International Offshore Geologic Carbon Storage Inventory and Data Collection

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Research & Innovation Center

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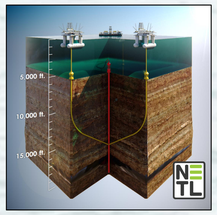
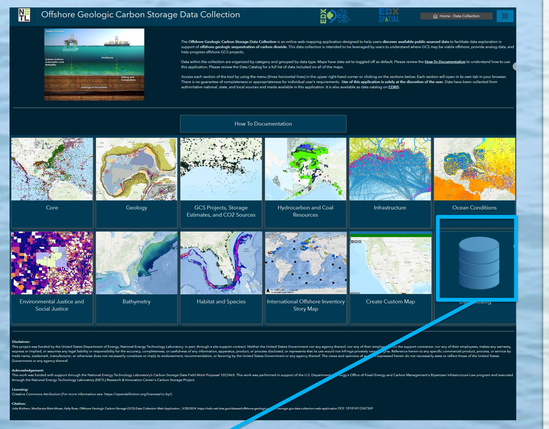
Understanding and Progressing Offshore Geologic Carbon Storage

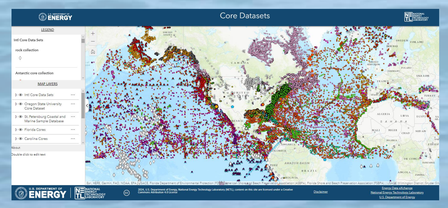
Offshore geologic carbon storage (GCS) has been taking place since 1996 and there are 39 active projects, with recent new leases in the North Sea. Despite these ongoing efforts, offshore GCS remains a relatively nascent industry, therefore, aggregations and summaries of offshore projects, opportunities, and learnings are disparate. Here we present an inventory and meta-analysis of global offshore GCS efforts to inform the development of ongoing and future projects. Meta-analysis, comparing projects qualitatively and quantitatively by their attributes, enables them to be better leveraged as analogs and facilitates cross-transfer of learnings.



Geologic Carbon Storage Data Collection and Web Application

- Collection of data to support offshore GCS, with an emphasis on the United States, was gathered and curated through a series of web maps for visualization.
- This data collection was gathered to make data resources to support offshore GCS more readily available to users and stakeholders.
- The eight maps allow the user to spatially view the datasets by category: Core; Geology; Environmental and Social Justice; GCS Projects and CO_2 Sources; Ocean Conditions; Infrastructure; Hydrocarbon and Coal Resources; and Habitat and Species.
- Each map is organized into a series of groups and layers to allow the user to display and interact with the data and then download the information from the original data source.



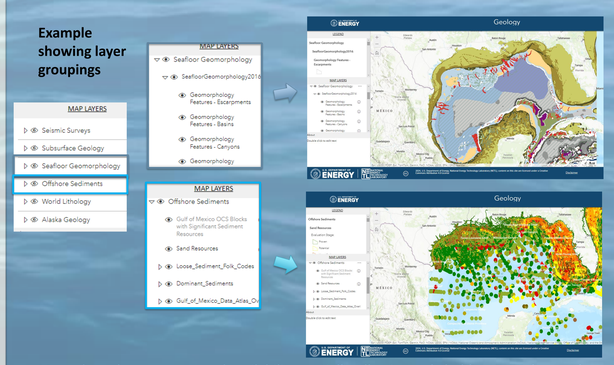


- Leveraging already published datasets keeps information evergreen and enables users to download the latest data directly from the original source.

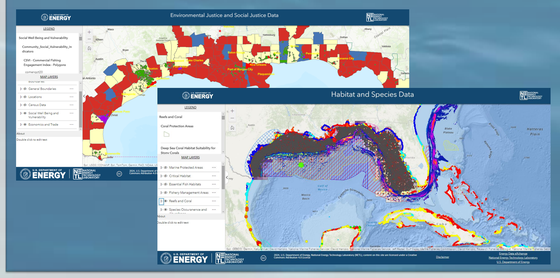
Spatial Data Catalog

- Catalog for spatial data collection consists of web hosted data links which are tagged by the data type and map within the data collection.
- This catalog enables users to access and download all data available within the collection.
- Leveraging web hosted data links ensures that users can access the latest, most up to date version of each dataset and compare between similar datasets brought in from different sources.

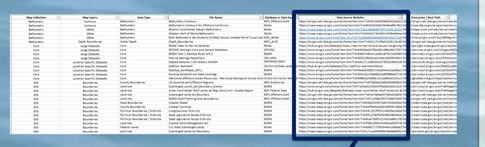
Example showing layer groupings



- Maps show data coverage and availability spatially, allowing stakeholders to understand the information available by location and data type.
- Maps also allow comparisons of data types from multiple sources and of multiple vintages so users can understand optionality among available resources.



Example Data



- Web hosted data sources ensure users have access to the latest data.

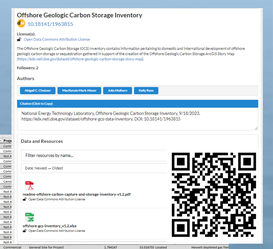
International Carbon Storage Inventory

- An inventory of offshore GCS projects and site characterizations has been in development by NETL since 2002.
- The inventory was developed through detailed literature search and has expanded through time as more sites have been added and more attributes have been carried for each site.
- It is currently published as a Microsoft Excel sheet catalog (Inventory Version 1.2) and available for download on NETL's Energy Data Exchange (EDX).
- Future versions will include an interactive web map and spatial data layer followed by an interactive dashboard.

Inventory Versions and Products

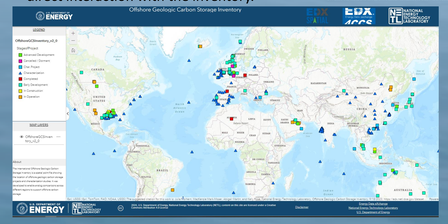
Inventory Version 1.2 – Available Online on EDX

- Microsoft Excel Sheet Inventory Version available online and includes ~220 projects and sites and a variety of attributes and categoricals for each site.



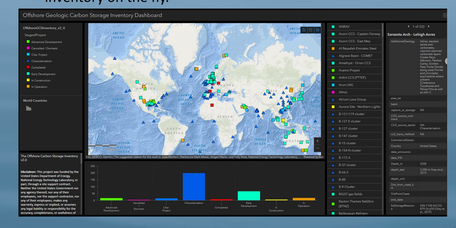
Inventory Version 2 – Spatial Feature Dataset and Interactive Web Map

- A web map and spatial data layer will enable direct interaction with the inventory.



Inventory Version 3 – Interactive Dashboard with Live Graphics

- The development of an interactive dashboard is underway which will enable users to generate graphics and comparisons of the inventory on the fly.



Analog Selection and Data Comparison

- Through time additional attributes have been added to the inventory to enable comparisons between sites and to sort and leverage projects and studies as analogs.
- The inventory includes attributes related to project/study location, characteristics, capacity, and geology.
- The attribute table for the inventory can be filtered and sorted to understand similarities and differences between projects and help with analog selection and comparisons.

Inventory Version 2 (In Development)

363 Sites (some onshore)

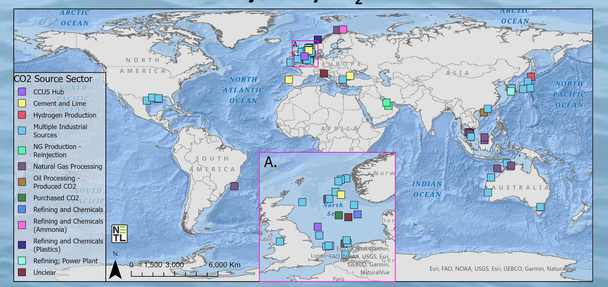
Attributes:

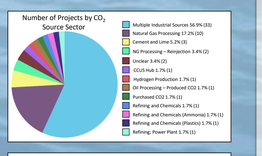
Field Name
Object ID
Project Name
Project Name (Short)
Region
Sub-Region
Country
State
Location
Location Description
Location Certainty
Basin
Project Stage
Project Stage Number Code
Project Type
Project Type (Simplified)
Study Type
Play Type
CO_2 Transport Method
CO_2 Source Sector
CO_2 Source Sector Description
Inventory Version
Longitude
Latitude
Water Depth Description
Water Depth (m)
Date Announced
Date FID
Expected Operational Year
End Date
Reservoir Lithology
Reservoir Fluid
Seal Lithology
Reservoir Depth Comment
Reservoir Depth (m)
Units of Reservoir Depth
Estimated Storage Resource
Min. Est. Storage Resource (Mt)
Max. Est. Storage Resource (Mt)
Rate of Injection Description
Rate of Injection (Mt/yr)
Companies
References
Distance from Coast Description
Distance from Coast (km)
Reservoir Depositional Environment
Reservoir Age
Reservoir Formation
Porosity Description
Porosity (%)
Permeability Description
Permeability (mD)
Reservoir Thickness Description
Reservoir Thickness (m)
Net to Gross
Area Description
Reservoir Characteristics References
Reservoir Characteristics Comments
Onshore vs. Offshore Location
Web Link
Seal Formation
Seal Thickness Description
Seal Thickness (m)
Percent CO_2 in Gas
IEA Name
Geologic Description

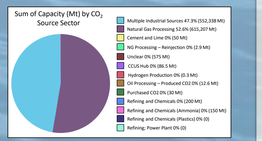
Spatial Meta-Analysis

- Attributes with specific bins, or categoricals, can be used to visualize and sort projects enabling spatial comparisons and meta-analysis.
- A series of maps by attribute show the distribution and variability in projects.

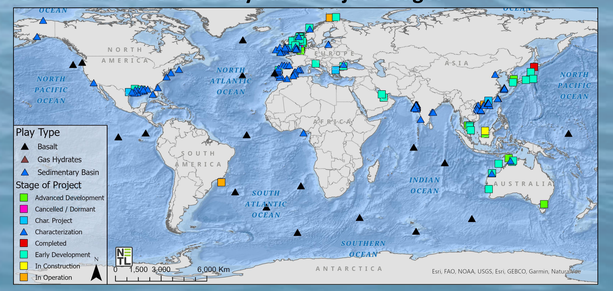
Global Offshore GCS Projects by CO_2 Emission Source Sector

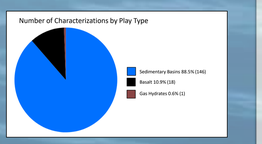


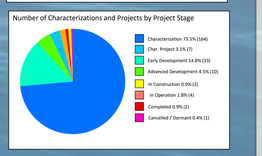




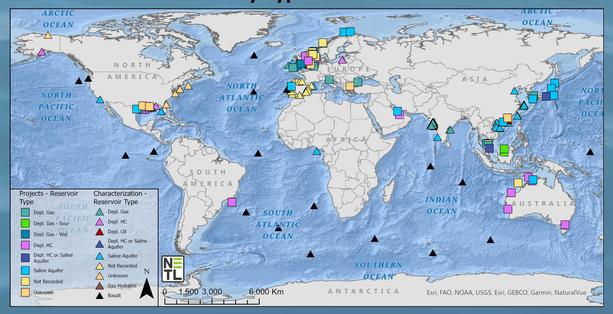
Global Offshore GCS Plays and Project Stages







Reservoir Fluid and Study Type



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Acknowledgement: This work was performed in support of the U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management's Carbon Storage Program and executed through the National Energy Technology Laboratory (NETL) Research & Innovation Center's Carbon Storage Data Field Work Proposal.

Data Collection:

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Mulhern, J.S., Mark-Moser, M., and Rose, K., 2024. Offshore Geologic Carbon Storage Data Collection and Data Gaps Analysis. DOE.NETL-2024.4804; NETL Technical Report Series; U.S. Department of Energy, National Energy Technology Laboratory: Albany, OR, 2024; p 24. https://doi.org/10.2172/2382659 https://edx.netl.doe.gov/dataset/offshore-geologic-carbon-storage-data-collection-and-data-gaps-analysis-trs-report

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