

Low-Carbon Basic Materials in Construction

Tech for Net Zero Knowledge Poster #6

What are low-carbon basic materials?

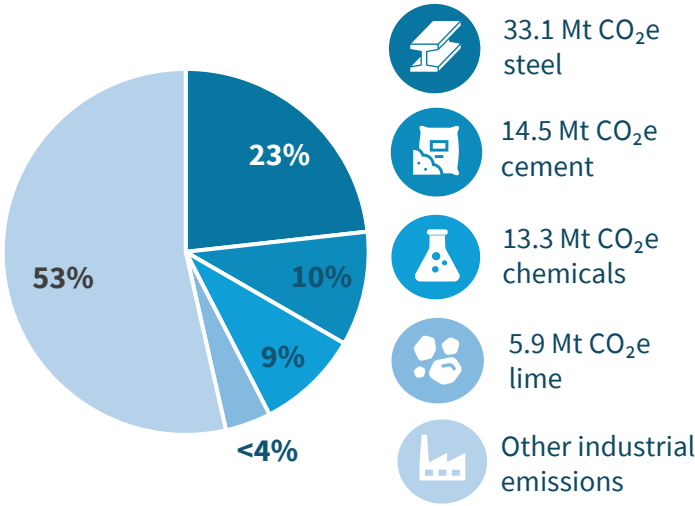


Low-carbon basic materials are high-volume industrial inputs such as steel, cement, chemicals and lime. They deliver the same technical function and performance as their conventional counterparts but are manufactured with substantially lower greenhouse gas emissions across the entire production lifecycle, from extraction to output.

144 Mt CO₂e
emissions from the
industrial sector
in Germany for 2025

46 %
are caused by the
production of basic
materials

Emissions in the industrial sector



Source: German Environmental Agency (2026)

Five cross-cutting levers for industrial decarbonization

Direct Electrification

Electricity replaces fossil fuel combustion.
It is mature for lower-temperature process heat today. High-temperature uses are mostly in pre-commercial stage.

Material Circularity

Recycled feedstocks lower process emissions and energy needs.
It reduces import dependence while strengthening sovereignty and resilience.

Energy Efficiency

Less energy used means fewer emissions and lower long-term costs.
Waste heat recovery and process optimization deliver immediate gains.

Green H₂ & PtX

Acts as both clean fuel and chemical feedstock or reducing agent.
Key for decarbonization of steel (direct reduction) and ammonia production.

CCU / CCS

Captures unavoidable process emissions, where alternatives are limited.
CCS stores CO₂ underground, CCU reuses it in products or fuels.

Case study: options for reducing emissions in cement production and use

Upstream



Quarrying & Inputs

- alternative raw materials
- recycled aggregates
- electric equipment & local sourcing

Cement production



Clinker production

- efficiency & waste heat recovery
- alternative fuels / hybrid heat
- CCUS for process emissions



Grinding & blending

- efficient grinding
- SCMs and blended cements
- lower clinker ratio

Concrete, use & circularity



Concrete batching

- optimized mix design
- lower-cement mixes
- water efficiency & admixtures



Construction & use

- low-emission logistics
- material-efficient design
- durability and longer life



End of life & circularity

- reuse of elements
- recycling into aggregates
- CO₂ mineralization & deconstruction

Clearing the path to market for low-carbon basic materials

Technology Readiness

- Low-carbon cement, steel and chemical routes are proven at pilot and first-plant scale (TRL 7-9).
- The technology is ready, and the companies driving it are scaling.

Finance Readiness

- First-of-a-kind plants lack the risk capital to reach a final investment decision. They need the right capital structure to bridge that gap.
- Today, fit-for-purpose project-finance structures are missing.

System Readiness

- Prescriptive standards, fragmented procurement and slow permitting keep proven materials out of the market.
- Policy reliability and lower energy costs are necessary.

Policy recommendations

- ➔ **Use performance-based standards:** Replace prescriptive, recipe-based standards with best practice: performance-based rules, harmonized carbon accounting, and fast-track approval pathways. Outdated standards act as market barrier to European innovation. Replacing them with performance-based standards allows rapidly decarbonizing cement, steel and chemical industries at a fraction of the cost.
- ➔ **Scale innovation through public offtake:** Leverage government procurement to create investment signals for low-carbon basic materials. Increase the local-content requirements under the Industrial Acceleration Act. Establish credible labeling and certification schemes to measure and verify carbon content for construction projects, aligned with emerging private-sector standards and initiatives.
- ➔ **Make carbon pricing work for low-carbon materials:** Deliver a predictable ETS price path and phase out free allowances on a clear schedule. Confining the price signal to primary production suppresses demand for low-carbon materials. A legislated ETS price trajectory with stable phase-out milestones and a robust CBAM are preconditions for European low-carbon producers to compete.

Tech for Net Zero network of low-carbon basic materials in construction



ecoLocked produces biochar-based admixtures for concrete. Its Carbon-to-Concrete Platform turns biomass residues into stable carbon materials, helping concrete manufacturers reduce emissions and store carbon in buildings.

ecopals develops recycled-plastic asphalt additives for sustainable road construction. In asphalt, the company's product line EcoFlakes replaces the virgin polymer share and reduces overall bitumen use, significantly lowering material costs and CO₂ emissions.



ecoworks provides industrialized serial building refurbishment. Its prefabricated, digitally planned wall and roof modules upgrade ageing residential stock to near-zero-energy standards, reducing build time, tenant disruption and operational CO₂ emissions.

everox advances circular concrete upcycling technology. Its patented process transforms end-of-life concrete into drop-in substitutes for cement, aggregates and sand, reducing virgin material use and CO₂ emissions in new concrete.



neustark operates carbon removal technology for mineral waste. Captured CO₂ is permanently mineralized in demolished concrete, slag or incinerator bottom ash, turning recycled residues into carbon-storing construction materials.

sequestra develops CO₂ mineralization for industrial residues. The startup operates the world's first dedicated lab for identifying carbonation potentials of all major mineral material streams, leading to optimized industrial processing.



Sublime Systems produces low-carbon cement through fully electrified manufacturing. Its process avoids limestone and combustion emissions, using carbon-free raw materials to create a drop-in cement replacement.