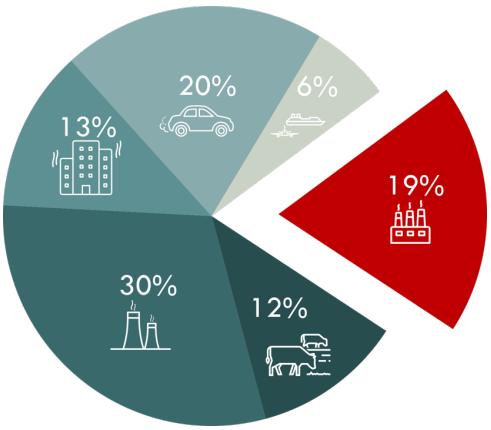
Climate action in the cement industry: Factsheet

At the 2015 Paris Climate Conference the world agreed to reach net-zero emissions by mid-century. This goal requires every sector to drastically reduce its carbon footprint and practically eliminate all CO_2 emissions within the next thirty years. This timeframe coincides with the investment cycle in energy and resource intensive industries. So to ensure industries such as cement have the means available to fulfill their obligations, important levers have to be pulled today.

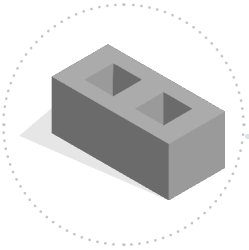


The climate impact of industries will grow as other emissions shrink.

Today, industry emits about a quarter of the EU's CO_2. While the climate transformation in the power (renewables) and transport (electrification) sectors is already underway, industry has largely been shielded from fundamental action, which leaves it remarkably exposed as climate and political pressures mount. With fossil coal and gas power plants being replaced with clean energy sources, industry sites will become the remaining large CO_2 point sources.

Cement is all around us.

Cement is the key ingredient in the construction of homes, roads, and to secure essential infrastructures, such as wind farms. As the demand for these and other climate technologies increases and living standards improve in the emerging economies, more cement will be needed over the coming decades.



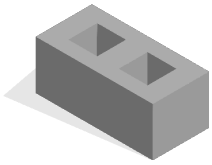
Concrete, the primary product of cement, is the 2nd most used material in the world after water.

Did you know?

Cement production and use emits more CO_2 than air travel.

5% of global emissions

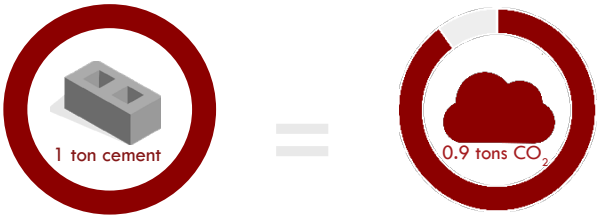
8% of global emissions



Rebuilding an emission-free Europe will require low carbon cement.

The EU is the third largest producer of cement. The sector provides over 38 thousand direct jobs in the EU, with additional millions of jobs in the construction business. Cement is a primarily locally produced and traded product. As we will need cement to build a net-zero emission economy, it is crucial that we also ensure cement production itself fulfills these ambitions. Doing so will be essential to ensure products we use do not cause negative climate effects elsewhere, and to safeguard jobs and economic benefits associated with an essential industry.

Producing 1 ton of cement, emits 0.9 tonnes of CO_2



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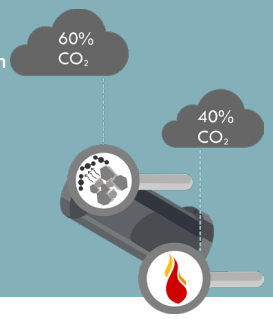
Climate change is caused by more than just the burning of fossil fuels.

Producing cement is based on fusing limestone and other raw materials into clinker. During this process, CO_2 is released from the limestone and minerals. These emissions are independent from the fuel combustion used for heat and represent "process emissions" – emissions that are integral to the making of cement.

The heating of limestone results in CaO and CO_2.

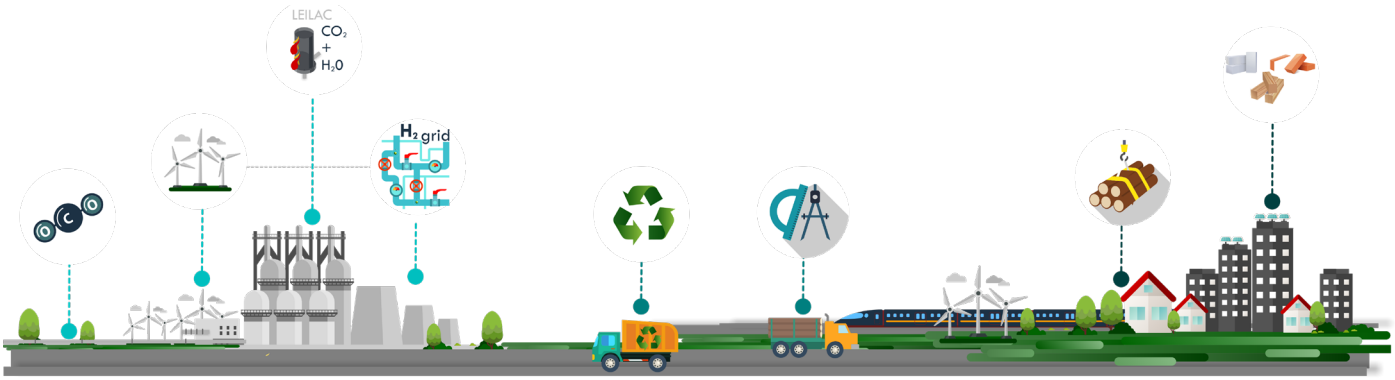


40% of CO_2 comes from the burning of fuels heating the kiln.

Reducing cement's climate impact requires simultaneous actions from production to use and end of life.

These actions include:

- improving resource and energy efficiency
- using alternative materials
- establishing stricter end of life separation and recycling
- developing new, innovative and clean production technologies



Replace

- fossil heat sources with burning waste and sustainable biomass, or through electrification and hydrogen use.
- some clinker with alternative materials, such as volcanic ash, ground bottle glass, and industrial waste products.
- cement in buildings with increased use of timber and alternative cementitious materials in construction.

Reduce

- the use of cement through new building norms and standards enabling a more efficient resource use in construction projects.

Recycle

- concrete from demolished structures as an aggregate, for example in road construction to substitute basic materials such as rocks.
- recovered cement through smart crushers to reduce need for new cement production.

Reinvent

- the way cement is produced to stop CO_2 from being emitted to the atmosphere.

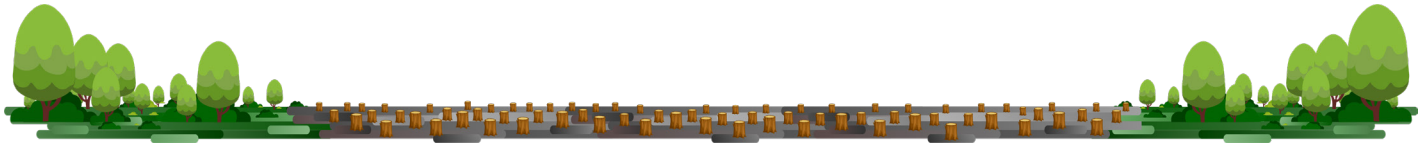
No single solution will be big or quick enough to prevent CO_2 emissions from cement production.

While all described actions need to happen, none can solve the challenge of eliminating CO2 emissions from cement production single-handedly. There are physical and technical limitations as well as issues of sustainability related to all levers of action.

Sustainability is key. The climate effect of any 'solution' needs to be fully accounted for.

Climate measures need to have a positive environmental and climatic impact. This requires the sustainable sourcing of substitution materials and cement alternatives, as well as the careful consideration of their overall carbon footprint. Also indirect emissions, such as emissions from chemicals required to treat timber or energy related emissions in the production of hydrogen to replace onsite fossil fuel use need to be taken into account.

Replacing 25% of cement used in construction with timber would require cutting a forest 1.5 times the size of India.

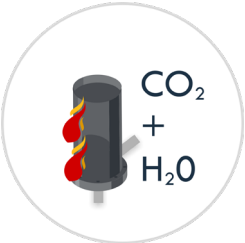


What Reinvention looks like.

Capturing CO_2 emissions from cement-making and storing them deep underground is currently the only way to prevent cement's "process emissions" from reaching the atmosphere. Carbon Capture and Storage (CCS) is a crucial reinvention of cement making that can complement the limitations of scale, costs and deployment time associated with other tools - which are nevertheless needed to be developed in parallel.

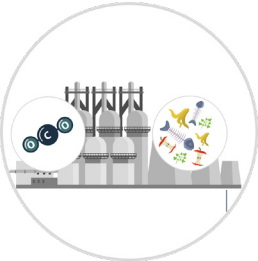
Beginning cement's path to net-zero today

Implenting solutions that we can employ now is essential to avoid further delay in climate action and reliance on the removal of CO_2 from the atmosphere in the future. Showcasing that deep decarbonisation is possible is a conversation-changer and sets new standards for industry. It creates new markets and opportunties and incentivises innovation in other measures and sectors, including alternative materials and recycling.



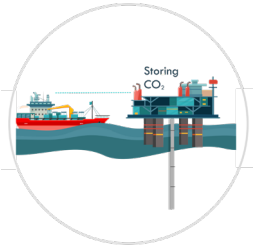
CO_2 capture at a cement plant

CO_2 can be captured at a cement plant through either post– or oxyfuel-combustion technologies. Novel capture technologies and production innovations will reduce costs and improve efficiencies.



CO_2 negative cement

Combining sustainable biomass for heat generation and CCS needed for process emissions provides industry with net-negative cement products that have actually taken CO_2 from the atmosphere.



Never reaching the atmosphere

Through CCS, cement has the ability to contribute to a net-zero emissions economy. After its capture, the CO_2 is transported via truck, train, ship or pipeline to an offshore storage facility. Here the CO_2 is permanently trapped in kilometres deep rock formations.

Did you know?

When CO_2 is stored in formations underground it gradually binds with surrounding minerals and effectively re-fossilises, i.e. becomes rock again.

The development of CO_2 transport and storage is a crucial part of climate action for cement and other energy intensive industries.

CCS can play a central role in reinventing the way in which we produce the basic materials of society. It is needed across other process industries, such as a chemicals and steel. As a three-step process from capture to transport and storage only the first step is distinct to each source point. This means that developing a shared CO_2 transport and storage network can benefit industry regions across Europe. As infrastructural projects take time, beginning the implementation today is essential for a CO_2 Network and CCS to be available at scale by 2030.

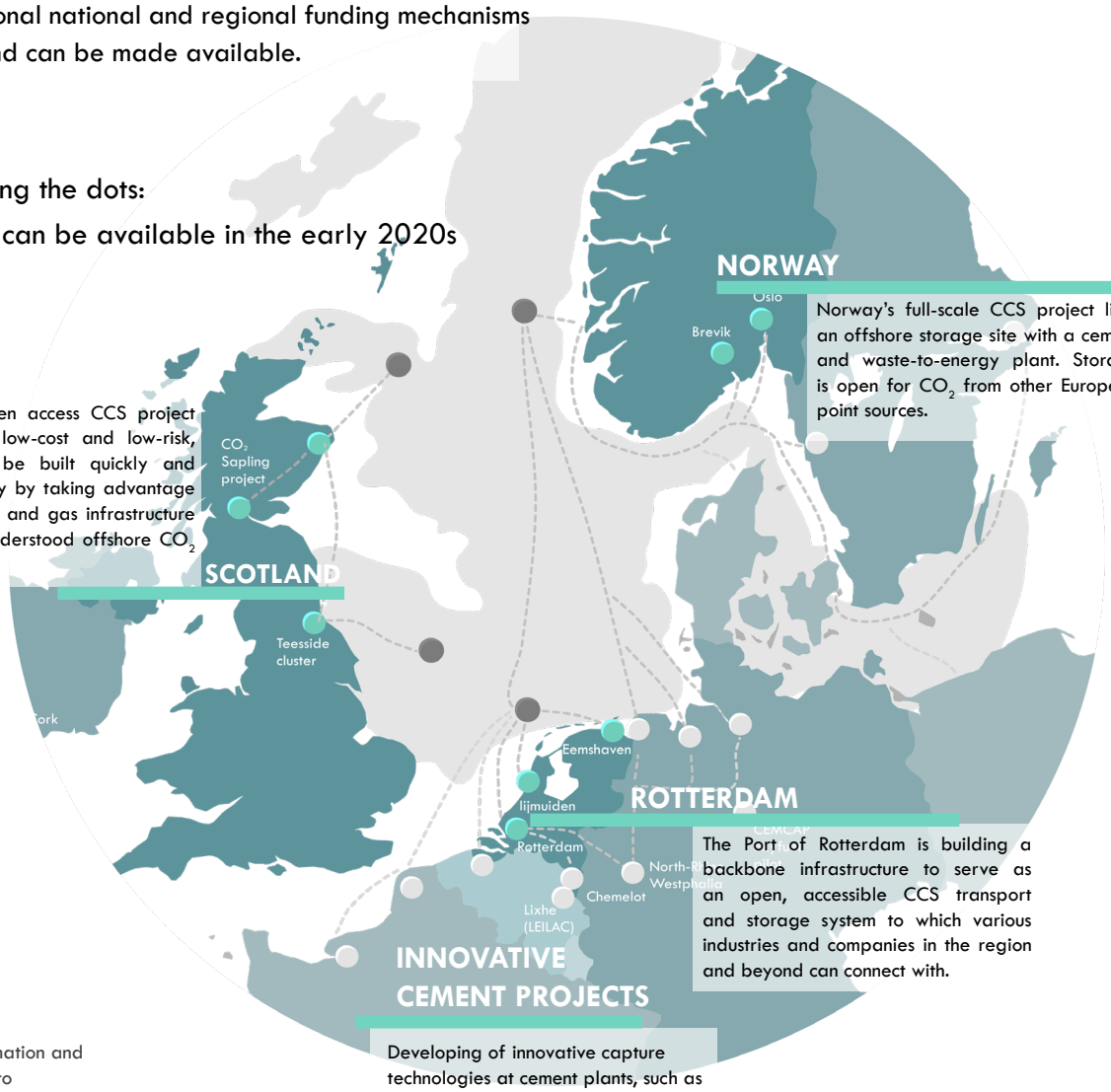
Europe is ready.

- The European CO_2 Storage Directive regulates CCS projects and ensures strict environmental and monitoring requirements are met.
- The Innovation Fund supports innovative, effective and scalable climate technologies.
- The Connecting Europe Facility (CEF) funds projects of common interest (PCI) that include cross-border CO_2 transport infrastructures.
- Additional national and regional funding mechanisms exist, and can be made available.

From demonstration to scale.

With regional & national governments in support, a demonstration capture plant can be up and running by the early 2020s if action is taken today. Sharing an open CO_2 network that links emission point sources with permanent offshore storage will reduce the cost of stopping emissions, allow more industries to make deep cuts in emissions and help transform high carbon employment into low carbon investment hubs.

Connecting the dots:
Storage can be available in the early 2020s



For more information and references, go to www.bellona.org to read our report "An Industry's Guide to Climate Action".

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