Project no. 256725

Project acronym: CGS Europe

Project title: Pan-European Coordination Action on CO_2 Geological Storage

Instrument: Coordination and Support Action

Thematic Priority: SP1-Cooperation, FP7-ENERGY-2010-1

Deliverable D4.11
JOINT RESEARCH ACTIVITIES. REPORT 4

Due date of deliverable: 31/10/2013
Actual submission date: 20/12/2013

Start date of project: 1 November 2010 Duration: 36 months

Organisation name of lead for this deliverable:
IGME-Spain (Instituto Geológico y Minero de España, IGME)

Project co-funded by the European Commission within the 7th Framework Programme (2010-2013)
Dissemination Level: Public (PU)

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CGS EUROPE REPORT 4 ON JOINT RESEARCH ACTIVITIES

1. Objectives

This report covers the last 6 months of the project, during which CGS Europe aimed to complete a dynamic picture of research in geological storage of CO_2 at a Pan European level. As described in details in previous reports on joint research activities, CGS Europe has been trying to establish common actions between its partners in the aspects of field research, regulatory development support, storage capacity estimations and others.

CGS Europe Advisory Body and the Management Board itself have insisted on the need of an active cooperation with other European bodies involved in CO_2 Capture and Storage, including the industry, national and European authorities, other research centres and globally with the society in general. That is why, CGS Europe partners have developed the study of "Opportunities for storage pilot projects across Europe" having close cooperation with the Zero Emission Platform (ZEP).

Not only is it necessary to promote new actions, but it is crucial to provide an understandable overview of the situation in the EU and of the potential contribution of R&D to a safe and efficient industrial deployment. CGS Europe partners contribute to these goals by providing consistent information (See Annex I and II) on their activities and the progress of research in their countries, within the frame of the last three years in which CGS Europe has been active.

Several CGS Europe partners have now become members of the CO_2GeoNet Association. Other lines of action that were developed during this project will now go on under the activities of CO_2GeoNet. For instance, the Atlas of CO_2 storage sites in Europe will continue to be strongly supported and the status of regulation regarding CO_2 storage will be continuously updated.

2. CGS Europe report on storage pilot projects

Thanks to a large effort by CGS Europe partners, the study of "Opportunities for storage pilot projects across Europe" is ready for releasing. The background and structure of the study has been previously reported in Joint Research Activities deliverables (see D4.10) although some updates have been included in the last version, regarding Italy and the Baltic Region. This document will now be distributed and disseminated to all other European stakeholders using all possible networks: ZEP, EERA etc.

This document shows the many opportunities that exist to demonstrate storage in various geological settings and covering a large part of Europe (see table below). Therefore, if funding could be secured, a number of sites could be turned into research platform on storage where field experiments would cover the research needs and help the efficient demonstration of CGS to the society. The next issue to be addressed by CO_2GeoNet, jointly with EERA and ZEP will be on the funding opportunities.

As a conclusion of the study, because of the amount, diversity and quality of the answers that have been provided to this report, it can be concluded that the expanded CO_2GeoNet Association, as an independent and durable scientific body that deals with all aspects of CO_2 storage, and with the cooperation of other CGS Europe partners, is in a very good position to help in the coordination of pilot projects, in the creation of links between them, in integrating research and results and in transferring newly acquired knowledge to the industrial sectors and the society as a whole.

Table 1 Summary of Pilot Project Proposals

COUNTRY	PILOT NAME	LOCATION	TYPE	DEPTH (m)	LITHOLOGY	FORECASTED BUDGET (M€)
Bulgaria	Pavlikeni	Onshore	Aquifer	800 - 1400	Limestone	
Czech Republic	Czech Republic	Onshore	EOR/Oil field	1600	Sandstones	20 - 40
Denmark	Skagerrak	Onshore	Aquifer	1200 - 1500	Sandstones	
France	Paris Basin	Onshore	Aquifer	2500-3000	Sandstones	55
Hungary	Hungary	Onshore	Aquifer	1500	Sandstones	20
Italy	Sulcis	Onshore	Coal			
The Netherlands	Q01	Offshore	Aquifer	1300-1600	Sandstones	50
The Netherlands	K12-B	Offshore	Gas field	3000	Sandstones	30-100
The Netherlands	Rotterdam	Onshore	Gas field	1200-1600	Sandstones	40
Norway	Sleipner	Offshore	Aquifer	750-900	Sandstones	
Norway	Snøhvit	Offshore	Aquifer	2430	Sandstones	
Norway	Svalbard	Onshore	Aquifer	670-970	Sandstones	
Norway	Svelvik	Onshore	Field lab	20-100	Sands	
Norway	Mongstad	Offshore				Large
Poland	Dziwie	Onshore	Aquifer	1250	Sandstones	19
Portugal	Lusitania	Onshore	Aquifer	1600	Sandstones	5
Romania	Turceni	Onshore	EOR/Oil field	2200	Sandstones	20-40
Romania	Rovinari	Onshore	Aquifer	1400	Sands	20-40
Romania	Craiova	Onshore	Oil field	1500	Sandstones	20-40
Romania	Galati	Onshore	Oil field	2000	Sandstones	20-40
Slovakia	Vienna	Onshore	Oil field	1350-1450	Limestone	9
Slovakia	Ptruska	Onshore	Gas field	1450-1850	Sandstones	9
Slovakia	Stretava	Onshore	Gas field	1100-1700	Sandstones	8
Slovakia	Marcelová	Onshore	Aquifer	1000-1700	Carbonates	25
Spain	Hontomín	Onshore	Aquifer	1600	Limestone	30
Sweden	Bastor	Offshore	Aquifer			
Turkey		Onshore	EOR/Oil field			
United Kingdom	UK on	Onshore	Aquifer	800-1200	Sandstones	
United Kingdom	UK off	Offshore	Field lab	12	Sediment	2

3. Mapping research progress in Europe

3.1 Research advances in CGS Europe countries

The CGS Europe project has been developed from November 2010 to October 2013. During this period, the economic activity in Europe has suffered a period of low growth and some Member States fell into recession. As a consequence, Carbon Dioxide emissions have not been as high as it was expected a few years ago and, subsequently, the price of emission rights is lower than it was previewed in economic scenarios built by then. CCS deployment has slowed down and research related to CO_2 storage (especially demonstration) has not gone through its best period.

In any case, some significant advances have taken place during these years and CGS Europe partners have been a very active part of these advances. Some significant projects are being developed at the moment and their results will be of importance when CCS is finally deployed. Besides their role in the planning and design of the pilot project proposals described in the "Opprtunities…" document, CGS Europe partners are key research agents in their countries and have relevant opinions on the advances of geological storage. In order to have a summary on these activities and opinions that can be publicly accessed, CGS Europe partners have filled up a simple questionnaire (see Figure 1) about CO_2 storage research progress in their countries.

Country		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?		
Has geological storage research progressed in your country in the last 3 years?		
Is CGS more relevant today in your country than 3 years ago?		
Are there more relevant projects/funding than 3 years ago?		
Other comments you may find interesting		

Figure 1: Questionnaire about research progress in CGS Europe countries

An overall reviewing of these answers reveals there is a general feeling that, although research has advanced in the last three years in almost every country in the EU, CCS is not a real option in the upcoming years because of the lack of

demonstration projects and the reduction of national funded research projects. In those terms, CGS can not be considered more relevant than three years ago, when more optimistic expectations about this option were held. Obviously, there are some exceptions to this rule, and they can be observed in complete answers (Annex I)

3.2 What do CGS Europe partners do in CGS research?

CGS Europe partners have carried out relevant research in the field of CO_2 geological storage in the last decade. CGS Europe Advisory Body has insisted throughout the whole project in the necessity of making an adequate summary of this research and stating how their fields of expertise may contribute in the near future to the deployment of CCS infrastructures in Europe. Therefore, an easy template (Figure 2) was created in order to be filled up by partners and showed out in the webpage of the project.

Name of institution	Logo of the institution
webpage Main headquarters address	Contact Person Phone number e-mail address
Institution profile	
CGS Projects:	Completed projects, Ongoing initiatives, European active projects, National projects
Fields of Expertise:	Fields that can be applied to CCS research
Researchers involved in CGS:	Number of researchers
Field and Laboratory equipment	Exploration and exploitation equipment adequate for CGS research

Figure 2: Template for mapping of research by institution

Templates filled up by partners can be reviewed in Annex II. CGS Europe partners are involved in a very large number of relevant projects related to CO_2 storage in Europe and cover a very wide amount of the fields of expertise that will have an application in the successive stages of CO_2 storage.

4. Future activities

Joint research activities will be now performed under the framework of the CO_2GeoNet association. 9 CGS Europe partners out of 21 not yet members (43%) joined the CO_2GeoNet association in 2013, following two calls for application. New partners that were not part of CGS Europe also joined the CO_2GeoNet association in 2013: GFZ (Helmholtz-Centre Potsdam, Germany), which is running the Ketzin storage pilot (CO_2 injection stopped mid-2013), and CIUDEN (Spanish foundation Ciudad de la Energía), which is running the new CO_2 storage pilot site at Hontomín in Spain where CO_2 injection is planned for the spring of 2014. Therefore the CO_2GeoNet association that was founded by 13 members in 2008 spanning 7 European countries now comprises 24 members from 16 European countries. A third call for applicants will be launched in December 2013, therefore it is expected that several other CGS Europe partners will join.

Future activities of the CO_2GeoNet association are defined annually within the Programme of Activity, in line with the CO_2GeoNet strategy adopted in 2012, along 4 main domains of activity**:**

1) Joint research,
2) Training and capacity building,
3) Scientific advice,
4) Information and communication

Main plans for joint research activities are:

1) Liaison with EERA and other stakeholders:
   - Further develop interaction at an appropriate level with other organizations concerned with CO_2 storage research: EERA, ZEP, ECCSEL, GCCSI, CSLF, ENeRG, IEA, IEAGHG, European Commission, etc.

2) Promoting research involving CO_2GeoNet members:
   - Initiate new Joint Research Activity Projects (JRAP), as done successfully in the past, at the time of the FP6 CO_2GeoNet project. CO_2GeoNet General Meeting agreed in September 2013 to initiate a JRAP on Hontomín for inclusion in the CO_2GeoNet programme of Activity 2014.
   - Find new opportunities for contracts (e.g. with H2020, GCCSI, IEAGHG, industry). In order to maintain independency from supporting entities, joint and open sponsoring will be favoured when initiating specific projects with the Industry.

3) Facilitation exchange of views and knowledge-sharing:
   - Develop research perspectives through internal workshops. In 2014, a CO_2GeoNet workshop on the future of CO_2 storage research will be organised in Venice next to the 9th CO_2GeoNet Open Forum in May.
   - Staff exchange

ANNEX I
RESEARCH PROGRESS IN CGS EUROPE COUNTRIES. ANSWERS TO QUESTIONNAIRES

Austria		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	No	CCS is prohibited in Austria for industrial purposes until 2018
Has geological storage research progressed in your country in the last 3 years?	No	There are no funds in Austria to finance research in CGS
Is CGS more relevant today in your country than 3 years ago?	No	No, after the implementation of the CCS Directive in Austria in 2011 research activities have stopped
Are there more relevant projects/funding than 3 years ago?	No	see above
Other comments you may find interesting		

Belgium		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	no	There is little public or private interest in CCS at the moment.
Has geological storage research progressed in your country in the last 3 years?	yes	CCS research is still ongoing. There is no active exploration though.
Is CGS more relevant today in your country than 3 years ago?	no	CCS and environmental issues have largely been pushed to the background because of the economic crisis.
Are there more relevant projects/funding than 3 years ago?	no	CCS and environmental issues have largely been pushed to the background because of the economic crisis.
Other comments you may find interesting		

BULGARIA		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	no	Basic reason is that the produced industrial CO_2 emissions in Bulgaria are much less than the fixed by Kyoto agreement
Has geological storage research progressed in your country in the last 3 years?	yes	In the frame of 3 accomplished projects, funding by EU (project CO2Stop 2012), Worley Parson (2010) and Toshiba (2011-2012), in which SU was national partner.
Is CGS more relevant today in your country than 3 years ago?	yes	After results, received in mentioned above 3 projects
Are there more relevant projects/funding than 3 years ago?	yes	The mentioned above 3 projects
Other comments you may find interesting		

Croatia		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	Yes	There subsurface geology of both the continental (Pannonian) Croatia and Adriatic off-shore is favourable. There are several point sources (mostly TPP), and current energy strategy foresees construction of new capacities in that sector. It is important to notice that a CO_2-EOR project is starting in continental Croatia, where 2 depleted oil fields are going to be included. The clean CO_2 point source from NGPP in northern Croatia is going to be used, a 70-km pipeline has been tested and a re-compression station is also finalised. Local pipeline network of 50 km has been constructed and injection is going to start really soon. The third phase of this project will include re-injection of the produced CO_2 in another reservoir, this is being planned. One PhD study is ongoing, following these problems.
Has geological storage research progressed in your country in the last 3 years?	Yes	2 PhD Theses have been defended and results published (in "Energy" and in "IJGHGC"), altogether 2 graduate theses and 5 undergraduate theses have been done only by geological students.
Is CGS more relevant today in your country than 3 years ago?	Yes?	Hardly. In particular because of both the international and domestic economical situation. The crisis has definitely pushed other problems higher on the agenda, not surprisingly because the ETS is not working properly.
Are there more relevant projects/funding than 3 years ago?	No	There are no domestic sources, and participation in FP6 projects is slowing down. Several applications have been made, domestic and regional.
Other comments you may find interesting		The only progress that has been made is the transposition of the relevant EU Directive, partly in the new Mining Law and then in more detail in the Low on Hydrocarbons. Apart from that, the dedicated by-law has been made with a section concerning "disposal of gases in deep geological structures". This is actually the translation of the Directive.

Czech Republic		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	no	CCS is not taken seriously by any stakeholder group except researchers. Large-scale CO_2 storage is prohibited until 2020 (result of the CCS directive transposition).
Has geological storage research progressed in your country in the last 3 years?	yes	One big CCS-focused national project has been finalised in 2013; most progress achieved in laboratory testing using supercritical CO_2 and reservoir conditions, risk analyses, geochemistry and reservoir modelling.
Is CGS more relevant today in your country than 3 years ago?	no	The energy policy focuses on nuclear power supported by renewables; industry is rather reluctant to solve GHG emissions. CO_2 storage is prohibited until 2020.
Are there more relevant projects/funding than 3 years ago?	yes	A special CCS sub-programme of Norway Grants is about to be launched (final confirmation still pending). This would enable starting preparations for a national storage pilot.
Other comments you may find interesting		General awareness of climate change and related issues in the country is low; climate change mitigation is not among societal priorities.

Denmark		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	Yes	Danish government climate action plan August 2013. The storage of CO_2 from power plants in the oil fields to increase oil production (CCS / EOR) The action plan are based on progressively starting from 2020, and from 2027 assumed reduction to reach approximately 4.5 Mt per year (without offsetting the emissions from the additional oil production).It can remain at that level until 2042, after which it decreases to 0 in 2050.
Has geological storage research progressed in your country in the last 3 years?	Yes	High technology research has been carried out on EOR in the Danish North Sea chalk reservoirs
Is CGS more relevant today in your country than 3 years ago?	Yes	Now officially mentioned in the government's plans
Are there more relevant projects/funding than 3 years ago?	No	Except for laboratory high technology research, research is missing on capture, storage sites mapping, capacity, monitoring etc.
Other comments you may find interesting		Public information strategies are also missing, but if Denmark is starting with offshore EOR, it may not be important.

Estonia		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	Capture-Yes, Storage -No	Studies on Oxyfuel combustion and CO_2 capture for the local Estonian oil shale as a source of energy is ongoing now. Geological options for storage are absent, therefore only transboundary storage in the neighboring regions and countries are possible
Has geological storage research progressed in your country in the last 3 years?	Yes	Starting from zero, we have published number of articles on international and national level and one PhD work to be finalized in 2014 (by Kazbulat Shogenov).
Is CGS more relevant today in your country than 3 years ago?	Yes	CCS directive is transposed at national level only, but not yet confirmed by EC. Only transboundary storage is possible.
Are there more relevant projects/funding than 3 years ago?	No	Moderate funding for the next years in the frame of the national project "Groundwater flow history, global paleoclimate signals and anthropogenic influence in the Baltic Artesian Basin: a synthesis of numerical models and hydrogeochemical data". The CGS modelling is included as one of the research topic.
Other comments you may find interesting		University course on CGS is developed and was read for international and national students in spring 2012 in Tallinn University of Technology (without additional funding) and in autumn 2013 in University of Warsaw by Alla Shogenova (as Visiting Professor in the frame of supported by EU project Modern University). It is planned to continue educational activities in Estonia and when possible in other countries.

Finland		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	yes	If considered capture.
Has geological storage research progressed in your country in the last 3 years?	no	The situation remains the same, no storage options in Finland.
Is CGS more relevant today in your country than 3 years ago?	no	It seems that the public interest and enthusiasm of the industry decrease within three years.
Are there more relevant projects/funding than 3 years ago?	yes	The national CCS project has started.
Other comments you may find interesting		

France		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	?	The failure of most AMI (national funding for pilots) and especially the failure of the French NER300 project were a cold shower for CCS in France. Most politician and industrials are rather in a 'wait-and-see' position. However, a pilot capture plant has recently been launched.
Has geological storage research progressed in your country in the last 3 years?	yes	But not suffciently to convince decision makers
Is CGS more relevant today in your country than 3 years ago?	no	Situation is the same
Are there more relevant projects/funding than 3 years ago?	no	They are actually decreasing
Other comments you may find interesting		

Greece		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	No	There are various views on this subject. Although the Directive 2009/31/EC on CCS has been transposed into the Greek legislation, there is no any official position of the Greek State on this issue. The interest is high but there is no clear government policy.
Has geological storage research progressed in your country in the last 3 years?	No	
Is CGS more relevant today in your country than 3 years ago?	Yes	
Are there more relevant projects/funding than 3 years ago?	No	
Other comments you may find interesting		

Germany		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?		Storage potential available, capacity estimated; legal basis in place: Transposition of EU Directive in August 2012; currently no CO_2 storage project under preparation
Has geological storage research progressed in your country in the last 3 years?	yes	Intense research activities during last three years funded mainly by Federal Ministry of Education and Research, but research programme is phasing out now.
Is CGS more relevant today in your country than 3 years ago?	no	
Are there more relevant projects/funding than 3 years ago?	no	
Other comments you may find interesting		

Hungary		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	yes	the geological and technical opportunity is real, the required knowledge is available and the legislation enables CCS activities. Currently the lack of financial motivation limits the activity in this question
Has geological storage research progressed in your country in the last 3 years?	yes	A better, detailed screening of potential storage sites has commenced, using the requirements stated in the EU Directive and related national legislation. Detailed modeling and lab experiments have also stared, with a strong focus on cap rock integrity
Is CGS more relevant today in your country than 3 years ago?	yes	Geologically and technologically yes; financially no
Are there more relevant projects/funding than 3 years ago?	yes	State-financed projects are currently available
Other comments you may find interesting		-

Ireland		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	NO	Statutory Instrument No. 575 of 2011, European Communities (Geological Storage of Carbon Dioxide) Regulations 2011, was published on 18th November 2011 and it was laid before the Oireachtas on 22 November 2011. The SI transposes Directive 2009/31/EC by prohibiting storage of CO_2 in amounts greater than 100 kilotonnes in the territory of the State, its exclusive economic zone and on its continental shelf.
Has geological storage research progressed in your country in the last 3 years?	YES	A joint project between the Geological Survey of Ireland and the British Geological Survey is assessing storage potential of saline aquifers in the Irish Sea, with total budget of 1 M € over three years until 2014. Current studentships in Irish universities are researching seismic methods in monitoring CO_2 storage sites, fluid flow in fault networks, and cap rock geochemistry.
Is CGS more relevant today in your country than 3 years ago?	YES/NO	Although CCS may be required to compensate for high agricultural emissions in meeting an intended emission reduction target of 80%, Ireland has no explicit CCS policies in place and has prohibited permanent CO_2 storage except for research purposes. Public awareness of CCS in Ireland is low, reflecting the lack of any major industrial initiatives and Government support.
Are there more relevant projects/funding than 3 years ago?	YES	Despite storage prohibition, national funding is available for research - see above
Other comments you may find interesting		

Italy		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	NO	CCS activities on a large scale are not a real option in Italy in the coming 2-4 years. This because the Porto Tolle project of ENEL had to be postponed. The time evaluated as necessary for getting the injection permissions has forced ENEL not to apply for the second round of NER300. In this moment, no other large-scale storage project may be envisaged. Activities related to CCS techniques are therefore restricted to research ones and planning of future pilot projects, such as the so called "Sulcis" one. This project is in the last phase of site characterisation in the coal basin of Sulcis, South-West of the Sardinia island.
Has geological storage research progressed in your country in the last 3 years?	YES	After the evaluation of potential storage sites in terrigenous formations performed during the GeoCapacity project, also carbonatic formations in the Adriatic area have been evaluated, as potential storage sites. See for that: "D. Civile, M. Zecchin, E. Forlin, F. Donda, V. Volpi, B. Merson, S. Persoglia: CO_2 geological storage in the Italian carbonate successions; International Journal of Greenhouse Gas Control 19 (2013) 101–116"
Is CGS more relevant today in your country than 3 years ago?	NO	
Are there more relevant projects/funding than 3 years ago?	NO	
Other comments you may find interesting		Also if demo projects cannot be envisaged as probable in the coming years, the Italian ministries continue to follow international initiatives, such as CSLF, and have completed the transposition in the Italian legislation of the EC Directive on CCS. Moreover, there is a national support to the creation in the Sardinia Island of a Center of Excellence on Clean Coal. Among of the envisaged activities, there are also the development of new CO_2 capture techniques and a pilot project for storing CO_2 in deep coal seams and underlying aquifer.

Norway		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	Yes	For Norway CCS is still a live option
Has geological storage research progressed in your country in the last 3 years?	Yes	A continuous flow of projects and reports seem to have increased the scientific knowledge base, if not improved public and industry perception
Is CGS more relevant today in your country than 3 years ago?	No	It was quite relevant also 3 years ago, situation unchanged
Are there more relevant projects/funding than 3 years ago?	No	Situation approx as before.
Other comments you may find interesting		Challenges remain to get acceptance or even perception of CCS among grassroot people and even politicians, although Norway seems to remain a CCS proactive country.but now the leading role is overtaken by other nations, like US, UK, Australia, Japan, China....

Poland		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	No	Most likely in 2020s.
Has geological storage research progressed in your country in the last 3 years?	Yes	National Programme has provided a more reliable assessment of storage potential of the country. A number of other studies followed (government and EC funded, under demo projects and CCS ready prefeasibility studies).
Is CGS more relevant today in your country than 3 years ago?	No	Seems to be less relevant.
Are there more relevant projects/funding than 3 years ago?	No	Less.
Other comments you may find interesting		Challenges remain to get acceptance or even perception of CCS among grassroot people and especially politicians.

Portugal		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	No	Not before 2030.
Has geological storage research progressed in your country in the last 3 years?	yes	During the last 3 years the first assessment of the CO_2 storage potential in Portugal was carried out (Projects Ktejo and COMET)
Is CGS more relevant today in your country than 3 years ago?	yes	CGS is still relevant. It has been difficult to convince the participation on CO_2GeoNet, due to the fact that the research bodies involved in CO_2 storage in Portugal are also part of EERA CCS, and there will be a fee for this participation, as well.
Are there more relevant projects/funding than 3 years ago?	No	
Other comments you may find interesting		

Serbia		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	Yes	There are some steps which are performed in the energy sector which show that there are some plans for CCS in Serbia.
Has geological storage research progressed in your country in the last 3 years?	Yes	Within strategy for climate change mitigation in the future decades, there are some studies related to CCS.
Is CGS more relevant today in your country than 3 years ago?	Yes	CGS mission, goal and results has been presented at different conferences, expert meetings and public lectures.
Are there more relevant projects/funding than 3 years ago?	Yes	There are several projects usually developed by foreign experts and financed by the world institutions and the Ministry of Energy and Environment protection of Serbia..
Other comments you may find interesting		

Slovakia		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	no	Due to difficult economic situation and real prices for CO_2 storage, it is impossible to suppose concrete activities in industrial scale. Moreover EUA are too low for support.
Has geological storage research progressed in your country in the last 3 years?	yes	Geological storage research really recorded progress because several projects from governmental sources have been finished (3) and two initial studies for private sector was completed.
Is CGS more relevant today in your country than 3 years ago?	yes	Certainly it is. But only in the scientific sphere. Possible spaces for storage in pilot/demo stage are assessed.
Are there more relevant projects/funding than 3 years ago?	no	
Other comments you may find interesting		Possibilities are especially in the methodology.

Slovenia		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	no	Complex geological settings (as a consequence high cost of CCS) and low political support; opportunity for pilot and niche projects;
Has geological storage research progressed in your country in the last 3 years?	yes	Necessary technical provisions better understood; basic information for professionals and general public available in national language; awareness process accelerated;
Is CGS more relevant today in your country than 3 years ago?	yes	CCS and CGS are better established than before: professionals have gained new knowledge and general public is more aware of this option;
Are there more relevant projects/funding than 3 years ago?	no	National CCS project had been finalized in 2011; no further planned CCS/CGS activities so far, predominately due to a specific economic situation in the country itself as well as restricted investments in energy sector; low political support;
Other comments you may find interesting		

Spain		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	yes	Although some industrial initiatives have been delayed and modified into a standby status, there is a very proactive community in CCS and interest is still high in some industrial and research sectors
Has geological storage research progressed in your country in the last 3 years?	yes	The pilot scale test of Hontomín is now active. 2 wells were drilled and several monitoring and hydraulic tests are being carried out. IGME has developed a complete screening of the storage potential in the country
Is CGS more relevant today in your country than 3 years ago?	no	CGS was really at a high point at that time and government support has slightly decreased now. Also some industrial sectors are now less proactive in this issue
Are there more relevant projects/funding than 3 years ago?	no	No, a lot of projects have come to an end and they have not being prolongued or substituted by others
Other comments you may find interesting		

Sweden		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	no	Storage is still not allowed in Sweden even though the intention is to allow storage off-shore in the future. However, when that future is, is not clear at the moment.
Has geological storage research progressed in your country in the last 3 years?	yes	
Is CGS more relevant today in your country than 3 years ago?	yes	
Are there more relevant projects/funding than 3 years ago?	yes	
Other comments you may find interesting		

UK		
Question	**Answer (yes/no)**	**Comments**
Is CCS a real option in the upcoming years in your country?	yes	The UK DECC announced preferred bidders in March 2013 for the UK demonstration project 'competition'. DECC will fund up to two projects. The Yorkshire-Humber project is also approaching FID, so with demo projects in the offing, CCS looks promising for the UK. UK regulations have also changed so that new fossil fuel power stations will need to be gas-fired or coal with CCS in order to meet emissions targets.
Has geological storage research progressed in your country in the last 3 years?	yes	Yes, a lot of research has been carried out covering all parts of the CCS chain funded by UK and EU funding.
Is CGS more relevant today in your country than 3 years ago?	no	CCS remains equally relevant as it did 3 years ago.
Are there more relevant projects/funding than 3 years ago?	no	Overall similar number of projects and funding to 3 years ago.
Other comments you may find interesting		

ANNEX II
MAPPING OF CGS RESEARCH FILLED UP BY INSTITUTIONS

(by alphabetic order of country)

Geologische Bundesanstalt	Geological Survey of Austria
www.geologie.ac.at Neulinggasse 38, A-1030 Vienna	Contact: Gregor Goetzl Phone: +43-1-7125674-336 e-mail: gregor.goetzl@geologie.ac.at
According to its general aims the Geological Survey of Austria (GBA) is focussing on regional to supra-regional surveys and research activities in order to provide geoscientific data for Austria in terms of maps, databases, models and reports.	
CGS Projects:	CGS Europe (7th Framework Programme) www.cgseurope.net CO2StoP (Geological Survey of Denmark and Greenland)
Fields of Expertise:	Geological Modelling Simulation Resource Assessment
Researchers involved in CGS:	2 Geoscientists
Field and Laboratory equipment	Geochemistry Laboratory Modelling Software: Gocad, Comsol Multiphysics

Royal Belgian Institute of Natural Sciences - Geological Survey of Belgium	
www.naturalsciences.be/geology Jennerstraat 13. 1000 Brussels (Belgium)	Contact: Kris Welkenhuysen Phone: +3227887654 e-mail: kris.welkenhuysen@naturalsciences.be
The Royal Belgian Institute of Belgium (RBINS) is a public federal reserach institute under the Belgian Science Policy Office. As one of its departments, the Geological Survey of Belgium (GSB) is the largest national geology knowledge repository, and a centre for national and international research. The RBINS-GSB was coordinator of the national CCS projects PSS-CCS, and is and was partner in several other CCS-related projects (GESTCO, CGS Europe, CO2StoP, ACCESS). The RBINS-GSB has recently joined the CO_2GeoNet network of excellence.	
CGS Projects:	CGS Europe (7th Framework Programme) www.cgseurope.net PhD project on geo-techno-economic uncertainties in CCS forecasting Monitoring of natural CO_2 releases in the Spa area
Fields of Expertise:	Techno-economic modelling Geological uncertainty Reservoir capacity assessment Monitoring natural CO_2 releases
Researchers involved in CGS:	2 Geoscientists
Field and Laboratory equipment	Mineralogy lab (ESEM, XRD, …) PSS III techno-economic simulator Basic CO_2 field survey equipment Permanently monitored field laboratory for CO_2 geogenic releases High-resolution field temperature loggers

Sofiiski Universitet "Sveti Kliment Ohridski"- Department of Geology & Fossil fuels (SU - GGF)	
www.uni-sofia.bg 15 Tzar Osvoboditel Blvd, 1504 Sofia, Bulgaria	Contact: Georgi V. Georgiev – Prof., Dr. Phone: +359 2 9308 252 Mobile: +359 888 038 280 e-mail: gigeor@abv.bg
The Sofia University-Department of Geology is the only Bulgarian institution which up to now performs assessment of CO_2 storage potential in Bulgaria. This detailed study, based on huge geological database (mainly numerous wells and seismic information from hydrocarbon exploration), was accomplished being BG partner in EU projects CASTOR (WP 2), GeoCapacity, CO2Stop and 2 another projects, accomplished by Worley Parson and Toshiba in common with BG Ministry of Economics and Energy	
CGS Projects:	GeoCapacity (6th Framework Programme) CGS Europe (7th Framework Programme) CO2Stop (7th Framework Programme)
Fields of Expertise:	Regional CO_2 storage assessment Site characterization Risk assessment Sedimentary Basin's analyses and modeling
Researchers involved in CGS:	3 Geoscientists
Field and Laboratory equipment	Different kind of Microscopes Equipment for Reflectance measurements Geo-Chemical laboratory BasinMod software

University of Zagreb - Faculty of Mining, Geology and Petroleum Engineering (UNIZG-RGNF)	
www.rgn.hr Pierottijeva 6, 10000 Zagreb (Croatia)	Contact: Bruno Saftić Phone: +38514605411 e-mail: bruno.saftic@rgn.hr
The Faculty conducts research in a range of sectors from soil and rock mechanics to applied geology, geophysical prospecting, drilling engineering, reservoir development and protection of environment. UNIZG-RGNF is the country representative in ENeRG (European Network for Research in Geo-Energy) and the leading CO_2 storage research body in Croatia. UNIZG-RGNF participated in four FP projects (EU GeoCapacity, CO2NetEAST, ECCO and CGS Europe) and mapped the storage potential of Croatia, Bosnia and Herzegovina and disseminated the CCS-related research results. In addition, the two PhD Theses were also completed – one by Domagoj Vulin testing the influence of thermodynamic and petrophysical parameters to storage potential assessment, and another by Iva Kolenković who conducted innovative parameter-sensitive regional mapping of deep saline aquifers.	
CGS Projects:	ECCO (7th Framework Programme) http://www.sintef.no/Projectweb/ecco/ CGS Europe (7th Framework Programme) www.cgseurope.net
Fields of Expertise:	Regional CO_2 storage capacity estimates, Site characterization Geological Modelling, Simulation
Researchers involved in CGS:	3 Geoscientists, 1 Petroleum Engineer
Field and Laboratory equipment	1 - Helium/Nitrogen porosimeter for effective porosity measurements 2 - Hassler core holder and apparatus for gas permeability measurements (i.e. to obtain corrected, Klinkenberg absolute permeability) 3 - Apparatus for measuring capillary pressure by Purcell's method

Česká geologická služba / Czech Geological Survey	
www.geology.cz Klárov 3, 118 21 Praha 1 (Czech republic)	Contact: Vit Hladik Phone: +420-543429289 e-mail: vit.hladik@geology.cz
Czech Geological Survey (CGS) is the leading geological research institution in the Czech Republic. It is a state research institute supervised by the Ministry of Environment. CGS-related research: assessemnts CO_2 geological storage potential of Czech Republic and selected potential storage sites within FP6 research projects CASTOR and EU GeoCapacity (2004-2008); coordination of CO2NET EAST – FP6 coordination action targeted at CCS knowledge sharing and awareness raising in New EU Members States and Associated Candidate Countries (2006-2009); research on CO_2 storage sites characterisation and modelling within TOGEOS – a Czech-Norwegian EEA-funded project (2009-2010); research on CO_2 storage into geological formations in the Czech Republic within a large national CCS R&D project (TIP) financed by the Ministry of Industry and Trade (2009-2013).	
CGS Projects:	CGS Europe (7th Framework Programme) - www.cgseurope.net TACR - methodologies for CO_2 storage safety barriers (national research project funded by the Technology Agency)
Fields of Expertise:	Site screening & characterization, storage capacity assessments Geological modelling Soil and soil gas geochemistry Sedimentology
Researchers involved in CGS:	5 geoscientists
Field and Laboratory equipment	Field equipment for soil gas sampling and on-site analyses Geochemical laboratory, incl. isotopic CO_2 testing Mineralogical laboratory PetroMod basin modelling SW

The Geological Survey of Denmark and Greenland **GEUS**	
www.geus.dk The Geological Survey of Denmark and Greenland Øster Voldgade 10 1350 Copenhagen K Denmark	Contact: Niels Poulsen Phone: +45 9133 3730 e-mail: nep@geus.dk
The Geological Survey of Denmark and Greenland, **GEUS**, established in 1888, is a research and advisory institute under the Danish Ministry for Environment and Energy. The main mission of GEUS comprises provision of R&D and advisory services for government agencies, local authorities and private enterprises in Denmark as well as internationally. Key scientific areas include: ground water and surface water resources, petroleum resources and subsurface energy storage/disposal, raw materials and minerals resources, geological mapping of Denmark, Greenland and the Faeroe Islands, marine geology, environmental impacts assessment, and physical & electronic data storage for the Kingdom. GEUS has conducted research pertaining to geological storage of CO_2 since 1993, being one of the European pioneers in this area. Annual turnover is about DKK 356 million (c. 48 million Euro). Governmental appropriations comprise to ca. 40-45 pct. while other public funding, mainly originating from Danish and international research programmes etc., and commercial consulting work account for the remaining ca. 55-60 pct. Current staff is about 350 full time specialists, technicians and administrative staff. Approximately 200 hold PhD or MSc degrees.	
CGS Projects:	SACS Phases Zero, 1 and 2, GESTCO, CO2NET 1 & 2 Weyburn, CCP, CO2SINK, CASTOR, CO2STORE, INCACO2, ULCOS, DYNAMIS, CO2ReMoVe, EU GeoCapacity, COACH, ECCO, AQUA DK 7th Framework Programme CGS Europe (2010-2013), CO2CARE (2010-2013), SiteChar (2011-2013), UltimateCO2 (2011-2015), TOPS (2013-2016) BIGCCS - International CCS Research Centre (2008-16) Nordic CCS Competence Centre (NORDICCS) (2012-2015). EUDP-AQUA-DK (2009-2013), CO2StoP (EC Contract ENER/C1/154-2011-SI2.611598) (2011-2013) HTF EOR, Danish High Technology Fund “(on-going). In addition GEUS is engaged in projects for the Norwegian Petroleum Directorate, the University of Oslo and GEO/MOGAS and other national / international projects
Fields of Expertise:	Storage capacity estimation, storage site characterisation and development, application of monitoring technologies to storage sites, dynamic modelling (numerical and analytical), geochemistry, enhanced hydrocarbon recovery, core analysis.
Researchers involved in CGS:	About 10-12
Field and Laboratory equipment:	Geochemical Laboratory, Laboratory for Core Analysis, Laboratory for Organic Geochemistry and Petrology. GIS Petrel (modelling), Eclipse (reservoir simulation)

Geological Survey of Finland	
www.Gtk.fi P.O. Box 97, FI-67101 Kokkola, Finland	Contact: Tuija Vähäkuopus Phone: +358294035224 e-mail: tuija.vahakuopus@gtk.fi
The Geological Survey of Finland (GTK) is a European centre of excellence in assessment, research and sustainable use of Earth resources. Our mission is to produce and disseminate geological information for industry and society that promotes systematic and sustainable use of crustal resources and the national geological endowment. Our research programmes are geared to creation of innovative technology and applications. We serve as Finland's national geoscientific information centre and participate actively in international research and project work. GTK is an agency of Finland's Ministry of Employment and the Economy.	
CGS Projects:	CCSP Finland (www.cleen.fi/en/ccsp)
Fields of Expertise:	Site characterization Geological Modelling
Researchers involved in CGS:	4 Geoscientists
Field and Laboratory equipment	High precision gravimeters Magneto - Telluric station

<table>
<tr><td>Bureau de Recherches Géologiques et minières</td><td>  </td></tr>
<tr><td>www.brgm.fr
3 av claude guillemin 45100
Orléans France</td><td>Contact: Isabelle Czernichowski Lauriol
Phone: +33 238 64 46 55
e-mail: i.czernichowski@brgm.fr</td></tr>
<tr><td colspan="2">BRGM is France's Public Institution responsible for mobilizing the Earth Sciences in the sustainable management of natural resources and the subsurface domain. It contributes advice and expert assessments to public authorities.
BRGM research and development programmes support innovation and work in the following areas: mineral resources, groundwater, development planning and natural risks, environment and pollution, environmental metrology, mapping and digital information systems. With a staff of 860 employees, BRGM is present in all the Regions of France through its network of Regional Geological Surveys and has been active for many years in more than 40 countries throughout the world.
BRGM is acknowledged within France as a leading authority on CO_2 storage and was involved in the pioneer EU Joule project twenty years ago and has been ever since partner or leader in many other CO_2 projects.
BRGM is currently coordinating two European projects: CGS Europe and Ultimate CO_2. In addition the presidency of CO_2GeoNet is held by BRGM.</td></tr>
<tr><td>CGS Projects:</td><td>EU projects:
• 3rd Framework Programme: JOULE II
• 4th Framework Programme: SACS
• 5th Framework Programme: SACS II, GESTCO, NASCENT, WEYBURN, CO2NET, CO2STORE (www.co2store.org)
• 6th Framework Programme: CASTOR, GRASP, INCA-CO2, INTAS, CO2GeoNet (www.co2geonet.eu), EU GeoCapacity (www.geology.cz/geocapacity) , CO2ReMoVe (www.co2remove.eu), ULCOS (www.ulcos.org),
• 7th Framework Programme: COMET (www.comet.lneg.pt), STRACO2, CGS Europe (www.cgseurope.net), CO2CARE (www.co2care.org), ULTIMATE CO2 (www.ultimateco2.eu), ECCSEL PPI & PPII (www.eccsel.org)
• RFCS: CARBOLAB (www.carbolab.eu)
• Eurogia+: CO2FieldLab (French and Norwegian funding) (www.sintef.no/Projectweb/co2fieldlab)

National projects:
• ANR (National agency for research): Géocarbone Picoref, Géocarbone Injectivité, Géocarbone Intégrité, Géocarbone Monitoring, Charco, CRISCO2, SOCECO2, Gaz annexes, Hétérogénéité-CO2, Proche puits, Sentinelle, CARMEX (http://carmex.brgm.fr), CO2 Dissolved, EM HONTOMIN, Hcube, CGS Microlab (www.anr-cgsmicrolab.cnrs.fr), CIPRES (http://cipres.brgm.fr), FISIC, SIGARRR
• ADEME (National agency for energy and environment): METSTOR (www.metstor.fr/), VASCO, France Nord, TGR-BF, MANAUS, SALTCO, AMIRAL, MOMECO2, IMPACT-CO2, COPTIK</td></tr>
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Fields of Expertise:	Site screening and characterization Geological Modelling Geochemical modelling Flow modelling Geomechanical modelling Coupled modelling Risk assessment Monitoring Remediation
Researchers involved in CGS:	35 full time Scientists
Field and Laboratory equipment	- Geophysics: ○ Controlled Source EM (CSEM) = 4 acquisition stations and EM emittors (with various power range) ○ Tomographic acquisition systems (ERT = Electrical resistivity tomography) for one-shot or continuous measurements with downhole electrode array ○ High resolution seismic acquisition system with surface source and downhole geophone array ○ 4 long period seismic stations ○ 2 high sensibility gravimeter CGS - Soil Gas: o Mobile infra red measurements (type LFG20 x4, type GA2000 x1), for CO_2, O_2 et CH_4 o Radon measurements by sampling (Algade) o Helium Mass spectroscopy: Continuous measurements or sampling (type Adixen) o Continuous Radon measurement probe (Barasol) o Continuous CO_2 and O_2 measurements (Gasclam) - Water : o Multiparameter probe (type Idronaut 302 (x1), Idronaut 303 (x1), Idronaut 316 (x2)) for log or monitoring of T pH, electric conductivity, Dissolved O_2, Eh. - Biology: o deep environment condition Bio-reactor

National Center for Sustainable Development [in greek "Ethniko Kentro Viosimis kai Aeiforou Anaptyxis (EKBAA)"] - Institute of Geology and Mineral Exploration	
www.igme.gr 1 Sp. Louis Str., Entrance C, Olympic Village, 13677, Acharnae, Attica, Greece	Contact: Apostolos Arvanitis Phone: +302131337242 e-mail: arvanitis@igme.gr

Institute of Geology and Mineral Exploration of Greece (G-IGME) is in fact the Geological Survey of Greece. It was established in 1952. IGME is a Legal Entity of Private Law, supervised by the Ministry of Environment and is official state adviser on geo-sciences, minerals and energy raw materials. Its main activities are the geological mapping, the general geological study of the country, the identification and assessment of minerals and energy raw materials, the research and exploitation of groundwater resources, the geoenvironmental issues, the assessment of risks from natural disasters, the climate change, the geological storage of CO_2 and the research, exploration, study and uses of geothermal energy. Its aim is to improve quality of life and environmental protection.

It is active in the research of the Geological Storage of CO_2 since 2000. It has participated in three EU projects on C.C.S. (GESTCO, NASCENT and GeoCapacity). It has acquired the necessary know-how to study the various aspects of CO_2 storage and monitoring. It has made the estimation of the potential for geological storage of CO_2 in various geological environments in Greece, Albania and FYROM. Furthermore, it has studied the Florina natural CO_2 field as an analogue of the CO_2 storage reservoirs. G-IGME has also participated in national initiatives related to geological storage as a study of the available storage options around the new power generating station using lignite planned by Public Power Corporation in Northern Greece.

In 2011, IGME was absorbed by the National Center of Environment and Sustainable Development (EKPAA) in accordance to the Ministerial Decision 25200 / 2011 (Official Gazette, 2612/B/8 November 2011) and a new legal entity called National Center for Sustainable Development (in Greek “Ethniko Kentro Viosimis kai Aeiforou Anaptyxis”, EKBAA) was established. Therefore, nowadays, IGME is a part of the National Center for Sustainable Development (NCSD or EKBAA).

CGS Projects:	CGS Europe (7th Framework Programme) www.cgseurope.net CO2StoP
Fields of Expertise:	Site characterization - CO_2 Storage Capacity Estimation - Natural Analogues - Geophysical Surveys
Researchers involved in CGS:	1 Geoscientist - In April 2013, a 10-member scientific team on CGS was established at EKBAA-IGME, but the members of this team are still inactive.
Field and Laboratory equipment	Equipment for soil CO_2 flux measurement - Portable equipment for soil CO_2 concentration measurements - Portable instrument for radon and radium measurements - Soil and Rock Mechanics Laboratory - Laboratory of Mineralogy and Petrology (XRD, XRF, SEM, DTA, RAMAN spectroscopy) - Water Analysis Laboratory - Laboratory of Paleontology, Sedimentology & Stratigraphy - Laboratory of Submarine Geology (submarine sediment analyses) - Remote Sensing Application Laboratory - Laboratory of Geophysics [gravimeters, magnetometers, kappa meter, VLF equipment, Transient Electromagnetic Device, equipment for geoelectric surveys (Terrameter, GEPS 2000, Syscal Pro Units, IPR12 receiver and transmitter TSQ 3.5 KW), Geometrics Geode 24-channel seismograph, equipment for crosshole seismic techniques, logging equipment, ground penetrating radar (georadar, GPR), geomagnetic observatory of Penteli]

Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)	
www.bgr.bund.de Stilleweg 2, D-30655 Hannover (Germany)	Contact: Franz May Phone: +495116433784 e-mail: franz.may@bgr.de
Bundesanstalt für Geowissenschaften und Rohstoffe, or the Federal Institute for Geosciences and Natural Resources (BGR) is the central geoscientific authority providing expertise to the German Federal Government. It is subordinate to the Federal Ministry of Economics and Technology. BGR was one of the founding members of CO_2GeoNet at the time of the EC contract and is now a cooperating partner of the CO_2GeoNet Association as defined by a cooperation agreement signed between the CO_2GeoNet Association and BGR. Since 2000, BGR has been examining various aspects of the geological storage of CO_2 in various locations and regions inside and outside Germany, partnered by national and foreign research institutions, geological surveys, and industry players.	
CGS Projects:	Pan-European Coordination Action on CO_2 Geological Storage - CGS Europe (7th Framework Programme) www.cgseurope.net Understanding the long-term fate of geologically stored CO_2 - ULTimateCO2 (7th Framework Programme) Techno-economic Assessment of CO_2 Quality Effect on its Storage and Transport - CO2QUEST (7th Framework Programme) Research into Impacts and Safety in CO_2 Storage - RISCS (7th Framework Programme) CO_2 Dependable Injection and Storage System Optimized for Local Valorization of the geothermal Energy Delivered - CO2DISSOLVED (cooperation with French ANR project) A multistep and regional characterization of potential CO_2 storage formations with a special focus on brine migration and leakage - CO2BRIM (national project) CO_2 Purity for Capture and Storage - COORAL (national project) Monitoring approach for geological storage of CO_2 by a hierarchical monitoring concept - MONACO (national project) Impact of bio-geochemical CO_2 transformation processes on long-term permeability development of reservoir and barrier rocks and cements - CO_2BioPerm (national project)
Fields of Expertise:	Capacity Assessment Geological Modelling Dynamic modelling (subsurface) Geochemistry (Modelling and experimental work) Geochemical and gas monitoring Geomicrobiology
Researchers involved in CGS:	about 15-20 Scientists (full-time equivalents; permanent and non-permanent staff)
Field and Laboratory equipment	Microbiological lab (molecular and cultivation-based techniques) High pressure-high temperature geochemical testing facilities Gas monitoring equipment (soil gas monitoring, atmospheric monitoring, underwater monitoring) Analytical facilities (mineralogy, fluid geochemistry, gas geochemistry)

Magyar Földtani és Geofizikai Intézet	Geological and Geophysical Institute of Hungary ESTABLISHED: 2012
www.mfgi.hu Stefánia út 14, Budapest, H-1143, Hungary	Contact: Gyorgy Falus Phone: +3612524999 e-mail: falus.gyorgy@mfgi.hu
The Magyar Földtani és Geofizikai Intézet - MFGI (integration of former ELGI and MÁFI) is a public research organism that belongs to the Ministry of National Development, Hungary. Its goal is to provide support to the Hungarian Office of Mining & Geology and other administration bodies as well as the society in the fields of geology, geophysics, mining, and climate policy. Our activities include the promotion of sustainable management of mineral and water resources of Hungary, as well as the research of the geological aspects of energy resources and the study of the processes within the Earth. MFGI has been a partner of the NASCENT, CASTOR, GeoCapacity and CO2NET EAST Projects financed by the EU 5 and 6 Framework Programme. MFGI has also participated in national initiatives related to geological storage.	
CGS Projects:	CGS Europe (7th Framework Programme) www.cgseurope.net National site screening program
Fields of Expertise:	Site characterization Geological modelling (Micro)Seismic processing and interpretation Well-log processing and interpretation Hydrodynamic simulation Hydrogeochemical simulation Geochemical lab analysis Microseismic monitoring
Researchers involved in CGS:	5 Geoscientists
Field and Laboratory equipment	Microseismic monitoring apparatus Fluid and rock geochemical lab (incl. XRD, LA ICP MS, LA ICP OES, FTIR, Gas chromatograph) Magneto - Teluric measurement equipment

Geological Survey of Ireland	
www.gsi.ies Beggars Bush, Dublin 4, Ireland	Contact: Brian McConnell Phone: +35316782850 e-mail: brian.mcconnell@gsi.ie
The Geological Survey of Ireland (GSI) is a public body, a division of the Department of Communications, Energy and Natural Resources. GSI is the national earth science agency, responsible for providing geological advice and information, acquisition of data for this purpose, and acts as a knowledge centre and project partner in all aspects of Irish geology. GSI currently participates in the following CCS-related activities: advice to Government on CCS; an Irish Sea CO_2 storage potential assessment, jointly with BGS; the CGS Europe network; funding of research into seismic monitoring of CO_2 in storage reservoirs. GSI was a partner in an all-island study of the potential for CO_2 storage in Ireland (published 2008), a study of the potential for CO_2 storage in the onshore Clare basin (publication due Feb. 2010), and the CO2StoP geocapacity assessment.	
CGS Projects:	Irish Sea CO_2 storage potential (joint GSI/BGS, nationally funded) CGS Europe (7th Framework Programme) www.cgseurope.net
Fields of Expertise:	Marine surveying Geological Modelling
Researchers involved in CGS:	2 Geoscientists (part-time, shared with other programmes)
Field and Laboratory equipment	Marine surveying vessels Onshore drilling rig

Instituto nazionale di Oceanografia e di Geofisica Sperimentale - OGS	
www.ogs.trieste.it Borgo Grotta Gigante, 42/C, Sgonico (TS), Italy	Contact: Federica Donda Phone: +39 040 2140437 e-mail: fdonda@ogs.trieste.it
OGS is a research institute financed by the Italian Ministry of University and Research. Its function is to carry applied and basic research in geology, geophysics, seismology, oceanography and marine biology, as well as to disseminate knowledge in these fields. More specific tasks are: crust and sedimentary studies, seismic methods, seismology, environmental geophysics, hydrogeology, hydrodynamics and ecology of the oceans. OGS participated and is participating or coordinating many EU programmes and projects, both in hydrocarbon exploration and monitoring and in environmental themes.	
CGS Projects:	CASTOR, IncaCO2, CO2ReMoVe, GeoCapacity, CO_2GeoNet, MoveCBM, ECCSEL1 (completed) RISCS, CGS Europe, CO2CARE, SiteChar, ECO2, ECCSEL2 (running) EERA (European initiative) Porto Tolle, SULCIS ECBM (Italian projects) Geological Storage Techniques (Italy-Algeria agreement) ECCSEL-NatLab Italy (Italian infrastructure)
Fields of Expertise:	site characterisation geological modelling deep and near surface geophysical monitoring remote sensing monitoring on-shore and off-shore monitoring impact evaluation on off-shore ecosystem
Researchers involved in CGS:	more than 15
Field and Laboratory equipment	geophysical exploration equipments aeroplane fully equipped for remote sensing monitoring benthic chambers and devices for long-term CO_2 monitoring at sea floor laboratories for marine biology calibration laboratory for sea instruments

Norwegian institute for water research	
www.niva.no	Contact: Lars G. Golmen, lars.golmen@niva.no, (+47)47890957
The Norwegian Institute for Water Research (NIVA) is a national research institute organised as a private foundation. The institute is Norway's foremost professional competence centre for environmental and resource issues relating to the field of water. NIVA carries out research and monitoring, as well as innovation and development work. NIVA plays a vital role in water resources management as a provider of research-based studies and advisory services. NIVA has a central role in providing scientifically based knowledge for policy-making on water related issues. NIVA's broad scope of competence, research expertise and extensive data collections represent an important resource for Norwegian business activities and industries, public administration on a municipal, regional and national level, and for Norwegian interests in the international arena. NIVA works both in fresh water and marine environments, often with a focus on coastal areas, and more recently with ocean energies and CCS, including participation in several EU projects. .	
CGS Projects:	CGS Europe (7th Framework Programme) www.cgseurope.net CO_2GEONET, ECO2, EERA CCS JP, FME-SUCCESS
Fields of Expertise:	Aquatic sciences, gases in water, water column monitoring, sediments, fauna, chemistry
Researchers involved in CGS:	7 Geoscientists
Field and Laboratory equipment	CO_2 chemistry lab analyses, CO_2 sensors, benthic lander equipment incubation chambers, mesocosm facilities

Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy (Polish Geological Institute – National Research Institute)	
www.pgi.gov.pl PGI-NRI 4, Rakowiecka Street 00-975 Warsaw, Poland	Contact: Adam Wójcicki e-mail: awojci@pgi.gov.pl phone: +48 22 45 92 452
Polish Geological Institute – National Research Institute, founded in 1919, manages multi-disciplinary research on the geological structure of Poland in order to use the knowledge for purposes of domestic economy and environmental protection. Besides research in all fields of modern geology, the Institute is also the geological and hydrogeological survey of Poland, securing economic stability to the country in areas of both mineral (including hydrocarbons, conventional and unconventional) and groundwater resources management, environmental monitoring, CCS and geothermal. There are the following areas of PGI research activities: - Security of Energy Supplies; - Energy and Climate; - Safe Infrastructure; - Geology and Health; - Basic Reseach; - Energy and Climate.	
CGS Projects:	Domestic research projects: National Programme “Assessment of formations and structures suitable for safe CO_2 geological storage including monitoring plans” (2008-2012/13) (http://skladowanie.pgi.gov.pl); Programme on enhanced hydrocarbon recovery for domestic oil and gas fields with the use of CO_2 injection (2011-12) (http://www.inig.pl/inst/projekty/inig-pig/index.html). (CGS) research part of the demo project of PGE Bełchatów (2009-2012) (http://www.pgegiek.pl/index.php/ccs/ccs-demonstration-plant/) and (previously) demo project of PKE&ZAK Kędzierzyn (2009-10). Participation in "CCS ready" prefeasibility studies (PGE, Tauron, etc.). CGS Europe (www.cgseurope.net); ECCSEL PP1&2 (www.eccsel.org).
Fields of Expertise:	Storage capacity estimation, storage site characterisation and development, application of monitoring technologies to storage sites.
Researchers involved in CGS:	In the National Programme up to 60 researchers were involved in various tasks (together with 5 other Polish partners) and in PGE Bełchatów demo project a dozen people involved in total.
Field and Laboratory equipment	Atmospheric and geochemical (groundwater and soil) monitoring. Geoelectric, electromagnetic, shallow seismic and gravity monitoring. Mineralogy & petrology laboratory, including SEM/EDS, XRD, XRF, CL, PL.

State Geological Institute of Dionyz Stur	
www.geology.sk Mlynska dolina 1 Bratislava Slovakia	Contact: Ludovit Kucharic Phone: ++421 259375478 e-mail: ludovit.kucharic@geology.sk
State Geological Institute of Dionýz Štúr, subordinated to the Ministry of Environment SR is a contributory organization which provides geological research and exploration at the territory of the Slovak Republic, creation of information system in geology as a component of the nation-wide information system, registration and evidence activities related to geological works performance, collecting, evidence and making available the geological works results carried out at the territory of the Slovak Republic, Central Geological Library performance, issuing and purchase of maps and professional geological publications.	
CGS Projects:	Slovakian National Project - possibilities for CO_2 storage (governmental sources - Ministry of Environment); Assessment of optimal conditions of permanent storage of CO_2 via method of mineral carbonatization;(Governmental sources)
Fields of Expertise:	Site characterization Geochemical modelling Ex situ mineral carbonation Pre-feasibility study creation
Researchers involved in CGS:	10 Geoscientists
Field and Laboratory equipment	High pressure CO_2 chamber Laboratory for testing technological properties of materials Geochemical laboratory

Geoinženiring d.o.o	
www.geo-inz.si Dimičeva 14, 1000 Ljubljana (Slovenia)	Contact: Marjeta Car Phone: +38641540709 e-mail: m.car@geo-inz.si
Geoinzeniring, a SME company is engaged in geological engineering and is one of the leading companies of its kind in Slovenia. The company's main activities comprise investigations, project designing and consulting in the areas of soil and rock mechanics, engineering geology and engineering geophysics. The modern measuring and laboratory equipment and extensive data bases enable professional staff to perform wide range of services, such as projects for infrastructure and power plants, geological and environmental hazard, water and mineral resources. Geoinzeniring is Slovenian national country representative in ENeRG (European Network for Research in Geo-Energy). It has been involved in previous international CCS related projects (CASTOR WP2.1, EU GeoCapacity, dissemination activities of CO2NET EAST, CGS Europe, CO2StoP) and acts as a leading knowledge transfer body in the country. CO_2 storage, monitoring and verification as well as utilisation of the deep subsurface is of our particular interest. Geoinzeniring has recently joined CO_2GeoNet Association.	
CGS Projects:	CGS Europe (7th Framework Programme) www.cgseurope.net CO2StoP (EC Specific Targeted Research Project) EU GeoCapacity (6th Framework Programme) www.geology.cz/geocapacity
Fields of Expertise:	Site characterization Geophysical testing Capacity assessment Monitoring
Researchers involved in CGS:	2 Geoscientists
Field and Laboratory equipment	DC resistivity equipment (1D, 2D, 3D) Seismic equipment (surface, in-hole, refraction, MASW) Rock mechanics laboratory

Instituto Geológico y Minero de España	
www.igme.es Ríos Rosas 23. 28003, Madrid (Spain)	Contact: Roberto Martínez Orío Phone: +34913495832 e-mail: ro.martinez@igme.es
Instituto Geológico y Minero de España- IGME is a public research organism that belongs to the Spanish Ministry of Science and Innovation. Its goal is to provide support to other administration bodies and to the society in general about all activities related to Earth Sciences. IGME has been a partner of the GeoCapacity Project and was also Work Package coordinator at the COMET Project, both financed by the Framework Programme. IGME has also participated in national initiatives related to geological storage, as PSE-CO_2 project and CenitCO2. IGME is also involved in the monitoring and modelling programme of the pilot test site of Hontomín, ran by the City of Energy Foundation (CIUDEN) IGME has recently joined CO_2GeoNet and it is a participant in the EERA CCS JP and founding member of the Spanish CO_2 Platform.	
CGS Projects:	COMET (7th Framework Programme) www.comet.lneg.pt CGS Europe (7th Framework Programme) www.cgseurope.net INNSONDA (National Strategy for Innovation, Innpacto Programme) PORE CO_2 (National Plan for Research and Development)
Fields of Expertise:	Site characterization Geological Modelling Simulation Gravimetry
Researchers involved in CGS:	7 Geoscientists
Field and Laboratory equipment	High pressure CO_2 chamber Rock mechanics laboratory Field Unit for Hydraulic in situ Tests High precision gravimeters Magneto - Teluric station

Natural Environment Research Council as represented by the British Geological Survey	British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
www.bgs.ac.uk British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, NG12 5GG, UK	Contact: Andy Chadwick e-mail: rach@bgs.ac.uk
Founded in 1835, the British Geological Survey (BGS) is the nation's principal supplier of objective, impartial and up-to-date earth science information and expertise. The BGS is a component part of the Natural Environment Research Council (NERC), the UK's leading body for basic, strategic and applied research and monitoring in the environmental sciences. Our annual budget is in the region of £45 million (US$73 m), a little over half of which comes from the UK government's Science Budget, with the remainder coming from external commissioned research. BGS has undertaken research on CO_2 storage since 1992. Its carbon dioxide storage research team consists of staff with an extensive range of skills including storage capacity estimation, storage site characterisation and development, predictive flow modelling, application of monitoring technologies to storage sites, analysis of geochemical and geo-mechanical processes, storage project reviews, regulatory and policy advice.	
CGS Projects:	CO2CARE (7th Framework Programme) http://www.co2care.org/ CGS Europe (7th Framework Programme) www.cgseurope.net CO2STOP (7th Framework Programme) BIG CCS (CEER scheme funding) http://www.sintef.no/projectweb/bigccs/ ULTimate CO2 (7th Framework Programme) http://www.ultimateco2.eu/ UKSAP (ETI funded) http://www.co2stored.co.uk/home.php RISCS (7th Framework Programme) http://www.riscs-co2.eu/ SiteChar (7th Framework Programme) http://www.sitechar-co2.eu/ CRIUS (NERC funded) http://homes.esc.cam.ac.uk/crius/home QICS (Nerd funded) http://www.bgs.ac.uk/qics/aims.html + several other national / international projects
Fields of Expertise:	Storage capacity estimation, storage site characterisation and development, application of monitoring technologies to storage sites, dynamic modelling (numerical and analytical), analysis of geochemical and geomechanical processes
Researchers involved in CGS:	Up to 40 geoscientists
Field and Laboratory equipment	High temperature and pressure laboratory experienced in CO_2 storage Transport properties research laboratory Rock mechanics laboratory Mineralogy including SEM , XRD, XRF etc Shallow/surface/atmospheric monitoring (flux meters, mobile IR, flux tower etc)