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## CCS Directive transposition into national laws in Europe: progress and problems by the end of 2011

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### Abstract

The EU CCS Directive transposition process and related issues in 26 European countries, comprising 24 EU member states, Norway and Croatia were studied in the EU FP7 project: “CGS Europe” in 2011-2012. By the end of 2011 the transposition of the Directive into national law had been approved by the European Commission (EC) in Spain only, but had been approved at national/jurisdictional level in 12 other countries (Austria, Denmark, Estonia, France, Greece, Ireland, Italy, Latvia, Lithuania, the Netherlands, Slovakia and Sweden) and two regions of Belgium. By January 2012, the European Commission had assessed and approved national submissions of CCS legal acts transposing the Directive in Denmark, France, Italy, Lithuania, Malta, the Netherlands and Slovenia. Implementation in the UK was completed in February 2012 and by end March 2012, implementation at national level was also complete in Bulgaria, Czech Republic, Portugal and Romania.

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Belgium, Croatia, Finland, Germany, Hungary, Norway and Poland had not finished the transposition of the CCS Directive by end March 2012. The process had been complicated by ongoing political debates in Norway, public opposition in Germany and ministerial elections in Poland. More than 20 operating, developing and planned CCS pilot and demonstration projects have been identified in nine European countries. Storage capacity was estimated by CGS Europe project partners as “sufficient at national level” in 17 countries.

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## 1. Introduction

Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide was published on 5 June 2009, and entered into force on 25 June 2009. This directive established a legal framework for the environmentally safe geological storage of carbon dioxide (CO<sub>2</sub>) to contribute to the fight against climate change. In article 39: “Transposition and transitional measures”, it is stated that “Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 25 June 2011”, that they “shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive” and they “shall ensure” that storage sites “are operated in accordance with the requirements of this Directive by 25 June 2012” [1].

The aims of this article are to:

- Give an overview of the progress towards, and results of, the transposition of the CCS Directive into national laws up to spring 2012.
- Describe issues that emerged during the transposition process in 26 European countries.
- Compare the situation after the deadline for transposition (25 June 2011) in different EU member states, to reveal country-specific and generic issues.
- Make a comparative analysis of the transposition process in Europe taking into account different geological, political and financial situations, various levels of research and technological development, and differences in public awareness and acceptance of CCS technology.

The study was undertaken because it was felt that comparison of the problems and progress in the CCS regulatory process in different countries would aid understanding of driving forces, barriers and prospects for implementation and regulation of CCS technology at both the national and international levels.

## 2. Data and methods

Status, progress and problems in the CCS Directive transposition process were monitored in all countries participating in the EU FP7 “CGS Europe” project at the end of January, end of April, and September-December 2011 and were updated in spring 2012. In most cases, data were collected by the participants in cooperation or consultation with the national legal authorities responsible for the Directive transposition.

The question of whether sufficient storage capacity was likely to be present in participants’ countries was also examined. Estimation of storage capacity as sufficient, insufficient or absent is based on the results obtained, or approach used, in the FP6 “EU GeoCapacity” project. In this project, CO<sub>2</sub> storage capacity was estimated using common principles and formulae, and calculated capacity was compared with national large industrial point source annual emissions (from point sources emitting >100 000 tonnes CO<sub>2</sub> per year) [2]. In the present study CO<sub>2</sub> storage capacity is described as sufficient if reported conservative estimates of storage capacity are large enough for storage of national emissions from large industrial point sources for 25 years or more.

### 3. Results

#### 3.1. Progress in CCS directive transposition up to spring 2012

**January 2011:** The pioneering work in CCS legislation in the EU was undertaken by the UK, which started the process in 2008 by implementation of the UK Energy Act shortly before the CCS Directive was issued. The UK Energy Act established a regulatory framework for offshore CO<sub>2</sub> storage, but also provided sufficient flexibility to transpose the CCS Directive [3].

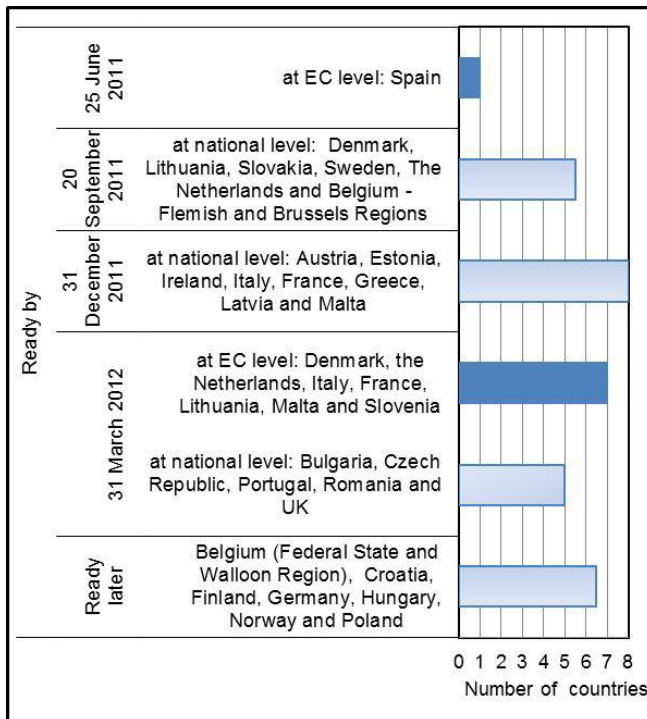


Fig. 1. Readiness of CCS Directive transposition at national and European Commission levels in 27 countries (the transposition for Malta is shown, but this country was not covered in the CGS Europe survey)

A further 15 EU countries and Norway started work on transposition of the CCS Directive in 2009-2010. The Directive is typically transposed through new laws and/or amendments of existing regulations. Among the 26 countries, only Spain reported their readiness for the full transposition of the CCS Directive at the beginning of 2011 (the relevant law was published by the Official State Bulletin on December 29th 2010) and transposition in Spain was acknowledged by the EC before their deadline for transposition, 25<sup>th</sup> June 2011 (Fig. 1).

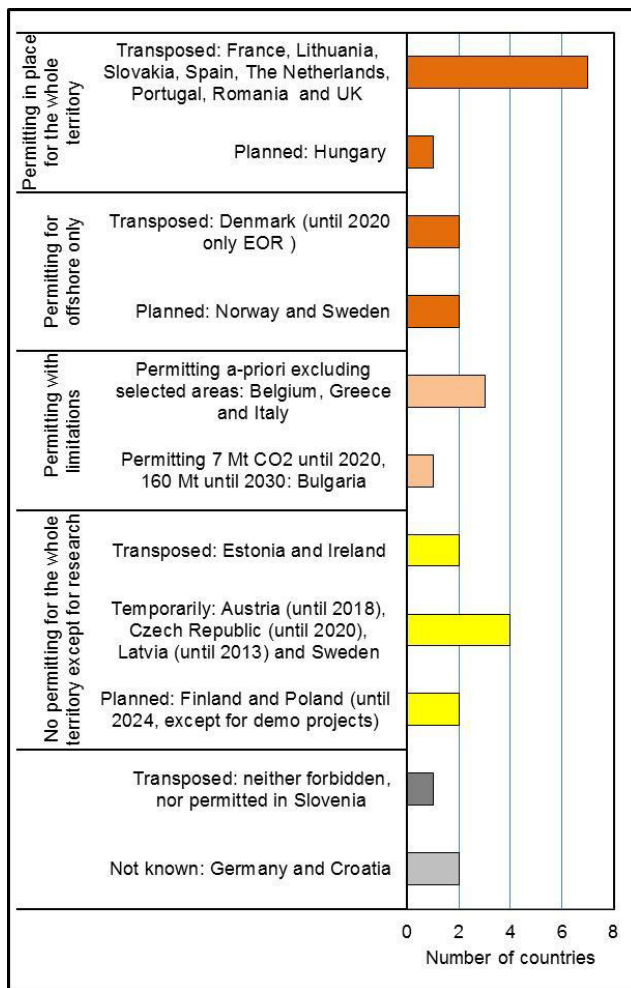
**June 2011:** Denmark (24/05/2011) and Sweden (22/06/2011) reported their readiness at national level before the deadline (25th June 2011). Denmark and Sweden decided to temporarily ban CO<sub>2</sub> storage, Denmark banned onshore storage until 2020 to gain more experience from on-going projects and Sweden did so in order to meet the deadline and to have enough time for preparation of regulations permitting offshore storage. Nine of the Member States studied (Austria, Belgium, Denmark, Finland, France, Ireland, Latvia, Lithuania, and the

UK) had communicated partial transposition measures to the EC and 13 countries (Bulgaria, Czech Republic, Estonia, Germany, Greece, Italy, Hungary, The Netherlands, Poland, Portugal, Slovakia, Slovenia and Sweden) had not communicated any progress towards transposition before the deadline. The governments of Romania (29/06/2011) and Lithuania (28/06/2011) completed the transposition of the CCS Directive at national level in June 2011, very shortly after the deadline.

**July-December 2011:** Early in this period, Romania informed the EC about transposition of the CCS Directive, while all other 25 EU member states including Lithuania received letters from the EC in July 2011 with formal notice about non-communication infringement procedures.

During this period Slovakia (12/07/2011), Italy (01/08/2011) and The Netherlands (10/09/2011) completed the CCS Directive transposition at the national level.

After consideration of the relevant published Romanian law, the EC found it incomplete and Romania received formal notice of non-communication infringement procedures in November 2011.



laws published and submitted to EC (transposed) and in draft legislations (planned) in the studied countries

By the end of 2011 the transposition of the Directive into national law was approved by the European Commission (EC) in Spain only, although it was indicated to be ready at national/ jurisdictional level in 13 countries (Austria, Denmark, Estonia, France, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Slovakia, Sweden and The Netherlands) and two regions of Belgium (Fig. 1).

**Spring 2012:** Early in 2012 Romania published additional laws (according to EC requirements). Bulgaria, Portugal, Slovenia and Czech Republic transposed the CCS Directive at the national level and the UK finalised their national transposition process (Fig. 1).

In January 2012 the European Commission had assessed further transpositions of CCS Directive, and seven more countries (Denmark, the Netherlands, Italy, France, Lithuania, Malta and Slovenia) were accepted to have fully communicated their transposition mechanisms to the Commission.

The remaining investigated countries (Belgium: Federal State and Walloon Region, Croatia, Finland, Germany, Hungary, Norway and Poland) had not finished national transposition of the Directive by spring 2012 (CCS laws had not been published at the time of submission of this publication). Consequently, the process of transposing the CCS Directive into national law and the assessment by the EC

of whether the relevant national laws properly transpose the Directive is still on-going in 2012 (Fig. 1).

### 3.2. Permitting or prohibiting CO<sub>2</sub> storage

As a result of the on-going transposition process, CO<sub>2</sub> storage is now permitted in eight of the studied countries (France, Lithuania, Portugal, Romania, Slovakia, Spain and the Netherlands) and is planned to be permitted in Hungary (Fig. 2). Only offshore storage is likely to be permitted in the near future in the UK. Offshore storage mainly for EOR, is permitted in Denmark before 2020; onshore storage in Denmark is banned until 2020. CO<sub>2</sub> storage is permitted excluding seismic areas in Italy, permitted except in selected areas (without storage capacity) in Belgium, and excluding areas where the storage complex extends beyond Hellenic territory in Greece. CO<sub>2</sub> storage is permitted with limitations in Bulgaria (storage of up to 7 Mt CO<sub>2</sub> until 2020 and 160 Mt CO<sub>2</sub> until 2030). CO<sub>2</sub> storage is temporarily forbidden in Austria (until 2018), Latvia (until 2013), Sweden, and the Czech Republic (until 2020). CO<sub>2</sub> storage is forbidden except for research and development in Estonia and Ireland. CO<sub>2</sub> storage is planned to be forbidden in Finland, and in Poland, except for demonstration projects (until 2024). The situation was still unclear in Germany, as two versions of the Climate Bill have been rejected to date and its new edition is still under discussion in the German Government. CO<sub>2</sub> storage is neither forbidden nor permitted in Slovenia. In all the countries where CO<sub>2</sub> storage is forbidden, or planned to be forbidden, the exception from Article 2 of the Directive is usually included for activities “with a total intended storage below 100 kilotonnes, undertaken for research, development or testing of new products or processes”, and requirements to newly constructed power stations to be “capture ready” with planned transportation and storage site (which in these cases will have to be transboundary).

## 4. Issues around transposition of the Directive

### 4.1. Storage capacity and conflicts of interest

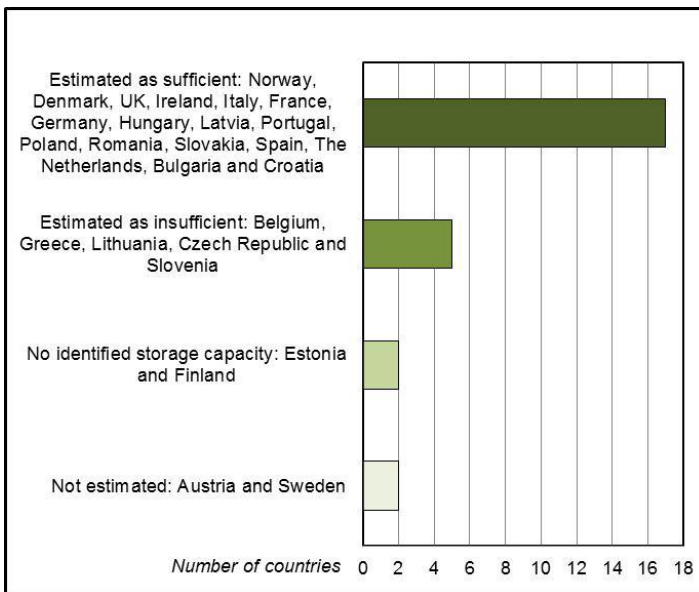


Fig. 3. Sufficiency estimation of CO<sub>2</sub> storage capacity in the studied countries

Estimates of CO<sub>2</sub> storage capacity were undertaken in the studied countries in the EU FP5 GESTCO project, EU FP6 Geocapacity project and also in independent national projects in some countries [1, 4-6]. The EU Geocapacity project estimated European storage capacity to be conservatively 127 Gt CO<sub>2</sub>, comprising 97 Gt in saline formations, 20 Gt in hydrocarbon fields and 1 Gt in coal seams [2]. Storage capacity was estimated by the CGS Europe project partners as “sufficient at national level” in 17 countries (Fig. 3). The Norwegian partners in this project consider that Norway could potentially offer capacity to other countries for cross-border storage [7]. Storage capacity

was estimated as “insufficient” in five countries, as “not identified” in Estonia and Finland and “not yet estimated” in Sweden and Austria.

The CCS Directive includes the right of Member States not to allow any storage, or to give priority to any other use of the underground [1]. After transposition of the Directive into national laws, CO<sub>2</sub> storage capacity has been variably considered as a geological resource which either has equal priority for exploitation relative to other resources (as in Spain and France), or has lower priority for exploitation (Poland, Slovakia, Portugal).

The CCS Directive states that Member States should ensure that no conflicting uses are permitted on the storage site during the period of validity of the exploration and storage permits [1]. Many countries reported that they have, or could have, conflict of interests between CCS and other legitimate activities. The most commonly cited conflicts of interests reported are with hydrocarbon exploration and production, drinking water, natural gas storage and geothermal resources.

The CCS regulations in most countries do not usually allow overlap between existing hydrocarbon production licences and CCS licences although there are exceptions (e.g. Spain, Lithuania). However, if a hydrocarbon field is in a state of depletion, many countries allow CO<sub>2</sub> storage combined with CO<sub>2</sub> injection as an enhanced hydrocarbon recovery technique. The production of other mineral resources could result in conflict of interests with CCS if within a comparable depth range, or deeper than the CO<sub>2</sub> storage complex. Shallow use of the subsurface is not necessarily an obstacle to CO<sub>2</sub> storage and vice versa. Geothermal applications present a possible conflict of use of saline aquifers; this is particularly the case for onshore aquifers at present, but could also apply to offshore aquifers in the future. However, interactions with geothermal projects are not necessarily negative. A number of studies have been published worldwide proposing the combined use of geothermal exploitation and CGS in the same place [8].

#### 4.2. National Policy in CCS and financial matters

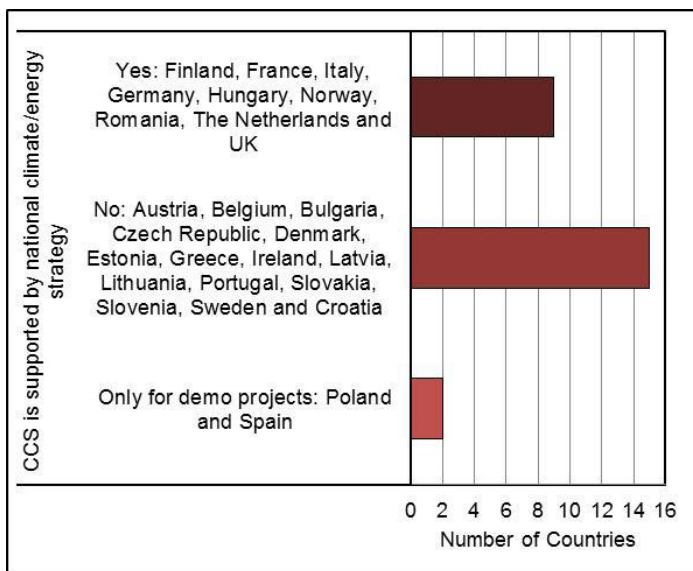


Fig. 4. Availability of CCS in national energy and climate strategy in the studied countries

In 2011 CCS was included in national energy/climate strategy/policy of nine of the studied countries (Fig. 4), while Poland and Spain reported that their policy in CCS would be only to allow planned demonstration projects. There was no reported strong CCS policy in the climate and energy strategic plans of the other countries studied.

The United Kingdom has one of the most proactive CCS policies in Europe, indeed in the world. Political support for CCS began in 2002 in the Energy Review. At present there is shared political agreement on CCS deployment in the UK with government commitment to fund four demonstration projects. Consequently on 03 April 2012, UK Energy and Climate Change Secretary Edward

Davey launched a new CCS Commercialisation Programme, including GBP 1 billion of capital funding to support commercial-scale CCS with a view to enabling commercial deployment 'in the 2020s'.

In Germany, in 2010, CCS technology was included in the German Federal Government's Energy Strategy which included ambitious reduction targets for greenhouse gas emissions for the period 2020-2050. Two demonstration CCS projects were to be built by 2020 and further export of CCS technology to developing countries, as well as application of CCS in the steel and cement industry sectors were mentioned in the German strategic plans. However, implementation of the CCS Directive in Germany ran into difficulties. Two versions of CCS Bill have already been rejected by Parliament several times since 2009. One of the reasons for this is the opposition of the Green Party in Germany, which have a much stronger position in Germany than in the UK [9].

Italy, France and The Netherlands provide examples of countries that have CCS plans in their energy and climate policies and which finished national transposition in 2011. Their transpositions were accepted by the EC in January 2012. Slovakia and Lithuania, both countries without strong CCS objectives, published CCS laws in their countries in August and September 2011 respectively, and Lithuanian CCS regulations were accepted by the EC in January 2012.

Financial problems related to the possible implementation of CCS technology were reported by 8 countries (Denmark, Estonia, Greece, Hungary, Italy, Latvia, Poland and Slovakia). On the other hand, government financial and/or political support and industrial support for CCS demonstration projects are presently available in France, Germany, Italy, the Netherlands, United Kingdom, Norway, Romania, Poland and Spain. By the end of 2011 several pilot- or demonstration-scale CO<sub>2</sub> capture plants were operating and a number of full chain CCS demonstration projects were planned in Europe. Six of these projects were selected in 2009 by the European Energy Programme for Recovery (EEPR) for European co-funding. 13 projects from seven countries (including 4 projects supported by EEPR) were submitted in 2011 for NER 300 funding. Only 11 of 13 projects submitted took part in the competition, because one of the seven submitted by the UK (Longannet) is no longer supported by the UK government, and Jämschalde project was withdrawn by Vattenfall because of the problems with the Directive transposition in Germany. In July 2012 the European Commission selected 8 CCS projects to be candidates for the NER 300 award decision (4 UK projects, Belchatow CCS Project, Poland; Green Hydrogen The Netherlands; Porto Tolle, Italy and ULCOS-BF, France) and two projects were left in the reserve list (Getica CCS Demo Project, Romania and Peterhead Gas CCS Project, UK) [10].

## 5. Conclusions

- Many of the European countries made significant progress towards implementation of CCS technology through a national climate and energy strategy, research, transposition of the CCS Directive into national law and development of pilot and demonstration projects. However, the transposition process met various barriers and problems in a number of European States and the ongoing economic crisis presented challenges.
- By the end of 2011 the EC had confirmed the full transposition of the CCS Directive into national law only in Spain. However, by the beginning of 2012, an additional seven countries were considered by the EC to have successfully transposed the Directive (Denmark, the Netherlands, Italy, France, Lithuania, Malta and Slovenia). In spring 2012 other 12 countries (Austria, Bulgaria, Czech Republic, Estonia, Greece, Ireland, Latvia, Slovakia, Sweden, Portugal, Romania and UK) were waiting for assessment by the EC of whether the relevant national laws properly transpose the Directive. Two regions of Belgium, Croatia, Finland, Germany, Hungary, Poland and Norway continued their transposition process after March 2012.

- The countries with the most advanced level of CCS research and technology, CCS plans included in their energy and climate strategies, and which are supporting or planning to support pilot and demo projects (Germany, UK, Norway, France, The Netherlands and Italy) did not finish transposition before the EC deadline. Among these countries Italy, France and The Netherlands completed transposition at national level in 2011, while Germany and Norway postponed it to 2012. The situation in the UK regarding implementation of CCS is one of the most promising in Europe, considering the decision on governmental financial support of one billion pounds for demonstration projects published in December 2011 and several ongoing actions towards implementation of CCS technology in the country. However only offshore storage is likely to be permitted in the near future in the UK.
- The strong influence of Green parties and NGOs, and their ability to involve the public in debates, may have negatively influenced the transposition process in Germany, and may have contributed to a ban on onshore storage in Denmark until 2020, and abandonment of the plans for onshore demonstration projects in both Denmark (Nordjylland Coal Power Station) and Germany (Jämschwalde Lignite Power Station).
- Eight countries prohibited or are planning to prohibit CO<sub>2</sub> storage permanently in their territory, except for research purposes (Estonia, Ireland and Finland), or temporarily (Austria, Czech Republic, Latvia, Poland, and Sweden). Belgium, Greece and Italy do not permit storage in some selected areas, and Denmark banned onshore storage until 2020. Several countries took measures to prohibit CO<sub>2</sub> storage temporarily in order to wait with large scale deployment of CO<sub>2</sub> storage technology in their territories (Austria and Czech Republic), or by limiting the amount of permitted for storage CO<sub>2</sub> (Bulgaria), and to see the results of the demonstration projects (Poland).
- In the studied countries CO<sub>2</sub> storage capacity was estimated as sufficient in 17 countries, insufficient in five countries, and no capacity was found in two countries (Estonia and Finland). No estimations are reported by Austria and Sweden.
- In summary therefore, it is clear that the speed with which the CCS Directive was transposed into national laws in the 26 studied European countries depends on different national conditions and problems, but does not directly correlate with national policy respect to CCS, financial situation or storage capacity. It seems that it is rather a specific combination of all these factors that influences the political climate in which such strategic decisions are to be taken.

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