



## CHAPTER 10

# Geodiversity, Earth protection and sustainable development

**Key words:** Geotope, geodiversity, geological heritage, geoparks, geoconservation, nature protection, biodiversity, sustainable development.

## Introduction

*Geodiversity* is the natural diversity of rocks, minerals, fossils, landforms, physical processes, soil features and their assemblages, relationships, properties, interpretations and systems. Geodiversity is part of the Earth's natural heritage and supports sustainable development by many ways, especially by attracting large numbers of tourists who wish to visit, enjoy and admire the dramatic and remarkable landscapes and geological formations that are witnesses to the history of the Earth.

Geodiversity can be considered as the main link between people and their culture and landscapes, through the interaction of biodiversity with aspects of geodiversity such as soils, minerals, rocks, fossils, active natural processes and the human, built environment. According to Gray (2004), active conservation of geodiversity is a measure of a civilized and sophisticated society that wishes to conserve elements of the planet that are both valued and threatened.

### 10.1. What is a *geotope*?

*Geotopes (or geosites)* are the geological and geomorphological sites and features that represent significant moments in the history of the Earth and are important witnesses of the long evolution of our planet, or demonstrate the active physical and geological processes that continue to evolve the Earth's surface. *Geotopes* can be considered as documentary evidence of the Earth's evolutionary process which have a special importance for science as well as for society as a whole. *Geotopes* are many and varied and their age can vary widely. We can see them in the countryside, in mountains, on coasts, in river systems and in cities. The qualities that a natural physical feature should ideally show to be identified as a geotope are rarity/or representativeness (of larger scale features), scientific value, naturalness (for a process-related geotope) as well as ideally a conservation status and, in many cases, an educational value linked to accessibility.

### 10.2. What is geological heritage?

*Geotopes* – both recognised and yet to be identified - constitute our *geological heritage*. The most important and the most representative geotopes should be identified and selected for conservation using appropriate legislation and policy and planning procedures. This is our duty for future generations.

### 10.3. How Geological Heritage is studied and why it should be protected

Geology is essentially a field-based science and the existence of well exposed geological features is critical for scientific study, educational use and recreational enjoyment. Geological heritage should be conserved because, firstly, it can be valued in many ways and, secondly, because it is threatened by a great variety of human activities. Geological heritage provides us with a means of studying and understanding both the history of our physical planet as well as the evolution of life. It records billions of years of history, during which time the Earth formed and evolved. Rocks, fossils and minerals record how continents have drifted, how life has evolved, how climates and sea-levels have changed and how natural processes such as volcanism, mountain building and erosion have shaped and continue to shape the landscape.

### 10.4. What is a Geopark?

*Geoparks* are (usually) nationally protected areas containing a number of geological heritage sites of particular importance, rarity or aesthetic appeal. Their interest may, in addition to geological, include ecological, archaeological, historical, or cultural features. Such Earth heritage sites or areas can contribute to an integrated concept for conservation, education and sustainable development of a region.

*Geoparks* achieves their goals through a three-pronged approach: Conservation, Education and Geotourism. They should also foster scientific research and cooperation with universities and research institutes, stimulating a dialogue between the geosciences and local populations.

### 10.5. What is the meaning of geoconservation?

*Geoconservation* (i.e. geological and geomorphological conservation) is the conservation of geology in its natural setting. This includes the conservation of rocks, fossils, minerals and natural processes. But it can also include museum specimens, building stones, geological data, maps, and art. In other words, Geoconservation deals with the conservation of non-living parts of the natural environment, including geological deposits and features, landforms and soils.

### 10.6. About nature protection and conservation

Nature protection and conservation have a long history. Some of the earliest attempts at conserving natural features were carried out by George Catlin in 1830 and Henry David Thoreau in 1850 and in 1864, George Perkins March formulated the first modern concept that man has to live with nature (Gray, 2004). Their efforts succeeded in 1864, when the Yosemite Valley in California, USA, became the first protected nature conservation area, followed by the world's first National Park at Yellowstone in 1872, also in the USA.

In the later 20<sup>th</sup> century, international bodies, such as IUCN, UNESCO and UNEP became more involved in nature protection with various initiatives and projects. For effective nature conservation systems, however, it is important that legal frameworks are adapted to meet local and national needs. In the last few decades many countries have also established legislation and

spatial planning systems and developed funding mechanisms to meet these needs. As a result, regulations for the conservation, management and protection of geotopes and often now available at many levels from state and regional authorities to local communities.

In various countries, geoconservation is also now incorporated into conservation policy and environmental protection as an essential environmental component. Connecting geoconservation to ecological and species (i.e. biodiversity) conservation provides a more holistic approach to nature conservation. In Europe the concept of geoconservation is widespread, although public awareness is still not at the level of biodiversity or other forms of conservation, such as archaeological and historical.

## 10.7. About sustainable development and geoheritage

Geological heritage is a part of the Earth's natural heritage and supports sustainable development by many ways, especially by attracting large numbers of tourists to dramatic and attractive landscapes and geological formations which are witnesses to the history of our planet. Initiatives like Geoparks stimulate local socio-economic development through the promotion of a quality-assured label linked with the local natural heritage and encourage the creation of local enterprises and cottage industries involved in geotourism and geoproducts.

## 10.8. About protected areas and geology

Even today, in protected areas such as Natural Parks, Cultural Parks and NATURA 2000 sites, an awareness of geoconservation is often missing, even when the links between biodiversity and geodiversity are obvious. Crucially, however, geoconservation can provide a fundamental background for biodiversity conservation, as geodiversity provides the variety of environments and conditions which directly influence biodiversity.

## 10.9. About the geological heritage of your area

To know about and value *local geological heritage* and its role in maintaining biodiversity creates a positive attitude towards nature as a whole. For this reason, geotopes are excellent tools for education for both teaching geology and raising awareness of the need for environmental protection. This raising of awareness can also help reduce the risk of inadvertent damage to or loss of important geological and geomorphological features.

An experiential approach to the study of geological features in place creates an understanding which can facilitate greater understanding of global and more complex geological processes. In this way, as well as raising awareness of geology and geological heritage, maintaining geotopes as part of broader nature conservation programmes can play an important role in the education of a general public.

### **Intended Learning Outcomes:**

- Demonstrate knowledge and understanding of the basic terminology of geodiversity.
- Be aware of geodiversity and geoconservation.
- Recognise that an understanding of geodiversity and geoconservation should be a precondition for broader nature consecration strategies.
- Be able to identify links between geoconservation and biodiversity conservation.
- Identify the links between geodiversity and biodiversity.

- Know where to find legislation for geoconservation at a national and international level.
- Recognise ones responsibilities for geoconservation issues as a local, national and international citizen.
- Appreciate geological heritage as a parameter for local sustainable development.
- Understand planet Earth as a system.

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- European Geoparks:** [www.europeangeoparks.org](http://www.europeangeoparks.org)
- GeoConservation Commission:** [www.geoconservation.com](http://www.geoconservation.com).
- Global Geoparks:** [www.globalgeopark.org](http://www.globalgeopark.org)
- Natural England:** [www.naturalengland.org.uk](http://www.naturalengland.org.uk)
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