

# New directions in geoconservation: Scotland's Geodiversity Charter

John E. Gordon\* Hugh F. Barron and Angus D. Miller

*Scotland's geodiversity is world-famous as the foundation of a remarkably varied landscape, and the source of inspiration for many advances in our understanding of how the Earth works. This geodiversity also underpins most ecosystems and delivers essential benefits and services for society through its influence on landscape, habitats and species, economic activities, historical and cultural heritage, education, and people's health and well-being. Understanding geodiversity is vital to inform climate change adaptation and sustainable management of natural resources, including minerals, the land, river catchments and the coast. With an emphasis on these wider benefits to society, Scotland's Geodiversity Charter has been developed to promote and deliver a strategic approach to the conservation of geodiversity. As part of an ecosystem-based approach, and through the engagement of all relevant stakeholders, it represents an important step towards better integration of geodiversity and geoheritage conservation across a range of key policy areas. This article outlines the background to the Charter and its key aims and objectives as a model for a collaborative approach involving government, local authorities, public bodies, voluntary organizations, academics, teachers, commercial businesses, land owners and individuals in promoting and maintaining geodiversity.*

*La diversité géologique en Ecosse, reconnue mondialement, est basée sur une variété de paysages remarquables, source d'inspiration à la base des nombreux progrès acquis dans notre compréhension des phénomènes terrestres. Cette diversité représente aussi un soutien pour la plupart des écosystèmes, un bénéfice essentiel et une aide envers la société par son influence sur le paysage, l'habitat et les espèces, les activités économiques, l'héritage historique et culturel, l'éducation, la santé et le bien-être de la population. La compréhension de la diversité géologique est vitale pour faire face au changement climatique et gérer durablement les ressources naturelles, incluant les gisements miniers, les régions, les bassins et le domaine côtier. En mettant l'accent sur ses avantages importants du point de vue social, la Charte écossaise de la Diversité Géologique a été développée pour fournir une approche stratégique vers la conservation de cette diversité et en faire la promotion. En tant qu'élément d'une approche pertinente de tous les dépositaires d'enjeux, cela représente un pas important vers une meilleure intégration de la conservation de la diversité et de l'héritage géologiques à travers l'éventail de secteurs politiques clés. Cet article souligne les fondements de la Charte, ses buts et objectifs prioritaires en tant que modèle pour une approche synergique impliquant le gouvernement, les autorités locales, les organisations publiques et bénévoles, les enseignants, le milieu des affaires, les propriétaires et les particuliers, unis dans la promotion et la pérennité de la diversité géologique.*

*La geodiversidad de Escocia es famosa en el mundo entero como soporte de un paisaje extraordinariamente variado y fuente de inspiración de muchos avances en nuestra comprensión de cómo funciona la Tierra. Dicha geodiversidad es también el soporte de muchos ecosistemas y proporciona beneficios esenciales a la sociedad por su influencia en los paisajes, hábitats y especies, actividades económicas, patrimonio histórico y cultural, educación y la salud y el bienestar de la población. Entender la geodiversidad es vital para valorar la adaptación al cambio climático y la gestión sostenible de los recursos naturales, incluidos los minerales, el territorio, los ríos y la costa. Poniendo énfasis en tales beneficios para la sociedad, se ha desarrollado el Estatuto Escocés de la Geodiversidad, para promocionar y generar un enfoque estratégico de la conservación de la geodiversidad. Como parte de un enfoque basado en los ecosistemas, y por medio de la implicación de todas las partes interesadas, representa un paso importante hacia una mejor integración de la geodiversidad y el patrimonio geológico en una amplia serie de políticas. Este artículo repasa los antecedentes del Estatuto y sus principales objetivos como modelo de un enfoque colaborativo implicando al gobierno, las autoridades locales, los organismos públicos, las organizaciones de voluntarios, la universidad, los profesores, los empresarios, los propietarios y los individuos, en la promoción y mantenimiento de la geodiversidad.*

**G**eoconservation has a strong focus on the assessment and management of protected sites for geological and geomorphological features. This is reflected in many national programmes across Europe to establish site inventories, including the benchmark Geological Conservation Review in Great Britain (Ellis,

\* School of Geography & Geosciences, University of St Andrews, Fife KY16 9AL, Scotland, UK, jeg4@st-andrews.ac.uk

2011), and initiatives such as ProGEO's GEOSITES project and the evaluation and promotion of geomorphosites by the International Association of Geomorphologists (Reynard *et al.*, 2009). Such activities have delivered benefits for geoheritage, tourism, education, public awareness and geoscience research. As recognized in the *European Manifesto on Earth Heritage and Geodiversity* (2004), there has also been growing appreciation in the last decade of the wider role and relevance of geodiversity in rela-

tion to landscape, biodiversity, economic development, climate change adaptation, sustainable management of the natural environment, historical and cultural heritage, and people's health and well-being (Johansson, 2000; Gordon & Leys, 2001; Gray, 2004; Stace & Larwood, 2006; Gordon & Barron, 2011).

At an international policy level, the importance of the conservation of geodiversity and its wider values has been

highlighted by the Committee of Ministers of the Council of Europe (2004). They recommended that the “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” and that geological and geomorphological features are essential characteristics of landscapes that should be considered when implementing the European Landscape Convention. IUCN, too, has recognized the wider role and relevance of geodiversity - “the conservation and management of geological heritage need to be integrated by governments into their national goals and programmes” (IUCN, 2008). Similarly, UNESCO has promoted the cultural and economic importance of geodiversity through the Global Geoparks network (McKeever *et al.*, 2010). However, in many relevant policy areas, including climate change, water, economic development and marine conservation, geodiversity has not been integrated either at European or national levels.

An ecosystem approach, as set out in the Convention on Biodiversity (1992) and the Millennium Ecosystem Assessment (2005), is now a key policy driver for nature conservation globally and is a central pillar of the EU Biodiversity Strategy (2011). Although often undervalued or overlooked, geodiversity contributes to critical ecosystem services (Gray, 2011; Gordon & Barron, 2011; Gray *et al.*, in press). Consequently, there is now advocacy for a more holistic approach that recognizes the wider benefits of geodiversity to society and integrates geodiversity more closely in environmental policy and practice (Prosser *et al.*, 2011; Henriques *et al.*, 2011; Gordon *et al.*, 2012; Gray *et al.*, in press). This should lead to better recognition that geodiversity is of significant value to society and relevant to society’s needs. In turn, this should help to strengthen geoconservation and the role of geodiversity as the essential foundation of most ecosystems and the services they provide. Such an approach underpins the development of Scotland’s Geodiversity Charter.

#### **Scotland’s Geodiversity Charter: recognizing the wider importance and value of geodiversity**

The rationale behind Scotland’s Geodiversity Charter (*Fig. 1*) was to demonstrate and build on the wider values of geodiversity and to advocate a more strategic and integrated focus to the conservation

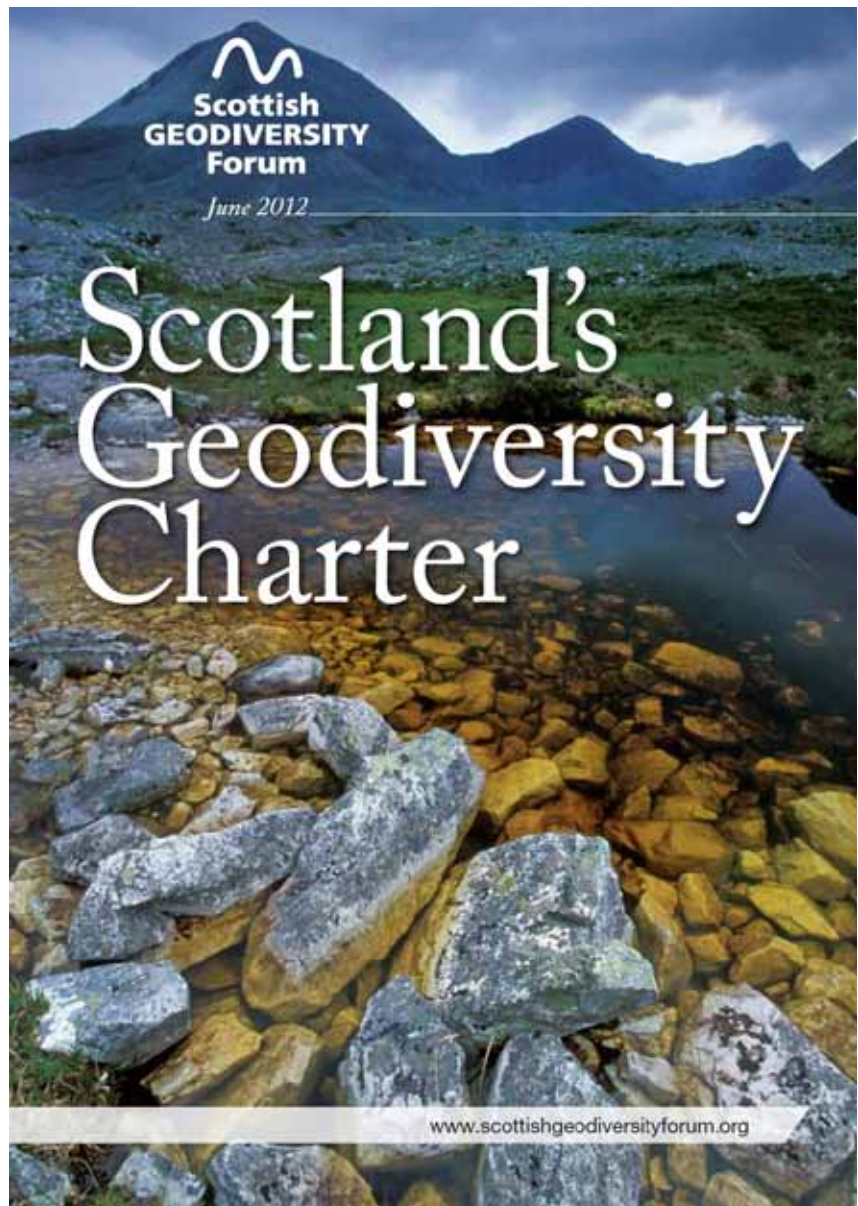


Figure 1: Scotland’s Geodiversity Charter (<http://scottishgeodiversityforum.org/charter>).

of biodiversity, geodiversity and landscape within the framework of an ecosystem approach and underpinned by sound Earth system science. Working in collaboration, Scottish Natural Heritage (SNH) and the British Geological Survey (BGS) prepared an evidence base to support such an approach (Gordon & Barron, 2011). Their report demonstrated that geodiversity delivers or underpins many different types of ecosystem service and provides a wide range of benefits for society and the environment (*Table 1*). It concluded that a strategic framework would highlight the wider role and benefits of geodiversity and associated geoconservation activities and facilitate their better integration into the existing policy framework. It would also

help to identify priorities for geoconservation activities and provide a foundation for actions by different stakeholders and sectors.

Geodiversity interacts with biodiversity through our ecosystems and also links landscapes, people and their cultures. In some cases the benefits from geodiversity are direct (e.g. enhancing the aesthetic quality of the landscape), whereas in others they are achieved through the influence that geological, hydrogeological, geomorphological or pedological factors and processes have on both landforms and the biodiversity they support. Not only is the conservation management of the non-living parts of the natural world crucial for sustaining living



<b>Benefits arising from geodiversity and geoconservation</b>	<b>Links to EU policies</b>
<i>The knowledge to help society adapt to climate change and sea-level rise and to mitigate natural hazards through better understanding of natural processes and regional differences</i>	<i>Supporting the Floods Directive, the EU Climate Change Policy – Adapting to Climate Change</i>
<i>The physical basis for our varied landscapes (both rural and urban) and the foundation for terrestrial and marine habitats, wildlife and use of land and water</i>	<i>Supporting the EU Habitats Directive, the EU Water Framework and Groundwater Directives, the EU Biodiversity Strategy, the European Landscape Convention, the Marine Strategy Framework Directive, the Integrated Maritime Policy and Recommendation on Integrated Coastal Zone Management</i>
<i>The resources for many aspects of economic development, including minerals, tourism-based activities (e.g. Geoparks), soils, and renewable energy</i>	<i>Supporting EU Economic policy, the Sustainable Development Strategy and Sustainable Tourism Policy</i>
<i>A powerful influence on our cultural heritage as a source of inspiration for art, sculpture, music, poetry and literature, and on the character of our built environment through the use of different building stones</i>	<i>Supporting EU cultural and education policies</i>
<i>The resources for education and research (Earth system science) that support cross-curricular activities, provide opportunities for employment and enhance our knowledge of how the Earth works</i>	<i>Supporting EU science, education and economic policies</i>
<i>The resources for a variety of recreation and outdoor activities, with consequent benefits for people's health and well-being</i>	<i>Supporting the EU Health Strategy and Health Programme</i>

Table 1: Benefits from geodiversity and geoconservation and links to EU policies.

species and habitats (e.g. Anderson & Ferree, 2010), but geodiversity also has a fundamental bearing on people's health and well-being. The basis of the Charter, therefore, is that geodiversity has an essential part to play in dealing with the challenges that society faces today, such as climate change adaptation, loss of biodiversity, sea-level rise, sustainable economic development and improving people's quality of life. These are cross-cutting issues of current concern to decision makers in government. By aligning with the Scottish Government's Strategic Objectives on the economy, quality of life, education, the environment and health, the Charter can help to add value to important economic, social and environmental outcomes (Gordon & Barron, 2012).

The voluntary geoconservation sector, through the Scottish Geodiversity Forum, has taken a lead in developing the Scottish Geodiversity Charter, facilitated by key organizations including SNH, BGS and the Scottish Government. The Forum ([www.scottishgeodiversityforum.org](http://www.scottishgeodiversityforum.org)), established in 2011, promotes Scotland's geodiversity and seeks to widen the profile of geodiversity and influence national and local policies in education, community involvement and health, the development of tourism and the wider economy. Its members include local geoconservation groups, Geoparks, the

industry, education and academic sectors, related governmental and non-governmental organizations and interested individuals.

The Charter was launched in June 2012 by Stewart Stevenson MSP, Minister for Environment and Climate Change. It sets out a vision that Scotland's geodiversity is recognized 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. The signatories commit to maintain and enhance geodiversity, recognizing its contribution to:

- 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;
- public health, quality of life and national well-being and helping

people to re-connect with the natural environment.

The Charter encourages determined and collective action from all sectors – public bodies, commercial businesses, land owners and managers, academics, teachers, voluntary organizations and individuals – to fulfil the vision and so ensure that 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:

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, outreach and public 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 nationally and locally important sites, and in the wider rural, urban and marine environments;

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.

For example, local authorities, public agencies and government departments should undertake to ensure that due consideration, management, enhancement and promotion of geodiversity and national and local geosites are an integral part of decision making. The types of action they can take include:

- Acknowledging the value and importance of geodiversity in policy and guidance documents at national and local levels, including: national planning policy and Local Plans; policies and guidance for biodiversity, nature conservation, climate change, tourism, landscape, greenspace, land and water management, the historic environment and marine conservation, as well as seeking advice from appropriate expert bodies and agencies in decision making where appropriate;
- Promoting Scotland's geodiversity as a tourism asset that adds value to visitor experience and enjoyment;
- Forming partnerships with local geoconservation groups to audit geodiversity sites and develop geodiversity action plans, and involving local communities in collating information about sites of interest (e.g. former quarries, building stones);
- Encouraging developers to allow access to temporary exposures to record and sample, and to contribute borehole data to BGS.

Appropriate case studies illustrate the types of action that can be taken. For example, East Dunbartonshire Council, one of the signatories, completed a geodiversity audit in 2010, jointly funded by the Council and SNH, and carried out by BGS. In this local authority area in the west of

Scotland, 36 sites were identified for their geological/scientific merit, education value, community site value, cultural heritage, economic importance, access and fragility, and 34 were recommended as Local Geodiversity Sites. As well as having geoheritage importance, the sites have numerous links to landscape character, historical structures, ecology and the economic and cultural history of the area. Such systematic inventory and evaluation provides a foundation for developing a Local Geodiversity Action Plan and better integration of geoheritage in local planning policies.

As of August 2012, the Charter had 31 signatories, including public bodies, NGOs, industry and landowner representative groups, geoconservation groups and Geoparks; further signatories are expected. The next step now underway is to monitor progress towards delivering the aims of the Charter, to encourage further sign-up and to develop and promote more examples of best practice. In terms of outcomes at a UK level, the Charter also aligns with, and supports, the UK Geodiversity Action Plan (UKGAP) ([www.ukgap.org.uk](http://www.ukgap.org.uk)) and will contribute to its delivery.

#### Opportunities at a European level

The type of approach underlying the Charter may have wider relevance since conservation of geodiversity and geoheritage can play a vital part in a more sustainable Europe in line with a range of EU policies (*Table 1*). For example, this was demonstrated at a stand organized by the EFG Panel of Experts on Soil Protection and Geological Heritage, together with five other European Earth Sciences and related organizations, at the Exhibition, 'Every Drop Counts', held as part of the European Commission's Green Week in Brussels, 22-25 May 2012 ([www.eurogeologists.eu](http://www.eurogeologists.eu)). The key message presented was that the role of geodiversity in the EU water policy framework should be enhanced. Care for Europe's geodiversity and geoheritage is crucial in relation to the globally increasing demand for clean drinking water, management of water-related hazards such as flooding and coastal erosion, climate change adaptation, development of renewable energy (hydro power) and opportunities for water-based recreation and outdoor activities with their

benefits for tourism and people's health and well-being. Better integration of geodiversity and geoconservation in existing water policies, measures and decision frameworks would help Europe to find more sustainable solutions that in the long term would be less costly as well as providing positive economic benefits. At the same time, it would help to protect Europe's geoheritage and safeguard the quality of the living environment of European citizens, while mitigating risks such as flooding, biodiversity loss and soil loss.

#### Conclusion

Integration of geodiversity in wider environmental policy and decision frameworks is now essential not only to protect our geoheritage, but also to ensure more holistic conservation management of biodiversity, geodiversity and landscape through an ecosystem approach, to inform climate change adaptations, and to contribute to resolving broader environmental, economic and social issues. Scotland's Geodiversity Charter represents an important step in this direction. It instigates a process through which key stakeholders will work together to achieve greater awareness of geodiversity and the realization of its benefits through the sustainable management of land and water, consistent with the economic, social, cultural and environmental needs of Scotland. By moving in this direction, the Charter aims to demonstrate that geodiversity matters and that geoscience knowledge and geoconservation can deliver positive benefits for people and the environment at national and local scales. In doing so, it should help to place geoconservation and geoheritage on a more strategic footing. This is part of a broader European challenge to raise awareness of the value and benefits of geodiversity at a policy level and to position geodiversity at the foundation of an ecosystem approach.

#### Acknowledgements

We thank Eleanor Brown, Natural England, for helpful comments. HFB publishes with permission of the Executive Director of the British Geological Survey.

## References

- Anderson, M.G., Ferree, C.E. 2010. Conserving the stage: climate change and the geophysical underpinnings of species diversity. *PLoS ONE* 5(7): e11554. doi: 10.1371/journal.pone.0011554.
- Committee of Ministers of the Council of Europe 2004. Recommendation Rec(2004)3 on conservation of the geological heritage and areas of special geological interest. <https://wcd.coe.int/ViewDoc.jsp?id=740629&Lang=en>
- Ellis, N. 2011. The Geological Conservation Review (GCR) in Great Britain - rationale and methods. *Proceedings of the Geologists' Association*, 122, 353-362.
- European Commission 2011. Our life insurance, our natural capital: an EU biodiversity strategy to 2020, COM(2011) 244 final. <http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm>
- Gordon, J.E., Barron, H.F. 2011. Scotland's geodiversity: development of the basis for a national framework. *Scottish Natural Heritage Commissioned Report*, No. 417.
- Gordon, J.E. & Barron, H.F. 2012. Valuing geodiversity and geoconservation: developing a more strategic ecosystem approach. *Scottish Geographical Journal*, DOI:10.1080/14702541.2012.725861.
- Gordon, J.E., Leys, K.F. (Eds) 2001. *Earth Science and the Natural Heritage. Interactions and Integrated Management*. Edinburgh, The Stationery Office.
- Gordon, J.E., Barron, H.F., Hansom, J.D., Thomas, M.F. 2012. Engaging with geodiversity – Why it matters. *Proceedings of the Geologists' Association*, 123, 1-6.
- Gray, M. 2004. *Geodiversity: Valuing and Conserving Abiotic Nature*. Chichester, John Wiley & Sons.
- Gray, M. 2011. Other nature: geodiversity and geosystem services. *Environmental Conservation*, 38, 271-274.
- Gray, M., Gordon, J.E., Brown, E.J. in press. Geodiversity and the ecosystem approach: the contribution of geoscience in delivering integrated environmental management. *Proceedings of the Geologists' Association*.
- Henriques, M.H., Pena dos Reis, R., Brilha, J., Mota, T. 2011. Geoconservation as an emerging geoscience. *Geoheritage*, 3, 117-128.
- IUCN 2008. Resolutions and Recommendations adopted at the 4th IUCN World Conservation Congress. Resolution 4 040: Conservation of geodiversity and geological heritage. [http://intranet.iucn.org/webfiles/doc/IUCNPolicy/Resolutions/2008\\_WCC\\_4/English/RES/res\\_4\\_040\\_conservation\\_of\\_geodiversity\\_and\\_geological\\_heritage.pdf](http://intranet.iucn.org/webfiles/doc/IUCNPolicy/Resolutions/2008_WCC_4/English/RES/res_4_040_conservation_of_geodiversity_and_geological_heritage.pdf)
- Johansson, C.E. (Ed.) 2000. *Geodiversitet i Nordisk Naturvård*. Copenhagen, Nordic Council of Ministers.
- McKeever, P.J., Zouros, N., Patzak, M. 2010. The UNESCO Global Geoparks Network. *European Geoparks Magazine*, 7, 10-13. <http://www.scribd.com/doc/80356479/EGN-Magazine-Issue-7>
- Prosser, C.D., Bridgland, D.R., Brown, E.J., Larwood, J.G. 2011. Geoconservation for science and society: challenges and opportunities. *Proceedings of the Geologists' Association*, 122, 337-342.
- Reynard, E., Coratza, P., Regolini-Bissig, G. (Eds) 2009. *Geomorphosites*. Munich, Verlag Dr. Friedrich Pfeil.
- Stace, H., Larwood, J. 2006. *Natural Foundations: Geodiversity for People, Places and Nature*. Peterborough, English Nature.