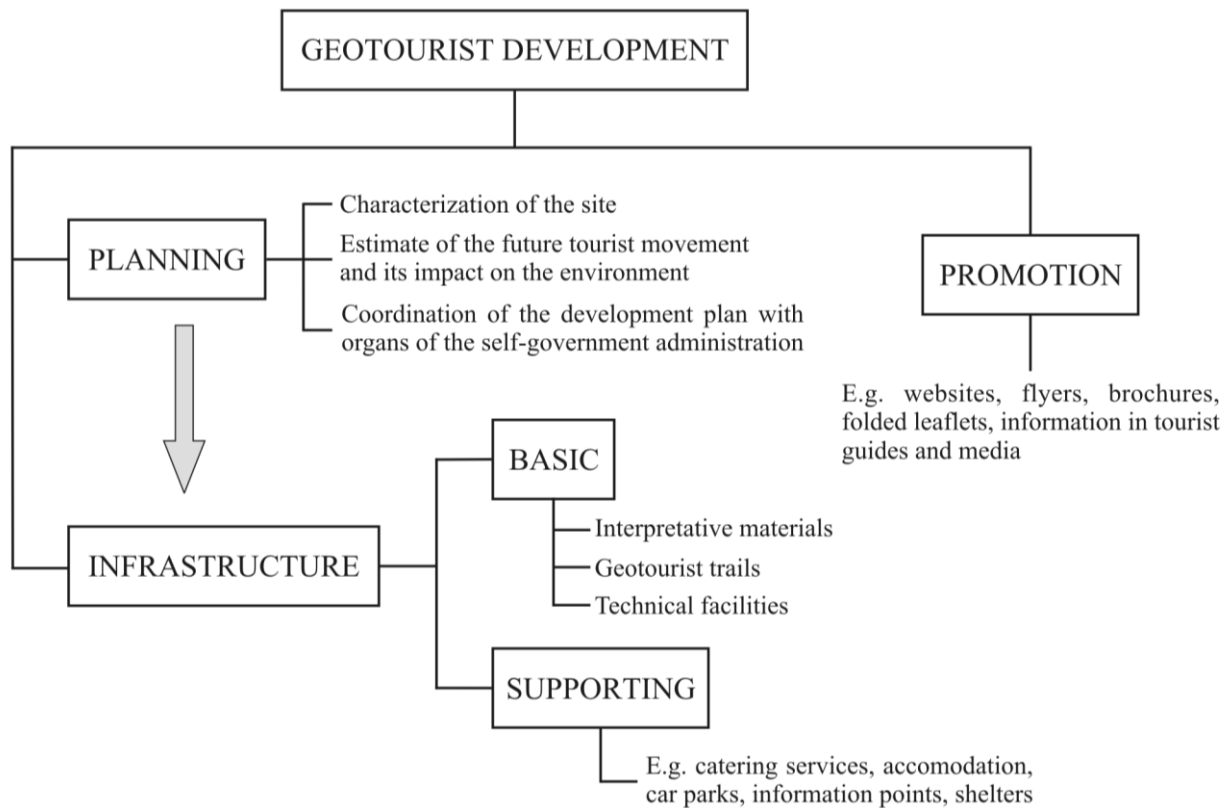


Fig. 1. The model of geotourist development.

Every geotourist site has a different nature, but almost everyone (if the result of valorization proves it) is suitable for geotourist development. The fundamental component of this development is infrastructure (understood as the elements of permanent nature) which consists of basic and supporting infrastructure. The first includes interpretative materials, geotourist trails and technical facilities aiding sightseeing.

Interpretative materials are essential at any geotourist sites. Their overriding function is interpretation, but they are also used for providing “facts” to the public. The outdoor panels, interactive touch

more attention to it. This form is particularly intended for a wide range of non-specialists recipients. The authors’ research suggests that usually the information on panels is too scholarly, complex, unclear and visually unattractive to visitors. The ideal interpretative panel should be characterized by being graphic-rich and text-poor. The text should be written in a way that can be easily read and understood. Graphics should add explanations, show details which could be otherwise overlooked, and not repeat what tourists can see themselves. Applied colouring should harmonise with surroundings and simultaneously attracts tourist’s attention. Materials as well as construction should be

consistent with local architecture. It is also essential to pay attention to panel location. Panels should be accessible and placed at suitable distance from sites. More details with regard to the rules of designing and location of panels are provided by Hose (2000). It is worth noticing that the text should be written in the language of the country of site's location, as well as in language known by the majority of foreigners, usually in English. Multilingual descriptions are particularly important if the sites are located in borderland. Then, the good practice is to use the language of the neighbours.

The geotourist trails are other elements of the basic infrastructure. Predominantly, it is a walking trail among several geotourist sites. The descriptions of them are available in the form of booklets or on-site panels. This trail has to be marked and has adequate protection and facilities for visitors. Furthermore, the kind of trail, issues, time of covering the distance, degree of difficulty and equipment requirements must be specified. It should also be possible to hire the geotourist guide, and in justified cases, sightseeing with guide should be obligatory (for example in mines or caves) (Kicińska-Świdorska and Słomka, 2004).

The technical facilities are designed both for ensuring the safety and comfort during sightseeing and protection of site. Adequate preservation of ground, for the sake of tourist's safety, applies primarily to the mines, tunnels, caves, quarries, phenomena and processes occurring today (for example volcanic activity) etc. While the protection of sites, by imposing restrictions to tourists' motion, is of particular importance in case of places legally protected. The most common technical facilities are: the direction signs, warning notices, railings, handrails, fences, stairs, which are installed in places where difficulties in exploring may appear (precipices, chasms, steep climbs), as well as observation and view platforms. Furthermore, in many cases it is necessary to provide lighting system. This concerns mainly caves, mines and tunnels, and also buildings constructed from rocks or other sites which sightseeing by night may be a great attraction.

It should be noticed that the scope of infrastructure depends on the specificity of sites, thus not all elements of basic infrastructure have to be created.

The supporting infrastructure is quite a wide range of constituents which are designed to assist basic infrastructure. It includes mostly car parks, cater-

ing services, shelters, benches and tables, dustbins, sanitation, accommodation and information points. Each component of the infrastructure, both basic and supporting, should be properly integrated in landscape, so that not to be too conspicuous and not to obscure the sites or view.

The promotion is the last element of the proposed model of the geotourist development. Appropriate publicity of sites may be a key to attract and educate a large number of visitors and provide economic benefits to local residents. The aim of promotion is "selling the sites", that is to encourage tourists to visit the geotourist sites by providing information about their unique qualities. Nowadays, the most proper place for this task is the Internet. Creating a website presenting the geotourist site or trail is the basis for promotion and easily accessible source of information, not only in tourism. Other forms of publicity may be small flyers, folded leaflets or brochures (available in local authorities' seats and tourist information points), articles in local as well as specialist newspapers and broadcast in local media. Additionally, placing the markers, for example logos, on tourist maps and general information in tourist guides can also support the promotion.

3. Case study

3.1. Research area

The region of Jasieniowa Mt. is located in the south part of the Cieszyn Foothills, which is numbered among the Śląskie Foothills, in the Western Outer Carpathians. The examined area lies within the administration of Śląskie province and Cieszyn district. Golezów is a village situated at the foot of the Jasieniowa Mt. (Konracki, 2002). The important tourist centres as Cieszyn and Ustroń are situated at the distance of no more than 10 km from considered region.

The described area is built of the flysch deposits of Cieszyn Subunit (the lower part of the Silesian Nappe). This subunit includes the oldest deposits of the Outer Carpathians, which are traditionally called the Cieszyn Beds. Among them, the following deposits can be distinguished: Lower Cieszyn Beds- Vendryne Formation (Kimmeridgian- Tithonian), Cieszyn Limestones- Cieszyn Limestone Formation (Upper Tithonian- Lower Valanginian) and Upper Cieszyn Shales- Cisownica Shale Member (Valanginian- Hauterivian) (Golunka et al. 2008). In the vicinity of Jasieniowa Hill, the outcrops of the two oldest formations can be ob-

serve. The Vendryne Formation is developed as dark gray to black marls with rare intercalations of redeposited limestones. This pre-flysch deposits represent the chaotic type of sedimentation (Słomka, 1986; Ślącza and Kamiński, 1998; Golonka and Waśkowska-Oliwa, 2007). The deposits of the Cieszyn Limestone Formation are lithologically unique (calcareous flysch) and have begun the series of flysch sedimentation in Polish Carpathians, thus there are the example of the oldest deposits of turbiditic currents. The occurrence of this formation is restricted only to the western, marginal part of the Outer Carpathians, between Soła and Olza rivers. It is generally represented by white or light grey limestone beds interbedded with grey marly shales. The limestones are diverse, from pelitic and thin-bedded in lower part of the sequence, to detrital, coarse grained, and thick-bedded in upper part (Peszat, 1967; Słomka, 1986; Ślącza and Kamiński, 1998; Golonka and Waśkowska-Oliwa, 2007).

Several abandoned quarries, where the limestones were mainly exploited, can be found on the slopes of Jasieniowa Mt. The biggest one, situated on the eastern slope, because of its exceptional scientific value, belongs to the Polish list of representative geosites selected for the European Network- the Global Geosites Project (Alexandrowicz, 2006). Moreover, it should be emphasized, that this quarry has been protected as the documentary site since April 2009.

3.2. Results- the proposal of geotourist development

The proposal of the development, in considered case, focuses primarily on the basic infrastructure which includes: delineating the geotourist trail



Fig. 3. The outcrop of marly shales representing the pre-flysch deposits, abandoned marl quarry.

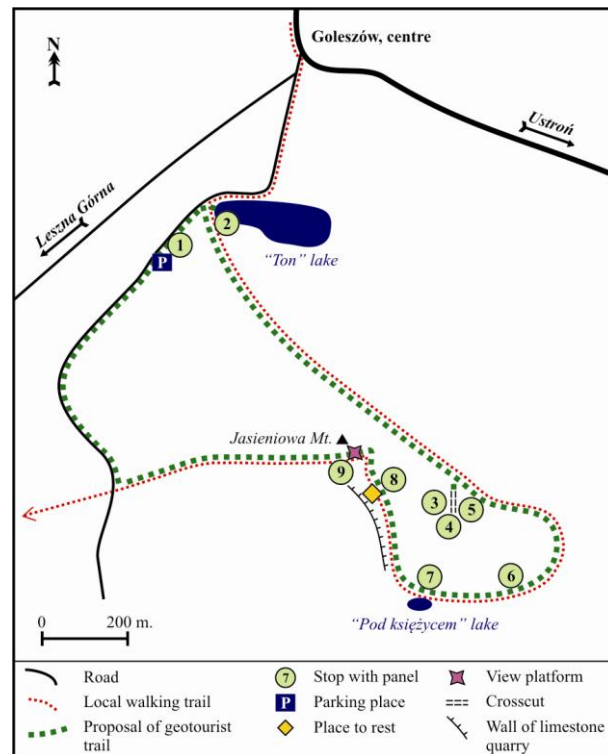


Fig. 2. The sketch map of proposed geotourist trail “Jasieniowa Mt.” together with location of interpretative panels.

with stops, the location of the necessary technical facilities and the design of information panels. The parking place and place to rest are the elements of supporting infrastructure, which are provided for this project. The proposed trail has an overall cognitive and educational character. This initiative enables to acquaint visitors with geological structure of this region, rocks which can be found here, and history of abandoned quarries. The issue of geoconservation is also brought up. Moreover, it leads through the forest and several view points, which allow the tourists to spend time close to nature and to enjoy the beauty of the landscape.

The length of the trail is 3,5 km, the estimated time of covering the distance is 1,5 hour (on foot, the time for stops and rest is not included) and the total climb is 100 m. This suggested geotourist trail coincide with the fragment of the local walking trail called “Jasieniowa”. It is intended for individual visitors, as well as for tourist groups, particularly schoolchildren.

The geotourist trail and also the location of sites and stops are shown on figure 2. The trail begins nearby the complex of small ski jumps, to the south-west of the centre of Goleiszów. There is a possibility of parking there. Then it leads to the first abandoned quarry. In the past the marls were



Fig. 4. The view on the abandoned marl quarry with the “Ton” lake, farther Golezów and the summit of Beskid Śląski Mts.

exploited here, today the void is filled with water. The walk around the lake called “Ton” is an opportunity to observe the small occurrences of marls, which represent the Vendryne Formation (Fig. 3). From above the quarry stretches the view on the lake, Golezów and the summits of Beskid Śląski Mts. (Fig. 4). The following interesting site on the trail is called by local people “ravine”. It is a crosscut in the ridge of Jasieniowa Mt. which was used to export the stone from a nearby quarry to



Fig. 5. The general view on the crosscut in the ridge of Jasieniowa Mt. The layers of limestones intercalated by marly shales are visible.

cement plant in Golezów. Currently, the 20 m high walls of crosscut are a convenient place to observe the rocks belonging to the Cieszyn Limestone Formation (Fig. 5). The trail goes further to the biggest in considered area, abandoned limestone quarry. It is partly cover with vegetation, but the fragments of 30 m high and over 200 m long rock walls are still visible (Fig. 6a). In the lower part of this quarry the small, temporary lake called “Pod księżycem” can be found (Fig. 6b). A small forest clearing, picturesquely located in the upper part of the quarry is an perfect place to rest. After a short climbing, almost from the top of Jasieniowa



Fig. 6. The abandoned limestone quarry with outcrop of the thick-bedded limestones (a) and the temporary lake called “Pod księżycem” (b).

Mt., one can enjoy the wide and attractive view of the Cieszyn Foothills and the Beskid Śląski Mts. In the end, the trail returns to the parking place. Following stops were situated on the trail:

1. Geotourist trail “Jasieniowa Mt.”

Scope of information: general information about the geotourist trail, its main aims, a sketch map with trail and location of stops, issues of panels at stops.

2. The old marls quarry and “Ton” lake.

Scope of information: what are marls, the use of marls, the outline of history of exploitation, current use of quarry.

3. The Carpathian flysch.

Scope of information: basic information about flysch, what is called flysch, its origin, idea of nappe, region of Jasieniowa Mt. on geological map of the Polish Carpathians Flysch, the Cieszyn Beds as the oldest deposits of the Polish Carpathians Flysch.

4. The Cieszyn limestones.


Scope of information: the variety of Cieszyn limestones, their origin, the ways of identifying their age.

5. The traces in rocks.


Scope of information: what are trace fossils and hieroglyphs (Fig. 7).

The geotourist trail “Jasieniowa Mt.”

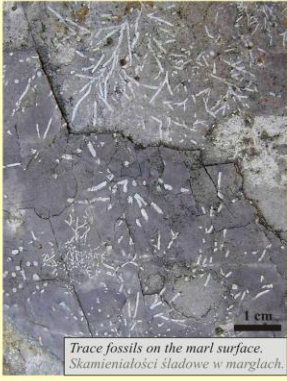
THE TRACES IN ROCKS 5



The fossils, that are the preserved remains of organisms, are extremely rare in flysch deposits. However, on the surface of rock layers so-called **trace fossils (ichnofossils)** often can be found. They are geological records of biological activity of organisms, for example: feeding marks, footprints or burrows. The traces mentioned above are immensely valuable for scientists, because can reveal information on how and where these creatures lived. The study of trace fossils is called the paleoichnology (from Greek: palaios- old; ichnos- trace, footprint; logos- to speak, study).




Trace fossils on the marl surface.
Skamieniałości śladowe w marglach.



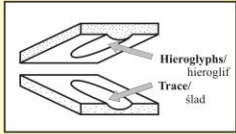
Trace fossils on the marl surface.
Skamieniałości śladowe w marglach.

The trace fossils occurring in this area are the feeding traces of organisms, which lived in rich in organic matter, soft sediments on the bottom of the Carpathian sea. Two principal forms of traces can be distinguished here: small spots and streaks on the marls surfaces (traditionally called *fucoïds*) and protuberances of various shapes on the lower surfaces of limestones.


These protuberances are called the organic hieroglyphics. The **hieroglyphics** are the cast (negative) of traces, which were covered and preserved by the sedimentary material, on the lower surface of layers. Besides the organic hieroglyphics, also hieroglyphics of mechanical origin are encountered. They are related to current activity and were formed as a result of haul objects or hitting them on the bottom.



Mechanical hieroglyphs on the limestone surface.
Hieroglify mechaniczne na powierzchni wapienia.



Hieroglyphs/
hieroglify
Trace/
śląd



Trace fossils- organic hieroglyphs on the limestone surface.
Skamieniałości śladowe- hieroglify organiczne (wapieni).

W osadach fliszowych, na powierzchni warstw skalnych, można spotkać tzw. **skamieniałości śladowe (ichnofosylia)**. Są one efektem działalności życiowej organizmów (np. ślady żerowania, drążenia, czy tropy). Na ich podstawie można poznać warunki i styl życia dawnych organizmów. Badaniem ichnofosyliów zajmuje się paleoichnologia.

Skamieniałości śladowe występujące w okolicy są w wyniku żerowania organizmów, które żyły w bogatych w materię organiczną, miękkich osadach na dnie morza karpacciego. Mają one dwie zasadnicze formy: niewielkie smugi i cętki na powierzchni margli (tradycyjnie nazywane *fucoïdami*) oraz wypukłości o różnych kształtach na dolnych powierzchniach wapieni.

Wypukłości te to tzw. hieroglify organiczne. **Hieroglify** są odlewem (negatywem) śladów, które zostały pokryte i zakonserwowane na dolnych powierzchniach warstw przez materiał osadowy. Oprócz hieroglify organicznych można tu również spotkać hieroglify mechaniczne, czyli takie, które są związane z działalnością prądów morskich (włoczenie przedmiotów lub uderzanie nimi o dno).

Fig. 7. A design of one of the interpretative panels.

6. The history of limestone exploitation.

Scope of information: outline of history of limestones exploitation in this region, the use of limestones, the transportation of stone- the traces of the narrow gauge railway.

7. The „Pod księżycem” lake

Scope of information: how the origin of lake is explained.

8. The protection of abiotic nature.

Scope of information: the reason for abiotic nature protection, the documentary site, the reason of protection of this limestone quarry.

9. The view point.

Scope of information: „geological view”- combination of view with geology of this region, relation between relief and geological structure.

The following technical facilities are indispensable components of this project: railings over the marl quarry and along the crosscut, the stairs with handrails nearby the 2nd, 7th and 9th stop and the view platform below the summit of Jasieniowa Mt. Moreover, the shelter, benches, tables and dustbins at the place to rest and the parking place belong to the suggested elements of the supporting infrastructure.

The best form of promotion of described geotourist trail is the website as well as the folded leaflets which should be available at least in tourist information points in Ustroń, Cieszyń and Wisła. In order to present the initiative to local residents, the authors suggest to run the articles in local newspaper.

4. Conclusions

The proper interpretation of geological features and processes is a key to making geotourism accepted by general public. That is why the appropriate development of valuable geotourist sites is responsible so significant and action.

In the considered case, marking the geotourist trail together with the proper facilities as well as placing on-site interpretative panels are the most appropriate way of development. This solution allows visitors to acquaint with the values of selected sites to a sufficient extend. Moreover, completing the project will surely contribute to increase attractiveness of Golezów commune, and also enrich the tourist offer of entire region.

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