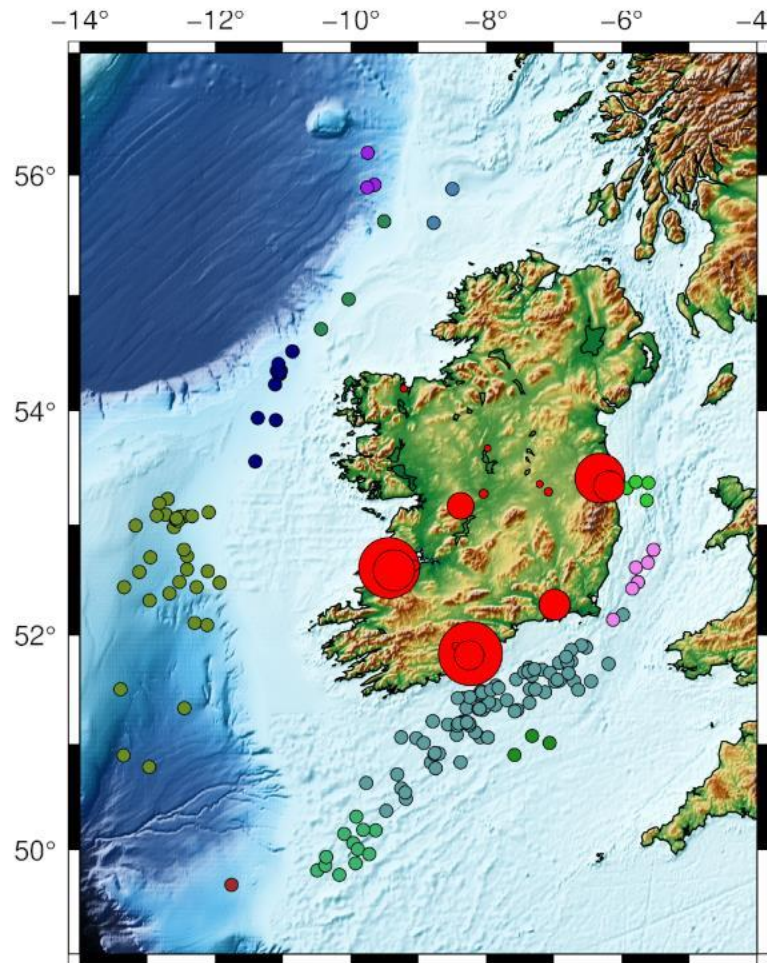


Carbon Capture and Storage in Ireland

Carbon Capture and Storage in Ireland

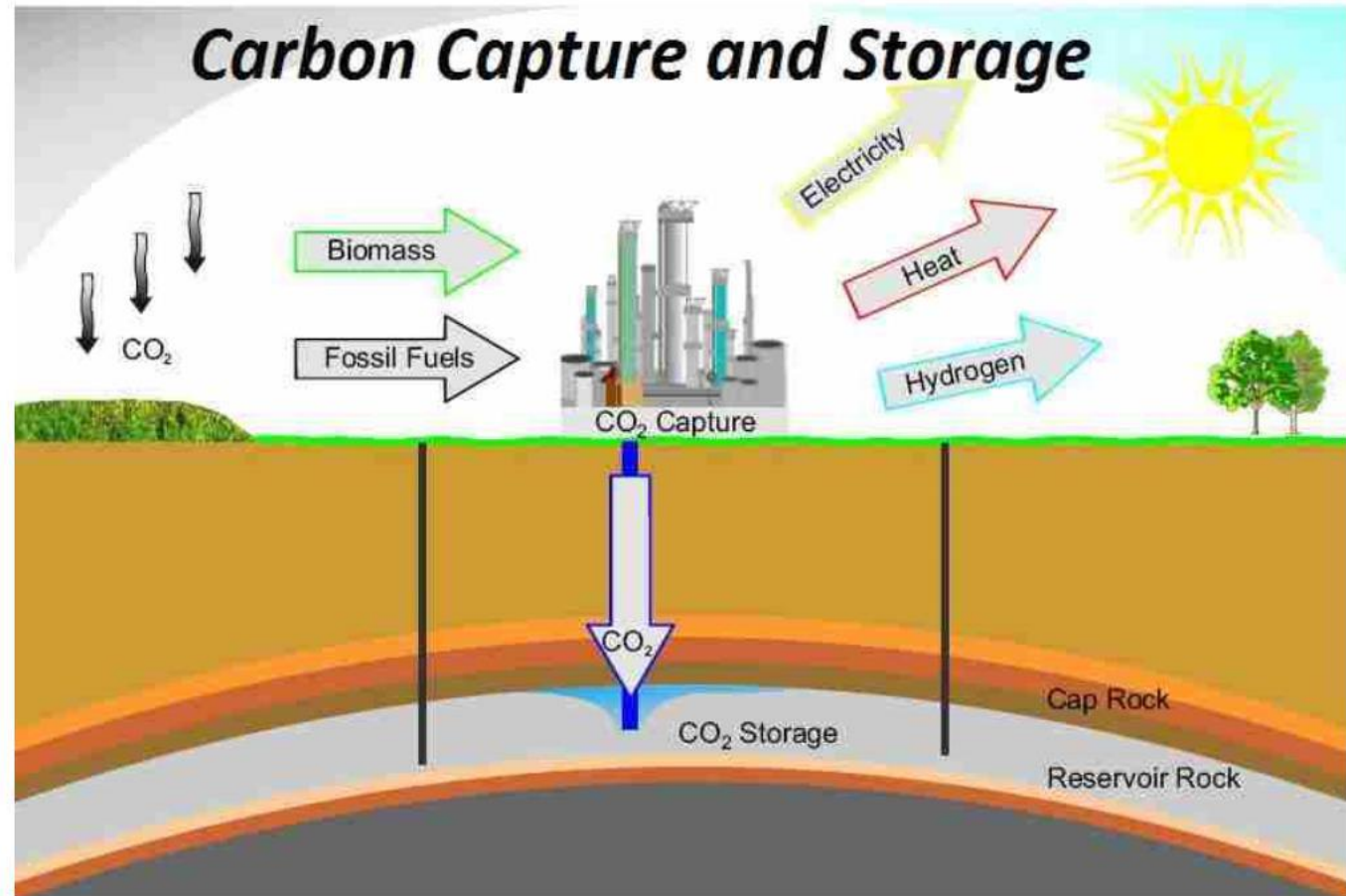


- Carbon Capture and Storage (CCS) is considered a key technology to combat climate change.
- The sedimentary Celtic Sea basin offshore in Ireland (Fig. 1) hosts large potential for CO₂ storage.
- This could potentially contribute to the achievement of EU carbon reduction targets.

Figure 1. Wells drilled in the Irish offshore (each colour represents a different sedimentary basin) and main onshore CO₂ sources.

CO₂ Storage

- Involves first **capturing** CO₂, **pressurising** it to bring it to its liquid state and **transport** it through pipelines or vessels to the storage facility
- The storage facility involves one or more wells reaching **depths > 1000 m**
- A **trap** (a geological structure that contains the fluid)
- A **reservoir** (porous rock in which the fluid is stored), and
- A **seal** (impermeable rock that prevents the CO₂ to escape to the surface)



CO2 Storage in the Celtic Sea

- Researchers at iCRAG are investigating the CO2 storage potential of the Celtic Sea basin rock structure (Fig. 2) using Ireland's hydrocarbon (oil & gas) exploration database.
- The relatively shallow water depths (+/-100 m, Fig. 2), the presence of proven seal and reservoir units and its proximity to large CO2 sources onshore, makes the Celtic Sea basin an ideal location for CO2 storage projects.

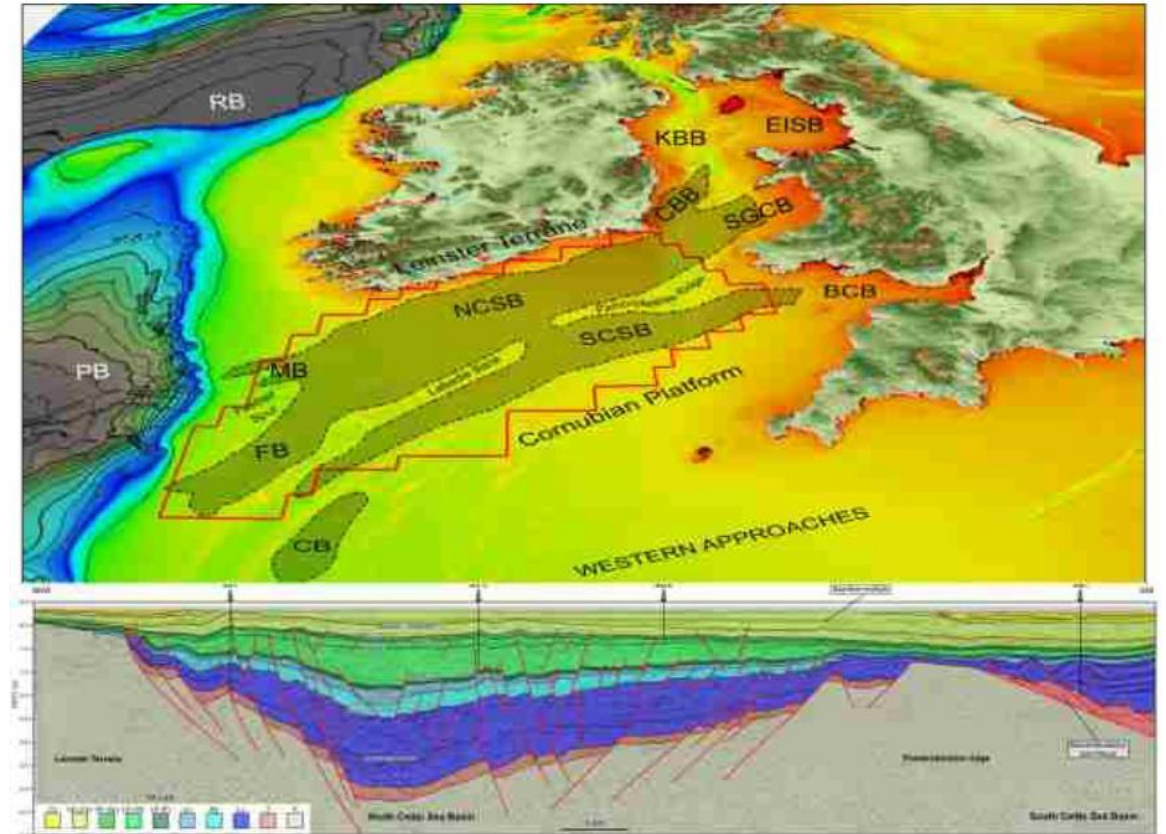


Figure 2. A) Bathymetric map of offshore Ireland showing the location of the Celtic sea Basins

A photograph of two industrial workers wearing hard hats and safety glasses. They are standing in front of a large piece of machinery with a prominent circular component. The worker on the left is wearing a green safety vest, and the worker on the right is wearing a blue safety vest. The background is slightly blurred, showing an industrial setting.

A technology called
carbon capture and storage

The CO2 Storage Elements

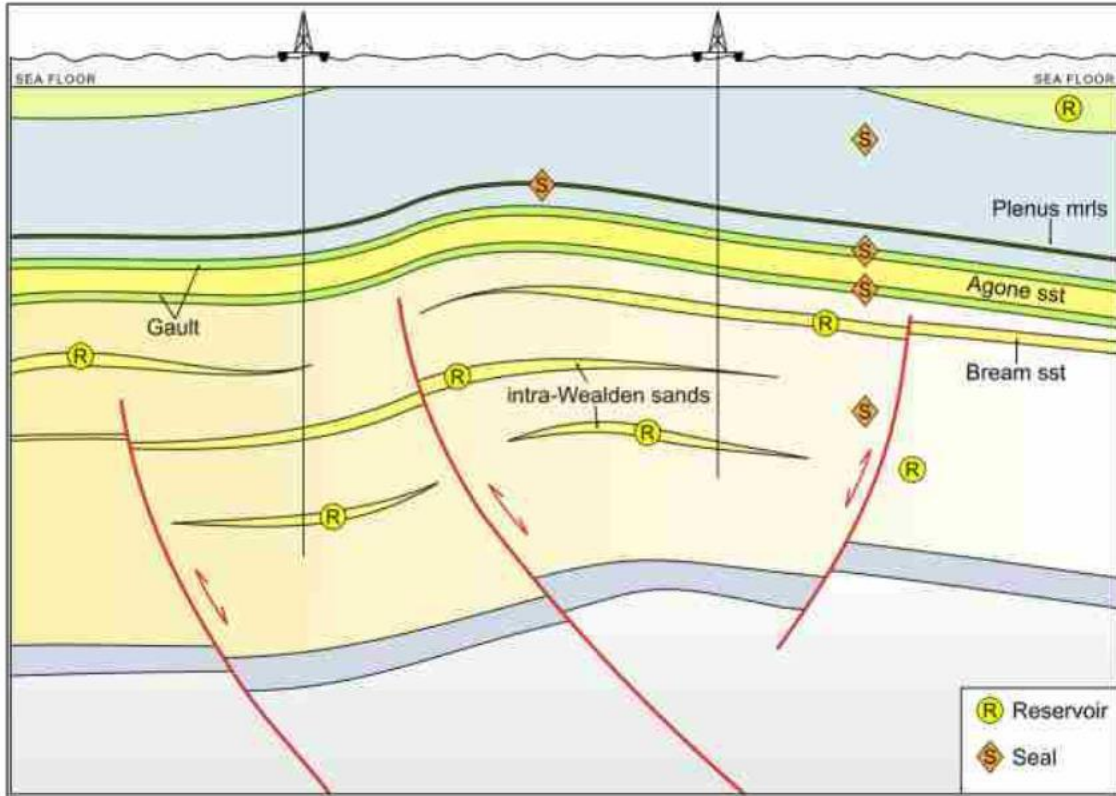
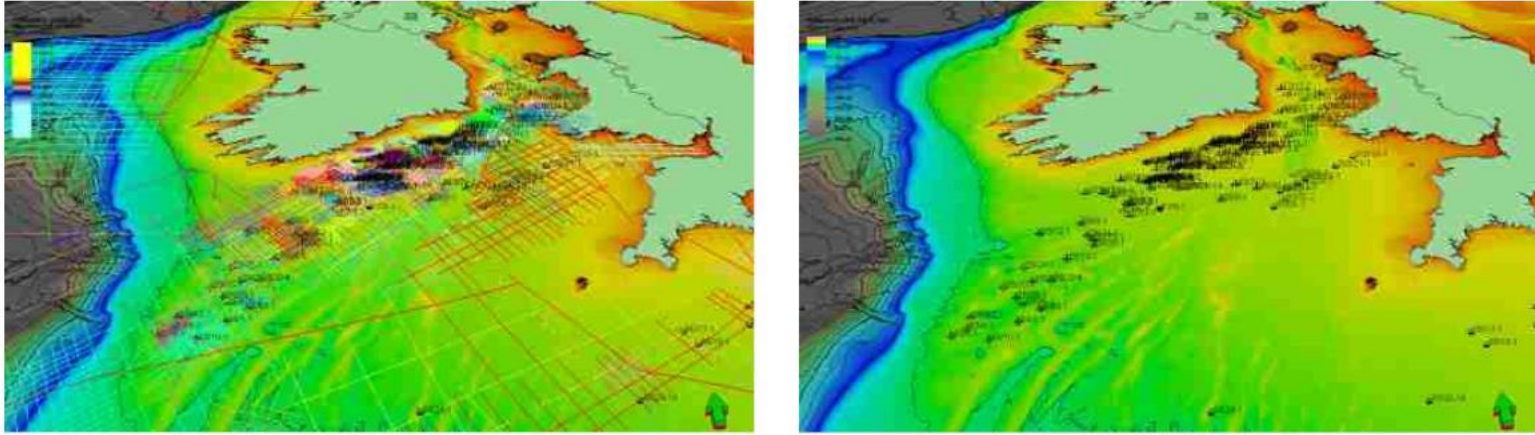


Figure 3. The Upper Cretaceous CO2 storage play in the Celtic Sea.

- During this study the CO2 storage capacity of the Celtic Sea basin has been evaluated.
- 96 locations have been mapped
- The elements being investigated include the main trap, a seal (S) made up of a thick layer of Cretaceous chalk and reservoir units (R).

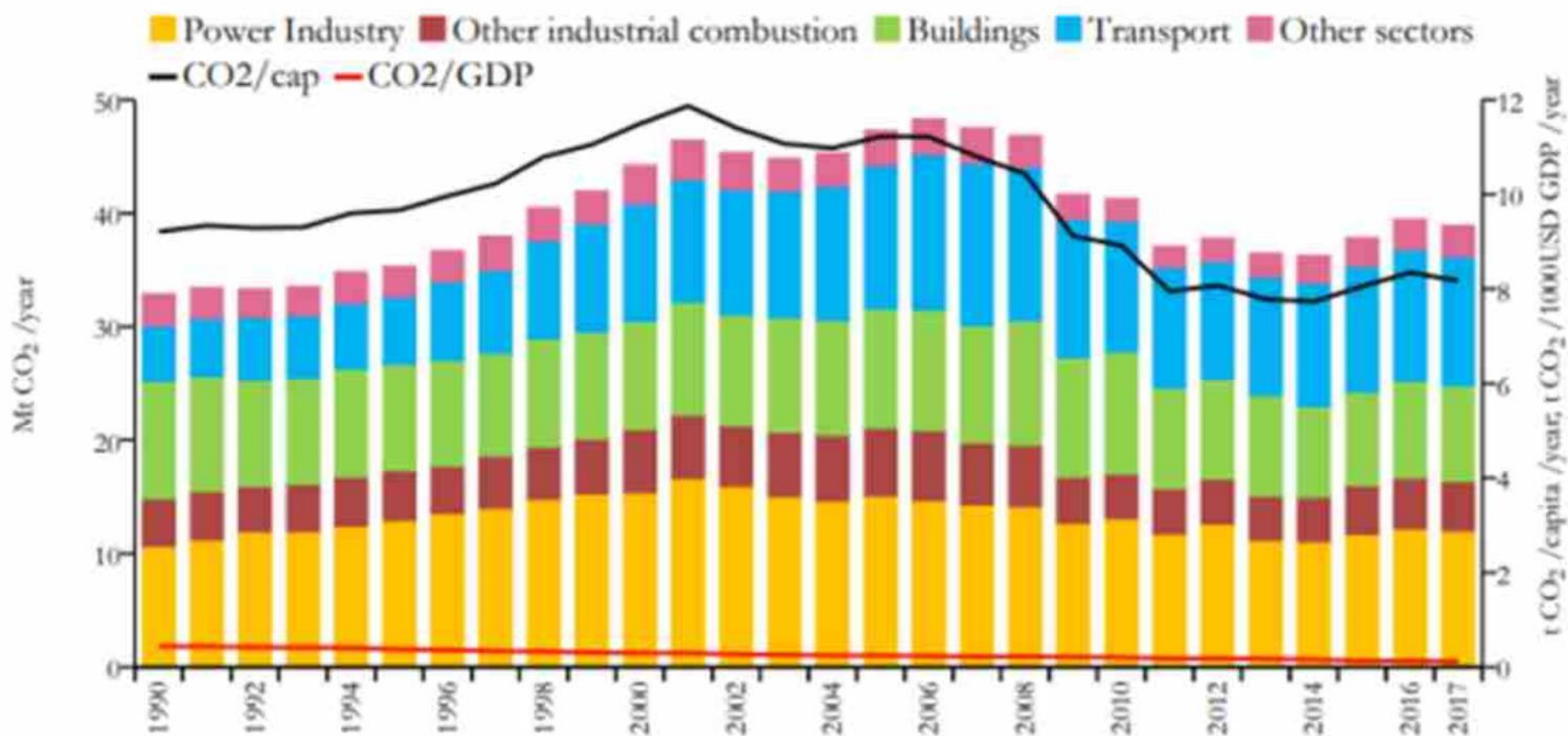
Geological Knowledge



Seismic (left) and borehole (right) database in the Celtic Sea.
The yellow-green colour = 100 - 125 m of water depth.

- Geological knowledge is critical to predict the amount of energy that can be stored, and develop the storage site
- In Ireland we have access to subsurface rock information from 50 years of hydrocarbon exploration:
 - **Wells:** Direct access to the rocks, but the information is spatially restricted
 - **Seismic:** Regional access to the rocks, we can see faults, folds, gross thickness of beds, but the scale of observation is too coarse (no direct access to rocks, beds thinner than 30 m are not imaged.)

CO2 Emissions in Ireland by Sector



Year	Mt CO ₂ /yr	t CO ₂ /cap/yr	t CO ₂ /kUSD/yr	Population
2017	38.914	8.172	0.120	4761657
2005	47.277	11.222	0.244	4212977
1990	32.852	9.204	0.436	3569257

Preliminary results

- The estimated capacity (17,611 Mt CO₂) far exceeds Ireland's annual emissions (ca 35 Mt CO₂).
- Additional capacity by undrilled inversion structures and pre-Cretaceous plays is currently being assessed.
- Future work will focus on evaluating undrilled structures and assess its Hydrogen storage potential.

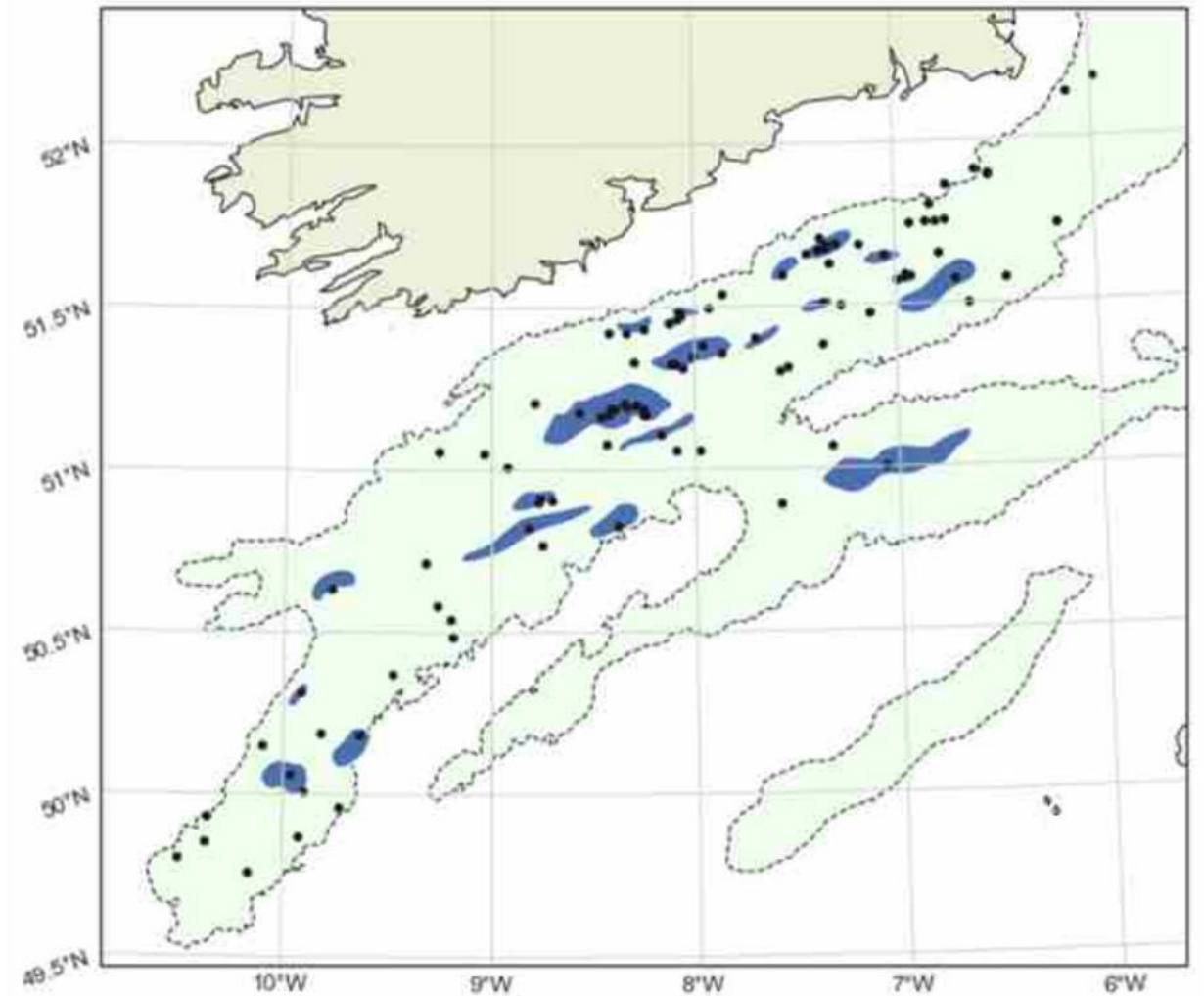
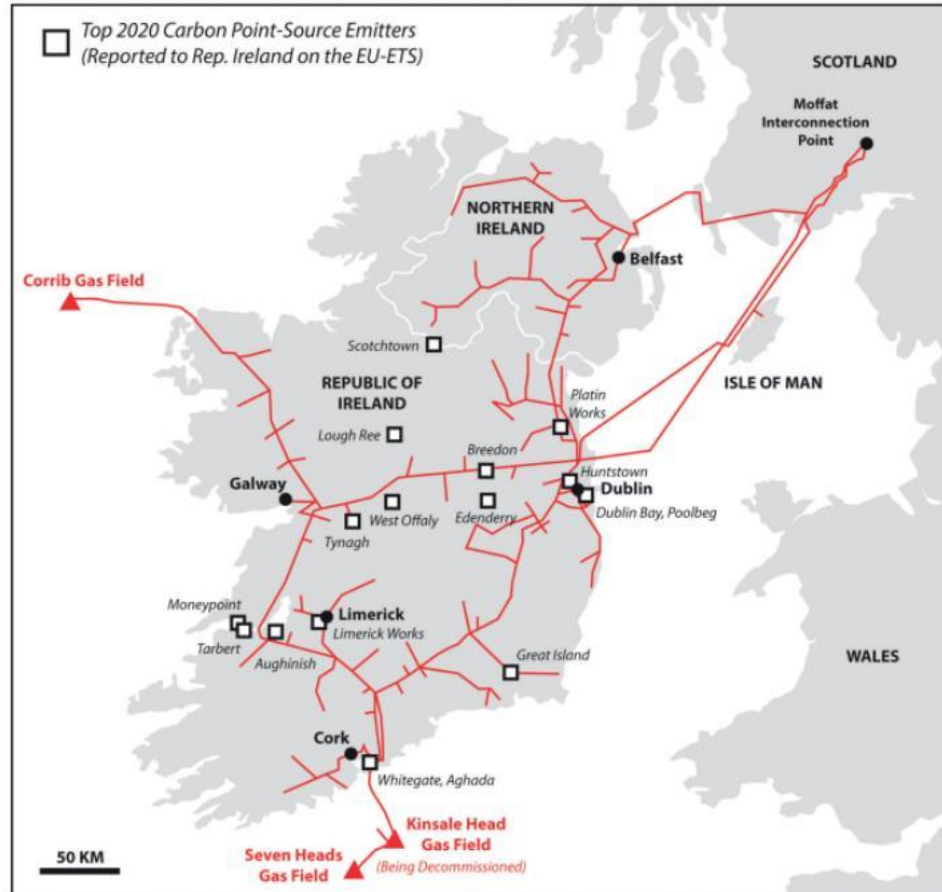


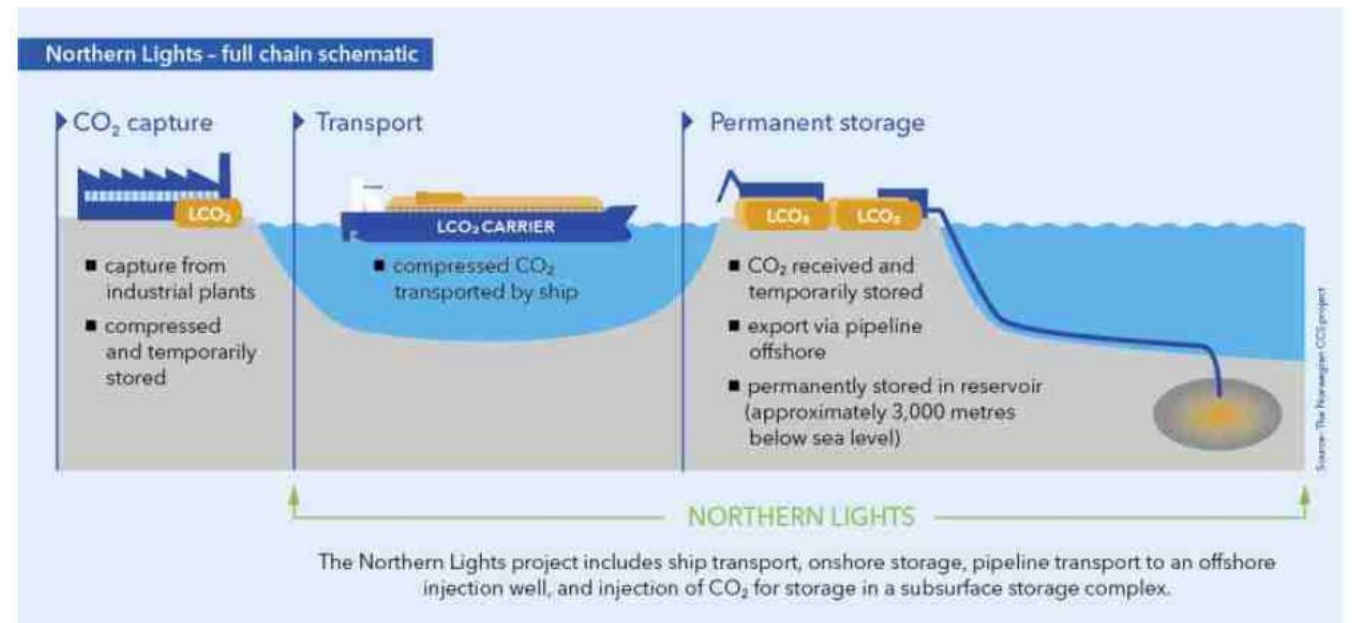
Figure 10. Map showing the selected of inversion structures for calculating the theoretical CO₂ storage capacity.

Transport of CO₂ from source to storage sites



Map of the gas pipelines in Ireland

- Gas Pipeline (under pressure)
- Road (Motorway network)
- Rail Network
- Shipping (Cork Ports)



Potential Costs of Infrastructure

- Capture and transport: gas compressors at CO₂ source points, and pipelines connecting sources with offshore storage sites
- Storage: drilling offshore wells and platform linked to the wells with equipment (compressors, pumps, etc) to conduct storage operations.
As a reference value, the cost of drilling the most recent wells in offshore Ireland ranges between 30 – 50 million euros
- After storage infrastructures are built, potential costs involve the process of collection (includes separating CO₂ from other products and the process of transport and storage)

Acknowledgements

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