



**Scottish
GEODIVERSITY
Forum**

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Scotland's Geodiversity Charter

www.scottishgeodiversityforum.org

Foreword

For its size, Scotland has an exceptional geodiversity—our rocks, landforms, soils and natural geomorphological processes span a vast 3 billion-year-long geological timescale. Scotland was the birthplace of modern geoscience, led by the great insights of James Hutton in the late 18th century. Hutton unlocked 'the abyss of time' and presented a vision of a living world that recognised the crucial links between geology, soils, plants, animals and human beings.

Today, the value of Scotland's geoheritage and the role it has played in the development of geoscience are recognised internationally. But it is much more than about events of the past. Geodiversity has a wide relevance today, affecting all of our lives in many different ways. It provides mineral resources for economic growth and sources of renewable energy. Our economy also benefits from the many visitors who come to experience our scenery and natural features.

Our vital biodiversity and life-support systems depend fundamentally on geodiversity for the support of habitats and ecosystems. We live in a dynamic environment where climate change may see enhanced risk of flooding, rising sea levels, coastal erosion and landslides. Understanding these natural processes is a vital part of enabling us to successfully manage and adapt to change.

Geodiversity also has wider cultural resonances through its inspirational role in art, literature and music and its contributions to people's 'sense of place'. Many iconic landmarks, such as Staffa, have strong cultural associations and are valued visitor attractions. Geodiversity forms the landscape foundations of many of our recreational spaces, with consequent benefits for people's health and well-being.

I therefore commend this charter which has been drawn up by the Scottish Geodiversity Forum, in recognising not only the value of geodiversity, but also the need for action to promote awareness and more integrated management as part of an ecosystem approach. It sets out a vision and outlines how everyone can contribute to ensuring that geodiversity continues to benefit present and future generations. This will help to position geodiversity alongside biodiversity and landscape in a more integrated way. In doing so, it will contribute to the Scottish Government's purpose of increasing sustainable economic growth and to realising a greener, wealthier & fairer, healthier, safer & stronger and smarter Scotland.



Stewart Stevenson MSP, Minister for Environment and Climate Change

This charter has been drawn up by the Scottish Geodiversity Forum, with support from the Scottish Government, Scottish Natural Heritage, the British Geological Survey and GeoConservationUK.



Introduction

Scotland has world-class geodiversity—the variety of rocks, landforms, sediments, soils and the natural processes which form and alter them. Our geodiversity is vital as the foundation of life, providing essential benefits for society through its profound influence on landscape, habitats and species, the economy, historical and cultural heritage, education, health and well-being. This Charter encourages everyone to work together to promote and manage Scotland's geodiversity and to ensure that it is better integrated in policy and guidance consistent with the economic, social, cultural and environmental needs of Scotland. This will help to protect our geoheritage and deliver more sustainable management of Scotland's natural resources, including minerals, land, river catchments, the coast and water resources, and will better inform climate change mitigation and adaptation.

The importance and value of Scotland's geodiversity

Scotland has been shaped during 3 billion years of the Earth's history by the movements of its tectonic plates, mountain building, volcanic activity, climate and sea-level changes, and erosion and deposition. This has given rise to a remarkable geodiversity of national and international importance, both on land and offshore. Scotland is recognised as the cradle of our modern understanding of the physical Earth, and many aspects of its geodiversity are renowned worldwide. The rich variety of fossils contained in Scotland's rocks have also contributed to our understanding of the evolution of life.

On land and offshore, geodiversity plays a critical role in: the exploration and production of mineral resources, coal, oil and gas; new technologies (e.g. Carbon Capture and Storage); location of wind and hydro power resources; infrastructure development; waste storage and remediation of pollution. It continues to make an immense contribution to Scotland's economy, as a source of energy and materials, and as a visitor attraction through its contribution to our unique landscape.

Crucially, Scotland's geodiversity underpins biodiversity through providing mosaics of landforms, soils, water, nutrients and natural processes to support our nationally and internationally important habitats, species and ecosystems. Our soils store large amounts of carbon, an important consideration in climate change mitigation. Today we live in a dynamic landscape where understanding of geomorphological processes is a vital part of 'natural' approaches to management of hazards such as flooding, coastal change and landslides. The geochemistry, too, of our rocks, soils and groundwater can have an important influence on human health.

Geodiversity links the people, cultures and landscapes of Scotland. It forms part of our 'sense of place' and has been a powerful influence on cultural and intellectual development, as a source of inspiration for art, sculpture, music, poetry, literature and science. Geodiversity is also a fundamental determinant of the character of our valued landscapes and seascapes, while the local character and distinctiveness of our built environment reflects the use of different building stones. As a rich resource for education and research, it lends itself to cross-curricular learning through the Curriculum for Excellence.

Geodiversity is internationally recognised by the Recommendation of the Committee of Ministers of the Council of Europe (2004) that: *“geological heritage constitutes a natural heritage of scientific, cultural, aesthetic, landscape, economic and intrinsic values, which needs to be preserved and handed down to future generations”*. UNESCO has also emphasised its importance through the Global Geoparks Network, promoting the cultural and sustainable economic importance of geodiversity.

Geodiversity has an essential part to play in dealing with the challenges we face today, such as sustainable economic development, changes in climate and sea-level, loss of biodiversity and improving people's health and well-being. Considered management of Scotland's geodiversity aligns with, and supports, the Scottish Government's purpose of increasing sustainable economic growth and its five Strategic Objectives. It also supports the delivery of the Scottish Biodiversity Strategy, the Scottish Soil Framework, the Land Use Strategy and Scotland's Landscape Charter.

The importance and value of Scotland's geodiversity and the many benefits it provides to society may be summarised through the provision of 'ecosystem services': the multitude of resources and processes that are supplied by natural ecosystems. Geodiversity benefits Society by providing:

- provisioning services: fresh water (surface and groundwater), mineral resources (including oil and gas, renewable energy).
- regulating services: carbon sequestration and climate regulation, regulation of erosion and natural hazards such as flooding.
- supporting services: soil formation, geomorphological processes, terrestrial and marine habitats.
- cultural services: aesthetic and inspirational values, landscape character, resource for recreation and outdoor activities, tourism and education and lifelong learning.



The need for action

Geodiversity is an integral part of the natural environment that cannot be taken for granted. It is a common misconception that the many facets of geodiversity are sufficiently robust not to require active management. Its loss or mismanagement, as a consequence of factors such as unsustainable or misguided development, changing land use or climate change, not only devalues our geoheritage but also presents real threats to biodiversity and can result in significant economic and social costs (e.g. enhanced coastal erosion or flooding). Conversely, the sustainable management of geodiversity and promotion of its importance and value can have very positive economic, social, cultural and educational benefits.

The value of geodiversity is less well appreciated than that of biodiversity or landscape, and by comparison, poorly integrated in wider environmental policy and decision frameworks. Such integration is now strategically vital not only to conserve vulnerable elements of our geoheritage, but also to ensure more holistic conservation management of biodiversity, geodiversity and landscape through the 'ecosystem approach'. The consideration of geodiversity at a strategic level will better inform robust action on climate change, and contribute to the Scottish Government's National Performance Framework.

Soils are essential both to geodiversity and to biodiversity. The Scottish Soil Framework (2009) provides the primary basis for activities promoting the better integration of soil issues into existing policy. Hence, while supporting the principles of the Scottish Soil Framework, this charter is concerned with soil actions essentially where they are seen as integral to the conservation of geoheritage and the management of geodiversity.



A vision for Scotland's geodiversity

The shared vision of the signatories to this charter is that Scotland's geodiversity is recognised as an integral and vital part of our environment, economy, heritage and future sustainable development, to be safeguarded and managed appropriately for this and future generations. We commit to maintain and enhance our geodiversity, recognising its contribution to Scotland's:

- natural heritage, valued landscapes and sea-bed features;
- habitats and species, and the many essential benefits it provides for society;
- adaptation to changes in climate and sea-level through sustainable management of land and water at a landscape/ecosystem scale based on the principle of 'working with natural processes';
- sustainable economic development;
- historical and cultural development, intellectual growth and creative expression; and
- public health, quality of life and national well-being and its role in re-connecting people with the natural environment.

To achieve the vision, future action should address four main areas of activity:

1. raising awareness of the importance of geodiversity and its wider links with landscape, culture and sense of place, and encouraging a sense of pride through education (at all levels including schools, universities and life-long learning), promotion and interpretation;
2. integration of geodiversity in relevant policies to ensure sustainable management of the natural heritage, land and water at a landscape/ecosystem scale for the wider benefit of Scotland's people, environment and economy;
3. conservation and enhancement of our geoheritage and its special character: within existing designated sites and areas, by further designation of local sites, and in the wider rural, urban and marine environments; and
4. research to improve our understanding of the role of geodiversity in providing benefits to ecosystems and people, and to address key knowledge gaps such as the functional links between geodiversity and biodiversity in terrestrial, freshwater and marine environments.

What needs to be done

The Charter encourages determined and collective action from all sectors—public bodies, commercial businesses, land owners and managers, academics, teachers, voluntary organisations and individuals—to fulfil our vision and so ensure that our geodiversity is adequately considered and conserved, and continues to provide essential benefits for Scotland.

A. Individuals and communities

Experience and enjoy your local landscape and geodiversity and appreciate its importance and value.

Actions:

1. Become a champion of your local geoheritage and work with partners to celebrate, conserve and promote it.
2. Help to identify and record new sites of interest, including temporary exposures (e.g. by contributing to citizen science projects - an example being www.bgs.ac.uk/citizenscience/).

Case study: Witch Craig Wall Local Geodiversity Site.

The Witch Craig Wall viewpoint in the Bathgate Hills was constructed to provide a welcoming resting place for walkers and stunning views across Scotland from the Bass Rock to Arran. The stonework includes a series of rocks illustrating the geology of the landscape.

Case study: Geoparks.

Scotland's Geoparks are community-based bodies that aim to protect and promote geological heritage while supporting tourism and sustainable rural development. The key strategic aims of the Scottish Geoparks align very closely with this Charter.



B. Land owners and managers and Non-Governmental Organisations

Take into account the geodiversity of the land you manage, try to work in sympathy with natural processes and landforms, and consider how geodiversity can be appreciated on your land.

Actions:

1. As far as possible work with the natural processes on your land (e.g. by the restoration of natural river channels).
2. Maintain the geodiversity of your land (e.g. by not burying existing rock exposures). Seek information and advice to help you understand what you can do to manage and enhance geodiversity.
3. Inform your local geoconservation group of any new exposures (e.g. landslips, borrow pits, road cuts, building sites). Contact them through our website, or contribute to Citizen Science projects.
4. Help local communities and schools to appreciate the connections between geodiversity, land use, history and biodiversity by encouraging safe and responsible access to local sites.
5. Incorporate geodiversity and geoheritage in your existing nature conservation activities or policies.

For advice and sources of further information to support these actions, see www.scottishgeodiversityforum.org

Case study: Logie Burn.

Two meanders of the Logie Burn were reconnected as part of the Dee Catchment Partnership project, restoring the burn to its old course. It is hoped this will improve water quality in downstream Loch Davan and also on the Muir of Dinnet National Nature Reserve.

Case study: Lang Craigs SSSI, north of Dumbarton.

The basalt cliffs of Lang Craigs offer spectacular views of the Clyde estuary and include a good, accessible example of an extensive landslip. In planting new woodland below the cliffs, Woodland Trust Scotland have worked with Strathclyde Geoconservation Group to ensure viewpoints are maintained.

Case study: Scottish Wildlife Trust Geodiversity Policy (2002).

The Policy recognises that geodiversity is an essential component of the natural heritage and that its conservation is an important part of land management practice. The Trust will promote the conservation of geodiversity through its work on its reserves and in its support for the Local Geodiversity Site system.



Top: The Callanish Standing Stones, Isle of Lewis demonstrating that the connection between people and geodiversity stretches back millennia © Lorne Gill/SNH.

Above: The Sgurr of Eigg, Inner Hebrides. A spectacular pitchstone ridge formed by volcanic activity 58 million years ago. © Brian Jackson.

C. Developers, industry and business sector

Ensure that new developments aim to maintain and enhance geodiversity and provide long-term, safe access to local sites of interest for education and enjoyment.

Actions:

1. Develop sustainable businesses utilising geodiversity, including tourism, accommodation, local products, guiding and interpretation, retail sales and local arts and crafts.
2. Develop company geodiversity action plans.
3. Work with natural processes as far as possible, and consider the 'ecosystem services' they provide when planning new developments.
4. Support efforts to encourage public awareness and enjoyment of geodiversity, by enabling safe access to rock faces and other sites of interest once work is completed.
5. Facilitate access to geoheritage features, including temporary exposures, and make available records and samples as part of local and national geological record keeping.

Case study: Machrihanish Golf Course.

Close collaboration between DMK Golf Design and Scottish Natural Heritage resulted in the successful development of a new golf course, Machrihanish Dunes, that is sustainable, resilient and in harmony with the geomorphology, wildlife and landscape.

Case study: Craigleith Quarry, Edinburgh - Local Geodiversity Site.

Edinburgh's most important sandstone quarry was infilled after extraction finished, and became a shopping centre. The local geoconservation group worked with Sainsbury's to safeguard and enhance the remaining rock face which is now designated as a Local Geodiversity Site.

Case study: Ravelrig Quarry, Kirknewton.

Tarmac's Ravelrig Quarry is a major source of aggregate for Central Scotland. Discussions have taken place with Lothian & Borders GeoConservation about restoration of the site when the quarry operation ceases, and the prospect of leaving an accessible rock exposure to show the contact of the dolerite sill with underlying sedimentary rocks.



Sandstone building stone used in the wall of the hunting lodge at Chatelherault, near Hamilton.
© Lorne Gill/SNH

Ravelrig Quarry, near Edinburgh. © Tarmac.

D. Local authorities, public agencies and government departments

Ensure that due consideration, management, enhancement and promotion of geodiversity and Local Geodiversity Sites are an integral part of decision making, and support action by local communities to achieve this.

Actions:

1. Acknowledge the value and importance of geodiversity in policy and guidance documents at national and local level, including national planning policy and Local Plans, and policies and guidance for biodiversity, nature conservation, climate change, tourism, landscape, greenspace, land & water management and marine conservation, and seek advice from appropriate expert bodies and agencies in decision making where appropriate.

2. Promote Scotland's geodiversity as a tourism asset that adds value to visitor experience and enjoyment.

3. Form partnerships with local geoconservation groups to audit geodiversity sites and develop geodiversity action plans, and involve local communities in collating information about sites of interest (e.g. former quarries, building stones).

4. Encourage developers to allow access to temporary exposures to record and sample, and to contribute borehole and other factual geological data to the British Geological Survey.

Case study: East Dunbartonshire Geodiversity Audit (2010).

This systematic evaluation of the area's potential Local Geodiversity Sites provides a foundation for developing a Local Geodiversity Action Plan. The audit recognised thirty-four sites on the basis of their scientific merit, value for education and community use, cultural/heritage/economic importance, access and site fragility. The sites also have numerous links to landscape character, historical structures, ecology and the economic and cultural history of the area.

Case study: Edinburgh Local Biodiversity Action Plan (2010-2015).

The Local Biodiversity Action Plan includes five geodiversity actions linked with 17 targets. These focus on the identification of Local Geodiversity Sites, monitoring site condition, promoting their use for education and public awareness, and developing skills and resources to support the work of Lothian and Borders Geoconservation Group.

Case study: Inverarnie Esker Trail, Strath Nairn.

Forest Enterprise worked with the local community to develop a forest walk and interpretation trail within Littlemill Fluvioglacial Landforms SSSI. The Trail makes use of deforested viewpoints and leads the visitor around the landforms created by the meltwaters from the last ice sheet, including some of the best examples of eskers and kettle holes in the country.

Case study: The Fossil Grove, Victoria Park, Glasgow.

When the fossil stumps of Carboniferous trees were exposed during excavations in 1887, the local authority constructed a building to cover the site, making this one of the earliest examples of geoconservation in Britain. In 2006, the Fossil Grove Trust was re-established to plan improvements.

E. Education and Research sector

Share and promote the values and applications of Scotland's geodiversity through world-class research and teaching.

Actions:

1. Work to inspire teachers and students at all levels about Scotland's geodiversity and the links with biodiversity, ecosystems, the cultural and built heritage and our economy. Develop the use of Scotland's geodiversity as a learning tool to promote outdoor teaching and learning in an Earth and environment context.
2. Share research evidence to demonstrate the wider benefits, values and applications of geodiversity (e.g. through Pathways to Impact and Knowledge Exchange).
3. Develop the scientific and theoretical framework of geodiversity and address key knowledge gaps, including the functional links with biodiversity and our knowledge of marine geodiversity and its wider significance.
4. Work with CAMERAS (Coordinated Agenda for Marine, Environment and Rural Affairs Science) to develop a strategic approach to monitoring geodiversity as part of the Scottish Environment Monitoring Strategy to meet evidence needs of decision makers to protect and improve the environment.
5. Improve access to, and encourage better use of existing information and data (e.g. through Scotland's Environment Website).
6. Help to promote the case for geodiversity at a policy level and support local geoconservation groups and local authorities in designating Local Geodiversity Sites.
7. Follow the Scottish Outdoor Access Code and established codes concerning fieldwork and collecting.

Case study: Moniaive GeoDial.

This sculpture was constructed in 2009 using a variety of rocks, mostly collected from the local area. It is used as an outdoor classroom by the local primary school, and as a place to celebrate the geodiversity of Dumfries and Galloway.



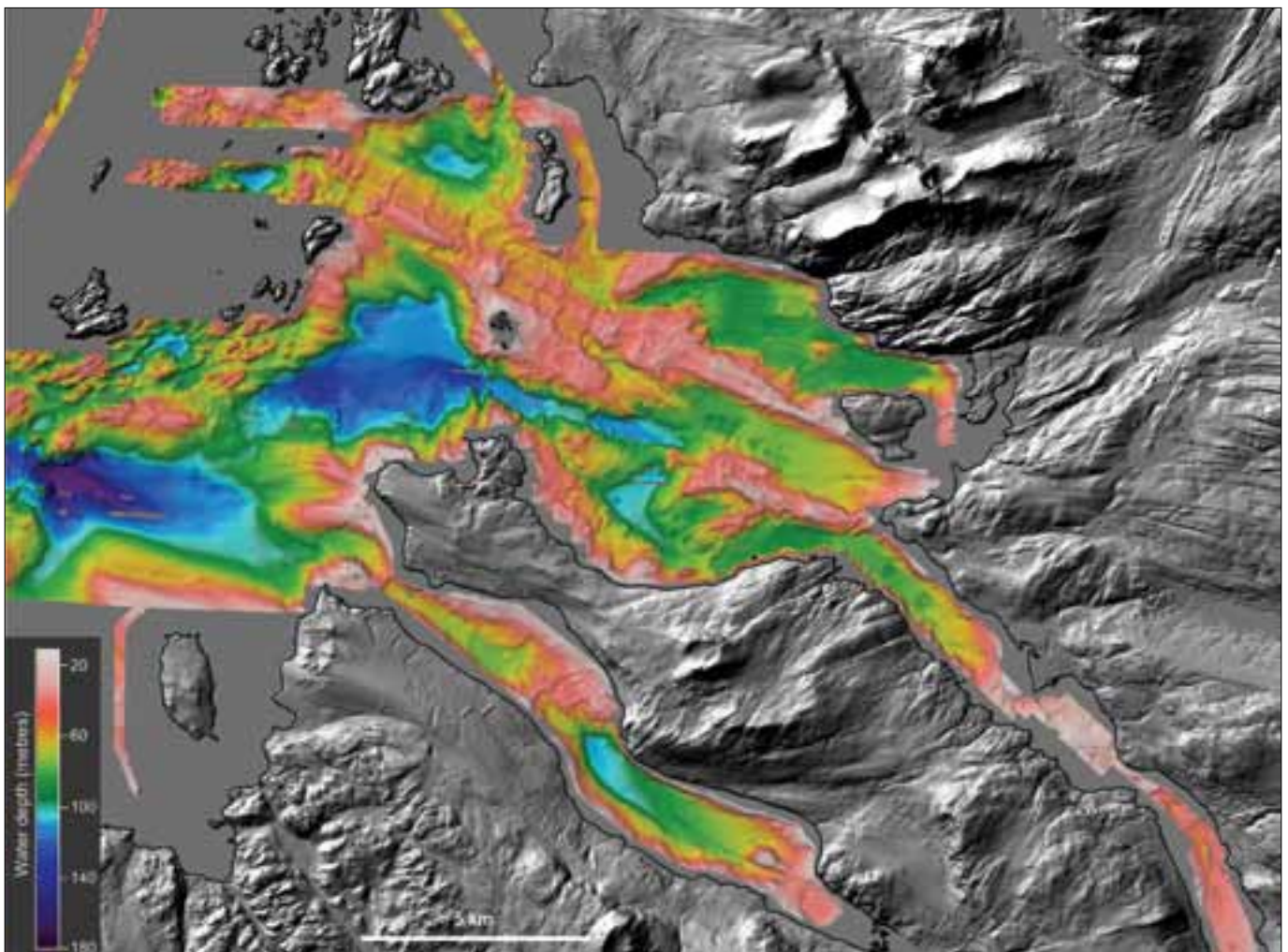
Launch of the Moniaive GeoDial, local geodiversity interpretation in action. © Jason Turner.

Case study: Seabed geodiversity, Loch Broom and the Summer Isles.

Recent studies by the British Geological Survey have revealed detailed information about the geodiversity of the seabed, including submarine moraines and other landforms. These provide an important link with onshore evidence and allow a much fuller understanding of the pattern of retreat and dynamic behaviour of the last British Ice Sheet.

Case study: The Scottish Earth Science Education Forum (SESEF).

SESEF develops resources to support Earth and environmental science teaching and learning within the Curriculum for Excellence. Examples include resources on energy, fossil fuels and new technologies (e.g. carbon capture and storage), glaciation and landscapes, climate change and outdoor education.



Sea bed topography in the Loch Broom, Little Loch Broom and the Summer Isles region revealed by detailed studies by the British Geological Survey. Image courtesy of BGS.

Signing the charter

The following organisations have signed this charter, agreeing to support the vision and work towards relevant actions:

Scottish Natural Heritage
British Geological Survey
GeoConservation UK
Botanical Society of Scotland
Royal Commission on the Ancient and Historical Monuments of Scotland
Royal Scottish Geographical Society
Scottish Earth Science Education Forum
Scottish Land and Estates

East Dunbartonshire Council
Glasgow City Council
Edinburgh Geological Society
Geological Society of Glasgow
Geopark Shetland
Lochaber Geopark
North West Highlands Geopark
GeoD (Geodiversity Dumfries & Galloway)
Geodiversity: Argyll & Islands
geoHeritage Fife
Lothian and Borders GeoConservation
Stirling & Clackmannan RIGS
Strathclyde Geoconservation
Tayside Geodiversity

Border Geo-Science
Geowalks
Mr Wood's Fossils
Shetland Geotours

Other organisations and individuals are encouraged to sign the charter, and further information can be found at the Scottish Geodiversity Forum website: www.scottishgeodiversityforum.org

The Scottish Geodiversity Forum was established in 2011. It promotes Scotland's geodiversity, and seeks to widen the profile of geodiversity and influence national and local policies. It is the national Scottish forum for local geoconservation groups, Geoparks, the industry and education sectors, related governmental and non-governmental organisations and interested individuals. The Forum promotes the role and value of geodiversity in education, community involvement and health, the development of tourism and the wider economy. It is open to all organisations and individuals who are interested in promoting Scotland's geodiversity and the sharing of experience and good practice.



Scottish Natural Heritage
Dualchas Nàdair na h-Alba

All of nature for all of Scotland
Nàdar air fad airson Alba air fad



British Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL



Royal Commission on the Ancient and Historical Monuments of Scotland



Lochaber GEOPARK



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