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Geological Survey
Suirbhéireacht Gheolaíochta
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Geological Survey Ireland

Euro Geo Surveys Marine Expert Group
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1. Geological Survey Ireland; Marine Geology and Geophysics

Introduction

The Geological Survey Ireland (GSI) was established in 1845, since then it has evolved to become Ireland's national geoscience agency providing geological advice and information.

A division of the Department of Communications, Climate Action and Environment (DCCAE); the Geological Survey records, compiles and interprets a variety of geological data gathered throughout Ireland's territory. The Geological Survey contributes towards the sustainable development of our Earth's resources and the protection of our environment, leading to better land use and planning decisions.

As a national geoscience knowledge centre, the Geological Survey produces a range of support services and specific products across all of its operational thematic programmes. These include: Marine Mapping, Land Mapping, Groundwater, Minerals, Geotechnical, Geological Heritage and Geohazards. An ever-growing store of earth-science information comprising an extensive library; paper maps and reports, physical materials and digital databases are maintained at our offices in the Beggars Bush Complex, Dublin.

The Geological Survey Ireland's Marine Geology and Geophysics section continues to actively promote understanding of the marine area through;

- the national marine mapping programme, INFOMAR,
- data product production for industry,
- information and outreach,
- research,
- engaging with cross (Irish North and South) border projects, European initiatives and international collaborations.

The surveys stakeholders are an important focus point and their feedback is crucial to us. Our work in marine geology and geophysics is showcased annually at the surveys annual seminar GeoScience and our national seabed mapping program seminar INFOMAR.

During 2016 an increase in public engagement has been evident from statistics that record social media interaction. This vindicates our efforts to promote marine related survey activity and media coverage through the use of Facebook and Twitter, as well as our websites and online reports.

Throughout the year marine geoscience information and guidance has been provided to a range of national and international agencies with varied maritime interests. During 2016 a new communications strategy and branding has been established in an effort to modernise the surveys approach and broaden the surveys appeal and network. We further solidified our commitment to geological, geophysical and environmental science by reviewing the surveys goals and objectives and drafting a new research roadmap.

The GSI's marine team actively engaged in national and international geoscience and maritime related conferences and events including: The BT young Scientist Exhibition, The Irish Geological Research Meeting, Dive Ireland, Skipper Exhibition, Atlantic Ireland, Sea fest 2016, EMSAGG, Marine Industry Awards, EMODnet, NAGTEC, GeoScience 2016, Ocean Science 2016, and the 35th International Geological Congress.



New Research Roadmap for the Geological Survey

The Geological Survey continues to provide for an increased appreciation and awareness for geology, geological processes and the role they play in influencing and enhancing our everyday lives. As highlighted in the surveys Statement of Strategy ¹ and reflected in the surveys new [Research Roadmap](#)², our principle goals are:

1. To support sustainable development of Ireland's natural resources,
2. To provide reliable geoscience support for environmental protection and effective spatial planning,
3. Complete geological surveys and mapping in priority areas in response to the needs of specific sectors and customers,
4. To support the knowledge economy through the provision of access to geoscience databases and supporting business development, priority research and education services.

The surveys new Research Strategy, underpins each of these goals through the support of new knowledge and development of links so we can improve our understanding of the natural world.

Marine specific national governance, 2016

Marine policy in Ireland is outlined by Marine Plan³, Harnessing our Ocean Wealth. It is overseen by a Departmental Marine Co-ordination Group that includes our department DCCAE and the Marine Technical support group which in turn includes survey members.

In 2016 Ireland ratified the EU Marine Spatial planning (MSP) Directive and is now moving toward introducing MSP in Ireland. MSP in Ireland will be coordinated by the Department of Environment with decisions made by An Bord Pleanala (translation: the planning board). MSP will have a "technical support group" relying on marine data produced by the Geological Survey, including INFOMAR outputs, supported by Irelands Marine Institute.

Baselines Project

The Geological Survey was one of the partners involved in Irelands [Baselines project](#), completed in 2016. The collaborative project included the Ordnance Survey Ireland and a host of national agencies. Together these agencies established 50 geo-located points from which we measure our maritime jurisdictions.

SeaFest

The new national maritime festival, SeaFest has helped promote the public visibility of marine geology and our marine territory. The Geological Survey participated in the 2016 festival with an exhibition booth and tours of our survey vessels.

<http://www.ouroceanwealth.ie/seafest-2016>



2. INFOMAR: Ireland's seabed mapping programme

Ireland's marine mapping programme, INFOMAR (INtegrated Mapping FOR the Sustainable Development of Ireland's MARine Resources) is a joint programme, co-managed by the [Geological Survey Ireland](#) and the [Irish Marine Institute](#). Baseline data produced by INFOMAR underpins a range of national environment requirements including; management plans for inshore fishing, aquaculture, coastal protection and engineering works, environmental impact assessment, and support for the Marine Strategy Framework Directive and the Water Framework Directive as well as evolving needs in the coastal zone management area including Marine Spatial Planning.

INFOMAR is a dual phased programme, funded by the Department of Communications, Climate Action and Environment. INFOMAR Phase 1 reached successful completion after 10 years of operation at the end of 2015. During Phase 1 mapping of 26 priority bays and 3 strategic areas around the coast were completed.

2016 marked the beginning of INFOMAR's second phase and a new strategy; to complete the mapping of all Ireland's remaining marine area to hydrographic order 1A standards. Focus areas include unmapped portions of the coastal zone, shallow shelf areas offshore west and south west Ireland as well as in the Irish and Celtic Seas. Both Marine Institutes large vessels (the RV Celtic Explorer and RV Celtic Voyager) completed surveys in the shallow shelf areas this year; while the Geological Survey's three vessels the RV Keary, RV Geo and RV Tonn continued to focus on the coastal zone primarily in the Irish Sea.

During Phase 2, the programme will continue to produce charts, maps and collect ground truth datasets, while continuing to develop and increase products. Regular updates to equipment and technology will continue alongside investigations into cutting edge technologies and their capabilities.

Embracing new technologies

During 2016 the Geological Survey Ireland supported research into drone technology by funding a feasibility study through its Geoscience Research Short Call aimed at furthering research and technology in the geosciences nationally.

The feasibility study has enabled the Geological Survey Ireland to expand its data acquisition in the coastal environment through the use of Unmanned Aerial Vehicles (UAV). The technology was found useful for other applications such as coastal geomorphology, groundwater and karst feature mapping.

The study has developed standard operating procedures along with processing methodologies and analytical processes. The use of the technology has been deemed feasible.

The advantages of UAV to various national geoscience mapping surveys has resulted in the acquisition of a state of the art UAV by the Geological Survey Ireland.

Further verification of acquisition techniques, survey platforms, additional sensors and analysis software is scheduled to be carried out throughout 2017, with the intention of determining the technology's full potential for Ireland's Earth Science Agency.



Data Products and outreach

INFOMAR continues to produce a range of products including: bathymetry and backscatter charts; seabed classification maps; shipwreck maps and 3D models; and 3D maps of bathymetry. Our data is made available online through our web [mapping viewer](#), [open source portal](#), the [NOAA database](#) and [Google Earth](#). We have also worked on developing new information and outreach products, such as area specific [story maps](#) and [smartphone apps](#), all of which are available from our INFOMAR website.

INFOMAR has embraced communication through [Facebook](#) and [Twitter](#), with new posts and #'s such as “[#ShipwreckSaturday](#)” and “[#OnThisDay](#)”. We are slowly and economically increasing our audience.

In 2016 a short video was produced describing the INFOMAR programme and seabed mapping: <https://www.youtube.com/watch?v=yLWVuiOAmMM>

INFOMAR Seminar 2016: *Collectively creating an INFOMAR legacy*

In October 2016, the annual INFOMAR stakeholder seminar was held in Galway. This year the theme was: Collectively creating an INFOMAR legacy. The main objective of the seminar was to assess the programme activity, and investigate the associated research and technology landscape. During the event it was shown how INFOMAR data and derived products are fundamental to our involvement in European projects.

Planning for 2017 and beyond

INFOMAR's 2017 survey planning is in progress, the 2017 Operational Programme will be available shortly and is to focus on the completion of inshore bays and priority areas, as well as Ireland's mid-water shelf zone.



Figure 1 INFOMAR 2016 Team photograph November 2016



3. Research, collaborations and initiatives

Collaborative Research

A Science Foundation Ireland (SFI) call in 2013 resulted in the funding of a centre for Irish Research in Applied Geosciences (iCRAG in 2016). Divided into five spokes representing different geoscience themes; three of iCRAG spokes focus on marine geology; Marine, Hydrocarbons and Raw Materials. The Geological Survey has been a key enabler in fusing this national collaborative centre and sits on the advisory board.

The Irish Research Centre (IRC) & the Geological Survey co-funded post-doctoral positions in 2016, these included:

- Mapping the shallow geology of the Porcupine Bank, west of Ireland;
- Methane Hydrates and Shallow Gas in the Atlantic Irish Waters – Resource Evaluation;
- Mapping Malin; a geological interpretation of the Malin Shelf;
- Dublin Bay geochemical mapping.

2015 Research Call

The Geological Survey funded twenty, one year long research and development projects which concluded in 2016. Marine related projects were presented at the annual INFOMAR Seminar. The schedule and presentations can be found at http://www.infomar.ie/Annual_Seminar/2016/2016.php

2016 Research call

The survey announced Postdoc Funding in 2016, the deadline for proposals was Nov 14th. The marine related research topics included:

- Development of methodologies for remote observations/sensing for geo-surveying and site investigations;
- Development of remote, real time monitoring systems for environmental parameters; applications for the extractive industries;
- Tsunami hazard assessment and vulnerability around the Irish coast;
- Geophysical and geochemical characterization of gas in marine sediments;
- New Earth observation remote sensing techniques for coastal monitoring and bathymetric mapping;
- Lithostratigraphy of Irelands Atlantic offshore Quaternary deposits including a quantitative study of aggregate potential;
- A new hydrodynamic model for the Irish Sea; integration and analysis of acquired data.

All proposals are in review, the survey will fund the two top scoring proposals.

Further information is available at: www.gsi.ie/research



4. International projects and proposals

Table 1 This table illustrates international marine related research initiatives, the surveys involvement and potential opportunities

Key research initiatives	Geological Survey Ireland Involvement	Opportunities
EPOS	The Geological Survey is the Irish representative.	Will not be funded in the 2016 call, but we are looking at other funding options.
INTERREG proposal with UCD, DIAS and Cantabria University & Portuguese	Tsunami wave modelling, susceptibility mapping & tsunami triggers (e.g. & submarine mass movement).	Calls only open to organisations/consortia within the Network. Maybe expand marine minerals section of Minerals4EU.
INTERREG funded project CHERISH (Climate, Heritage and Environments of Reefs, Islands and Headlands)	The Geological Survey are partners with Aberystwyth University RCAHMW (Welsh Heritage) and the Discover Programme (Irish Heritage Council). INTERREG proposal submitted to the final INTERREG funding round, and successfully funded, year end 2016.	Establishing shared heritage of Wales and Ireland, onshore & offshore (Irish Sea), developing best practice on climate change & heritage protection. Supporting specialist organisations in Wales and Ireland to employ cutting-edge technologies to analyse coastal and island archaeology and maritime heritage sites, which are most affected by climate change, coastal erosion and rising sea levels.
GEO ERA (EU ERA Net)	Minerals and raw materials theme.	Open calls (early next year) for any researchers within the countries contributing.
ERA MIN 2 (EU ERA Net)	Minerals and raw materials research funding.	Possibility to assess more projects (applied).
iCRAG (National funding)	Marine Geology Spoke & Raw Materials Spoke.	Will not be funded in the 2016 call, but we are looking at other funding options.
EMODnet	The Geological Survey is involved in EMODnet Bathymetry, EMODnet Coastal and EMODnet Geology all of which ended their second phase in	Involvement in this project secures funding in-house which in turn employs marine geoscientists and data experts that fulfil Ireland's mandate to

	2016 and tendered for a third, which if successful will begin in 2017.	marine projects and national needs.
MIM group (Mariano, INFOMAR, Maremap)	Open forum for knowledge and best practice sharing; development of frameworks and procedures for the systematic mapping of offshore features.	Development of skills and strengthening of North West Atlantic marine mapping communities.
Global Ocean Research Alliance	The Geological Survey, BGS and GeoScience Australia worked to bring as many geological surveys and similar agencies with responsibility for marine mapping together at the 35th International Geological Congress in Cape Town in 2016. A survey developed to poll seabed surveys objectives, knowledge, best practice and queries has been aggregated and distributed. It is anticipated this network will be open, formalised and meet annually. Next meeting is scheduled for GeoHab 2017.	Connectivity across marine seabed mapping surveys internationally, for the open sharing of knowledge, best practice, queries and developments.
NAG-TEC	The Geological Survey partner in the North Atlantic GeoSurveys Tectostratigraphic study of the evolution of the NE Atlantic.	The NAG-TEC project atlas was made publicly available in 2016. This year also marked the publication of a volume of papers generated as a GeoSoc Special Publication. The project also gained a 19 th sponsor in 2016. Plans for a NAG-TEC 2 were ongoing throughout the year.

5. Deep Sea Research: TRASNA

In 2015 a transatlantic cruise co-ordinated by Irelands Marine Institute successfully mapped a section of the North East Atlantic from St John's Newfoundland to Galway, Ireland as part of the [Atlantic Ocean Research Alliance](#). The Geological Survey Ireland conducted a similar traverse in May 2016.

The survey, called TRASNA, mirrored the 2015 survey and mapped a parallel swath of seabed. The survey also allocated a day to study the Charlie Gibbs spreading centre, along the mid-Atlantic ridge. Bathymetry data was acquired, mapping this mountainous region in greater detail; 5 dredge hauls were attempted, with returns from 3; one hours drop camera footage was taken on one of the topographically high areas.

An additional day was used to take sub bottom data over the Porcupine bank, west of Ireland, for one of the Geological Survey funded post-doctoral student's research.

Both sites provided a wealth of information that will be studied further in 2017 and will influence future collaborative research, ship time applications.

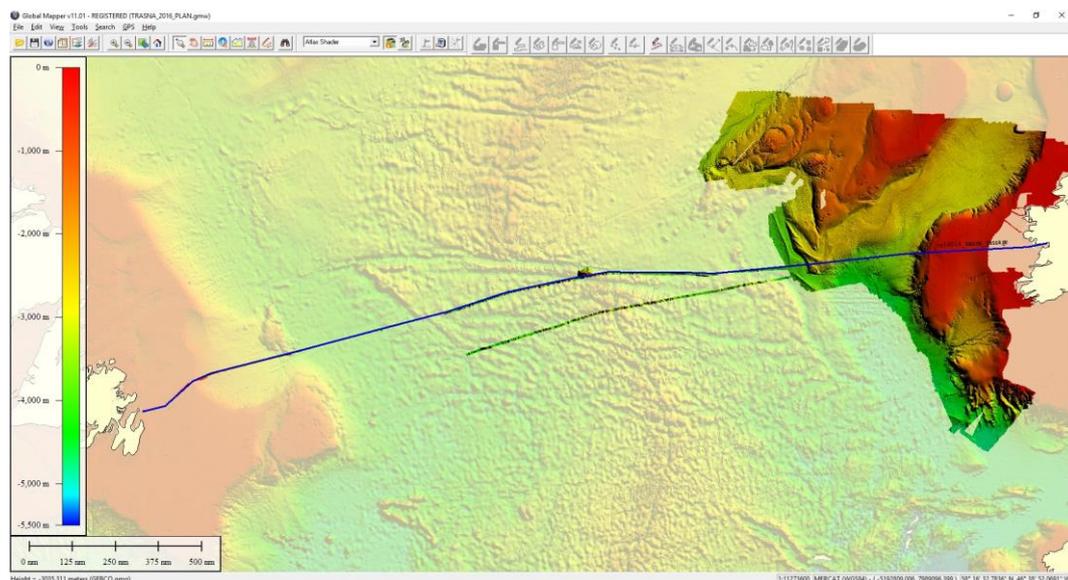


Figure 2 The 2015 trans-Atlantic survey line in blue, mapped the 2016 transit line

References

- ¹ GSI Statement of Strategy 2014-2017 & Business plan 2016
- ² [Geological Survey Ireland Research Roadmap](#), 2016
- ³ Harnessing our Ocean Wealth. An integrated Marine Plan for Ireland. July 2012

