



Rialtas na hÉireann
Government of Ireland



Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Irish Geothermal Potential & Latest Developments

Dr Sarah Blake

Geothermal Programme

GEOHERMICA/CETP Workshop, Dublin, 10 Oct 2023

Who are we?



Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

175 years | bliain 1845-2020



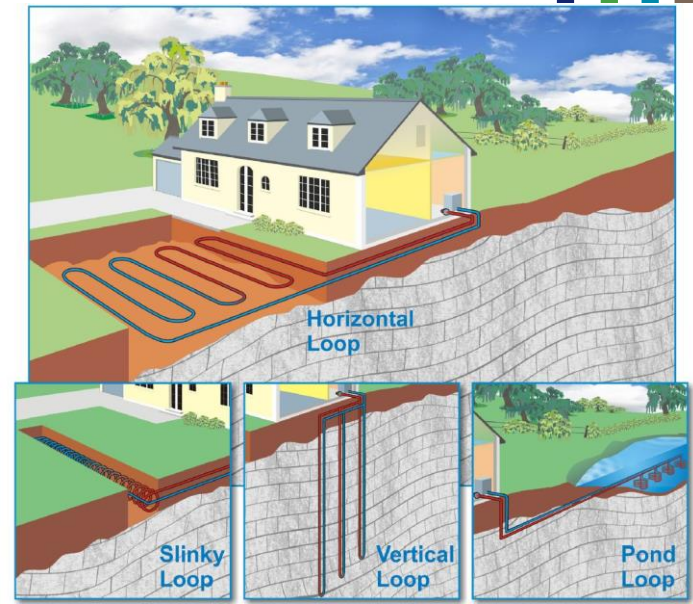
- Geological Survey Ireland is Ireland's public Earth science knowledge centre and is a division of the Department of the Environment, Climate and Communications.
- We provide free, open and accurate data and maps on Ireland's subsurface.
- We deal with a diverse array of topics including bedrock, groundwater, seabed mapping, natural disasters, and public health risks.

www.gsi.ie



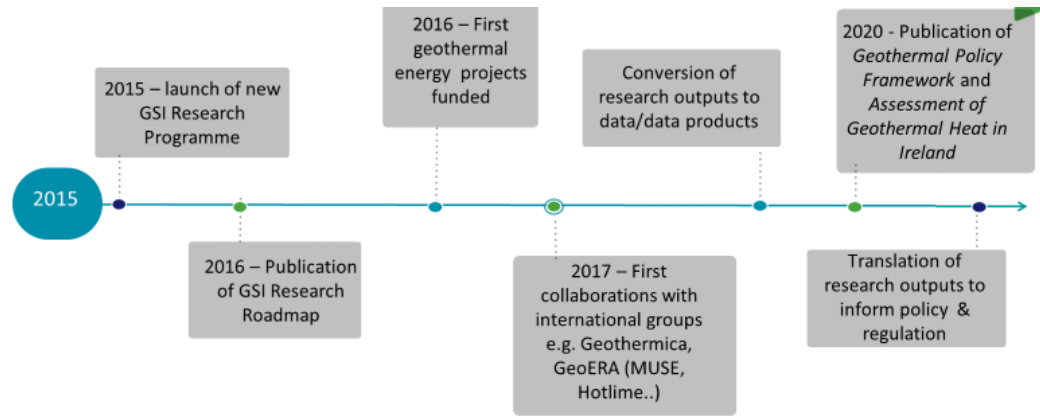
Our Geothermal Programme

- Active since late 1990s
- Part of Groundwater & Geothermal Unit
- Developed GSHP suitability maps in 2015
- Now expanding the National Geothermal Database (current phase 2021 – 2025)
- Funders of external research
- Provide technical support for geothermal policy and decision-making
- Outreach
- Seeking funding for public demonstration projects



Funding external geothermal research

- Over €3M spent on geothermal research since 2016
- Building capacity in Irish universities and industry



External Research funding

- GSI funding for geoscience research
- Co-funding with other agencies (national & International)



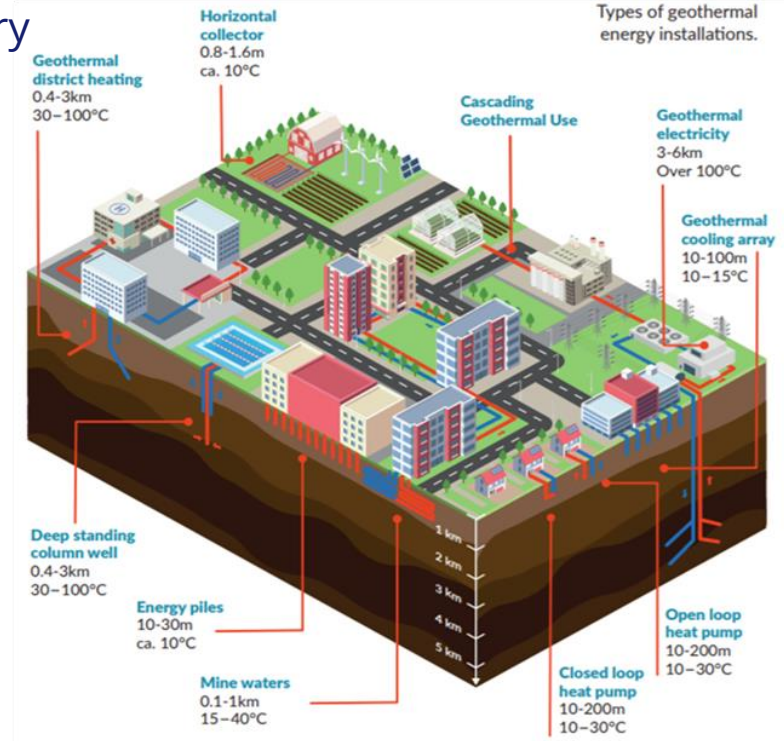
Support for Internal Research Activities

- Governance
- Specialist Management (e.g. EU projects)
- Project development
- Collaborative projects (Academic. /Agency)



Input into National & International policies & Implementation

- Research & skills, energy, environment, climate, agri/food...
- Translation of academic research to policy



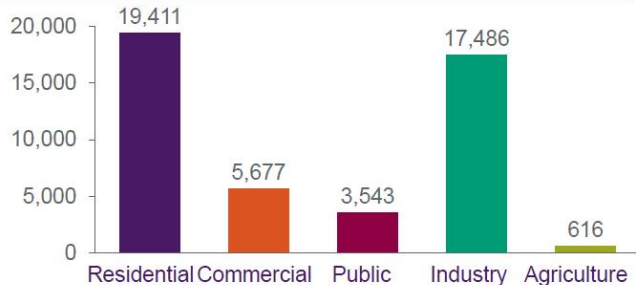
Ireland's energy transition so far...

Key insights

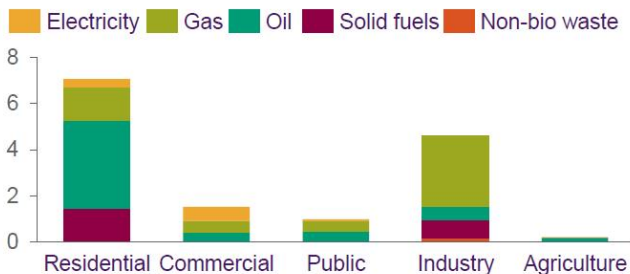
- Heat related CO₂ emissions are rising



Total heating demand (GWh) by sector



Total emissions (MtCO₂) from fuel use for heating by sector, broken down by fuel type



94%

24%

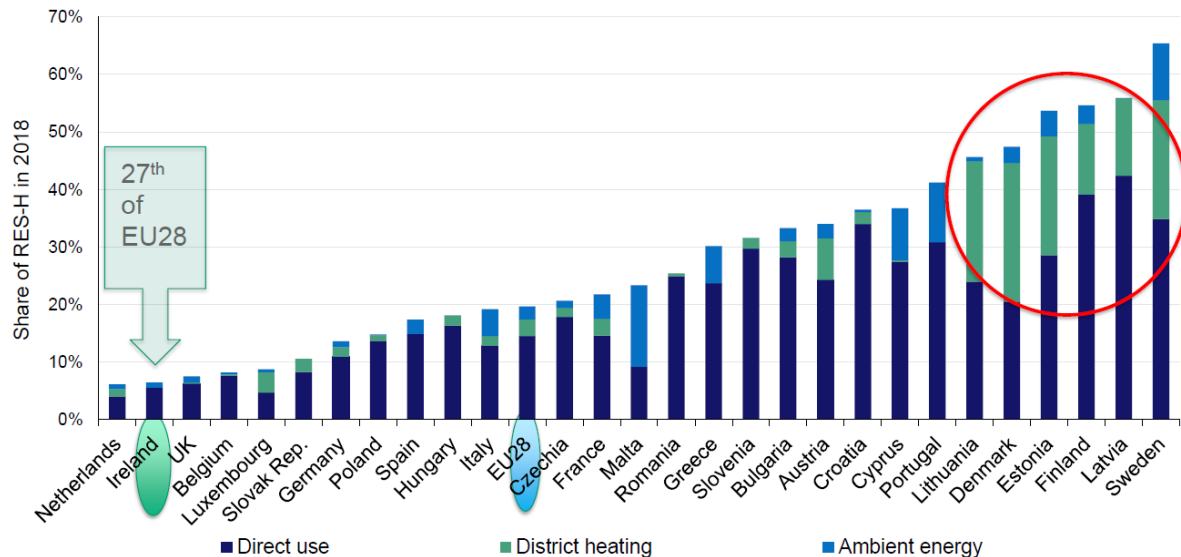
Last

Heat related emissions are **38%** of energy related emissions and **24%** of total national GHGs.

Since the low in 2014, CO₂ emissions are up **13%**, growing at the historical rate. (excl. Electricity)

How do we tackle our heat sector?

Renewable heat in EU

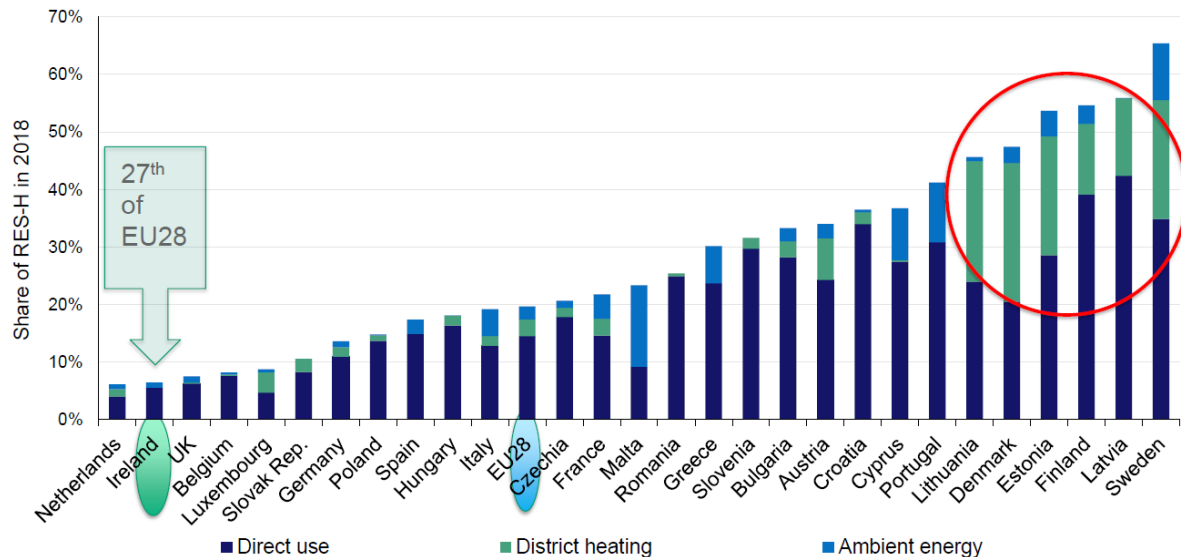


Recommendations from National Heat Study 2022:

- District heating could provide 50% of building heating demand
- Heat pumps necessary and prominent in our energy future
- Geothermal energy has significant potential (shallow and deep)

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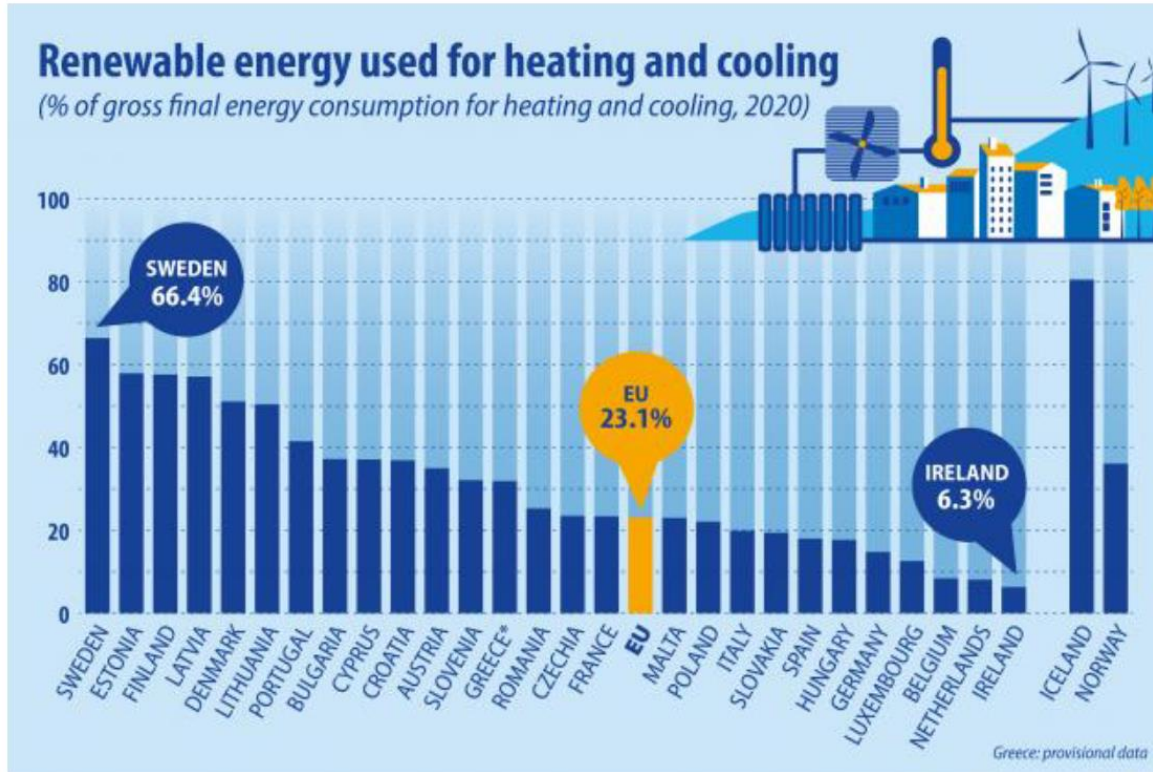
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An opportunity for geothermal heat?



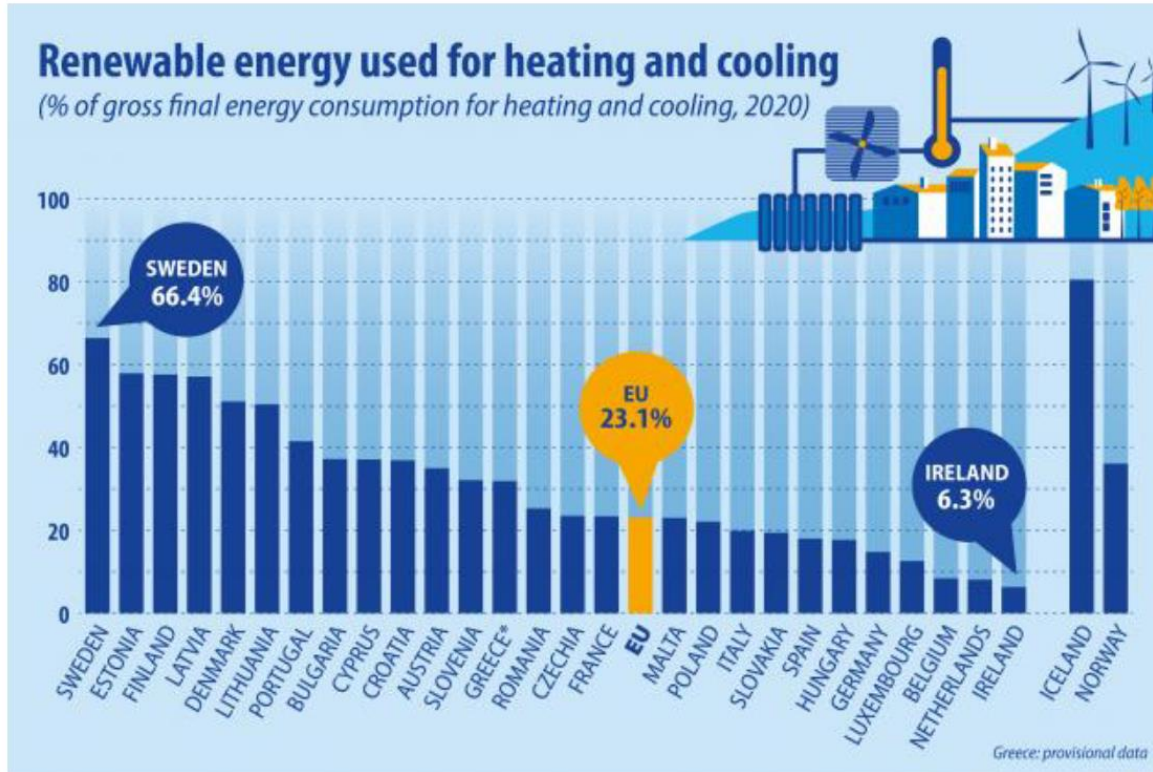
Shallow:

- 94% of Ireland suitable for GSHP
- Currently only 208 MWth installed.
- GSHPs have just 3% HP market share

Deep:

"Further work aimed at the complete characterisation of the suitability of the geothermal resource across Ireland will allow a better understanding of its potential for district heating at various locations" National Heat Study (SEAI, 2022)

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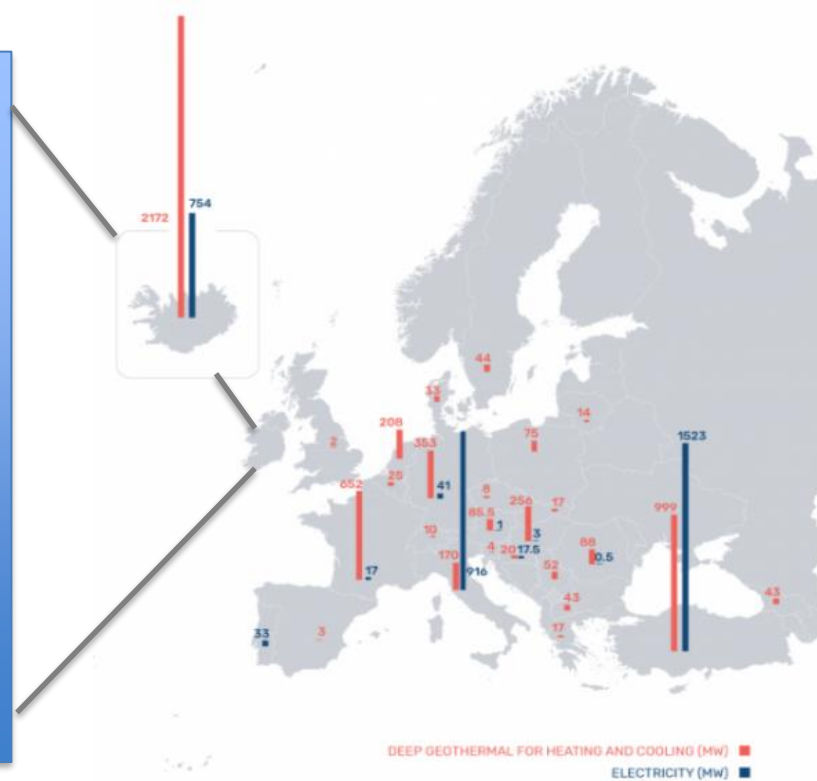
What are the barriers?

94% of Ireland suitable for shallow geothermal (GSHP) yet has failed to gain traction. Why?

- Lack of **Awareness**
- Lack of **Policy**

Deep geothermal remains an untapped source of always-on, low carbon renewable energy in Ireland. Why?

- Lack of **Awareness**
- Lack of **Policy**
- Lack of **Data** (high geological uncertainty)



EGEC, 2020

Geothermal policy developments

Published:

- GSI Assessment of Geothermal Energy for District Heating in Ireland
- 2020 Non-Technical Roadmap for a Policy and Regulatory Framework
- Geothermal Policy Statement published in 2023 (Geoscience Policy Division in DECC, technical support from GSI)

In the works:

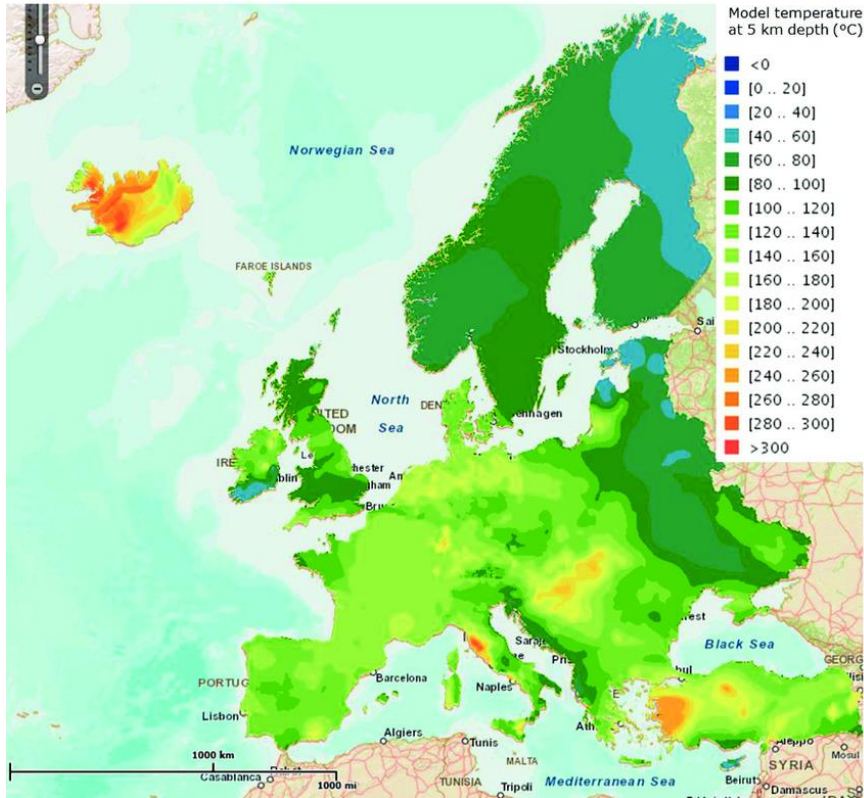
- National geothermal strategy in development
- Legislation first draft by end 2024
- National Geothermal Database

New standards:

- GSHP standard recommendations published by National Standards Authority of Ireland (NSAI, 2021)



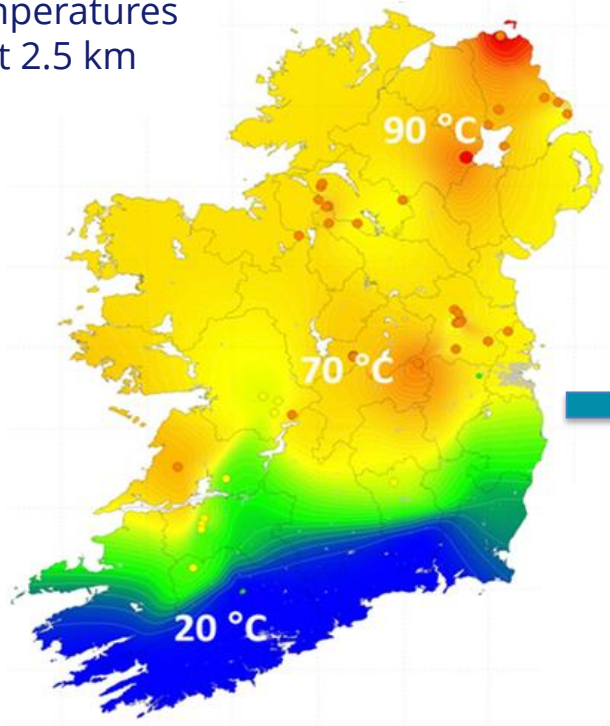
Awareness: changing the narrative...



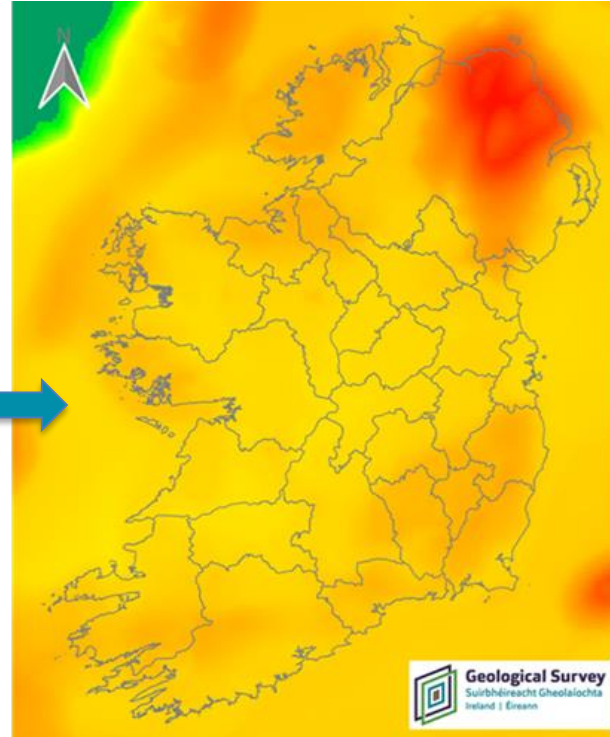
From GeoElec project (2013)

Awareness: changing the narrative...

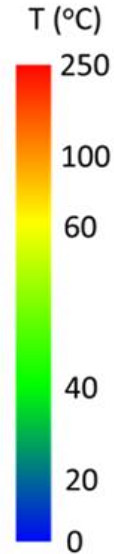
Temperatures
at 2.5 km



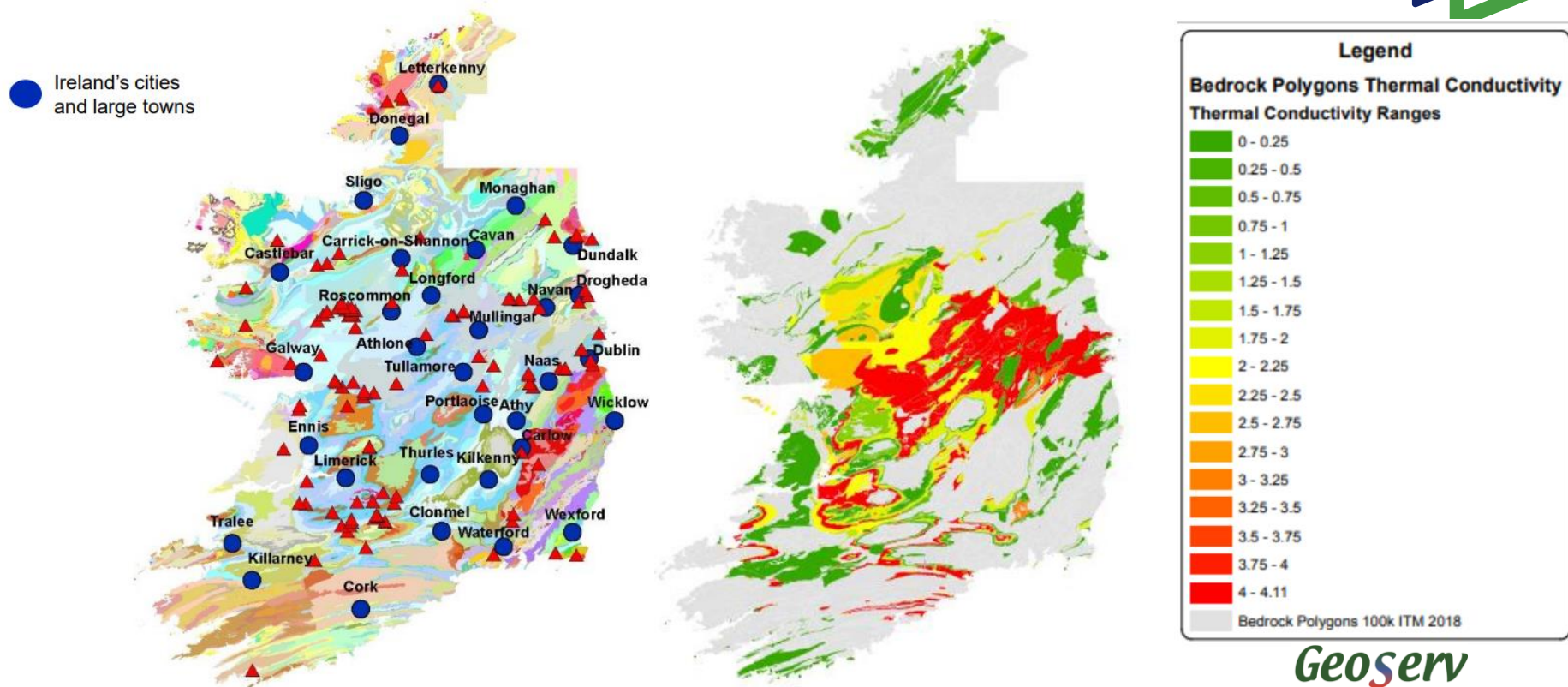
After Goodman et al. (2004)



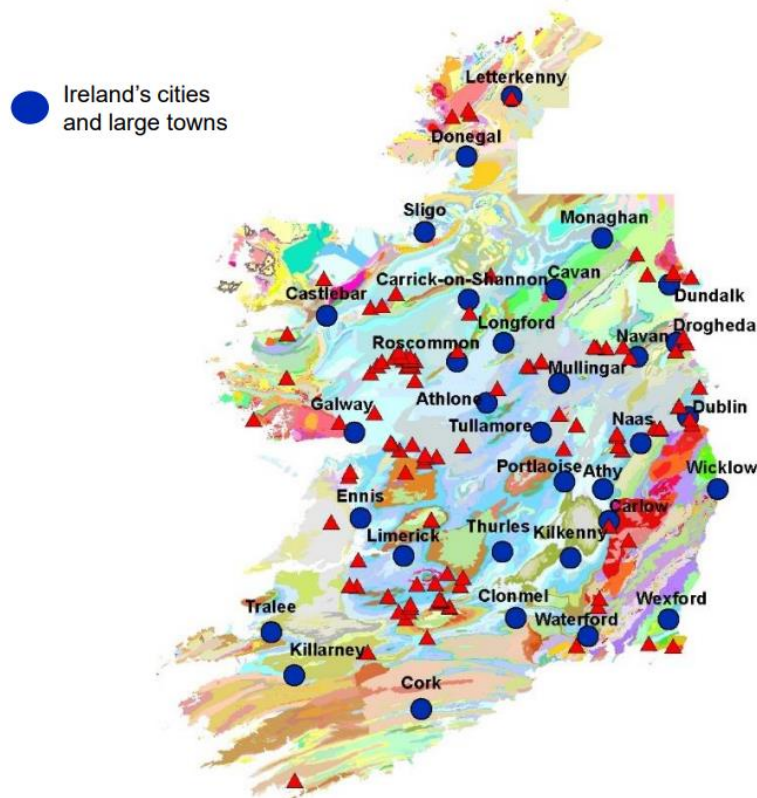
Using data from Mather et al. (2019)



Data: Really suffering from spatial bias!



Data: Really suffering from spatial bias!



Mapping geothermal properties for the NGD

WHY is a nationwide program of petrophysical data gathering required to support geothermal development?

WHAT useful data can be collected on core?

HOW can the data be collected in a consistent and efficient manner?

WHERE are the highest priority areas to focus data gathering on?

WHO is responsible for data QC, processing and interpretation?

WHEN can data be integrated into the NGD and made available to public?

NGD: Key research themes



Developing 3D
Geological Framework

Surfaces

Facies

Faults

Understanding
Temperature
Variation

Crustal Heatflow
Variation

Thermal Conductivity
Heterogeneity

Advection Influence

1D Modelling

Understanding Fault
Permeability & Flow

Stress Mapping

Fault Characterisation &
Flow Correlation

Fault Slip Potential

Mechanical Strat.

Techno-
economic

Economic Studies

Closed Loop
Assessment Tool

Suitability/Risking

Social
Acceptance

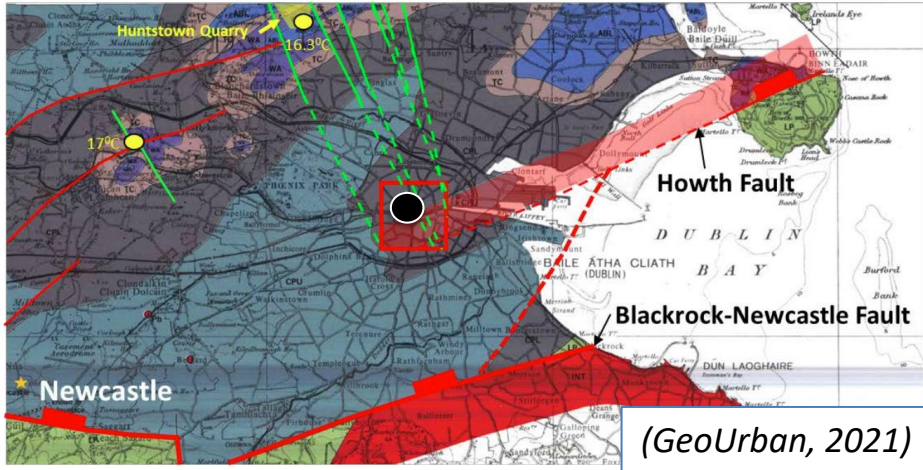
Seismicity
Workshop

Data Gathering (Seismic, well-based, existing core based)

Deep Geophysics

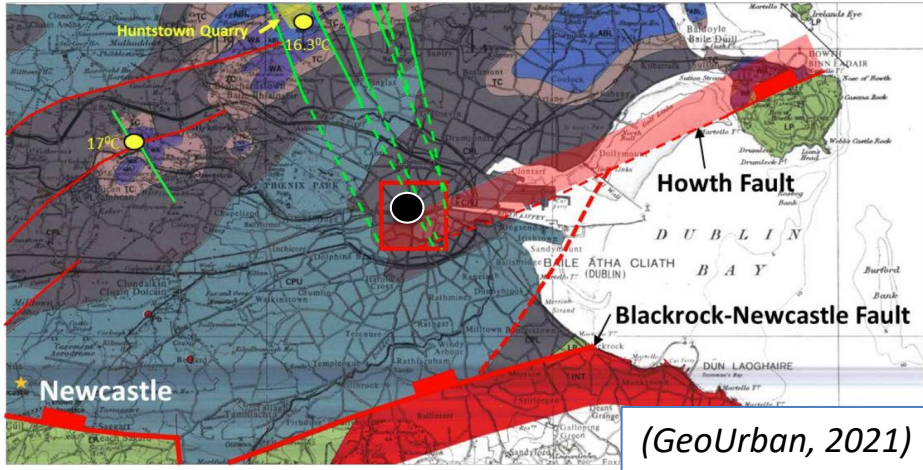
Heat Output Assessment Tools

Data & awareness: demonstrators



- GEOTHERMICA funded research
- ↓
- GSI drilling in TU Dublin Grangegorman (2021)
 - Revised cost estimate (2022)

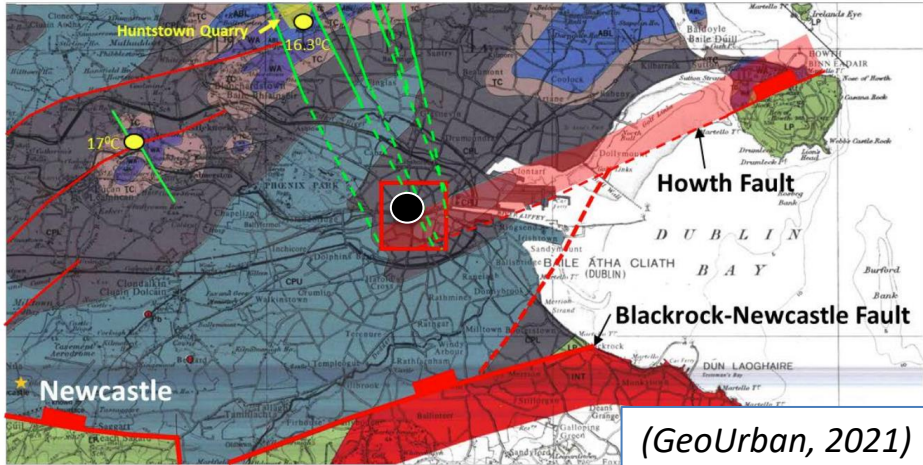
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Data & awareness: demonstrators



Maximum temperature of 37.98 °C at 1km depth



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A person in silhouette is working on a large spool of cable. The person is positioned on the right side of the frame, leaning over the spool. The background is a bright, clear sky with the sun visible, creating a strong lens flare effect. The overall scene is backlit, giving the person and the equipment a glowing appearance.

Go raibh maith agaibh

Thank you

www.gsi.ie

[@GsiGroundwater](https://twitter.com/GsiGroundwater)

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#ECOEYE