Introduction

In the 1970s, tourism around the world saw the emergence of a new development: the birth of 3E tourism (Entertainment – Excitement – Education). Within this model, the third component has undergone the most emphatic strengthening; the role of tourism requiring an increased level of intellectual involvement has been ever more important at the expense of 3S (Sun – Sand – Sea) recreational tourism (Mazurski, 2007). This has coincided with a quest for a new tourism paradigm, arising from the notion that the intellectual, moral, and ethical level of the world’s nations has risen considerably. In consequence, there emerged the concepts of ‘soft’ or ‘mild’ tourism, organized in accordance with the principles of sustainable development, and hence, among others, with complete respect for nature (Kramer, 1983). What that means is that, to respect the laws of the natural environment, one must first of all get to know nature itself. In reality, that was hardly anything new. After 1660 or thereabouts, interest in nature was seen to rise sharply among those travelling Europe, not only professional travellers, but especially intellectually inclined burghers searching for and investigating various natural curiosities, who until the 19th century were referred to as ‘naturalists’ (Mańczak, 2008). While biotic nature has always been at the centre of discussions concerning threats to the environment, much less attention was given to abiotic nature. It was not until the 1990s that the latter gained more notice, leading among others to the formulation of a demand that it be protected as geodiversity, in addition to biodiversity. That was the scientific foundation for the emergence of a new trend in cognitive tourism, namely geotourism. It has been gaining in importance for several years and its theoretical foundations have been developed (Migoń, 2012). A study visit to England has confirmed the above and provided observations of local activity and adaptation of particular sites that can also be put to use in Poland for an implementation of new forms of education, popularization and management.

Areal Geology and main landforms

The core of the geopark is formed by two longitudinal hill chains: the Abberleys in the north and the Malverns in the south. The former, rising to just 283 m a.s.l. at Abberley Hill but fairly conspicuous in the landscape, got their name from a sixth-century Saxon chief Eobald. The ancient history of the area is evidenced by a 12-hectare hill fort on Woodbury Hill, which is also a scenic point. The Abberleys feature an almost complete stratigraphic profile from the Silurian to the Triassic (www.geopark.org.uk). The Silurian reef limestones are more than 440 million years old. Carboniferous sandstones adjoin them on the north as well as 320-million-year-old coal deposits that used to be mined. Red sandstones, seen in the area of Bewdley, Kidderminster, and Bridgnorth, were formed from desert dunes and local alluvial cones and date to the early Permian (299 million years ago).

The name Malvern comes from the language of Britons, where it meant ‘bare hill’. Dominating over the surrounding landscape, the Malverns have steeper eastern slopes and extend over a distance of 13 kilometres, from Great Malvern, a town that rose to prominence as a recreation and spa resort owing to numerous mineral water springs, and the village of Colwall in the south. Here, the hills approach another well-known area, the Cotswolds. A popular hiking destination, Worcestershire Beacon (425 m a.s.l.), is visible well from the Severn.
plain is built of Late Triassic deposits. The above-mentioned limestones became the substrate for fertile soil on which a calciphilic flora has developed, whereas at higher altitudes, on igneous rocks, the plant communities are acidophilic in character, of the kind not found anywhere nearer than in the Welsh interior. As a result of these habitat features, the area is a kind of ecological island with numerous rare species, and many places have been designated as Sites of Special Scientific Interest (SSSIs). The plant communities range from wetlands to grasslands as well as woodlands, which have been spreading to higher-lying areas in recent years in consequence of reduced grazing. The geopark is home for numerous species of the fauna, with the greatest scientific interest focused on invertebrates, especially butterflies, as well as birds.

The presence of the Triassic (200 million years ago) in the form of the dry-climate shallow-sea continental deposits, characteristic of many parts of Europe, ends at the southern boundary of the AMHG. The Pleistocene brought about modifications caused by strong climatic changes, including the abundance of water in the rivers, reflected in the clearly visible terraces and deepened valleys of such rivers as the Severn (the longest river in Britain), the Stour, the Teme, the Rea, the Frome, and the Ledon, which traverse the geopark.

### The Stratigraphic Profile

Natural sites, like rocky outcrops and rock cliffs, and quarries make possible it to see the rock strata, being dated back to more than 700 million years ago as a result of the fact that the hills lie on the so-called Malvern Line, which consists of a number of faults and folds exposing the deeper strata. The core igneous rocks have survived in a better-preserved form in the landscape. Apart from the Cenozoic formations, the strata present a relatively continuous system, reflecting the changing geological history of the area. The following rocks can be seen in all this area (Fig. 1):

**Precambrian** – The youngest Precambrian is represented by various volcanic rocks; the middle Precambrian, by basalt lavas and tuffs as well as rhyolites; the lower Precambrian, by deep-intrusive metamorphic granites and diorites, which were formed 60° south of the equator, as well as paragneisses;

**Cambrian** – A sequence of formations indicative of a gradual increase in the sea depth: from conglomerates and quartzite sandstones to mudstones (White-Leaved Oak Shale Formation);

**Ordovician** – The Upper Ordovician saw the intrusion of dolerites between mudstones (the oldest deposits) and claystones with interstratifications of sandstones originating from pyroclastics;

**Silurian** – In the Upper Silurian, limestones and mudstones were formed with thin sandstone interstratifications. In the Lower Silurian, sandstones, claystones, mudstones, limestones and some conglomerates were deposited, which is indicative of significant spatial and temporal variability of the environment;

**Devonian** – Varicoloured terrigenous sandstones and mudstones;

**Carboniferous** – In the Upper Carboniferous, sandstones and mudstones were deposited along with hard coal seams. In the Middle Carboniferous: mostly limestones with interlayers of sandstones and coal; locally, quartzite sandstones and fan-delta conglomerates (Cornbrook Sandstone Formation) and similar terrigenous formations. In the Lower Carboniferous, interstratification with intrusive basalt and dolerite occurred;

**Permian** – Desert sandstones;

**Triassic** – In the Upper Triassic, Britain drifted 20–30° north of the equator; dark grey mudstones and sandstones were formed with a thin interlayer of limestone. Towards the end of the period, red desert mudstones were formed along with local grey ones resulting from heavy rainfall; also fluvial sandstone was deposited. The Lower Triassic saw the formation of coarse-grained sandstones and conglomerates with fine-grained sandstones formed along rivers;

**Lower Jurassic** – Lias limestones and mudstones.

### General Overview of the Abberley-Malvern Hills Geopark and its management

The Abberley-Malvern Hills Geopark (AMHG) is located in the West Midlands region of England, close to the Welsh border, covering the area of the Abberley Hills and the Malvern Hills, at the junction of four counties: Gloucestershire, Herefordshire, Shropshire, and Worcestershire (www.shropshiregeology.org.uk/RIGS/RIGS_view.html). The total area is 1250 square kilometres, extending longitudinally from Bridgnorth (Shropshire) in the north to Gloucester in the south (Fig. 2). The landscape is marked by contrasts between flat areas and fairly high rims framing them on the east and south with gently rolling hills in the remaining area (Fig. 3). The area is adorned by numerous wooded areas with old deciduous trees in the north and west, regular patchworks of land subdivisions in the east (mainly pastures) and south (fields), as well as small hamlets with traditional buildings (Fig. 4).
For this reason, the Malvern Hills, covering an area of 105 square kilometres, were afforded protection in 1959 as an Area of Outstanding Natural Beauty (AONB), one of the forty-nine AONBs in the United Kingdom, which also features cultural heritage sites in the form of ancient hill forts (dating from 800 BC – AD 43) (Fig. 5), castles, churches, and other built landmarks. In view of the geological and geomorphological qualities of the area, local residents together with the staff of local organizations and institutions of higher education embarked additionally on an initiative to protect those assets and use them to promote the region.
The governmental Department for Environment, Food and Rural Affairs encouraged the formalization of the initiative, although no official approval for the activities has been granted. Members of the local inhabitants and organizations established in 2003 a completely nongovernmental geopark, named the Abberley-Malvern Hills Geopark. In 2008, the park joined the European Geoparks Network, but two years later membership in the organization was given up owing to an excessive bureaucracy and the costs exceeding the benefits. In consequence, more can be achieved at a lower cost.

The geopark operates on the basis of fairly flexible rules within the framework of the broad prerogatives of local self-government (much broader than in Poland and with much less restrictions), with a focus on pursuing such goals as geoconservation, raising public awareness, and education.

The existence and functioning of the AMHG is not formalized in the form of any charter, court registration or other official recognition. It is more of a platform for cooperation than a true partnership, although its members are called partners, of whom there are currently fifteen. These include the following organizations representing local authorities:
- Severn Valley Country Park as a unit of Shropshire Council,
- Malvern Outdoor Education Centre as a unit of Worcestershire County Council,
- Herefordshire Heritage Services as a unit of Herefordshire Council.

The remaining partners are the University of Worcester, the Abberley Hills Preservation Society, Gloucester Geology Trust, the Malvern Hills Conservators, the Severn Valley Railway, the Shropshire Geological Society, Museums Worcestershire, the Woolhope Naturalists’ Field Club (Geology Section), the Herefordshire and Worcestershire Earth Heritage Trust, and the Forestry Commission. The office of the geopark is run with a very modest manpower by the Worcester-based Earth Heritage Trust (EHT) established at the local college (now the University of Worcester) in 1996. When requested for assistance or cooperation, various organizations and bodies never refuse, and the geopark’s activities are supported by more than a hundred volunteers, mostly organized into small field groups, which – among other things – monitor the Local Geological Sites. The Heritage Service and the Geology Trust in particular are engaged in regular collaboration. The EHT and the individual partners use grants from various sources, membership fees, and charges for participation in some events such as trips – these are usually nominal amounts of £1–2, legacies, and gifts to support the activities of the geopark.

**Selected Geosites**

The rich geodiversity of the region is protected at a number of levels and significance of particular sites (Fig. 6). Such places are protected by local authorities, the Geopark Board, and volunteers as well. Some of them get a fence, some other – scenic platforms or foot-bridges, sometimes a gaining of fossils and rock probes are forbidden.
Another form is to built rest and park places, somewhere with services. First of all, there are more than a hundred Local Geological Sites (LGSs). While there is no statutory basis for their protection, they are taken into account in the local planning process. Six of them are considered the leading sites and two geology reserves carry on educational and tourism activities. In Shropshire alone, 1419 LGSs have been designated through the efforts of the Shropshire Geological Society (www.shropshiregeology.org.uk/RIGS/RIGS_view.html).
England’s Abberley-Malvern Hills Geopark as a Tourism Project

Fig. 7. Gullet Quarry, phot. K.R. Mazurski • Kamieniolo m Gullet, fot. K.R. Mazurski

Fig. 8. Fossils in Shavers End Quarry, phot. K.R. Mazurski • Skamieliny w Shavers End Quarry, fot. K.R. Mazurski
There are also thirteen sites of national significance, designated as Sites of Special Scientific Interest (SSSIs), which come under the remit of the governmental agency Natural England, and 179 similar geology and geomorphology sites of regional significance. Particularly valuable is the Huntley Quarry Geology Reserve, now comprising of three geosites. The reserve consisting of former quarries, of which one is owned by the Gloucestershire Geology Trust, was opened in 2007. The main quarry is Huntley Quarry, considered as a ‘geological gem’ because:

– It features a cut from the Upper Ordovician to the Lower Silurian (445–439 million years ago);
– There are volcaniclastic interlayers;
– A fault is clearly visible.

The basic petrographic mass consists of Lower Silurian sandstones and mudstones (436–428 million years old).

The disused Gullet Quarry (Fig. 7) is also interesting on account of its profile, which includes Precambrian rocks such as diorite, granite, gneiss (formerly quarried for road construction), pegmatites, dolerite, and schists in the rock cover. Easily visible are pegmatite veins of up to two-metre thick, of which one is fractured in an interesting way. Next to them are Silurian sediments (The Geopark Way, 2009). The small but picturesque disused Loxter Ashbed Quarry features an anticline with limestone accompanied by bentonite. Bentonite interlayers in limestone (223 million years), thinly interstratified with marls can also be seen at Shavers End Quarry (Fig. 8). At some places, a pinkish calcite crystallized. The geology of the area can also be studied at other locations, such as the geology gardens behind the school at Martley, Worcestershire, or at Bewdley Museum (Fig. 9). Ruins of the old human-made structures are exposed to display the uses of stone, such as the relics of a viaduct at the Holding Pens (Earth Heritage..., 2011). There is a wealth of information available online; for instance, Shropshire has a detailed table on its website that gives the grid reference and topographic information on each site, information on access to the site, a description of the site’s stratigraphy, petrography, and/or geomorphology, and other data, as applicable (http://www.shropshiregeology.org.uk/RIGS/RIGSintro.html).

**Tourism Use**

The geopark functions on the basis of a management plan, which is updated annually (sometimes twice a year) addressing the main aims relating to the protection and consolidation of its values. The plan also includes measures to promote those values, popularize the area as a tourist destination while respecting the principles of sustainability, to utilize, and fill the needs of the local economy, to initiate and disseminate scientific research, and to implement the aims in the programmes of the local authorities.

The principal activity with respect to geotourism within the rather densely populated area of the AMHG is the organization of the field education points.
After identifying and examining a geology or geomorphology site, immediate foot access is arranged (gangway, steps), vehicular access and parking facilities are improved (free of charge even by private landowners). If necessary, guard rails and information signs are provided (which are not vandalized!). In the case of privately owned land, access may require obtaining permission, which is not a major problem.

Another important thing is a laying out and maintaining of trails, which there are now over twenty, of a great geotourism and landscape value. It is done by three organizations: the Earth Heritage Trust, the Shropshire Geological Society, and the Gloucestershire Geology Trust. A network of six Geopark Visitor Information Points (GVIPs) is also being developed based on the partners’ existing facilities, such as those at Bewdley Museum, the Cob House, or the Ledbury Heritage Centre. The aim is to reduce the cost of projects and to limit the introduction of new infrastructure into the natural space. The basic GVIP consists of geopark maps, trail presentations, geological exhibits and geological information, and local landscape features. In addition, there are publications (some of them are free) and a shop with a varied offer. As a separate project, three earthquake observatories are being developed at a cost of £20,000 to provide learning experiences for children and the general public. The annual Rock and Fossil Roadshows, organized every June for schoolchildren and their parents but also open to other interested people, is very popular. The participants can learn how to recognize rocks, minerals and fossils using replicas. Equally popular is the GeoFest, a three-month programme (the longest one in the UK) of excursions, discussions, shows and similar events, which attract visitors from around Britain.

Field sites and identified structures built with the local stone (geological designation, quarry location) serve as points of interest for trip programmes. The guides also take the participants to walk around towns and villages, explaining the ‘geology’ of houses, churches, bridges, and the like (Fig. 10). However, the number one of the geotourism attractions is the Geopark Way. It is the United Kingdom’s first long-distance geological trail, 175 kilometres long, established on the initiative of the Herfordshire and Worcester Earth Heritage Trust and approved by the Department for Environment, Food and Rural Affairs (Fig. 11). It runs from Bridgnorth to Gloucester using different forms of travel and existing routes down the Severn. One can plan one’s own itineraries, especially as there is no shortage of accommodation options at various locations in the area. Walkers, bikers, and motorists can be met on the trail. An excellent guidebook (*The Geopark Way*, 2009) is a great help. In addition to an introduction to the park and its geology, the guidebook contains 17 sections offering detailed descriptions of the entire trail, starting from Bridgnorth, with schematic but informative maps and numbered points of interest.
It also features a glossary of terms and provides useful contact information. As separate additions, the package contains a variety of materials, including accommodation information and, very important, a 1:100,000 geological map. The latter, unfortunately, is limited to the extents of areas covering particular geological units and the locations of major towns and villages and the sites shown on photographs. Outside the map frame is a stratigraphic section and an excerpt from a detailed explanation for a larger section of the trail. The map is based on a British Geological Survey map.

Conclusions

The AMHG is a successful attempt to put the area’s rich geodiversity to educational and tourism use. The initiative has been made possible by the understanding and support of the local public and the local authorities. The project demonstrates that knowledge about abiotic nature can be disseminated very well not only through the natural sites but also using seemingly useless decommissioned quarries, what is already well-known nearly in all the world, and disused constructions. Their appropriate promotion and presentation stimulates tourism improving the economic balance of the region after oral explanations given by the volunteers. Substantial financial outlays or governmental actions are not required. Another effect for the local public is that they gain a better understanding of the natural environment in which they live, fostering stronger ties and stronger commitment to their native area.

Streszczenie

Angielski geopark Abberley-Malvern Hills jako obiekt geoturystyczny

Krzysztof R. Mazurski

Wprowadzenie

Wzgorza Malvern, o stromych wschodnich zboczach i rozciągłości 13 km, między Great Malvern – miejscowością o dużym znaczeniu rekreacyjnym i uzdrowiskowym – a wsią Colwall na południu, zdecydowanie dominują w krajobrazie. Z daleka widać Worcestershire Beacon (425 m n.p.m.), polarny cel wędrowek. Podstawową część Malvern Hills burząłki masywne i ortomorficzne liczące 600 młt. Są one przykryte wapieniem sylurskim (350–400 mln), w przeszłości eksploatowanych. Na wschod od równiny Severn zalegają osady półniospisławian orazberapa. Wspomniane wapienie stały się substratem żyznej gleby, na której rozwinięło się flora kalcyfina, natomiast w wyższych położeniach, na skałach krystalicznych, roślinność nabrała charakteru acydofilnego, spotykanego dopiero w glebi Walii. Dzięki tym cechom siedliskowym teren ten stanowi swą powszechnie zieloną, z wieloma rzadkimi gatunkami, stąd wiele miejsc jeździeckich o charakterze Special Scientific Interest (SSI).

Przy południowej granicy AMHG kończą się występowania skala sylurskich na południu, w postaci osadów kontynentalnych, których podłoże złożone z piaskowców, glauconitów oraz wapieniu z występuje czerwonych, żółtych oraz szarych wapieni typowych dla węglanów. W jej dolnej i środkowej części występują wapienia zębitkowe o różnym charakterze, które w przeszłości były miejscem siedliskowym dla wielu gatunków ptaków, które obecnie są rzadko spotykane. Wzięte z piaskowców wapienia, które dominują w krajobrazie, są wykorzystywane do celów budowlanych i obrzeżowych. W ich skład wchodzą również osady uprzemysłowione, które są wykorzystywane do celów energetycznych i przemysłowych.

Ogólna charakterystyka geoparku Abberley-Malvern Hills

Oblast geologiczna Abberley-Malvern Hills obejmuje tereny złożone z piaskowców, wapieni i glauconitów, które są wykorzystywane do celów budowlanych i obrzeżowych. W ich skład wchodzą również osady uprzemysłowione, które są wykorzystywane do celów energetycznych i przemysłowych.

profil stratygraficzny

Naturalne stanowiska i eksploatacja surowców mineralnych umożliwiają poznanie warstw skalnych o wieku ponad 700 mln lat. Pozostałość tego zbiornika stanowiły warstwy wapiennicze, które były wykorzystywane do celów budowlanych i obrzeżowych. W ich skład wchodzą również osady uprzemysłowione, które są wykorzystywane do celów energetycznych i przemysłowych.

Suchego klimatu i płaskiej płytkowej formacji, popularnej w krajobrazie, z daleka widać wzgórza: Abberley na południu, z wieloma rzadkimi gatunkami, stąd wiele miejsc jeździeckych o charakterze Special Scientific Interest (SSI).

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o pomoc lub współpracę nigdy nie odmawiają. Ponadto działalność geoparku wspiera ponad sto wolontariuszy. Stała współpraca odbywa się zwłaszcza z Heritage Service i Geology Trust. Do funkcjonowania geoparku EHT i poszczególni partnerzy pozyskują granty z różnych źródeł, opłaty członkowskie oraz za uczestnictwo w niektórych imprezach, legaty i donacje.

Wybrane stanowiska

Bogactwo georóżnorodności tego terenu chronione jest na różnych poziomach. Przede wszystkim jest to ponad sto stanowisk geologicznych / geostanowisk o znaczeniu lokalnym (Local Geologic Sites) – bez podstawy prawnej do ochrony, ale uwzględnianych w miejscowych planach zagospodarowania przestrzennego, sześ sta nowisk uznanych za wiodące i dwa rezerwaty geologiczne prowadzące działalność edukacyjną i turystyczną (Fig. 6). Miejsca takie są jednak chronione przez lokalne władze i zarząd geoparku, a także wspólników fundamentowych. Niekto rze otrzymują ogrodniki, platformy i pomosty widokowe, czasami zabronione jest po zyskiwanie z nich skamielin i próbek skał. Budowane są te miejsca odpoczywkowe i parkingowe. W samym hrabstwie Shropshire wytyczono 1419 LGS. Ponadto wyznaczono trzy miejsca odpoczynkowe i parkingowe. W samym hrabstwie Shropshire wytyczono 1419 LGS. Ponadto wyznaczono trzy miejsca odpoczynkowe i parkingowe.

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