



Vlaamse
overheid



Geological data transparency Belgium – Net Zero Industry Act (NZIA) Art. 21.1

Obligation

NZIA Art. 21(1) - By the end of 2024 Member States shall:

- (a) Make publicly available data on all areas where CO₂ storage sites could be permitted on their territory;
- (b) oblige entities which are or have been holders of oil and gas production authorisations as defined in Article 1, point 3, of Directive 94/22/EC on their territory to make publicly available on a non-reliance basis geological data relating to production sites that have been decommissioned or whose decommissioning has been notified to the competent authority (2).

This data should include, if available, economic assessments of the respective costs of enabling CO₂ injection, information about the suitability of the site(s) for permanent CO₂ storage (i.e. any data that can support the CO₂ storage assessment, at the highest degree of maturity possible), and the availability or need for transport infrastructure and modes suitable for safely transporting CO₂ to reach the site.

Belgian contribution

Consultation is ongoing between the national geological survey and regional authorities to coordinate and streamline the data collection and transmission, in line with the recommendations of the European Commission.

Geological data for Belgium in general and on potential storage formations is available here:

- At national level: <https://gisel.naturalsciences.be>
- For the Brussels Capital Region: <https://geodata.environnement.brussels/client/brugeotool/>
- For the Flemish Region: <https://www.dov.vlaanderen.be>
- For the Walloon Region: <http://geoapps.wallonie.be/Cigale/Public/#CTX=CGEOL>

The most recent and national assessment on potential storage reservoirs and storage capacity for CO₂ geological storage was published by Welkenhuysen et al. (2013). This data was also added to the European CO₂ storage overview of the CO₂StoP project, consultable on the European Geological Data Infrastructure (EGDI). Within the HyStorIES project, targets and geological data were updated for the very similar process of hydrogen storage. As member of EuroGeoSurveys, the national Geological Survey of Belgium is also involved in the process of setting up a Geological Service for Europe (GSEU), where a pan-European CO₂ storage atlas is being created.

New insights in research and societal needs require updates of these existing assessments. For example, CO₂ storage in abandoned coal mines in Belgium, as investigated by Piessens & Duser (2004) is now regarded as less feasible. At the same time, new data is being collected, for example in the light of deep geothermal applications targeting the same potential reservoir layers. The Interreg DGE-Rollout project has created a cross-border North-

West European 3D model of the Lower Carboniferous limestone, as primary target for multiple deep subsurface uses, consultable at <https://data.geus.dk/egdi/?mapname=dgerolloutwebtool>.

With these and future efforts, the goal is to create regular updates on storage data and capacity assessments, create alignment between the governmental levels on data reporting, and to continue international cross-border harmonization.

References

- Welkenhuysen K., Ramírez A., Swennen R. & Piessens K., 2013. Strategy for ranking potential CO₂ storage reservoirs: A case study for Belgium. International Journal of Greenhouse Gas Control, 17, 431-449. <http://dx.doi.org/10.1016/j.ijggc.2013.05.025>
- EGDI, <https://maps.europe-geology.eu/>
- DGE-Rollout,
- Piessens, K. & Dusar, M., 2004. Feasibility of CO₂ sequestration in abandoned coal mines in Belgium. Geologica Belgica, 7 (3-4), 165-180. <https://popups.uliege.be/1374-8505/index.php?id=308>

For the Federal State:

The evaluation for geological storage of CO₂ in the subsurface of the Belgian Continental Shelf was made in 2011 (Piessens, 2011). The study of 2011 focused on the requirements of ‘permanent containment’ and ‘no significant risk of leakage’ of the CCS-Directive (Directive 2009/31/EC) . No additional data has become available since that changes the outcome of this assessment.

The geology of the Belgian Continental Shelf consists of deposits of Quaternary, Paleogene-Neogene and Cretaceous age that occur in a position that is too shallow to allow geological storage of CO₂. The Upper Palaeozoic and part of the Mesozoic are absent in this sector of the North Sea, and it are the Lower Palaeozoic units that form the basement. This geological entity is the offshore extension of the Brabant Massif. The drillings on the Belgian Continental Shelf have not reached the Lower Palaeozoic, but the depth to the top of the basement can be inferred from seismic sections. These show a basement that occurs in the southern corner of the study area at depths around 250 m. The top of the basement deepens in general in a northward direction, as it does onshore, to reach depths that may slightly exceed 600 m. The seismic line MPNI-9101 shows the Brabant Massif as a seismically transparent zone without internal reflections (Rijkers et al., 1993), similar to the onshore BELCORP seismic section, except for the southern part of the profile where south dipping reflectors can be identified which probably correspond to the Silurian and Ordovician succession. The onshore map of the Brabant Massif (Piessens et al., 2005) was extended to offshore based on structural understanding and geophysical data (aeromagnetic and gravimetric potential field data), and is therefore less detailed than the onshore part. A map and discussion of the map are available as an online publication (Piessens, 2015).

Following storage options can be excluded without in-depth discussion:

Hydrocarbon fields: The storage concepts related to oil and gas, either for storage in depleted fields or to enhance ongoing or future production, are not relevant for off-shore Belgium because of the absence of accumulations of hydrocarbons.

Coal sequences: Storage in coal or coal sequences is equally impossible in view of the clear absence of coal-bearing strata. The only significant coal occurrences in this part of Europe are linked to the Carboniferous, a part of the stratigraphy which is missing in the off-shore region of Belgium.

Mineral sequestration: Geological mineral sequestration, which relies on the chemical interaction of injected CO₂ with adjacent rocks, is not feasible in view of the absence of sufficient volumes of suitable rocks.

Aquifer storage options require a more detailed discussion, assessing the combined probability that the four principal elements of a storage complex (reservoir, primary seal, trap) are present somewhere in the subsurface of the Belgian Continental Shelf. This evaluation is negative. This outcome is corroborated by the similar negative evaluation of the onshore part of the Brabant Massif for geological storage of CO₂.

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The conclusion therefore still stands that with confidence the geology in the off-shore part of Belgium excludes with almost certainty the safe and permanent geological storage of CO₂.

References

- European Parliament & Council of the European Union, 2009. DIRECTIVE 2009/31/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006, Directive 2009/31/EC, Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF>.
- Piessens, K., 2011. Evaluation of the off-shore storage potential for Belgium. Federal Public Service, Health, Food Chain Safety and Environment.
- Piessens, K., 2015. Off-shore map of the Brabant Massif. <https://doi.org/10.13140/RG.2.1.3468.4002>
- Piessens, K., Vancampenhout, P. & De Vos, W., 2005. Geologische subcropkaart van het Massief van Brabant in Vlaanderen.
- Rijkers, R. et al., 1993. Crustal structure of the London-Brabant Massif, southern North Sea. Geological Magazine, 130(5), 569-574.

For the Flanders Region:

The Flanders Region has no hydrocarbon production areas that have been decommissioned or are under decommissioning (b). There are no conventional hydrocarbon reserves known on the territory and unconventional hydrocarbon reserves are theoretically present, but unproven. There has been exploration interest for coalbed methane (CBM) in the past, but apart from an unsuccessful pilot well in 1994, there have been no additional drillings to prove the potential.

The deep subsurface in Flanders has a small theoretical potential for CO₂ storage in saline aquifers (Piessens et al., 2008 and 2012; Welkenhuysen et al., 2011), but extensive exploration would be needed to confirm such options. The theoretical potential is based on depth and thickness of aquifers, an estimated average transmissivity and presence of geological low permeable layers. There is large uncertainty about local and effective transmissivity, integrity of cap rocks, possible confining structures and role of faults with respect to leaking paths. All basic geological data is freely available via the Flemish database for the subsurface (Databank Ondergrond Vlaanderen, DOV; <https://dov.vlaanderen.be/>). There are so far no readily available storage options for CO₂ to be permitted on the territory (a).

For the Brussels Region:

Voor wat het Brussels Hoofdstedelijk Gewest betreft kunnen we kort zijn. De geologische opslag en de opslag in de waterkolom van CO₂ is in ons gewest verboden. Zie hiervoor het ministerieel besluit van 2 februari 2012. https://www.ejustice.just.fgov.be/cgi/article.pl?language=nl&sum_date=2024-07-02&dt=Arr%EAt%E9&htit=captage&text1=transport&choix1=et&choix2=et&fr=f&nl=n&du=d&trier=promulgation&lg_txt=n&pd_search=2012-02-29&s_editie=&numac_search=2012031073&caller=list&2012031073=1&view_numac=2012031073F
In ons gewest zijn er ook nooit vergunningen geweest voor olie- en of gasproductie uit de ondergrond.

As far as the Brussels Capital Region is concerned, we can be brief. Geological storage and storage in the water column of CO₂ is prohibited in our region. Zie hiervoor het ministerieel besluit van 2 februari 2012. https://www.ejustice.just.fgov.be/cgi/article.pl?language=nl&sum_date=2024-07-02&dt=Arr%EAt%E9&htit=captage&text1=transport&choix1=et&choix2=et&fr=f&nl=n&du=d&trier=promulgation&lg_txt=n&pd_search=2012-02-29&s_editie=&numac_search=2012031073&caller=list&2012031073=1&view_numac=2012031073F

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Nor have there ever been any permits for oil and/or gas production from underground in our region.

For the Walloon Region:

No conventional hydrocarbon exploration and/or production licenses have been applied for, issued or are currently pending in the Walloon Region; consequently, there are no abandoned or decommissioned facilities of this type in its territory.

The collection of firedamp was carried out in some coal mines during their period of operation; since the end of mining and the flooding of the de-hollowed massifs, this collection has ceased.

Currently, a permit has been issued to exploit mine gas (for power generation) on a single reservoir at Anderlues.

As far as geological storage of CO₂ is concerned, it is unthinkable to store it in the part of the coalfield where coal mining took place. This reservoir is not watertight (an attempt to store natural gas underground failed). Injecting CO₂ would increase CH₄ desorption in an ancient massif (extremely folded) which has been mined on all sides and in which the state of abandonment of the installations is largely unknown. This would lead to a risk of excessive desorbed firedamp production (and accumulation) beneath densely populated areas.

Theoretically, CO₂ storage could have been envisaged in the Carboniferous limestone aquifer and, above all, in the Houiller massif deep beneath the Midi fault.

CO₂ storage in carbonate aquifers is a priori an obstacle to geothermal energy and therefore to the production of renewable energy (which is a priority for Wallonia, but also for the EU).

The "competition" between these two superimposed activities implies choices and raises questions about issues whose implications have yet to be studied, such as: the (supposed) watertightness of the Midi fault, natural wells (Quaregnon...) in the Houiller, the exact nature of the subsoil beneath the Midi fault, the effects of injecting CO₂ into a flooded deposit, etc....

All these questions show that the geological storage of CO₂ in the Walloon Region will not be possible in the near future without serious studies on the issues raised, not to mention the cross-border impacts of this CO₂ storage on the coal gas reserves of neighboring French regions.



Annex 1:

- A. State of play related to legally binding framework, to make relevant geological data publicly available.

Currently there are insufficient legal provisions to include data in above mentioned links, related to confidential or proprietary data, related to hydrocarbon production areas that have been decommissioned or are under decommissioning, held by (previous) titleholders of the respective fields.

Public data on all areas where CO₂ storage sites could be permitted will progressively be detailed on regional, national or European data platforms.

In cooperation with the European Commission and in close collaboration with and inspired by the best practice of geological surveys of other members we hope to develop such legal framework and a mandate for the coordinating Belgian national geological survey organization and its regional counterparts.



