CO_2 geological storage

A pan-European scientific body for facilitating CCS demonstration and implementation of the EU Directive…

The EU has already made significant progress in advancing CO_2 Capture and Storage (CCS) as a bridging technology for combating climate change. The situation now calls for acceleration and an even spread throughout the EU member states and associated countries.

CGS Europe, a coordination action funded by the European Commission's 7th Framework Programme (November 2010 to October 2013), has been created to complement existing CCS initiatives and, more specifically, to tackle the part of the CCS chain dealing with scientific research on CO_2 geological storage across the whole of Europe.

Building on the sound foundation of CO_2GeoNet, the European Network of Excellence on CO_2 Geological Storage, CGS Europe is creating a credible, independent and long-lasting pan-European scientific body of expertise to support widespread understanding of the technology and foster knowledge development and sharing. The aim is to facilitate the large-scale demonstration and deployment of CCS and support the implementation of the EU Directive on the geological storage of CO_2.

Returning carbon back to the ground

Our prolific burning of fossil fuels for power production, heating, industry and transportation is responsible for 80% of anthropogenic CO_2 emissions into the atmosphere, of which 60% comes from large fixed plants where CCS can be applied.

CCS is a promising mitigation pathway that could contribute 20% of the CO_2 reduction needed by 2050. It involves capturing CO_2 at coal or gas-fired powers stations and industrial plants, transporting it by pipeline or ship to a storage location, and injecting it via a well into a suitable deep geological formation for permanent storage.

In doing so, the carbon extracted from the ground originally in the form of coal, oil or gas is returned back again in the form of CO_2 rather than disturbing the atmosphere. The existence of many natural CO_2 fields in the subsurface throughout the world proves that geological formations are able to store CO_2 efficiently and safely for extremely long periods of time.

The scientific challenges of CO_2 storage

The storage component of CCS requires particular attention because it is site-specific due to local geology, the regulations are still being developed, and its large-scale feasibility in terms of capacity, efficiency and safety remains to be fully proven.

The scientific challenges are numerous: site selection and characterisation, modelling and monitoring of CO_2 fate and site behaviour, risk assessment – including possible local impacts on humans and ecosystems – and safety protocols. CO_2 storage is a complex field of research in which many different disciplines interact: geology, geophysics, geochemistry, geomechanics, hydrogeology, microbiology, ecology, reservoir engineering, oceanography, etc.

Various components of a storage site have to be considered: reservoir, cap rock, overburden, groundwater, soils, surface, vegetation, wells. Similarly with the different phases: planning period (~5 years), injection period (~40 years), closure period (~5 years) and post-closure period (~1,000 years).

Much knowledge has already been acquired through major research programmes conducted since the 1990s in Europe, the USA, Canada, Australia and Japan, and through the world's pioneering industrial-scale projects, such as Sleipner in Norway where 1Mt/year of CO_2 has been injected since 1996.

Robust technical expertise already exists and the world is now moving into a large-scale demonstration phase to allow commercial deployment from 2020 onward. In Europe, the goal is now to have some 12 large-scale demonstration projects up and running by 2015 to harness knowledge and experience from a number of different geological, geographical and industrial contexts.

CGS Europe, a coordination action across 28 countries

At this critical point in the implementation of CCS worldwide, and in order to support Europe's strategy in terms of CCS demonstration and deployment as expressed in the Climate and Energy Package adopted in December 2008, transnational cooperation and networking on CO_2 geological storage should be reinforced and enlarged to all relevant EU member states and associated countries.

This is the aim of CGS Europe, which is based on networking between 34 research institutes, and offering wide European coverage across 24 EU member states and four associated countries. The CGS Europe Consortium has grown from the initial nucleus and experience of the CO_2GeoNet Network of Excellence, initially an EC-funded project (2004-2009) and now an independent association involving the founding 13 institutes from seven countries.

CGS Europe has already set about:

- Networking research capacity on geological storage of CO_2 in 28 countries;
- Liaising with other CCS initiatives in order to help coordinate R&D;

Recent and upcoming events

April 13th-14th 2011: 1st CGS Europe Regional CCS-awareness-raising workshop, Vilnius, Lithuania, 'CO_2 capture and storage – response to climate change'. Reaching out to stakeholders in the Baltic Sea Region and Central and Eastern Europe.

May 9th-11th 2011: San Servolo Island, Venice, Italy

- **6th CO_2GeoNet Open Forum** dedicated to CO_2 storage developments in the whole of Europe: a status on the large-scale CO_2 storage demos in Europe, the associated regulatory framework and the current state of research;
- **1st CGS Europe knowledge-sharing workshop** on 'Legal and regulatory issues – implementation of the EU Directive on the geological storage of CO_2'.

September 22nd-23rd 2011: Internal communication workshop, Brussels, Belgium, designed for press officers and researchers to share experiences in and knowledge of communication on CO_2 geological storage research.

October 17th-19th 2011: 2nd CGS Europe knowledge-sharing workshop on natural analogues, Maria Laach, Germany. By studying natural CO_2 occurrences, researchers will improve their understanding of the long-term processes that could occur in a CO_2 storage reservoir and the vicinity.

November 24th 2011: SciTechEUROPE, Brussels, Belgium. Masterclass and booth on CO_2 geological storage aimed at promoting exchange with industry stakeholders, funding agencies, academics and policymakers.

April 17th–19th 2012: San Servolo Island, Venice, Italy

- **7th CO_2GeoNet Open Forum;**
- **3rd CGS Europe knowledge-sharing workshop** on the latest developments by national research programmes.

Spring 2012: 1st edition of the CGS Europe Spring School, Bełchatów, Poland. One week course for students with case studies and a field trip linked to the Polish CCS demonstration project.

- Building a centralised information source of the status of CO_2 storage R&D over the whole of Europe;
- Reducing the gap in knowledge/awareness and in the implementation of geological storage of CO_2 between 'forerunner' countries and other countries where actions are not yet happening;
- Contributing to large-scale demonstrations and industrial deployment of CCS by providing the necessary link between industrial developers and other vital players (national authorities, the public, etc);
- Supporting the implementation of the EU directive on the geological storage of CO_2 and other regulatory regimes through scientific advice, experience-sharing and dissemination of information.

CGS Europe will mature during the three year EC funding period and intends to continue beyond as a durable reference body in Europe for authorities, regulators, industry and the public on scientific matters related to the geological storage of CO_2.

The objective now is to develop relationships among the 34 institutes, possibly by all joining the CO_2GeoNet Association, and to foster scientifically informed decisions at all levels of the CO_2 storage chain in all the European countries.

Lighthouse actions and events

CGS Europe is dedicating a major effort to the management of scientific knowledge on CO_2 storage:

- The establishment of a 'Knowledge Repository' to collect, structure and summarise key existing knowledge in a form that will be easily accessible by interested parties;
- 'Knowledge Development' involving the coordination of research activities, internal knowledge sharing workshops and exchange of personnel;
- 'Knowledge Dissemination' including annual forums, awareness-raising workshops in regions of low level of CCS awareness, CO_2 storage knowledge dissemination workshops in countries where CCS demonstration projects are under preparation, 'spring schools', presentations and publications, and interaction with media.

The CO_2GeoNet brochure '*What does CO_2 geological storage really mean?*' is already published in 11 languages (www.co2geonet.com/brochure) and is being translated into many more under CGS Europe.

Participating countries and institutes include:

Austria (GBA); Belgium (RBINS-GSB); Bulgaria (SU); Croatia (UNIZG-RGNF); Czech Republic (CzGS); Denmark (GEUS*); Estonia (TTUGI); Finland (GTK); France (BRGM*, IFPEN*); Germany (BGR*); Greece (G-IGME); Hungary (ELGI); Ireland (GSI); Italy (OGS*, URS*); Latvia (LEGMC); Lithuania (GTC); the Netherlands (TNO*); Norway (IRIS*, NIVA*, SINTEF*); Poland (PGI-NRI); Portugal (LNEG); Romania (GEOECOMAR); Serbia (UB); Slovakia (SGUDS); Slovenia (GEO-INZ); Spain (S-IGME); Sweden (SGU); Turkey (METU-PAL) UK (BGS*, HWU*, IMPERIAL*)

*CO_2GeoNet member

Isabelle Czernichowski-Lauriol
Coordinator of CGS Europe
President of CO_2GeoNet
Head of BRGM's Deep Aquifer Unit

CGS Europe Project
BRGM
Water Division
3 Avenue Claude Guillemin
45060 Orléans Cedex 2
France

Tel: +33 2 38 64 46 55
Fax: +33 2 38 64 37 19

i.czernichowski@brgm.fr
info@cgseurope.eu
info@co2geonet.com

www.cgseurope.net
www.co2geonet.eu