Concepts of geodiversity

The value of geology as a science

Geodiversity and the concept of 'geoconservation' will be new to many people. The fact that the physical elements of the landscape – rocks and soils – need to be managed and in some cases protected is not evident to many. The very structure of the surface of the Earth perhaps seems so robust that protection is not needed. Consideration of the scale of soil erosion around the world, the rate of mineral extraction, the extent to which landscapes can be modified and remoulded to suit human needs, demonstrates that this is not true.

In this section you will find:

- discussion of the needs for geoconservation, stressing the value of geology as a science in its own right, as a science that underpins many aspects of our society and that also provides crucial insights into the history of climate change and sea-level rise that are now of especial relevance to people.

- an analysis of the the term 'geodiversity': what it means in a European and Australian context and an introduction to some of the key threats to geodiversity and the necessary legal frameworks needed to protect this part of our natural heritage.

- geoconservation examples from the European Union – covering soil conservation, petrified forests in Greece and German volcanic landscapes – to give a flavour of activities in Europe.

The early pioneers in geology such as Steno, Hutton, Murchison, Smith and Sedgwick have played an important part in the development of what are now universally applied principles in geology.

Geology – as a science – has existed as an academic discipline only for the last 200 years. Despite this, geology is of great scientific significance because it has made a valuable contribution towards our understanding of the history of the Earth and the evolution of life. The geological record contained in rocks and sediments contains evidence of billions of years of Earth history and many of our rocks can be used to demonstrate evidence of continental movement, climatic change, changes in sea level and the evolution of present-day natural landscapes. Geology also has a fundamental impact upon the human environment.

For example, geology and geological processes have influenced the following:

- location and distribution of natural resources that support our everyday existence.
- economic development at a local, regional and national levels.
- our natural and cultural landscape, land use and biodiversity.
- our understanding of the dynamic nature of the environment (mountain building, climate change, extinctions and geological hazards).
- people's social and economic wellbeing.

By learning about the geological processes that have shaped our planet in the past, we can make predictions about the impacts of climate change or changes in sea level. This will enable us to safeguard our future and ensure a positive future for generations to come.

"*The only record of the history of our planet lies in its landscape and in the rocks beneath our feet. Here, and only here, can we trace the cycles of change and renewal that have shaped the Earth in the past, and that will continue to do so in the future. The record is unique and much of it is surprisingly fragile. It must be conserved so that future generations can enjoy it and seek a greater understanding of it for the benefit of the planet and humanity*".
(Malvern International Task Force, 1993)

Emergence of the term 'geodiversity'

The first use of the actual word 'geodiversity' appears to have been in Tasmania shortly after the adoption of the Convention on Biodiversity at the Rio Earth Summit in 1992. However the use of terms such as 'landform diversity' and 'geomorphic diversity' were already being used during the 1980s, drawing parallels with biological concepts in using terms such as 'landform species' and 'landform communities'. Thus when 'biodiversity' came to international prominence in the early 1990s, Tasmanian geoscientists quickly adopted 'geodiversity' as the geological equivalent. And a very significant step forward was taken with the publication of the Australian Natural Heritage Charter, in 2002.

'*Conservation is based on respect for biodiversity and geodiversity. It should involve the least possible physical intervention to ecological processes, evolutionary processes and earth processes*' (Australian Heritage Commission, 2002).

However, the idea that geological and geomorphological diversity is important and ought to be conserved has a longer history. For example, the Report of the Wild Life Conservation Special Committee (Huxley, 1947) commented that 'Great Britain presents in a small area an extremely wide range of geological phenomena ... the supply of a steady flow of trained geologists for industrial work at home and overseas, require that there shall be available in this country a sufficient number of representative areas for geological study'. For 'range of geological phenomena' in this quote we could easily substitute 'geodiversity' and the conept of 'representative areas' selected for geoconservation has become a key aspect of conserving a country's geodiversity.

In Britain, the subsequent selection of sites through the Geological Conservation Review (GCR) began in 1977: '... From the outset the Geological Conservation Review used the highest scientific standards to identify systematically the key Earth science sites in Britain. The site series would reflect the range and diversity of Great Britain's Earth heritage ...' (Nature Conservancy Council document). One of the three components of site selection was 'sites that are nationally important because they are representative of an Earth science feature, event or process which is fundamental to Britain's Earth history'. Again, note

the use of the words 'range', 'diversity' and 'representative' in these quotes.

Similar implicit concepts of geodiversity conservation can be detected in other countries even though the term itself is not used. For example, in the USA, new units proposed for the National Park network must not represent a feature already adequately represented in the system. By implication, there is a sense here that the aim is to conserve representatives of the range of the country's natural and cultural heritage (including geodiversity). A second US designation, National Natural Landmark, must be 'one of the best examples of a type of biotic community or geologic feature'. In other words this site network attempts to conserve different types of geological features, i.e. geodiversity.

The use of the word 'geodiversity' was debated at an international geoconservation conference held in Malvern, UK in 1993, but failed to receive significant support because it was perceived to be attempting to draw too strong a parallel between sites, landscape features and processes in biology and geology.

In the last few years there has been increasing international use of the term, for example in all the Scandinavian countries, Spain, Portugal, Poland, Japan, United Kingdom, USA, as well as its continued use in Australia.

Definition of the term 'geodiversity'

There are many definitions of the term 'geodiversity'; some definitions focus on the variety of rock types, soils, landforms and processes operating within 'geological time and space', whereas other definitions make the link between geology, people and associated heritage such as biodiversity and our cultural landscape. Regardless of what definition is adopted it is essential that the term geodiversity is accepted and recognised outside the geological community and is adopted by policy makers, schools and the general public. This will encourage us to base our way of life upon the opportunities and resources that geodiversity has provided, whether it is landuse, mineral wealth or recreation.

Geoconservation

The conservation of areas, sites and features of geological and geomorphological importance is referred to as geoconservation. There are few actual definitions of geoconservation; Sharp (2002), suggests that if 'geodiversity' is the quality we are trying to conserve, then 'geoconservation is the endeavour of trying to conserve it'. The term 'geoconservation' has not been universally accepted as a term. For example, some, such as the United Kingdom have tended to use the broader term 'Earth Heritage Conservation' which refers to all aspects of the conservation, protection, management, interpretation and education relating to geological, geomorphological, landscape and soil sites.

There are many documented examples of measures to protect geological sites dating from the early 1800s. During the 1800s and early 1900s

Selected Definitions of geodiversity

'*the link between people, landscape and culture: it is the variety of geological environments, phenomena and processes that make those landscapes, rocks, minerals, fossils and soils which provide the framework for life on Earth*' (Stanley, 2001).

'*the range or diversity of geological (bedrock), geomorphological (landform) and soil features, assemblages, systems and processes*' (Australian Heritage Commission, 2002).

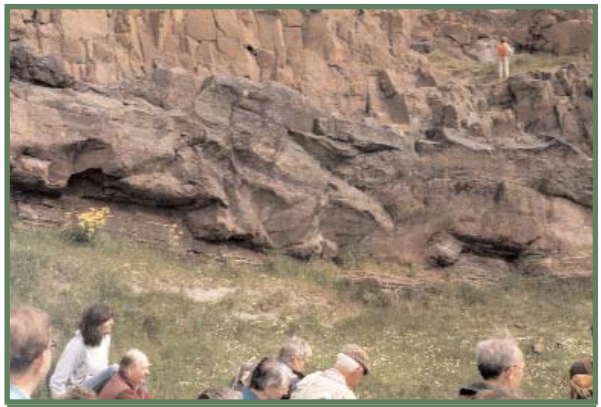
'*the natural range (diversity) of geological rocks (rocks, minerals, fossils), geomorphological (landform, processes) and soil features. It includes their assemblage of features. It includes their assemblages, relationships, properties, interpretations and systems*' (Gray, 2004).

'*geological diversity or the variety of rocks, fossils and minerals and natural processes*' (Prosser, 2002).

'*geodiversity is the quality we are trying to conserve*' (Sharples, 2002).

there was a strong appreciation that geology was a significant part of the natural world, supporting and helping to nurture the habitats and wildlife that live upon the underlying rocks and soils. For example, early examples of protective measures in the United Kingdom include legislation to protect Salisbury Crags in Edingburgh, and the Cheesewring granite tor in Cornwall, England from quarrying activity. Furthermore, the geological importance of the volcanic landscape of Siebengebirge, Germany was recognised in its designation as the first geological nature reserve in 1836. These early geoconservation efforts were not just confined to Europe. Nationally backed approaches to the conservation of the natural environment also emerged in the United States: for example, in 1864 Yosemite Valley in California became a protected area, which was closely followed by the designation of the world's first national park at Yellowstone. The main reason for its designation was to protect its 'natural curiosities and wonders', thus preserving the features of geothermal interest in their natural condition.

There have been many attempts to develop structured approaches to geological conservation since the 1800s. Examples include the development of a Dutch Geoconservation working group in 1969 called 'Gea' which had a target to develop an inventory of Earth science sites of scientific and educational importance. Geological societies within the United Kingdom such as Shropshire Geological Society and the Black Country Geological Society were also actively identifying 'sites of geological significance' or 'prime sites' using designation criteria based upon scientific and education importance. However, many of these initiatives were slow to progress largely due to lack of funding, political support and poor participation by nature conservation organisations and even by the geological community itself.



Hutton's Classic Section, Holyrood Park, Edinburgh - an early geoconservation site. Carboniferous dolerite sill intruded into Lower Carboniferous Ballagan Formation (Inverclyde Group) sedimentary strata. Note the upturned folded beds at the sill's basal contact in two places that convinced James Hutton of the dynamic intrusion of liquid magma as against the passive Wernerian 'crystallisation like salt from evaporating sea water' for the origin of igneous rocks.

During the late 1980s, the profile of geological conservation increased across Europe, largely due to a series of workshops and symposiums which allowed practitioners in geoconservation to communicate and share good practice at an international level. Earth Scientists from various European countries who shared a common interest in geoconservation were invited to attend the Leersum meeting in 1988. This meeting led to the establishment of the European Working Group on Earth Science Conservation. The number of countries participating in the working group and annual meetings increased steadily, but progress was slow and difficult, largely due to lack of support and the small number of professional practitioners in geoconservation. However, developments were not solely confined to Europe. Other countries such as China and Tasmania were actively participating in the conservation of geological sites

Key developments in geoconservation in the early 1990s were focused the following events:

- The publication of 'Earth Science Conservation – a Strategy' in 1990 by the Nature Conservancy Council in the United Kingdom.
- The Digne Meeting in 1991, the first international symposium on geoconservation which resulted in the signing of the 'International Declaration of the Memory of the Earth'.
- The International Conference on Geological and Landscape Conservation, Malvern 1993

Since the 1990s, geoconservation has progressed substantially and the numbers actively participating in geoconservation has increased, largely due to the dedication of individuals and organisations who have often been working on a voluntary basis. Many of these developments and examples of good practice will be reviewed later in this publication. However, despite these developments, conservation of our geodiversity is still overshadowed by habitat and species conservation. Many original geological designations have often enhanced the biodiversity of the site or area at the same time, and yet as a consequence the original reason for the designation – the geodiversity – has become overshadowed and there is often little or no geological interpretation available at such sites.

It is the responsibility of the geological community

Geology and ecology are inextricably linked. The often intimate relationship between geology and plants is an important factor in understanding the ecology of an area.

to raise the profile of geodiversity and to emphasise that geological conservation does not focus solely on the importance of non-living things in conserving biological systems or merely forming the substrate to support biodiversity. But it should be based on the premise that geodiversity has an important conservation value in its own right. This is only possible if geological conservation is firmly embedded in government policies and there is legislation in place to protect our geodiversity. Some of these policies are reviewed elsewhere in this publication.

Emergence of the term 'geoconservation' in the UK

Dr Colin Prosser
Principal Geologist, Natural England

The need to conserve geological and geomorphological features (geoconservation) was first recognised at a governmental level in the UK during the 1940s. A report entitled 'Conservation of Nature in England and Wales', published in 1947 by a government special committee which included geological specialists, recommended that geological and 'physiographical' (the latter now usually referred to as geomorphological) features and sites should be conserved as part of a national conservation system. As a consequence of this, the first national nature conservation legislation to be passed in the UK included provisions for the conservation of 'geological and physiographical features' (National Parks and Access to the Countryside Act, 1949).

Although the term 'geology and physiography' has remained enshrined within all revisions of nature conservation legislation up to the present day, the term 'geology and geomorphology' has replaced it in day-to-day use, to a point where the term 'physiography' has been dropped from common usage, other than in legislation.

The term 'geological and geomorphological conservation', sometimes combined into the term 'geoconservation', has remained in fairly consistent use in the UK, but other terms for essentially the same thing have also been used at different times. From the mid 1980s until the early 1990s the term 'Earth science conservation' was widely used, for example in the 1990 watershed publication by the Nature Conservancy Council, 'Earth science in Great Britain – a strategy'. Another term widely used in the 1990s was 'Earth heritage conservation', which emphasised heritage over science, and resulted in the renaming, in 1994, of the UK conservation agency journal 'Earth Science Conservation' as 'Earth Heritage', a title it still retains in 2009.

Despite the range of terms mentioned above, the term 'geological and geomorphological conservation' sometimes shortened to 'geoconservation' remains the most established and understood term in the UK. For example, the Geological Society of London channels all of its conservation activity through its 'Geoconservation Commission'.

Furthermore, the term 'geodiversity', as a means of describing the geoconservation resource, is now also used very widely in the UK. Perhaps the best way to capture current thinking in the UK is to quote Sharples, work from his work in Tasmania. Sharples defines 'geodiversity' as the quality we are trying to conserve, and 'geoconservation' as the endeavour of trying to conserve it (Gray, 2004).

Geoconservation concepts in Tasmania

Chris Sharples

The development of geoconservation concepts and management practices in Tasmania, Australia, has been closely linked with the identification and protection of nature conservation values in the Tasmanian Wilderness World Heritage Area (TWWHA). The inundation of the outstanding glacio-fluvial landform of Lake Pedder for hydro-electric development in south-west Tasmania in 1972 was a major event in the history of environmental politics in Australia. In Tasmania, it triggered the notion that landforms – and not just living things – should be a major focus of nature conservation.

After two decades of political controversy, the Tasmanian Wilderness World Heritage Area (TWWHA) was inscribed on the UNESCO World Heritage List in 1989. Two of its key values were its possession of large areas in which geomorphological and soil processes (fluvial, karst, coastal and blanket bog) were predominantly unmodified by contemporary human activities, and its possession of a range of relict glacial, glacio-karstic, periglacial and uplifted coastal landforms and sediments that provided the best southern hemisphere geomorphological record of the Late Cainozoic 'Ice Ages' phase of Earth history in a tectonically stable, temperate maritime environment. The significance of these values in the Tasmanian context has led to the development of geoconservation priorities focusing on maintaining the natural geodiversity of landforms and soils, and on conserving natural rates and magnitudes of change. This is in contrast to mainland Australia, where geological heritage work has historically had a much stronger emphasis on the preservation of bedrock features and rock exposures. However, dynamic geomorphological processes are highly relevant to mainstream nature conservation, since these underpin natural ecosystems and therefore how we carry out bioconservation. This ethos has made geoconservation easier for Tasmanian land managers to understand and perceive as relevant to their ongoing lifestyle and practices.

Recognition of geoconservation values as key values underpinning the World Heritage listing of the TWWHA has made funding available for a variety of relevant research and management activities, including the following examples:

- Monitoring and removal of invasive exotic dune vegetation from TWWHA sandy coasts, since such infestations have significantly modified dune dynamics on other Tasmanian coasts and hence threaten natural coastal geomorphological processes in the TWWHA.
- Innovative restoration of former natural hydrological processes associated with a quarry whose operation was degrading ongoing karst processes in the major Exit Cave system of the TWWHA.
- Research into the effects of differing burning regimes on TWWHA blanket bog peat soils, which can be severely degraded by excessive burning yet are periodically burnt deliberately in some parts of the TWWHA for bioconservation management. The TWWHA blanket bogs have World Heritage significance in their own right, and also play a major role in natural fluvial and hydrological processes in the TWWHA.
- Monitoring of bank erosion caused by tourist boat wakes on the TWWHA Gordon River estuary, and development of techniques to minimise boat wake impacts that are sympathetic to nature conservation.
- Revitalisation of mid-Holocene alpine lunette dunes damaged by former traditional stock grazing and firing in the Central Plateau region of the TWWHA.

Although much effort has been spent on researching and developing management practices aimed at protecting geodiversity in the TWWHA, the same geomorphologically focused conservation concerns have also led to significant measures to appropriately manage active karst systems, relict glacial landforms and other areas in Tasmania.

Threats to Geodiversity

There are many threats to geodiversity, although the majority of these threats are predominantly induced by human land use. However, natural processes such as erosion, climate change and the dynamic nature of the Earth can also present a threat to our existing geological heritage. A large number of geological sites or features have been lost, obscured or irreversibly damaged in response to changes in land use and increased urbanisation. In some cases this could have been prevented if adequate consultation had taken place at the planning stage, together with an increased recognition of the importance of protecting our geodiversity.

Human impacts on geodiversity can be summarised as:

- Complete loss of the geological features of interest (burial, excavation, or obliteration by engineering activity)
- Irreversibly interrupting natural geomorphological systems (for example, through coastal engineering)
- Partial loss or physical damage
- Fragmentation of features of interest, by systematic, or sporadic, human land management activities
- Loss of visibility of the geological features
- Loss of access, affecting our ability to view or study the geodiversity
- Interruption of natural processes in dynamic geomorphological sites

Purfleet Chalk Pits (Essex, UK). The site is designated as Site of Special Scientific Interest (SSSI) under British law, for the occurrence of unconsolidated sands and gravels which are important for understanding the Quaternary evolution of the River Thames and Northern European interglacial sequences. The site has been damaged by unauthorised tipping and the subsurface features of scientific interest are no longer accessible due to vegetation encroachment.

Pichovet, Vachères, France. The Campagne Calavon limestones are particularly rich in vertebrate fossils. In 1981, an almost complete skeleton of a herbivorous mammal, the size of a gazelle, was discovered. It is the only known complete specimen of Bachitherium insigne*. This fossil now belongs to the Luberon Geological Nature Reserve, it is displayed at the Vachères Communal Museum. The photographs illustrate some destructive excavations performed by fossil traders. The site was classified in 1987 as a geological nature reserve and is now protected.*

Legal framework for the protection of geodiversity

It is possible to protect geodiversity without legislative backing to a certain degree, using non-specific meaures. But it is unlikely that geodiversity can be successfully managed or protected without some supporting political, specific, framework. The existence of legislation requiring the implementation of geoconservation management can form the basis for allocating funding and can raise the profile of geodiversity at a national and international level.

Some countries do have legislation in place which offers protection to geological sites. Some of this legislation explicitly gives protection to features of geological interest but is largely aimed towards those sites of scientific and educational importance. The levels of statutory and non-statutory protection of selected areas are reviewed in Section C.

In the absence of specific geoconservation legislation (which is present in the UK, for example), geodiversity may get some protection in policies aimed towards nature conservation or the removal of historical or archaeological artefacts (which may be broadly interpreted to include geoconservation or the protection of palaeontological objects). For example, Act 1/91 on the Historic Heritage of Andalusia refers to geological and palaeontological heritage.

Despite substantial progress in adding geodiversity management and geoconservation to the political agenda, many countries do not have legislation in place to protect their geodiversity. Many do not have any relevant legislation or even a concept of

geological heritage. The lack of political support for conserving the geological heritage has proved to be a hindrance for those seeking international designations such as World Heritage Status for their premier geoveristy sites. However, nominations for inscription on the World List can be made only by governments. But the inscription of the Dorset-East Devon World Heritage site in 2003 in England is a great example of how this can be achieved.

Soil conservation

Patricia Bruneau, Scottish Natural Heritage

Soils are the foundation of all terrestrial ecosystems and cover most of the natural terrestrial world, supporting key processes involving the living world – growth of plants and therefore the food-chain, including agriculture – and, moreover, the exchanges with atmospheric and hydrological systems. Even in our cities, soils are present in gardens and parks, or lie beneath our buildings and pavements. Soils are at the interface between the organic and mineral world. Soil and the above-ground biodiversity are inextricably linked, such that we need to aware of how to use our soils sustainably.

Because of the timescale involved in their formation, soils are considered to be a non-renewable resource. However, soils are continuously changing as their properties and development reflect the interaction of soil forming factors (climate, relief, vegetation, fauna, geology) at any given time and location. Human-driven activities can affect the balance between these factors, leading to immediate, often adverse, impacts on the soil resource or acceleration of natural trends.

Changes to soils that affect their chemistry, physical properties and biological make-up are often irreversible and damaging and the best remedial action will only be able to restore what we can. A full understanding of any soil functionality requires an accurate assessment of:

The European Soil Directive

Hanneke (J.A.M.) van den Ancker, Foundation Geomorphology & Landscape, The Netherlands

It was only in the last stage of preparation of the Soil Directive that eleven international organisations handed over the EU Manifesto on Earth Heritage and Geodiversity, requesting to include the subjects of geodiversity and geological heritage in the directive. Their request was granted by the EU Commission and by the broad soil scientific platform SCAPE which was raised in support of the development of the Soil Directive and Soil Strategy.

The text of the EU Soil Directive was published in September 2006. Within the next two years this text shall be discussed in the European Parliament and in the Council of Ministers. It is planned to be implemented in 2008. EU countries are invited to develop best practices in soil management in line with the soil directive. Over fifteen years a review of the effectiveness of the soil directive and an improvement are planned. The text of Article 1 of the Soil Directive (see below) bears most relevance for geodiversity and geoheritage.

Article 1 of the EU Soil Directive
This Directive establishes a framework for the protection of soil and the preservation of the capacity of soil to perform any of the following environmental, economic, social and cultural functions:
(a) biomass production, including in agriculture and forestry;
(b) storing, filtering and transforming nutrients, substances and water;
(c) biodiversity pool, such as habitats, species and genes;
(d) physical and cultural environment for humans and human activities;
(e) source of raw materials;
(f) acting as carbon pool;
(g) archive of geological and archaeological heritage.

To that end, it lays down measures for the prevention of soil degradation processes, both occurring naturally and caused by a wide range of human activities, which undermine the capacity of a soil to perform those functions. Such measures include the mitigation of the effects of those processes, and the restoration and remediation of degraded soils to a level of functionality consistent at least with the current and approved future use.

- the soil's current status (e.g. extent and quality and understanding its physical make-up);
- the factors likely to change the soil (e.g. the way in which it is used, land-use change and climate change);
- the threats/risks to the soil (e.g. contamination, planning development, loss of biodiversity), and;
- the impact on, and response of, soil to changes.

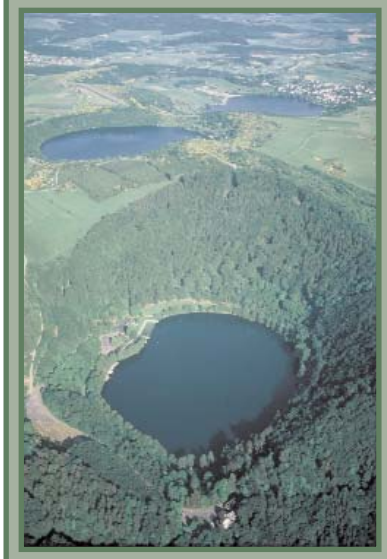
In relation to the natural heritage, soils perform a wide range of ecological and physical functions, involving both above- and below-ground ecosystems. These functions can be grouped into five categories:

i as components of geodiversity, playing a part in the physical processes that underlie the natural environment and creating the basis for scenery and the built environment;
ii as features of the natural heritage with their own intrinsic conservation value;
iii as an essential part of terrestrial ecosystems and a critical factor in the distribution of plant and animal species;
iv for their wider environmental contribution, linking air, water and land (e.g. the filtering and buffering function of soils in controlling nutrients, contaminants, greenhouse gases, carbon storage, runoff and water storage); and
v as an archive of environmental and cultural information (including palaeoenvironmental records and infromation about historical and prehistorical human activity) which may also provide baselines for environmental monitoring and forecasting.

The role of soils in the conservation of the natural heritage lies in their value as an intrinsic constituent of the natural heritage and in their support functions and interactions with wildlife, habitats and landscapes. In setting conservation objectives for soil, broader environmental objectives and the links between soil, air and water quality also need to be considered. It is important to recognise the different functions that soils perform and to identify clearly those issues related to protection of the soil as a component of the natural heritage and those related to the sustainable management of soil to maintain wider environmental services.

Soil is the link between geology, surface habitats and a wide range of human activities such as agriculture, horticulture and construction. Soil conservation is complex because of the physical and biological nature of the material, and needs to be addressed through approaches that integrate conservation and economic requirements.

Germany's Volcanoes – a region of maars...
Vulkaneifel European Geopark, Germany



Undeniably, Vulkaneifel is a fascinating place.

It is Germany's youngest volcanic region. A place where more than 350 million years of Earth history can be experienced. It is a source of famous mineral waters, and a region of superlatives: it has the youngest, deepest and largest maar on Earth. Not only that, it is also wonderful place to visit for a great holiday.

The area was shaped by violent explosions with lava and ash that spewed out from the depths of the Earth and blew holes in the planet's surface, creating what are now mountains. Up until 10,000 years ago the volcanoes here still gave off smoke and most recently the Ulmen Maar was formed – Germany's youngest volcano. Volcanic activity hasn't completely stopped, the volcano lies dormant, with another eruption likely in the future. Nevertheless, the legacy has been impressive: some 350 small and large volcanoes, maars, lava flows and countless mineral springs and gas vents. Yet the natural history of the Vulkaneifel Geopark offers even more: red sandstones, ancient tropical reefs and an impressive geological record of marine environments that existed hundreds of millions of years ago.

Craters full of water

Within the Vulkaneifel 75 maars have been identified. Nine of them are still water-filled and bear a maar lake – those are the 'eyes of the Eifel'. Other maars have developed into a sort of highland bog after the maar lakes have dried up, and have a unique plant diversity.

An exciting journey to the boiling past

The Vulkaneifel shows many geological phenomena that are unique world-wide in their occurrence, with a great international importance for the development of the study of the natural sciences. Research projects lead to new perceptions, but also stimulate new questions. The rocks of the Vulkaneifel are the key to understanding this impressive scenery and its history. Each interpretive centre in the park is centred around a specific topic and provides insights into the natural, historical and cultural relationships in the Vulkaneifel.

Volcanic hospitality

The landscape speaks for itself: maars, volcanic cones, spectacular cliff formations, and stone quarries with fossils that are millions of years old. But the journey through this landscape is enhanced by people that can tell about the history of the formation of these natural treasures: trained Geopark rangers are there to guide you through tours and excursions. And don't forget the restaurants, cafés, accommodation, studios and entertainment organizers willing to show interested visitors the connection between the volcanic landscape and gastronomic pleasures, artistic creativity and adventure activities.

To find out more visit the website at: http://www.geopark-vulkaneifel.de