

# ACCSESS:

## Addressing drastic CO<sub>2</sub> emissions cuts and removal in four key industries

Presenter:

Rubén M. Montañes, PhD

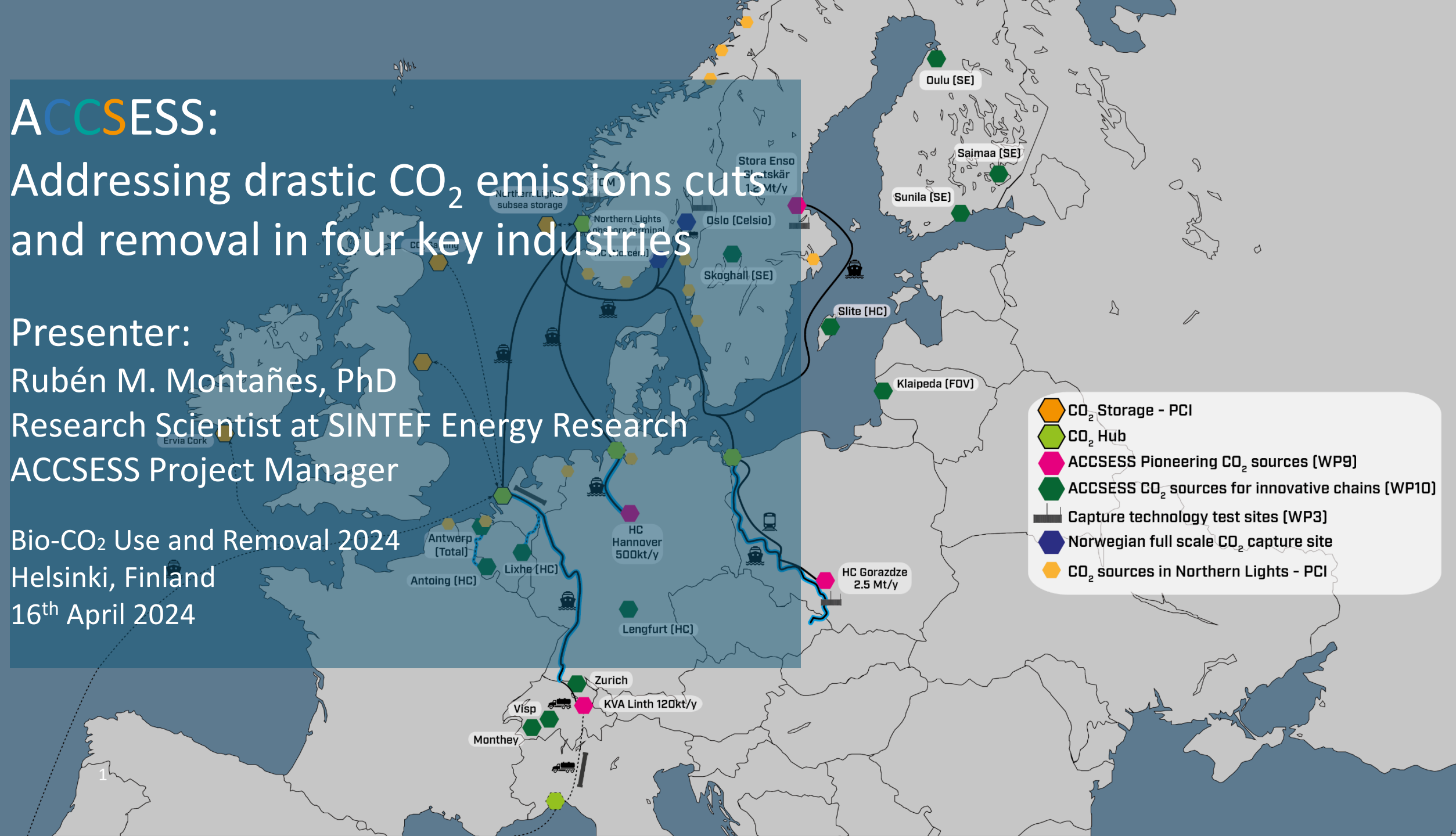
Research Scientist at SINTEF Energy Research

ACCSESS Project Manager

Bio-CO<sub>2</sub> Use and Removal 2024

Helsinki, Finland

16<sup>th</sup> April 2024

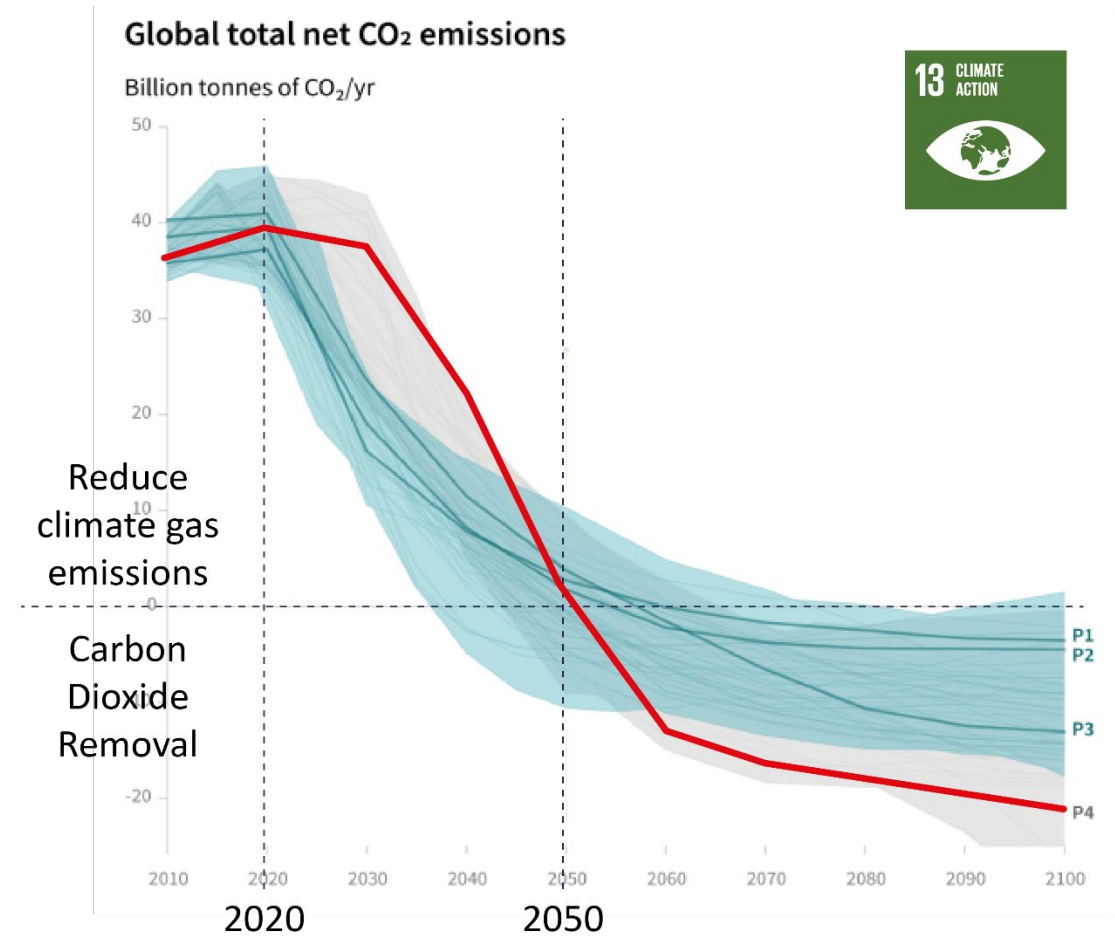




# The **ACCESS** Vision is to Develop replicable CCUS pathways towards a Climate Neutral Europe in 2050

*A need for deep emission reductions and net removal of CO<sub>2</sub> to reach the 1.5°C target*

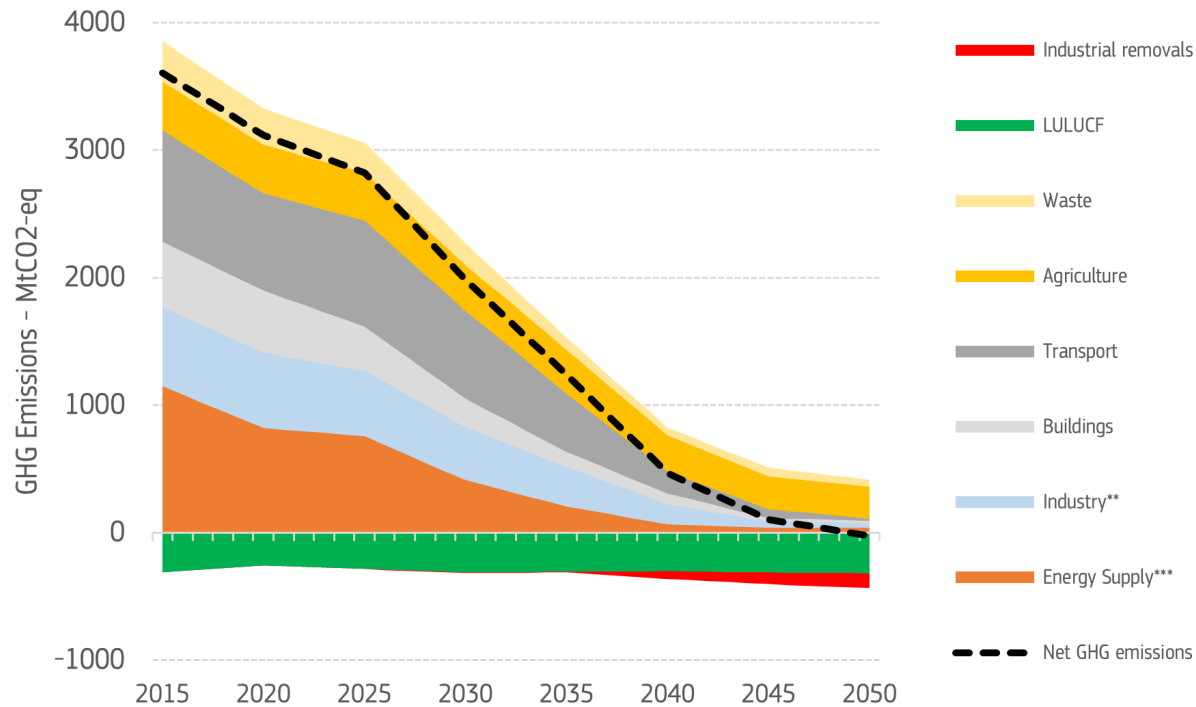
- IPCC AR6 WGI: "Anthropogenic CO<sub>2</sub> removal (CDR) leading to global net negative emissions would lower the atmospheric CO<sub>2</sub> concentration and reverse surface ocean acidification."*



Adapted from [Global Warming of 1.5 °C — \(ipcc.ch\)](https://www.ipcc.ch)



Greenhouse gas emissions in the period 2015-2050\*



\*Source: PRIMES, GAINS, GLOBIOM

\*\*Excluding non-BECCS industrial removals

\*\*\*Including Bioenergy with carbon capture and storage (BECCS)

Source: European Commission

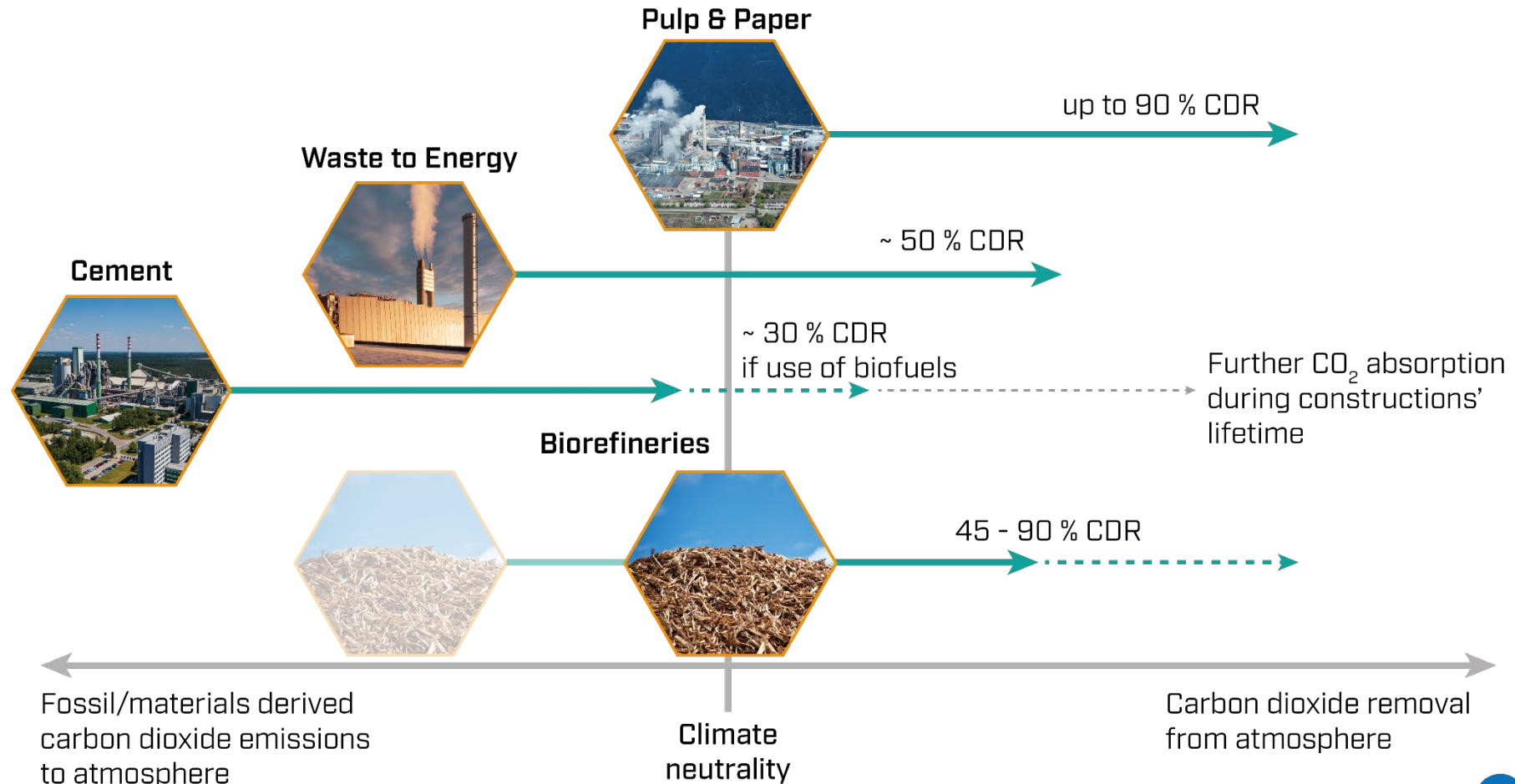
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# EU policy towards climate neutrality

- The EU is committed to climate neutrality by 2050, to contribute to limiting global warming to 1.5°C.
- A comprehensive policy framework is being implemented to reduce emissions by at least 55% by 2030
- A 90% net GHG emissions reduction target by 2040, compared to 1990 levels was recently presented by the Commission
- Net Zero Industry Act (NZIA): storage of at least 50 Mt CO<sub>2</sub> geologically by 2030 in the EU

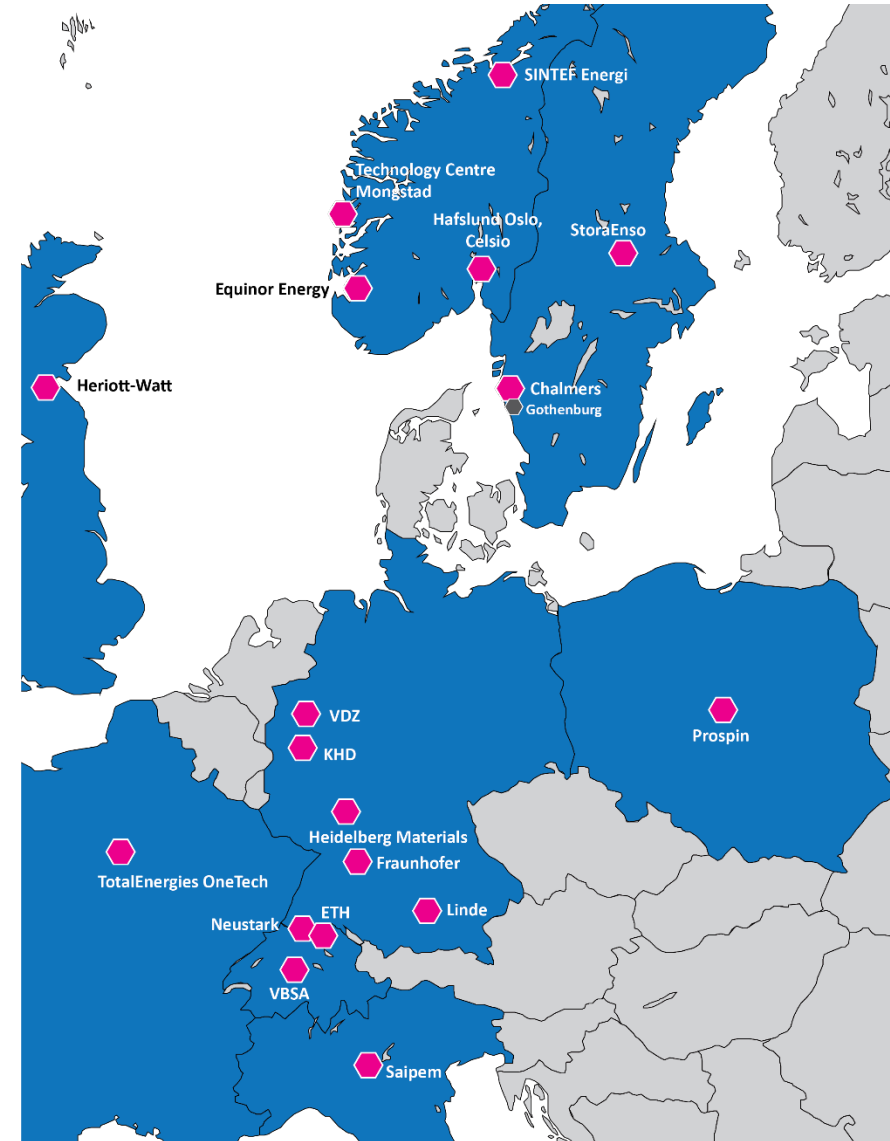


# Emission reductions and CDR (Carbon Dioxide Removal)



# Project consortium

- Covers four energy-intensive sectors: Pulp and Paper, Cement, Waste to Energy and Refining
- Technology and R&I competence along the full CCUS chain as well as complementary expertise



- **SINTEF Energi AS**  
Trondheim - NO
- **Stora Enso AB**  
Falun - SE
- **Heidelberg Materials**  
Heidelberg - DE
- **Hafslund Oslo, Celsio**  
Oslo - NO
- **Saipem**  
Milano - IT
- **Neustark AG**  
Stettlen - CH
- **Linde Aktiengesellschaft**  
Munich - DE
- **KHD GmbH**  
Cologne - DE
- **Equinor Energy AS**  
Stavanger - NO
- **TotalEnergies OneTech**  
Paris - FR
- **Technology Centre Mongstad**  
Mongstad - NO
- **VBSA**  
Bern - CH
- **ETH Zürich**  
Zurich - CH
- **VDZ Gemeinnützige GmbH**  
Dusseldorf - DE
- **Fraunhofer IAO**  
Munich - DE
- **Chalmers Tekniska Högskola AB**  
Gothenburg - SE
- **Heriot-Watt University**  
Edinburgh - UK
- **Prospin**  
Lodz - PL



# ACCESS

## Providing access to cost-efficient, replicable, safe, and flexible CCUS

Horizon2020 Innovation Action

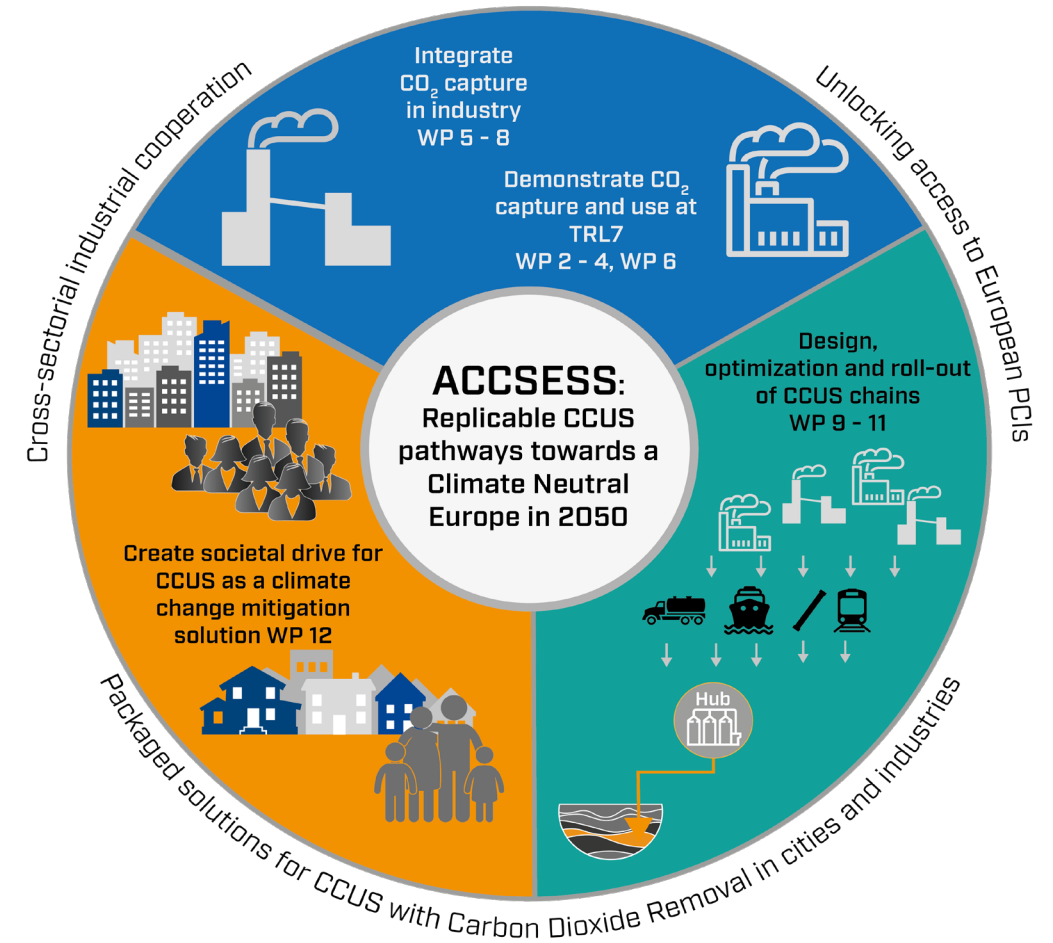
Duration: May 2021 - April 2025

Coordinator: SINTEF Energy Research (Norway)

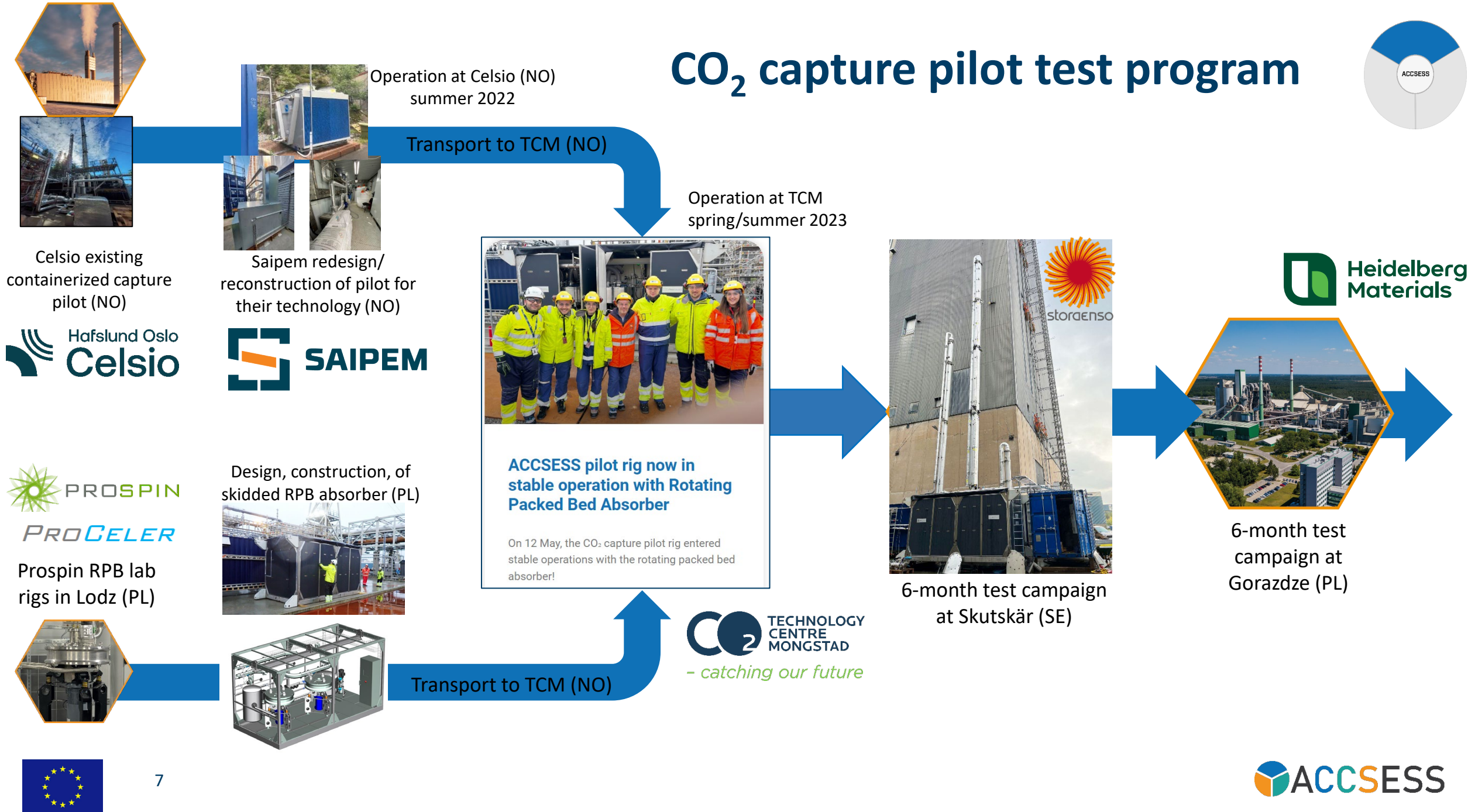
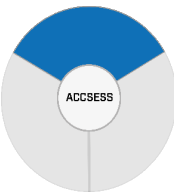
Budget: 19 MEUR, EU funding 15 MEUR

### Main objectives:

- **Capture:** Demonstrate CO<sub>2</sub> capture and use in industry; integrate capture technologies industry
- **Chains:** Develop and improve CCUS chains from continental Europe and the Baltic area to the North Sea
- **Society:** Engage and inform stakeholders about CCUS and explain its societal benefits at large and for sustainable cities



# CO<sub>2</sub> capture pilot test program



# Pilot testing: Recarbonation of alkaline industrial mineral waste



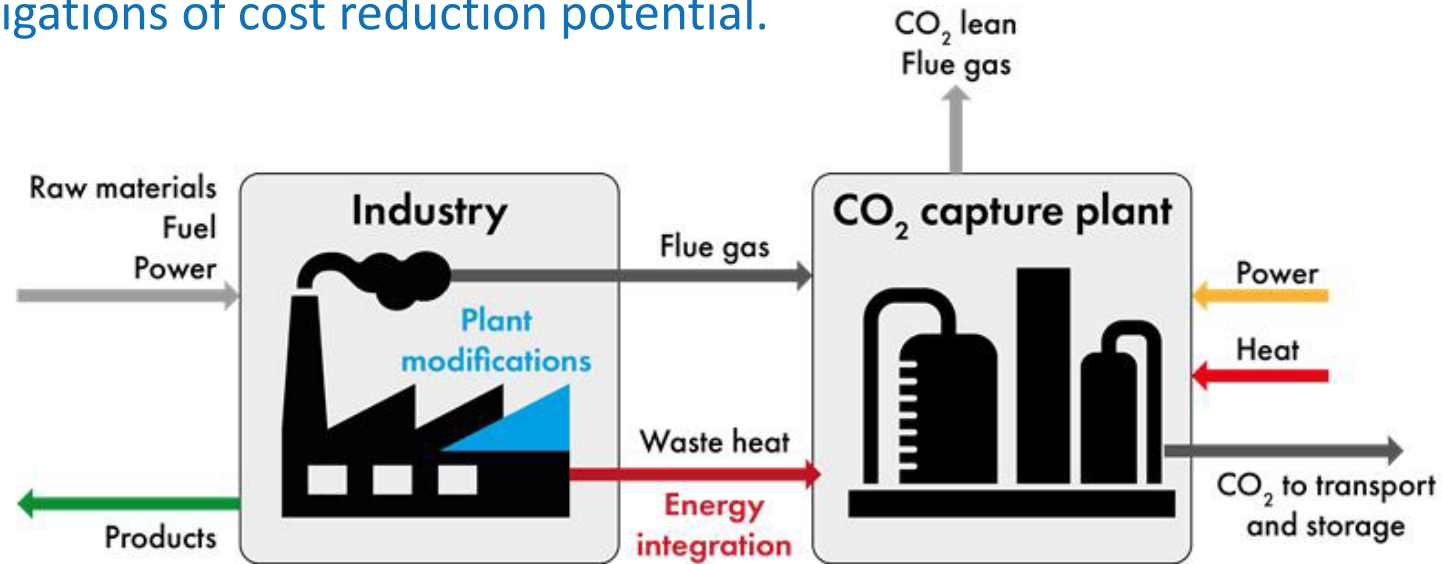
- Aims at CDR value chains and certification
- Pilot testing during 2024
- Storage of first ton of CO<sub>2</sub> announced one month ago
- Testing with pure CO<sub>2</sub> during spring 2024, thereafter with industrial flue gases



# Post-combustion CO<sub>2</sub> capture integration in industries



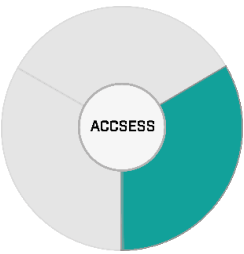
- Heat and mass integration as well as investigations of redesign of the industrial plants.
- Investigations of cost reduction potential.



ETH zürich

CHALMERS

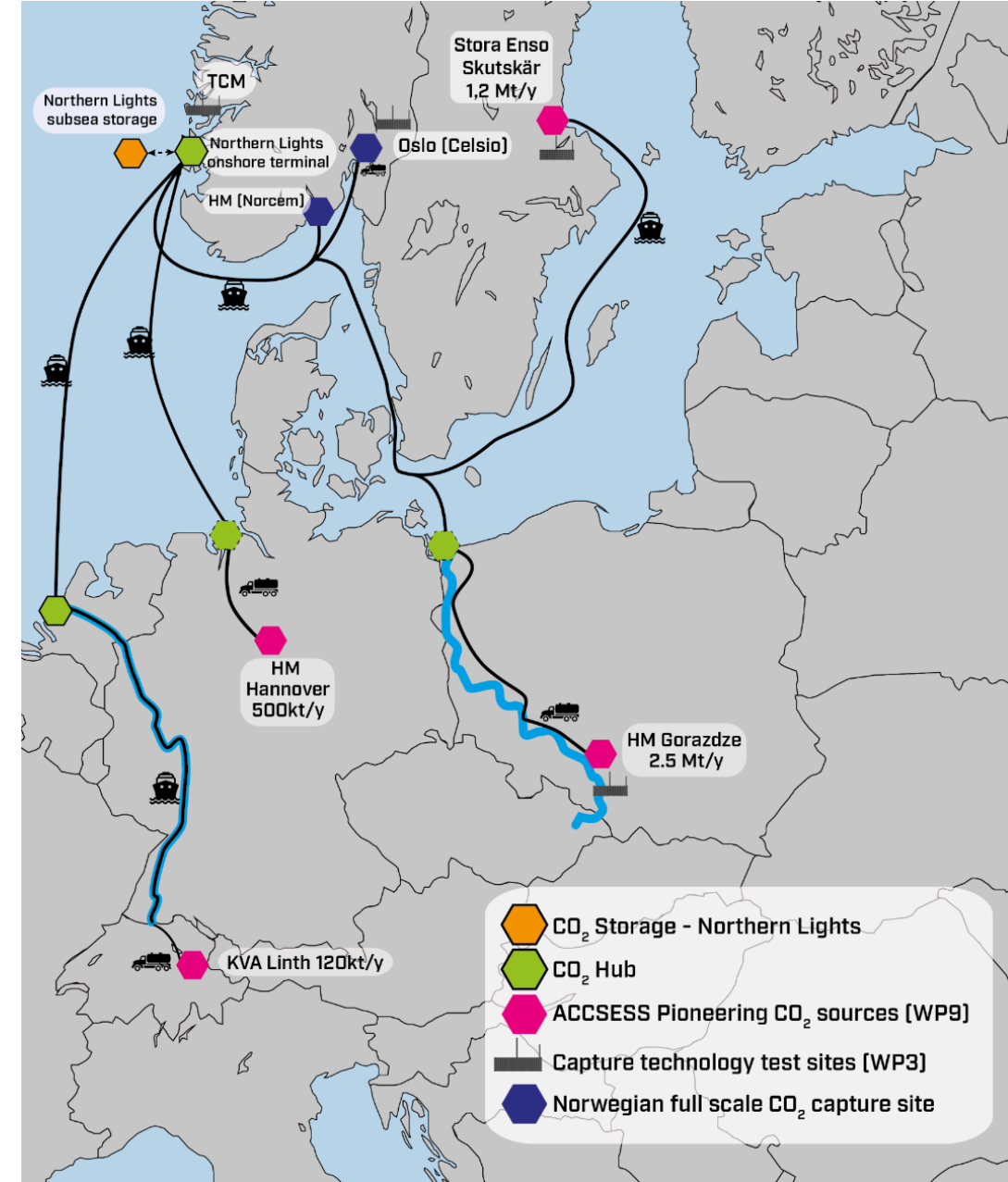


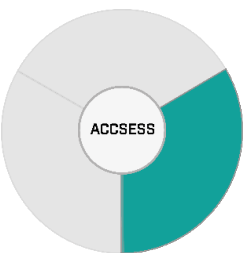


# CCUS Chain analysis

*"The holistic approach for the development of the CCUS chain network targeted for large scale European CO<sub>2</sub> market is ground-breaking" (from Evaluation Summary Report)*

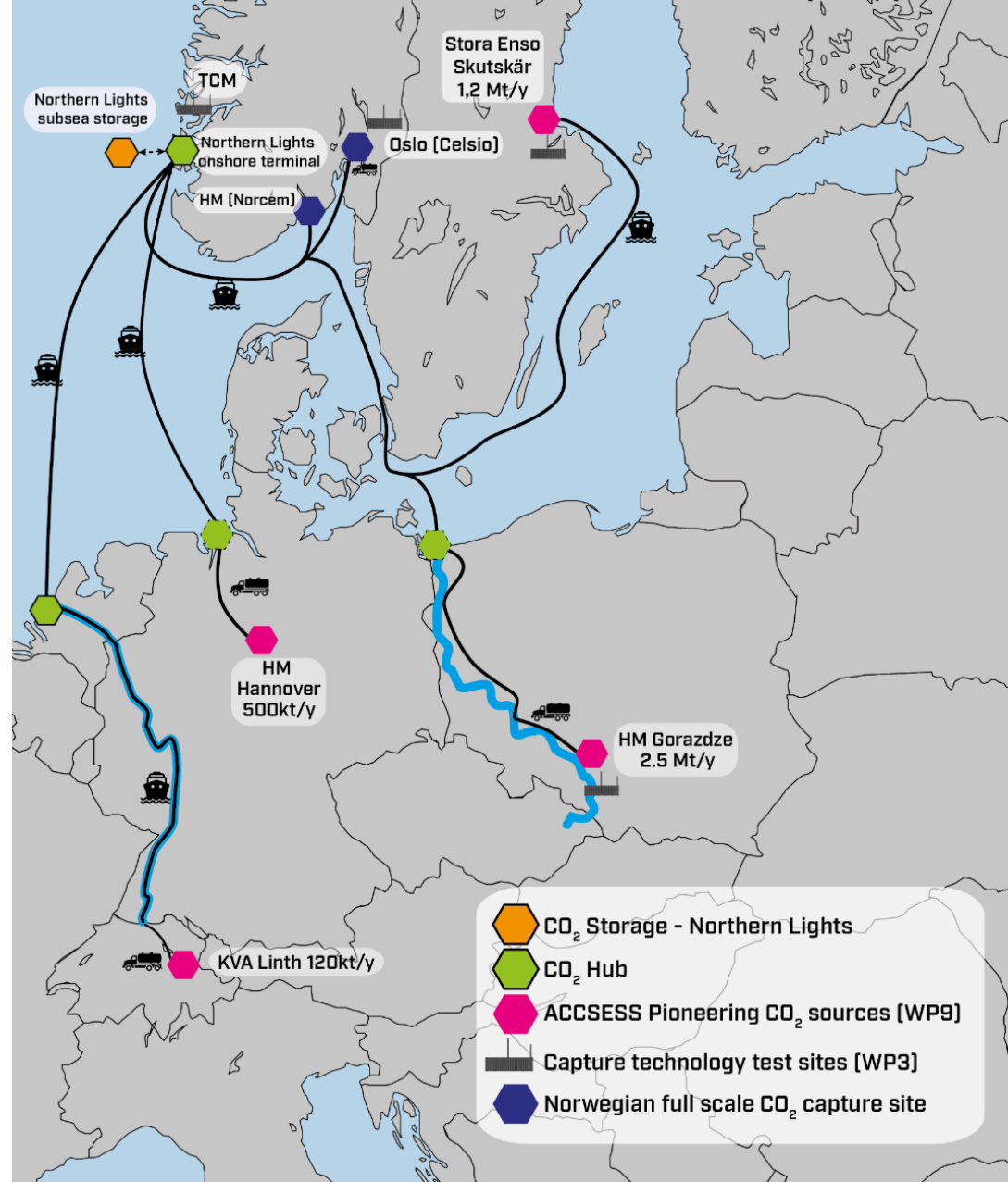
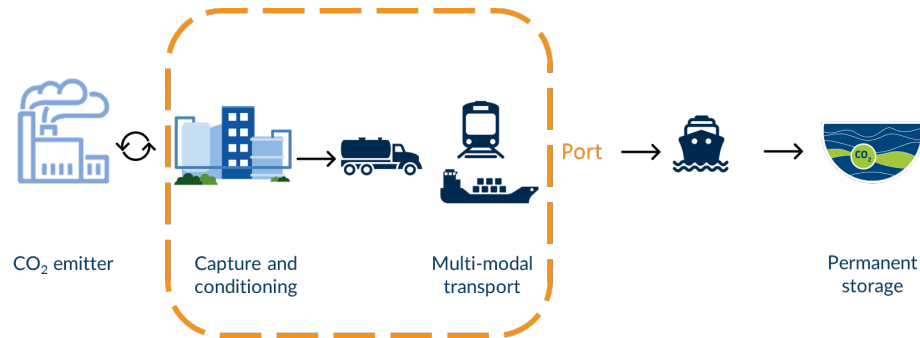
- Technoeconomic analysis
- Regulatory/legal framework
- Environmental aspects/LCA along the chain
- Delivery of an Open-source code for optimizing CCUS networks over time and in space

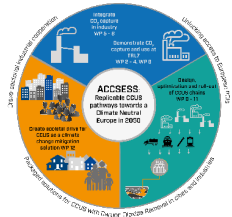




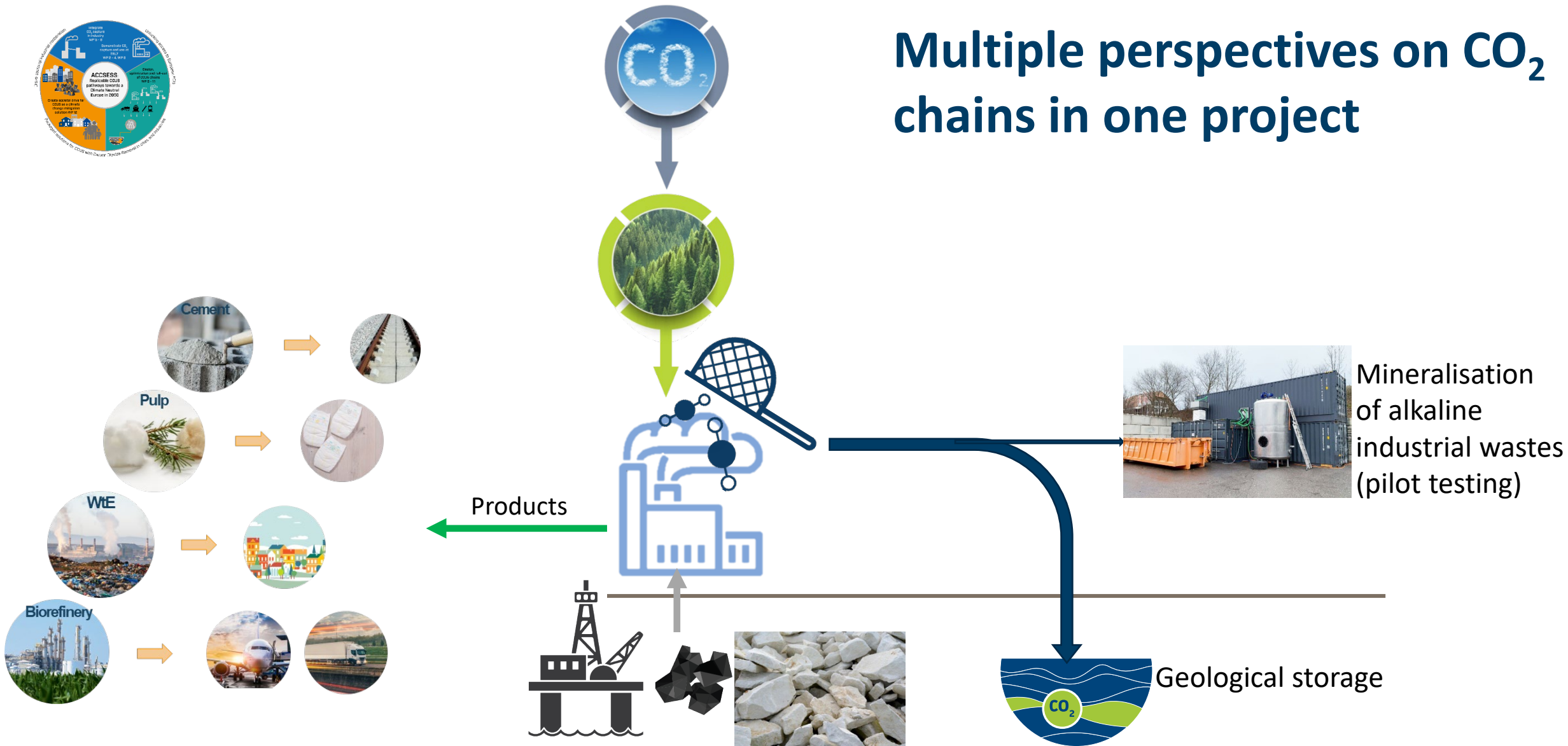
# Pioneering CCS chains

- Techno-economic analysis and LCA for reference pioneering CCS chains in ACCSESS
  - Cement plant in Germany, transport to Wilhelmshaven
  - Cement plant in Poland, transport to Szczecin
  - Pulp mill in Sweden with access to port
  - Waste-to-energy plant in Switzerland, transport to Rotterdam



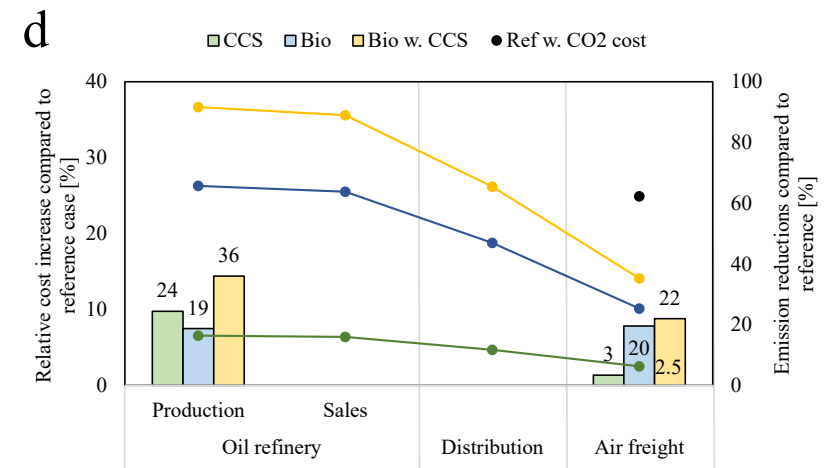
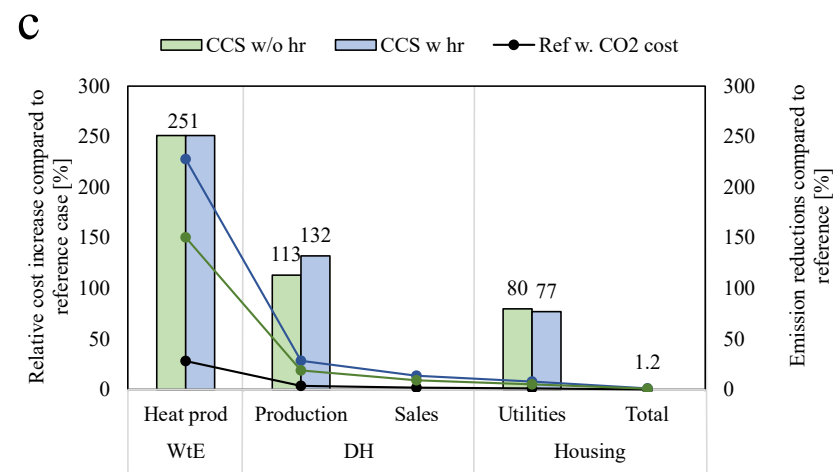
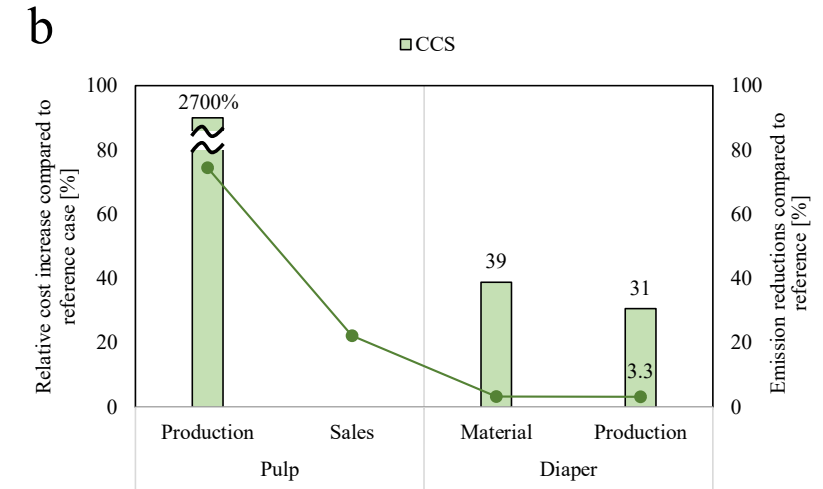
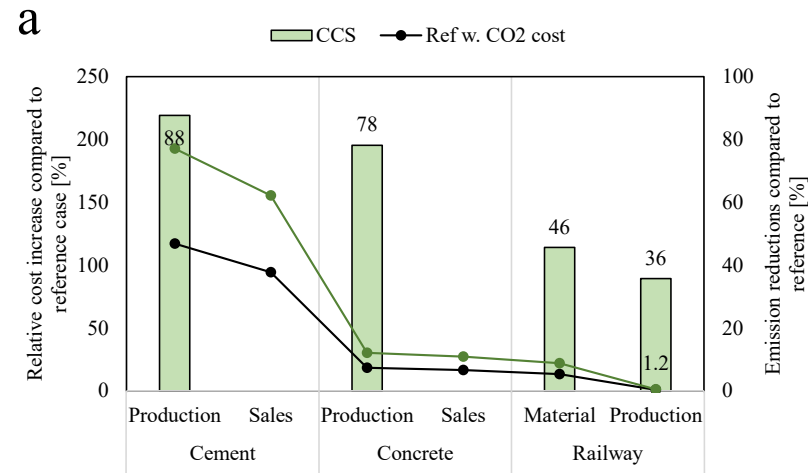


# Multiple perspectives on CO<sub>2</sub> chains in one project



# Product Value Chain Results

- The production cost of basic commodities increases significantly, however the cost increment for the end-use is small
- Life-cycle emissions related with the end-use is drastically reduced



# ACCSESS will

Demonstrate environmentally benign CO<sub>2</sub> capture in Waste-to-Energy, Pulp and Paper and Cement.

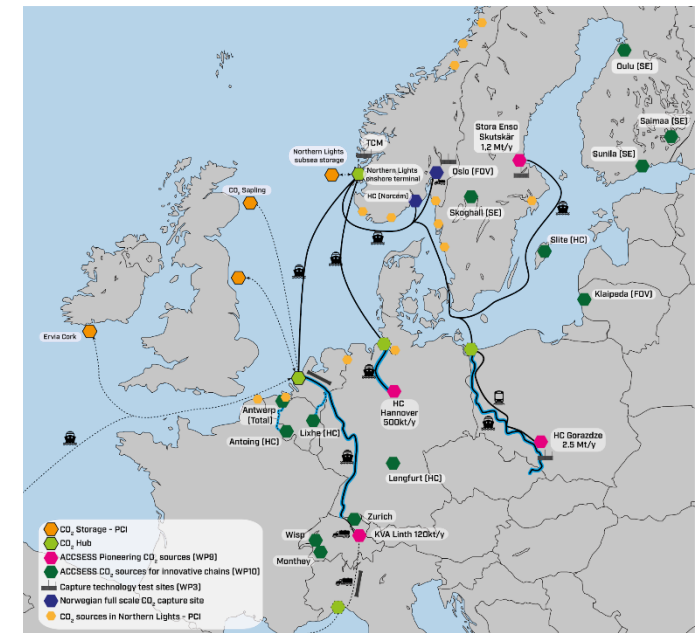
Investigate the cost reduction potential for CO<sub>2</sub> capture integration

Develop tools for optimal CO<sub>2</sub> capture deployment in industrial clusters

Deliver an Open-source code for optimizing CCUS networks over time and in space

Develop CCUS chains from inland Europe and the Baltics

Generate replicable results that will have an impact on CCUS over the medium to long term, and contribute to the deployment of CCUS in hubs and clusters



# Where to find results from ACCCESS?

European Commission | CORDIS EU research results

English EN

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**Providing access to cost-efficient, replicable, safe and flexible CCUS**

Fact Sheet Reporting Results News & Multimedia

**Periodic Reporting for period 1 - ACCCESS (Providing access to cost-efficient, replicable, safe and flexible CCUS)**

Reporting period: 2021-05-01 to 2022-10-31

Summary of the context and overall objectives of the project

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

**Project Information**

**ACCCESS**  
Grant agreement ID: 101022487

DOI  
10.3030/101022487

EC signature date  
20 April 2021

Start date  
1 May 2021

End date  
30 April 2025

Funded under  
SOCIETAL CHALLENGES - Secure, clean and efficient energy

Total cost  
€ 18 427 186.75

EU contribution  
€ 14 983 874.00

Coordinated by  
SINTEF ENERGIA S  
Norway

RPB skid - external view

Visit to CO2 Celsio during ACCCESS Open Oslo Event - CO2 capture pilot in the background

<https://cordis.europa.eu/project/id/101022487>

zenodo

**ACCCESS** ACCESS  
<https://www.projectaccess.eu/>

New upload

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9 results found Sort by Most viewed

August 23, 2023 (v1) Dataset Open

**Pulp mill pinch data**  
Skoglund, Henrik

Data set utilized to construct grand composite curve of a pulp mill.  
Part of ACCCESS, EU Open Research Repository (Pilot)  
Uploaded on August 23, 2023

148 33

November 22, 2022 (v1) Conference paper Open

**ACCCESS Project: Providing access to cost-efficient, replicable, safe and flexible CCUS**  
Montañés, Ruben M.; Jordal, Kristin; Schiesari, Fabio; and 6 others

This paper is included in the Proceedings of the 16th Greenhouse Gas Control Technologies Conference (GHGT-16), organised 23-27 October 2022 in Lyon, France. It provides an overall summary of the contents of the EU-funded H2020 ACCCESS project  
Part of ACCCESS, EU Open Research Repository (Pilot)  
Uploaded on February 8, 2023

118 128

November 30, 2022 (v1) Journal article Open

**Systematic design of absorption CO2 processes considering total CO2 avoided cost and varying operating conditions**  
Zotica, Cristina; Fu, Chao; Riboldi, Luca; and 2 others

This paper is included in the Proceedings of the 16th Greenhouse Gas Control Technologies Conference (GHGT-16), organised 23-27 October 2022 in Lyon, France. This work introduces a systematic design procedure for CO2 absorption-based processes using as solvent the mixture of AMP-PZ. We propose to minimize the total CO2 avoided cost. We make the...  
Part of ACCCESS, EU Open Research Repository (Pilot)  
Uploaded on February 28, 2023

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<https://zenodo.org/communities/access>

**ACCCESS** About ACCCESS Work Plan Project Results News & Events

**Providing access to cost-efficient, replicable, safe and flexible CCUS**

FIND OUT MORE

**CCUS across industrial sectors**

ACCCESS takes a cross-sectoral approach to CO2 Capture, Transportation, Utilisation and Storage (CCUS), working with Pulp and Paper, Cement, Waste to Energy, and Biorefining, all industries with big potential for carbon dioxide removal.

**Cost-efficiency**  
Demonstrate and integrate cost-efficient CO2 capture and use in industrial installations to enable permanent CDR.

**Access**  
Provide access routes for CO2 captured from European industries to flexible transport and storage infrastructures in the North Sea.

**Integration**  
Leverage CDR to drive societal integration of CCUS towards improved urban and European sustainability.

<https://www.projectaccess.eu/>



# Consortium



Linked third parties



# Acknowledgement

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101022487

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