

# GlobalScientia

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Global Science and Technology

## Neelie Kroes

Building the EU. European Commissioner for the Digital Agenda.

## BMBF

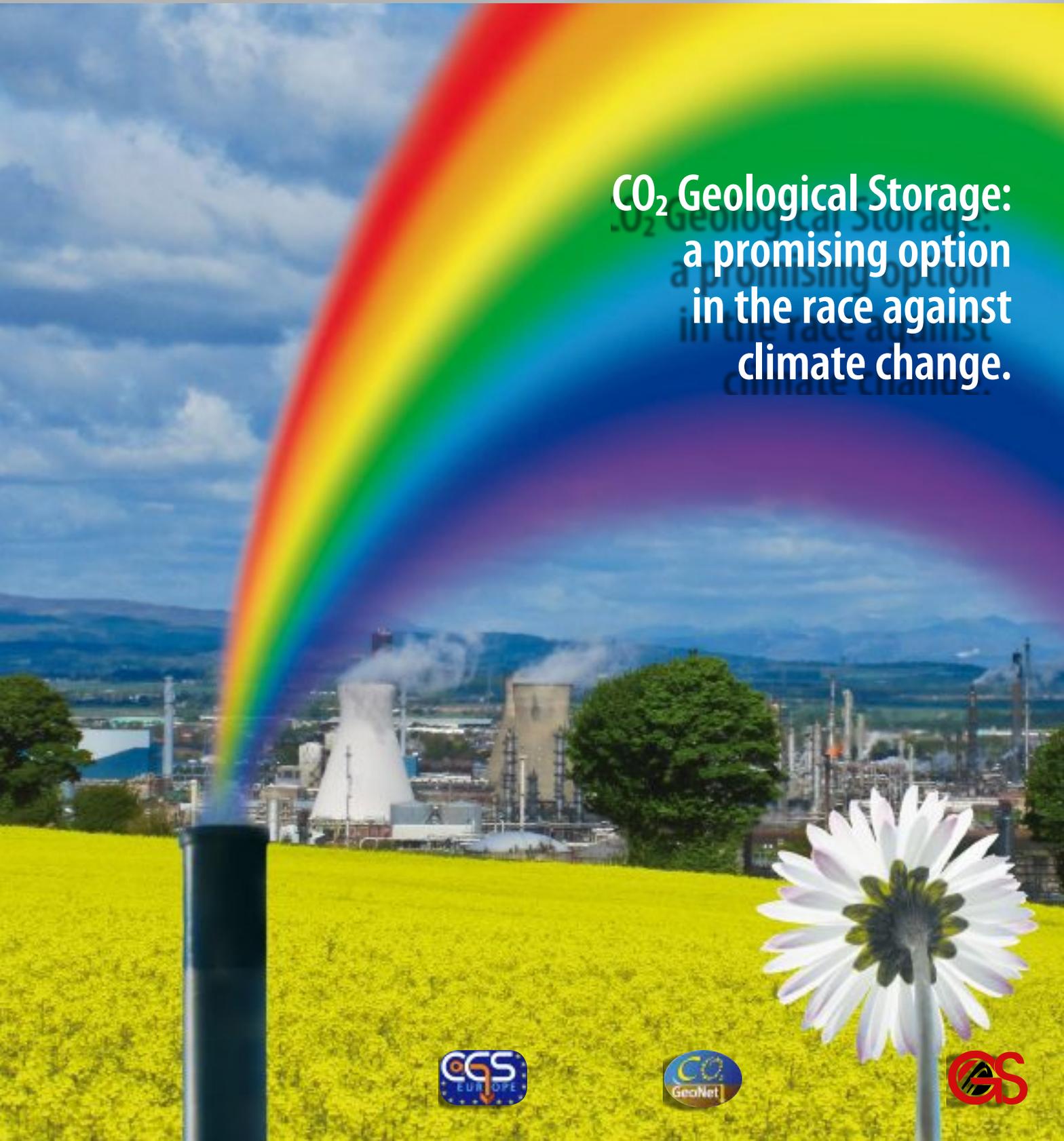
Annette Schavan – “The Significance of Progress and Innovation for Prosperity and Growth in the Context of Demographic Change.”

## Isabel Celaa

Ministry of Education, Universities and Science – Basque Country.

## CERN

Is in the fundamental physics business.



CO<sub>2</sub> Geological Storage:  
a promising option  
in the race against  
climate change.



# CO<sub>2</sub>GeoNet and CGS Europe: A European response to global climate change through CO<sub>2</sub> geological storage.



The European Union has already made significant progress in advancing CO<sub>2</sub> Capture and Storage (CCS) as a bridging technology for combating climate change. The situation now calls for acceleration, particularly in terms of getting CO<sub>2</sub> geological storage pilots and demonstration projects off the ground. CO<sub>2</sub>GeoNet and CGS Europe are the result of a European joining of forces and expertise on all aspects of CO<sub>2</sub> geological storage, in the aim of supporting CCS demonstration and deployment and promoting trans-national cooperation and networking throughout the EU Member States and Associated Countries.

## Returning the carbon back to the ground

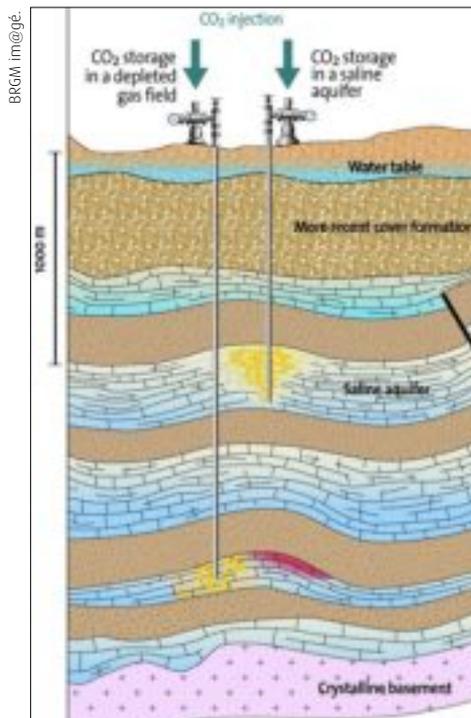
Our prolific burning of fossil fuels for power production, heating, industry and transportation is responsible for 80% of anthropogenic CO<sub>2</sub> emissions into the atmosphere, of which 60% comes from large fixed emitters where CCS can be applied. CCS is a promising mitigation pathway that, according to the International Energy Agency, should contribute 20% of the CO<sub>2</sub> reduction needed by 2050 in order to achieve

stabilisation of greenhouse gas concentrations in the atmosphere in the most cost-effective manner. CCS involves capturing CO<sub>2</sub> at coal- or gas-fired power 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 long-term storage. In doing so, the carbon extracted from the ground in the form of coal, oil or gas is returned back again in the form of CO<sub>2</sub>, making CCS a smart solution that can help avoid the current situation of large CO<sub>2</sub> emissions disturbing the atmosphere and provoking climate change, sea level rise and ocean acidification.

## Time is pressing for storage pilots and demonstration projects

According to the EU Energy Roadmap 2050, CCS needs to be applied from around 2030 in the power sector in order to reach emission-reduction targets. Following 20 years of research and a number of pioneering CCS pilots and industrial operations, the world must now move into a large-scale demonstration phase, vital for enabling progressive commercial deployment within the right timeframe. In Europe, the first CCS demonstration projects are emerging under the leadership of major power and industrial companies and with financial support from the European Economic Plan for Recovery (EEPR), the NER300 mechanism for the



co-financing of CCS and innovative renewables in the framework of the European Union Emissions Trading System (EU-ETS), and Member States. The goal is to have 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, both onshore and offshore. However, the very low price of CO<sub>2</sub> in the EU-ETS (<10€/ton) will not fund as many NER300 demos as anticipated and does not provide a secure environment for long-term investment. Other incentives are necessary.

Furthermore, the procedure for selecting, characterising and obtaining a permit for a storage site takes several years, and time is also needed for its connection to a CO<sub>2</sub>-emitting plant by an appropriate transport infrastructure. No investment decisions can be taken for CCS projects without confidence early on regarding the storage site.

### The scientific challenges and the expertise within CO<sub>2</sub>GeoNet and CGS Europe

More research effort must now be placed on storage compared to capture, which has been attracting much attention to date. This is because each storage site i) is unique due to its specific geology - often complex and unexplored, and ii) must be capable of trapping CO<sub>2</sub> over periods of at least 1000 years. The scientific challenges of CO<sub>2</sub> storage are numerous: site selection and characterisation, modelling and monitoring of CO<sub>2</sub> fate and site behaviour, risk assessment – including possible local impacts on humans and ecosystems – and safety protocols. CO<sub>2</sub> storage is a complex field of research in which many different disciplines interact: geology, geophysics, geochemistry, geomechanics, hydrogeology, microbiology, ecology, reservoir engineering, oceanography, etc. Furthermore, 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 (~1000 years). The existence and study of many natural CO<sub>2</sub> fields in the

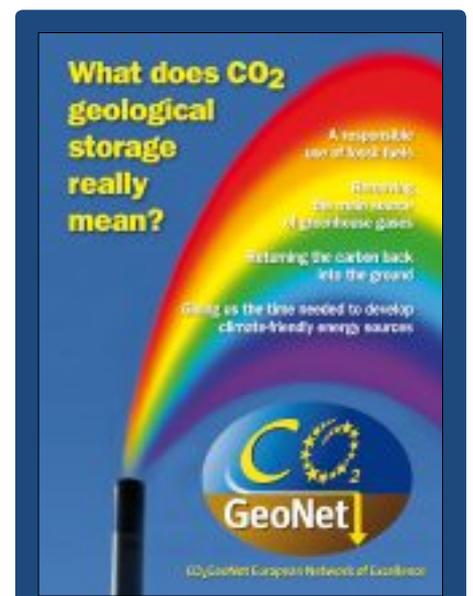
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subsurface proves that geological formations are able to store CO<sub>2</sub> efficiently and safely for extremely long periods of time.

In terms of storage, the abovementioned pilots and demonstration projects are vital for advancing knowledge concerning the storage capacity of a given site, and for testing on-site, in various storage settings, the performance of tools and methodologies developed for site characterisation, modelling, monitoring and risk management. The lessons learned from these field tests will be invaluable in improving the technological blocks so as to guarantee efficient and safe industrial-scale operations, as required by the European Directive on the geological storage of carbon dioxide adopted in 2009. The pool of expertise and research experience available within CO<sub>2</sub>GeoNet\* and CGS Europe\* is a true resource for Europe, providing scientific support for the geological storage of CO<sub>2</sub> and facilitating the large-scale demonstration and deployment of CCS. Activities include research, scientific advice, training and information and communication on CO<sub>2</sub> storage matters. Durability will be ensured by expansion of CO<sub>2</sub>GeoNet membership to include other CGS Europe partners, thus broadening the critical mass, extending geographical coverage to truly European, and offering privileged CO<sub>2</sub> geological storage contact points in the EU Member States and Associated Countries.

Article co-authors: Isabelle Czernichowski-Lauriol (i.czernichowski@brgm.fr) and Rowena Stead (r.stead@brgm.fr).



### Find out more in 24 languages

The CO<sub>2</sub>GeoNet brochure “What does CO<sub>2</sub> geological storage really mean?” tackles pertinent questions on this vitally important technology and explains the basics, such as how geological storage of CO<sub>2</sub> can be carried out, under what circumstances it is possible, and what criteria are needed for its safe and efficient deployment. You can learn more about site selection and characterisation and the monitoring techniques employed for CO<sub>2</sub> geological storage.

The brochure is the fruit of CO<sub>2</sub>GeoNet’s research activities and results, which were presented during CO<sub>2</sub>GeoNet’s Training and Dialogue Workshop on this same subject. It currently exists in 24 languages, thanks to the efforts initiated by CO<sub>2</sub>GeoNet and that are now continuing under CGS Europe: [www.co2geonet.com/brochure](http://www.co2geonet.com/brochure)



**CO<sub>2</sub>GeoNet**  
**The European Network of  
 Excellence on the Geological  
 Storage of CO<sub>2</sub>**

CO<sub>2</sub>GeoNet ([www.co2geonet.com](http://www.co2geonet.com)), the European scientific body on CO<sub>2</sub> geological storage, brings together over 300 researchers with the multidisciplinary expertise needed to address all aspects of CO<sub>2</sub> storage. With activities encompassing joint research, training, scientific advice, information and communication, CO<sub>2</sub>GeoNet has a valuable and independent role to play in enabling the efficient and safe geological storage of CO<sub>2</sub>. CO<sub>2</sub>GeoNet was created in 2004 as a Network of Excellence under the EC 6<sup>th</sup> 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<sub>2</sub>GeoNet Open Forum in Venice enabling dialogue between the scientific community and all CCS stakeholders ([www.co2geonet.com/openforum2012\\_presentations](http://www.co2geonet.com/openforum2012_presentations)).

#### Contacts

**Secretariat:** [info@co2geonet.com](mailto:info@co2geonet.com)

**President:** Isabelle Czernichowski-Lauriol  
[i.czernichowski@brgm.fr](mailto:i.czernichowski@brgm.fr)

#### Members of CO<sub>2</sub>GeoNet:

- 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<sub>2</sub>**

CGS Europe ([www.cgseurope.net](http://www.cgseurope.net)), a three-year Coordination Action (11/2011 to 10/2013) funded by the EC 7<sup>th</sup> Framework Programme, has been created to complement existing CCS initiatives and, more specifically, to tackle the part of the CCS chain dealing with CO<sub>2</sub> 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<sub>2</sub> geological storage across 28 countries (24 European Member States and 4 Associated Countries). It builds upon the networking and integration experience of CO<sub>2</sub>GeoNet 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<sub>2</sub> 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](mailto:info@cgseurope.eu)

**Coordinator:** Isabelle Czernichowski-Lauriol (BRGM)  
[i.czernichowski@brgm.fr](mailto:i.czernichowski@brgm.fr)

#### CGS Europe partners:

- CO<sub>2</sub>GeoNet 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)
- UB (Serbia)
- SGUDS (Slovakia)
- GEO-INZ (Slovenia)
- S-IGME (Spain)
- SGU (Sweden)
- METU-PAL (Turkey)