

FACT SHEET

DECARBONISATION PATHWAYS FOR EUROPEAN CEMENT

4% of EU's GHG emissions come from its cement industry

39K

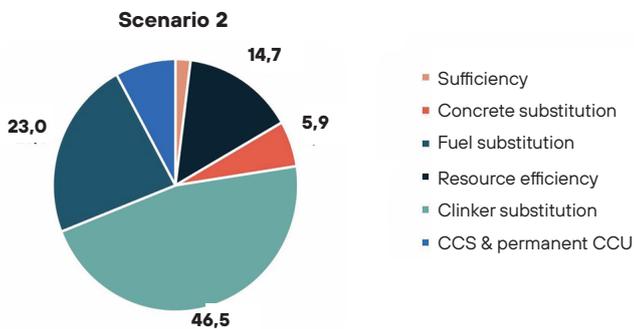


workers are employed in the European cement industry (**14.3M** if including the construction sector)

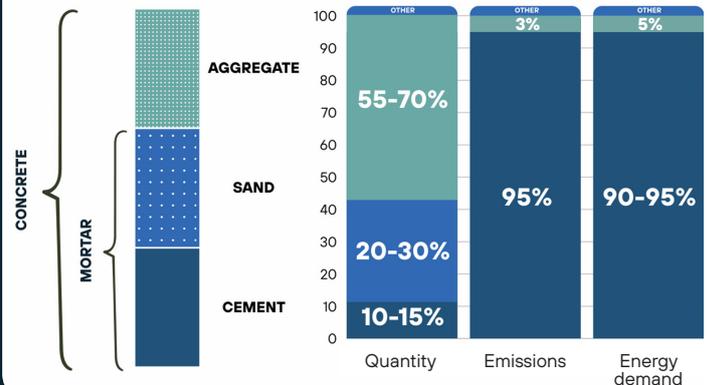
HIGHLIGHTS

- 1** As the highest emitting fraction of concrete, **decarbonising cement production is the priority to reduce emissions in construction**
- 2** **Permanent carbon capture is needed in all decarbonisation scenarios, to reach net-zero in the cement sector**
- 3** **Resource efficiency has the highest decarbonisation potential** if properly leveraged and promoted
- 4** Cost-effective decarbonisation options exist but they are not sufficient to **reach net-zero**

PRIORITISATION OF CLINKER SUBSTITUTION WITH CHANGE TO CEMENT STANDARDS



CONCRETE COMPOSITION



OUR RECOMMENDATIONS

- Deploy all levers simultaneously**, as no silver bullet exists for decarbonising the European cement industry
- Speed up the creation of the needed CO₂ infrastructure** to ensure cement plants have access to carbon storage sites
- Create demand for low-carbon cement and concrete**, to support the business case for deep decarbonisation projects: we need mandatory environmental criteria in public procurement and strict whole-life carbon limits under the EPBD, which should also be extended to cover the infrastructure sector.
- Shift from a policy framework that favours permanent carbon capture to performance-based standards**, levelling the playing field for all available technologies



Read the full report: eu.bellona.org



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4 DECARBONISATION SCENARIOS FOR EUROPEAN CEMENT



DEMAND REDUCTION

By optimising and reducing the use of concrete it is possible to reduce cement emissions as well

DECARBONISATION PATHWAYS:

Sufficiency: make a better use of the existing building stock and promote renovation over demolition

Resource efficiency: optimise the use of concrete through better design, prefabrication, and design-for-disassembly

Concrete substitution: using timber to substitute part of the concrete and reduce emissions

LIMITATIONS OF DEMAND REDUCTION

- **Requires data about building occupancy, involvement of the local communities**, and changes in personal habits, and **actions at local level**
- **Requires changes** in designing habits, building codes, construction process
- **Competition for high-value, sustainable biomass** and timber availability limitation = potential high costs



CLINKER SUBSTITUTION

By changing the cement composition and substituting part of clinker with Supplementary Cementitious Materials (SCMs) and fillers, emissions reduction & circularity are possible

DECARBONISATION PATHWAYS:

Substitution of up to 55% of clinker with a maximum emissions reduction of 63%

Cost-effective decarbonisation solution

Substitute clinker with Alkali-Activated Materials (AAMs)

LIMITATIONS CLINKER SUBSTITUTION

- **Affects the final properties of cement** and there is a need to adapt the standards
- **Need for new and adapted standards**
- Need for appropriate compositions and **value chain setup**
- **Competition between AAMs and SCMs for the same materials**



FUEL SUBSTITUTION

Using waste and biomass reduces fossil fuel use and dependency, with an overall emissions reduction of 33%

DECARBONISATION PATHWAYS:

Biomass: using sustainable biomass reduces emissions

Waste: using waste reduces emissions helps with waste management

Electrification: combined with renewable electricity reduces the need for fossil and alternative fuels

LIMITATIONS OF FUEL SUBSTITUTION

- **Competition for sustainable biomass** across sectors
- **Waste presents high variability in calorific power** and may affect material properties
- **Full electrification not possible** at scale yet



PERMANENT CARBON CAPTURE

By optimising and reducing the use of concrete it is possible to reduce cement emissions as well

DECARBONISATION PATHWAYS:

Carbon Capture and Storage: the CO₂ removed from the flue gas is transported and injected into permanent storage sites

Permanent Carbon Capture and Utilisation: the CO₂ removed from the flue gas is used in other processes and is permanently chemically bound

LIMITATIONS OF CARBON CAPTURE

- **High costs for both CapEx and OpEx and need for CO₂ infrastructure**
- **Limited permanent CCU applications**