

Commentary: Cement is a big part of the carbon problem. How to make it part of the solution

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In 2014, hundreds of Angelenos gathered downtown to watch more than 2,000 trucks pour concrete into a vast hole. During that event, Los

Angeles set a world record: 80 million pounds of concrete were laid down over 18 straight hours to form the foundation for the Wilshire Grand Center, which now towers 73 stories over the city.

This material that has been used for thousands of years, that formed the Colosseum and the Pantheon, has become indispensable. It's the most-consumed human-made material on Earth. It's also one of society's biggest sources of greenhouse gas emissions.

Globally, manufacturing of cement—which binds together sand and rock to form concrete—emits 8% of the [carbon dioxide pollution](#) in the atmosphere, contributing to the climate change that's causing wildfires, hurricanes and record heat waves. Cement and concrete manufacturing emits as much carbon dioxide as India.

We can't stop building the homes, factories and roads we rely on, but we can and should stop cement's unchecked emissions. Fortunately, new technologies are beginning to show the way forward, even promising that [cement production](#) could one day pull carbon from the atmosphere and become part of the solution to global warming.

In cement manufacturing, limestone and other ingredients are added to a kiln. In the standard process today, fossil fuels are burned to heat the kiln, emitting carbon dioxide. The heat breaks down the limestone, freeing carbon trapped inside the rock, emitting more carbon dioxide.

This makes cement a massive source of the greenhouse gas emissions accelerating climate change—and its use is projected to keep increasing through 2050, driven by growing global population, urbanization, wealth and infrastructure needs.

Here in California, we produce more cement than any other state except Texas. In 2022, our state's cement plants emitted more than 9 million

metric tons of carbon dioxide, equivalent to the emissions from 2 million cars and SUVs or 22 gas-fired power plants. This makes our state an excellent laboratory in which to find solutions.

Electrically heated cement kilns and limestone alternatives could drastically cut climate pollution. For instance, one Oakland-based company is commercializing cement made from carbon-free calcium silicate rock, which emits no carbon dioxide when processed in a kiln.

By combining clean heat with carbon-free minerals or equipment to capture the carbon emissions from breaking down limestone, cement-making could become carbon neutral by 2045. That's an excellent first step, but the innovations happening today could take us beyond carbon neutral.

After concrete is made, it gradually absorbs carbon dioxide from the atmosphere in a process called carbonation. With the ingredients and techniques common today, making cement produces more emissions than the material can later absorb, so every new ton of cement worsens climate change. But if cement kilns are heated with clean electricity and the emissions from breaking down minerals are avoided or stored underground, then the simple act of pouring concrete would remove carbon pollution from the air. New construction would help repair our climate.

This won't happen on its own. Governments will have to implement smart policies to incentivize clean cement manufacturing. California is taking the lead, but the race isn't over.

In 2021, Gov. Gavin Newsom signed Senate Bill 596, which requires the state's cement producers to achieve net-zero [greenhouse gas emissions](#) by 2045. Then, last August, the California Building Standards Commission established limits on emissions from manufacturing the

materials used in large commercial and school buildings. We're the first state in the nation to consider these "embodied" emissions in building codes.

Next, California should do more to help cement-makers achieve their net-zero target. The 2017 Buy Clean California Act mandated that state infrastructure projects prioritize steel, glass and insulation manufactured with low-emission processes. This provides a protected market in which low-carbon manufacturers can sell products without competition from dirty materials, helping scale up clean manufacturing and drive down its costs.

Unfortunately, concrete was removed from the bill before it became law, which seemed at the time designed to spare the industry from regulation. In retrospect, its exclusion denied cement makers and concrete makers a lucrative market that could have paid above-market rates to help them commercialize clean cement technology. The state Legislature should amend the statute to include cement and concrete, as well as other important construction materials, such as aluminum.

Additionally, the Building Standards Commission can expand the market for clean cement by extending limits on embodied emissions to additional building types. And supporting clean cement used in projects funded by the California Infrastructure and Economic Development Bank could provide incentives in a way that does not worsen California's budget deficit.

Cement is an ancient invention that remains crucial to the modern world. But producing it using old-fashioned methods is taking a terrible toll on our climate. Fortunately, innovative cement technologies can simultaneously build stronger societies and fight climate change by removing carbon dioxide from the atmosphere.

One of today's biggest climate threats could become the foundation of a sustainable future.

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