Chapter 2: THE NEED FOR EARTH HERITAGE CONSERVATION

The value of Earth heritage sites and the importance of conserving them can be summarised under six themes:

- The international significance of Earth heritage sites
- Exceptional Earth heritage sites
- Earth science research
- Environmental forecasting
- Earth heritage sites in education and training
- Earth heritage as a cultural and ecological resource

Many people are aware of the need for the conservation of the natural world. Reports about pollution, disappearing rain forests, and the extinction of species have increased our perception of the need to protect the natural environment. Rocks, minerals, fossils, soils and landforms are an integral part of our natural world. The distribution of habitats, plants and animals depends not only upon climate, but also upon the geology and landscape.

As well as being a fundamental part of the natural world, geology and landscape has had a profound influence on society and civilisation. Our use of the land, for agriculture, forestry, mining, quarrying and for building homes and cities is intimately related to the underlying rocks, soils and landforms. Moreover, economic resources such as coal, oil, gas and metal ores have played an important role in the industrial development of Britain, particularly during the Industrial Revolution.

The international significance of Earth heritage sites

Much of the early knowledge of the history of the Earth was developed in Britain and many British sites have played a part in the development of now universally-applied principles of geology. These sites have great historical importance. For example, many of the names of periods of geological time are derived from Britain. Many other sites serve as international reference sections. By reference to these international ‘standards’, the relative ages of rocks all over the world can be compared. Other internationally important British reference sites include those where rocks, minerals and fossils were first described. Such sites must be conserved so that they can continue to be used as the standard references.

Dob’s Linn in south-west Scotland is an internationally important site officially recognised by the International Union of Geological Sciences (IUGS) as the reference section for the boundary between the Ordovician and Silurian Periods. This boundary is used as the global standard for comparative purposes. For example, fossils and other attributes that occur at Dob’s Linn can be compared with those in rocks elsewhere.

Exceptional Earth heritage sites

There are many sites in Britain which are of international importance because of their exceptional nature. For example, Charnwood in Leicestershire has yielded some of the oldest multi-celled animal fossils in the world. Similarly, a site at Rhynie in Scotland, contains some of the oldest known fossils of higher plants, insects, arachnids (mites and spiders) and crustaceans. They occur in an exceptionally well-preserved state, so much so, that microscopic detail and cell structures of the original organisms can be studied. Such sites are rare and are an irreplaceable part of the Earth heritage of the world.

Earth science research

The geology of Britain provides a resource for research. Natural rock outcrops and landforms, and artificial exposures of rock created in the course of mining, quarrying and engineering works, are crucial to our understanding of Britain’s Earth heritage. Future research which may help to resolve current geological problems, support new theories and develop new techniques or ideas only if sites are available for future study.
Moel Tryfan in Gwynedd is a historically important site, 400 metres above sea level, that consists of sand and gravel containing fossils of sea-shells. It was cited as evidence for the biblical flood by the Diluvialists. Subsequently it was interpreted as a glacial deposit carried from the sea bed by an Irish Sea ice sheet during the last ice age, about 23,000 years ago. This has a bearing on the dimensions of the last Irish Sea ice sheet, the extent to which it may have depressed the Earth's crust, and the degree of crustal 'rebound' after glaciation. It is a subject of ongoing research.

Environmental forecasting
Understanding how processes have operated in the past – the climate system, soil formation, desertification and the evolution and extinction of plants and animals – contributes to understanding the problems of the present. We may be able to use this knowledge to forecast volcanic activity, earthquakes or changes in climate. For example, by studying the dynamics of natural systems, such as rivers and coasts, it may be possible to predict how land and coastal processes will operate in the future. This will aid flood prediction and management, mapping of physically hazardous areas, and coastal management.

Evidence from the sediments and landforms, particularly over the past 15,000 years, shows that the natural environment is highly sensitive to climate change. Further study will throw light on possible future changes in the climate system and the faunal, floral and environmental responses to such changes.

As well as recording natural changes, the sediments in lakes and bogs provide records of the effects of human activities on the environment through pollution, vegetation changes (including forest clearance) and soil erosion. These records are important for assessing the effects of current human activity.

Traeth Mawr, Brecon Beacons. This site has a sequence of peat and clay deposits which contain a pollen record reflecting marked fluctuations in climate from 14,000 years ago to the present. It provides information about the nature and rate of climatic and environmental changes.

Earth heritage sites in education and training
Earth heritage sites are essential for training and education. Students and teachers need sites for practical demonstration of the principles of geology and to illustrate the processes of landscape evolution.

The use of rocks and minerals, water and the energy derived from fossil and nuclear fuels, are at the centre of modern society and are essential to its economic well-being. Trained geologists are needed to locate and extract oil and gas, metal ores, the raw materials for the construction industry, such as clays for brick-making, stone for building and aggregates for concrete. Geologists also discover aquifers, and locate reservoirs and sites for major engineering projects.

Earth heritage as a cultural and ecological resource
Geological features contribute to the aesthetic and ecological quality of landscape as part of the cultural heritage of Britain. Geology trails, visitor centres, museums, show caves and mines open to the public, enhance and deepen our appreciation of the Earth heritage. Some places attract hundreds of thousands of visitors each year.