CO_2 Accounting

Heidelberg Materials

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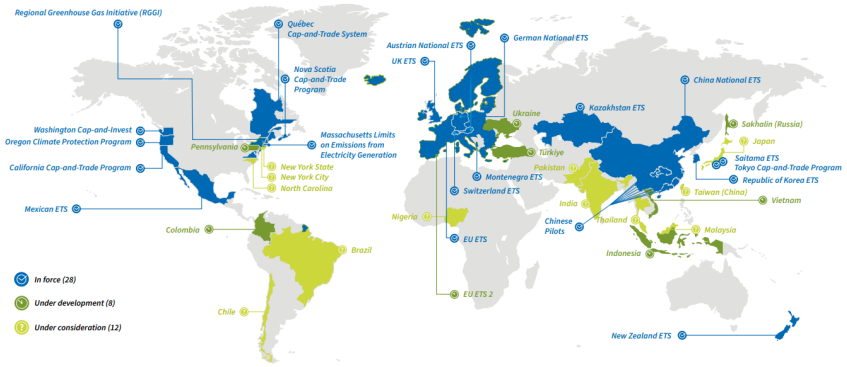
CO_2 accounting voluntary and mandatory regulations

Global Cement and Concrete Association



CO_2 and Energy Accounting and Reporting Standard for the Cement Industry

- Drafted in 2001, it sets the methodology for calculating and reporting CO2 emissions. It was closely aligned with the overarching Greenhouse Gas Protocol developed under a joint initiative of the WBCSD and the World Resources Institute (WRI).
- 2 main revisions published in 2005 and 2011.
- Besides cement and clinker production it reports on energy (fuels, power)

EU ETS

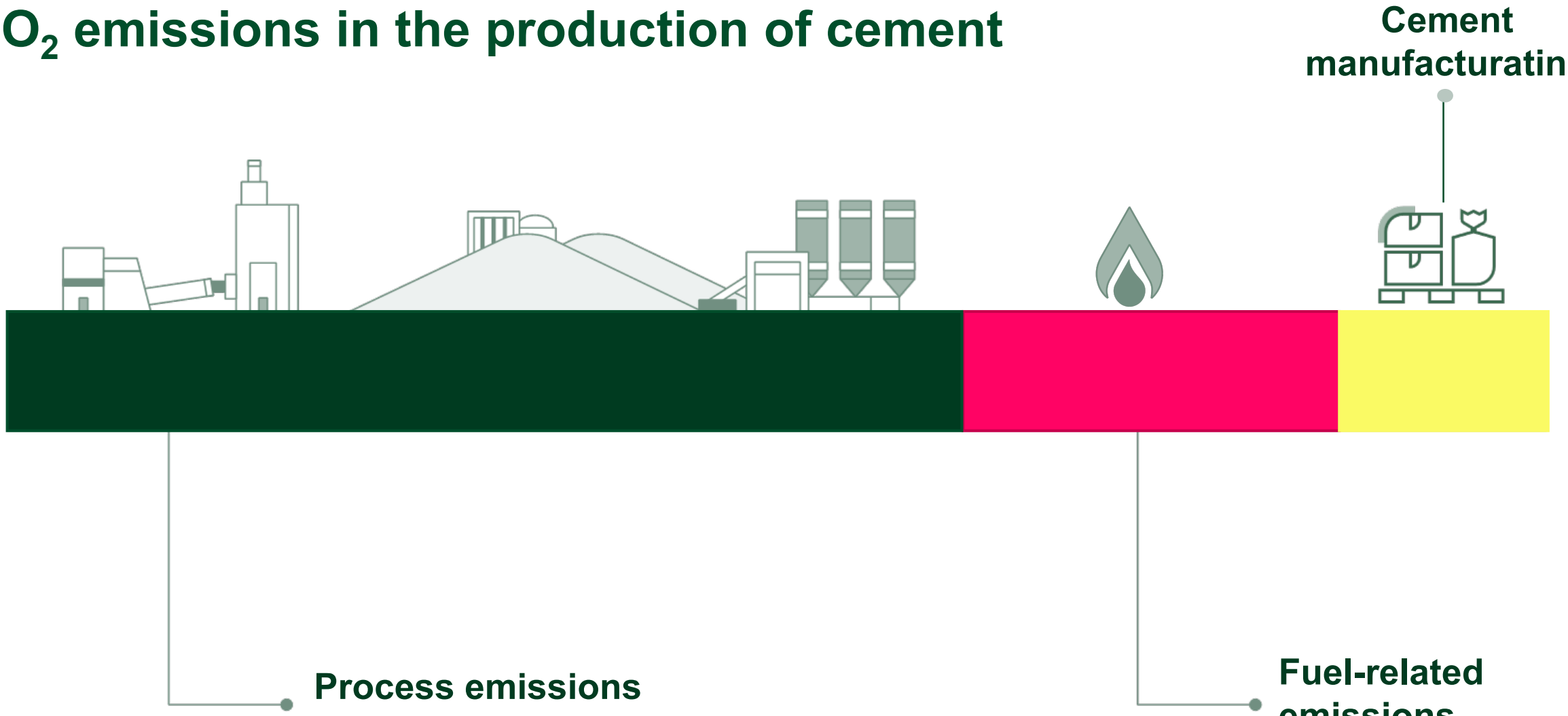
- Cap and trade system based on product benchmark, historical production, and plant emissions
- Significant reduction of free allowances from 2026 – phasing out by 100% in 2034
- Stringent requirements to identify low carbon fuels sources (RED II)
- Extension of ETS coverage on shipments and trucks

Other carbon systems

- Cap and trade system based on product benchmark, historical production, and plant emissions
- Tax implications

Cement production process

CO_2 emissions in the production of cement



Direct CO_2 emissions: Process emissions in clinker production

- **Chemical conversion** of the raw material (limestone + clay) into clinker at a temperature of approx. 1450 °C
- **Formation of CO_2 through the calcination of the limestone** during the firing process: $CaCO_3$ → $CaO + CO_2$

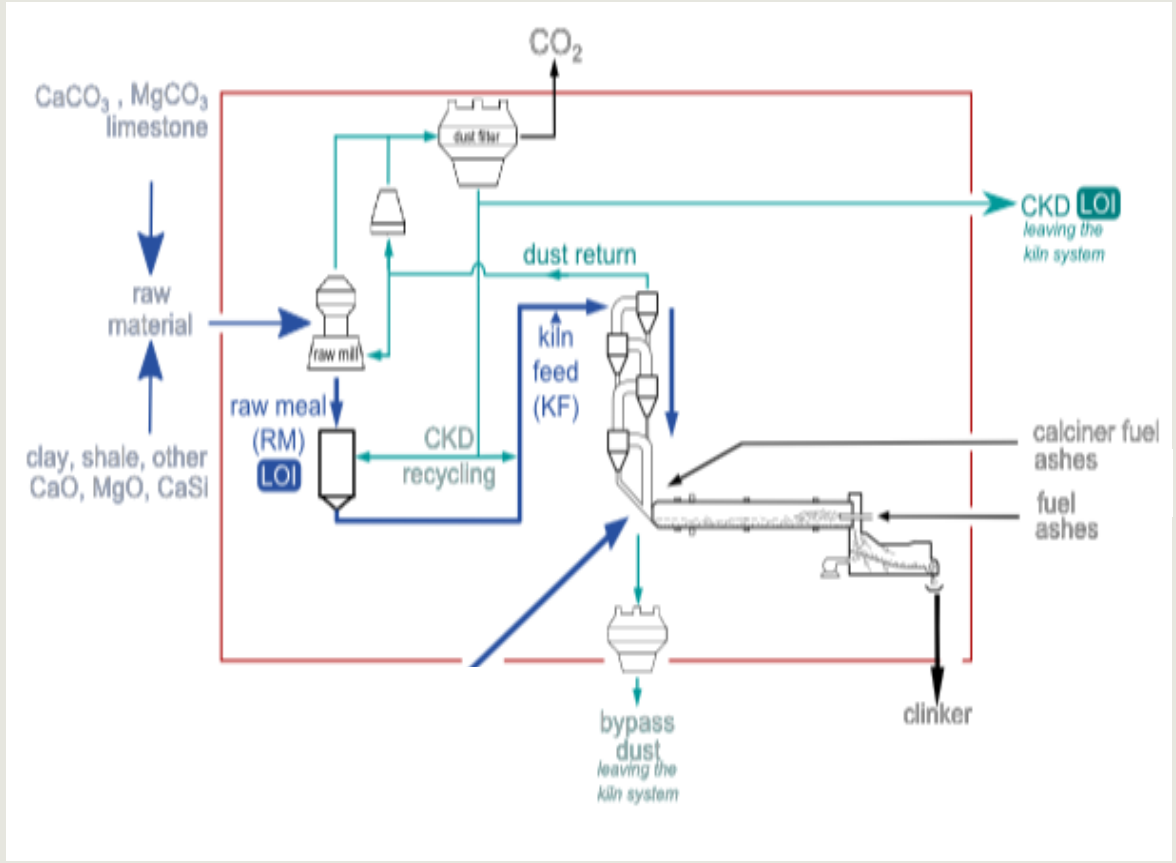
Direct CO_2 emissions: Fuel-related emissions in clinker production

- Energy use in **burning, cooling and grinding** the clinker

Direct CO_2 emissions: Fuel-related emissions in clinker production

- Energy use in drying of secondary cementitious materials
- Grinding

Process emissions (input data)



- **Limestone**
- **Clay**
- **Shale**
- **Alternative raw materials (i.e. ashes)**

Fuel emissions (input data)

Equation 13: CO_2 emissions from fuels

$$CO_2\ emissions\ [t\ CO_2/yr] = Fuel\ [t/yr] \times LHV_{fuel}\ [GJ/t] \times [1\,t/1000kg] \times EF_{fuel}\ [kg\ CO_2/GJ]$$

where:

- *Fuel = Amount of fuel in tonne per year*
- *LHV_{fuel} = Lower heating value of fuel in gigajoules per tonne*
- *EF_{fuel} = Emission factor of fuel in kg CO_2 per gigajoule*

Conventional fuels: coal, petrol coke, heavy fuel, diesel oil, natural gas, ignite, others.

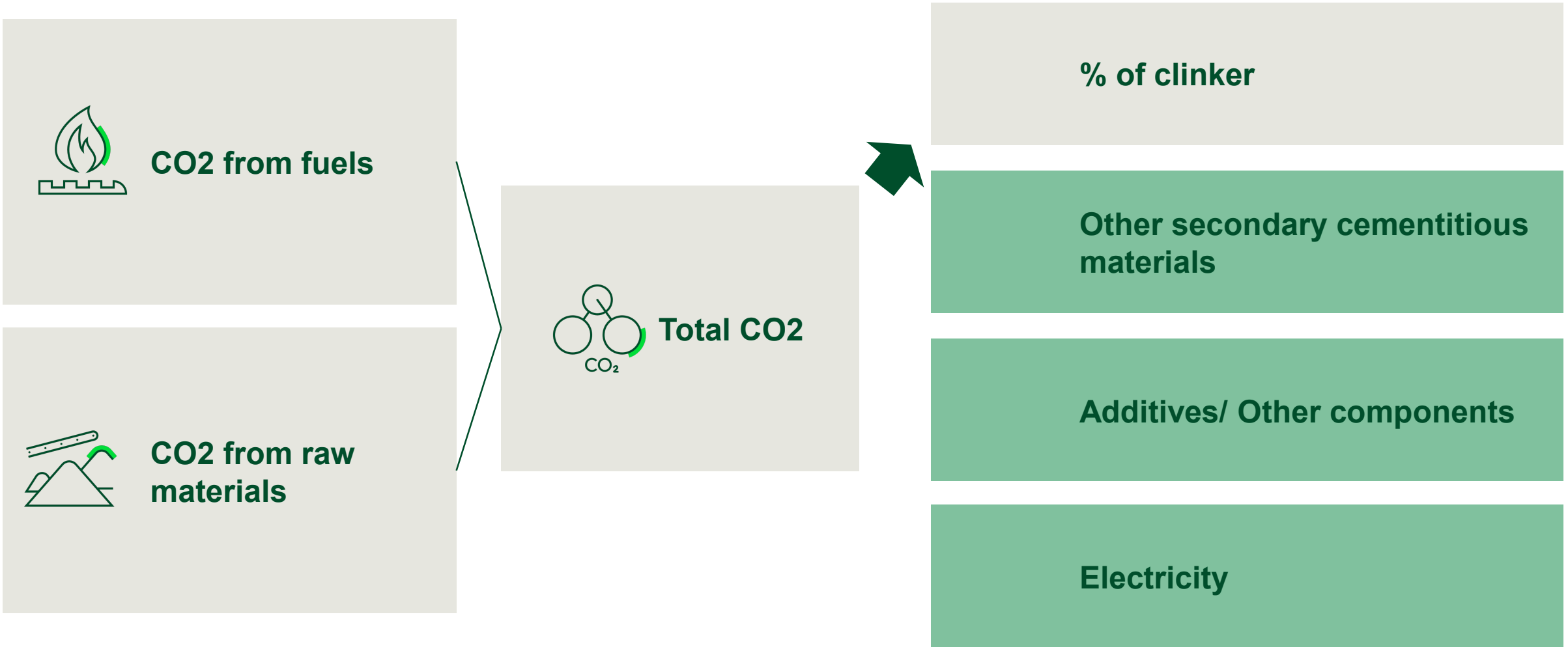
Alternative Fuels (incl biogenic fuels): waste oil, tires, RDF, sewage sludge, animal waste, agricultural waste, saw dust, others.

Emission factors – data sources

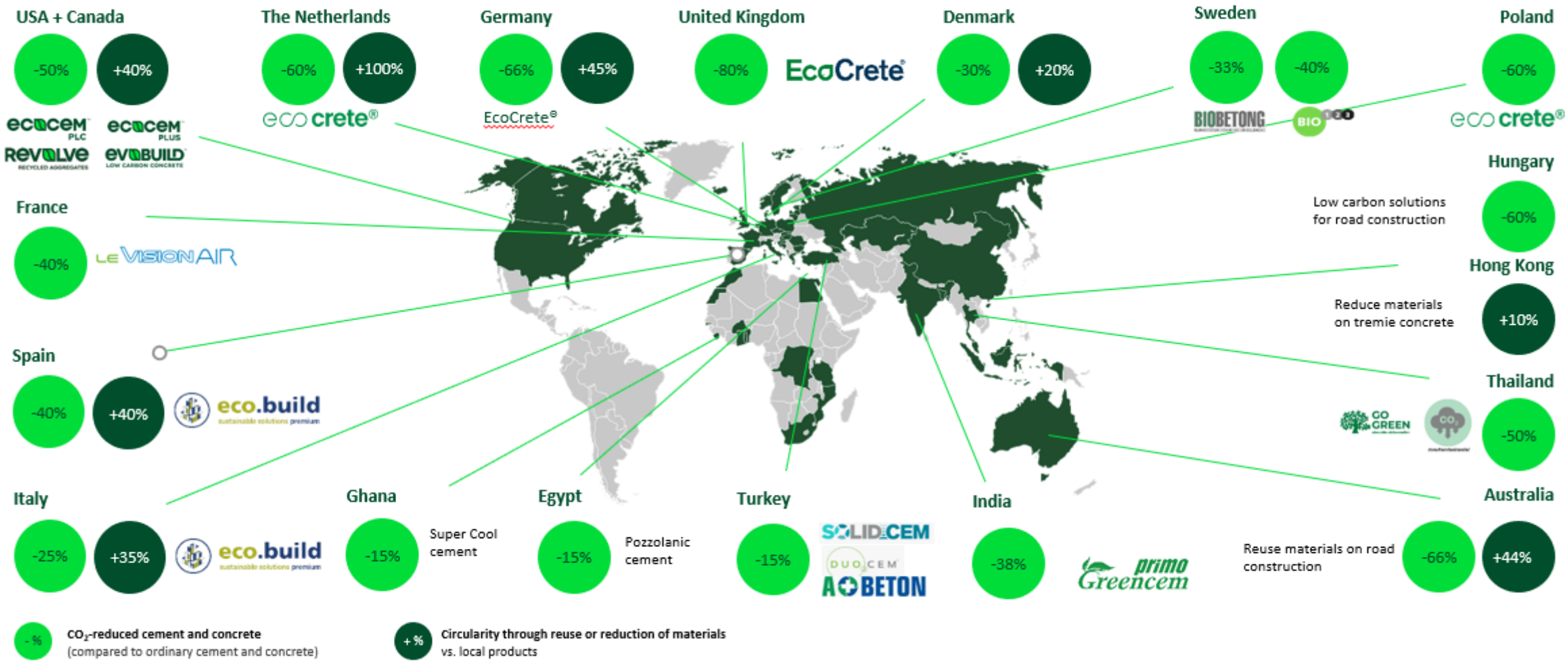
Primary data	Testing	Industry standard / secondary data
• Supplier data • Challenges: accuracy / transparency on the information, awareness on CO2 accounting	• On site testing • Challenges: periodicity, availability of equipment, cost, time.	• Global values • Challenges: accuracy

Benefits of transparent CO_2 accounting

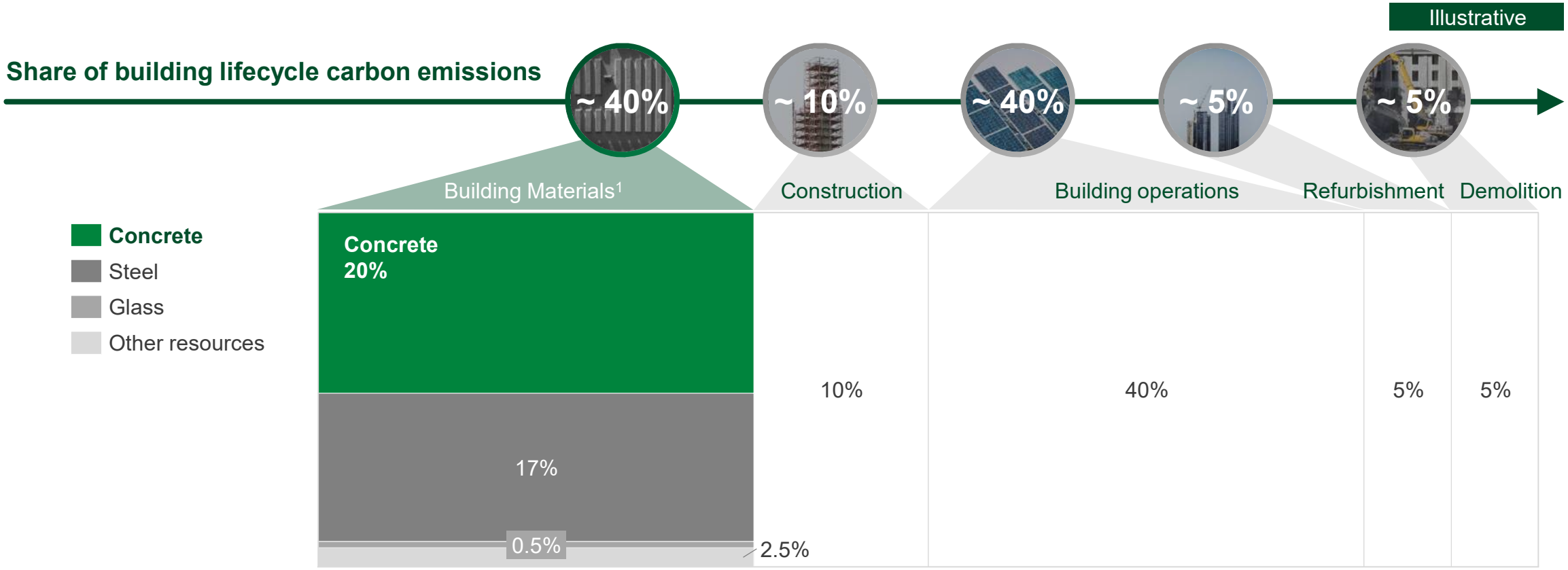
CO_2 footprint assigned based on product composition



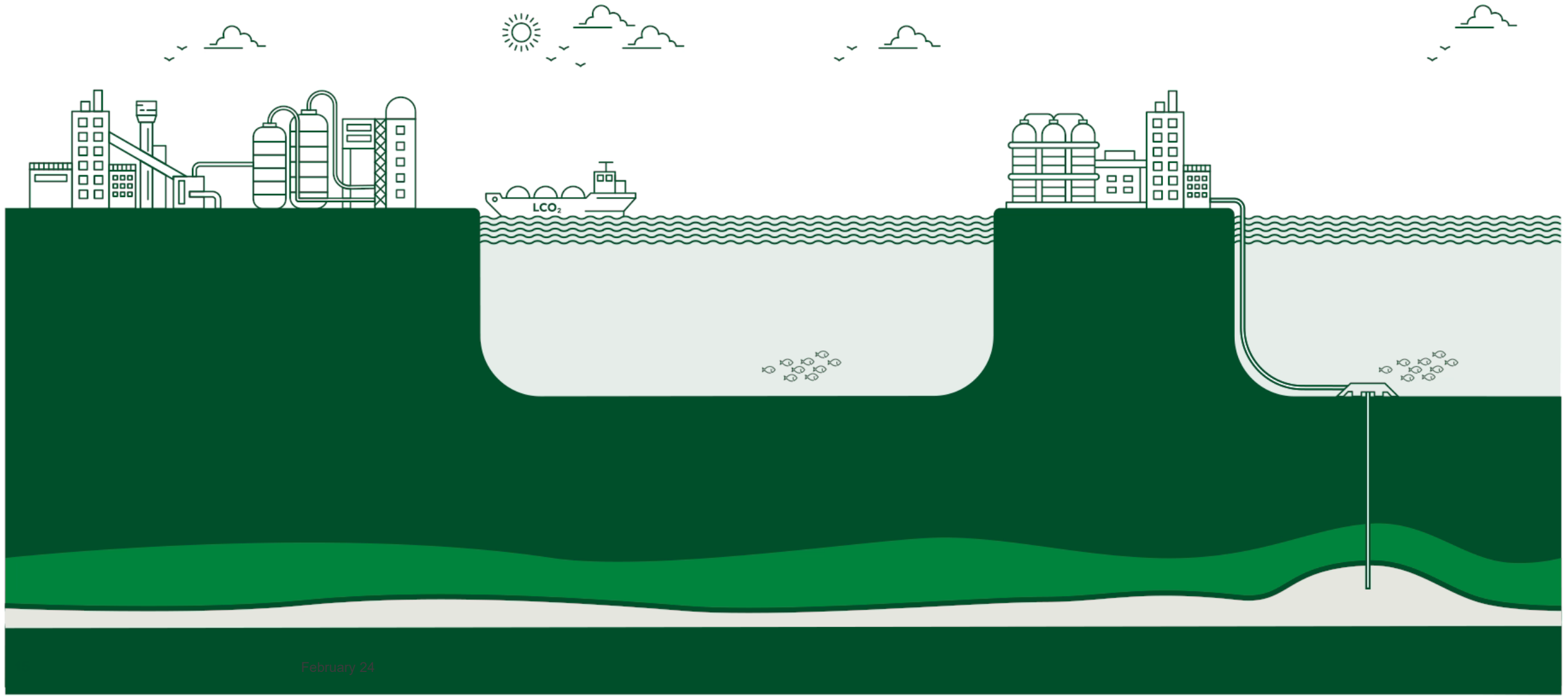
Customers benefit globally from our sustainable products



Lifecycle emissions: building materials are a significant emission source



The CO_2 journey from capture to storage



Thank You.

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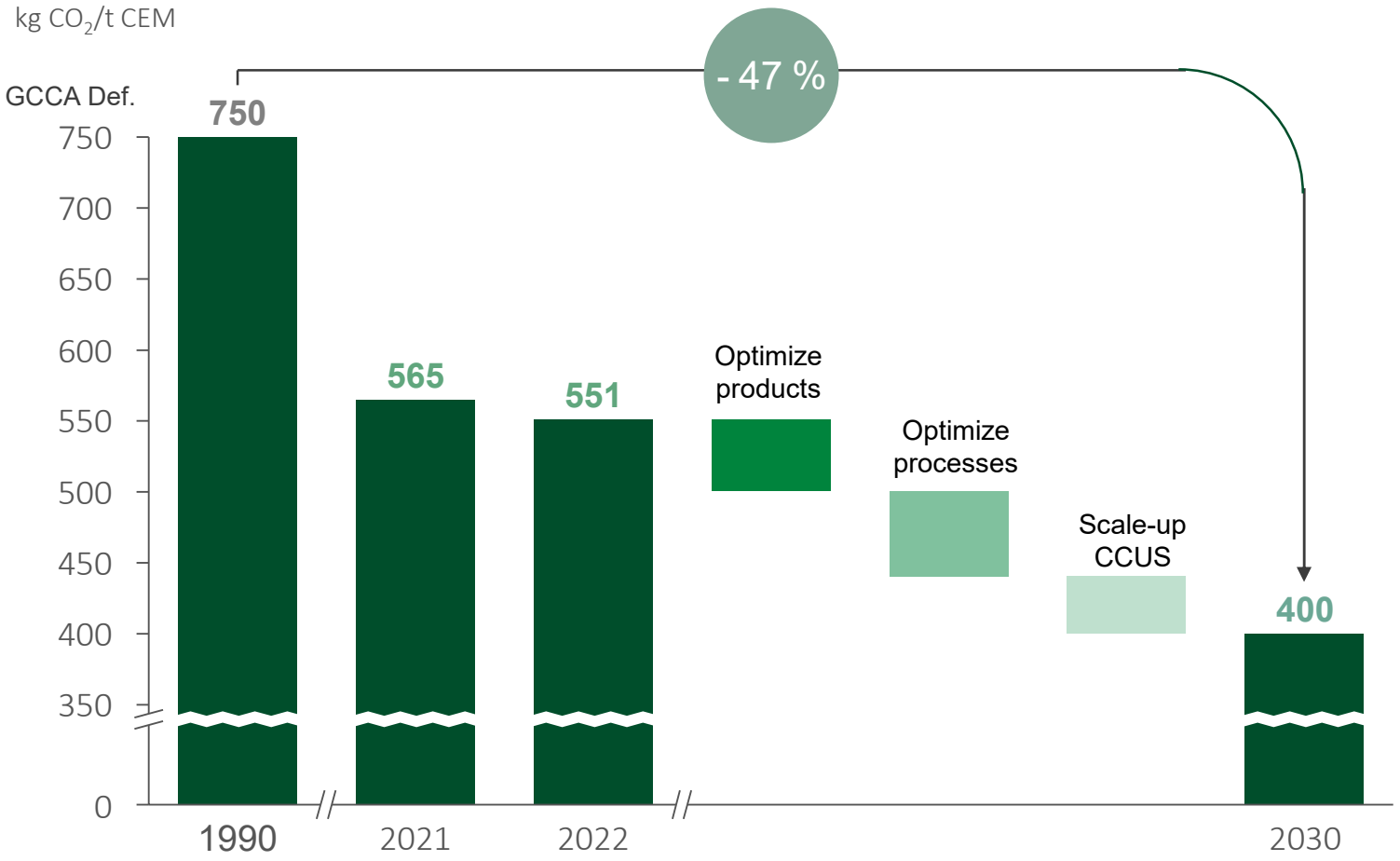
We will reduce our CO_2 emissions by 47% by 2030 vs. 1990



Levers to reach our 2030 target

- **Products**
  Clinker incorporation <68%
  Drive circularity
- **Process**
  45% Alternative fuels rate
  20% Biomass fuels rate
- **CCUS**
  10 mt CO_2 captured by 2030 (cumulatively)