THE CONCRETE INITIATIVE
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THE CONTRIBUTION OF THE CEMENT AND CONCRETE SECTOR TO CARBON REMOVALS

Brussels, 02/05/2022

CEMBUREAU's 2050 Carbon Neutrality Roadmap "*Cementing the Green Deal*" (see link) sets out the technological and innovation pathways to achieve carbon neutrality by 2050 in the cement industry. These pathways span the full value chain and assess the CO_2 reduction potential in both the manufacturing part of the business (clinker and cement manufacturing) as in the production, use and end-of-life of the end product, concrete, which is a key enabling building material for tomorrow's sustainable built environment thanks to its durability, strength, recyclability and its carbonation potential. The CEMBUREAU Roadmap puts forward intermediate CO_2 reduction targets of 30% (cement) and 40% (over the value chain) by 2030.

Achieving the CO_2 reduction targets requires significant investments that, on their turn, are preconditioned by a stable and facilitating regulatory framework that guarantees viable investment projects with proper returns on investment.

Such regulatory framework is key notably for carbon uptake in our industries (cement, precast concrete, ready-mix concrete, concrete admixtures, aggregates) which occurs via two main streams: Carbon Capture, Utilisation and Storage (CCUS) and carbon uptake in concrete.

1. Carbon uptake in cement with CCUS

With two thirds of its CO_2 emissions related to the manufacturing process (calcination of limestone), the cement industry strongly focuses on carbon capture as its key technology representing 42% of is CO_2 emission reduction efforts by 2050. Carbon capture and storage (CCS), which will make cement carbon neutral can even become carbon negative when biomass waste is used as alternative fuel. A significant number of carbon capture and storage and use (CCUS) projects are currently under development by the European industry[1]. The viability of the technology hinges on the way the CO_2 captured is recognized and accounted for under the regulatory framework. Given the geographic spread of cement kilns across Europe, CO_2 utilisation is an essential avenue to explore for the sector.

As the European Commission acknowledges, the EU will still need carbon by 2050 and beyond as a feedstock to produce sustainable synthetic fuels, plastics, chemicals and advanced materials[2]. The sustainable character of each of these uses requires a proper accounting of the CO_2, a fact that CEMBUREAU does not contest. The core question in this debate is ***where*** the CO_2 will be accounted for.

[1] https://cembureau.eu/about-our-industry/innovation/map-of-innovation-projects/
[2] https://ec.europa.eu/clima/system/files/2021-12/com_2021_800_en_0.pdf

Policy ask: in CEMBUREAU's view, CO_2 must be accounted for at the point in time where the CO_2 is released into the atmosphere. In concrete terms, when the capturing installation transfers the CO_2 to a third party for either permanent storage, mineralisation or use in further products, including synthetic fuels, there is no release into the atmosphere at the point of capture. Therefore, the capturing installation should be allowed to deduct the CO_2 from its emissions. Absent a clear rule allowing such deduction, an investment into a capture installation is simply not economically viable.

2. Concrete as carbon sink

Cement is made by heating limestone to very high temperatures (>1450°C) allowing the limestone to be broken down in calcium oxide, the key ingredient of cement, and calcium dioxide (CO_2). Part of the CO_2 released during manufacturing is reabsorbed during the lifetime of a built structure as well as at the demolition stage where the concrete is exposed to the air. This reabsorption process, which is in fact the reverse from what happens in cement manufacturing, is a natural process which mineralises mortar and concrete and returns it to its stone-like properties.

Carbonation in the cement and concrete sector contributes to carbon removals through 3 main processes:

a) Enhanced carbon uptake in cement and concrete production

Some alternative raw materials in cement production and cement itself could be cured with captured CO_2 at the cement plants. The same process could also apply to the production of ready-mix and precast concrete. This way the absorbed CO_2 is permanently captured in the mineral structure of the new cement and concrete. Furthermore, the CO_2 curing accelerates the setting of the concrete and enhances its strength.

Policy ask: in order to incentivise CO_2 utilisation for curing and mineralisation, which allows for a permanent capture, the European Union should include enhanced CO_2 uptake in cement and concrete in its coming carbon removal certificates.

b) Naturally throughout the lifetime of the building infrastructure

The absorption of CO_2 turns the built environment into carbon sinks and this natural carbonation effect has been recognized in the Full Sixth Assessment Report of the Intergovernmental Panel on Climate Change[3]. Proper attention should be given to the recognition of the carbonation potential for mortar and concrete to be included in the estimation of negative emissions. **In particular, it is critical that the EU fully recognises carbonation alongside other carbon sinks.** The cement and concrete industry is engaging in research projects that seek to enhance this process and has commissioned a study[4] to calculate the CO_2 uptake in cement-containing products to support improved calculation methods within the IPCC and national greenhouse gas calculations. CEMBUREAU estimates that the potential carbonation volume is 16 million tonnes CO_2 per year in the EU27.

[3] Please see https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf, page 1171
[4] Please see https://www.ivl.se/download/18.72aeb1b0166c003cd0d64/1541160245484/B2309.pdf

Policy ask: all Members States and the European Union should recognise carbonation alongside other carbon sinks, and include carbonation in MS and EU greenhouse gas calculations. The UNFCCC acknowledges the carbonation of concrete in national GHG inventories.

c) At the end of life

At the end of life, concrete should be re-used and/or recycled into aggregates. At this life stage, the carbon uptake can be enhanced by crushing it and leaving it exposed to air for a period of time in order to maximise carbonation. In addition, some producers are also working on enhancing carbon uptake in recycled aggregates to lower the CO_2 content of new concrete[5].

Policy asks:

- Construction and demolition waste companies should be incentivised to capture CO_2 in recycled aggregates through the recognition of carbonation via carbon removal certificates.
- As for point a), in order to incentivise that form of CO_2 utilisation, which allows a permanent capture, the European Union should include enhanced CO_2 uptake in cement and concrete in its coming carbon removal certificates.

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[5] https://fastcarb.fr/en/home/