

# Member States report on Implementation of Directive 2009/31/EC on the geological storage of carbon dioxide (“CCS Directive”)

## Portugal Report – 2023

### Changes, reviews and updates of national implementation legislation

#### 1. Are there any changes to national legislation, permitting system or competent authorities that have taken place since the last report on implementation of the CCS Directive in your country?

No. PT is still in the assessment phase; investigation projects being conducted by investigation institutions (see questions 16 & 17) for the purpose of:

- identification, characterization and capacity of potential geological areas/sites for storage, its risks and costs;
- Assess the options for CO<sub>2</sub> transport and related risks and cost involved.

No permits for CCS activities have been given in Portugal.

The Portuguese legislation for geological storage of carbon dioxide activity is Decree-Law 60/2012, of 14<sup>th</sup> March (DL 60/2012), and establishes the legal framework to this activity. This law results from the transposition of the EU Directive 2009/31/CE - Geological Storage of Carbon Dioxide. Subsidiary, Decree-Law 30/2021, of 7<sup>th</sup> May, also is applied.

DGEG is the Portuguese Competent Authority for the CO<sub>2</sub> exploration/storage activities licensing and regulation, being responsible for the supervision and compliance of the respective legislation in what concerns geological CO<sub>2</sub> storage permits.

Other issues related, namely Greenhouse Gases Emissions and Environmental Impact Assessment, are under competencies of Agência Portuguesa do Ambiente (APA), the Portuguese Environmental Agency.

#### 2. Are there processes in place for storage permit applicants to engage pro-actively with the competent permitting authorities regarding relevant applications? If yes, please provide details.

Not yet, these are being developed internally in case of future permit applications.

#### 3. Please provide the name, email address and telephone of the contact point at the competent authority responsible for fulfilling the duties established under the Directive.

José Miguel Martins ([jose.martins@dgeg.gov.pt](mailto:jose.martins@dgeg.gov.pt))

Telephone number: +351 217922790

Mariana Martinho ([mariana.martinho@dgeg.gov.pt](mailto:mariana.martinho@dgeg.gov.pt))

Afonso Martins ([afonso.martins@dgeg.gov.pt](mailto:afonso.martins@dgeg.gov.pt))

**4. Are there any issues that the competent authority would like to discuss with other competent authorities in relation to the practical implementation of the Directive and in particular the national permitting procedures in the Information Exchange Group under the auspices of Article 27(2)?**

No, not at the present situation. Through the IEG, PT has been informing on the country development of CCUS.

#### **Selection of areas for storage sites (Article 4)**

**5. Which areas are determined from which storage sites may be selected pursuant to Article 4(1) until April 2023?**

None in particular. Potential geological areas, onshore and offshore, have been partially identified/characterized through investigation projects (see questions 16 and 17) but, under article 4 of DL 60/2012, no areas have been, so far, established for CCS activities.

**6. Will additional areas be determined from which storage sites may be selected in the period until the next report at the end of 2027, if so, which geological type of areas are considered (e.g, saline aquifers, depleted or not depleted gas & oil fields, mafic rocks) from a geological point of view and what are the next steps?**

See questions 16 & 17. Assessment has being developed, so far, only under investigation projects conducted by investigation institutions, mainly in saline aquifers and mafic rocks. PT has no identified gas & oil fields and never had exploitation of oil & gas.

**7. Are there information about environmental and/or health risks relating to the geological storage of CO2 in accordance with the applicable Community legislation available to the public?**

No. No permits have been so far requested or attributed for exploration/storage, under articles 12 to 16 of DL 60/2012. Under portuguese law, EIA is foreseen to be applied for geological storage permitting (concession, under portuguese legal terminology and configuration).

#### **Exploration permits (Article 5)**

**8. Are there areas or specific sites where no exploration permits are required to generate the information necessary for the selection of storage sites, pursuant to Article 5?**

Portugal had Oil & Gas exploration for 8 decades and substantial deep subsurface data has been generated to allow development of investigation projects to generate some important information about potential storage sites, onshore and offshore (see questions 16 & 17). Nevertheless, until a pilot project is tested in the field or an exploration permit is granted for field application, all information is conceptual.

PT had no oil & gas exploitation to generate information about depleted oil & gas fields.

**9. How many exploration permits have been given pursuant to Article 5 since your last reporting?**

None.

#### **Storage permits applications (Article 10)**

**10. Member States shall make the permit applications available to the Commission within one month after receipt. Are there any plans of potential operators to apply for storage permits pursuant to Article 7? If yes, please provide an approximate timing.**

No, not at present. No permits for CCS activities have been requested/attributed.

#### **Third-party fair and open access (Article 21)**

**11. What measures – if any – have been taken to ensure that potential users are able to obtain fair and open access to transport networks and to storage sites for the purposes of geological storage of the produced and captured CO<sub>2</sub> (Article 21)**

PT has implemented the necessary measures in portuguese law by including those measures in Articles 40<sup>o</sup> and 41<sup>o</sup> of DL 60/2012.

**12. Are you aware that prospective transport operators and/or storage operators have refused access to their facilities on the grounds of lack of capacity?**

No, no exploration/storage permits have been given in PT.

**13. What measures – if any – have been taken to ensure that the operator refusing access on the grounds of lack of capacity or a lack of connection makes any necessary enhancements as far as it is economic to do so or when a potential customer is willing to pay for them? (Article 21)**

PT has implemented the necessary measures in portuguese law by including those measures in Articles 40<sup>o</sup> and 41<sup>o</sup> of DL 60/2012.

#### **Transboundary cooperation (Article 24)**

**14. Is there any experience or plans for transboundary CO<sub>2</sub> transport or CO<sub>2</sub> storage sites or storage complexes? Please provide details on the status of preparations, if any.**

No. In Portugal, there are still no transport of CO<sub>2</sub> or transboundary storage sites/infrastructures.

#### **CO<sub>2</sub> capture readiness (Article 33)**

**15. How many combustion plants with a rated electrical output of 300 MW or more have received a permit since the last implementation report? What was the outcome of the assessment under Article 36 of Directive 2010/75/EU? In case of negative assessment, have the combustion plants set aside suitable space irrespectively? Please provide detail for each permit according to Annex 2.5**

None.

## Further questions

### 16. What other national programmes are in place or planned to support research, demonstration and deployment of CCS?

CO<sub>2</sub> capture studies have been conducted at academic level, although with the participation of industry, energy production stakeholders.

The first research study on CO<sub>2</sub> transport in Portugal was the EU FP7 Project **COMET**<sup>1</sup> (2009-2013), which sought to define an integrated transport and storage infrastructure in Portugal, Spain and Morocco. The project involved most of the major CO<sub>2</sub> emitters in Portugal at the time, from the energy production and industry sectors, and has studied a pipeline network for CO<sub>2</sub> transport considering the cost optimization of the whole CCS chain. COMET provided the first integrated approach to the cost-effectiveness of CCS in the Portuguese context. The project also included an assessment of the viability of CO<sub>2</sub> transport by ship.

Project **KTEJO**<sup>2</sup> (2010-2011) assessed the technical-economic viability of retrofitting the Pego coal power plant, the second largest in the country at the time, by evaluating potential geological onshore and offshore areas/sites for CO<sub>2</sub> storage. This power plant has been decommissioned meanwhile and no other coal power plants remain in Portugal.

Within the scope of the KTEJO and COMET projects, systematic analysis of the storage capacity in deep saline aquifers was conducted at the regional scale, resulting in effective storage capacity estimates of up to 7.6 Gt of CO<sub>2</sub>, the vast majority (above 90%) of which in offshore environments. Storage capacity in the Douro coal basin was also studied at University Fernando Pessoa<sup>3</sup>.

The project **CCS Roadmap for Portugal**<sup>4</sup> (2013-2015) was co-funded by the Global CCS Institute. It looked on the role that CCS could play in decarbonising the country's energy and industry sectors. It also considers cost-effectiveness of CCS deployment, and the potential risks and benefits for economic development. At the time, an 80% GHG national reduction target seemed enough to make CCS cost-effective technology from 2030, for the cement sector, but not for others, most remarkably for the energy production sector. It was also found that in Portugal onshore CO<sub>2</sub> storage offered the lowest costs solution, but also that offshore capacity was larger and its utilisation politically more feasible.

Finally, the Horizon 2020 Coordination and Support Action **STRATEGY-CCUS**<sup>5</sup> (2019-2022), that aimed to develop strategic plans for CCUS development in 8 regions of Southern and Eastern Europe. One of the regions addressed and studied in more detail, was the Lusitanian Basin in Portugal, which includes about 42% of the major fixed CO<sub>2</sub> emission sources of the country, spanning from the Leiria-Figueira da Foz axis to the Lisbon industrial region. This project revisited

---

<sup>1</sup> Boavida, D., Carneiro, J., Tosato, G., Martinez, R., Van den Broek, M., Gastine, M., (2013) COMET Final report, Integrated infrastructure for CO<sub>2</sub> transport and storage in the west Mediterranean. Laboratório Nacional de Engenharia e Geologia. Lisboa, pp. 58.

<sup>2</sup> Tejo Energia (2011) Estudo de viabilidade da captura e armazenamento de CO<sub>2</sub> na central termoelétrica do Pego. Relatório final técnico-científico. Tejo Energia. Lisboa. 130 pp.

<sup>3</sup> Rodrigues, C & Dinis, Maria & Sousa, M.J.. (2013). Unconventional coal reservoir for CO<sub>2</sub> safe geological sequestration. International Journal of Global Warming. 5. 46. 10.1504/IJGW.2013.051481.

<sup>4</sup> Final report available at <https://www.globalccsinstitute.com/archive/hub/publications/192613/carbon-capture-storage-community-portuguese-language-countries-opportunities-challenges.pdf>

<sup>5</sup> Information and Reports available at the Project website <https://www.strategyccus.eu/>

the Portuguese storage sites' capacity and properties and examined potential CO<sub>2</sub> transport solutions in three phases of increasingly captured volumes – for CCS, but for CCU needs as well, i.e. production of fuels based on renewable hydrogen. This work was supported by detailed energy-emissions modelling and scenarios and by economic analysis. The results suggest that CCUS is essential for the carbon neutrality goal of the country. CCS is required only in final phase approaching 2050, from a national point of view. However, from the point of view of specific industries, such as cement, lime, glass, and ceramics, it may be useful for reducing the carbon footprint of their products, although *not* cost-effective at the projected ETS licence prices.

**17. Are there any ongoing national or European research projects that may have relevance to the Directive?**

The **InCarbon**<sup>6</sup> Project, funded by national sources FCT and FEDER, intends to assess the potential of CO<sub>2</sub> storage in mafic / ultramafic rocks from Alentejo, captured by industrial sources, namely those present in the region of the Industrial cluster of Sines.

The Horizon 2020 **PilotSTRATEGY** Project<sup>7</sup> – “CO<sub>2</sub> Geological Pilots in Strategic Territories” is a follow-up project to STRATEGY-CCUS. It intends to improve the characterization of potential sites for pilot CO<sub>2</sub> injection facilities in geological formations, compatible with the transport and storage schemes developed by STRATEGY-CCUS. It includes the preparation of preliminary engineering studies that provide technical and scientific support necessary for a final decision on the financing of pilot CO<sub>2</sub> storage facilities in geological formations of three regions, including the Lusitanian Basin.

**18. Are there other plans to support further appraisal of CO<sub>2</sub> storage sites, to prepare for CO<sub>2</sub> transport infrastructure or for CO<sub>2</sub> hubs and clusters?**

Not yet. Portugal is currently assessing needs, challenges and tasks involved in the implementation of transport infrastructure/hubs and clusters.

---

<sup>6</sup> *Carbonatação in-situ para redução de emissões de CO<sub>2</sub> de fontes energéticas e industriais no Alentejo*, Project PTDC / CTA-GEO / 31853/2017. Information available at <https://www.uevora.pt/investigador/projetos?id=3822>

<sup>7</sup> Information available at the project website <https://pilotstrategy.eu/>

**Member States are encouraged to include in their updated NECPs the efforts planned to enable their industries to capture and store their inherent process emissions permanently in geological storage sites, in accordance with Directive 2009/31/EC.**

The NECP 2030 is currently under revision by the Portuguese Authorities, in parallel with the Carbon Neutrality Roadmap 2050. These revisions are supported by refreshed national energy-emissions modelling and scenarios, that include the assessment of the role of CCS.

**Box 6: Setting objectives, targets and contributions for carbon capture and storage.**

**Annual aggregated projection of inherent process emissions that will have to be abated through CO<sub>2</sub> capture**

Not yet available/under study.

By large, the process emissions are related to the Cement & Lime sector. But all the Portuguese manufacturers have declared ambitious goals towards carbon neutrality by 2050 and sketched strategies to reduce emissions, including process emissions. This includes processes and technologies to compensate process emissions besides CCS, such as recycling products, storing CO<sub>2</sub> in the products themselves, etc. As these are viewed as post-2040 strategies, it is still unclear what CCS levels will be needed after all. In any case, they are likely to be in the range 1 to 3 Mton per year.

**Annual biogenic and direct air CO<sub>2</sub> that will be available for geological storage of CO<sub>2</sub>**

Not yet available/under study.

The current national modelling and scenarios being developed at the Portuguese Directorate-General for Energy and Geology suggest that, in the long term, 90% of the biogenic CO<sub>2</sub> will be directed to the fabrication of synthetic fuels based on renewable hydrogen. Then the amounts available for CCS would be under 1 Mton per year by 2050. It is remarked that this BECCS mechanism would be initiated only after 2040, as it is not found to be required sooner for a consistent path towards carbon neutrality.

**Geological CO<sub>2</sub> storage capacity that can be made operationally available annually**

Not applicable/under study.

The national potential is estimated at 7 600 Mton, by Project STRATEGY CCUS, however no capacity is currently operational. In fact, the country it still at the stage of improving storage characterisation, cf. project PilotSTRATEGY and the answer to question 17.

**Annual CO<sub>2</sub> storage capacity that may become available at the end of exploitation of hydrocarbon reservoirs**

Not Applicable, there are none exploited.

**Planned CO<sub>2</sub> transport infrastructure**

No infrastructure planned yet. There are only academic studies, see answers to questions 16 and 17.

**Public funding support available for investment in CO<sub>2</sub> capture, transport and storage.**

None is yet available.

**Any other measures to support the deployment of long-term geological CO<sub>2</sub> storage opportunities.**

