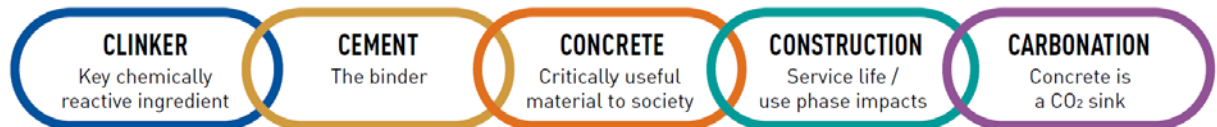


Summary of Roadmap to Carbon Neutrality – Portland Concrete Association (PCA), by Jan Bradford

- 1) Committed to achieving carbon neutrality across the cement and concrete value chain by 2050.
- 2) This industry drives the American economy and represents more than 6% of gross domestic product.
- 3) PCA member companies produce the majority of cement manufactured in the U.S, and many members also manufacture ready-mix concrete and cement-based materials.
- 4) Climate and Sustainability Council Task Group Leaders for Clinker, Carbonation, Cement, Construction and Concrete.



- 5) Their Roadmap includes the entire value chain starting at the cement plant and extending through the entire life cycle of the built environment to incorporate the circular economy.
- 6) The five links in the value chain include the production of clinker, the manufacture and shipment of cement, the manufacture of concrete, the construction of the built environment, and the capture of carbon dioxide using concrete as a carbon sink.
- 7) Based on the U.S. Environmental Protection Agency (EPA) carbon emissions data, the manufacture of cement accounts for 1.25% of U.S. CO₂ emission.
- 8) PCA Approach:
 - a. **Step 1: Production – At the Cement Plant**
 - i. Replace raw materials with decarbonated materials
 - ii. Use alternative fuels
 - iii. Continue efficiency improvements
 - iv. Implement carbon capture, utilization, and storage (CCUs) technology
 - v. Promote new cement mixes
 - vi. Increase use of Portland-limestone cement (PLC)
 - b. **Step 2: Construction – Designing and Building**
 - i. Optimize concrete mixes
 - ii. Use renewable fuels
 - iii. Increase the use of recycled materials
 - iv. Avoid overdesign and leverage construction technologies
 - v. Educate design and construction community
 - c. **Step 3: Everyday – Concrete Infrastructure in Use**
 - i. Incentivize energy efficient buildings
 - ii. Reduce vehicle emissions by improving fuel efficiency
 - iii. Decreased maintenance
 - iv. Recycling
 - v. Carbonation

The construction sector is poised for growth, with the U.S. predicted to add another 121 billion square feet of buildings by 2050, the equivalent of constructing New York City every year for the next 20 years. This does not account for trillions of dollars the country is poised to spend on reviving infrastructure, rehabilitating existing roads and bridges, and expanding construction in growing cities.

Near-Term Goals:

- Replace raw materials with recycled materials
- Product low-carbon cement blends
- Optimize designs for the lowest life cycle emissions

Mid-Term Goals:

- Increase the use of alternative fuels
- Use renewable energy

Long-Term Goals:

- Carbon capture
- Introduce new cement blends

Adopting whole-building life cycle-based standards in design and construction can have dramatic impacts in reducing CO₂ associated with the built environment. The initial CO₂ impact of building materials is minuscule in comparison to the CO₂ associated with heating and cooling a building, and energy for lighting, phones, computers, display screens, workstations and dozens of other energy needs.