

# ENeRG GEO ENeRG

## EU COST ACTION CA21127: Techno-economic analysis of carbon mitigation technologies (TrANsMIT)

A new EU COST Action CA21127 Techno-economic analysis of carbon mitigation technologies (TrANsMIT) has been developed to address the need for intensified communication and collaboration in the topic of CO<sub>2</sub> mitigation, resulting from increasing global climate efforts, changing policy focus and rapid technology development. TrANsMIT was officially launched on 7th October 2022.

The Action focuses on the techno-economic analysis (TEA) of the overall, integrated CO<sub>2</sub> Capture, Utilisation, and Storage (CCUS) value chain as well as negative Emissions Technologies (NETs).

### Goal of the Action

TrANsMIT aims to bring together academia, research institutes and industry into a cutting-edge, pan-European knowledge network. The Action advances the research frontier of CCUS/NETs TEA from partially unharmonized and disciplinary research to harmonized, holistic pan-European, coordinated research on the full CCUS system, facilitating development of the most technologically, economically and commercially feasible CCUS technologies and systems.

This will be achieved by harmonizing and coordinating the methods and tools used

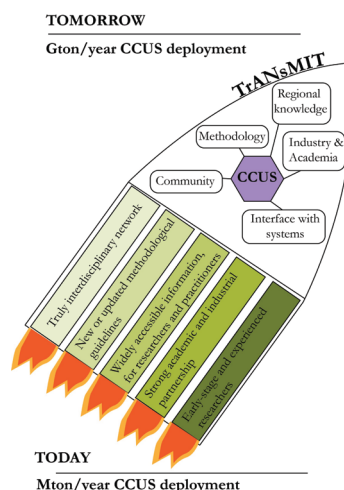


Fig. 1 TrANsMIT concept

for CCUS/NETs TEA in Europe, leveraging the knowledge created by our partners in national or international research projects. The project focuses most on holistic assessment of the CCUS chain, and on those areas where most development is needed (e.g., CO<sub>2</sub> capture from air).

The created science will be an essential means to steer CCUS R&D and deployment in a direction that allows reaching climate targets on-time and in a cost-effective manner, while harnessing the competitiveness of European industry.

### Participation

TrANsMIT establishes the network spanning the whole CCUS chain covering broad range of technologies, with a special emphasis on further TEA development, in a collaboration with academia, research institutes and industry, that is open for anyone to join. Within TrANsMIT activities strong emphasis will be put on collaboration with other network organisations in Europe in order to exploit synergies, maximise the impact and not to overlap the activities. Several ENeRG partners are Management Committee members of TrANsMIT.



Fig. 2 The TrANsMIT Kick-off meeting group photo in Bruxelles

### Mission

In TrANsMIT, a strong focus on knowledge sharing and career development will be taken, tackling existing disparities in knowledge distribution and career opportunities. Our action will also foster strong collaboration between the more and the less research intensive countries in Europe, improving the access of the latter to State-of-the-Art science and new research projects. It will put into leadership roles early-career researchers and minorities, helping to fast-track their career development. TrANsMIT will lead to top-tier techno-economic analysis of CCUS systems across European countries.

Initials links have already been made. To learn more about TrANsMIT COST Action and join scan the code or visit EU Action Page at:



[www.cost.eu/actions/CA21127/](http://www.cost.eu/actions/CA21127/)

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### The Newsletter content

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## Horizon Europe Project CCUS ZEN

A new Horizon Europe project CCUS ZEN (Zero Emission Network to facilitate CCUS uptake in the industry) is a Coordination & Support Action project coordinated by SINTEF (Norway), which started in September 2022. 14 project partners from 11 countries, including eight EU countries, Norway, Turkey and UK, will cooperate with 60 network partners during 2.5 years of the project.

CCUS ZEN (Zero Emission Network) aims to contribute to reducing CO<sub>2</sub> emissions from industrial clusters and hubs in Europe by building networks and sharing knowledge and experience of CCUS. SINTEF, the Norwegian applied research group, is coordinating both the project and the network. SINTEF researchers have been working on CCS/CCUS for decades. The Norwegian



government's Longship project, the first cross-border, open-source CO<sub>2</sub> transport and storage project, has helped bring the concept of CCS/CCUS into the mainstream.

The partners have broad expertise and knowledge across the CCUS value chain including partners working in CCUS infrastructure, industry, energy, and CO<sub>2</sub> storage. The network's goal is to foster effective knowledge sharing, enable faster development of CCUS projects and identify potential new initiatives in CO<sub>2</sub>

transport and storage. Countries and regions further ahead in the development and use of CCUS can contribute knowledge to countries with less experience.

The project will focus on the Baltic region and the Mediterranean region. The Kick-off meeting of the CCUS ZEN took place on 28-29 September in Paris (Fig. 3). The event was hosted by one of the partners, Technip Energies. The two-day event gave the opportunity to participants to connect and align on project milestones and main objectives. Workshops were held to share technical, regulatory, development planning, and commercial insights.

ENeRG members from Estonia, Poland and Turkey are among the CCUS ZEN partners (TalTech, PGI-NRI and METU), while ENeRG is one of the network partners. ENeRG member TalTech is coordinating the WP3 in the project (Value Chain Scenarios).

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Fig. 3 The CCUS-ZEN Kick-off meeting group photo in Paris includes project partners from 11 countries and network members from all over the Europe.

## 16<sup>th</sup> Greenhouse Gas Control Technologies Conference

The GreenHouse Gas Control Technologies (GHGT) conferences are the focal point for international research on carbon capture, storage and use (CCUS). The last conference, GHGT-16, took place between 23-27 October 2022 in the Palais des congrès de Lyon, France (Fig. 4). The conference was fully booked, with 1200 participants, over 350 oral presentations and 300 posters. All papers will be included in the proceedings volume of the conference which will soon be available.

Abstracts can be viewed already on SSRN platform.



Fig. 4 Picture from the conference venue



Fig.5 Participants looking at natural CO<sub>2</sub> bubbling at the water surface of the Grand Saladis Spring during a site visit.

It was for the 1<sup>st</sup> time that the conference took place in France, with a French organising committee composed of Club CO<sub>2</sub>, ADEME, BRGM, IFPEN and TotalEnergies. A 6 min video entitled "Towards CCUS deployment, where do we stand in France?" was presented during the opening session.

Two site visits were organised on 28 November: One by BRGM at a natural CO<sub>2</sub> seepage area close to Clermont-Ferrand (Fig. 5), the second one by IFPEN at its

lab in Lyon on CO<sub>2</sub> capture test facilities and at VICAT plant in Montalieu to see an industrial-scale CCU demonstration project, using the CO<sub>2</sub> captured from a cement plant to feed micro-algae.

Several ENeRG members have attended the conference and had oral and poster presentations. We can mention here the involvement of representatives from BRGM, GeoEcoMar, Czech Geological Survey and Sapienza University. During the conference, 100 copies of the newsletter no 45 were also distributed.

Emissions Reduction Alberta announced at the end of the conference that they will co-host GHGT-17 with IEAGHG in Calgary, Alberta, Canada in October 20 to 24, 2024.

More information can be found at <https://ghgt.info/>.

Isabelle CZERNICHOWSKI-LAURIOL  
BRGM



# STRATEGY CCUS – final results

STRATEGY CCUS project elaborated plans for the deployment of CCUS in eight European regions – Paris basin and Rhône valley in France, Ebro basin in Spain, Lusitanian basin in Portugal, Northern Croatia, Galati area in Romania, West Macedonian area in Greece and Upper Silesia in Poland. A total of 174 industrial and power facilities were mapped which amounts to 121.5 Mt of CO<sub>2</sub> emission in 2017. Storage resources equated to 8.5 Gt of capacity with ~92% in Deep Saline Aquifers (DSA) and ~8% in Depleted Hydrocarbon Fields (DHF). Although regions presented a high potential of geological storage capacity, these estimations are mostly immature prospects with low confidence.

The techno-economic evaluation of the scenarios evaluated where CCUS is more attractive than EU ETS compliance (70€/ton). The top three regions are: (1) Upper



Silesia (4 302 M€ of lower costs with CCUS compared to EU ETS costs), followed by (2) Paris Basin (1 411.9 M€), and then Northern Croatia with 1109.5 M€ of financial gap. Across the regions, nearly 78% or 357 Mt of the CO<sub>2</sub> captured is avoided with 343 Mt of CO<sub>2</sub> stored and 14 Mt of CO<sub>2</sub> used in mineralization (Western Macedonia and Ebro Basin). On average, OPEX costs contribute 63% of total CCUS costs and are mainly energy consumption.

Life cycle assessment (LCA) performed in Rhône valley (FR), Lusitanian Basin (PT) and Ebro Basin (ES) identified the capture process (mainly related to energy provision) as the most critical contributor

to generated GHG emissions and to Cumulative Energy Demand (CED). The impacts of CO<sub>2</sub> utilization strongly depend on the final use of CO<sub>2</sub> and on the transformation process settings (e.g. renewable power consumption for energy needs). In these three regions, Multi-Regional Input-Output analysis (MRIO) assessed socioeconomic benefits of CCS deployment. CCS would create 276,200 full time equivalent (FTE) jobs up to year 2050, both direct and indirect. That is approximately 11,050 permanent jobs. In three regions, the employment retained would be 203,300 FTE jobs (74%), or 8,130 permanent jobs.

The possible way forward for CCUS deployment in STRATEGY CCUS regions is divided into three groups: techno-economic, social and policies, and government factors. Business model and cost (mainly related to capture system and OPEX),

maturity of storage, establishing good social awareness, policies, incentives and working with clarifying the regulations for CO<sub>2</sub> storage appear as cornerstone for enabling CCUS value chains across Europe.

STRATEGY CCUS launched a regional study on the feasibility of CCUS technology in eight territories of seven EU countries. The PilotSTRATEGY project, sequel to this one, a 5-year H2020 RIA project is making an important step in the feasibility of STRATEGY CCUS scenarios. PilotSTRATEGY will increase the maturity of five Deep Saline Aquifers storage resources in Paris basin, Lusitanian basin, Ebro basin, West Macedonia and Upper Silesia.

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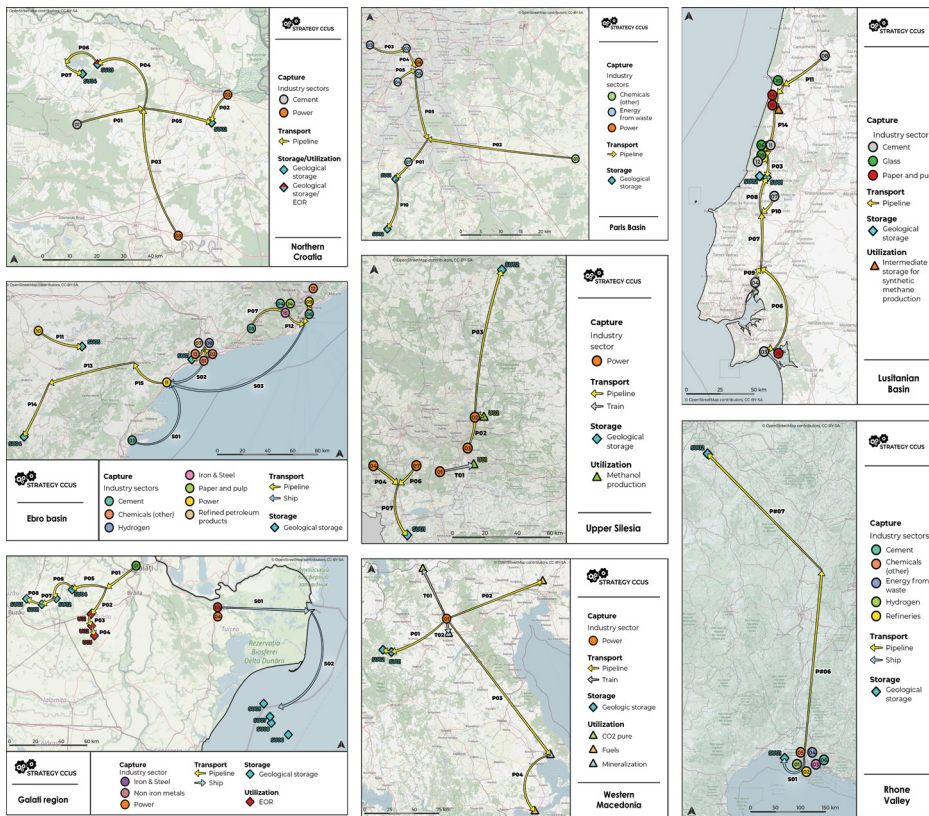


Fig. 6 Maps with the CCUS development scenarios analysed within STRATEGY CCUS project

## ENeRG – European Network for Research in Geo-Energy

**ENeRG – European Network for Research in Geo-Energy** is an informal contact network open to all European organisations with a primary mission and objective to conduct basic and applied research and technological activities in the field of sustainable use of the underground for the energy transition. **ENeRG president** is Dr. Alla Shogenova from Department of Geology, Tallinn University of Technology (Estonia), [alla.shogenova@taltech.ee](mailto:alla.shogenova@taltech.ee) **ENeRG secretariat** is run by Centre for Research and Technology Hellas, Athens, Greece. Contact person: Dr. Eleonora Manoukian, [manoukian@certh.gr](mailto:manoukian@certh.gr)

**ENeRG website:** <https://www.energnet.eu> is maintained by SHOGenergy, Estonia. Contact person: Dr. Kazbulat Shogenov, [kazbulat.shogenov@taltech.ee](mailto:kazbulat.shogenov@taltech.ee) **ENeRG Newsletter - GEO ENeRGY** is published by Department of CO<sub>2</sub> Geological Storage, GeoEcoMar, Romania. Editor: Dr. Alexandra Dudu, [alexandra.dudu@geocomar.ro](mailto:alexandra.dudu@geocomar.ro) Layout and computer typesetting: Point Media Concept SRL Language review: Dr. Gillian E Pickup, Heriot-Watt University, UK, [G.Pickup@hw.ac.uk](mailto:G.Pickup@hw.ac.uk) **Copyright © All rights reserved / ENeRG**

# New call for the Master on CO<sub>2</sub> Geological Storage (deadline 16<sup>th</sup> January 2023)

A new call is open for a Master which opens your horizons both in terms of technology innovation and with regard to creating connections and new professional liaisons with colleagues all over Europe.

Sapienza University of Rome together with University of Zagreb and the participation of Heriot-Watt University of Edinburgh, Tallinn University of Technology and the Geological Survey of Denmark and Greenland (GEUS) are offering a one-year Postgraduate specialist university course (60 ECTS credits) on CO<sub>2</sub> Geological Storage with the support of CO<sub>2</sub>GeoNet, the Network of Excellence on the Geological Storage of CO<sub>2</sub>. The proposing institutes are also partners of ENeRG.

The students on the Masters course will be trained on all aspects of CO<sub>2</sub> Geological Storage, and they will be introduced to the scientific and professional community

working on CO<sub>2</sub> Geological Storage in Europe and beyond.

The call for the Academic year 2022-2023 is now open, deadline for application on 16<sup>th</sup> January 2023.

The course provides a comprehensive preparation for young professionals interested to work in the field of CCS. It is composed of a period of lessons (February to July), fieldwork and a period of traineeship at one of CO<sub>2</sub>GeoNet research institutes.

The course will present an overview of state-of-the-art CCS operations and research; it will focus on the technical and scientific considerations for CO<sub>2</sub> injection and safety monitoring, the exploration of critical processes in laboratory studies, numerical modelling, and conclusively on sound and reliable storage capacity estimates, including the project economics, social aspects, and planning of mitigation measures in case regulatory requirements are not fully met.



Fig. 9 Geological modelling

The students will be able to understand the work of the different specialists involved in CCS projects, learning from high level specialists, and connecting with the most advanced research institutes in Europe.

More information is available at <https://web.uniroma1.it/masterco2/home>

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Fig. 7 CO<sub>2</sub> storage experimental site.



Fig. 8 Geochemical monitoring

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