

Scotland's Geodiversity Charter

2018–2023

Foreword

From the familiar granite buildings of Aberdeenshire, to the sweeping landscapes painted by Horatio McCulloch, the Scotland we know has been hugely influenced by its exceptional geodiversity. Indeed Scotland is the birthplace of modern geology, for it was following a visit to Siccar Point in Berwickshire, in the late 18th Century, that James Hutton put forward his world-changing ideas on the origin and age of the Earth.

Thanks to Hutton's insights, we now know that 3 billion years of geomorphological processes have worked to shape Scotland's land and culture. Of course, such long timescales can be a challenge for many of us to relate to. But it is clear that we live in a dynamic environment where we can already see the effects of climate change happening around us. To manage and adapt to its impacts we need to understand natural processes, including the interactions between geodiversity and our wider ecosystems. For example, our soils and peatlands store huge amounts of carbon, form vital habitats for our wildlife and have a role in water management. Understanding the processes behind such interactions is crucial if we are to successfully adopt an ecosystem approach to managing our land.

Geodiversity also influences how we see ourselves. Our mountains, rivers and glens have been shaped over millions of years and are part of our 'sense of place'. They contribute to our geoheritage, as well as attracting tourists from around the globe. This geoheritage has been a source of inspiration for many artists, poets and scientists over the years.

Scotland continues to build on Hutton's legacy and, when this Charter was first published in 2012, it was the first of its kind internationally. With over 60 signatories it is clear that it has struck a chord. This is a good time to review progress over the first five years, and the Scottish Geodiversity Forum are to be warmly congratulated for their work to refresh the Charter. I am sure the Charter will continue to raise awareness of the importance of geodiversity and the benefits of an integrated ecosystem approach.



Roseanna Cunningham,
Cabinet Secretary for Environment, Climate Change and Land Reform



Front cover: The Highland Boundary Fault cuts across Loch Lomond, creating a stark landscape contrast between the Highlands and Lowlands of Scotland. © P&A Macdonald/SNH.

Above: The Ure Water meanders through salt marsh habitat on the Solway Firth; an environment where active processes maintain a delicate balance and support important biodiversity. © P&A Macdonald/SNH.

Introduction

Scotland has world-class geodiversity that provides the foundation of our remarkable geoheritage and essential benefits for people and nature. It has a profound influence on landscape, the economy, historical and cultural heritage, habitats and species, education, health and well-being.

This Charter encourages the promotion and management of Scotland's geodiversity and better integration of geodiversity into policy and guidance, consistent with the economic, social, cultural and environmental needs of Scotland. This will help to protect a crucial aspect of our natural heritage and deliver more sustainable management of Scotland's natural resources.

Geodiversity is the variety of rocks, landforms, sediments, soils and the natural processes which form and alter them.

The first five years

Scotland's Geodiversity Charter was launched in June 2012 and gained the support of 61 signatory organisations. The Charter has been successful in a widening appreciation of the many facets of geodiversity and its impact on society. The international importance of this, the world's first Geodiversity Charter, is recognised in similar initiatives being taken forward in other nations of the UK. Three updates have been published to promote the Charter and share new case studies.

The Charter has encouraged varied and innovative public engagement projects organised by small voluntary organisations working in partnership: voyages in homage to Hugh Miller, a writing competition, workshops, conferences and festivals. Two of Scotland's community-led Geoparks have gained UNESCO Global Geopark status and are actively contributing to their local economies.

Engagement with and support for Scotland's Local Authorities has encouraged better awareness of local geodiversity, with several Local Authorities developing geodiversity audits and Geodiversity Action Plans (often included in Local Biodiversity Action Plans). Over 100 Local Geodiversity Sites are now designated in central Scotland. The Scottish Geodiversity Forum and other partners have worked with the tourism industry to showcase the value of Scotland's geodiversity in promoting Scotland internationally.

The Charter was established and is being taken forward by the Scottish Geodiversity Forum, with support from the Scottish Government, Scottish Natural Heritage, the British Geological Survey, GeoConservationUK and other partner organisations. These organisations will continue to promote the Charter through conferences and the sharing of best practice and support further developments by signatory organisations.

Geoheritage is those elements of our geodiversity that have significant intrinsic, cultural, aesthetic, scientific or educational value.

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 tectonic plates, mountain building, volcanic activity, climate and sea-level changes, and erosion and deposition. This has given rise to a remarkable geodiversity, both on land and offshore. Scotland is the cradle of geological science, with many aspects of our geodiversity renowned worldwide and contributing key aspects of world geoheritage. Together, the different elements of geodiversity record the history of the Earth, as in the pages of a 'great stone book', and form part of our natural heritage to be passed on to future generations. The rich variety of fossils contained in Scotland's rocks has contributed significantly to our knowledge of the evolution of life.

Geodiversity is not only about the past, but enables a better understanding of the geological processes that continue to shape the world we live in today and it contributes to human well-being through cultural and aesthetic values and other economic and environmental benefits for society.

Geoheritage 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 the fundamental determinant of the character of our valued landscapes and seascapes, while the local character and distinctiveness of our built environment reflect 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 and provides opportunities for lifelong learning. In addition, it provides the platform for diverse recreation and outdoor activities that contribute to the economy and people's health and well-being.



Kayakers take to the sea from Elgol, Isle of Skye, to explore a varied coastal and mountain landscape created by 58 million year old volcanic rocks intruding older sedimentary layers.
© George Logan/SNH.

Tourism, a vital component of Scotland's economy, is largely based on geodiversity. Visitors come to Scotland for world-class scenery, distinctive history and culture and an outstanding natural environment. Scotland's Geoparks, developed by their local communities, are beacons of innovation that demonstrate how awareness and promotion of geodiversity can contribute to local economies. Geological tourism in Scotland is still small in scale, but there is potential for international marketing of Scotland as 'the home of geology'.

On land and offshore, geodiversity makes a significant contribution to Scotland's economy as a source of energy and materials, playing a critical role in: the exploration and production of mineral resources, coal, oil and gas; the development of new technologies (e.g. Carbon Capture and Storage); the location of wind and hydro power resources; infrastructure development; waste storage and remediation of pollution; and provision of fresh water.

Scotland's geodiversity provides the foundation for a rich biodiversity. Mosaics of landforms, soils, water, nutrients and natural processes support nationally and internationally important terrestrial and marine habitats, species and ecosystems. Soils store large amounts of carbon, an important consideration in climate change mitigation. We live in a dynamic landscape where understanding of river, coastal and slope processes is a vital part of nature-based solutions to management of hazards such as flooding, sea-level rise, coastal erosion and landslides.

International recognition of geodiversity

There is now international appreciation of the value of geodiversity and growing support for its conservation. The International Union for Conservation of Nature recognise that geodiversity is part of natural diversity and geoheritage is part of natural heritage (Resolutions WCC 2008 RES 040 and WCC 2012 Res 048). They also acknowledge the scientific, cultural, aesthetic, landscape, economic and intrinsic values of geoheritage and the relevance of geodiversity in underpinning biological, cultural and landscape diversity. This follows 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". The United Nations Organisation for Education, Science and Culture (UNESCO) also recognised the importance of geodiversity with the creation of UNESCO Global Geoparks in 2015. This is the first new UNESCO designation of this kind to be established in over 40 years and puts Global Geoparks alongside UNESCO's World Heritage Sites.

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 conservation or active management. The loss or mismanagement of geodiversity, 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, educational and public health benefits.

Integration of geodiversity into wider environmental policy and decision frameworks is 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' advocated by the Scottish Biodiversity Strategy. Geodiversity has an essential part to play in dealing with societal challenges, including sustainable economic development, changes in climate and sea-level, loss of biodiversity and improving people's health and well-being. The consideration of geodiversity at a strategic level will better inform robust action on climate change, and contribute to the Scottish Government's five Strategic Objectives and the National Performance Framework.



St Andrews University GeoBus assists GCSE geology pupils from Mintlaw Academy with field work, taking a closer look at the Portsoy gabbro intrusion.
© GeoBus.

Scotland's Geodiversity Charter: 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 managed appropriately and safeguarded for this and future generations.

We commit to maintain, promote and enhance geodiversity as an integral part of our natural heritage, recognising its contribution to:

- Scotland's remarkable geoheritage
- historical and cultural development, intellectual growth and creative expression
- sustainable economic development and essential benefits for society
- informing nature-based solutions for adaptation to changes in climate and sea-level
- supporting biodiversity
- public health, quality of life, national well-being and reconnecting people with nature.







A new rock cutting on the southern approach to the Queensferry Crossing exposes a superb section through Carboniferous sedimentary rocks, including sandstone and mudstone.
© Lorne Gill/SNH.

Achieving the Vision

The Charter encourages determined and collective action from all sectors – public bodies, industry, 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.

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

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- Raise awareness** of the importance of geodiversity and its wider links with landscape, culture and sense of place, and encourage a sense of pride through education (at all levels including schools, universities and life-long learning), promotion and interpretation.
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- Integrate 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.
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- Conserve and enhance** our geoh heritage 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.
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- Undertake 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.

A. Individuals and communities

Promote the importance and value of local geodiversity and landscapes. Join a local geoconservation group, start your own group or volunteer to help in one of Scotland's Geoparks. You can:



Raise awareness of the importance of geodiversity and its links to local landscape and culture.



Provide information on local geodiversity to local authorities, encouraging integration of geodiversity in policy and planning decisions and the designation of Local Geodiversity Sites.



Undertake practical restoration and maintenance work to improve the quality of geodiversity sites in your area.



Visitors discover the geological explanation while enjoying the view over Loch Glencoul in the North West Highlands UNESCO Global Geopark.
© Lorne Gill/SNH.

Case Studies

UNESCO Global Geoparks

Geoparks are run by local communities to promote and manage geological sites and landscapes with a strong focus on education and sustainable development, creating jobs and supporting small businesses. Scotland's Geoparks run visitor centres, organise events (including festivals, guided walks, talks and geotours) and provide interpretation to help visitors and local people understand the landscape and geology of their area.

In 2015, the creation of UNESCO Global Geoparks gave these areas of geological significance an equivalent status to UNESCO's World Heritage Sites. Geopark Shetland and the North West Highlands Geopark became UNESCO Global Geoparks in 2015, and Lochaber Geopark has now applied for UNESCO status.

Hugh Miller: celebrating the legacy of Scotland's great geologist, writer and social campaigner

In 2014 and 2015, two sailing voyages celebrated the rich legacy of Hugh Miller (1802–1856). Miller was a writer and newsletter editor, key figure in the Free Church, social campaigner and fossil collector. His book, *The Cruise of the Betsey*, documented social conditions in the Inner Hebrides as well as his geological discoveries.

The two voyages brought together writers, artists, geographers, film makers, geologists and local communities. They were organised by a partnership including the Royal Scottish Geographical Society, The Friends of Hugh Miller and the Scottish Geodiversity Forum, with support from the geological societies of Edinburgh and Glasgow. The subsequent Hugh Miller Writing Competition in 2016 resulted in new poetry and prose inspired by Miller's writing.

Atlantic Island Centre, Luing

This new building on the Island of Luing, south of Oban, tells the story of the people, nature and landscape of Luing and the adjacent islands. Since opening in May 2015 the Centre has made a huge difference to people's lives, providing a hub for the community, with a cafe, exhibition space and rich cultural programme of arts and science events all year round.

The centre also provides information for visitors, and its success is reflected in a threefold increase in visitor numbers to the island, including many groups. Additionally, the Centre has created 6 FTE jobs (increasing the number of jobs on the island by over 30%) and motivated 36 regular volunteers who donate 1,000 hours of work per month.

Safeguarding Skye's fossil heritage for research and tourism: Staffin Museum, Skye

Founded and curated by Dugald Ross, the Staffin Museum contains excellent collections of local geological and fossil specimens, as well as representative artefacts illustrating the prehistory and social history of Trotternish on the north-eastern tip of Skye.

Since its development in the 1980s, the Museum has become a popular tourist attraction and has increased awareness and understanding of Skye's fossil heritage both in the local community and among visitors. Dugald's voluntary rescue and safeguard of internationally important fossil material, in conjunction with paleontological research, has allowed significant advances in Middle Jurassic dinosaur ecology and evolution, raising the profile of Skye's geology in the international arena.

B. Land owners and managers

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. You can:



Help local communities and schools to appreciate the connections between geodiversity, land use, history and biodiversity, and encourage safe and responsible access to sites.



Incorporate geodiversity and working with natural processes into your management practice, existing nature conservation activities or policies.



Maintain the geodiversity of your land. Seek information and advice to help you understand what you can do to manage and enhance geodiversity.



Support responsible geodiversity research, and ensure important sites are accessible and safe for study.



Restored meander at Rottal Burn, Glen Clova; creating a more natural flow benefiting habitats and wildlife.
© EnviroCentre.

Case Studies

Rottal Burn, Glen Clova, Angus

The River South Esk in Glen Clova is one of Scotland's leading salmon rivers. It is designated a Special Area of Conservation (SAC) for both Atlantic salmon and the freshwater pearl mussel. The Rottal Burn is a major tributary of the River South Esk. However, in an effort to reduce flooding in the area early in the 19th century, the Rottal Burn was radically straightened by digging a new channel which effectively destroyed the habitat for fish.

Around 2012, a partnership involving SEPA, SNH, Landowners, the Local Authority and the Esk Rivers & Fisheries Trust brought about the restoration of 800 metres of canalised burn to its original meandering course with the planting of several thousand native tree species. The result has been a return to a more natural flow regime. This has created a diverse riparian and aquatic habitat and brought visual enhancement of the area. It is hoped that the restoration of this dynamic geodiversity feature will in time encourage the return of freshwater pearl mussels to the Rottal Burn.

The restoration of this Angus burn, to its original meandering course, illustrates how consideration and appropriate management of dynamic geodiversity features can benefit biodiversity.

SNH Remedies project

In the last 6 years, SNH has applied 'remedies' – management interventions – at over 20 geological sites. The most commonly required action is tree or scrub clearance, but there has also been removal of graffiti from rock faces, measures to prevent dumping, removal of dumped material (including 6 vegetation-covered vehicles at one site), and habitat management to reduce dune erosion. Implementation of remedies is ongoing and will continue in tandem with the Site Condition Monitoring programme, now in its third seven-year cycle.

National Trust for Scotland – Culzean

Culzean Castle and Country Park, managed by NTS, contains a coastal stretch notified as a Site of Special Scientific Interest for both its geological and biological features. The geological features are of international importance demonstrating the intrusion of magma into what was soft, wet sediment. Work was required to remove and replace the existing sewage outfall, remove long-redundant sewage pipework from the castle cliffs and install a new iron outfall pipe. In consultation with SNH, the works (including the construction of a temporary road across the beach) were undertaken in manner that considered the conservation value of the rock outcrops, resulting in minimal negative impact on the geodiversity.

C. Industry and business

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



Support efforts to encourage public awareness and enjoyment of geodiversity. Develop sustainable businesses utilising geodiversity, including tourism, local products, guiding and interpretation, retail sales and local arts and crafts.



Develop company geodiversity action plans. Contribute to geodiversity work carried out by Local Authorities, including site audits and action plans.



Work with natural processes as far as possible, and consider the 'ecosystem services' provided by geodiversity when planning new developments.



Facilitate access to geodiversity features including temporary exposures, and make available records and samples as part of local and national geological record keeping.



The abandoned Spireslack Opencast pit in East Ayrshire presents opportunities for development to create a visitor attraction and a training ground for academia and industry. © BGS.

Case Studies

Preservation of a geological section in quarry restoration - Geopark Shetland

Haggrister quarry in Shetland was used for several years as a roadstone quarry, during which time white scapolite veining and an ultrabasic intrusion were exposed in striking contrast with the red Eastern Granite. It was designated as a geosite by Geopark Shetland and a number of geology field trips and tours made use of the resource.

Geopark Shetland have developed a close working relationship with the planning department at Shetland Islands Council, with a representative from the department sitting on the Geopark Shetland Working Group. This ensures that Shetland's more than 100 geosites will be given consideration within the development process, even though most of them have no statutory protection.

When the quarry operation ceased and reinstatement was planned, Geopark Shetland was able to work with the developers through the planning department in order to ensure that the geological interest was left exposed and safely accessible. The site was subsequently designated as a Local Nature Conservation Site within the Shetland Development Plan and is now frequently visited by geological field parties.

Lochaber Geopark: development of business opportunities

Lochaber Geopark is a community-led Scottish charity run by a volunteer board of Directors, with the support of many other volunteers. The Geopark employs four part-time staff (3 FTE posts) to manage the Geopark, a Visitor Centre on Fort William High Street and the 'Darwin's Rest' café, craft shop and information centre in Roy Bridge, at the entrance to the Glen Roy National Nature Reserve and the Parallel Roads of Glen Roy. These developments were made possible by a three-year business development grant from Highlands and Islands Enterprise in 2016. The business plan is for Lochaber Geopark to become self-sustaining, by selling own-brand merchandise, including 'Ben Nevis' chocolates, high-quality craft goods from local suppliers, books, maps and guides. Goods and information are also available at a growing network of 'Lochaber Geopark Info Points' throughout the area.

Scottish Carboniferous Research Park / East Ayrshire Council area for conservation

The late 18th to mid-20th century industrial prosperity of Scotland and its urban development depended upon the extensive deposits of approximately 325 million year old Carboniferous coal, ironstone and oil shale. Opencast coal sites at Spireslack in East Ayrshire and at Mainhill Wood in South Lanarkshire are now unique and stunning geological exposures. These sites can be retained for a wide range of uses and developed to provide a rich visitor and learning experience of coal geology, the coal industry and a way of life for previous generations of Scots.

The Scottish Mines Restoration Trust, the British Geological Survey and partners are exploring ways to fulfil the potential of the sites as an open-air laboratory and learning platform, alongside a rich visitor experience that can support local businesses and communities.

D. Local authorities, public agencies and Scottish Government

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. You can:



Promote Scotland's geodiversity as an asset that provides a sense of place for local communities and adds value to visitor experience and enjoyment.



Acknowledge the value and importance of geodiversity in policy and guidance at national and local level, and seek advice from appropriate expert bodies and agencies in decision making.



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.



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.



Dumbarton Rock on the River Clyde, where geodiversity creates a varied landscape and complex river and estuary system, influencing the human use and biodiversity of the river. © SNH.

Case Studies

Clyde Marine Partnership, integrating geology into marine planning

The Clyde Marine Planning Partnership is tasked to create a statutory marine plan for the Clyde marine region. The geodiversity of the Clyde has a significant impact on its shape, function and ecosystem. The sediments play an important role in waste breakdown and detoxification of the water, as well as supplying nutrients and minerals that form the basis of the food chain. Soft muds provide essential habitat for *Nephrops* which underpin the Clyde's main fishery, and intertidal mudflats support internationally important numbers of wintering birds.

In providing source material for replenishing the beaches the seabed geology is integral to the amenity value of the coast, while the raised beaches support a number of world-renowned golf courses. The topography of the seabed and the surrounding hills plays a significant role in everything from tidal dynamics to wind patterns. The wealth of geodiversity makes the area fascinating for everyone from university students to rock climbers. It is a perfect training ground for a wide range of skills, from geologist to submarine helm or kite flyer!

Designation of Local Geodiversity Sites in the Lothians

Lothian and Borders GeoConservation has worked with City of Edinburgh Council, West Lothian Council and the British Geological Survey to identify 80 sites with important local geodiversity. The City of Edinburgh Council designated 30 geodiversity sites as Local Nature Conservation Sites in the Edinburgh Local Development Plan adopted in 2016. West Lothian Council have listed 51 West Lothian Geodiversity Sites in Supplementary Guidance that supports the West Lothian Local Development Plan.

Clyde Urban Super Project (CUSP)

Knowledge of the subsurface is vital in planning and delivering successful construction and regeneration projects – yet poor understanding of ground conditions is the largest single cause of construction project delay, and overspending. To address this, and other urban subsurface issues in the Glasgow area (e.g. planning, flooding, contamination), the British Geological Survey's (BGS) Clyde-Urban Super-Project (CUSP) has developed 3D and 4D subsurface models and other geoscience datasets (geochemistry, groundwater, engineering geology).

The models and datasets provide new insights into Glasgow's complex geology, impacts of its industrial legacy, and opportunities for harnessing heat from abandoned mine workings.

To increase accessibility, BGS and Glasgow City Council have established the pioneering ASK (Accessing Subsurface Knowledge; www.bgs.ac.uk/asknetwork), a data and knowledge exchange network involving public and private sector partners. In addition, a NERC Knowledge Exchange Fellowship is helping to translate improved understanding of Glasgow's sub-surface into appropriate forms to support various decision-making purposes, and underpinning regeneration and other projects, and the next generation of Glasgow's City Development Plan.

Lessons learnt in Glasgow are being shared widely, for example through a European COST Action (Sub-Urban) focussed on sustainable urban subsurface use in 30 countries, between those who develop urban subsurface knowledge and those who can benefit most from it – the planners and developers of the cities of tomorrow.

www.bgs.ac.uk/research/engineeringGeology/urbanGeoscience/clyde

E. Education, research and museums

Share and promote the values and applications of Scotland's geodiversity through education, public outreach and world-class research. You can:



Inspire teachers and learners at all levels about Scotland's geodiversity and the wider links. Develop the use of Scotland's geodiversity in outdoor learning in an Earth and environment context. Support and develop outreach activities for the general public.

Improve access to, and encourage better use of existing information and data (e.g. through Scotland's Environment Website).



Help to promote geodiversity at a policy level. Share research evidence to demonstrate the wider benefits, values and applications of geodiversity.



Follow the Scottish Outdoor Access Code and other codes and advice about fieldwork and collecting. Support local geoconservation groups and local authorities in designating Local Geodiversity Sites.



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.



A summer field camp organised by GeoBus from the University of St Andrews encourages keen school pupils to find out more about opportunities for studying geoscience at university. © GeoBus.

Case Studies

GeoBus: taking Earth Science education to schools across Scotland

GeoBus is an Earth Science education resource based at the University of St Andrews, which delivers interactive workshops in Scottish secondary schools. Launched in 2012, the project worked with over 54,000 pupils in its first five years in schools all over the country – from Gretna to Shetland and everywhere in between.

There are currently no specific Earth Science qualifications in the Scottish curriculum and, as a result, GeoBus works with classes (and teachers) across a variety of subjects to highlight the integral and applied nature of Earth Science, as well as the opportunities available in a diverse range of related careers. In addition to classroom workshops, GeoBus also supports senior pupils carrying out project fieldwork for Geography and Environmental Science qualifications and promotes responsible approaches and best practice in an outdoor learning context.

GeoBus actively involves current researchers and industry partners in the development of teaching materials, and promotes continued interaction and learning by providing follow-up resources and teacher CPD sessions on specific topics. Acting as a uniquely well-established bridge between industry, academia and schools, GeoBus is therefore well placed to champion geodiversity in Scottish education.

geobus.st-andrews.ac.uk

Shore shapers

The shore shapers guide helps people understand more about the geomorphology of rocky coasts and how the plants and animals that live on rocky shores shape their habitat, explaining how rock composition and physical characteristics influence the types of plants and animals that live on the shore. It was showcased by The Times and National Geographic Kids Magazine in 2014, and became a permanent exhibition in the aquarium at the Field Studies Council Centre in Millport in 2015. It is used in Scottish Wildlife Trust public engagement activities with Edinburgh schools as part of the Edinburgh Living Landscapes programme, with funding from NERC's pilot earth public engagement call. The guide was funded by Esmée Fairbairn Foundation.

www.shoreshapers.org

ClimateXChange: assessing risks to geoheritage

ClimateXChange has assessed the vulnerability to climate change of natural heritage features in protected areas, including more than 650 notified Earth Science features in Scotland's Sites of Special Scientific Interest. Scottish Natural Heritage has taken a lead role in this work alongside the James Hutton Institute, Aberdeen University and Dundee University. The project assessed risk of detrimental climate change impacts on Earth Science features based on factors including fragility, location and extent. This work will continue to consider suitable mitigation and adaptation measures to reduce the impacts of climate change for features ranked as high risk.

www.climatexchange.org.uk

Signing the Charter

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

NATIONAL ORGANISATIONS

Scottish Geodiversity Forum
 Scottish Natural Heritage
 British Geological Survey
 GeoConservation UK
 Historic Environment Scotland
 James Hutton Institute
 Landscape Institute Scotland
 Mineral Products Association Scotland
 National Museums Scotland
 Royal Scottish Geographical Society
 Scottish Environment Protection Agency
 The Geologists' Association
 The Geological Society
 Visit Scotland
 Association for the Protection of Rural Scotland
 Bat Conservation Trust
 Botanical Society for Scotland
 British Ecological Society's Scottish Policy Group
 British Society for Geomorphology
 English Geodiversity Forum
 Froglife
 International Appalachian Trail Scotland
 John Muir Trust
 Mountain Training Scotland
 National Trust for Scotland
 The Palaeontological Association
 Plantlife Scotland
 Quaternary Research Association
 Ramblers Scotland
 Salmon and Trout Conservation (Scotland)
 Scottish Association of Geography Teachers
 Scottish Centre for Geopoetics
 Scottish Lime Centre Trust
 Scottish Mineral & Lapidary Club
 Scottish Tourist Guides Association
 Scottish Wild Land Group
 Scottish Wildlife Trust
 Trees for Life
 Woodland Trust Scotland

UNIVERSITIES

University of Aberdeen
 University of Dundee
 School of GeoSciences, University of Edinburgh
 University of Glasgow
 Heriot-Watt University
 University of the Highlands and Islands
 Edinburgh Napier University
 School of Earth & Environmental Sciences, University of St Andrews
 University of Stirling
 University of Strathclyde

LOCAL AUTHORITIES / REGIONAL ORGANISATIONS

Aberdeen Geological Society
 Angus Council
 Arran Geopark
 Cairngorms Campaign
 Cairngorms National Park Authority
 City of Edinburgh Council
 Clyde and Avon Valley Landscape Partnership
 Dynamic Earth
 Earth Science Society, University of Glasgow
 East Dunbartonshire Council
 Edinburgh Geological Society
 Geological Society of Glasgow
 Glasgow City Council
 The Highland Council
 Highland Geological Society
 Lochaber Geopark
 Loch Lomond & The Trossachs National Park
 North West Highlands Geopark
 Orkney Islands Council
 Perth and Kinross Council
 Shetland Amenity Trust / Geopark Shetland
 West Lothian Council

COMMUNITY

Friends of Hugh Miller
 Friends of Kelvin Valley
 GeoBus
 Geodiversity: Argyll and the Islands
 geoHeritage Fife
 Lochranza Centre CIC
 Lothian and Borders GeoConservation
 Strathclyde Geoconservation
 Tayside Biodiversity Partnership
 Tayside Geodiversity
 The Way of St Andrews

COMMERCIAL

BioGeoD
 Border Geo-Science
 Breedon Northern Ltd
 EnviroCentre Ltd
 Hamlet Mountaineering
 Hills of Hame
 Geowalks
 Mr Wood's Fossils
 Mull Geology
 Selkie Ventures
 Wilderness Scotland

Other organisations 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. Membership is open to all organisations and individuals who are interested in promoting Scotland's geodiversity and the sharing of experience and good practice.

Support and guidance:

scottishgeodiversityforum.org/whocanhelp/

Geoconservation Groups –

www.scottishgeology.com/find-out-more/geoconservation/

SNH website –

www.snh.scot/landforms-and-geology/protecting-our-geodiversity

BGS website –

www.bgs.ac.uk/research/ukgeology/scotland/scottishGeodiversity.html

Taking Scotland's Geodiversity Charter forward: Tourism –

scottishgeodiversityforum.org/charter/

Ethical Rock Collection Policy –

scottishgeodiversityforum.org/charter/ethical-rock-collection/

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This publication should be cited as:

Scottish Geodiversity Forum (2017). *Scotland's Geodiversity Charter 2018–2023*. Edinburgh: Scottish Geodiversity Forum.

Preparation of the Charter was supported by grants and in-kind support from Scottish Natural Heritage, the British Geological Survey, the Edinburgh Geological Society and the Geological Society of Glasgow.



Above: Gyle Castle, Kerrera, near Oban. This small but impressive castle was built on a cliff of tough conglomerate in 1582 by the Clan MacDougall, and boasts excellent views down the Firth of Lorn. © Lorne Gill/SNH.

Back cover: Visitors to Calton Hill in Edinburgh city centre can discover and appreciate how the city, and its history, are shaped by its geodiversity. © Lorne Gill/SNH.

