



Climate Action at Geological Survey Ireland

As geoscientists, staff at Geological Survey Ireland are in a unique position to assist in climate action. We understand the Earth, understand the necessity for accurate and robust data for underpinning policy and guidelines, and we have an established network of multi-disciplinary national and international partners with whom we can share best practice. Our work in climate action is in response to the anticipated effects of climate change in Ireland, including sea-level rise, increase in intensity and frequency of storms and rainfall events, flooding, and summer water shortages, as well as in the solutions of alternative energies, decarbonisation, and smart farming. Our outputs are data, maps and models, and will be of benefit to our partners in planning, resource management and in advisory services. In addition to our own work, we fund research and make our data available to researchers in climate action and climate studies.

Our climate action work is divided into the three broad themes of hazards, water and carbon.

1. Hazards

a. Landslides

Our **Landslide Hazard** pilot mapping project is building on the National Landslide Susceptibility mapping programme and the National Landslide Database maintained by GSI. We are developing a hazard model with Met Éireann and other stakeholders to assist with risk assessment of current and future infrastructure projects. The model will assist Local Authorities and the Office of Emergency Planning in responding to the increasing hazards from peat slides during more frequent significant weather events.

b. Groundwater-related flooding

The **GW Flood** project is monitoring and mapping groundwater flooding and flood risk in karst limestone areas, supporting the next round of OPW Flood Risk Management Maps and developed in response to a specific Climate Action in the Programme for Government (2016). Historic flooding has been modelled, indicative flood extent maps have been delivered to OPW and data will be used predictively to understand the potential impacts of climate change on floods.

c. Coastal change

At Geological Survey Ireland, we are involved in a range of projects investigating coastal change and coastal vulnerability, both internally, and in collaboration with our project partners.

- **INFOMAR**, in partnership with the Marine Institute, is mapping the challenging coastal intertidal and near shore interface. High resolution and accurate elevation baseline measurements are important to understanding offshore sediment transport in response to increased storms and monitoring Essential Climate Variables (ECVs) such as sea level changes.
- **CHERISH** is a five-year cross-disciplinary Ireland-Wales project which is raising awareness and understanding of the past, present and near future impacts of climate change, storminess and extreme weather events on the rich cultural heritage of the Irish and Welsh regional seas and coasts. It uses innovative techniques to study iconic coastal locations and community outreach to disseminate the results and best practice for future climate change adaptation. Outputs include high-precision digital elevation models, with regional and cultural context, to assist in coastal management.
- The **Coastal Erosion** project, funded by the European Space Agency, is tackling coastal erosion challenges along 200km of the Irish coastline using earth observation datasets from Copernicus Sentinel satellite. This two year project (2019-2021) will produce coastal erosion products such as intertidal elevation models, shoreline delineation, and assessments of sediment change in the near shore, and will provide an insight into the relative susceptibility of the Irish coast.
- GSI is also undertaking a new **Coastal Vulnerability Mapping Initiative (CVI)**, starting on the east coast. The CVI is a commonly used method to assess coastal vulnerability to sea level rise, in particular due to erosion and/or inundation. This tool for coastal mapping has been recommended by The European Climate Adaptation Platform. Map outputs produced by this project will identify the coastal regions most likely to be affected by impacts of sea-level rise. Future local sea-level projections will be incorporated to identify hotspots from both CVI and potential flooding derived from local relative sea-level rise under extreme weather.

2. Water

a. Groundwater supply

Our groundwater mapping and characterisation work is focused on the water-stressed Greater Dublin region, and will directly support Irish Water in maintaining supply. The national groundwater maps suite, which is used extensively by organisations such as EPA and Irish Water, will be updated through Horizon2020 projects to give a better understanding of climate change impacts on groundwater drinking water and environmental resources.

b. Water environment / ecosystems

Groundwater monitoring is being expanded into the border area through our Catchment CARE project, with plans to expand the network to a national groundwater observatory that complements the EPA's network. This will help us understand groundwater for supply and protection.

3. Decarbonisation

a. Geothermal energy

The Irish heat energy sector accounts for approximately one-third of our overall energy expenditure. Geothermal energy is practically carbon-zero and has significant potential to decarbonise our heat sector, particularly as part of district heating schemes (as supported by DCCAE under the Climate Action Fund). We are continuing to support and conduct a wide range of geothermal energy research projects, with the aims of assessing and promoting the potential of Ireland's geothermal resources for climate change adaptation and mitigation, and to build capacity in the growing geothermal industry in Ireland. We hope to be the national repository of geothermal data and we are developing a roadmap for geothermal resources in Ireland.

b. Raw materials

Our minerals programme is working with European, academic and industry partners to address the global raw materials supply challenge forecast as a significant barrier to the decarbonisation of the energy economy and the transition to a greener and more sustainable society. A project on Irish construction materials includes work on the overall carbon footprint of sourcing aggregate and building material, particularly relevant to the implementation of Project 2040. Data and research into Irish natural resources is focused on climate critical elements, including zinc as a large scale battery material, lithium and rare earth elements.

c. Soil carbon and sustainable agriculture

The Tellus project in Geological Survey Ireland is measuring a proxy for soil carbon at two depths, 5-20cm and 35-50cm, at a density of 1 sample per 4km², covering all agricultural land and upland and lowland peatlands, and its airborne geophysical survey collects radiometric data which can be used to indicate peat extent and thickness. These datasets will be developed to inform a current baseline status of soil carbon and peat extents regionally, to understand regional geological controls on soil carbon and to measure future change, given mitigation measures. We are working with Teagasc on the Terra Soil collaborative research project to optimise agricultural advice in Ireland using new data from Tellus archive soil samples, to support more sustainable and smart agriculture.

d. Carbon capture and storage

Carbon Capture and Storage (CCS) could contribute significantly to reducing Ireland's CO₂ emissions, by providing a bridging solution while renewable energy sources are developed to large-scale implementation. CO₂ is captured from fossil-fuel power stations and industrial processes and injected into underground geological reservoirs of porous rock for permanent storage. Projections by IPCC and IEA calculate that CCS is a necessary component of the energy transition. GSI have participated in several CO₂ storage projects, including assessments of potential reservoirs. As a member of the CGS Europe consortium, GSI co-authored a Key Report on CO₂ storage site selection and we sit on the recently formed CCS Working Group chaired by DCCAE.

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