

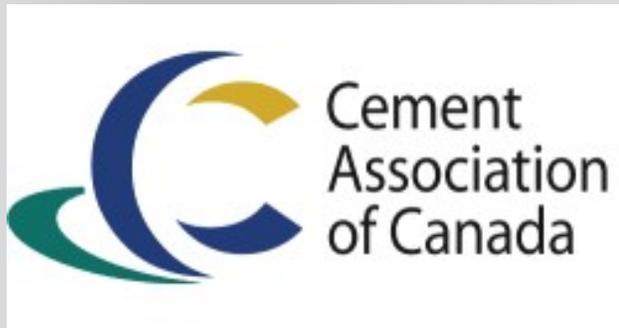


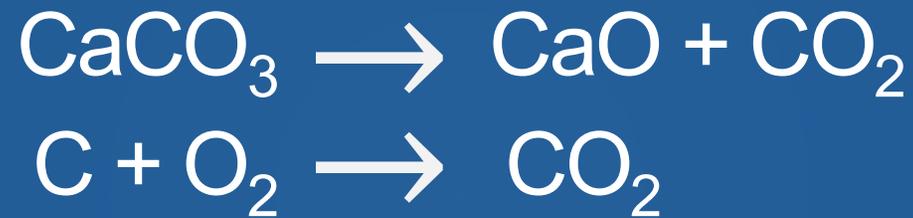
THE PORTLAND CEMENT ASSOCIATION PRESENTS ITS ROADMAP TO CARBON NEUTRALITY

shaped
BY CONCRETE

PCA *Since 1916*
America's Cement Manufacturers™

COOPERATION / COLLABORATION / COORDINATION

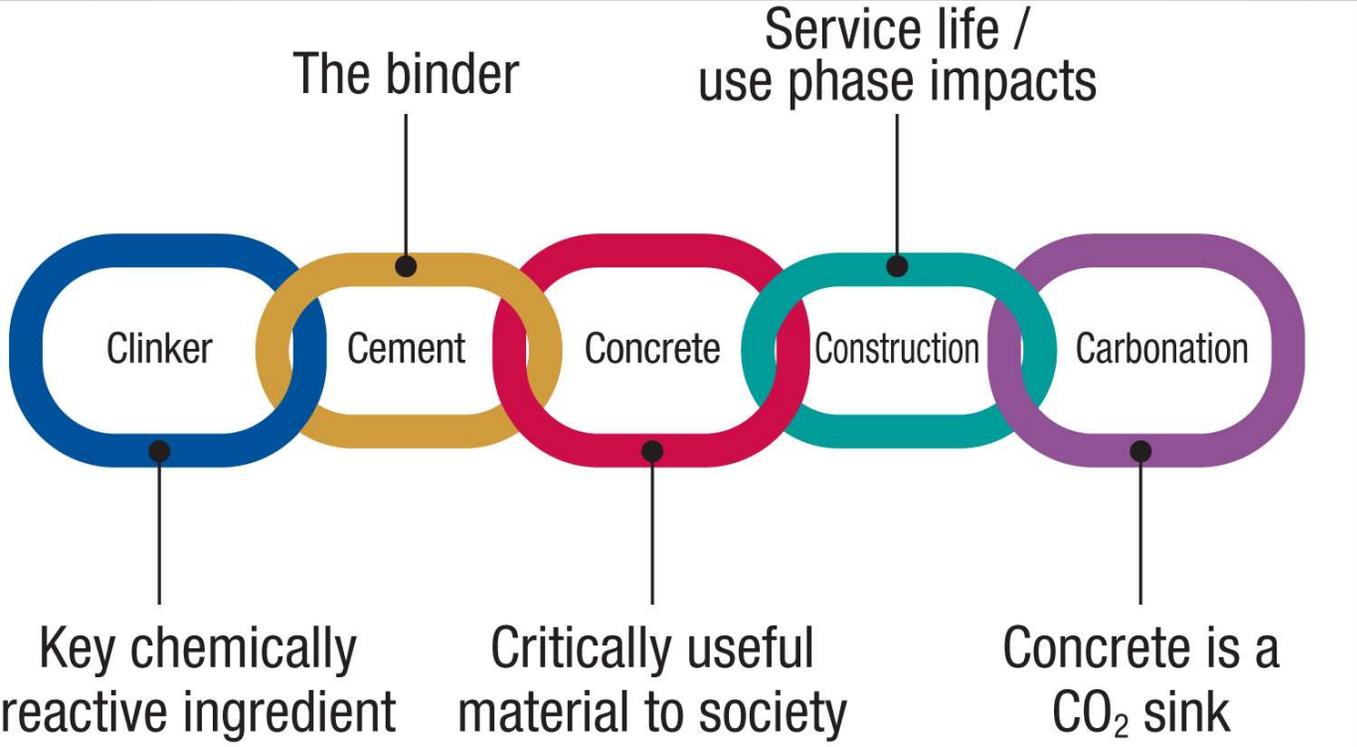




U.S. Cement Industry contribution to global GHG = 0.17% CO_{2eq}

U.S. Cement Industry contribution to U.S. GHG = 1.25% CO_{2eq}

THE VALUE CHAIN



ADDRESSING CLINKER TODAY

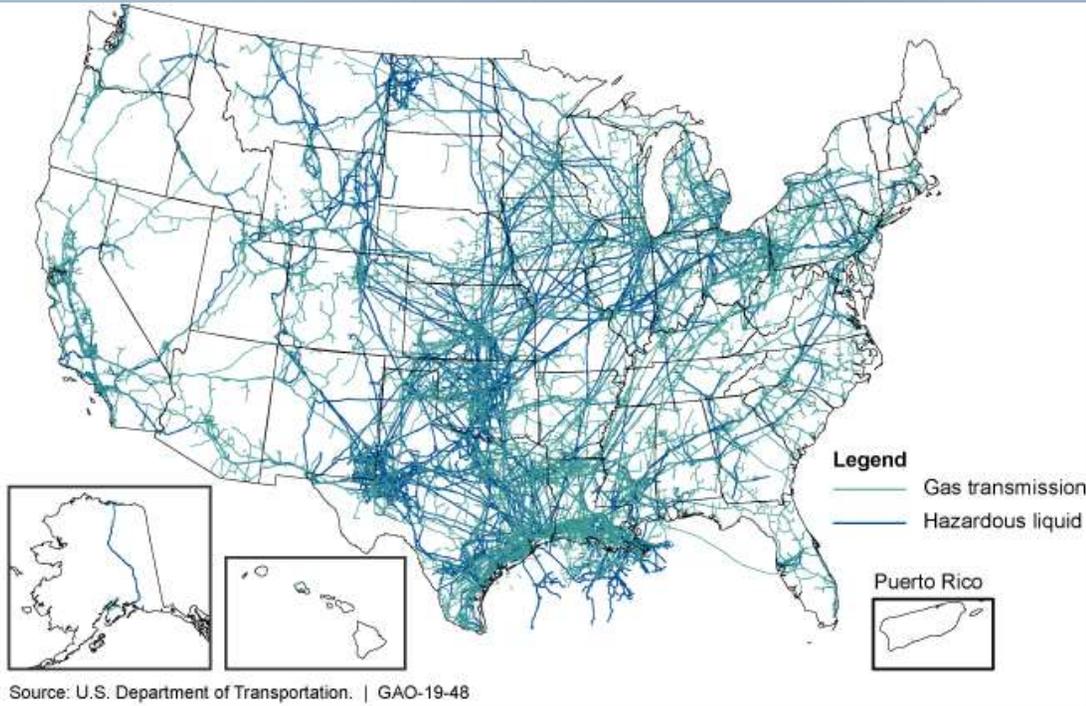
- Increased use of alternative raw materials
- Efficiency gains in the manufacturing process
- Fuel switching/fuel substitution/renewables



ADDRESSING CLINKER TOMORROW

- Transformative fuels and technologies like hydrogen
- Incorporating carbon capture and sequestration

INFRASTRUCTURE NEEDS – NEW PIPELINE CAPACITY NEEDED FOR CO₂, H₂, NATURAL GAS



INFRASTRUCTURE NEEDS – ENERGY

- Energy consumed by CCUS is significant and existing energy production is woefully inadequate
- Energy delivered by On-Site Power Generation requires added grid capacity
- Energy from renewable sources requires added grid capacity



OPTIMIZING CEMENT

- Right-sizing the amount of clinker in cement
- Using more non-gypsum additions
- Recognizing the benefits of portland-limestone cements
- Choosing the right cement specification for the specific application
- Zero emissions bulk transportation (rail/truck)

OBSTACLES TO OPTIMIZING CONCRETE

- Limits on how much supplementary cementitious material (SCM) can be used
- Restrictions on the use of fly ash as an SCM
- Minimum requirements for how much cementitious material should be used
- Limits on water-cementitious materials ratio
- Restrictions on aggregate grading

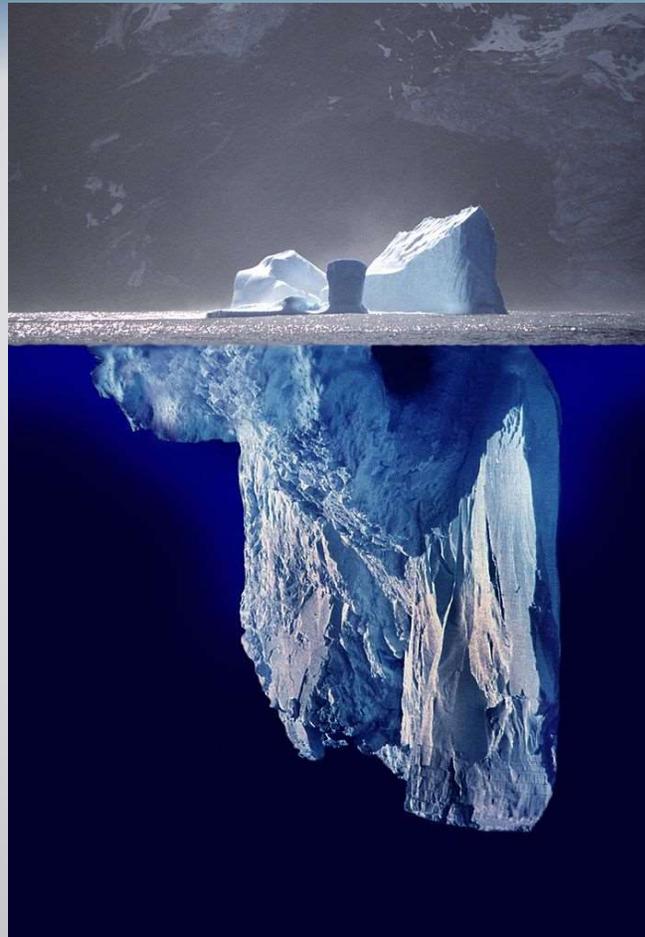
THE SOLUTION?

- Shift from prescriptive to performance-based specifications
- Incentivize innovation with today's products instead of institutionalizing inertia with yesterday's practices
- The right mix using the right materials for the right application to achieve the right performance

OPTIMIZATION OF THE BUILT ENVIRONMENT – IT'S ABOUT MORE THAN THE MATERIALS



LOWEST INITIAL CARBON MAY NOT EQUAL LOWEST OVERALL CARBON



CLIMATE RELATED WEATHER EVENTS REQUIRE SMART CONSTRUCTION... AND SMART CONSTRUCTION MUST BE SUSTAINABLE CONSTRUCTION



SUSTAINABLE CONSTRUCTION IS RESILIENT



BUILDING BACK BETTER MEANS CONCRETE CONSTRUCTION



THE IMPORTANCE OF LIFE CYCLE

- Completed January 1943
- 435,000 cubic yards of concrete
- 43,000 tons of steel
- 680,000 tons of sand and gravel
- Still absorbing CO₂ after nearly 80 years
- **Concrete can absorb 10% of the CO₂ emissions generated during the manufacture and transportation of both cement and concrete**



THE BIG TEN



Research, Development & Innovation



Regulations, Permitting & Guidance



Financial Incentives & Support



Performance-Based Material Standards



Market-Based Carbon Pricing



Market Acceptance



Community Acceptance



Cradle-to-Cradle Life Cycle-Based Procurement



Low-Carbon Infrastructure



Level Playing Field

QUESTIONS?

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