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GEOLOGICAL SURVEY OF NORTHERN IRELAND

Annual Report 2024/25

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Front cover image: Greywacke sandstone with sole markings demonstrating current flow from near Donaghadee, Co. Down.

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Contents

Cretaceous limestone exposed on the Antrim coast shoreline © Tourism Ireland by Arthur Ward

Director's statement: Dr Marie Cowan

This year has marked a significant period of progress and ambition for the Geological Survey of Northern Ireland (GSNI), as we continue to deliver high-impact public science for government, society, and the environment. As a small but ambitious team embedded within the Department for the Economy, and staffed by scientists from the British Geological Survey, our work is increasingly central to supporting policy development, economic resilience, and climate adaptation across Northern Ireland.

Our science and innovation programmes—spanning energy transition, environmental change, baseline geoscience, and societal engagement—have expanded in depth and impact. From leading flagship projects such as GeoEnergy NI and GEMINI to completing the national 1:10k superficial geology dataset for the first time and revised Engineering map for Belfast, successful bid for new CMAP project, our work this year exemplifies how robust geoscience underpins strategic decisions for infrastructure, energy and environmental management.

In the area of geothermal energy, GSNI has made major strides. The co-hosting with Ulster University of a ministerial-supported heat pump event, delivery of the first government-owned geothermal borehole at Stormont, publication of secondary-level education resources, and hosting of the GeoEnergy NI documentary at the NI Science Festival collectively demonstrate our commitment to supporting Northern Ireland's energy transition through public engagement, data, and policy-relevant science.

In addition to the roles GSNI scientists' serve on NI central and local government steering groups and fora, this year saw GSNI deepen its contributions to national and international dialogue and provide leadership on academic, editorial, and advisory boards including:- UK National Hazards Partnership, Royal Irish Academy, Trinity College Dublin, University College Dublin, 13 of UK's Russell Group of Universities, international universities, the Geological Society of London, Institute of Geologists of Ireland, UK Geoscience Strategic Alliance, European Geosciences Union, and UNESCO Global Geoparks Council.

We are proud that our science provides evidence into government priorities. Our role in shaping climate adaptation strategies, land use frameworks, and minerals policy has grown substantially. GSNI's ability

to convene and inform scientific insight, stakeholder engagement, and policy relevance remains a hallmark of our partnership approach.

Internally, we have maintained robust governance and operational delivery. This includes monthly Executive oversight, rigorous work programme reporting to DfE, and successful completion of our office relocation. Our ongoing preparations for ISO 9001, ISO 14001, and ISO 45001 accreditations reflect our commitment to high standards in project management, environmental management and occupational health, safety, and wellbeing.

The achievements of our team this year have been exceptional. Whether through staff promotions, national appointments, or cross-sector partnerships, GSNI continues to demonstrate the value of expert, place-based, science in serving the public good.

We are committed to a research culture that is inclusive, forward-looking, and for society. The development of our EDI Action Plan, our contribution to the BGS Athena Swan Silver award, our role on the European Geosciences Union EDI Committee, and our continued commitment to education and the next generation of geoscientists reflect this ethos.

GSNI is a small team with a wide reach. As the challenges facing our society and environment grow, so too does the importance of place-based, policy-relevant science. In the coming year, we will deepen our focus on natural resources for the energy transition, subsidence and coastal vulnerability, and the digital transformation of geoscience data.

As we look ahead, GSNI remains committed to delivering trusted geoscience in service of a sustainable, secure, and informed future for Northern Ireland. I want to thank all our staff, partners and stakeholders for their continued support. Together, we are demonstrating the power of geoscience to inform, to connect, and to lead.

Dr Marie Therese Cowan PGeo, MIoD MRIA
Director, Geological Survey of Northern Ireland

Introduction

GSNI is an office of the Department for Economy (DfE) in Northern Ireland staffed by scientists of the British Geological Survey. It was established under the Minerals (Miscellaneous Provisions) Act (Northern Ireland) 1959 and sits within the Energy Group of the DfE.

GSNI provides professional, technical and scientific research, data services and archive management to inform the development of NI's economy and to help protect its environment.

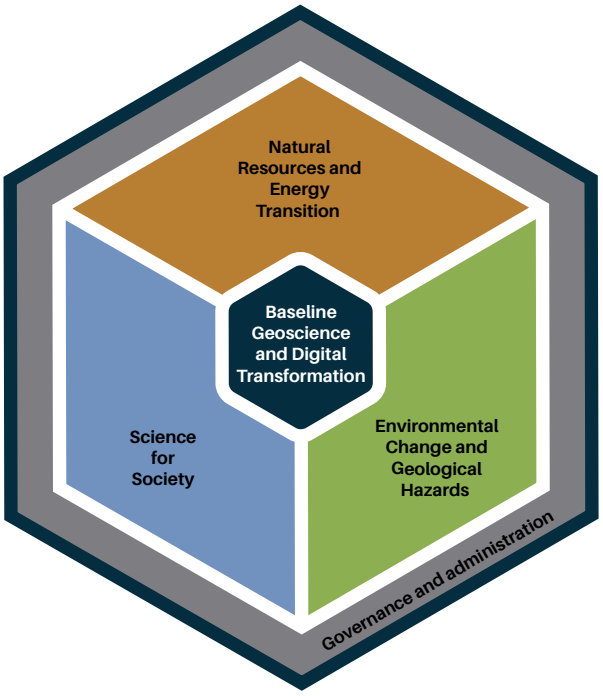
The work programme for DfE and associated terms and conditions are detailed in a service level agreement (SLA) between DfE and UK Research and Innovation (UKRI). The same applies to SLAs with Northern Ireland Environment Agency (NIEA) and other public sector bodies.

UKRI is a non-departmental public body sponsored by the Department for Science Innovation and Technology (DSIT) which governs the BGS and employs GSNI staff.

Public science role

GSNI'S mission is to deliver high quality scientific evidence and expert knowledge to inform the sustainable use of natural resources and sound environmental governance whilst helping society transition to a low carbon economy and adapt to a changing world. We achieve that through four overarching strategic objectives:

- Society, economy and environment: Delivering geoscience data and evidence to progress the economic and social ambitions of Northern Ireland while protecting and enhancing its natural environment.
- People and assets: Recruiting, developing and supporting our people and assets to provide high impact, innovative, efficient and effective public service.



Views over the glacially-carved Glens of Antrim © Tourism Ireland by Bernie Brown

- Partners and customers: Engaging with and listening to the public and stakeholders to inform our work and help build trust in, and understanding of, geoscience and the GSNI. Strategically informing and supporting key decisions and policies on national geological issues in Northern Ireland.
- Unlocking our data: Unlocking the value of our paper records and physical collections in our archive and through digital transformation of our data and delivery mechanisms.

GSNI work programmes

Governance and administration

In an organisational context, governance refers to the rules, policies, procedures, processes that guide the organisation, including its board of directors and executive management structure. Administration involves the daily operations of the organisation, such as managing employees, handling customer service, and producing goods or services.

The GSNI Director, supported by the Science Programme Manager and Chief Geologist, leads and has responsibility for the governance and administration of GSNI. This includes strategic oversight and operational management of all GSNI's activities, ensuring adherence to national policies, scientific integrity, stakeholder engagement, and providing effective management of risk.

GSNI's public-good science is delivered through four science and innovation programmes using a coordinated approach to address local, national and global challenges. A summary of each of these has been provided below.

Natural resources and energy transition

An essential part of GSNI's work is ensuring our geoscience knowledge and expertise helps NI make best use of natural resources in a sustainable way and that policy decisions are informed by data and high-quality research. To this end, the Natural Resources and Energy Transition work programme supports the regulatory duties of DfE and wider government through the provision of technical expertise.

The green technology revolution relies on critical raw materials, sustainable use of groundwater resources and utilisation of low-carbon subsurface energy solutions. The Natural Resources and Energy Transition work programme increases the understanding of the distribution of these resources in Northern Ireland, and how subsurface properties and the modelling of geological processes can help in planning for the energy transition and sustainable use of water resources.

Environmental change and geohazards

Climate change is the most pressing environmental issue we face, impacting our coastline, infrastructure, built environment and natural ecosystems. The Environmental Change and Geohazards work programme helps increase our understanding of changes to our natural and built environment, the vulnerability of our environment to geological hazards and how it is responding to climate-driven challenges.

Key tasks within the Environmental Change and Geohazards work programme include enhancing geological hazard characterisation by implementing new monitoring techniques, increasing knowledge of groundwater to help reduce groundwater vulnerability, assessing coastal change to reduce coastal vulnerability, and increasing the understanding of the urban and built environment to support climate resilient development.

Baseline geoscience and digital transformation

The expansion and improvement of our national baseline geoscience data is necessary to ensure we have the right data to address future challenges such as the supply of energy, raw materials and water.

Good data underpins sound decision making and the demand for open access to data resources is increasing; data users want access to authoritative, modern, and increasingly, real time data. Our archives hold a wealth of information that must be accessible in order to be appraised against today's geoscience challenges.

The Baseline Geoscience and Digital Transformation work programme expands our geoscience data holdings and delivers GSNI's data to end users by supplying the underlying infrastructure, applications and processes that support all of the other work programmes.

Science for society

NI faces several societal challenges that present an opportunity to highlight the key role that geoscience must play in addressing these. By communicating with the public and our stakeholders and by strategically informing and supporting relevant government policy, we can raise awareness of and begin to address these challenges.

Increasing societal challenges will require an increased number of future geoscientists to enhance NI's sustainability and economic resilience which can be achieved by developing an inclusive approach to geoscience education. This is complemented by supporting sustainable geological tourism and using it as an effective and powerful means of bringing geoscience directly to society.

Statutory responsibilities

As an office of DfE, GSNI has several statutory responsibilities as laid out in NI legislation as indicated in the table below.

NI legislation that determines GSNI's statutory responsibilities

Theme	Legislation
Minerals	Minerals (Miscellaneous Provisions) Act (Northern Ireland) 1959
	Mineral Development Act (Northern Ireland) 1969
Planning	Planning Act (Northern Ireland) 2011
	The Planning (General Development Procedure) Order (Northern Ireland) 2015
	The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2015
Petroleum	Petroleum (Production) Act (Northern Ireland) 1964 and secondary legislation in 1987 & 2010
Abandoned Mines	Mineral Development Act (Northern Ireland) 1969
National Core Repository	Minerals (Miscellaneous Provisions) Act (Northern Ireland) 1959
Climate Change	Climate Change Act (Northern Ireland) 2022

Cloughmore glacial erratic overlooking Carlingford Lough, near Rostrevor © Tourism Ireland by Chris Hill Photographic

Section 1
Our public-good science

Delivering the GSNI strategy

GSNI Science Advisory Committee

The role of the GSNI Science Advisory Committee (SAC) is to advise the GSNI Director and GSNI Executive on the development and delivery of GSNI's science strategy. The SAC comprises just over 20 external members from all sectors, trade bodies and professional bodies in NI, and representatives from Ireland and elsewhere in the UK.

This SAC aims to meet twice per year, and the position of Chair rotates amongst the university representatives; this year the SAC met online in October.

GSNI Science Task Force

The GSNI Science Task Force (STF) was established in September 2022 and has the following roles:

- Review current research science and ensure links into relevant NI government policies.
- Prioritise future research that aligns with and meets the requirements of the GSNI science strategy.
- Maximise the impact of our science; and ensure benefits for society.

The membership of the STF consists of GSNI scientists who meet quarterly. This year, the STF met in-person in August, October, November and February.

The STF reports to the GSNI Executive with the focus being to strategically prioritise research as part of the GSNI work programme and to respond to new research challenges as they arise.

Science into policy

GSNI's position as an office within DfE provides a valuable opportunity to inform and support public policy development right across NI government, and to inform debates and decisions on relevant issues. Using this approach, it is providing the scope to identify policy trends and opportunities not just within NI, but throughout the UK, Ireland, and the rest of Europe.

GSNI staff have a wide range of expertise demonstrated through the breadth of science work programmes making it possible to provide valuable contributions to relevant policy consultations, calls for evidence and requests for information. Topics covered this year were centred around climate change including mitigation and adaptation related policies, as well as there being a strong focus on energy infrastructure.

Summary of science into policy

A list of policies that GSNI has provided input to are provided in the table below. Specific examples of science into policy are provided in the next section.

Department / Organisation	Policy
UNESCO	Review of the Operational Guidelines for UNESCO Global Geoparks
The Executive Office	NI Draft Programme for Government Consultation 2024-2027
DAERA	Development of NI's Third Climate Change Adaptation Programme (NICCAP3)
UK Climate Change Committee	Development of the 4th UK Climate Change Risk Assessment (CCRA4)
DAERA	Review of NI's Second Climate Change Adaptation Programme (NICCAP2)
UK House of Commons Science, Innovation and Technology Committee	Under the Microscope submission on geoscience skills supply on behalf of the UK Geoscience Strategic Alliance.

Summary of outputs

6 Peer-review papers and books

5 Public webinars and talks

19 Conference abstracts

5 GSNI-led fieldtrips

6 Reports

4 Public in-person events

2 Magazine article

2 Education resources

Summary of SLA objectives

A summary of the work programme delivered as part of the DfE SLA is provided in the table below.

WP	No.	Objective	Target Achieved in 2024/25
Governance	1	Governance and administration	
	2	Coordination of scientific and technical activities	
	3	Strategy and stakeholder engagement	
	4	People	
	5	Communications	
	6	Leadership and representation	
Natural Resources	1	Minerals and quarries: operational	
	2	Minerals policy development	
	3	Petroleum policy development	
	4	Geothermal energy	
	5	New technologies and geostorage potential	
	6	Groundwater resources	
	7	Marine	
Geohazards	1	Abandoned mines programme	
	2	Earth observation and shallow geohazards	
	3	Coastal change	
	4	Disaster response	
	5	Groundwater environment characterisation	
Data & baseline	1	Core store	
	2	Geoscience data collection and curation	
	3	Geoscience data publication	
	4	Digital support tools	
	5	Strategic baseline mapping	
Science for	1	Development management (planning)	
	2	Climate action and sustainable development	
	3	Sustainable tourism and geoheritage	
	4	Skills and education	
	5	Public engagement and outreach	
Geothermal	1	Scientific and Technical Support (Stormont)	
	2	Scientific & Technical Support (Greenmount)	
	3	Communications	
	4	Project support	
	5	Administration	

Governance highlights

The GSNI Executive maintained structured oversight mechanisms including monthly Executive meetings, quarterly finance, and performance reviews with DfE, and ongoing risk management. Budgets across all funding sources were monitored effectively, with regular returns, invoice verifications, and alignment with both DfE and BGS finance, health, safety and wellbeing and risk protocols. The full relocation of GSNI from Dundonald House was successfully completed, reflecting efficient resource and estate management.

Monitoring and reporting activities remained rigorous throughout the year. The GSNI Executive produced monthly and quarterly reports for DfE, conducted mid-year reviews, and ensured full compliance with DfE SLA performance indicators. All staff allocations were tracked, and resource planning aligned to projects' needs. Regular updates to clients, and uploads to the NICS Content Management System ensured that reporting was transparent.

Leadership and strategic influence

The Director and Executive Team have played a vital role in shaping and promoting the societal value of geoscience throughout the past year. Their leadership has ensured the GSNI remains at the forefront of national and international geoscience policy, innovation, and collaboration. Highlights include chairing the NI Geothermal Advisory Committee and the Science in Stormont initiative, providing expert evidence to the UK House of Commons, and contributing to strategic boards across major academic institutions such as University College Dublin, the University of Leeds and Armagh Observatory and Planetarium.

The Director's role as an elected Council Member of the Royal Irish Academy and keynote speaker at major energy and economic conferences further amplified GSNI's voice in energy transition, skills development, and sustainable resource use. The Science Programme Manager and Chief Geologist are both members of multi-disciplinary committees at the Royal Irish Academy. All these roles have significantly advanced GSNI's mission to deliver geoscience that serves society, strengthens policy, and drives economic and environmental resilience across the island.

Dr Kirstin Lemon has made an outstanding contribution to GSNI, BGS and to the wider geoscience community significantly enhancing the reputation of UKRI/NERC and the BGS. This year she was appointed to UNESCO's Global Geoparks Council cementing her influence on global geoscience education, geoscience for sustainable development and geoheritage policies.

Professor Mark Cooper has been appointed adjunct professor at Trinty College Dublin. He is also a lecturer at Belfast Metropolitan College, co-supervisor on multiple PhDs and Masters projects. He is a co-author on several papers and of the Irish Journal of Earth Sciences Special Publication on Critical Raw Materials.

View from the summit of Cuilcagh Mountain, Co. Fermanagh © Tourism Ireland by Gareth McCormack

Organisation, event or initiative	Month	Role
UNESCO / Geological Survey of India Geopark Workshop, New Delhi, India	Sep	Invited expert
UNESCO in NI workshop, Belfast	Oct	Invited speaker
Science in Stormont, Belfast	Oct	Chair
UNESCO reception for International Geodiversity Day, Paris, France	October	Invited speaker
NI Geothermal Advisory Committee	June, Nov, Mar	Chair
Royal Irish Academy Council	May, Sept, Nov, Feb	Elected member
UK Geoscience Strategic Alliance	Oct, Nov, Feb, Mar	Member, consultation response co-author
Geosolutions External Advisory Board, University of Leeds	Nov	Invited member
ICRAG Governance Board, University College Dublin	Oct, Nov	Invited member
Project Innerspace Roundtable, London,	Mar	Invited expert
Atkins Realis Geotechnical data Roundtable, London	Mar	Invited observer
Minerals Deposits Studies Group Conference, Dublin	Jan	Panel chair
RIA / Geological Survey Ireland Geoscience Lecture, Dublin	Feb	Invited panellist
ICRAG at 10 Conference, UCD, Dublin	Feb	Panel chair
Murrayfest Conference, UCD, Dublin	Dec	Invited speaker
N. Ireland Economic Conference, Belfast	Dec	Invited panellist
Geothermal Energy Summit, Dublin	Nov	Invited speaker
Ground Engineering Magazine: Geotechnical Information	July	Invited contributor
Agenda NI Magazine, Heat Pump event	June	Co-author
Energy Ireland Conference, Dubin	June	Invited speaker
Geoscience and Skills Supply Geological Society of London,	May	Invited keynote
Irish Journal Earth Sciences, Special Volume: Critical Raw Materials	Various	Editorial board member, co-authors
UNESCO Global Geoparks Council	Various	Elected member
Armagh Observatory and Planetarium Board	Various	Minister-appointed board member
RIA Geography and Geosciences Committee	Various	Member
RIA Climate Change and Environmental Sciences Committee	Various	Member
Department of Geology, Trinity College Dublin	Various	Adjunct Professor
Belfast Metropolitan College	Various	Lecturer

Scientific and Technical boards, committees, groups, events that GSNI staff were invited to participate in throughout the FY

Science highlights

Natural resources and energy transition

Minerals licensing support

GSNI continued to provide operational support to DfE through the year with ongoing input to the mineral licensing system. Routine support in meetings with licence holders, visits to active licence exploration activities and screening of proposed work programme items for environmental impact remained core support activities.

In November a Judicial Review ruling was delivered on three licences that were initially awarded by DfE for a six-year period in 2019. As a result of this ruling, the licencing process was updated to include several additional documents as part of the consultation process. GSNI's input was manifest in the processing of the applications (through geological assessment and screening for potential environmental impact) and map production for the DfE website.

Research to support critical raw materials policy development

Recent mineral policy development has been ongoing since 2021 with DfE commissioned research into the social, economic and environmental impacts of mineral development. With the publication of the UK Critical Mineral list as a driver, GSNI has been identifying potential mineral development opportunities in NI. Funding for laboratory analysis of target mineral datasets has provided vital support for this research into the critical mineral potential of the region.

Additional academic research supervised by GSNI staff is ongoing with Universities in the UK Ireland and Canada. Among these are collaborations with the University of Cambridge (on critical raw materials), Edinburgh University (critical raw materials and VMS), Trinity College Dublin (Platinum group mineral research) and proposals for research into antimony potential with Leeds University. Findings from all these research lines have the potential to inform the further development of policy relating to critical minerals in NI.

Critical Raw Materials at the European Minerals Conference

GSNI presented the results of DfE funded research on Critical Raw Materials (antimony) in the Longford-Down terrane at the recent European Minerals Conference, hosted by the Mineralogical Society of the UK and Ireland at Trinity College Dublin. In addition, GSNI co-lead a fieldtrip to Carlingford (Co. Louth) and Slieve Gullion (Co. Armagh) both of which have been subject to historic minerals exploration. The field trip was co-led by Critical Ireland, a Science Foundation Ireland project investigating the Palaeogene geology of the island to look for signs of platinum group elements (PGEs) mineralisation and understanding their conditions of formation.

Past and present Economy Ministers, Conor Murphy and Dr Caoimhe Archibald together with the US Special Envoy to Northern Ireland for Economic Affairs, Joe Kennedy III visiting the GeoEnergy NI drill site at Stormont

Drilling completes as part of GeoEnergy NI project

As part of the DfE's GeoEnergy NI project, ground works were completed at the geothermal demonstrator site within the Stormont Estate in Belfast. Drilling of the stratigraphic borehole was followed by geophysical logging and drilling of four hydrogeology borewells. This represents a key milestone for the project, the results of which are being used to assess the shallow geothermal potential for heating and cooling of buildings on the NI Government estate at Stormont. The project welcomed visits from the DfE Minister, Conor Murphy, and the US Special Envoy to NI for Economic Affairs, Joe Kennedy.

Launch of the GEMINI project

Together with 14 other partners, GSNI launched the Geothermal Energy Momentum on the IslaNd of Ireland (GEMINI) project. This £17.3 million project aims to drive shallow and deep geothermal energy adoption across Ireland and will showcase the diverse applications of geothermal energy at several demonstration sites in Belfast, Sligo and Dublin. Additional data will also be collected for potential future sites, to increase knowledge of the sub-surface and the island's potential geothermal resources. The project is funded through the PEACEPLUS programme managed by the Special EU Programmes Body (SEUPB).

BGS Hydrogeology Course delivered in NI

GSNI, together with other BGS hydrogeologists, developed and delivered the Introduction to Hydrogeology Course for staff from across BGS. The course was delivered in Belfast with field visits in the surrounding area to underpin the classroom content. The course provided basic hydrogeology training and helped to highlight the groundwater science that GSNI delivers together with key stakeholders such as NI Water and the NI Environment Agency.

Participants on the BGS Hydrogeology Course delivered by GSNI

Environmental change and geological hazards

Abandoned mine programme

GSNI continued its abandoned mine monitoring programme carrying out assessments of NI's historic mine workings. A total of 71 inspections were conducted during the year with mitigation measures carried out at three sites. Throughout the year GSNI continued to deliver its abandoned mine 24/7 emergency response service with one incident reported.

The development of a new mines database was completed and work started on digitising and incorporating over 10,000 abandoned mine documents to the new system which will be made publicly available online in 2025.

Ground instability and critical energy infrastructure

GSNI, together with members of the Shallow Geohazards Team at BGS, has completed a report assessing the ground stability of the Carrickfergus abandoned salt mines and implications for the Belfast Gas Transmission Pipeline (BGTP). This report was completed as part of the abandoned mine monitoring programme for DfE and is crucial for understanding and minimising the risk from ground instability to critical energy infrastructure in NI because of unstable mine workings. The results have initiated the design and set-up of a high-density geodetic monitoring network across the area which will be operational in 2025.

GSNI joins the Natural Hazard Partnership

GSNI joined the Natural Hazards Partnership (NHP) and attended their Steering Group meeting in December. The NHP is a UK-based collaboration of government agencies, research institutions, and other stakeholders focused on enhancing preparedness and response to natural hazards. This is the first time there has been representation from NI within the NHP, that brings together the science and practitioner community across the natural hazard resilience space. GSNI presented on our governance within both BGS and the NI government, and how we work with various government departments to provide information and advice on natural hazards.

GSNI staff together with representatives from BGS and DfE at the launch of the updated Engineering Geology Map for Belfast

Launch of Engineering Geology Map for Belfast

GSNI launched the new Engineering Geology Map for Belfast, an update to the original 1970s map to meet the needs of numerous geotechnical, civil and environmental engineering stakeholders. The map provides an overview of the distribution of superficial deposits, the underlying bedrock formations, and depth to the base of estuarine deposits, bedrock and till across Belfast. In addition, the map contains generalised descriptions of the geological formations encountered as well as a series of illustrations describing a conceptual model of the development of superficial deposits in Belfast.

Success with PEACEPLUS funding for CMAP

GSNI is one of 12 partners included within the PEACEPLUS Coastal Monitoring for Adaptation Planning project (CMAP). PEACEPLUS is a cross-border funding Programme supported by the European Union, the UK Government, the Government of Ireland, and the Northern Ireland administration. This €9.6 million project, led by Ulster University, will help us to monitor several sites along the coast of Northern Ireland and border counties and develop ways to adapt to climate change.

Knowledge exchange with Northern Ireland Environment Agency

GSNI organised and led a knowledge exchange workshop with the NI Environment Agency (NIEA) to learn about peat slides and their impacts. It was attended by GSNI staff together with the Chief Executive of NIEA and members of their Country, Coast and Landscape Planning Branch. The event was held in Cuilcagh Mountain and was facilitated by Fermanagh and Omagh District Council together with the Cuilcagh Lakelands UNESCO Global Geopark. GSNI currently has a Service Level Agreement with NIEA to deliver joint training events on peat slide risk assessments, and this visit was the first in a series that will work towards the development of a regional peat slide susceptibility map.

Group	Lead Organisation	GSNI Role
Climate Change Adaptation Working Group	DfE	Member
Giant's Causeway World Heritage Site Steering Group	National Trust	Member
Groundwater Resources Working Group	DfE	Chair
Land Use Working Group	DAERA	Member
Local Energy Action Plan	Belfast City Council	Invited Member
Mourne Gullion Strangford UNESCO Global Geoparks Management Group	Newry and Mourne District Council	Member
NI Abandoned Mines Oversight Committee	DfE	Member
NI Earth Observation Steering Group and User Forum	DoF	Members
NI Geothermal Advisory Committee	DfE	Chair
Planning Statutory Consultee Forum	DfI	Member
UK Natural Hazards Partnership	Various	Member
Whitespots Executive Stakeholder Group	Ards and North Down Borough Council	Member

Central and Local Government and NGO Groups and committees that GSNI participated in throughout the FY

Science into policy

Planning development management

GSNI, through DfE, is a statutory consultee for planning applications in the development management process as stipulated in The Planning (General Development Procedure) Order (Northern Ireland) 2015. This is for all mineral applications and for all applications for hydrocarbon exploration or extraction. In addition, GSNI is a non-statutory consultee for planning applications that may be impacted upon by geological issues including but not limited to abandoned mines, compressible ground, and geological hazards. This year, there were 182 planning consultations, with 48% being statutory.

As part of the development management process, GSNI supports Planning Officials through the provision of expert advice including recommending necessary site investigations needed for specific sites and reviewing a wide range of assessments including, but not limited to, Environmental Statements, slope stability reports, landslide risk assessments and mine risk assessments

DAERA Marine Plan Policies

GSNI contributed to the final draft of the Department for Agriculture, Environment and Rural Affair's (DAERA) Marine Plan, prior to their issue for public consultation. GSNI provided comment on and / or is named for Further Guidance in Strategic Policy STP02 Climate Change, Core Policy CP02 Geodiversity and in Sectoral Policies SP03 Energy – Renewables, SP04 Energy – Transmission and Storage, SP05 Energy – Oil & Gas, SP06 Energy Carbon Capture, Usage and Storage, and SP10 Marine Aggregates.

Climate Change Adaptation Planning

GSNI continues to work with the DfE Climate Change Team to ensure that geoscience solutions are included as part of NI's contribution towards climate change adaptation. This year GSNI reviewed the actions submitted as part of NI's 2nd Climate Change Adaptation Programme (NICCAP2) and provided updates on GSNI's progress. We also contributed to the DAERA commission for input into the third NI Climate Change Adaptation Plan (NICCAP3). GSNI has committed to delivering elements of climate change adaptation under the themes of energy, water supply, critical infrastructure, and towns and cities.

GSNI are invited participants on the Land Use Working Group established by DAERA

DAERA Land Use Working Group

GSNI has been invited to participate in the Land Use Working Group (LUWG) established by DAERA. The task of the LUWG is to produce a report and agree recommendations that will support the future development of a land use strategy / framework for NI, supported by stakeholder engagement. This will include reviewing existing government policies, strategies and plans for their impacts on land, alongside emerging pressures, to agree what outcomes are wanted from land, consider approaches taken across the rest of the UK and Ireland, as well as the role of relevant science models in future decision making.

Policy integration for NI's Geodiversity Charter

GSNI has delivered a successful outreach programme in support of NI's Geodiversity Charter 2021-2024. This phase of outreach focused on local and central government highlighting the relevance of geodiversity for local and national policies. Presentations were delivered to the Historic Environment Division of the Department for Communities, DAERA, through the Office of the Chief Scientist, and to the Ards and North Down Borough Council Place and Prosperity Committee.

Geopark Workshop for Indian Government

GSNI worked with the UNESCO South Asia Regional Office in New Delhi together with the Ministry of Mines, Government of India and Geological Survey of India, to deliver a workshop and develop a road map for the establishment of UNESCO Global Geoparks in India. With a growing interest in the concept of geological heritage the workshop was delivered for local communities, professional associations as well as local, state and national government representatives.

GeoEnergyNI Education Resources

GSNI has been working to develop education and skills expertise to support geothermal energy in NI as part of the GeoEnergy NI project. This is being done through the development of education resources for a range of levels, building on the success of the primary school resources developed in the previous year. This year we focused on secondary school resources aimed at GCSE (Key Stage 4) pupils, specifically for Science (Physics) as a single

GSNI staff demonstrating the GeoEnergy NI education resources at the NI Science Festival

subject or double / single award. Two resources have been developed looking at energy forms and energy transfer, both of which have been linked to geothermal energy and include case studies from the GeoEnergy NI project and the use of ground source heat pumps.

Northern Ireland Programme for Government

Through our data, research advice and geothermal projects for DFE, Geothermal was cited, together with wind and biomethane, for the first time under the decarbonisation policy options.

Baseline geoscience and digital transformation

Completion of 1:10K superficial geology mapping

GSNI has completed mapping of the 1:10K superficial geology of NI meaning that there is nearly 100% coverage for the first time in GSNI's history. Geological mapping has been ongoing since before GSNI's inception in 1947, but superficial geology has only received more focused attention over the past decade. This has been driven by a strategic need for a better understanding of NI's superficial geology such as to support groundwater, critical raw materials and for geothermal energy.

Strategic review of GSNI mapping

Geological mapping offers critical insights into the structure, composition, and history of the subsurface. It helps us to identify strategic resources such as critical minerals, groundwater, and energy sources as well as aiding in the assessment of natural hazards enabling better risk management and land-use planning.

Despite being one of the most geologically mapped places on the planet, the quality and quantity of some of NI's geological mapping is not suitable for today's demands. As a result, GSNI's mapping has undergone a strategic review to identify priority areas for updates and improvement and that aligns with GSNI's science priorities as well as those of NI government.

Launch of OREO NI

The Online Resource for Earth Observation in Northern Ireland (OREO NI) platform was launched this year. GSNI was part of the Earth Observation (EO)

The GSNI archives at Castle Buildings were audited to prioritise data digitisation.

steering group and user forum, helping to steer and guide the development of the platform and providing NI specific case studies. This newly developed web platform provides access to EO resources through a single access point for the NI public sector. This provides increased awareness of EO applications and encourages knowledge sharing and capacity building for using EO to address public sector challenges.

Audit of GSNI collections

Following the clearance of Dundonald House, the GSNI collections were reviewed to identify material that should be prioritised for scanning and digitisation. These materials were deposited with, or collected by, GSNI and include maps and reports related to ground conditions, minerals, energy and land-use. These documents provide valuable information that can be re-appraised to support critical raw materials and geothermal energy, and create new and innovative products to help with land-use and planning.

In addition, existing digital data were reviewed to identify improvements that will ensure that these data remain fit for purpose, serve the needs of customers, and ensure that GSNI collect the data required to inform our science today and into the future.

GSNI core store

Work has continued to manage and catalogue the geomaterials collections. The core store was re-organised with the assistance of the Department to improve storage capacity. A number of cores have undergone a trial of high resolution imaging that have subsequently been made available to researchers.

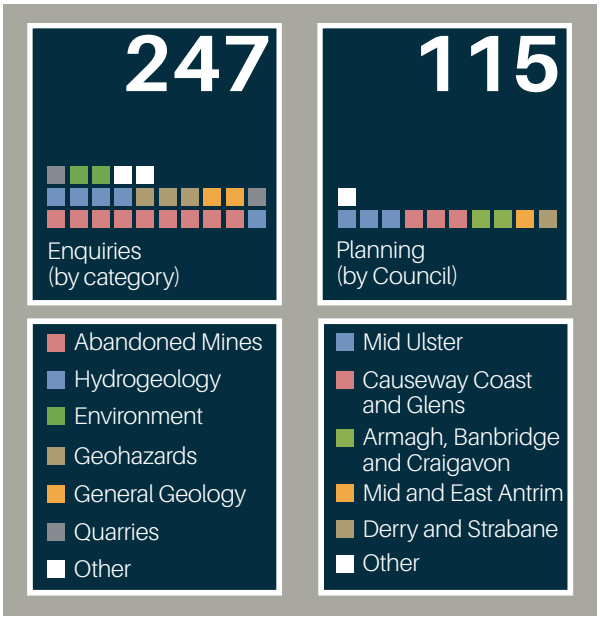
Thoughout the year and the collections were used to support a variety of PhD's, MSc's and postdocs. The core store had 67 visitors from eight institutions: Aberdeen, Birmingham, Cambridge, Edinburgh, Liverpool, Queen's University Belfast, Trinity College Dublin, and University College Dublin.

The imaging of the thin sections collection has been completed and this has proven useful to researchers looking into defective concrete.

Core that has been photographed and provided for research projects

Enquiries

GSNI responded to 247 enquiries with an average time to completion of 11 days. The sector represented and enquiry type have been collated from the enquiries database and are shown in the infographic below.



Engaging stakeholders and the public with our science

GeoEnergy NI engagement

Engagement in association with the GeoEnergy NI project has been ongoing, designed as an integral part of the project to derisk and support the future geothermal energy sector. Thousands of visitors have now learnt about geothermal energy at the GeoEnergy Discovery Centre and the drilling site at Stormont Estate including Ministers, Assembly Committee members, MLAs and VIPs including former US Special Envoy, Joe Kennedy III. A significant impact being that geothermal energy is now regularly referenced by key stakeholders including Ministers, senior civil servants and academics. Some of the facts and figures associated with this engagement campaign are seen on page 27.

Heat pump knowledge exchange and networking event

GSNI hosted a knowledge exchange and networking event on heat pumps, together with Ulster University. The event was held at Ulster University's Belfast City Centre campus and aimed to support a cluster scale-

The GeoEnery NI documentary screening in the Ulster Museum as part of the NI Science Festival

up and focused on innovation, entrepreneurship and skills. It was attended by over 120 people that included SMEs, entrepreneurs, academics, policymakers, estate managers, investors and third sector participants all of whom were involved in or had an interest in heat pump engineering, manufacture and the installation supply chain.

International Geodiversity Day at UNESCO

GSNI was one of four expert speakers invited to present at an event in UNESCO Headquarters in Paris, jointly hosted by the UNESCO Ambassadors of the UK, Kazakhstan, Poland and Portugal, to celebrate International Geodiversity Day. A presentation was delivered on the contribution of the UK UNESCO Global Geoparks Network (GGN) in delivering the UN Sustainable Development Goals with a special focus on natural resources and climate change.

Publication of AGEO book

GSNI are named authors in four out of 14 papers published as part of the Platform for Atlantic Geohazards Risk Management (AGEO) project, funded through the INTERREG Atlantic Area programme. This open access book shows how citizens' involvement in geohazard risk prevention can strengthen regional and national risk management systems, to demonstrate a new form of engagement between civil society and local authorities.

Launch of GeoEnergy NI documentary

GSNI, together with DfE launched the documentary film about the GeoEnergy NI project as part of NI Science Festival. The film was presented by local radio celebrity Paulo Ross and was launched at the Ulster Museum to an audience of prominent stakeholders, followed by an in-depth panel discussion with members of the project team including those from GSNI, DfE, TetraTech and Morrow Communications. The documentary was also showcased for local schools the next day providing the opportunity for both GCSE and A Level pupil to ask questions about the project and about geoscience careers in general.

RIA Geoscience and Climate Change Lecture

GSNI was delighted to be asked to be a panellist as part of the inaugural Geological Survey Ireland

Events programme showcased geothermal energy to over 250,000 people

Schools programme has visited every NI council area and welcomed over 40 schools

Over 13,000 unique visitors and 28,000 visits. To the GeoEnergy NI website

Average monthly social media impressions: 12k and engagement rate of 10-15%

Significant media coverage across TV, radio, print and digital media of 2.25 million

Estimated documentary viewership of more than 100,300 since launch in February

Significant increased public awareness and understanding of geothermal energy +5%

75% of public support the use of geothermal energy in future local energy mix, increase of 6%

Geoscience Lecture that took place in January. The Royal Irish Academy partnered with Geological Survey Ireland in the event with the aim of raising awareness of geosciences and their relevance to society's needs and challenges. The event brought world-class Irish and international geoscientists to an Ireland-based audience to talk on the theme, 'Geoscience Solutions for the Climate Crisis.'

Geothermal webinar series

GSNI worked with Queen's University Belfast, Geothermal Association of Ireland and Geological Survey Ireland GSI this year to host ten webinars on geothermal energy all of which are available on the GSNI YouTube channel. In total, the webinars attracted 1309 registrants from 67 countries.

Webinar Title	Company
Building the Global Geothermal Market: A Sustainable Energy Frontier	International Geothermal Association
Building Geothermal - The New Regulatory and Policy Tools	European Geothermal Energy Council
Numerical Modelling of Geothermal Systems	University of Glasgow
Heterogeneity in the Triassic Sherwood Sandstone Reservoir in NI	University College Dublin
Finding the Heat: Mapping Geothermal Gradients Using Indirect Measurements	Dublin Institute for Advanced Studies
Supercharging UK Geothermal with the National Geothermal Centre	National Geothermal Centre
GeoEnergy NI: Unearthing the Heat Beneath Our Feet	Department for the Economy
Geothermal Providing Geosolutions for the University of Leeds Campus	GeoSolutions Leeds (University of Leeds)
Evaluating The Geothermal Potential of Hot Sedimentary Aquifers	WSP

Section 2
Our People

Sunset at the Giant's Causeway World Heritage Site © Tourism Ireland photographed by Chris Hill

GSNI staff highlights

GSNI Director elected member of The Royal Irish Academy Council

GSNI's Director, Marie Cowan, was elected from 43 nominated members of the Royal Irish Academy to one of 12 members of the Academy's Council at its annual Stated General Meeting. This is the board of the island of Ireland's pre-eminent academic organisation. Marie will participate in quarterly council meetings whilst continuing her work on the Academy's North-South Standing Committee and Council Recommended Members Committee.

Adjunct Professorship at UCD

Mark Cooper has been nominated and approved as adjunct professor with University College Dublin (UCD). This title recognises Mark's geological knowledge and experience (GSNI for 29 years), and his current involvement with the Science Foundation Ireland funded 'Critical Ireland' project as a supervisor to 2 PhDs and 1 MSc by research (soon to be a PhD).

UNESCO Global Geoparks Council

Kirstin Lemon has been appointed as one of 12 members of the UNESCO Global Geoparks (UGGp) Council, made up of representatives from around the world with expertise in the establishment and development of UGGps, in geological heritage and sustainable development. The Council provides essential advice to the Director-General of UNESCO on the development and execution of strategy, planning, and implementation of UGGps. In addition, the Council plays a crucial role in evaluating new and renewed UGGp nominations.

Global Geoparks Network Certification of Recognition

Kirstin Lemon was presented with a Certificate of Recognition from the Executive Board of the Global Geoparks Network (GGN) because of her significant contribution to the development of the GGN. The award was presented during the 17th European Geoparks Network Conference in Reykjanes UNESCO Global Geoparks, Iceland, as part of the 20th celebrations of the GGN. This prestigious honour reflects Kirstin's pivotal role in shaping the network's development and further raises the profile of UK geoscience internationally.

European Geosciences Union Equality, Diversity and Inclusion Committee

Michelle O'Grady was appointed to the European Geosciences Union (EGU) Equality, Diversity and Inclusion (EDI) committee in February 2025. The committee promotes, supports and raises awareness of EDI in the Earth, planetary and space sciences and works closely with the EGU Council, the Early Career

Scientists and Outreach Committee. They implement activities that promote and demonstrate EGU's commitment to EDI, such as sessions and meetings dedicated to EDI during the EGU General Assembly.

Staff changes

At the end of year, GSNI had 13 members of staff. There have been several staff changes in the past year:

- Rebecca Ni Chonchubhair has been successful in her personal promotion application and has moved from Band 7 to Band 6.
- Kate Davey, GSNI's Business Administrator, retired in August after over 20 years of service with GSNI.
- Melanie Biausque joined GSNI as our new Coastal Geomorphologist and Systems Modeller in October. Melanie is employed as part of the BGS Multi-Hazards and Resilience challenge area.
- Deirdre Blaney joined GSNI as our new Administrator in January. However, Deirdre has since resigned to avail of a new opportunity within the creative industries.
- Rob Raine is taking a long-awaited period of adoption leave beginning in March and will be absent for approximately 12 months.
- GSNI has recruited two new geologists; Michael MacKenzie has been successful as our new Energy Geologist and Dr James Shaw has been successful as our new Structural Geologists. Both posts will start in the new financial year.

Office move

The clearance of GSNI's former office at Dundonald House is now complete with all GSNI's assets and furniture now being located elsewhere.

Health, safety and well-being

Health, safety and well-being has continued to be a high priority as staff continue to operate in a hybrid working environment.

GSNI are in the process of preparing to be audited for ISO 45001, an international standard for occupational health and safety management systems, designed to help organizations create safer and healthier workplaces. Preparation was assisted by a visit from BGS Head of Health and Safety with a few minor actions to be addressed before the audit takes place.

Staff health and well-being is a priority with a few staff being encouraged to develop well-being action plans to proactively support their mental and physical health, particularly in the workplace. GSNI's line managers participated in the BGS Mental Health and Stress Awareness for Managers with the aim of helping to improve staff well-being, increase productivity, and to foster a more supportive and positive work environment.

Learning and development

Learning and Development (L&D) is primarily managed by the L&D team at BGS who provide and support training in leadership and management, behavioural / soft skills, IT, science, Health and Safety, bespoke coaching, mentoring and other training opportunities as they arise.

Mandatory training

Mandatory training has been completed in the following topic areas: Health and Safety, Cybersecurity and information management, Governance and management and EDI.

Continuing Professional Development

Continuing Professional Development (CPD) is encouraged and supported at all levels.

Other CPD highlights for this year are as follows:

- Two staff members are now trained BGS Internal Auditors.
- All Line Managers have embarked upon a comprehensive suite of training courses designed to make better managers within BGS.
- GSNI Director undertook 9 sessions on Understanding Racism in Geosciences training
- GSNI Director asked to record video for BGS Human Resources' new Resilience Course

Equality, Diversity and Inclusion (EDI)

One member of GSNI staff also is part of the BGS EDI Steering Group, is a UKRI EDI Advocate and a member of several associated staff networks. This role allows for much needed insight into wider organisational initiatives providing valuable advice on how they can be applied at GSNI.

GSNI participated in BGS' Self-Assessment Team for the Athena Swan accreditation application for a Silver Award which BGS were awarded in recognition of their ongoing commitment to gender equality.

A GSNI EDI Action plan was produced and will be implemented in the coming year. GSNI also developed an 'EDI Checklist for Events' and training which will facilitate the development, delivery and evaluation of inclusive events.

Supporting the next generation of geoscientists

GSNI are committed to supporting the next generation of geoscientists through engagement including work experience, provision of internships, school talks and MSc/PhD student supervision.

Procedures manual

All aspects of GSNI governance are detailed in the Procedures Manual, an internal organisational document, which is updated as required, reviewed and signed by all staff annually and is also audited cyclically by DfE. Due to a significant number of staff changes, the Procedures Manual underwent a full review in January.

Section 3
Financial summary

Income 2024/25.

Income type	£*	%
NI Public Service Level Agreement	£1,160,178	88.1%
BGS Teams (UKRI)	£15,508	1.2%
Personal Development (UKRI)	£54,667	4.2%
Research	£86,846	6.6%
Total income	£1,317,198	

*excludes overheads

Northern Ireland Public Science

GSNI predominantly provides public science research services to government departments and Northern Ireland councils, primarily for DfE as part of its three-year recurrent work programme managed under a service level agreement (SLA).

Additional research

GSNI also has funding from UKRI via BGS and EU programmes. GSNI-based staff work on BGS Teams (UKRI) either on external research or internal 'national capability' or operational projects.

Professional development

As GSNI staff are UKRI employees, BGS (UKRI) pays for their continuing professional development (CPD), mandatory training including health and safety.

Project partners at the launch of the GEMINI project in Dublin

Summary of external SLAs

In addition to the main SLA with DfE, GSNI staff also work with a few public sector organisations through other SLAs.

NIEA

GSNI has been operating under an SLA with the NIEA to deliver key actions under the Natural Heritage Directorates within NIEA. Work this year included an appraisal of Northern Ireland's Earth Science Conservation Review: Pleistocene subject block, an update of NI's Geodiversity Charter and further engagement on peat slide risk assessments. The SLA is renewed annually with a work programme being established to deliver several key tasks.

NI Water

GSNI has been operating under an SLA with NI Water to provide hydrogeological oversight for the development of groundwater resources to supplement the Northern Irish drinking water supply. GSNI's main role is to scope relevant work required from external hydrogeological consultants, as well as the assessment and review of such work, and to present this internally to NI Water.

GEMINI

The €20M 15-partner Geothermal Energy Momentum on the island of Ireland (GEMINI) project, led by CODEMA, was launched in Dublin in November 2024. GEMINI will support geothermal energy development through four pilot sites in Sligo, Belfast, and Dublin. It will generate valuable subsurface data to inform future projects, policy, and planning. Outputs include heat potential maps, cross-border recommendations, toolkits, and community and business engagement resources for a more sustainable energy future. GSNI has played a critical part in the strategic, scientific and partnership elements of this project which is matched funded by EU, British, Irish and NI Governments. Projects like this position GSNI at the forefront of sustainable, data-driven geoscience for Northern Ireland.

Section 4
Forward look

Geothermal

As a work package leader on the EU-funded GEMINI project, we will coordinate data collection, procurement and modelling to support demonstration sites across the island. Through GeoEnergy NI, GSNI will provide ongoing geological research and advice to support continued work on Stormont Estate data and CAFRE Greenmount sites. Our focus will be on integrating new findings with regional datasets and providing clear, evidence-based advice on the technical and economic potential of geothermal energy as part of a low-carbon energy mix. To support the transition from demonstration to wider deployment, GSNI will work with DfE to scope a national exploration drilling programme. Drawing on UK and international best practice, we will advise on target areas, risk mitigation and delivery models to help de-risk investment and accelerate progress.

Coastal

GSNI is continuing to develop its coastal geology work. This work will receive a major boost this year with the commencement of the Coastal Monitoring and Adaptation Planning (CMAP) project. This four-year, €9.6 million, cross-border project is supported by PEACEPLUS, a programme managed by the Special EU Programmes Body (SEUPB) and is being led by Ulster University. CMAP funding will be used to help tackle the problems of climate change impacts on the Irish coast including from rising sea levels and increased storm activity, causing erosion challenges and reducing resilience of our coasts.

Mapping

Over the next year, GSNI will be focusing on completing our strategic view of our geological mapping. This will be complementary to a similar review being carried out by the wider BGS, helping to deliver the 'maps and models for the 21st century' aspect of the BGS Strategy. GSNI has identified priority areas based on the strategic themes of geothermal energy, groundwater, critical minerals and geological hazards. These will be correlated with areas of geological mapping that need to be updated as well as those that have insufficient coverage for either superficial or bedrock geology, so that priority areas can be targeted.

ISO accreditation

To bring us in line with the wider BGS, GSNI is working towards ISO accreditation in three main areas. These include ISO 9001:2015 (Quality Management), ISO 14001:2015 (Environmental Management) and ISO 45001:2015 (Occupational Health and Safety Management). Working towards these accreditations will help us to identify, manage and monitor the systems we have in place to deal with these aspects of governance, and highlight any current deficiencies so that they can be adequately addressed. Accreditation will be sought across all GSNI's estate comprising Adelaide House, Castle Buildings and the Core Store.

Coastal section at Ballyhornan Beach, Co. Down

Outputs

Peer-reviewed papers and books

Carter, E., Stock, M., Beresford-Browne, A., **Cooper, M.**, **Raine. R**. and Fereyrolles, A. (2024). Volcanic tempo driven by rapid fluctuations in mantle temperature during large igneous province emplacement. Earth and Planetary Science Letters, 644,118903. https://doi.org/10.1016/j.epsl.2024.118903

Hrysiewicz, A., Wang, X., Holohan, E.P., Falcão, A.P., Rodrigues, D., **Parker, K.**, Mangina, E. and Gomes, R.C. (2025). Geohazards Revealed by Multi-temporal InSAR Datasets at AGEO Citizen Science Observatory Pilots in Lisbon, Madeira and Northern Ireland. In Citizens' Observatories on Geohazards: Lessons from Five Pilots (pp. 69-84). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-53371-6_5

Jaud, M., Le Dantec, N., Lummert, C., Cocquempot, L., Montoya-Montes, I., Pinto, C., Ferreira, M.A., **Parker, K.**, **Lemon, K.**, Rodrigues, D. and Gouveia, F.P. (2025). Presentation of the Citizens' Observatory Pilots. In Citizens' Observatories on Geohazards: Lessons from Five Pilots (pp. 141-154). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-53371-6_8

Moles, N.R., **Cooper, M.R.**, Hollis, S.P. and McConnell, B. (2024). Provenance of the Trainor's Rocks microconglomerate, Northern Ireland: a mid-Silurian (Hawick Group) submarine channel fan deposit in the closing Iapetus Ocean. Journal of the Geological Society, 181 (6), 2024-025. https://doi.org/10.1144/jgs2024-025

Montoya-Montes, I., Quental, L., Galindo, I., Holohan, E., Jaud, M., **Parker, K.**, Rodrigues, D., Gonçalves, P., Sánchez, N., García, I., Le Dantec, N., **Lemon, K.**, Ramalho, E., Machado, S., Le Berre, I., Gouveia, F.P., Pinto, P., Herrera, G., and Gomes, R.C (2025). Copernicus Services and Geohazards Management. Lessons Learnt from Citizens' Observatories. In Citizens' Observatories on Geohazards: Lessons from Five Pilots (pp. 43-67). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-53371-6_4

Parker, K., **Lemon, K.** and Gomes, R.C. (2025). Causeway Coast, Northern Ireland: Developing a Geohazard Citizen Observatory to Assist Risk Management. In Citizens' Observatories on Geohazards: Lessons from Five Pilots (pp. 211-228). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-53371-6_12

Conference abstracts (talks and posters)

Beckwith, J., Stock, M.J., **Cooper, M.R.**, Holness, M.B., Andersen, J.C., Huber, C., Chew, D.M., Higgins, O.,6, Carter, E.J., BroomFendley, S. (2025). Multi-Stage Inflation and Mineralisation within the Carlingford Complex Layered Intrusion, Ireland. VMSG and MDSG, Dublin, January 2025.

Beckwith, J., Stock, M.J., **Cooper, M.R.**, Holness, M.B., Andersen, J.C., Huber, C., Chew, D.M., Higgins, O.,6, Carter, E.J., and BroomFendley, S. (2025). Multi-Stage Inflation and Mineralisation within the Carlingford Complex Layered Intrusion, Ireland. 68th Irish Geoscience Research Meeting, Dublin, March 2025.

Carter, E.J., Stock, M.J., Beresford-Browne, A., **Cooper, M.R.**, **Raine, R.** and Fereyrolles, A. (2025). Rapid temperature fluctuations in the early Iceland plume. VMSG and MDSG, Dublin, January 2025.

Cooper, M.R., **Patton, M.A.G.**, McNulty, K., Murrells, A., Hollis, S. and Torvela, T. (2024). Preliminary Results of an Antimony Geochemical Study, Longford-Down terrane. 4th European Mineralogical Conference, Dublin, August 2024.

Cooper, M.R., **Patton, M.A.G.**, McNulty, K., Murrells, A., Hollis, S. and Torvela, T. (2024). Preliminary Results of an Antimony Geochemical Study, Longford-Down terrane. IAEG Annual Conference, Sligo, September 2024.

Cooper, M.R. and Tapster, S. (2025). Mapping and geochronological constraints on intrusion of the Fleetwood Dyke Swarm onshore Northern Ireland. VMSG and MDSG, Dublin, January 2025.

English, K., English, J., Moscardini, R., Haughton, P., **Raine, R.** and **Cooper, M.**, Triassic reservoirs of Ireland and Great Britain and their future role in geoenergy applications. 86th EAGE Annual Conference & Exhibition, Jun 2025, Volume 2025, p.1 – 5 https://doi.org/10.3997/2214-4609.202510923

Geifman E, Stock M.J., **Cooper M.R.**, Carter E., Higgins O., Chew D.M., Holness M.B. , Andersen J.C., and Huber C. (2025). Rare Earth Element Indicators of Assimilation in Magmas of the British and Irish Paleogene Igneous Province. 68th Irish Geoscience Research Meeting, Dublin, March 2025.

Geifman, E.I., Stock, M.J., Holness M.B., **Cooper M.R.**, Andersen J.C.Ã, Huber C., Carter E.I, and Chew D.M. (2025). Assimilation-induced outcrop scale liquid immiscibility in the Portrush Sill, Northern Ireland. VMSG and MDSG, Dublin, January 2025.

Geifman, E.I., Stock, M.J., Holness M.B., **Cooper M.R.**, Andersen J.C.Ã, Huber C., Carter E.I., and Chew D.M. (2025). Assimilation-Induced Outcrop Scale Liquid Immiscibility in the Portrush Sill, Northern Ireland. 68th Irish Geoscience Research Meeting, Dublin, March 2025.

Koch, H., Stock, M. J., Milinevsky, A. and **Cooper, M. R**. (2025). Critical raw material prospectivity mapping in the north of Ireland. VMSG and MDSG, Dublin, January 2025.

Koch, H.A., Stock, M., Milinevsky, A. and **Cooper, M.R.** (2025). Regional Prospectivity Mapping of Magmatic Sulphide Mineralisation in the north of Ireland. GSI Geoscience Conference, Dublin, January 2025.

Koch, H., Stock, M. J., Milinevsky, A. and **Cooper, M. R.** (2025). Critical Raw Material Prospectivity Mapping in the north of Ireland. 68th Irish Geoscience Research Meeting, Dublin, March 2025.

Lemon, K. and Sauer, N. (2024). Workshop for existing and aspiring Transnational UNESCO Global Geoparks: connecting countries and sharing stories. 17th European Geoparks Network Conference, October 2024.

Mongeau, P., Hollis, S.P., **Cooper, M.R.**, Piercey, S., Butler, I. and McClennaghan, S. (2025). Mineralisation styles and critical metal potential of VMS occurrences in the Tyrone Igneous Complex, Northern Ireland. VMSG and MDSG, Dublin, January 2025.

Monks, G., **Cooper, M.R**. and Stock, M.J. (2025). New field constraints on the structure and stratigraphy of the pegmatitic Killala Gabbro, Co. Mayo (Ireland). VMSG and MDSG, Dublin, January 2025.

Morrison, A., Stock, M.J., Andersen, J.C.Ã., **Cooper, M.R.**, Carter, E.J., Hughes, H.S.R., and McGrath, E. (2025). A national survey of the Platinum Group Element abundance in the Irish lithospheric mantle. VMSG and MDSG, Dublin, January 2025.

Morrison, A., Stock, M.J., Andersen, J.C.Ã., **Cooper, M.R.**, Carter, E.J., Hughes, H.S.R., and McGrath, E. (2025). A national survey of the Platinum Group Element abundance in the Irish lithospheric mantle.

68th Irish Geoscience Research Meeting, Dublin, March 2025.

Stock, M.J., Beckwith, J., Geifman, E., Morrison, A., Bretagne, E., Carter, E., **Cooper, M.**, Holness, M.B., Andersen, J.C. Ø., Huber, C. and Chew D.M. (2024). Critical-Ireland: Using Irish mafic intrusions as a natural laboratory to understand PGE mineralising processes. 4th European Mineralogical Conference, Dublin, August 2024.

Reports

Lemon, K. (2024). Report from the UK Committee for UNESCO Global Geopark – 2024. Global Geoparks Network.

Lemon, K., **O'Grady, M** and **Donald, A**. (2024). GSNI Annual Report 23/24. Geological Survey of Northern Ireland.

Lemon, K. & Ottria, G. (2024). Revalidation mission report: Central Catalunya UNESCO Global Geopark, Spain. UNESCO.

Lemon, K. & Ottria, G. (2024). Revalidation mission report: Las Loras UNESCO Global Geopark, Spain. UNESCO.

Parker, K. and **Lemon, K**. (2024), Abandoned Mines Annual Report 23/24, Geological Survey of Northern Ireland.

Parker, K., Novellino, A., McAllister, E., Bateson, L., & **Lemon, K.** (2024). Carrickfergus abandoned salt mines: Assessment of ground stability and implications to the Belfast Gas Transmission Pipeline. British Geological Survey Internal Report, GSNI/01/24. 29pp.

Magazine articles

Cowan, M.T. (2024). Heat pumps for decarbonisation and good jobs: A compelling combination. AgendaNI. Available at: https://www.agendani.com/heat-pumps-for-decarbonisation-and-good-jobs-a-compelling-combination/

Lemon, K. and **Parker, K**. (2025). Building on solid ground: why geohazards must shape Northern Ireland's infrastructure planning. AgendaNI. Available at: https://www.agendani.com/infrastructure-investment-conference/?random-post=1

Public Webinars and Talks

Lemon, K. (2024). UK UNESCO Global Geoparks and the UN Sustainable Development Goals. Public talk and webinar for UNESCO as part of International Geodiversity Day. 8th October 2025.

Parker, K. and **Cooper, M.R**. (2024). Northern Ireland landslides and geohazards. Public talk for the Institute of Civil Engineers and the Geological Society of London. 11th November 2025.

Lemon, K. (2024). A world of fire and ice: the geology of the Mournes. Public talk for Mourne Heritage Trust in Newcastle Centre. 13th August 2024.

Lemon, K. (2024). The geology of Castlewellan. Public walk for Newry and Mourne District Council. 22nd October 2024.

Lemon, K. (2024). The geology of the Mournes and the surrounding area. Talk for Newcastle Probus Club. 13th November 2024.

Blogs

Cowan, M.T. (2024). Exploring the future of heat pumps. GeoEnergy NI. Available at: https://geoenergyni.org/exploring-the-future-of-heat-pumps/

Lemon, K. (2025). Your future, our science: developing geothermal education resources. GeoEnergy NI. Available at: https://geoenergyni.org/your-future-our-science-developing-geothermal-education-resources/

O'Grady, M. (2024). How to ignite a career in geothermal energy. GeoEnergy NI. Available at: https://geoenergyni.org/how-to-ignite-a-career-in-geothermal-energy/

Other

Lemon, K. & **O'Grady, M**. (2024). GeoEnergy NI KS4 Resources – Energy Transfer - CCEA GCSE Science (Physics)

Lemon, K. & **O'Grady, M.** (2024). GeoEnergy NI KS4 Resources – Energy Forms and Resources - CCEA GCSE Science (Physics)

Glossary

AFBI	Agri-Food and Biosciences Institute
AGEO	Platform for Atlantic Geohazards Risk Management
BGS	British Geological Survey
CAFRE	College of Agriculture, Food and Rural Enterprise
CCC	Climate Change Committee
CMIC	Critical Minerals Intelligence Centre
CPD	Continuing Professional Development
CRM	Critical Raw Materials
DAERA	Department for Agriculture, Environment and Rural Affairs (NI)
DfC	Department for Communities (NI)
DfI	Department for Infrastructure (NI)
DfE	Department for the Economy (NI)
DSIT	Department for Science, Innovation and Technology (UK)
EDI	Equality, Diversity and Inclusion
EU	European Union
GAC	Geothermal Advisory Committee
GDC	GeoEnergy Discovery Centre
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
GO-Science	Government Office for Science
GSNI	Geological Survey of Northern Ireland
H&S	Health and Safety
ICB	Innovation City Belfast
InSAR	Interferometric Synthetic Aperture Radar
IPCC	Intergovernmental Panel on Climate Change
LAEP	Local Area Energy Plan
MLA	Member of the Legislative Assembly
MPL	Mineral Prospecting Licences
NERC	Natural Environment Research Council
NI	Northern Ireland
OREI	Offshore Renewable Energy Installation
PGE	Platinum Group Elements
SAC	Science Advisory Committee
SGEO	Shallow Geohazards

SLA	Service Level Agreement
SPPS	Strategic Planning Policy Statement
STF	Science Task Force
UK	United Kingdom
UKRI	UK Research and Innovation
UNESCO	United Nations Education, Scientific and Cultural Organisation
URGE	Unlearning Racism in GEosciences

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