

ROADMAP TO CARBON NEUTRALITY

EXECUTIVE SUMMARY

A more sustainable world is
Shaped by Concrete

OUR VISION

Collaboration with industry and private partners will be imperative to realize the multitude of solutions that this Roadmap outlines. The best success stories are always when we work together to solve these grand challenges."

Michael Ireland

President & CEO, Portland Cement Association

shaped
BY CONCRETE

To learn more about the industry's commitment to sustainability visit cement.org/sustainability.

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PCA
America's Cement Manufacturers™
Since 1916

OVERVIEW

PCA member companies are committed to achieving carbon neutrality across the cement and concrete value chain by 2050.

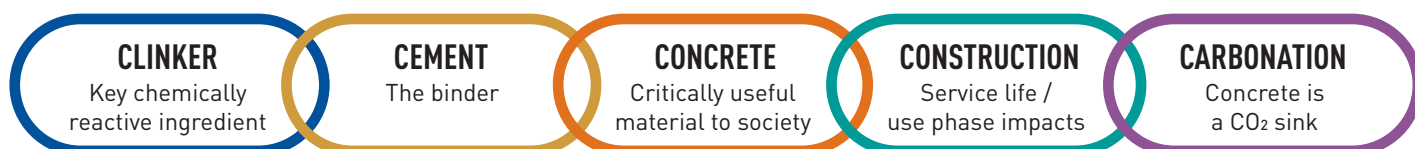
The PCA Roadmap involves the entire value chain starting at the cement plant and extending through the entire life cycle of the built environment to incorporate the circular economy. This approach to carbon neutrality leverages relationships at each step of the value chain, demonstrating to the world that this industry can address climate change.

The cement and concrete industry cannot do this alone. To bring down CO₂ emissions from all sources, including the building sector, one must recognize the way that our world is interconnected. Stakeholders must work together to ensure that the building sector is creating a built environment that is actually sustainable – this is why PCA member companies are embarking on a journey to carbon neutrality as a full industry and inviting others across the value chain to join this effort. Government agencies, non-governmental organizations, and academic institutions all have a role and the industry looks forward to collaborating on this mission to achieve carbon neutrality across the value chain.

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.

Each link identifies specific targets, timelines, technologies, and policies to reach the goal of carbon neutrality. The approach in this Roadmap leverages each step of the value chain from the farthest upstream to the final reuse and recycling phase. PCA member companies can specifically work on actions to reduce emissions associated with the manufacturing of clinker and the production of cement. Many PCA member companies also produce concrete products. Additionally, PCA member companies sell to concrete producers and can seek to effect change there as well. Cement and concrete manufacturers do not control every link in the value chain, but this Roadmap provides direction and incentives that spur action.

On the next page are the pathways for unlocking emissions reductions along the cement and concrete value chain, now and in the near future.



PRODUCTION: AT THE CEMENT PLANT	
Replace raw materials with decarbonated materials	Using decarbonated materials eliminates CO ₂ emissions from processing traditional raw materials, like limestone.
Use alternative fuels	Replacing traditional fossil fuels with biomass and waste-derived fuels lowers greenhouse gas (GHG) emissions and keeps materials out of landfills.
Continue efficiency improvements	Increasing energy efficiency reduces the amount of CO ₂ emitted for each ton of product.
Implement carbon capture, utilization, and storage (CCUS) technology	CCUS directly avoids a significant portion of cement manufacturing emissions.
Promote new cement mixes	Creating new cements using existing and even alternative materials reduces emissions from mining for new materials, while optimizing the amount of clinker used ensures emissions correspond to necessary production.
Increase use of portland-limestone cement (PLC)	As an existing lower-carbon blend, universal acceptance of PLC will reduce clinker consumption and decrease emissions.
CONSTRUCTION: DESIGNING AND BUILDING	
Optimize concrete mixes	Considering the specific needs of the construction project and using only the materials necessary, avoiding excess emissions.
Use renewable fuels	Switching to solar, wind and other renewable sources of energy directly reduces emissions from other energy sources.
Increase the use of recycled materials	Diverting these materials from landfills.
Avoid overdesign and leverage construction technologies	Designing for the specific needs of the construction project reduces unnecessary overproduction and emissions; incorporating just-in-time deliveries.
Educate design and construction community	Improve design and specifications to be more performance oriented which will permit innovation in cement and concrete manufacturing. Encourage the use of advanced technologies to improve structural performance, energy efficiency, resiliency, and carbon sequestration.
EVERYDAY: CONCRETE INFRASTRUCTURE IN USE	
Incentivize energy efficient buildings	Increasing buildings' energy efficiency can cut energy use and resulting emissions from heating and cooling.
Reduce vehicle emissions by improving fuel efficiency	Because of its rigidity, concrete pavements enhance the fuel efficiency of vehicles driving over them, reducing vehicle emissions.
Decreased maintenance	Due to their durability, concrete structures (buildings, pavements, bridges, dams, etc.) last longer and require less frequent maintenance.
Recycling	Concrete in place can be 100% recycled, limiting the use of raw materials and production emissions.
Carbonation	Every exposed concrete surface absorbs CO ₂ and over the course of its service life, a building can reabsorb 10% of cement and concrete production emissions.

POLICY AND SHARED ADVOCACY

The Roadmap to carbon neutrality is more than targets, timelines, and technologies for each link within the value chain. Each of these require significant policy support. PCA supports market-based policies and initiatives that will enable the cement and concrete industry's continued reduction of its carbon footprint responsibly and sustainably.

Federal policy should be realistic and technically feasible. It must recognize the significant technology, funding and market innovation needed for rapid decarbonization while preserving economic growth and international competitiveness. These reductions will not come easily and will require technology advancements, regulatory refinements, new ways of thinking about clean energy and industrial fuels, and increased resiliency of our buildings and infrastructure. However, the cement and concrete industry cannot achieve this goal alone and effective federal policies are needed to help reach this goal. Without effective policies, the industry cannot attain the goal of carbon neutrality by 2050.

PCA has identified ten major policy levers that can help the industry achieve its goal of carbon neutrality and they include:

1. Accelerated research, funding, and investment in manufacturing, material innovation, and CCUS technologies and associated infrastructure.
2. Streamlined regulation, siting, and permitting practices for facility and infrastructure modernization.
3. Recognition and credit for industry reduction levers.
4. Community acceptance of CCRs, alternative fuels, CCUS, and other manufacturing technologies.
5. Consideration of a market-based carbon price – preferably a cap-and-trade mechanism – consistent with core principles, including fairness, transparency, and innovation.
6. Market acceptance of low-carbon alternative cements and concrete.
7. Adoption of performance-based standards for building materials.
8. Consideration of the full product, material, and building life cycle in procurement standards and policy.
9. Investments in clean fuel, energy, transportation, and industrial infrastructure.
10. Leakage protections for domestic manufacturers competing against less regulated imports.

PCA MEMBER COMPANIES

