



CCS deployed on a global scale is essential to achieving the Paris Agreement targets

As the targets of the Paris Agreement are translated into actions by countries worldwide, the need for large-scale deployment of CO₂ Capture and Storage (CCS) will become even more apparent. The **12th CO₂GeoNet Open Forum focused on driving CCS towards implementation** in order to realise its crucial role in climate change mitigation strategies.

No success without CCS: It is essential to act quickly: the carbon countdown is ticking. Mitigation costs are expected to be more than double for the 2°C scenario (2°S) if CCS is not deployed. Not emitting CO₂ into the atmosphere is no longer enough; to meet the Paris Agreement targets a net removal of CO₂ from the atmosphere will be necessary even to meet the 2°S. CCS is the only currently available large-scale technology that can achieve negative emissions.

How to break the current inertia and get things moving: CCS has progressed over the last two decades, but has not yet reached its full potential to reduce emissions. We need to take steps now. This could include getting small but upscalable projects going, seeking synergies with other low carbon technologies, providing 'storage-ready' solutions for emitters and deploying CCS at high concentration sources.

Stable policy support is essential: Meeting attendees reiterated that a long term policy framework supporting CCS is critical for implementation and wider community engagement. CCS needs similar investment and consideration as other low carbon technologies. Investment of public funds in CCS has been shown to have a strongly positive effect in leveraging larger investments from the private sector.



Learning by doing is essential: Experience is key to optimising project planning, design, spending and construction. Lessons learned from demonstration projects will allow significant reductions in cost for the next generation of CCS projects. Research at field laboratory and pilot scale is part of the process; opportunities for refining processes and technologies identified through current demonstration projects can be explored.

More detail is given in the '[key messages](#)' document published on the CO₂GeoNet website. Please also refer to the linked article on page 2 on the joint BGS-GEUS Open Forum workshop.

Ceri J. Vincent, BGS, UK

CO₂GeoNet will again be active at the 23rd United Nations Framework Convention on Climate Change Conference of the Parties (UNFCCC COP23) as an officially accredited Research Observer Organisation (RINGO). COP23 is hosted by Fiji and will be held in Bonn from November 6th to 17th, 2017. The event is organised in two zones; the Bula (negotiations) zone

CO₂GeoNet at COP23

and the Bonn (observer) zone. All side events and booths will take place in the Bonn zone. CO₂GeoNet will provide



information on the key role CCS can play in meeting our climate targets (please see list below).

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CO ₂ GeoNet at the COP 23	Bonn Zone:
Booth on CCS	6 – 17 November
We need CO₂ Capture & Storage (CCS) to meet the Paris Agreement targets	stand G.09.02
CO ₂ GeoNet with co-organiser: TCCSUA	1 st floor
Side event	6 November
CO₂ infrastructure for public good	10:00 – 11:30
CO ₂ GeoNet with co-organisers: Bellona, CCSA, EERA-CCS, GCCSI & IEAGHG	Area A01, Brussels Room EU Pavilion
Side event	8 November
Storing carbon dioxide in order to meet Paris Agreement targets	9:00 – 10:30
CO ₂ GeoNet with co-organisers: IPIECA, e5 and TCCSUA	Energies 2050 Pavilion
Presentation at Side event	14 November
Review of CO₂ EOR transition to CCS: follow-on deep dive study of Texas and Alberta	11:00 – 12:30
	Business Hub, IETA Room
	Carbon Capture Project (CCP4)



CO₂GeoNet Open Forum 2017 workshop: Bringing CCS to new regions of the developing world

Only a few developing countries recognise CCS as an essential mitigation option. The main priority in developing countries is to improve living conditions for the population. CCS can support socio-economic development while limiting impact on the climate.

Countries with CCS experience must support developing countries in considering CCS as a low carbon technology through raising awareness, undertaking knowledge sharing activities, capacity building and technology transfer.

During the first day of the Open Forum, Felicia Mogo perfectly captured the key message for advancing CCS in developed and developing countries; we must ensure that no one is left behind. This means drawing together stakeholders from all over the world and from all relevant fields of expertise (including CCS researchers, the general public, political leaders, financial experts, regulators, banks and insurers to name just a few) to work together towards a common goal, that of a better future.

At the 12th Open Forum, BGS and GEUS organised a workshop on '**Bringing CCS to new regions of the developing world**'. A brief outline of the presentations is presented below.

Joseph Essandoh-Yeddu (*Energy Commission, Ghana*) presented on implementing CCS in Africa, focused on Sub-Saharan Africa. Joseph pointed out

in his key messages that in Africa, as elsewhere in the world, more awareness is needed and that public support for CCS is essential. In order to get CCS into the picture, we need to look at drivers that are important for developing countries.

Felicia Mogo (*Marine Environment Management, Nigerian Maritime Administration and Safety Agency (NIMASA), Nigeria*) presented on 'CCS in Nigeria: The Journey so Far'. Nigeria aims to reduce greenhouse gas emissions by at least 25% by 2020. A small team of national agencies are working on how best to promote CCS and EOR in Nigeria. This includes prioritizing areas for CCS activities in Nigeria and stakeholder engagement to create advocacy for CCS. CCS in Nigeria is likely to create 100,000 jobs and will reduce the health impact from gas flaring and protect the environment from acidification.

Jonathan Pearce (*BGS, UK*) presented on the "Growing Opportunities for CCS in India". India has the third largest economy in the world which is still increasing rapidly. Rapid urbanisation and increasing income is increasing energy demand. In order to meet the 2020 National Action Plan Climate Change target, low carbon options are needed. "Since fossil fuel will occupy a major part of energy mix to at least 2047, there is no climate friendly scenario in the long run without CCS" (India Energy Security Scenarios, NITI Aayog, 2014).

Júlio Carneiro (*University of Evora, Portugal*) gave an overview of CCS Opportunities and Challenges in the Community of Portuguese Language Countries (CPLC), focusing on Mozambique, Angola, Equatorial Guinea, East Timor and Cape Verdes. Major drivers and the way forward included looking for opportunities using EOR (Angola and Equatorial Guinea), assessment of CO₂ storage capacity and the observation that most African members of the CPLC and East Timor are usually listed as among the most vulnerable countries in the world to climate change.

Nigel Hicks (*Council for Geoscience (CGS), South Africa*) presented 'New Projects in South Africa'. The CGS has been active in CCS research for almost a decade having worked in various national research projects together with South Africa National Energy Development Institute (SANEDI) who lead the South African Centre for CCS (SACCCS). Now in 2017, work is focusing on the SACCCS Pilot Carbon Dioxide Storage Project (PCSP), the third milestone in the South African CCS Roadmap. The primary aims of the PCSP are to demonstrate safe storage of CO₂ in South Africa, increase human and technical capacity and to raise awareness of the potential importance of CCS amongst the South African public.

*Ceri J. Vincent,
BGS, UK*



Left
*Joseph Essandoh-Yeddu,
Energy Commission, Ghana*



Right.
Felicia Mogo, Marine Environment Management, Nigerian Maritime Administration and Safety Agency, Nigeria



ENOS
Enabling Onshore CO₂ Storage

ENOS - one year on



The ENOS project started a little more than a year ago. Many research activities are underway, the results of which will be delivered over the next 3 years.

Looking back over the first year, the main outstanding achievements are:

- The preparation of two experimental sites for CO₂ injection. The Sulcis Fault lab in Italy (Sotacarbo, Sapienza, OGS) and the UK GeoEnergy Test Bed (University of Nottingham, BGS) are working towards CO₂ injection into the shallow subsurface (less than 200 m depth) during 2018 – 2019 (see [our website](#) for more details). Activities included comprehensive site characterisation to confirm geological formations and to improve our understanding of the environment, contracting for infrastructure installation (drilling, sensor installation, etc.), and the start of baseline monitoring.
- The injection of 432 m³ of brine and 405 tonnes of CO₂ at the Hontomín site in Spain (CIUDEN) during preliminary testing. A discontinuous injection strategy was adopted to advance under-

standing of the transmissivity of fractures in the reservoir (fractures provide the main pathways for fluid migration in the storage reservoir at Hontomín). The target is to correlate pressure data from wells with the cumulative amount of injected water and CO₂. Data and results will be used to update the design of continuous and alternative injection strategies to be conducted later on site, and to maximise storage and injection while assuring cap-rock integrity.

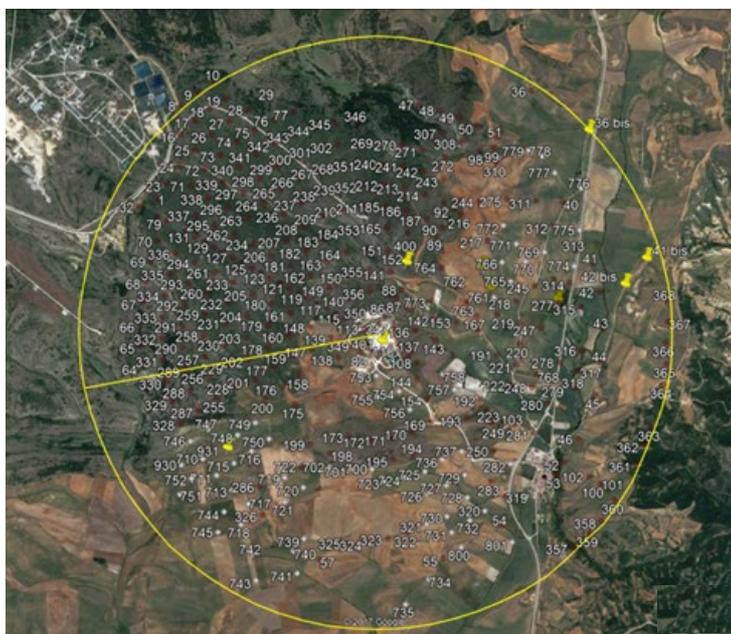
- The acquisition of a 3D Vertical Seismic Profiling (VSP) survey by OGS using Silixa's intelligent Distributed Acoustic Sensor (iDAS™), a permanent fibre optic monitoring solution. Specialist optic fibre, installed in the injection well at Hontomín, was used to receive signals from multiple artificial noise sources (vibrator trucks) at the surface (see figure). By combining the signals from multiple sources at the surface, a 3D picture of the rocks around the well can be built. Using the iDAS™ system, it is possible to acquire down-hole signals in real time for each source point, which makes data acquisition much more effi-

cient and ensures good repeatability of measurements. The acquired data have been quality checked and a first look indicates great potential for insight into the reservoir and overburden at affordable cost. Full processing and interpretation of the data is currently underway.

Dissemination and knowledge sharing are key to the ENOS project. The ENOS project is presented in our beautifully illustrated brochure **"ENOS: Participating in CO₂ Geological Storage Research"** - please download it from the [ENOS website](#) (currently available in three languages: English, Italian and Spanish). Art and science have come together to explain what the ENOS project is about and provide an enticing glimpse into the project for all stakeholders. Please enjoy and share this brochure!

Stay tuned for more details about ENOS progress through our website www.enos-project.eu and during the next CO₂GeoNet Opem Forum in April 2018 in Venice.

Marie Gastine, BRGM, France



Above: Surface view of the ENOS 3D VSP acquired in September 2017 with a grid of 390 surface source points distributed around the injection well at Hontomín, Spain. The yellow circle has a radial distance of 2.1 km from the well (map courtesy OGS, Italy)



Right: Sample illustration from our brochure **"Participating in CO₂ Geological Storage Research"** (illustration courtesy Sapienza, University of Rome, Italy)



CO₂GeoNet at the Asia Oceania Geosciences Conference

CO₂GeoNet was invited to give an oral presentation at the CCS session, convened by **Qi Li** from the Chinese Academy of Science, **Andrew Feitz** from Geoscience Australia, and **Masao Sorai** from the Geological survey of Japan. The session gave a good overview of the progress of research activities in China, Japan, Taiwan and

Australia. The CO₂GeoNet presentation focused on the international collaboration activities, which are already rich, but could be further enhanced with new collaborations between Europe, Asia-Oceania and the rest of the world, as it is crucial to join efforts globally to keep the temperature rise well below 2°C.

Isabelle Czernichowski-Lauriol, CO₂GeoNet President Emeritus, at the AOGS Conference (photo courtesy Ziqiu Xue, RITE)



The CO₂GeoNet talk highlighted collaborative actions with the IEA Greenhouse Gas R&D Programme (IEAGHG), the Global CCS Institute (GCCSI), the Carbon Sequestration Leadership Forum (CSLF), the ISO CCS Technical Committee, the Climate Technology Centre and Network (CTCN), and UNFCCC with participation to COP climate conferences as an accredited Research NGO.

Specific collaborations with Asia-Oceania partners include the translation of the CO₂GeoNet brochure '*What does CO₂ geological storage really mean*' in [traditional Chinese](#) and in [Taiwan/Singapore Chinese](#) thanks to **TCCSUA (Taiwan CCS and Utilization Association)**, now available on CO₂GeoNet website), and a twinning programme between European onshore pilot sites and similar sites abroad including South Korea (Janggi) and Australia (Otway) in the framework of the current H2020 ENOS research project 'Enabling Onshore CO₂ Storage in Europe' initiated by CO₂GeoNet. Participants from Asia-Oceania were also invited to attend the 13th CO₂GeoNet Open Forum in Venice in April 2018.

*Isabelle Czernichowski-Lauriol
BRGM, France*



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