



CARBON CAPTURE, UTILIZATION AND STORAGE

At Holcim, we are on a mission to decarbonize building to create a net-zero future.

Population growth and urbanization are driving the construction of cities the equivalent of New York City every month.

Decarbonizing building starts with our operations, and more specifically with cement manufacturing. As a key ingredient in concrete, **cement is essential to build vital urban infrastructure.**

At Holcim, we focus on two main approaches:

- **Reducing CO₂ emissions,** from low-carbon formulations to renewable energy.
- **Advancing Carbon Capture, Utilization and Storage (CCUS)** technology for the remaining CO₂ emissions.



At our plant in Lägerdorf, Germany, our Carbon2Business project will capture CO₂ and repurpose it as an industrial raw material



What is CCUS?

CCUS involves capturing CO₂ from industrial processes to then store or utilize in other industries.

Already established in other industries, CCUS holds great potential for the building materials industry to stop emissions from cement production from reaching the atmosphere.

MATURE TECHNOLOGIES

We are developing two main types of mature carbon capture technologies.

Post-combustion technologies

These solutions capture CO₂ in the exhaust gas of a traditional kiln system at the “end of the pipe.” The most advanced post-combustion solution is based on liquid solvents such as amines:

- The CO₂ in the exhaust gas is absorbed by the solvent.
- The CO₂-rich liquid is sent to the regenerator where the CO₂ is released in a concentrated form.
- The solvent is then reintroduced to the absorption column.

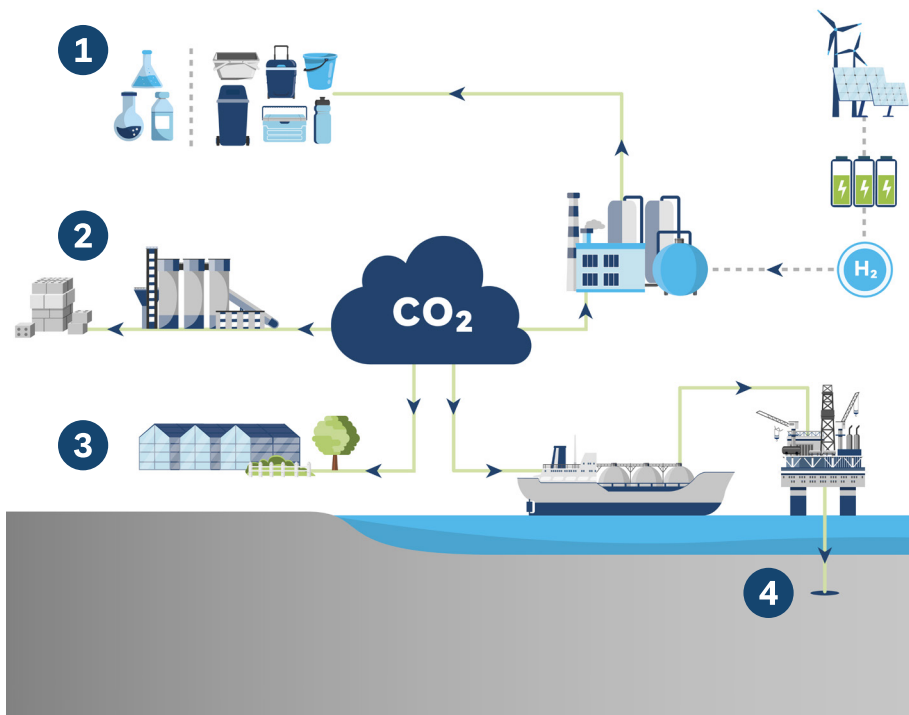
Integrated processes

Alternatives to pure post-combustion capture include integrated processes such as oxyfuel, electrification of clinker manufacturing and calcination of raw materials. We are conducting various site-specific investigations to develop integrated concepts. In the oxyfuel approach:

- Air for combustion in the cement manufacturing process is replaced by oxygen.
- This prevents nitrogen in the system and enables a concentrated CO₂ exhaust stream.

OUR CCUS PATHWAYS

We understand there is no “one size fits all” CCUS solution. Options for CCUS depend on the site and the local regulations. Our **comprehensive, bottom-up approach** allows us to tailor pathways and value chains based on local conditions, ensuring **cost-effective, viable** and **scalable** solutions.



1 CONVERSION UTILIZATION

CO₂ can be repurposed by reaction with green hydrogen to produce fuels that can decarbonize the aviation and maritime sectors, or can be used to produce chemicals and plastics.

2 MINERALIZATION

CO₂ is reacted with minerals to form carbonates, storing the CO₂. In the cement sector, this reaction provides a way of capturing CO₂ as a raw material to produce new building materials.

3 MARKET UTILIZATION

Captured CO₂ can be used for greenhouse plants as a crop growth enhancer or in the food and beverages industries – for beverage carbonation for example.

4 STORAGE

CO₂ is captured from a facility and transported to a location via pipelines, trains, ships or trucks. It is then safely stored underground either onshore or offshore in abandoned oil and gas reservoirs or dedicated saline aquifers.

SCALING UP CCUS

To establish CCUS as a long-term solution to meet climate targets, collaboration is essential. And this starts with sorting fact from fiction to unlock the business case for CCUS.



Is CCUS technology safe?

CCUS technology is **well regulated and scientifically proven to be safe**. In the United States, carbon has been safely and reliably transported since 1972.

Even in the unlikely event of a leak during transport, there is very little human health risk when pure CO₂ is released into ambient air.



Can CCUS help us reach net zero?

The IPCC and IEA agree that **CCUS has an important role to play in reaching climate targets**.

CCUS is the only technology that contributes to both directly reducing emissions in hard-to-abate sectors – such as cement – and to removing CO₂ to balance emissions that can't be avoided.



Is CCUS technology expensive?

CCUS technology **costs are rapidly declining, bolstered by policy and financial incentives**.

The IPCC estimates it would be 138% more expensive to reach global climate goals without the deployment of CCUS. Holcim's CCUS projects are designed to deliver positive financial returns.