Policies to Enable Carbon Capture, Utilisation and Storage

A document to contribute to Cement and Concrete Breakthrough Priority Action C.4 with respect to Carbon Capture Utilisation and Storage

Introduction to Cement and Concrete Breakthrough
The Cement and Concrete Breakthrough aims to strengthen the collective decarbonization efforts of the global cement and concrete sector by building political momentum. The initiative was launched at COP 28 in Dubai by co-chairs Canada and the United Arab Emirates. Since its launch, the Cement and Concrete Breakthrough has attracted a growing number of country partners that support this work, including: Australia, Austria, Canada, Egypt, Ethiopia, Germany, Ireland, Kenya, the Kingdom of Saudi Arabia, the Republic of Congo, Switzerland, Türkiye, the United Arab Emirates and the United Kingdom.

The initiative also works closely with eleven international enabling organizations to expedite delivery of key priorities, while mobilizing deeper support for these initiatives to maximize their impact. These enabling initiatives are: Climate Club; ConcreteZero; First Movers Coalition (FMC); Global Cement and Concrete Association (GCCA); Industrial Deep Decarbonization Initiative (IDDI); Industrial Transition Accelerator (ITA); International Energy Association (IEA); Leadership Group for the Industry Transition (LeadIT); Mission Innovation Net-Zero Industries Mission (MI NZI); Mission Possible Partnership (MPP) and United Nations Industrial Development Organization (UNIDO).

The Cement and Concrete Breakthrough launched its inaugural 2024-25 Priority Actions in June 2024, focusing on deliverables and interim priority actions for COP30, including:

C1. Creating common definitions and standards for low carbon cement and concrete
C2. Supporting demand creation for low carbon cement and concrete
C3. Fostering greater innovation, education and collaboration around the decarbonization of the industry; and
C4. Strengthening the finance and investment landscape for decarbonization of the industry.
C5. Enhancing the coordination and transparency of international collaboration on low and near-zero emission cement and concrete.

("C" differentiates cement and concrete actions from those in other sector breakthroughs.)

Cement and Concrete Breakthrough Priority Action C4
Priority Action C4.c: Strengthen the international financial and technical assistance offer through matchmaking for industrial decarbonisation of the cement and concrete sector by COP30, with a particular focus on ensuring that developing countries have better access to assistance (including from multilateral development banks), and supporting a more thorough understanding of the regulatory roadblocks that prevent projects from reaching investor support, with the goal of mobilising private investment at scale in emerging and developing economies.

Document Purpose

1. Summarize some of the main points discussed during the Cement and Concrete Breakthrough's Thematic Dialogue discussion on CCUS;
2. Support governments and enabling organisations that are working towards Priority Action C4 with the relevant context that could facilitate CCUS-enabling policies.

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1. Introduction

Carbon Capture, Utilization, and Storage (CCUS) refers to technological processes that capture CO_2 emissions from industrial sources and either store them so that they will not enter the atmosphere or reuse them in other industrial processes. CCUS is an essential component of most roadmaps for net-zero concrete, especially as the process emissions of cement production, most of which originate from heating limestone, require carbon dioxide to be captured, reused if possible, or permanently stored in deep geological formations. Deployment of CCUS could significantly reduce process emissions.

As new projects are being announced in North America and Europe, the growing number of CCUS pilots in industrial-scale carbon capture operations reflects the is substantial momentum in the development of the technology. While the industry is developing technologies, conducting pilots and investing in industrial-scale facilities, it is leveraging mature technologies and commercial projects (such as Boundary Dam and Petra Nova) that have been deployed in other sectors (such as power and refining). However, to realize the full emission reduction potential of CCUS, it is critical to create the enabling framework conditions and infrastructure within this decade to ensure its full deployment beyond 2030.

While the industry is already engaged in numerous CCUS projects, the sector cannot achieve this on its own. Deploying CCUS and related infrastructure requires a broad stakeholder dialogue and public acceptance, as well as long-term commitments by governments and society alike. Some countries and regions, such as Canada, the EU, the UK, and the USA, have announced different policy initiatives to facilitate CCUS deployment. A set of targeted policy actions at local, national and international levels is needed to:

- Ensure investments for the CCUS project construction and operation
- Allow for the accounting of captured, stored or utilised CO_2 emissions
- Create the infrastructure needed for CO_2 transportation and storage
- Ensure concurrency in the development of infrastructure and investment in CCUS
- Ensure access to sufficient, affordable, decarbonised energy

2. About CCUS

CCUS is a technology aimed at capturing carbon dioxide (CO_2) emissions from industrial processes, power plants, and other sources, preventing them from entering the atmosphere and contributing to climate change.

The captured CO_2 can then be either utilised in manufacturing or recycled in various industrial applications - or stored permanently in geological formations deep underground. The CO_2 is then monitored to ensure it is stored securely.

CCUS is a crucial solution for the cement sector because a large share of emissions is due to the specific chemistry of cement making (so-called "process" emissions). Approximately 40% of emissions in cement manufacture come from energy, while roughly 60% of emissions stem from chemical process emissions[1]. As such, whereas other industries can reduce carbon emissions by decarbonising their energy source, such actions will only address a limited share of emissions from the cement sector.

Carbon capture

Carbon Capture technology is improving, and the significant number of industrial-scale facilities currently being deployed in cement production demonstrates its technical viability. A variety of capture technologies are currently being implemented at various scales. These include post-combustion (e.g., chemical absorption by amines), direct separation, oxyfuel, calcium looping, and adsorption by metal-organic frameworks. Typically, significant additional low-carbon energy is needed for these technologies to operate the CO_2 separation and handling processes.

Utilisation (or Valorisation)

The aggregates and concrete industry are developing an economy for CO_2 by using CO_2 to manufacture useful products. CO_2 can be permanently bound in minerals to produce mineral products, such as aggregates and hardened concrete. Additionally, concrete, both in use and at the end of its life, can permanently store CO_2 through the process of carbonation. This has long been understood by engineers with respect to reinforced concrete and is rightly limited during the structure's lifetime for the sake of durability. Recent developments have focused on maximising CO_2 uptake in crushed concrete as a method of sequestering CO_2[2]. This approach not only stores CO_2 permanently but also enables the reuse of demolition waste, linking carbon removal and material recycling in one process.

Captured CO_2 can also be used in the production of e-fuels and as a feedstock for the chemical industry. More specific uses include promoting crop growth in greenhouses and the food and beverage industries.

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[1] Global cement and Concrete Association. (2021) The GCCA 2050 Cement and Concrete Industry Roadmap for Net Zero Concrete. https://gccassociation.org/concretefuture/

[2] Intergovernmental Panel on Climate Change (IPCC). (2023). AR6 Synthesis Report. https://www.ipcc.ch/report/ar6/syr/

Storage
CO_2 can be permanently stored or sequestrated in geological formations, which would prevent it from being released into the atmosphere. Examples of storage deployed at a commercial scale are available from the Global Carbon Capture and Storage Institute's CO_2RE database or the IEA CCUS Projects Database, which include Sleipner, Norway, which has been storing millions of tonnes of CO_2 from an industrial process since 1996. Today CCUS stores around 0.1% of global emissions — around 50 million metric tons of carbon dioxide (CO2) but capacity is growing with new projects and planned expansions[3]. Expanding global storage capacity will be essential for meeting mid-century climate targets and reducing industrial emissions

3. Policy Context

CCUS requires policies that will accelerate its development and secure its long-term future.

Financing
The next five years will be crucial for reducing costs across the entire value chain and enabling the development of a business case for CCUS by 2030. An appropriate carbon price, as well as long-term predictability, is needed to enable companies to make further investments into CCUS projects Given the significant development and scaling costs of this technology, however, additional and targeted public funding is necessary to lower the financial risks associated with innovative, pioneer projects. This must include investments in R&D, as well as the industrial deployment and early operational periods.

To attract further private investments, CCUS should also be incorporated and classified as a green economic activity in dedicated sustainable financing schemes, such as the EU Taxonomy.

CO_2 transport and storage
The widespread deployment of CCUS technologies necessitates that cement plants manage large volumes of CO_2. Not every plant will have the capability to store CO_2 locally due to various geographical, geological or logistical constraints. Consequently, some plants could consider transporting CO_2 off-site to locations where it can be securely stored or utilised in other industrial processes. To ease the potential transport of $CO_{2,}$ international cooperation could include transboundary agreements to facilitate the cross-border transport and storage of CO_2, removing barriers to the development of the CCS market and risk allocation.

[3] Global CCS Institute. (2024). Global CCS Status of CCS 2024. https://www.globalccsinstitute.com/wp-content/uploads/2025/10/Global-Status-Report-6-November.pdf

The challenge of developing the necessary transport and storage infrastructure is significant and cannot be undertaken by the cement industry alone. Building this infrastructure and identifying suitable storage sites will require close collaboration with a wide range of partners, including regulatory agencies, industrial stakeholders, and other key players in the energy and infrastructure sectors.

Given the substantial volumes and distances involved, these transport solutions will likely include a combination of pipelines, rail links, and shipping facilities tailored to the specific needs of each plant. This infrastructure is particularly crucial for cement plants in rural or dispersed areas, which may be far from potential storage sites or industrial hubs.

The benefits of developing this infrastructure extend beyond the cement industry. By creating shared CO_2 transport networks and storage capacities, broader carbon reduction efforts can be implemented across multiple industrial sectors. A coordinated approach involving all stakeholders is essential to map and develop these networks, ensuring they align with both onshore and offshore storage capacities. Additionally, integrating these efforts with related infrastructure developments, particularly those in the hydrogen sector, can further amplify the impact of these initiatives.

To encourage competition and enable scalability, CO_2 storage infrastructure (both storage and transport) should respect the principles of transparency and third-party access, to offer to customers fair market access conditions.

Accessible decarbonised electricity
CCUS has a significant electrical demand and therefore a robust policy framework is required to make electricity with a low carbon footprint widely accessible at a low cost.

Use of carbon, and carbon accounting
Whilst storage presents its own challenges, significant investments are also required in use options for captured CO_2. The opportunity exists to create new industrial symbiosis relationships, as other sectors could utilize CO_2 supplied from the cement sector to produce less carbon-intensive products (e.g., e-fuels).

The business case for deploying these technologies rests heavily on the ability of installations that capture CO_2 to discount it from their emissions, whether used for permanent geological storage, mineralization, or the production of products that substitute for more carbon-intensive ones. Where biogenic material is used in the energy fuel mix and its emission captured and permanently stored (i.e., BECCS), the resulting negative emissions must be recognised in the accounting.

This acknowledgement of negative emissions should be included in industrial accounting for plants, companies, and at the country level, as well as at the product level in Environmental Product Declarations (EPDs), which are used in the construction sector for low-carbon procurement.

Public acceptance
CCUS, like many new technologies, need public awareness programs, and targeted communication campaigns to support the understanding of its technical maturity, benefits, and proven safety. In particular, if these are land-based, then there will need to be public acceptance of the solution; this will require politicians and communities alike to be supportive. These efforts, combined with appropriate legal mechanisms such as certification and CO_2 accounting frameworks, can help build confidence and enable the successful deployment of CCUS solutions.

Liability
To facilitate long-term storage, outstanding issues, including liability for the CO_2 need to be resolved. A promising practice of how this could be done comes from the UK, where an unilateral burden on industry has been avoided through creating models of shared public/ private liabilities.

Demand for low-carbon products
The long-term success of CCUS is highly dependent on the procurement, regulatory, and standardization frameworks that will lead to a market transformation and establish market demand for the very low-carbon products that CCUS will enable. The emission methodologies used for procurement (EPDs) should recognise carbon capture.

4. What Policymakers can do to bolster CCUS

Carbon Capture, Utilisation and Storage can be bolstered through enabling policies that:

1. Manage carbon costs and prevent carbon leakage through stringent, transparent, and predictable **carbon pricing** mechanisms that create a level playing field.

2. Integrate CCUS into **public financing** mechanisms that cover the initial investments, including feasibility and operational abatement costs, as well as retrofitting of existing cement plants, to allow for an investable business case.

3. Support **public-private partnerships** to accelerate CCUS developments, including shared investment in CO_2 transport and storage networks.

4. Provide **fair recognition of carbon removal** measures, both where the CO_2 is ultimately stored or used in products, either by acknowledging them as part of regional/national emission trading systems or by developing tailored accounting rules. Incorporate negative emission savings from the use of CCUS combined with biomass fuels into the accounting rules. In addition, recognise different types of CO_2 utilisation so that options offering long-term or permanent storage are prioritised over short-lived or lower-impact utilisation pathways.
5. **Provide efficient permitting processes** to facilitate the construction of carbon capture, transport, utilisation and storage facilities.
6. Provide reliable access to sufficient and competitively priced low emission **energy**.
7. **Support the creation of transport infrastructure and storage infrastructure** to move captured carbon to places where it can be used or stored.
8. **Provide regulations and/or a regulator(s) for CO_2 transport** (pipeline networks and other transport) to set standards, ensure fair access and reduce risks. In addition, the infrastructure needs to be regulated in such a way that dispersed sites are not disadvantaged when it comes to access and costs.
9. **Provide regulatory guidance and harmonisation on CO_2 quality and standards**, as these underpin CCUS project design and enable collaboration and project implementation.
10. **Provide robust regulatory frameworks** that prioritize transparency, safety, and the permanent storage of CO_2.
11. **Support R&D,** including cross-industry collaboration for carbon capture technologies and new uses in other sectors of CO_2 captured by the cement and concrete industry.
12. Enable the integration of CO_2 performance in public procurement, building standards, and construction codes alongside traditional criteria (e.g., technical performance) to create demand for **near-zero carbon products**.
13. Implement **public engagement strategies** to educate communities about the benefits and safety of CCUS technologies, addressing any concerns that may arise. Implement robust practices to demonstrate the effectiveness of CCUS initiatives. This will be crucial for compliance and for attracting investment.