Northern Ireland's Geodiversity Charter 2025–2030

Department for the Economy
www.economy-ni.gov.uk

An Roinn Geilleagair

GSNI Geological Survey of Northern Ireland
www.bgs.ac.uk/gsni

NIEA Northern Ireland Environment Agency
www.daera-ni.gov.uk

Front cover: Fossils at Portrush, Co. Antrim

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Introduction

Geodiversity can be defined as the variety of geological features in a specific location including rocks, minerals, fossils, soils, landforms and the processes that shape them. Northern Ireland for its size is one of the most geologically diverse places on Earth and this remarkable geodiversity has played a key role in shaping the very fabric of our daily lives.

Geodiversity is vital to life on Earth. It supports food production, water management and energy production all of which are basic requirements for human survival. Geodiversity is a key aspect of the natural world and is critical for nature recovery, including climate change resilience and landscape diversity. Geodiversity can also help people to enjoy and connect with nature, helping to improve not just physical but mental health and well-being.

Despite all of its benefits, geodiversity is often under-valued and over-exploited. With the growing need for resources and rising impacts of climate change, it has never been more important to have an effective Geodiversity Charter that delivers for Northern Ireland. The aim of the Charter is to encourage promotion and management of our geodiversity and its integration into policy and decision-making. These actions will lead to better protection of our geological heritage and enable sustainable use of natural resources now and in the future.

Bluebells in Glenariff, Co. Antrim.
Courtesy Tourism Ireland

Update on NI Geodiversity Charter 2021-2024

Northern Ireland's First Geodiversity Charter was launched in October 2017 with the support of 25 organisations including those from government departments, local government, industry, academia, charities, NGOs and learned societies, not just from Northern Ireland, but from across the UK and Ireland.

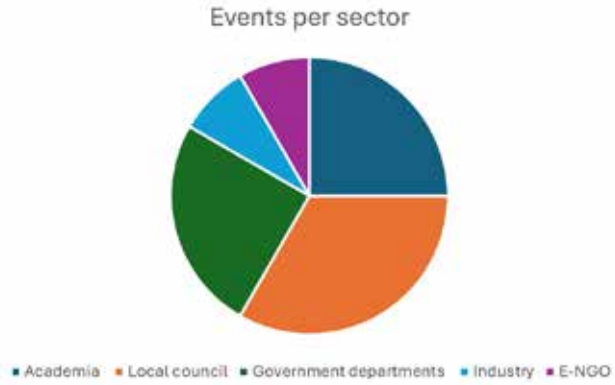
After a review of the first, the second Northern Ireland Geodiversity Charter was launched in 2021 with a focus on five key outcomes, aligned with those included within the Northern Ireland Draft Programme for Government published in 2021. These were as follows:

- We live and work sustainably – protecting the environment
- Everyone can reach their potential
- People want to live, work and visit here
- Our children and young people have the best start in life
- Our economy is globally competitive, regionally balanced and carbon neutral

To achieve these outcomes, there were four main areas of activity: policy integration; raising awareness; conservation and enhancement; and research. There were some significant successes in these areas which have been highlighted below.

Policy Integration: The policy landscape in Northern Ireland was unproductive for a significant period of the second Geodiversity Charter because of a lack of functioning government. However, devolved government was reinstated in February 2024, leading to a flurry of policy development opportunities. One of the major successes for geodiversity was in the Draft Marine Plan for Northern Ireland produced by the Department for Agriculture, Environment and Rural Affairs (DAERA), which at the time of writing is in the final stages of approval. Geodiversity has been included as one of the Core Policies (CP 02 Geodiversity) within the Draft Marine Plan meaning that Geodiversity should be considered when determining all marine proposals. It is given equal recognition as biodiversity which is a big step forward with regards to public policy in Northern Ireland.

Raising Awareness: One of the areas that was focused on during the second Geodiversity Charter was raising awareness of the Charter itself. This came about from feedback from the first Geodiversity Charter whereby various organisations consulted were unaware of its purpose and how to get involved. This led to the delivery of an outreach programme to accompany the Charter where various audiences were targeted including those that were not typically associated with geodiversity. A total of 12 engagement events were held with various sectors and stakeholders reaching an audience of approximately 500 people.



Conservation and Enhancement: In Northern Ireland, Areas of Special Scientific Interest (ASSI) are designated under the Environment (Northern Ireland) Order 2002 for their flora, fauna, geological, or physiographical features. During the period of the second Geodiversity Charter, the Northern Ireland Environment Agency (NIEA) undertook management work to improve the condition of one such site designated for its geological features, Scrabo ASSI, located just outside Newtownards. The site had been assessed as being in 'Unfavourable' conservation condition due to vegetation growth limiting access to and visibility of the geology. Work has now been undertaken to remove vegetation from a key part of the ASSI which has improved the conservation condition of the site.

Research: During the period covered by the second Geodiversity Charter, the Geological Survey of Northern Ireland (GSNI) established its Science Task Force (STF). The role of the STF is to identify and prioritise areas of geoscience research interest to help underpin and deliver the GSNI strategy and align to Northern Ireland government priorities. GSNI currently works with over 30 research institutions from not just the UK and Ireland, but internationally all of whom deliver projects with GSNI on a range of topics including geothermal, critical minerals and geohazards.

Importance and value of a Geodiversity Charter

Northern Ireland's Geodiversity Charter is a guidance document that promotes the recognition, conservation and sustainable management of our geodiversity, through a defined set of outcomes and suggested actions. It recognises that geodiversity is vital for the environment, economy, heritage, and future sustainable development by all sectors and at all levels.

An understanding of past geological processes is critical in gaining a better understanding of the world today, as well as helping to predict what may happen in the future. These processes continue to shape the world we live in and make a significant contribution to sustainable development through its economic, social and environmental benefits for every citizen of Northern Ireland.

Geodiversity plays a critical role in Northern Ireland's economy providing vital natural resources including minerals, aggregates, and water. All of these have a role to play in economic development through the provision of essential infrastructure, job creation, commercial water resources, and renewable energy resources. Our geodiversity is responsible for soil formation that is essential for agriculture and plays a vital part in Northern Ireland's tourism industry, so it is important that we understand and protect our geodiversity so that we can continue to manage our natural resources sustainably.

Geodiversity links people and places and nowhere is this more evident than in Northern Ireland. The landscape, and underpinning geodiversity, have had a profound influence on our language and cultural heritage, providing inspiration for poetry, music, art and literature. Geodiversity is fundamental in determining the character of our natural landscape and of the built environment, something that is a source of pride for our local communities and provides an important recreational resource, both locally and nationally. As part of our green infrastructure, Northern Ireland's landscapes are essential for our mental and physical well-being.

The rich tapestry of rocks, landforms, soils, nutrients and natural processes support Northern Ireland's nationally and internationally important biodiversity. Better understanding of geodiversity will assist environmental management and protection, ultimately providing a healthy and accessible environment and landscapes.

Northern Ireland, like the rest of the world, is experiencing unprecedented change, due to events at both the national and at the international level. As a result, there are a number of opportunities and challenges that are relevant to geodiversity in Northern Ireland.

Mourne Mountains, Co. Down.

Challenges and Opportunities

Challenges

Climate change: Undeniably, the biggest threat that Northern Ireland and indeed planet Earth is currently facing, is that of climate change. Rising sea-levels and surface temperatures, increasing storm activity and unpredictable rainfall are just some of the impacts that we are already witnessing. Climate change poses a fundamental threat to our landscapes and livelihoods.

In Northern Ireland, climate change will have significant implications for our geodiversity that may include changes in landscape character, flooding, river channel readjustments, soil erosion, and coastal change. Mitigation and future adaptation to the impacts of climate change is essential and may require development of, for example, screening tools or susceptibility layers for geohazards.

Lack of recognition and education: Geodiversity is often underutilised and poorly understood by policy makers and as a result it is often excluded from key policies. This has the dual effect of missing the opportunity to help raise an awareness of geodiversity but also to use geoscience as a key contributor to a range of government policies including infrastructure, energy and the environment.

Geodiversity is severely lacking in the formal education setting in Northern Ireland. Since the last Geodiversity Charter, the number of schools teaching geology as a single subject is down to one. There are limited opportunities to study geology at a higher education level with the Open University being the only option for geology as a standalone subject. This presents a significant challenge not only because of a limited understanding of what geodiversity is, but also in the lack of suitably qualified geoscientists that are sorely needed for sectors such as renewable energy, water supply and resource exploration.

Human activities: Our geodiversity is coming under pressure by a range of human activities all of which, if not carefully managed, will lead to the damage or destruction of some our most important natural assets.

Natural resource exploration including for minerals, energy and water is essential for economic development, but it must be done in a sustainable and responsible way to ensure that they safeguard our geodiversity and geoheritage for future generations. Over-tourism also poses a significant threat to our geodiversity with sites like the Cuilcagh Boardwalk and the Giant's Causeway already taking measures to minimise and reduce the impact that over-crowding has on these iconic tourism sites.

Opportunities

Sustainable development: Geodiversity is crucial for sustainable development as it supports biodiversity, provides essential resources and contributes to human well-being and cultural heritage, all of which are interconnected in helping to achieve the UN Sustainable Development Goals.

At the very basic level, geodiversity is the foundation for sustainable development, providing the vital resources for human society including building materials, water, agricultural soils and energy sources. It also contributes to human well-being through access to recreational

opportunities and the cultural and spiritual values associated with the landscape.

Climate change mitigation and adaptation: Geodiversity not only provides insight into past climate change, but it can help inform present-day strategies and enhance natural carbon sequestration through rock, soil and coastal and terrestrial habitats. It also provides an opportunity to support renewable energy through its role in locating both offshore and onshore wind farm development and in the production of geothermal energy.

Understanding geomorphological processes such as flooding, erosion and deposition is crucial for developing effective adaptation strategies and it can also guide land management practices to maintain landscape stability in the face of changing climatic conditions.

Recognising geodiversity as a key part of nature: Geodiversity is a fundamental part of nature and natural heritage. The geodiversity of Northern Ireland has played an important role in understanding the history of the Earth and the processes that formed it. This is our geoheritage. Protecting geoheritage is referred to as geoconservation and as for important habitats and species, without conservation and management we may lose our important geoheritage. Furthermore, recognising the intrinsic link between geodiversity and biodiversity can improve our understanding of nature and conservation efforts, and act as a means of demonstrating the essential role of geodiversity in ecosystem services. This presents the opportunity to address a number of key cross-cutting issues.

Some of the many ways in which this can be demonstrated include: Links between marine biodiversity and geodiversity currently help to inform a number of our Marine Protected Areas; soil and habitat restoration, including the management of peatland, provides valuable habitats and carbon sequestration; river catchment restoration that enables sustainable flood management and; the important role groundwater plays in forming and maintaining key terrestrial habitats.

International and National Context

During the period of the second Geodiversity Charter, on 21 November 2021, UNESCO proclaimed 6 October to be International Geodiversity Day with the first event being held in October 2022. This was a momentous step change in the way that geodiversity is viewed internationally and recognised the importance of geoscience in solving major challenges that humanity is facing today. Despite this, many people are still not aware of how dependent we are on geodiversity.

Alongside this shift, there is a growing urgency for geodiversity to be included as an equal component in the definition of 'nature'. With increasing pressures on our ecosystems, it is time to fully consider the whole of nature, not just the biotic component but the all-important abiotic features as well. It is exactly this proposal that has been put forward to the International Union for the Conservation of Nature (IUCN), recommending that the definition of nature is broadened and strengthened so that nature is defined as "encompassing both the non-living components (i.e. geodiversity) and the living components (i.e. biodiversity) of the natural world."

However, in addition to the direct recognition of geodiversity at an international level, it is useful to explore the various international and national governance documents that are relevant, whilst not explicitly focusing on geodiversity.

UN Sustainable Development Goals

The 2030 Agenda for Sustainable Development provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth, all while tackling climate change.

Whilst geodiversity is not explicitly mentioned within the SDGs, it has a role to play in ensuring that the goals are met. Understanding, monitoring, protecting, managing, and enhancing the natural environment is central to many of the SDGs. Geodiversity plays a critical role in the delivery of the SDGs requiring a knowledge of the Earth's structure, the processes by which it is shaped and of natural resources, together with the ability to translate this knowledge into tools to inform policy and practice.

Northern Ireland Programme for Government

The Northern Ireland Programme for Government "Our Plan: Doing What Matters Most" was published in February 2025. It has identified nine priorities with the overall goal of improving the well-being of everyone living and working here in Northern Ireland. Those most relevant for the Geodiversity Charter are 'Grow a Globally Competitive and Sustainable Economy' and 'Protecting Lough Neagh and the Environment'.

Northern Ireland Environmental Improvement Plan

Northern Ireland's first Environmental Improvement Plan (EIP) was published by DAERA in September 2024 and forms the basis for a coherent set of interventions to deliver real improvements in the quality of the environment. The EIP aims to link each set of proposed actions and targets to improve our environment to the relevant SDGs. Geodiversity is considered in the strategic context in the EIP both as an element of 'Our Natural Environment' as well as part of our 'Natural Capital'. More specifically, elements of geodiversity are included as part of Strategic Environmental Outcome 2: Healthy & accessible environment & landscapes everyone can connect with & enjoy, Strategic Environmental Outcome 3: Thriving, resilient & connected nature and wildlife and, Strategic Environmental Outcome 4: Sustainable production & consumption on land and at sea. There are also geodiversity aspects to Strategic Environmental Outcome 5: Zero waste & highly developed circular economy and also Strategic Environmental Outcome 6: Net Zero greenhouse gas emissions & improved climate resilience and adaptability.

Strategic Planning Policy Statement (SPPS) for Northern Ireland

The SPPS is a statement of DAERA policy on important planning matters. The overall objective of the Northern Ireland planning system is to further sustainable development and improve well-being for all citizens of Northern Ireland. It is aimed at unlocking development potential, supporting job creation and aiding economic recovery, but not at the expense of the environment.

The SPPS includes a direct provision for the conservation of geodiversity as part of Natural Heritage including as part of Regional Strategic Objectives, as part of the Local Development Plan process, and as part of Regional Strategic Policy.

Local Councils Plans and Strategies

All 11 of Northern Ireland's local councils have produced comprehensive corporate plans or strategies. These set the strategic direction for the area, which will contribute to the economic, social and environmental well-being of everyone that lives there. The local council Corporate Plans or Strategies do not exist in isolation and are designed to sit within a regional framework that together, contributes to well-being across Northern Ireland.

Whilst each local council Corporate Plan or Strategy is different and is dependent on needs and requirements locally, they all provide an opportunity to deliver aspects of Northern Ireland's Geodiversity Charter. This could be through the promotion of natural, built and cultural heritage, the development of recreational opportunities, or in developing local policies to encourage conservation or site enhancement.

Local councils represent a key channel for the delivery of Northern Ireland's Geodiversity Charter, which together can contribute to the provision of better economic, environmental and social outcomes for all.

Mussenden Temple, Co.Londonderry.
Gareth McCormack/garethmccormack.com

Vision

The vision for Northern Ireland's Geodiversity Charter is to recognise geodiversity as vital for people, the planet and for prosperity, and that it is managed appropriately and safeguarded to support the needs of Northern Ireland's citizens for current and for future generations.

Main areas of activity

Policy integration: Mainstreaming geodiversity into relevant policies, strategies, guidance and advice to ensure a sustainable and integrated approach to management of natural heritage for the wider benefit of Northern Ireland's economy, society and the environment.

Raising awareness: Raising awareness in all sectors of the value and importance of geodiversity. This includes its wider links with the natural and built environment, cultural heritage, sense of place, and community empowerment through education and promotion at all levels.

Conservation and enhancement: Encourage conservation, enhancement and appropriate management of our geological heritage, and continue to develop and share good geoconservation practice.

Research: Support research that improves our understanding of geodiversity and its role in providing benefits to the economy, society and the environment. Address key knowledge gaps leading to better decision making especially in regard to key societal issues such as sustainable resource management, climate change and geological hazards.

Achieving the vision

Northern Ireland's Geodiversity Charter encourages determined and collective action from all sectors including but not limited to central government departments, local government, academia, industry, education, NGOs, and charities.

As our geodiversity faces unprecedented pressures, the Geodiversity Charter has identified an ambitious list of ten outcomes and suggested actions to aim for. The actions, whilst local to Northern Ireland, will contribute to global impact and, as such, have been aligned to the 17 UN Sustainable Development Goals.

Case studies have been provided for each which provide clear examples of where these outcomes have already been achieved.

Outcomes

Outcome 1: Increase food security and promote sustainable agriculture
Outcome 2: Deliver quality education and promote lifelong learning opportunities for all
Outcome 3: Ensure availability and sustainable management of water
Outcome 4: Ensure access to affordable, reliable and sustainable energy
Outcome 5: Promote sustained, inclusive and sustainable economic growth
Outcome 6: Ensure communities are safe, resilient and sustainable
Outcome 7: Ensure sustainable consumption and production patterns
Outcome 8: Take urgent action to combat climate change and its impacts
Outcome 9: Conserve and sustainably use the coast and marine environment
Outcome 10: Protect, restore and promote the sustainable use of terrestrial ecosystems

2 ZERO HUNGER

OUTCOME 1

Increase food security and promote sustainable agriculture

Geodiversity is crucial for food security as it underpins ecosystem services like soil health, water filtration, and nutrient cycling, all essential for agriculture and food production.

SUGGESTED ACTION

Ensure that geodiversity is incorporated into resilient agricultural practices to increase productivity and production

CASE STUDY

Soil Nutrient Health Scheme

Soils are an important aspect of geodiversity, and a better understanding of their health is crucial for the Northern Ireland agricultural sector. The Soil Nutrient Health Scheme, managed by AFBI, is one of the most comprehensive regional soil nutrient sampling schemes to be undertaken anywhere in the world. Once complete, it will provide the farmers of Northern Ireland with information to optimize the application of crop nutrients to their soils and help increase farm profitability. This will result in a reduction in nutrient loss to waterbodies and provide a baseline assessment of farm carbon stocks in soils and hedgerows and contribute to the transition to Net Zero farming in Northern Ireland.

Soil sampling for the Soil Nutrient Health Scheme.

4 QUALITY EDUCATION

OUTCOME 2

Deliver quality education and promote lifelong learning opportunities for all

Education about geodiversity is crucial for understanding our planet, fostering responsible stewardship of natural resources, and promoting sustainable development by highlighting the interconnectedness of geology, ecosystems, and human activities.

SUGGESTED ACTIONS

Develop opportunities for young people to acquire skills for employment that include geodiversity and its value for society

Support learning opportunities that develop skills and knowledge linking geodiversity and sustainable development

CASE STUDY

Belfast Hills Trainee Ranger Scheme

The highly successful Trainee Ranger Scheme, delivered by the Belfast Hills Partnership, offers young people aged (18-25) an opportunity to boost both their employability and well-being. The scheme is aimed at young people who want to gain skills and qualifications that will help them move on to employment or further training. Whilst providing practical experience in the environmental sector, it also encourages young people to get out into nature, exploring both the geodiversity and the biodiversity of the Belfast Hills, and forge friendships with other participants.

GeoEnergy Discovery Centre

Developed by the Department for the Economy, with technical assistance from the Geological Survey of Northern Ireland, the GeoEnergy Discovery Centre showcases the use of geodiversity as a source of geothermal energy and its links with sustainable development and climate change. This mobile exhibition centre has travelled across Northern Ireland to promote the use of geothermal heat and its links with geodiversity. During 2024 it has visited schools, town centres, local councils, as well as high profile locations such as the Balmoral Show and the Giant's Causeway Visitor Centre.

4 QUALITY EDUCATION

School pupils visiting the GeoEnergy Discovery Centre.

6 CLEAN WATER AND SANITATION

OUTCOME 3

Ensure availability and sustainable management of water

Geodiversity is vital for sustainable water management both above and below the surface providing the physical basis for water resources and helping to regulate both water quality and flow.

SUGGESTED ACTIONS

Ensure that geodiversity is recognised as a sustainable water source as part of integrated action to address water scarcity

Include geodiversity as part of the implementation of integrated water resources management

CASE STUDY

NI Water Groundwater Abstraction at Moneymore

NI Water has been exploring ways to augment its public water supply in times of drought. One of the ways this is being done is by increasing the use of groundwater as a water supply that has the dual benefit of helping enhance water security and also help NI Water to meet their carbon emissions targets by reducing the need to transport surface water from other sources. A major output of the work is the new groundwater abstraction project close to Moneymore in Co. Tyrone that pumps an extra 600,000 litres of water per day from the underlying sandstone aquifer. This frees up water from the main supply water treatment works to be delivered to other service reservoirs, improving the networks' overall resilience to high demand events.

CatchmenCARE

CatchmentCARE (Community Action for Resilient Ecosystems), was a €14m EU-funded project, aiming to improve freshwater quality in cross-border river basins, including the Finn, Blackwater, and Arney catchments. This was achieved by developing water quality improvement projects and installing groundwater monitoring stations, ensuring that both groundwater and surface water are considered in an integrated way. Fifty groundwater monitoring wells were designed and installed across the border region, helping to characterise aquifers and conduct baseline surveys of water quality, whilst investigating the interaction with surface water bodies as a post project legacy.

6 CLEAN WATER AND SANITATION

Schools outreach in the Arney River Catchment, Co. Fermanagh as part of the CatchmentCARE project.

7 AFFORDABLE AND CLEAN ENERGY

OUTCOME 4

Ensure access to affordable, reliable and sustainable energy

Understanding geodiversity is crucial for the sustainable development of renewable energy sources. This is not just in the use of geodiversity as a renewable energy resource as is the case with geothermal, but also in aiding decisions around site selection and infrastructure planning.

SUGGESTED ACTIONS

Ensure that geodiversity is included as a key component in energy infrastructure planning

Explore the use of geodiversity as a resource for renewable energy

CASE STUDY

Peat Slide Risk Assessment Knowledge Exchange

As statutory consultees for all energy infrastructure applications, the GSNI provides information on issues such as site suitability for all renewable energy developments. A major consideration for wind energy developments is the risk of peat slides as they are often planned for areas that are underlain by blanket bog, a common upland environment in many parts of Northern Ireland. Together with the NIEA, GSNI have been exploring ways to improve consultations that include Peat Slide Risk Assessments. This has been delivered through the development of standing advice for planners and developers, and through knowledge exchange visits so that both organisations can get a better understanding of the major issues to be considered as part of the application process.

GeoEnergy NI

The GeoEnergy NI project is being led by the Department for the Economy with technical support from the Geological Survey of Northern Ireland. The geothermal demonstrator project comprises two geothermal exploratory and feasibility studies at two locations. The first phase of this project at the Stormont Estate in Belfast will identify suitable drill sites. The next phase will involve the drilling and testing of water and rocks in five shallow exploratory boreholes. The intention is that the results will inform the design and installation of a shallow geothermal system on the Estate in the future. Activities at the second site at College of Agriculture, Food and Rural Enterprise (CAFRE) Greenmount Campus near Antrim will involve site investigations and geophysical surveys to identify suitable locations for the siting of a deeper geothermal borehole as part of future project delivery.

7 AFFORDABLE AND CLEAN ENERGY

Former Economy Minister Conor Murphy, former Finance Minister, and current Economy Minister, Caoimhe Archibald, and US Special Envoy Joe Kennedy III visiting the GeoEnergy NI drill site on the Stormont Estate, Belfast.

8 DECENT WORK AND ECONOMIC GROWTH

OUTCOME 5

Promote sustained, inclusive and sustainable economic growth

Geodiversity, as a key component of natural resources, has the capacity to create new jobs and stimulate economic growth, especially for remote and economically disadvantaged areas possessing rich geological features.

SUGGESTED ACTIONS

Ensure that geodiversity is considered as an opportunity within policies that support economic growth

Develop policies to promote sustainable geological tourism that creates jobs and promotes local culture and products

CASE STUDY

DfE Place Based Economic Plan

The Department for the Economy, in the delivery of its Place 10X initiative has been developing economic strategies that promote and prioritise Regional Balance. This recognises and considers the availability of local natural resources that occur as a result of Northern Ireland's geodiversity. This includes aggregates in the Mid Ulster region that are vital for the construction sector, groundwater in the Lagan Valley region that is an essential component of the agri-food sector, and key geological tourist sites such as the Giant's Causeway that act as a nucleus for tourism in the surrounding area.

Mourne Gullion Strangford Geopark Management Plan

The Mourne Gullion Strangford UNESCO Global Geopark (UGGp) gained its status in May 2023. As part of its continual growth, it has compiled a ten-year integrated development plan, strategically examining the potential for the sustainable growth of the Mourne, Gullion, Strangford UGGp. The plan serves as a blueprint for responsible tourism, conservation, and education, all underpinned by the internationally important geodiversity and includes improving the local economy through the creation of new businesses, hiring local workers in the tourism industry, and using local services, products, and supplies.

8 DECENT WORK AND ECONOMIC GROWTH

Celebrating World Tourism Day at the Mourne Gullion Strangford UNESCO Global Geopark.

11 SUSTAINABLE CITIES AND COMMUNITIES

OUTCOME 6

Ensure communities are safe, resilient and sustainable

Geodiversity plays a vital role in helping communities become more resilient and sustainable by providing knowledge and expertise to address environmental and natural resource challenges, including climate change, resource management, and disaster preparedness.

SUGGESTED ACTIONS

Ensure that geodiversity is included in evidence-based decisions to support safer communities

Gain a greater understanding of the impacts of geohazards including economic losses and vulnerability of communities

CASE STUDY

Ulster University Defective Concrete Research

The School of Geography and Environmental Sciences at Ulster University, through an international consortium led by them and funded by the Geological Survey Ireland and the Irish government's Department of Housing, Local Government and Heritage, has conducted research concluding that internal sulphate attack, triggered by pyrrhotite and framboidal pyrite oxidation in the aggregates, is the primary cause of defective concrete in Ireland. Defective concrete has led to severe structural weaknesses in both residential and commercial buildings and is thought to affect more than 7000 homes. The issue was first reported in Donegal and Mayo but other Irish counties have reported cases and the government have accepted that Sligo, Clare and Limerick are now impacted. A small number of cases have also been reported in Northern Ireland in the counties that Border Donegal. The research has led to a review of testing protocols for defective concrete that underpins a government grant scheme to assist homeowners to remediate their homes that is estimated will cost the Irish government between €2.5 to €3 billion.

Platform for Atlantic Geohazard Risk Management

The Platform for Atlantic Geohazard Risk Management (AGEO) was a four-year project funded through the EU Interreg Atlantic Area. GSNI was one of 13 partners from five countries: Portugal, Spain, France, Ireland and the UK. GSNI's role in the project was to deliver one of five Citizens' Observatories with the aim of improving risk management systems at each. For GSNI, this was done through the Causeway Coast Citizen's Observatory where they worked closely with the National Trust to monitor rockfalls at the Giant's Causeway and Carrick-a-rede, and engaged with staff, other stakeholders and the general public to raise awareness of geohazards not just on the Causeway Coast but across NI, with the aim of providing evidence-based information for sustainable risk management.

11 SUSTAINABLE CITIES AND COMMUNITIES

SUGGESTED ACTION

Support and strengthen efforts to protect and safeguard geological heritage

CASE STUDY

Coin research project at Giant's Causeway

As part of the Giant's Causeway World Heritage Site Management Plan, the Steering Group has commissioned research and a pilot study to address the issue of coin deposition within the basalt columns at the site. This was initially highlighted by NIEA staff following condition monitoring of the Giant's Causeway and Dunseverick ASSI. As Northern Ireland's first World Heritage Site and only one of a small number globally that have been inscribed because of their geological heritage, this destructive activity is thought to have begun over a decade ago when visitors began to insert coins into the joints within the basalt for 'good luck. The research commissioned concluded that the coins had led to physical and chemical damage to the rocks and could potentially damage or diminish the Outstanding Universal Value of the site. A pilot study has since been undertaken to remove the coins to get a better understanding of how this could be done on a more permanent basis and on whether this deters future occurrences.

Coins placed within the basalt columns at the Giant's Causeway, Co. Antrim.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

OUTCOME 7

Ensure sustainable consumption and production patterns

Natural resources are inherently tied to geodiversity; ranging from water extracted from beneath our feet, to our stunning natural landscapes, to the minerals extracted to build sustainable technologies of the future, these finite resources need managed responsibly to support our sustainable development.

SUGGESTED ACTIONS

Support companies in incorporating geodiversity as part of their sustainability practices

Improve the sustainable management of our geological resources

CASE STUDY

Coca-Cola HBC and groundwater

Coca-Cola HBC consolidated its bottling operations across the island of Ireland to a new purpose-built plant on the outskirts of Lisburn in 2008, specifcally because of the underlying geodiversity. They did this due to the ability to abstract high quality reliable groundwater from the underlying sandstone aquifer that would generate significant savings for the company. It also increased the resilience of the business in the face of future uncertainties. Based on a sustainable, high-quality, supply of groundwater Coca-Cola HBC invested £93.5m in its manufacturing plant in Lisburn, a 50,000 square metre facility employing more than 450 people. This is just one example from NI's food and drinks industry harnessing, off-grid, low-carbon, high-quality groundwater as a key ingredient for its products.

Northstone Materials and the Circular Economy

Northstone Materials has taken a progressive step toward improving the sustainable management of geological resources through the installation of a new asphalt plant at its Craigantlet location. This investment consolidated production from three older plants into a single, more efficient facility, reducing the overall environmental footprint of operations. The new plant is the first in Northern Ireland capable of producing asphalt with up to 70% Recycled Asphalt Planings (RAP), significantly reducing the demand for virgin aggregates and bitumen - both extracted from finite geological sources. Reusing existing road materials reduces the need for new extraction, lowers transport emissions, and supports a more circular, resource-efficient approach to infrastructure. The Craigantlet Plant demonstrates how innovation in materials processing can contribute to more sustainable consumption and production patterns within the construction sector and directly supports the delivery of lower carbon roads across Northern Ireland.

SUGGESTED ACTION

Improve the sustainable management of our geological resources

CASE STUDY

Sustainable production of Mannock Aircrete

Mannok's Aircrete division manufactures high-performance thermal aerated concrete blocks at the company's manufacturing hub in Derrylin, Co. Fermanagh. These offer exceptional insulation properties, enhancing energy efficiency, they are a key component in helping designers meet Net Zero Energy Building and Passive House standards. The manufacturing process primarily uses sand slurry as its main raw material. To improve sustainability, Mannok has optimised this process to substitute approximately 10% of the required sand slurry with silt recovered from its sand-washing process.This innovation reduces reliance on sand resources, prolonging the life of existing reserves, and repurposes a by-product that would otherwise require disposal. Additionally, the use of silt provides a further environmental benefit as the liquid silt fines are thickened to a slurry consistency for use, clean water is recovered and returned to the washing plant for re-use in the washing process. This recycling process reduces the need for groundwater abstraction, conserving local water resources while supporting a more circular manufacturing system.

Liquid batched slurry mix at Mannock Aircrete.

13 CLIMATE ACTION

OUTCOME 8

Take urgent action to combat climate change and its impacts

Understanding geodiversity is crucial for adapting to climate change and mitigating natural hazards. Only through the integrated knowledge of geodiversity with other aspects of the natural environment can we strengthen resilience and reduce vulnerability to climate change impacts.

SUGGESTED ACTIONS

Strengthen resilience and adaptive capacity to climate-related geohazards

Integrate geodiversity-based climate change measures into national policies, strategies and planning

CASE STUDY

Northern Ireland Climate Change Adaptation Programme

The Northern Ireland Climate Change Adaptation Programme (NICCAP) sets out the response from Northern Ireland Government departments to the risks posed by climate change as identified in the most recent Assessment of UK Climate Risk (CCRA3). The NICCAP identified a series of policies and / or proposals that will be delivered during the period of the NICCAP to address climate change. The response from the Department for the Economy includes six proposed actions that are dependent on geodiversity for their delivery including: research into options for water supply from groundwater aquifers in Northern Ireland; research into groundwater aquifers to reduce vulnerability and to improve management of groundwater resources; research into the peat landslides in relation to climate change and extreme weather events, with particular reference to their impact on energy infrastructure; research into landslide risk, including the impact and influence of climatic factors; research to monitor coastal change at three pilot sites; and research into the extent of groundwater flooding and how this interacts with fluvial flooding.

Call for Evidence on Planning Policy and Climate Change

The Department for Infrastructure (DfI) published a Call for Evidence in relation to a potential focused review of the Strategic Planning Policy Statement (SPPS) on the issue of Climate Change. The call for evidence will inform whether the current policy framework provided for by the SPPS in relation to climate change remains appropriate and fit for purpose. Comments were provided on specific subject policies identified within the consultation document by DfI including flood risk, transportation, and development in the countryside. A request was made to include a specific subject policy on ground conditions and geological hazards given the increase in slope instability events in relation to extreme weather. This was also highlighted due to several ground instability incidents that had affected high profile developments. The impacts of climate change will require a much greater consideration of ground conditions, something that is currently not recognised within the SPPS.

13 CLIMATE ACTION

SUGGESTED ACTION

Improve education, awareness-raising and institutional capacity on the role of geodiversity in climate change mitigation and adaptation

CASE STUDY

Climate Through Time at W5

W5, the award-winning science and discovery centre within the Titanic Quarter in Belfast, underwent a substantial redevelopment that includes an updated 'In Our Nature' exhibition. Focusing on climate and sustainability, the Climate Through Time element enjoys a prominent location within the exhibit and highlights past climate change as well as on current climate change with examples from our geological past across Northern Ireland. With over 280,000 visitors annually, this exhibition is one of several that together, improve education on not just climate change mitigation and adaptation but the role that geodiversity can play in those.

The Climate Through Time exhibiton at W5, Belfast.

14 LIFE BELOW WATER

OUTCOME 9

Conserve and sustainably use the coast and marine environments

Geodiversity in coastal and marine environments is often forgotten yet its understanding is vital for conservation and for the sustainable use of our oceans, seas and marine resources.

SUGGESTED ACTION

Use geodiversity to support the sustainable management and protection of marine and coastal ecosystems

CASE STUDY

Northern Ireland Coastal Observatory

October 2023 saw the launch of the Northern Ireland Coastal Observatory, created by ESRI Ireland in partnership with DAERA. The Coastal Observatory was an objective of the Coastal Forum Working Group, with the aim of facilitating and making available coastal datasets that are urgently required to inform sustainable management of the coast. DAERA commissioned several surveys using multiple methodologies including LiDAR surveys of both the coast and nearshore areas, the collection of high resolution orthophotography, acquisition of satellite derived bathymetry data, historical aerial photographs and of course, bedrock and superficial geological datasets of the coastline.

Coastal monitoring at Dundrum, Co. Down.

15 LIFE ON LAND

OUTCOME 10

Protect, restore and promote the sustainable use of terrestrial ecosystems

Geodiversity is an essential part of nature and its role in the protection and restoration of terrestrial ecosystems is critical for creating diverse habitats and resources, forming the foundation for a wide range of species to coexist.

SUGGESTED ACTION

Ensure that geodiversity is integral in the conservation, restoration and sustainable use of terrestrial and freshwater ecosystems

CASE STUDY

Peatland Restoration on Cuilcagh Mountain

The Cuilcagh Lakelands UNESCO Global Geopark has assisted the Ulster Wildlife Trust and local landowners to restore 17 hectares of eroded peat on Cuilcagh Mountain. This work was accompanied by the development of a Conservation Action Plan (CAP) to help guide management of Cuilcagh for healthy habitats and wildlife into the future. The CAP includes information on the geodiversity of the mountain and its role in supporting the development and health of the overlying blanket bog and supported habitats and species. More recently, £280,000 has been secured from the Shared Island Peatland Challenge Fund to conduct scientific monitoring on Cuilcagh Mountain and Cuilcagh Anierin SACs to create Peatland Restoration Plans, engage local communities and landowners in restoration and volunteering opportunities.

Peatland restoration on Cuilcagh Mountain, Co. Fermanagh.

Lough Atonagh from the Cuilcagh Boardwalk.
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Department for the Economy
www.economy-ni.gov.uk

An Roinn Geilleagair

GSNI Geological Survey of Northern Ireland
www.bgs.ac.uk/gsni

NIEA Northern Ireland Environment Agency
www.daera-ni.gov.uk