



Identification of promising CCUS clusters

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This project has received funding from UK Research and Innovation - Innovate UK under Innovation Funding Service (ISF)



Identification of promising CCUS clusters

Zero Emission Network to facilitate CCUS uptake in industry

Objectives

- To enable faster development of CCUS projects in Europe
- Identify potential new Project of Common Interest (PCI) storage
- Contribute to knowledge sharing on key issues relevant to deployment of CCUS

industrial clusters across
projects for transport and
to industrial



HORIZON-CSA (Coordination and Support Action)

- September 2022 - February 2025

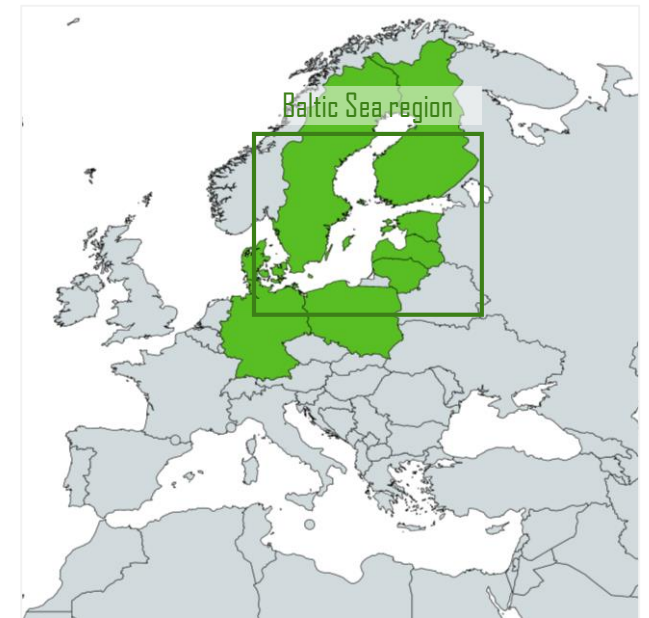


Identification of promising CCUS clusters

CCUS ZEN regions

Baltic Sea region

Denmark including the easternmost North Sea
Sweden
Finland
Germany
Estonia
Latvia
Lithuania
Poland
Baltic Sea





Identification of promising CCUS clusters

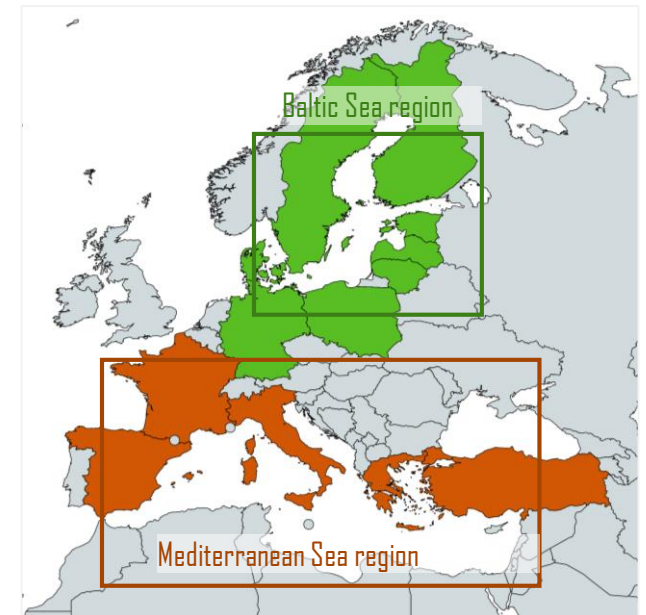
CCUS ZEN regions

Baltic Sea region

Denmark including the easternmost North Sea
Sweden
Finland
Germany
Estonia
Latvia
Lithuania
Poland
Baltic Sea

Mediterranean Sea region

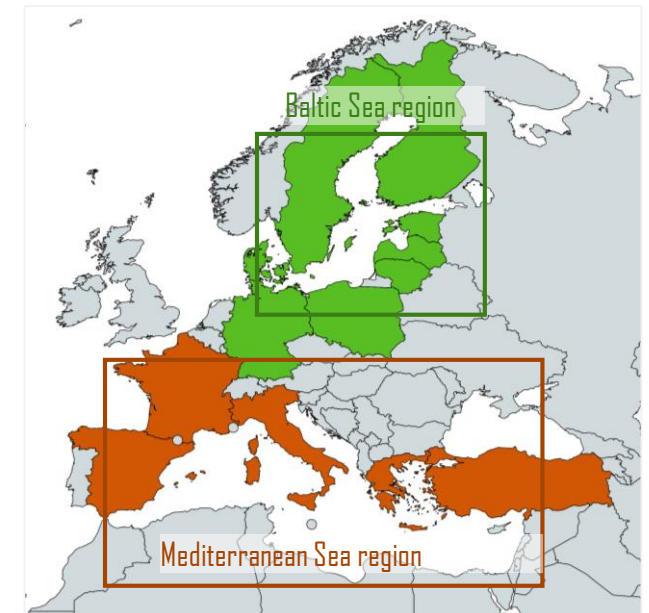
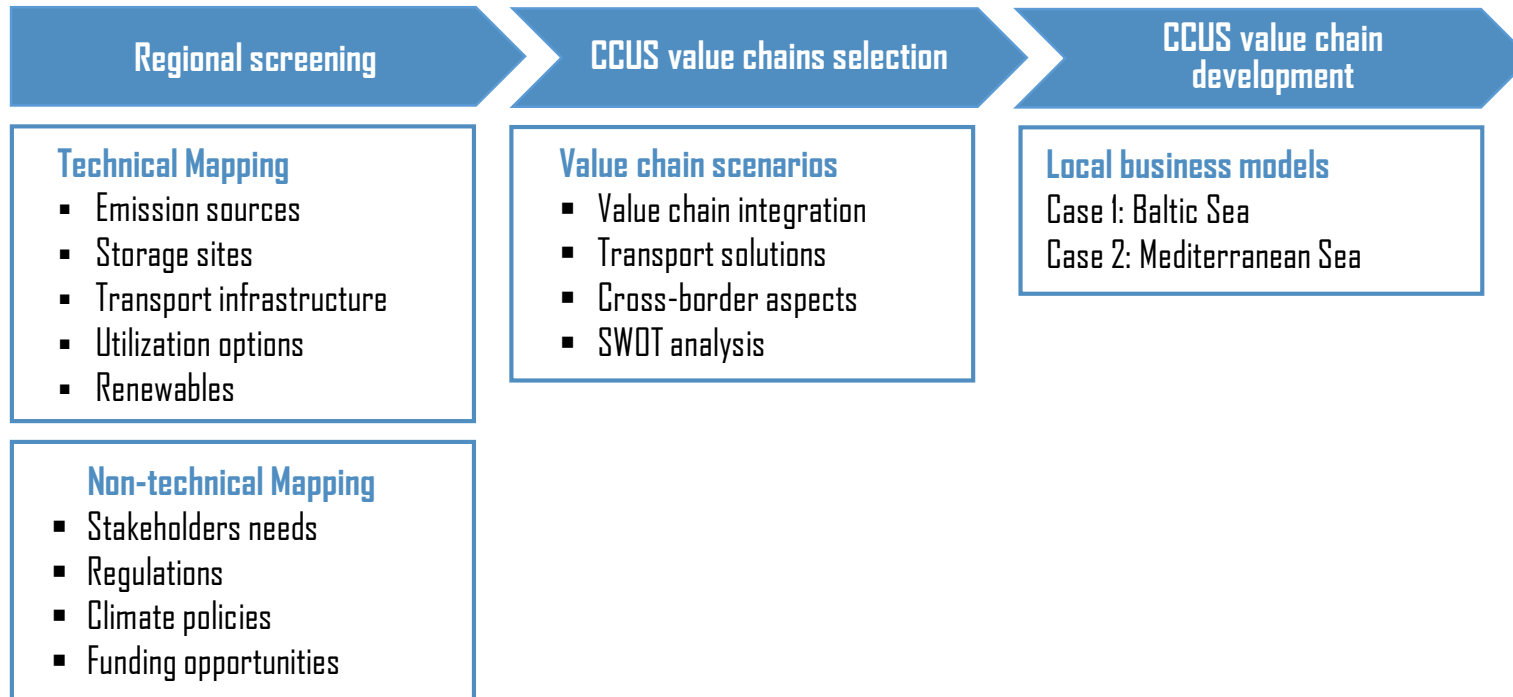
Spain
France
Italy
Greece
Türkiye
Mediterranean Sea





Identification of promising CCUS clusters

Framework for CCUS value chain development





Identification of promising CCUS clusters

Technical mapping / Emission sources

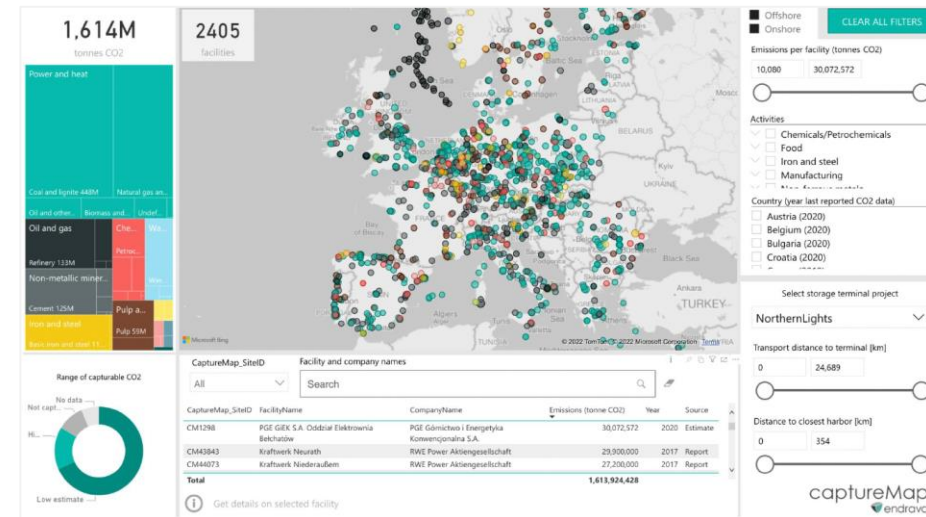
CaptureMap

- EU ETS (EU Emissions Trading System)
- E-PRTR (European Pollutant Release and Transfer Register)
- QA by Endrava

- QA by CCUS ZEN partners
Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Poland and France

Türkiye

- Middle East Technical University (CCUS ZEN partner)





Identification of promising CCUS clusters

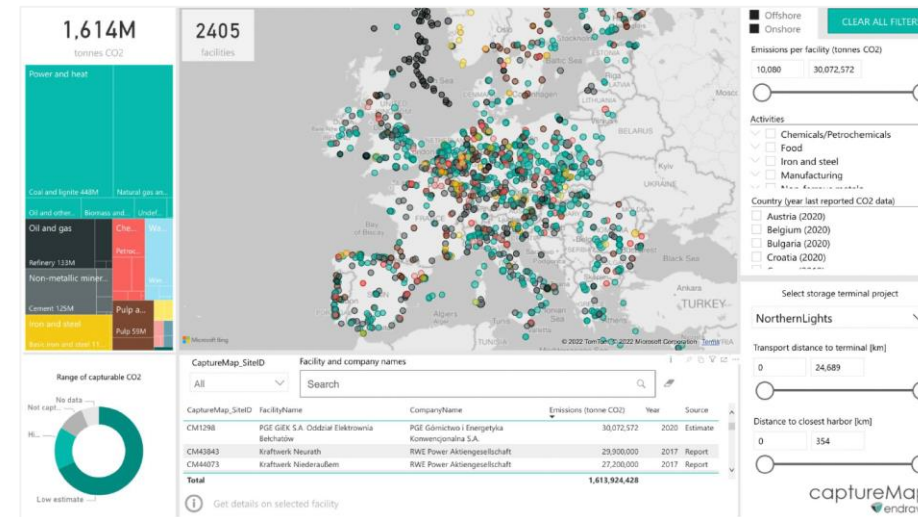
Technical mapping / Emission sources

Attributes

- Location
- Total emissions
- Emission trend
- Longlivity



ARC (<https://a-r-c.dk/english/visit-arc/>)





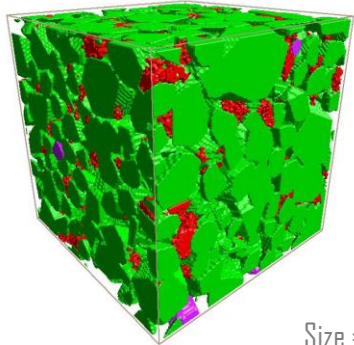
Identification of promising CCUS clusters

Technical mapping / Geological storage sites

Geological storage

Geological formations are porous

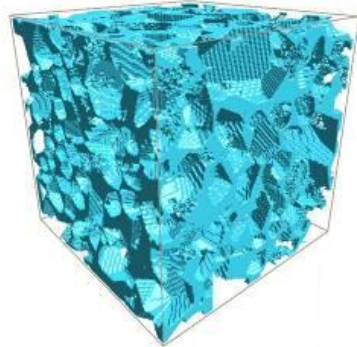
Rock matrix



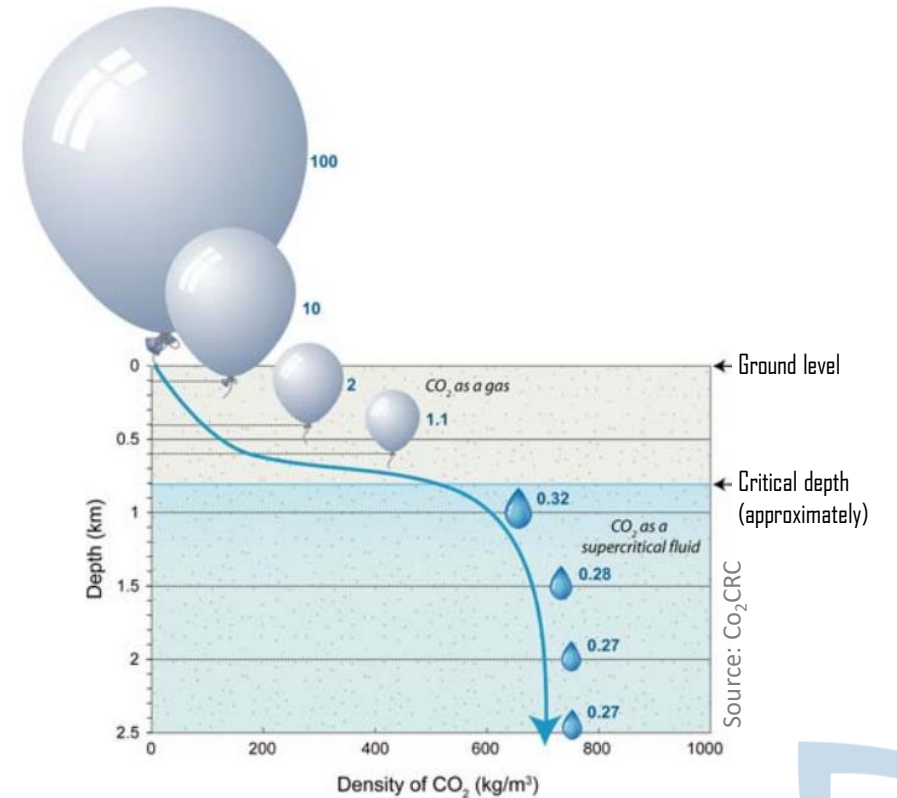
- Sandstone
- Quartz
- Clay
- Feldspar

Size = 1 mm x 1 mm x 1 mm

Pore space



Saturated with fluid(s) and/or gas(es)





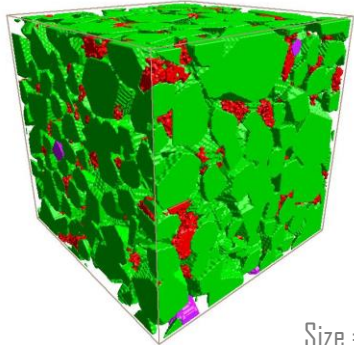
Identification of promising CCUS clusters

Technical mapping / Geological storage sites

Geological storage

Geological formations are porous

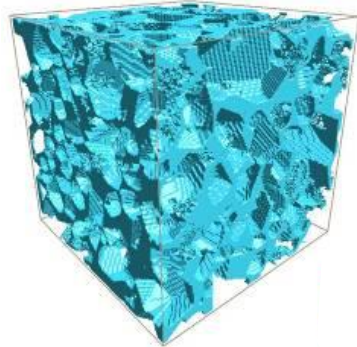
Rock matrix



Sandstone
■ Quartz
■ Clay
■ Feldspar

Size = 1 mm x 1 mm x 1 mm

Pore space



Saturated with
fluid(s) and/or
gas(es)

Storage sites

- Deeper than 800 m | **CO₂ volume**
- High porosity | **Storage volume**
- High permeability | **Injectivity**

Overburden layers

- Low permeability | **Sealing**

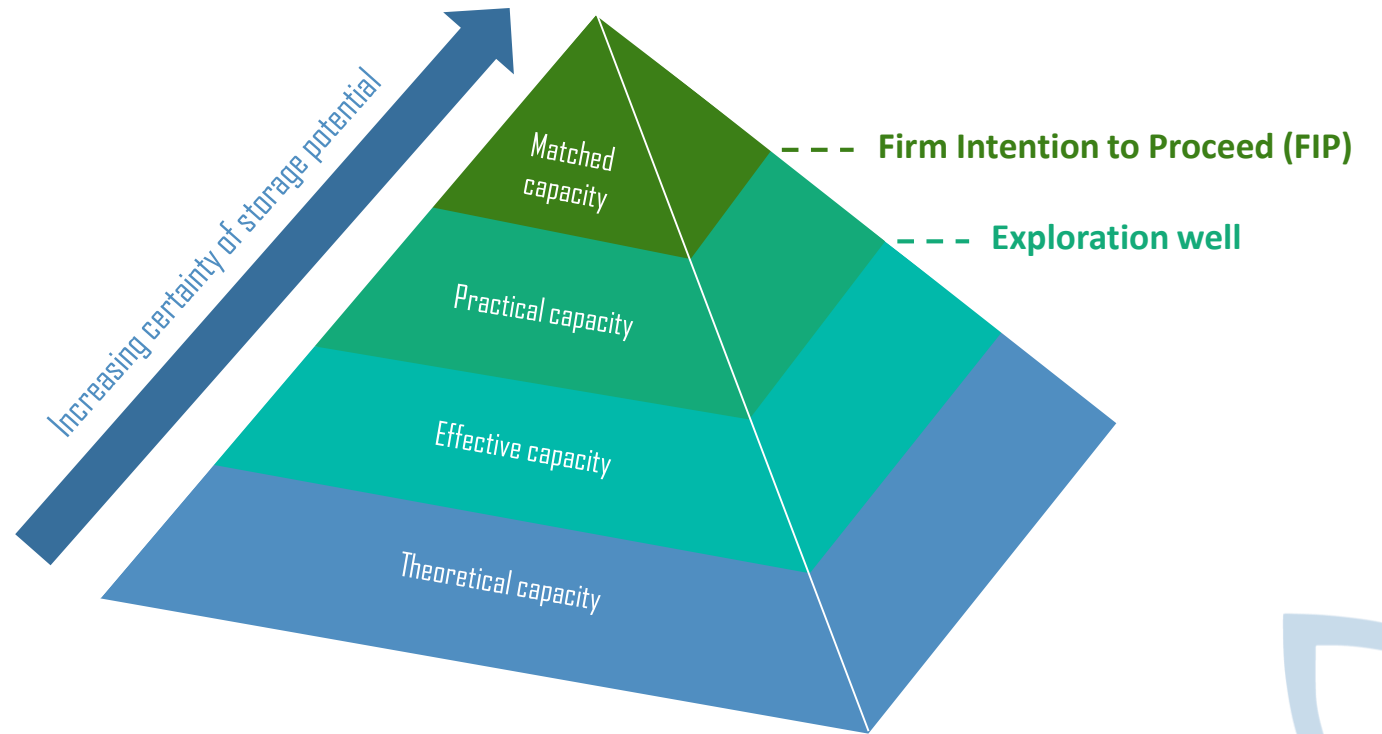


Identification of promising CCUS clusters

Technical mapping / Geological storage sites

Storage capacity pyramid

| Capacity | Assessment |
|-------------|-------------|
| Matched | Site |
| Practical | Prospect |
| Effective | Exploration |
| Theoretical | Regional |





Identification of promising CCUS clusters

Technical mapping / Geological storage sites

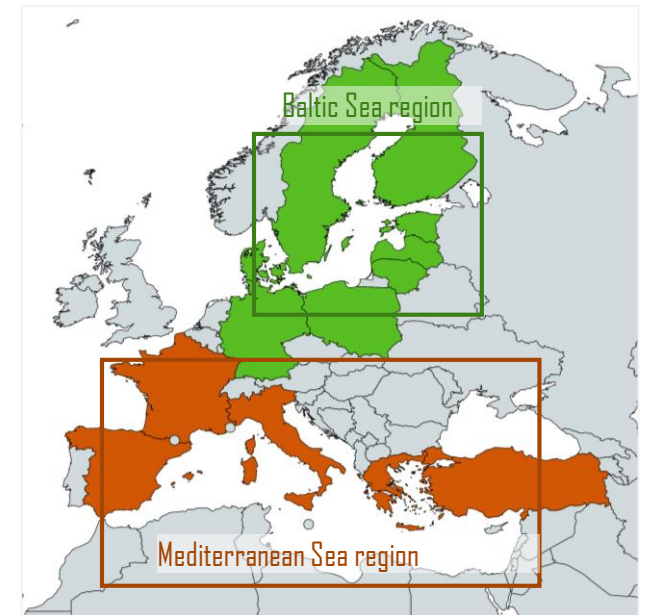
European projects

| Short name | Year |
|----------------|-------------|
| GESTECCO | 2000 - 2003 |
| GeoCapacity | 2006 - 2008 |
| CO2Stop | 2012 - 2014 |
| NORDICCS | 2012 - 2015 |
| Strategy CCUS | 2019 - 2022 |
| Strategy Pilot | 2021 - 2026 |

National projects

| Country | Year |
|---------|------|
| Sweden | 2021 |
| Denmark | 2020 |
| Spain | 2015 |
| Poland | 2014 |

Projects by universities and research institutions





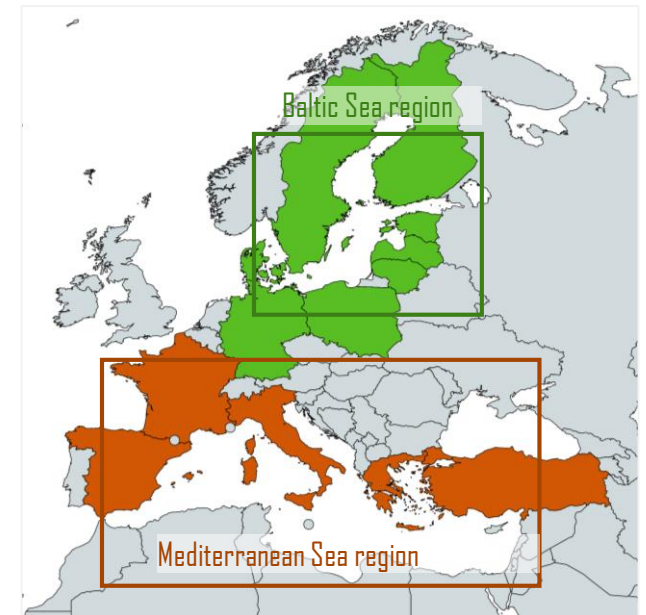
Identification of promising CCUS clusters

Technical mapping / Geological storage sites

Denmark

Hjelm et al. (2020)
[Evaluation of the CO₂ storage potential in Denmark](#)

Anthonsen et al. (2014)
[Screening for CO₂ storage sites in Southeast North Sea and Southwest Baltic Sea](#)





Identification of promising CCUS clusters

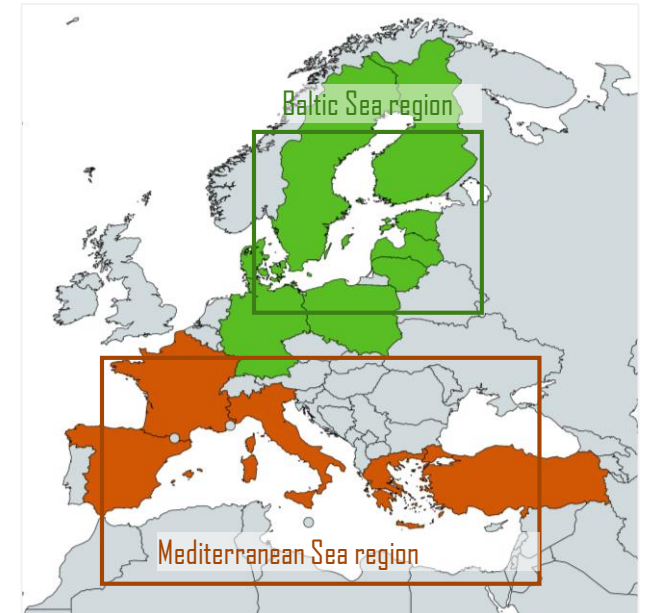
Technical mapping / Geological storage sites

Attributes

- Contour
- On-shore or off-shore
- Storage type (aquifer or hydrocarbon field)
- Storage capacity
- Storage Readiness Level (SRL)



Contour of prospective storage sites



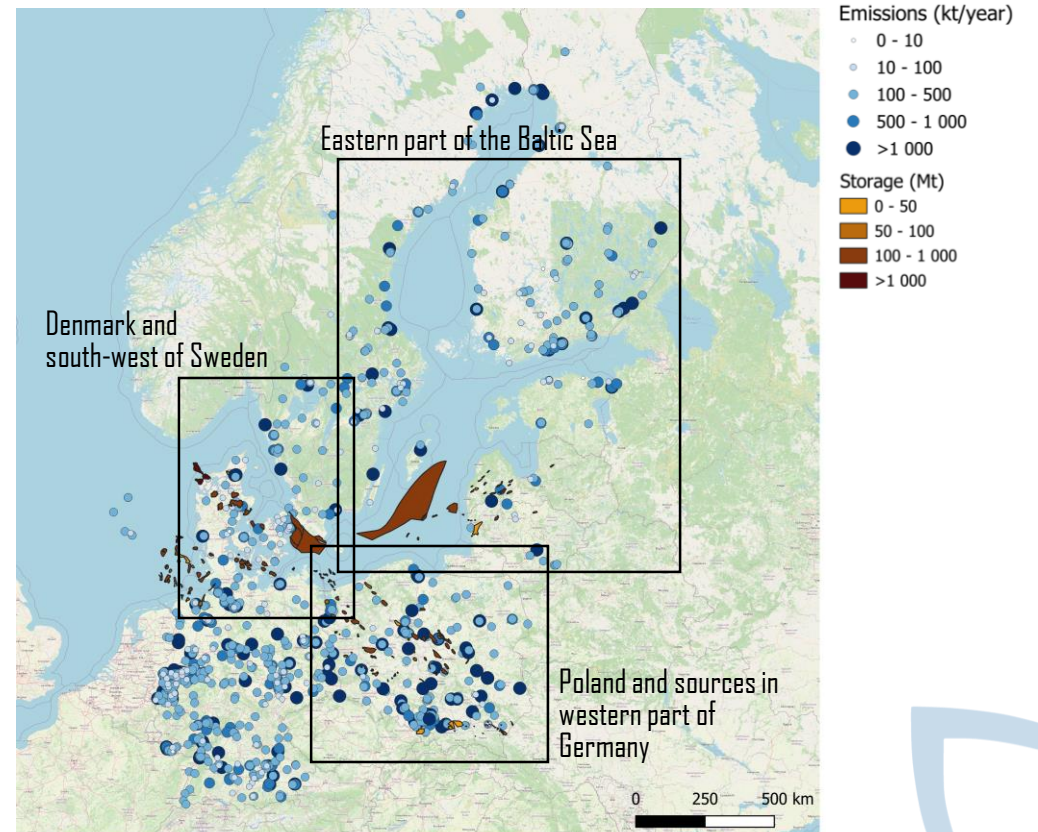


Identification of promising CCUS clusters

Connecting emission sources with storage sites

Baltic Sea region

Denmark including the easternmost North Sea
Sweden
Finland
Germany
Estonia
Latvia
Lithuania
Poland
Baltic Sea





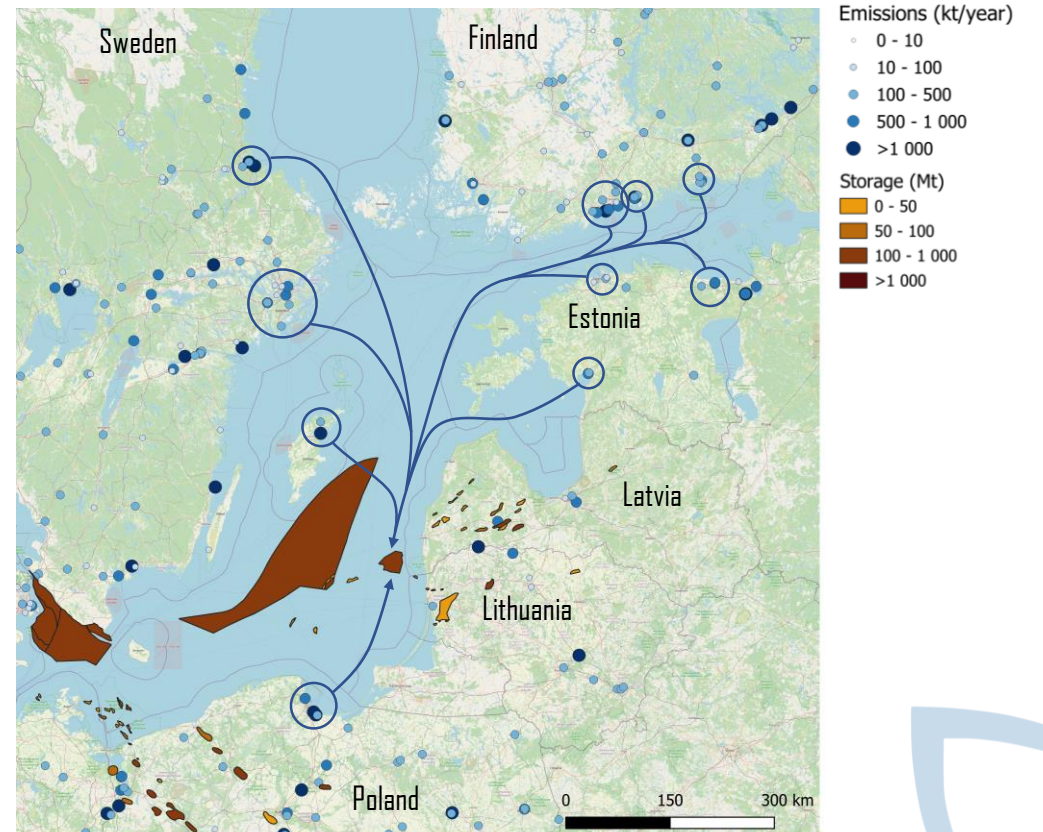
Identification of promising CCUS clusters

Connecting emission sources with storage sites

Baltic Sea region

Denmark including the easternmost North Sea
Sweden
Finland
Germany
Estonia
Latvia
Lithuania
Poland
Baltic Sea

Eastern part of the Baltic Sea





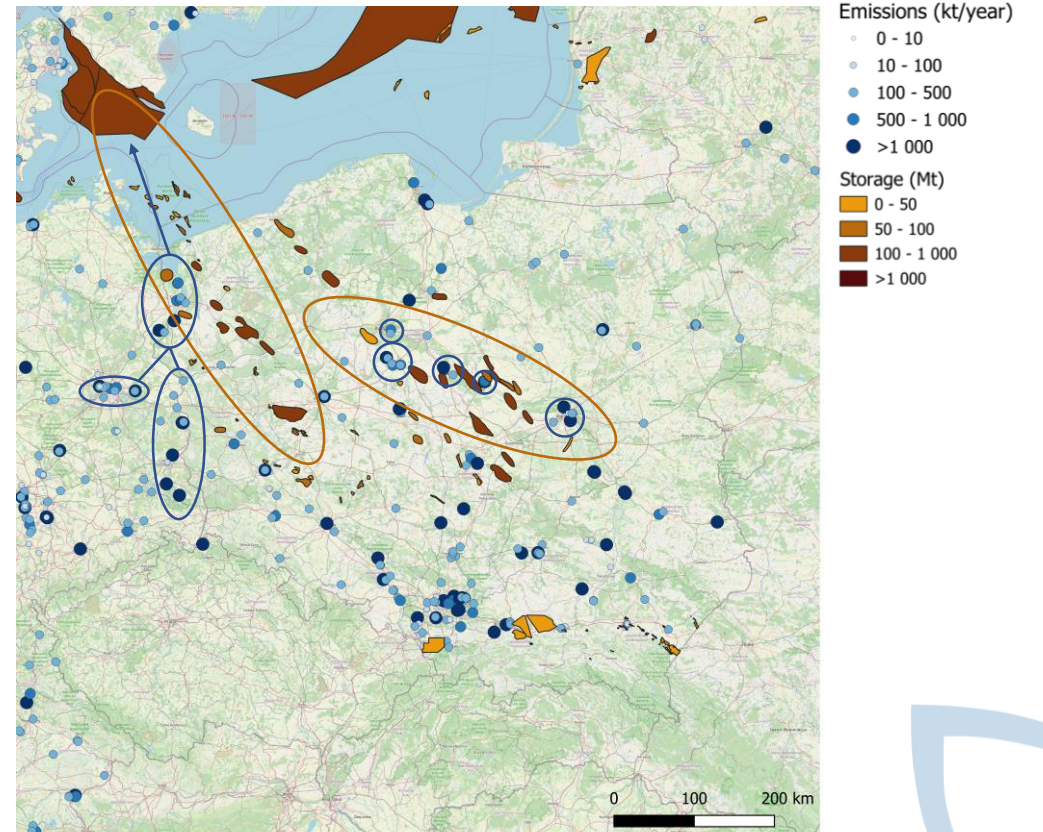
Identification of promising CCUS clusters

Connecting emission sources with storage sites

Baltic Sea region

Denmark including the easternmost North Sea
Sweden
Finland
Germany
Estonia
Latvia
Lithuania
Poland
Baltic Sea

Poland and sources in western part
of Germany





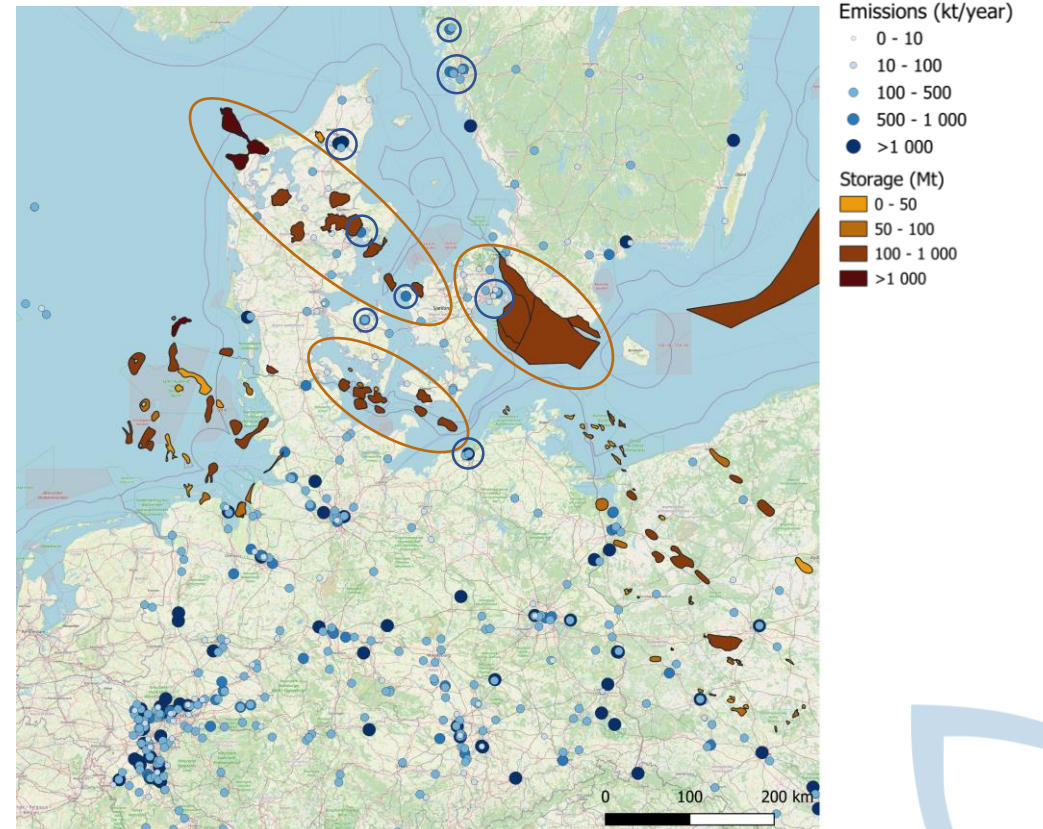
Identification of promising CCUS clusters

Connecting emission sources with storage sites

Baltic Sea region

Denmark including the easternmost North Sea
Sweden
Finland
Germany
Estonia
Latvia
Lithuania
Poland
Baltic Sea

Denmark and
south-west of Sweden



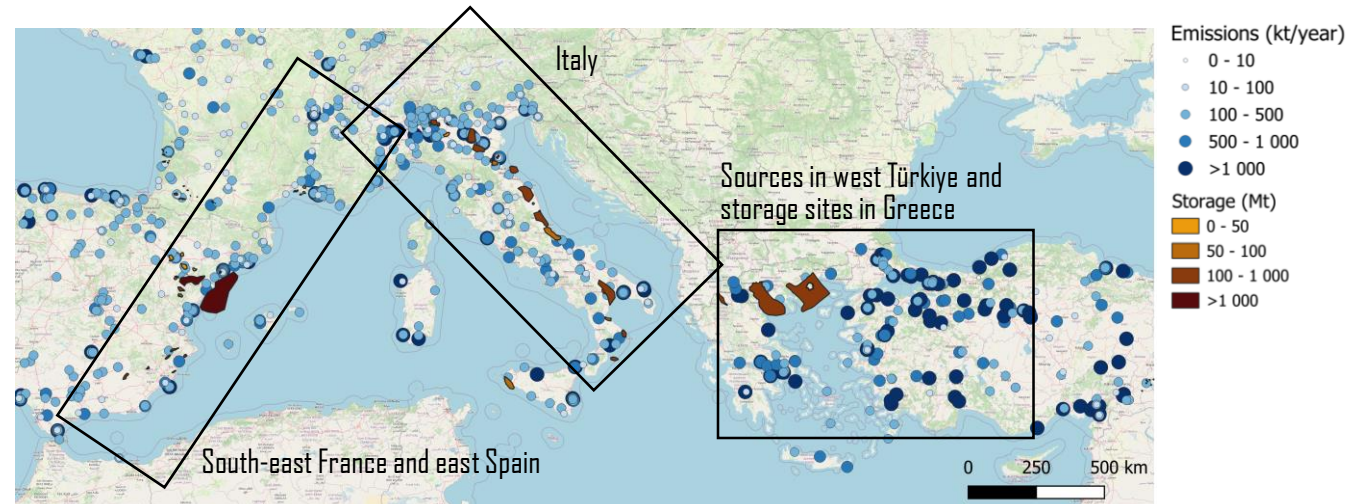


Identification of promising CCUS clusters

Connecting emission sources with storage sites

Mediterranean Sea region

Spain
France
Italy
Greece
Türkiye
Mediterranean Sea





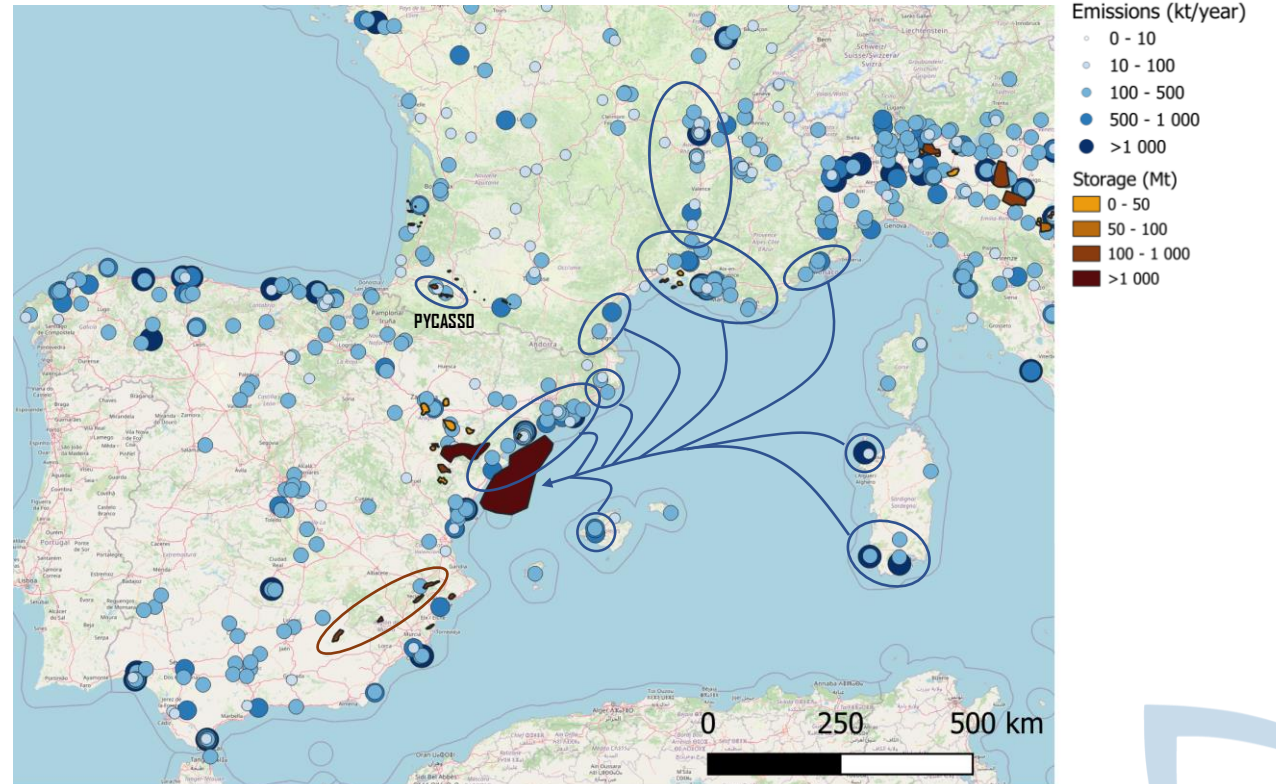
Identification of promising CCUS clusters

Connecting emission sources with storage sites

Mediterranean Sea region

Spain
France
Italy
Greece
Türkiye
Mediterranean Sea

South-east France and
east Spain





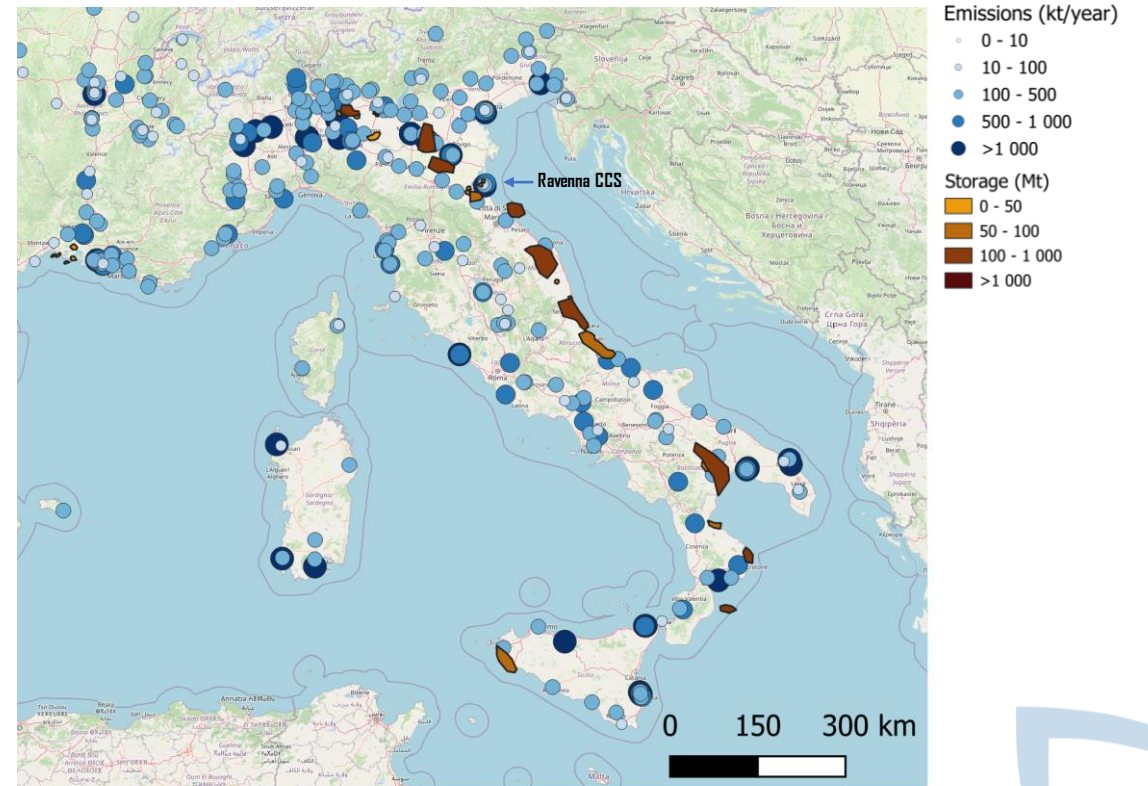
Identification of promising CCUS clusters

Connecting emission sources with storage sites

Mediterranean Sea region

Spain
France
Italy
Greece
Türkiye
Mediterranean Sea

Italy





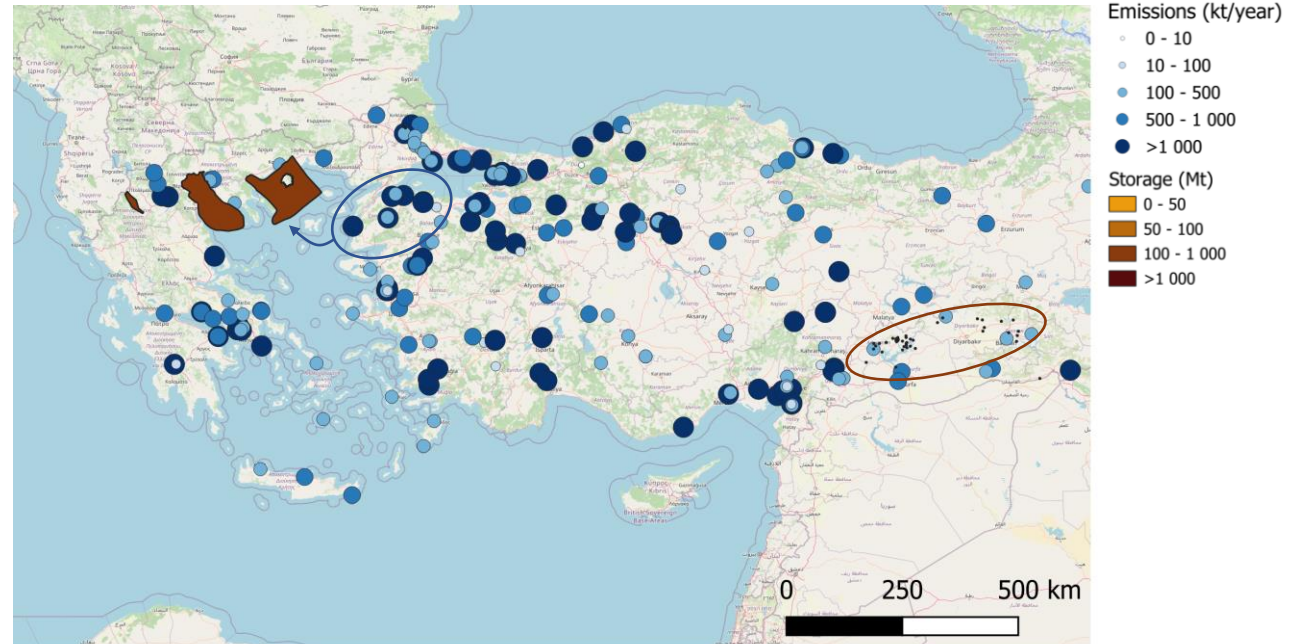
Identification of promising CCUS clusters

Connecting emission sources with storage sites

Mediterranean Sea region

Spain
France
Italy
Greece
Türkiye
Mediterranean Sea

Sources in west Türkiye and storage sites in Greece





Identification of promising CCUS clusters

Non-technical mapping

Topics

- Policy and public support
- Market readiness and financial aspects
- Legal and regulatory aspects





Identification of promising CCUS clusters

Non-technical mapping

Topics **Webinars**

- Policy and public support **Wednesday 14 June 10:00 - 12:00**
- Market readiness and financial aspects **Friday 24 June 10:00 - 12:00**
- Legal and regulatory aspects **Tuesday 2 May 10:00 - 12:00**





Identification of promising CCUS clusters

Non-technical mapping

Topics **Webinars**

- Policy and public support **Wednesday 14 June 10:00 - 12:00**
- Market readiness and financial aspects **Wednesday 28 June 10:00 - 12:00**
- Legal and regulatory aspects **Tuesday 2 May 10:00 - 12:00**

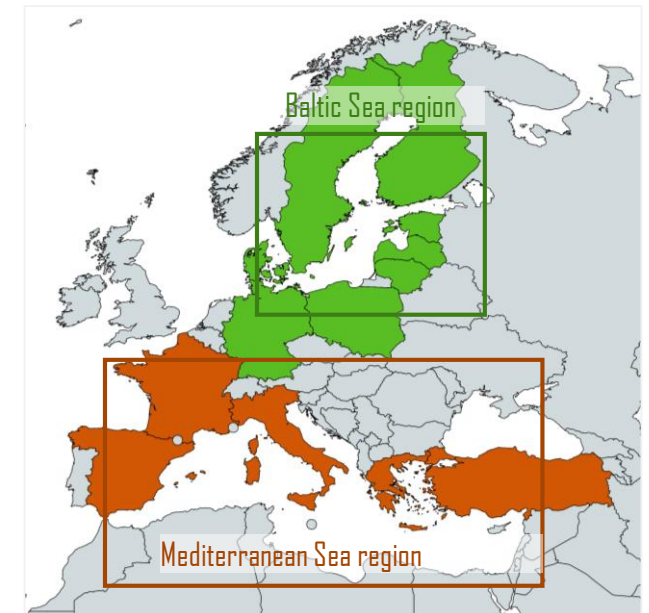
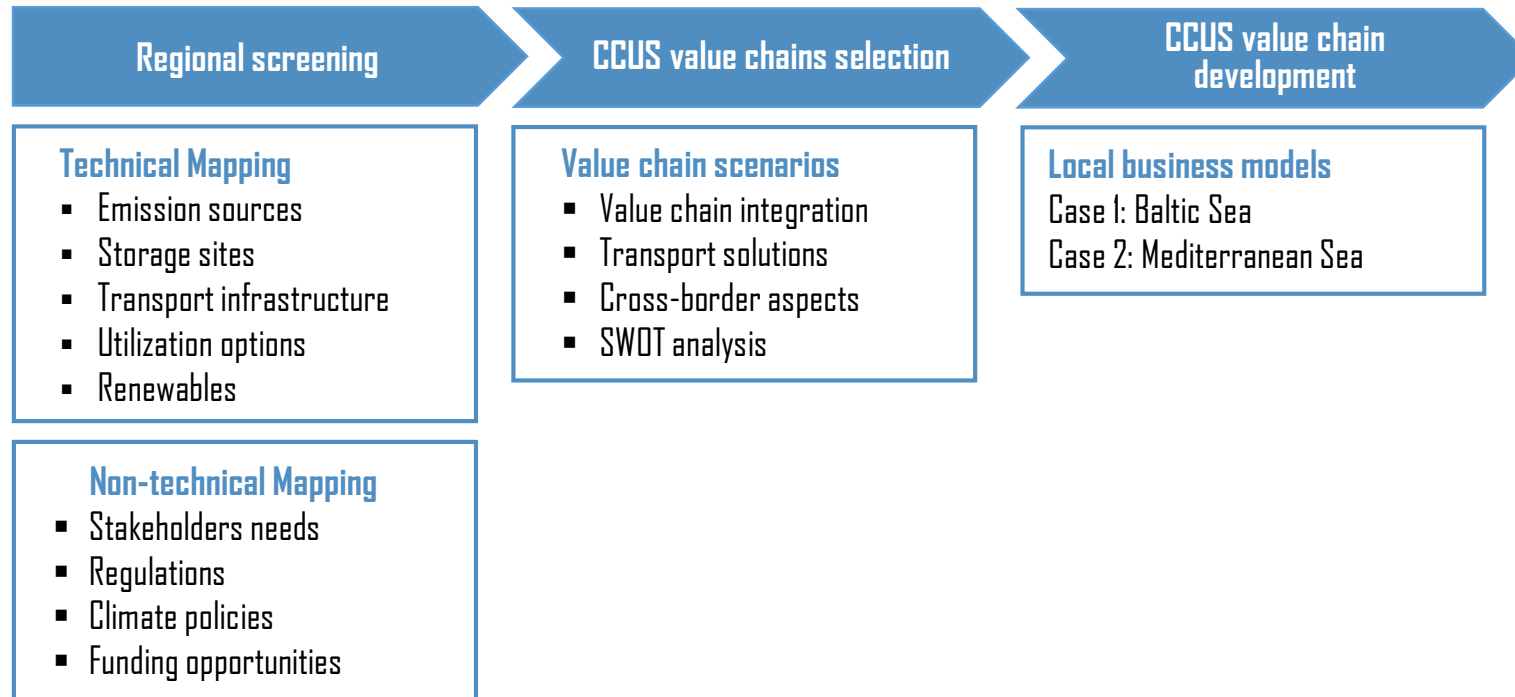
- London Protocol
Protection of the Marine Environment of the Baltic Sea Area
- Helsinki Convention
Protection of the Mediterranean Sea against Pollution





Identification of promising CCUS clusters

Framework for CCUS value chain development





Identification of promising CCUS clusters

Zero Emission Network to facilitate CCUS uptake in industry

Partners



Axelera



CO₂ Value Europe



French Geological Survey (BRGM)



Geological Survey of Denmark and Greenland (GEUS)



Technip Energies



IOM Law



Middle East Technical University



Perspectives Climate Research



Polish Geological Institute – National Research Institute



University of Jyväskylä



Ramboll



SCCS (The University of Edinburgh)



SINTEF



Tallinn University of Technology









Internship at SINTEF: Cécile Biragnet from l'Ecole Polytechnique (Palaiseau, France)



Identification of promising CCUS clusters

Zero Emission Network to facilitate CCUS uptake in industry

Networking partners

| | | | | | | | | | | |
|--|---|--|---|---|--|---|---|--|---|---|
|  ASPIRE ADVANCED PLANT RESEARCH ASSOCIATION |  AKER CARBON CAPTURE |  BASRECCS network of Carbon Capture and Storage |  BGR Federal Institute for Geosciences and Natural Resources |  Carbon Capture Cluster Copenhagen (C4) |  carboncause |  Technology Centre Mongstad |  Total Energies |  Tüpraş |  Vallourec |  Geological and Mining Institute of Spain (IGME), Spanish National Research Council |
|  DNV |  ECCSEL ERIC |  Endrava |  ENeRG |  Eni |  Equinor |  AkerBP |  Global CCS Institute |  Celsio |  INEOS |  Municipality of Thisted |
|  Heidelberg Materials |  Holcim Innovation Center |  Latvenergo |  NECCUS |  Noble Corp |  Pentair |  Geological Survey of Sweden |  CEA Liten |  Port of Hanstholm |  Ventspils nafta terminals SIA |  Chemical Business Association of Tarragona |
|  Piicto by Marseille Fos |  Port of Antwerp-Bruges |  Process4Planet |  Repsol |  Schwenk Latvija |  Shell |  The Carbon Capture and Storage Association |  Lhoist |  Storaensio |  Latvian Hydrogen Association |  CGG |
|  Gassnova |  Porthos |  Pôle AVENIA |  Bellona | | | | | | | |



Identification of promising CCUS clusters

Zero Emission Network to facilitate CCUS uptake in industry

www.ccuszen.eu

The screenshot shows the homepage of the CCUS ZEN website. At the top left is the CCUS ZEN logo. To the right is a navigation menu with links: About the Project, Knowledge Platform, CCUS in Europe, Industry Clusters, News, Events, Get in touch, and Search. Below the navigation are three main content cards:

- Industry Clusters:** CCUS ZEN is exploring the potential for enabling CCUS value chain deployment in the Baltic Sea and the Mediterranean Sea regions. Includes a "READ MORE >>" button.
- Knowledge Platform:** Access a range of shared knowledge, experience and advice to help drive forward CCUS deployment in Europe. Includes a "READ MORE >>" button.
- CCUS in Europe:** Find out how CCUS technology works, why Europe needs its rapid delivery and what progress has already been made. Includes a "READ MORE >>" button.

Below these cards is a section titled "Latest news & events" with three news items:

- TCCS-12:** The bi-annual Trondheim CCS Conference series is a leading scientific CCS technology conference. Since its inception in 2008, the conference has developed to become a globally important meeting place for over 400 CCS experts. The conference typically has 150 oral presentations, five or six parallel sessions, over 100 posters and world-leading keynote speakers. The 12th conference, TCCS-12, will build on the heritage of the previous conferences, and will be held June 19-21, 2023, in Trondheim, Norway. Includes a "READ MORE >>" button.
- INDUSTRY VETERAN RETURNS TO TRONDHEIM:** We profile Erik Falck da Silva, our project coordinator. In our relatively young carbon capture and storage (CCS) industry, Erik Falck da Silva, our project coordinator, can be considered a veteran. Looking through ads for PhDs back home while working as a research scientist for Mitsubishi Chemicals in Japan, he settled on an opportunity to study carbon capture at his alma mater the Norwegian University of Science and Technology (NTNU). Includes a "READ MORE >>" button.
- CCUS ZEN IN QUEST TO ACCELERATE CCUS IN EUROPE WITH CLUSTER PLANS:** As part of its mission to accelerate the roll out of carbon capture utilisation and storage (CCUS) in Europe, CCUS ZEN will this year identify two industrial clusters suitable for deployment of CCUS, one in the Mediterranean and one in the Baltic region. Includes a "READ MORE >>" button.



Identification of promising CCUS clusters

Zero Emission Network to facilitate CCUS uptake in industry

Workshop 7 – 8 March in Copenhagen hosted by Rambøll



Next Workshop: noon 9 – noon 11 October in Madrid to be hosted by [carboncause/nexwell](#)





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**Innovate
UK**

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