GlobalScientia

Issue 3 | A world-leading independent review.

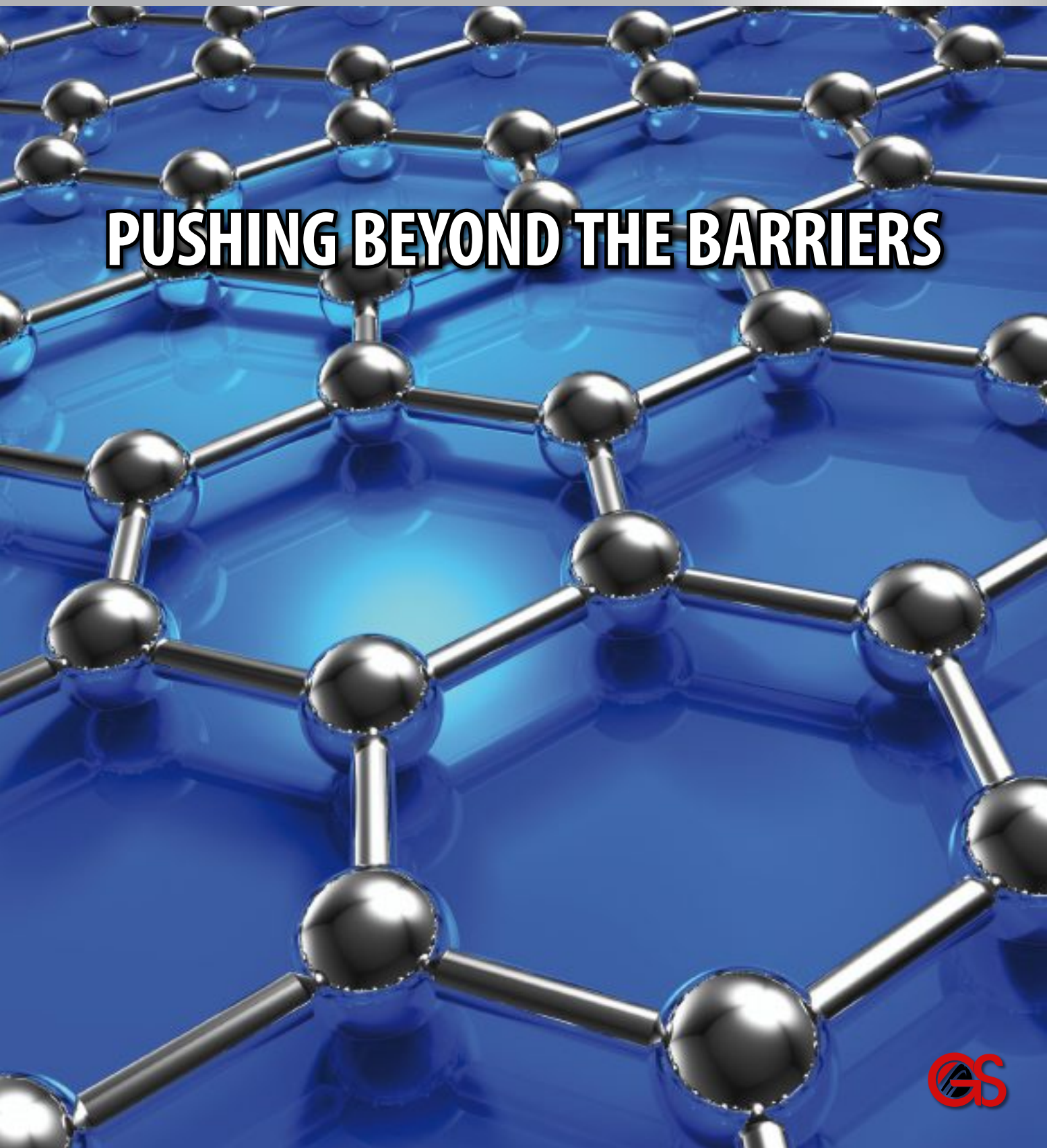
Global Science and Technology

Neelie Kroes
Digital Agenda for Europe
"Securing a Free & Open Cyberspace"

Prof. Bernhard G. Herrmann
Max Planck Institute for
Molecular Genetics.

Hanne Leth Anderson
Roskilde University
"University Education & Employability"

Prof. Daniel Berckmans
Katholieke Universiteit Leuven
Division M3 - BIORES



PUSHING BEYOND THE BARRIERS

CGS Europe and CO_2GeoNet – taste of European research networking

By **Vit Hladik**
Knowledge dissemination leader
of the CGS Europe project

CGS Europe, the Pan-European Coordination Action on CO_2 Geological Storage (CGS), and CO_2GeoNet, the European Network of Excellence on CGS, were introduced to Global Scientia readers last year (Issue 2, pages 75-77). Since that time, Europe has, unfortunately, recorded only little progress in development and implementation of the CO_2 Capture and Storage technology (CCS), rather the opposite. The start of the long prepared European Demonstration Programme had to be postponed, mostly due to lacking commitment of national governments and funding gaps. This must not, however, make the impression that CCS, a key bridging technology for combating climate change, is not needed any more. The reverse is true. If we really want to decarbonise the power sector and heavy industry, as proposed by the EU Roadmap for moving to a competitive low carbon economy in 2050 and the EU Energy roadmap 2050, the share of the CCS technology on the decarbonisation efforts will be vital.

The role of science, research and development remains highly important in this area, not only with respect to the necessary cost reduction of the technology itself but also (and maybe primarily) in relation to the security of geological storage of the captured CO_2. The knowledge connected with safe CO_2 storage sites needs to be spread out across the whole Europe, since also the CCS technology is expected to be widely applied throughout the continent. In this respect, pan-European networking is inevitable, and the CGS Europe project (www.cgseurope.net) is playing its unsubstitutable role.

Pan-European networking and knowledge-sharing

The importance of international networking in research & development is often underestimated, and such activities and projects are sometimes regarded as second-class or unimportant in comparison with "real research" projects. Such opinions are, however, truly incorrect, and CGS Europe, in combination with all the preceding networking activities in the field of CCS and CO_2 storage, is a clear evidence of how useful such networks can be.

Fig. 1 *"Our first research project on CO_2 storage in 2004 was worth 1,500 euros and aimed at a rough assessment of CO_2 storage possibilities in Romania. Now we are involved in the Romanian CCS demonstration project proposal worth 1.5 billion euros." - Dr Constantin Stefan Sava, National Institute for Research and Development of Marine Geology and Geoecology – GeoEcoMar, Romania.*

It was back in autumn 2001, when ENeRG – the European Network for Research in Geo-Energy (www.energnet.eu) – for the first time invited researchers from the – at that time – EU Candidate Countries from Central and Eastern Europe to participate in the network's activities. It was also for the first time when most of the researchers from "the East" heard about geological storage of carbon dioxide.

Since then, a lot has changed. The "new" network members of 2001 (and a few following years) have become research pioneers in the field of CO_2 storage and CCS in their countries and have also been active on the European research scene, including prestigious Framework Programme projects like EU GeoCapacity, CO2NET EAST, ECCO and, most recently, CGS Europe.

It was impressive to follow the research careers of some colleagues based on their growing knowledge and international overview. The pioneering role of the institutions brought their CCS research leaders not only in positions of project coordinators, evaluators and scientific reviewers but also in roles of government and ministry advisors and industry consultants or first-ever university teachers of subjects like CO_2 storage or CCS technology. An impressive story titled "From € 1,500 to € 1.5 billion", describing the development of CCS in Romania from the first sub-contract in the FP6 CASTOR research project in 2004 to the GETICA CCS demonstration project proposal in 2011 and presented recently by GeoEcoMar, the Romanian partner in CGS Europe, is another tangible example of how national R&D activities can grow using international support.

All the achievements and progress described above would have not been possible without European and international networking. Of course, the networking and knowledge-sharing activities alone are unable to build excellent national research in a new area. There must be commitment, efforts and governmental or industrial support on the national level as well, but with help of networking, the capacity building is much quicker and much easier.

CGS Europe is an excellent example of such a networking action. Pooling together research institutions from "forerunner" countries, with significant track record in CO_2 storage research (especially current members of the CO_2GeoNet Association – www.co2geonet.eu) and those from "follower" countries, with less experience and knowledge, the project offers abundant opportunities for knowledge-sharing, education, capacity building and awareness raising.

Reducing the gap

To reduce the knowledge gap between the "forerunner" and "follower" countries is one of the main goals of the CGS Europe project. Several types of instruments are used to achieve this objective. Among them, knowledge-sharing workshops, awareness-raising workshops and staff exchange play the cardinal role. Thematic knowledge-sharing workshops are organized every six months, providing an opportunity for spreading and exchange of knowledge among consortium partners. Four workshops have been organized so far, focused on natural CO_2 field laboratories, lessons learned from pilot and demonstration projects, legal and regulatory issues of CO_2 storage and national research programmes. Some of them included field trips providing opportunities to visit sites of high interest for CGS researchers.

The workshop on natural CO_2 laboratories (sometimes also called "natural analogues"), organized by the German project partner BGR at Laacher See in the Eifel region in western Germany, was an excellent example of a knowledge-sharing activity. The area offers a unique setting of a natural laboratory where naturally originated carbon dioxide streams from deep underground to the surface. Why do we need to study such sites? In fact, they represent an opportunity to study an analogue of a "worst-case" scenario of a CO_2 storage site, i.e. the case when CO_2 is leaking from the storage reservoir. Such scenario is presumably highly undesirable for a real storage project, and, due to the complex and strict regulatory requirements that a storage site has to meet to get a storage permit, it is very unlikely to appear in practice. Nevertheless, studying of such "what-if" cases in the form of natural analogues is very valuable from several points of view. Firstly, the scientists can study the behaviour of "leaking" carbon dioxide in shallow subsurface and its reactions with rocks, soil and groundwater. Secondly, these sites provide a good opportunity to study the impact of the "leaking" carbon dioxide on the environment. It would be appropriate to mention here, that the impacts observed at natural analogue sites are mostly very limited in size, usually not exceeding a few meters around the CO_2 vent itself. And, last but not least, the natural analogues provide an excellent opportunity to test various monitoring methods that have to be effective at different storage sites in future. All of these aspects related to the ongoing and planned research of natural CO_2 laboratories were discussed at the above-mentioned workshop, contributing to spreading of the relevant knowledge throughout Europe.

Fig. 2 *Natural CO_2 seep near Laacher See, Germany.*

CCS awareness-raising workshops represent a completely different kind of activity. They focus on all kind of CCS stakeholders in "follower" countries, i.e. countries with limited CCS activity so far. The tradition of these workshops dates back to 2007 when the first awareness-rising workshop was organized in Zagreb, Croatia. Since then, three more workshops took place in Slovakia, Lithuania and Turkey, each significantly increasing the level of general awareness of and knowledge about the CCS technology in a particular region of Europe. The workshops usually start with an explanation about the role of CCS in the decarbonisation portfolio and climate change mitigation, followed by presentation of the principles of CCS and description of the current status of the technology and its deployment in Europe and worldwide. Country/region specific topics are usually discussed after that, including the local potential of implementation of the technology, suitable examples from abroad and more technology-specific subjects. As a result, workshop participants (embracing usually a broad spectrum of stakeholders from policy makers and regulators, through industry representatives and consultants, up to researchers and students) are provided with a comprehensive overview of the CCS technology, its current status and future expectations.

Fig. 3 Culture and Convention Center of the Middle East Technical University in Ankara – venue of the 2nd CGS Europe CCS awareness-raising workshop.

International staff exchange is another activity contributing to the pan-European character of the CGS Europe project. Study visits provide an excellent opportunity for knowledge transfer and knowledge sharing to both young and senior researchers. One of the typical cases is a study visit of a researcher from a "follower" country at one of the "forerunner" project partners, aimed at execution of advanced laboratory tests or advanced modeling techniques that are not available at the home institute. Such visits represent an invaluable input in research capacity building across Europe.

Mapping of European research

"Who is doing what?" is a frequent question at international research events or in discussions with "people from Brussels" – those who are acting on European level, no matter if they are representing a European institution, association or multinational company. It is a big advantage of active networks like CGS Europe that such overview information can be gathered relatively easily and quickly. The feedback from Member States to the centre is one of the important roles of European networks, and CGS Europe is no departure from this rule. This networking capacity has already been used several times during the project, like, e.g. when mapping the national research programmes on CO_2 storage or following the progress of the transposition of the EU directive on the geological storage of carbon dioxide (well beyond the official statements that were available).

An interesting project outcome is scheduled for the first months of 2013 – an overview report entitled 'State of play on CO_2 geological storage in 28 countries covered by CGS Europe'. It will provide a long desired overview of current status of CGS-related research in Europe, including national programmes and projects that are often not well-known on the European level. In addition, an overview of other CCS-related activities like pilot and demonstration projects or status of national legislation are handled as well. As a result a "CO_2 storage activity map of Europe" could be compiled, describing the level of activities and commitment of individual countries (see Fig. 5). The report will be public and will be available on the CGS Europe website at www.cgseurope.net

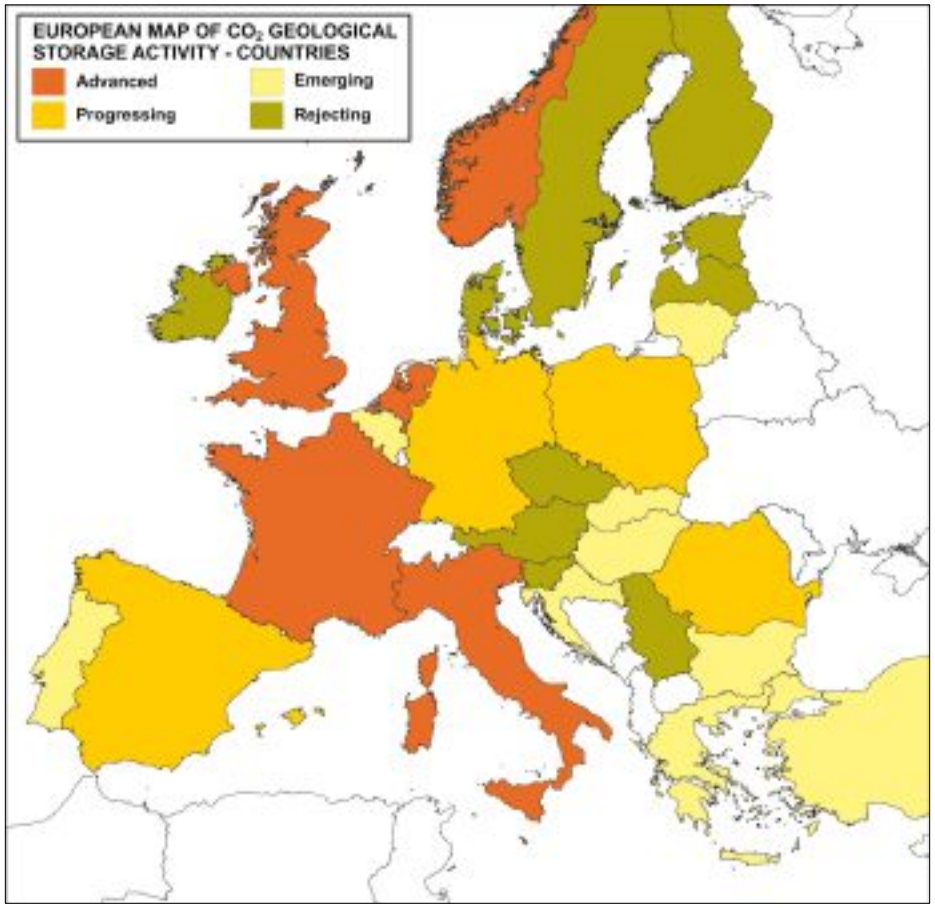


Fig. 5 *Map of CO_2 geological storage activity in Europe. The countries are ranked according to the extent of relevant activities and commitment to CCS. Pilot and demonstration projects, status of national legislation, scope of national research and governmental support of research and development are taken into account.*

Fig. 4 *"Thanks to my CGS Europe study visit at IFPEN, I was able to perform first-class laboratory experiments on my rock samples that represent an important part of my PhD research." - Kazbulat Shogenov, PhD student of Tallinn University of Technology, Estonia (pictured at IFPEN laboratory in Rueil-Malmaison, France).*

CO_2GeoNet Open Forum – European top event on CO_2 storage research

The annual Open Forum held at the San Servolo island in Venice in the spring of each year is the knowledge-dissemination highlight of CGS Europe. The Forum represents a tradition founded by the CO_2GeoNet Network of Excellence (now CO_2GeoNet Association) in 2006. It is a European top conference bringing together CCS stakeholders from various target groups and providing them with the opportunity to keep up-to-date with and discuss the latest progress of CO_2 geological storage with researchers. In 2013, the 8th edition of the Open Forum is being prepared, with the main theme 'Are pilot-scale CO_2 storage projects the way forward for CCS in Europe?' The event dates are 9 – 10 April 2013. A CGS Europe knowledge-sharing workshop on 'International cooperation and key results from European projects' will be organized on 11 April as an affiliated action. More information about the event is available on the CO_2GeoNet website at www.co2geonet.com

Looking to the future

CGS Europe and CO_2GeoNet will continue working on durability of the pan-European CGS networking in future.

Fig. 6 *San Servolo island in Venice – venue of the 8th CO_2GeoNet Open Forum held on 9 -11 April 2013 (www.co2geonet.com).*

This will be achieved by expanding the membership of the CO_2GeoNet Association to the interested research institutions who are active in CGS-related research. This process will start in 2013, changing CO_2GeoNet – currently comprising 13 members from 7 countries - into a really pan-European scientific body and strengthening its unique multidisciplinary expertise.

The enlarged Association will be ready to respond to the expected future research, training, scientific advice and information needs in the area of CO_2 geological storage. These needs will mostly be connected with the prepared pilot and demonstration projects that are likely to appear across Europe in near future, even if later than originally planned. The reason for this expectation is obvious – it would be extremely difficult for Europe to achieve its long-term decarbonisation objectives and contribute to the worldwide climate change mitigation efforts without the CCS technology. Or shall we rather stop fighting climate change and release the CO_2 into the atmosphere without limitations?

CO_2GeoNet
The European Network of Excellence on the Geological Storage of CO_2

CO_2GeoNet (www.co2geonet.com), the European scientific body on CO_2 geological storage, brings together over 300 researchers with the multidisciplinary expertise needed to address all aspects of CO_2 storage. With activities encompassing joint research, training, scientific advice, information and communication, CO_2GeoNet has a valuable and independent role to play in enabling the efficient and safe geological storage of CO_2. CO_2GeoNet was created in 2004 as a Network of Excellence under the EC 6th Framework Programme for 5 years. In 2008, the Network became a non-profit Association under French law. It currently comprises 13 public research institutes from 7 European countries, but expansion of membership is underway to include other partners of the CGS Europe project.

The lighthouse event is the annual CO_2GeoNet Open Forum in Venice enabling dialogue between the scientific community and all CCS stakeholders (www.co2geonet.com/openforum2012_presentations).

Contacts

Secretariat: info@co2geonet.com
President: Isabelle Czernichowski-Lauriol
i.czernichowski@brgm.fr

Members of CO_2GeoNet:

- **GEUS** (Denmark)
- **BRGM** (France)
- **IFPEN** (France)
- **BGR** (Germany)
- **OGS** (Italy)
- **URS** (Italy)
- **TNO** (Netherlands)
- **IRIS** (Norway)
- **NIVA** (Norway)
- **SPR SINTEF** (Norway)
- **BGS** (UK)
- **HWU** (UK)
- **IMPERIAL** (UK)

CGS Europe
The Pan-European Coordination Action on the Geological Storage of CO_2

CGS Europe (www.cgseurope.net), a three-year Coordination Action (11/2011 to 10/2013) funded by the EC 7th Framework Programme, has been created to complement existing CCS initiatives and, more specifically, to tackle the part of the CCS chain dealing with CO_2 Geological Storage (CGS) on a true European scale. CGS Europe is a networking project that pools together the expertise of 34 key research institutes in the area of CO_2 geological storage across 28 countries (24 European Member States and 4 Associated Countries). It builds upon the networking and integration experience of CO_2GeoNet with the ultimate goal of providing an independent, scientific, pan-European platform and reference source where national, European and international experts, institutes and regulators can access the most up-to-date results of CO_2 storage-related studies, share experiences and good practices, discuss the implementation of regulations, identify research needs to face upcoming challenges, and build new projects.

Contacts

Secretariat: info@cgseurope.eu
Coordinator: Isabelle Czernichowski-Lauriol (BRGM)
i.czernichowski@brgm.fr

CGS Europe partners:

- **CO_2GeoNet** Association
- **GBA** (Austria)
- **RBINS-GSB** (Belgium)
- **SU** (Bulgaria)
- **UNIZG-RGNF** (Croatia)
- **CzGS** (Czech Republic)
- **TTUGI** (Estonia)
- **GTK** (Finland)
- **G-IGME** (Greece)
- **MFGI** (Hungary)
- **GSI** (Ireland)
- **LEGMC** (Latvia)
- **GTC** (Lithuania)
- **PGI-NRI** (Poland)
- **LNEG** (Portugal)
- **GEOECOMAR** (Romania)
- **AGES** (Serbia)
- **SGUDS** (Slovakia)
- **GEO-INZ** (Slovenia)
- **S-IGME** (Spain)
- **SGU** (Sweden)
- **METU-PAL** (Turkey)