



CarbonCure's Path to the Decarbonization of Concrete

Reducing CO₂ Emissions by 500 Megatonnes Annually

Executive Summary

As a key construction material, concrete has everything going for it — except its carbon footprint. What if, instead of contributing to carbon dioxide (CO₂) emissions, concrete helped eliminate CO₂ from the built environment? What is currently viewed as a threat to the industry may just be one of its greatest opportunities.

Like the air we breathe, concrete is often taken for granted despite the vital role it plays in everyday life.

Concrete shapes the built environment around us — from schools, hospitals, and housing to roads, bridges, tunnels, runways, data centers, windmills, and water systems. Concrete is the most abundant human-made material in the world, with three tonnes used annually for every person on the planet. This prevalence is a testament to its efficacy. Concrete is simply the **most resilient building material** in the world.

Outside of the industry, few people give concrete a second thought. Increasingly, however, it is coming under scrutiny for its significant climate impact; carbon performance is the defining competitive issue for the foreseeable future.

Concrete is at the center of the collision between population growth and urbanization megatrends. Densely populated cities are growing at an unprecedented rate. By 2060 the world is expected to add **230 billion square metres** of new buildings, interconnected by critical infrastructure. That's equivalent to building another New York City every month for the next 40 years. Most of this new construction will be built with concrete. This construction volume presents a massive market opportunity for concrete producers.

However, cement — the key ingredient that gives concrete its strength — is also one of the largest emitters of CO₂ in the built environment. This is due to cement's inherent **calcination process** and its enormous scale. Cement represents **more than three times** the CO₂ emissions of civil aviation.



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And while the construction industry has been adopting carbon reduction technologies and best practices, many of the technologies available today (e.g., improvements in energy efficiency, increased use of alternative fuels, reduced clinker/cement ratio) are insufficient. They simply won't drive down the CO₂ emissions sufficiently to meet the fundamental goals of the **Paris Climate Agreement**. Disruptive solutions take too long to deploy and are often costly, without offering economic value in return. They can also result in some facilities becoming obsolete, or stranded.

CarbonCure has taken a different approach to CO₂ reduction. Our vision is that concrete decarbonization and profitability are not mutually exclusive. Instead, our strategy is to create retrofit solutions for the concrete industry with very low barriers to adoption. These solutions reduce the carbon footprint while boosting profitability, raising quality, increasing resource circularity, and creating a differentiated sales advantage. By working alongside our industry partners, construction end-users, government and policymakers, and other innovators, we can effectively decarbonize the industry.

CarbonCure's mission is to reduce 500 megatonnes (Mt) of CO₂ from the built environment annually by 2030. That is equivalent to taking **100 million cars off the road each year**.

5 Key Tenets of CarbonCure's 500 Megatonne Strategy

1. Enhance producer competitiveness with added profitability and sales differentiation
2. Rapid plant retrofits with very low barriers to adoption
3. Seamless integration that is complementary to existing low-carbon solutions, regulations, and supply chains
4. Continuous innovation of low-carbon, digital, and circular technologies
5. Win-win partnerships across the construction value chain, government, and industry

Our end goal is to support the complete decarbonization of the concrete manufacturing process through the continued evolution of our solutions and collaboration with other mission-aligned partners from industry, academia, government, and civil society.

This guide provides an aggressive yet achievable plan on how we can remove 500 Mt of CO₂ emissions annually from the concrete industry by 2030 while strengthening the competitive advantage for producers so they can succeed in the new low-carbon and circular economy. We're calling for a collaborative approach from the concrete industry, government policymakers, industry, and other innovators to play an active role in supporting this transition.

Sincerely,



Robert Niven

CEO & Founder, CarbonCure Technologies Inc.

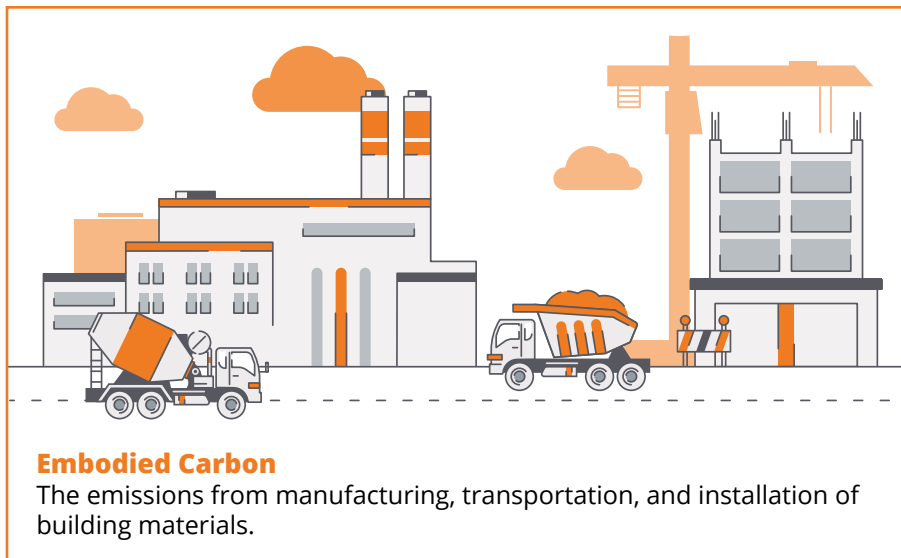
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Introduction

To stay within the global carbon budget defined by the [Paris Agreement](#), the emissions generated from the manufacturing and transportation of building materials — known as embodied carbon — need to [decline by 65% by 2030 and be eliminated by 2040](#). If we don't reach these goals, we will have lost the opportunity to meet what climate scientists have deemed a vital global warming threshold of 1.5°C above pre-industrial levels. According to the [International Panel on Climate Change \(IPCC\)](#), once that threshold is exceeded, climate change will become irreversible, resulting in greater economic instability, a reduction in wealth, and a reduced demand for construction.

The construction and building sector generates [39% of the world's greenhouse gas emissions](#), and over a quarter of these emissions come from embodied carbon. Since embodied carbon has mainly been overlooked by the design and construction communities until recent years, the issue is of growing concern: between now and 2050, embodied carbon will be responsible for almost half of all new construction emissions.



Why the Decarbonization of Concrete Matters

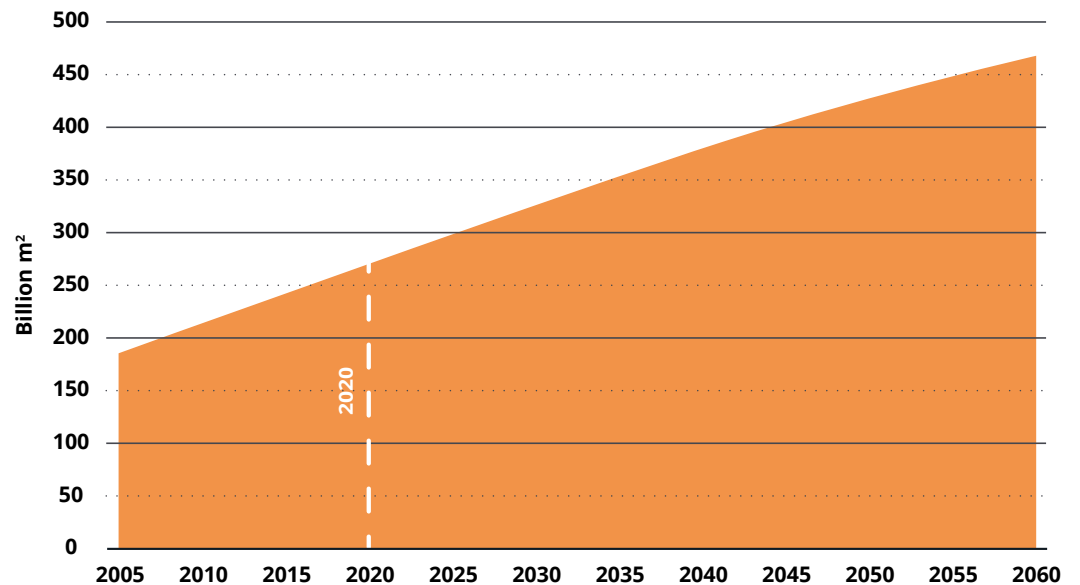
Concrete is the most abundant human-made material on the planet because its ingredients are widely available and result in a product that is incredibly strong, resilient, and effective in construction. There is no credible alternative to concrete, so innovation in concrete offers the biggest potential for CO₂ reduction in the built environment.

By 2060, **230 billion square metres** of new buildings will be constructed, effectively doubling the current worldwide building stock. In the next ten years, most of that construction will take place in the Global North¹ and China. In the Global South² where much of the infrastructure is yet to be built, the demand for concrete will be even higher over the next 40 years.

The **time value of carbon** — i.e. the amount of carbon reduction and when the reduction can happen — is critical here since the materials used in these projects will be manufactured in the near-term. Once carbon is emitted in the manufacturing process, it is difficult and expensive to recover it.

CO₂ emissions that are reduced today are more valuable than CO₂ emissions reductions that occur in the future given the radiative impact of global warming.

Growth of Global Building Stock by 2060



Source: [Architecture 2030](#)

¹ The Global North includes the United States, Canada, almost all the European countries, Israel, Cyprus, Japan, Singapore, South Korea, Australia, and New Zealand.

² The Global South is a term used by the World Bank and does not inherently refer to a geographical south, for example most of the Global South is within the Northern Hemisphere. Countries of the Global South have been described as newly industrialized or in the process of industrializing.

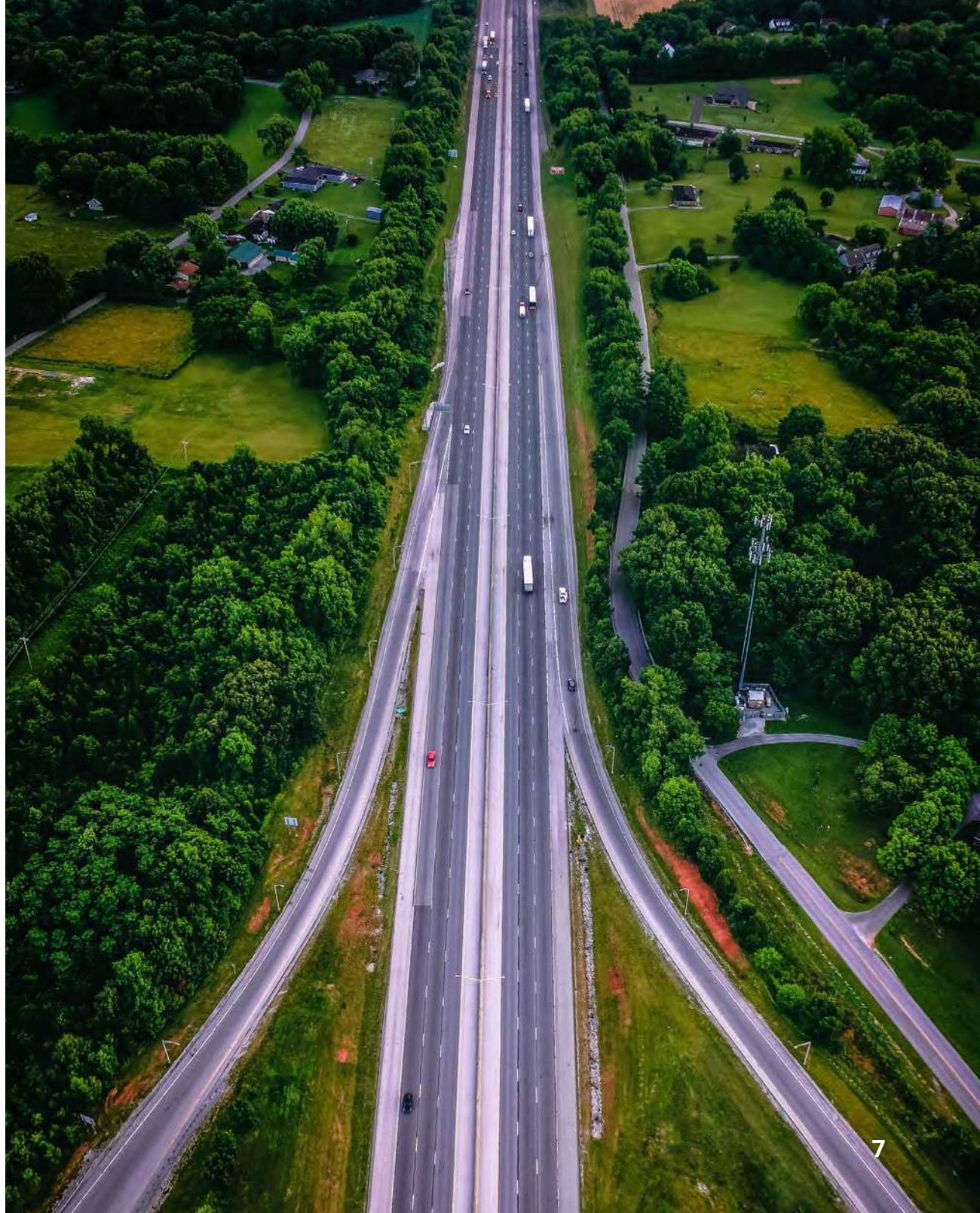
The Carbon Removal Landscape

Most climate scientists agree that carbon must be removed from the atmosphere through a process called **carbon removal** to avoid irreversible impacts of climate change.

Carbon removal is the highest quality climate solution since it actually reverses climate change by capturing and storing CO₂ using either natural or engineered solutions. The concrete industry is best placed to adopt and benefit from engineered carbon removal solutions due to its enormous scale, the permanence of concrete, and the value-added benefits that can be achieved.

Natural Carbon Removal Solutions

Natural carbon removal solutions include planting trees or modifying agricultural practices to pull CO₂ out of the air. These natural solutions are important, but most are considered temporary forms of storing CO₂, since trees and soil will eventually release CO₂ back into the atmosphere as part of the natural carbon cycle.



Engineered Carbon Removal Solutions

Engineered solutions pull CO₂ out of the carbon cycle and store it in places outside of the biosphere. Engineered carbon removal solutions can offer permanent forms of carbon storage, while also creating added value for the user. Engineered carbon removal solutions involve two steps: carbon capture and carbon utilization.

Carbon Capture

Carbon capture involves collecting CO₂ either from its original emission source or directly from the air. By itself, the process of capturing CO₂ does not provide a climate benefit unless the captured carbon is utilized or stored. Most CO₂ that is collected today is captured as a byproduct from industrial sources (e.g. ethanol, ammonia, and refineries). The food and beverage industry is the largest consumer of post-industrial captured CO₂ despite it not having a climate benefit since it is immediately re-released.

Direct air capture (DAC) is a process of capturing CO₂ directly from the ambient air. DAC is still in the early stages of development but has shown promise and will help accelerate growth in the carbon capture space. DAC will also enable the capture of carbon in areas where it is not possible today.

Once captured, in order to achieve an environmental benefit, the CO₂ must either be stored permanently (sequestration) or converted into valuable products (utilization).



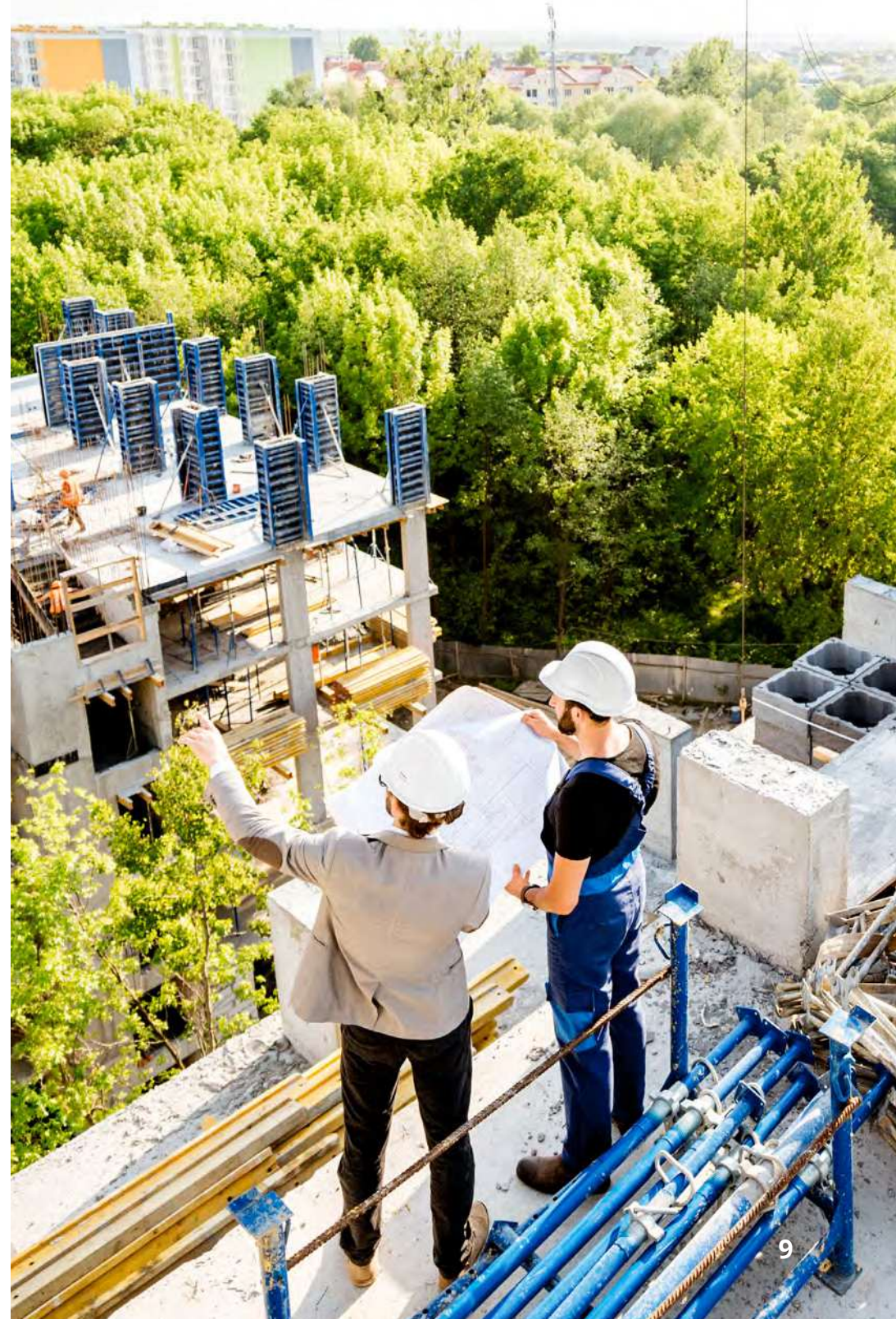
Carbon Utilization

Carbon utilization solutions include processes to convert CO₂ into chemicals, fuels, plastics, and concrete. Today, there are only a few utilization solutions that offer permanent storage of CO₂. For example, if CO₂ is utilized for fuel, it is released back to the atmosphere when the fuel is burned.

Converting CO₂ to a solid mineral in concrete offers permanent storage of carbon — it will never be released into the atmosphere. Carbon utilization has the potential to become an **\$800 billion to \$1 trillion** industry by the year 2030. In the concrete sector alone, it represents an estimated **\$400 billion market opportunity** and has the potential to reduce up to 3 gigatonnes of annual CO₂ emissions by 2030. This would be equivalent to the current emissions of the digital industry, and more than Japan's annual emissions.

CarbonCure's mission will help the concrete industry move from being the largest contributor to embodied carbon towards being a critical carbon removal and circular economy solution.

CarbonCure offers a carbon utilization solution which converts CO₂ into nano-sized minerals within concrete, known as CO₂ mineralization. In essence, CO₂ mineralization turns CO₂ back into limestone — the **lowest thermodynamic state of CO₂** — to both reduce embodied carbon in the built environment and create value for concrete producers.



CO₂ Mineralization: The Permanent, Profitable CO₂ Utilization Solution

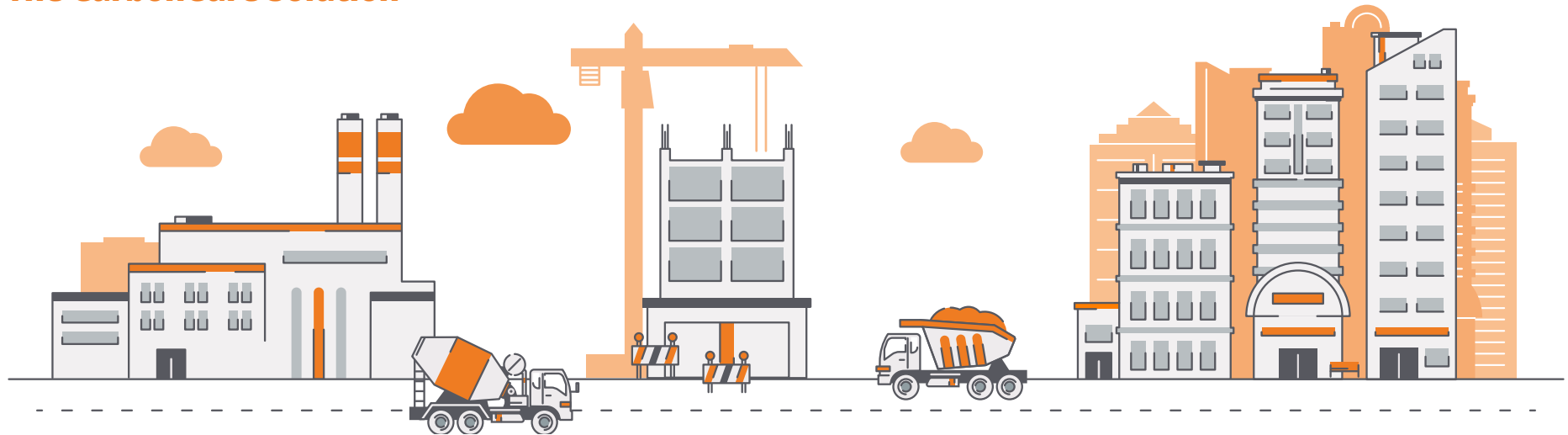
CarbonCure pioneered the utilization of captured CO₂ by injecting it into concrete during the mixing process. Once injected, the CO₂ chemically converts into a mineral and becomes permanently eliminated. The concrete would have to be **heated to over 750°C** for the carbon to be released back into the atmosphere — an unlikely scenario in the real-world usage of concrete.

The mineralized CO₂ also increases the concrete's strength, which enables producers to reduce the amount of cement content in their mixes while still maintaining concrete strength and performance. This is a win-win solution as it permanently eliminates the CO₂ that has been captured while also reducing the amount of carbon-intensive cement needed in concrete production.

On average, this carbon utilization method reduces the carbon footprint of concrete by 17 kg CO₂ per cubic meter (25 lbs CO₂ per cubic yard), meaning a typical commercial medium-rise building made with CarbonCure concrete will reduce the equivalent of 680 tonnes of embodied carbon.

Carbon reduction and profitability do not have to be mutually exclusive. CarbonCure's solutions not only reduce embodied carbon emissions, they also increase profitability for producers by reducing the need for cement, one of the most expensive ingredients in concrete production. CarbonCure has removed barriers to adoption of its technology by eliminating upfront investment and maintenance costs. The solution is installed in one quick visit and does not disrupt regular plant operations or cycle times. As such, it can be integrated seamlessly and adopted widely to help achieve the 500 Mt carbon reduction goal.

The CarbonCure Solution



1. Waste CO₂ emissions are collected from local industrial emitters by gas companies and then purified.

2. The purified CO₂ is stored onsite at the concrete plant and connected to CarbonCure's technology.

3. The technology injects CO₂ into the concrete during mixing to create high-performing, low-carbon concrete.

4. Private and public projects are built with CarbonCure concrete, reducing embodied carbon in new buildings.

The CarbonCure Mission: Our Path to Reducing 500 Megatonnes of CO₂ Annually

In 2012, CarbonCure set out on a mission to decarbonize the concrete industry. The first step on that mission was to align CarbonCure's commercial goals with an environmental goal to reduce the CO₂ emissions from the concrete industry by 500 Mt annually by 2030.

The company has built a detailed growth strategy centered on five key tenets:

1. Enhance producer competitiveness with added profitability and sales differentiation
2. Rapid plant retrofits with very low barriers to adoption
3. Seamless integration that is complementary to CO₂ solutions, regulations, and supply chains
4. Continuous innovation of low-carbon, digital, and circular technologies
5. Win-win global partnerships across the construction value chain, government, and industry

1. Enhance Producer Competitiveness with Added Profitability and Sales Differentiation

CarbonCure believes that the responsibility for reducing carbon in the built environment should not be shouldered by concrete producers alone — nor should the costs. As such, the onus is on carbon removal technology innovators like CarbonCure to be extra creative with their solutions, ensuring each one is pragmatic and drives real economic value for the concrete industry and for producers.

Every technology developed by CarbonCure aims to make the manufacturing process more efficient, unlocking value along the entire manufacturing chain and increasing profitability for concrete producer companies. Producers also gain a stronger competitive advantage to meet the rapidly growing demand for low carbon and circular construction materials.

CarbonCure can also help producers differentiate and offer sustainable concrete products to their markets. [Irving Materials Inc. \(imi\)](#) is an excellent example of a producer that built a competitive advantage in the midwest by being an early adopter of sustainable concrete solutions. Following its launch, imi's green concrete led to a host of new business, including a 6,000 cubic yard pour for the Indiana University Purdue University that saved 82 tonnes of CO₂. In just a few years, imi surpassed 10,000 tonnes of CO₂ savings with CarbonCure—a number that continues to steadily increase every day.

2. Rapid Plant Retrofits with Very Low Barriers to Adoption

CarbonCure's preferred pathway to concrete decarbonization is one that's collaborative and not disruptive to the industry.

CarbonCure aims to meet its goal of 500 Mt of CO₂ emissions reduction by 2030 by delivering on its pragmatic technology roadmap that can be retrofitted into any masonry, precast, or ready mix concrete producer's existing operations.

This makes CarbonCure a particularly attractive solution when considered in the context of the time value of carbon. CarbonCure can be integrated easily, now — and scaled quickly. Therefore, the carbon that can be reduced by CarbonCure is more valuable than carbon that is reduced by future disruptive technologies later.



3. Seamless Integration that is Complementary to CO₂ Solutions, Regulations, and Supply Chains

CarbonCure believes that if meaningful change is to happen, it has to happen now. That's why the company builds solutions that fit seamlessly on top of everything concrete producers are already doing today. It is complementary to other CO₂ solutions, it doesn't circumvent or reimagine any supply chains, and it is aligned with industry regulations.

CarbonCure is commonly integrated with other low-carbon solutions that producers are using today (e.g. supplementary cementitious materials and limestone cements) or may adopt in the future. For example, the technology is compatible with most emerging CO₂ capture and utilization technologies like direct air capture and carbonated aggregates. Compatibility is a valuable benefit for producers to take advantage of the latest solutions to enhance their competitiveness and reduce emissions.

CarbonCure also integrates seamlessly with a producer's existing supply chain — its technology syncs with all existing batching software, admixtures, feedstock materials, and production equipment. It also taps into existing CO₂ supply chains from global industrial gas suppliers that have established sources, distribution networks, and services. As novel sources of CO₂ become viable (e.g. cement kilns, biogenic emissions, etc.), they may be used in place of CO₂ sourced from other large industrial emitters.

CarbonCure has experienced early success achieving regulatory compliance within North America. Precedent for the approval of CO₂-mineralized concrete in public infrastructure has been set by the Hawaii Department of Transportation and Chicago Department of Transportation. Initiatives to align concrete procurement processes with concrete sustainability and quality best practices are rapidly advancing across North America and the globe. Policymakers may accelerate these regulatory advancements further through the implementation of low carbon concrete policy.

Finally, CarbonCure aligns with the current and future climate policy landscapes. For governments, using CO₂ to make concrete products is the most durable and economic option for reusing waste CO₂ currently available. As such, new procurement policies and legislation targeting low-carbon concrete have been introduced in [Portland](#), [Marin County](#), [Hawaii](#), [Austin](#), and [New York State](#). And the list is growing. CarbonCure is entirely compatible with existing codes and standards that govern the production of concrete, meaning that it can be deployed immediately.

As more and more governments mandate the need for green technologies and emissions reduction, producers that have adopted CarbonCure will have a distinct competitive advantage to offer solutions that meet their requirements.



4. Continuous Innovation of Low-Carbon, Digital, and Circular Technologies

CarbonCure's innovation strategy outlines a thoughtful technology roadmap that will deliver new, complementary carbon removal technologies over the next 10 years. These innovations will build on CarbonCure's scientific expertise and currently available technologies to create more new solutions that profitably use CO₂ in the concrete value chain.

CarbonCure for Ready Mix, Masonry, and Precast

Already available at nearly 300 plants, CarbonCure for Ready Mix, Masonry, and Precast uses mineralization technology to inject captured CO₂ into concrete during the mixing process. Once injected, the CO₂ is chemically converted to a mineral and permanently embedded in the concrete — removing it from the atmosphere.

This type of CO₂ mineralization improves concrete's compressive strength, enabling concrete producers to use less cement, further reducing the concrete's carbon footprint.

Saving Over 140 Mt Annually with CarbonCure for Ready Mix, Masonry, and Precast*

The ready mix concrete industry could potentially reduce 130.3 million tonnes of CO₂ emissions in 2030.* This would be achieved by:

- Mineralizing 4.2 million tonnes of CO₂
- Avoiding the production of 149.1 million tonnes of cement, further reducing emissions by 126.1 million tonnes of CO₂

The masonry and precast industry could potentially reduce 12.5 million tonnes of CO₂ emissions in 2030.* This could be achieved by:

- Mineralizing 0.4 million tonnes of CO₂
- Avoiding the production of 14.6 million tonnes of cement, further reducing emissions by 12.1 million tonnes of CO₂

	CO ₂ Utilized (Mt)	Impact of Reduced Cement (Mt)	Net Impact (Mt)
CarbonCure for Ready Mix	4.2	126.1	130.3
CarbonCure for Masonry and Precast	0.4	12.4	12.8

**Assuming a ready mix market size of 10,802 million cubic meters and a precast market size of 808 million cubic meters in 2030. All research methodologies, assumptions, and carbon reduction calculations are available in our [detailed Technical Roadmap](#).*

CarbonCure for Reclaimed Water

Every concrete producer in the world creates three kinds of by-products: CO₂, water, and solid waste. The water and solid waste are usually combined in slurry or concrete wash water from returning mixes and truck washouts.

CarbonCure for Reclaimed Water (currently in development) injects a precise dosage of CO₂ into a concrete plant's reclaimer system, which reacts with the calcium ions in the solution to produce a nano-scale suspended solid with strength-enhancing properties. This new nano-solid material can be incorporated back into new concrete mixes — along with chemically stabilized cement particles — to replace the amount of required freshwater and cement as virgin products.

CarbonCure for Reclaimed Water actually improves the quality of the concrete product when compared to the use of virgin materials. It also creates production and resource efficiencies and further reduces the cost of making concrete, increasing profitability for the concrete producer.

CarbonCure for Reclaimed Water is a finalist for the [NRG COSIA Carbon XPRIZE](#), a prestigious award given for organizations that develop breakthrough technologies to convert CO₂ emissions into usable products.

Saving Over 290 Mt Annually with CarbonCure for Reclaimed Water*

CarbonCure for Reclaimed Water could potentially reduce 294.9 million tonnes of CO₂ emissions in 2030.* This could be achieved by:

- Mineralizing 65.3 million tonnes of CO₂
- Avoiding the production of 282 million tonnes of cement, further reducing emissions by 229.6 million tonnes of CO₂

	CO ₂ Utilized (Mt)	Impact of Reduced Cement (Mt)	Net Impact (Mt)
CarbonCure for Reclaimed Water	65.3	229.6	294.9

**Assuming 168 million tonnes of cement with concrete reclaimed water. All research methodologies, assumptions, and carbon reduction calculations are available in our [detailed Technical Roadmap](#).*

CarbonCure for Recycled Aggregate

Concrete aggregate is produced from concrete recycled at the end of a building's life cycle (after demolition), or from excess concrete that is returned from a job site.

Currently, concrete aggregate is either downcycled to create road base materials or it goes directly to landfills. CarbonCure is developing a new technology that uses CO₂ to make better use of this material. The CO₂ can beneficiate concrete aggregate so that it can replace virgin aggregate to make better, more profitable concrete with a much lower carbon footprint.



Saving Over 95 Mt Annually with CarbonCure for Recycled Aggregate*

With CarbonCure for Recycled Aggregate, 95.8 million tonnes of CO₂ could be reduced in 2030 by mineralizing 80.7 million tonnes.

	CO ₂ Utilized (Mt)	Net Impact (Mt)
CarbonCure for Recycled Aggregate	95.8	80.7

**Assuming a recycled aggregate market size of 2.155 million tonnes in 2030. All research methodologies, assumptions, and carbon reduction calculations are available in our [detailed Technical Roadmap](#).*

Cumulative Impact

	CO ₂ Utilized (Mt)	Impact of Reduced Cement (Mt)	Net Impact (Mt)
CarbonCure for Ready Mix	4.2	126.1	130.3
CarbonCure for Reclaimed Water	65.3	229.6	294.9
CarbonCure for Masonry and Precast	0.4	12.3	12.7
CarbonCure for Recycled Aggregate	95.8	--	80.7
Cumulative Totals	166	368	519

CarbonCure's Path to the Decarbonization of Concrete

Along with the carbon utilization technologies described here, CarbonCure is exploring two additional innovations — alternative carbon capture and digital solutions — to complement its product roadmap.

These additional innovations will result in additional indirect CO₂ reductions. Critically, they will also make the concrete manufacturing process more efficient, driving down costs for concrete producers and increasing the adoption of CarbonCure at plants around the world.

Efficient Carbon Capture

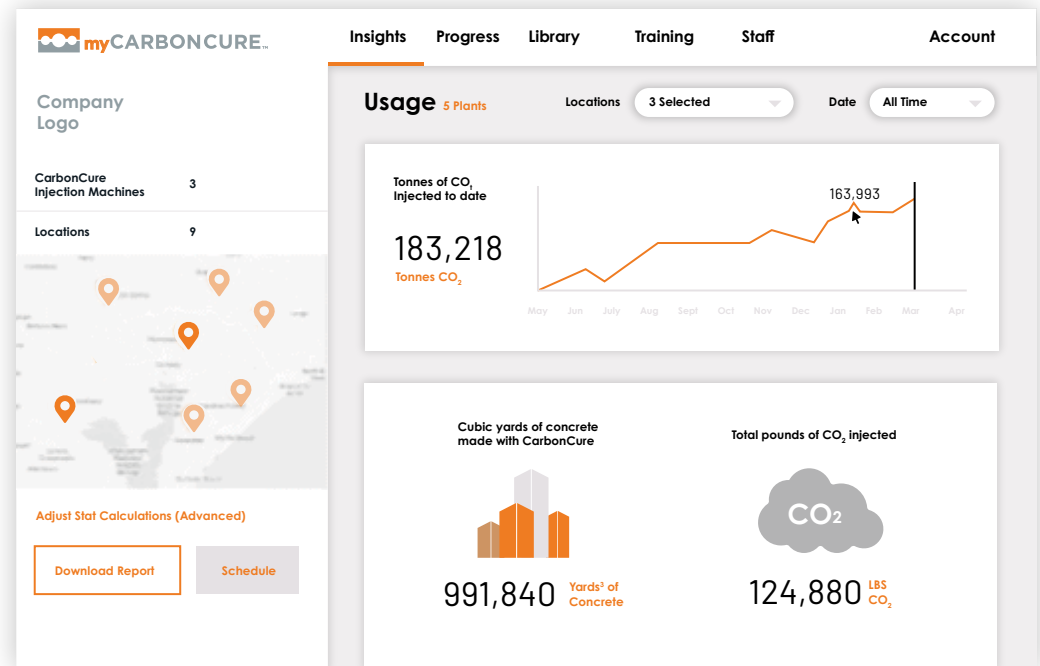
Currently, the CO₂ used in CarbonCure's technologies comes from waste emissions from industries like ethanol, ammonia, and refining. The main market for this post-industrial CO₂ is the food and beverage industry.

By sourcing CO₂ with a lower purity than this food-grade CO₂, cost and energy efficiencies may exist. CarbonCure is continually investigating more optimal sources of CO₂ from within the concrete supply chain, such as from a cement kiln, and from under utilized CO₂ sources from biogenic emissions or even from emerging Direct Air Capture (DAC) technologies.

Digital Solutions

In the past CarbonCure's digital solutions have been vitally important to support rapid expansion and customer service. Today, CarbonCure producers use a suite of CarbonCure's digital solutions — delivered via the **myCarbonCure** portal — to help accelerate the adoption of our technologies and drive customer engagement and satisfaction. The portal provides production insight and other resources to help producers as they scale up their production and achieve carbon reduction milestones. Future iterations of the portal will connect concrete producers with designers and specifiers to streamline the construction process and enhance collaboration on sustainable projects.

Leveraging technology and data is key to CarbonCure's success as it facilitates top-tier customer service (delivered by the Technical Services and Support team) and cutting-edge marketing services (delivered by the Market Development team) to ensure both producers and project teams experience the maximum benefits of sustainable concrete.

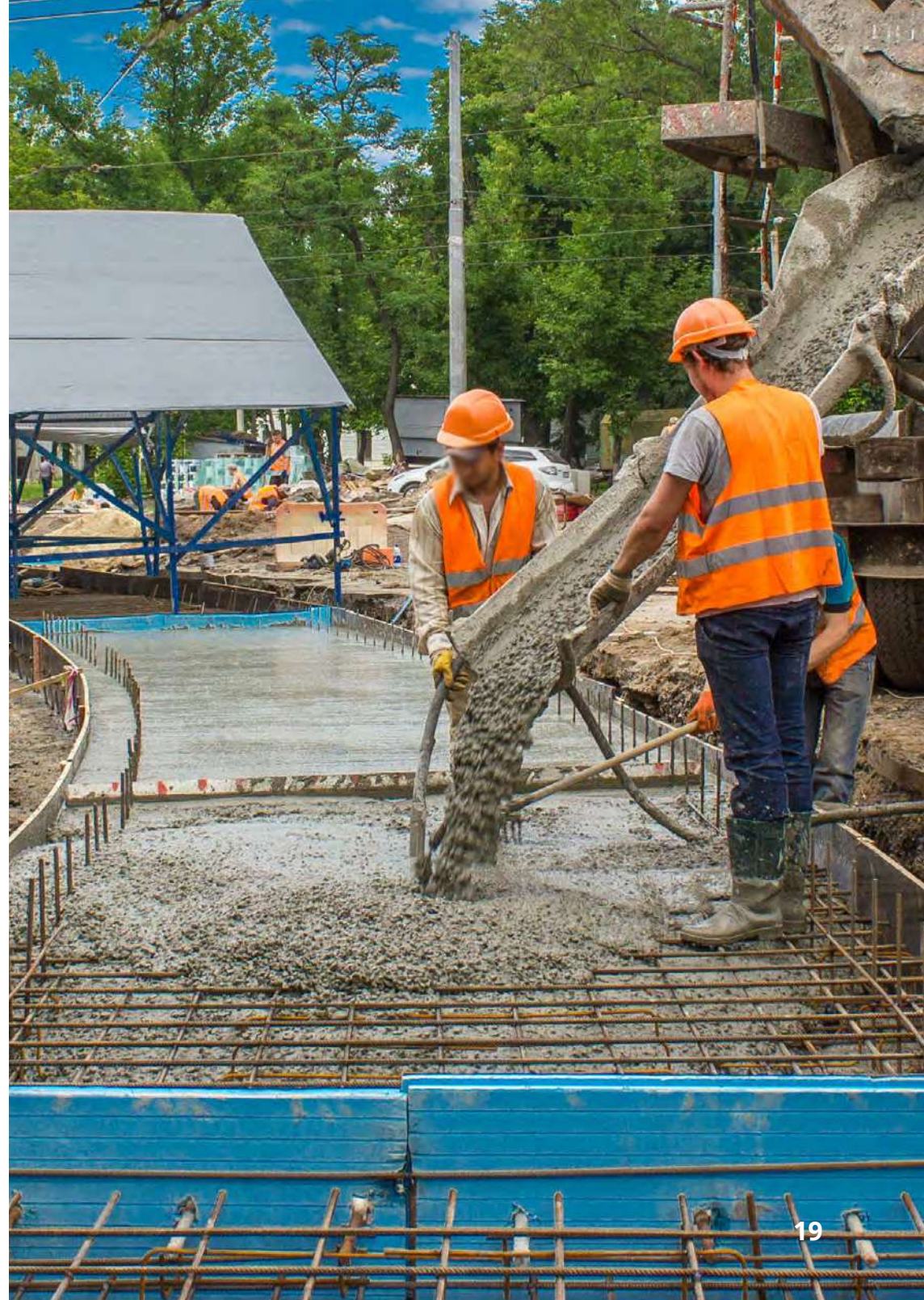


5. Win-Win Global Partnerships Across the Construction Value Chain, Government, and Industry

CarbonCure for Ready Mix, Precast, and Masonry is already in use in nearly 300 plants primarily in North America. While it has huge growth potential in the North American market, CarbonCure considers that its overall mission is led by more than just economic factors. It is a global responsibility to bring the environmental benefits of its technology solutions to every community around the world.

In order for CarbonCure to effectively meet its goal of 500 Mt annual CO₂ emissions reduction by 2030, the company will continue its global expansion over the next 10 years. Our overseas expansion has begun in Asia, South America and Oceania, where partnerships have been established with producers and distributors that have the local expertise and relationships to help expand CarbonCure's adoption quickly and efficiently.

The decarbonization of the concrete industry is an incredibly important mission. But CarbonCure and/or other carbon removal innovators cannot do it alone. Support is needed from governments, the design community, concrete industry players, and any other stakeholder around the world that can contribute to this global mission. That is why CarbonCure is launching several important calls to action:



Call to Action for Concrete Producers

As the largest contributor to embodied carbon, concrete is central to the growing discussions and initiatives spearheaded by designers, builders and policymakers to reduce embodied carbon from the built environment.

Concrete producers can play a pivotal role in these discussions and position themselves as a key stakeholder in building the solution. Without representation in the conversation, concrete risks becoming vilified.

Concrete producers can actively participate in the embodied carbon conversation by joining their local chapter of the [Carbon Leadership Forum](#) or the [World Green Building Council](#) to take a proactive role in shaping the future of their industry.

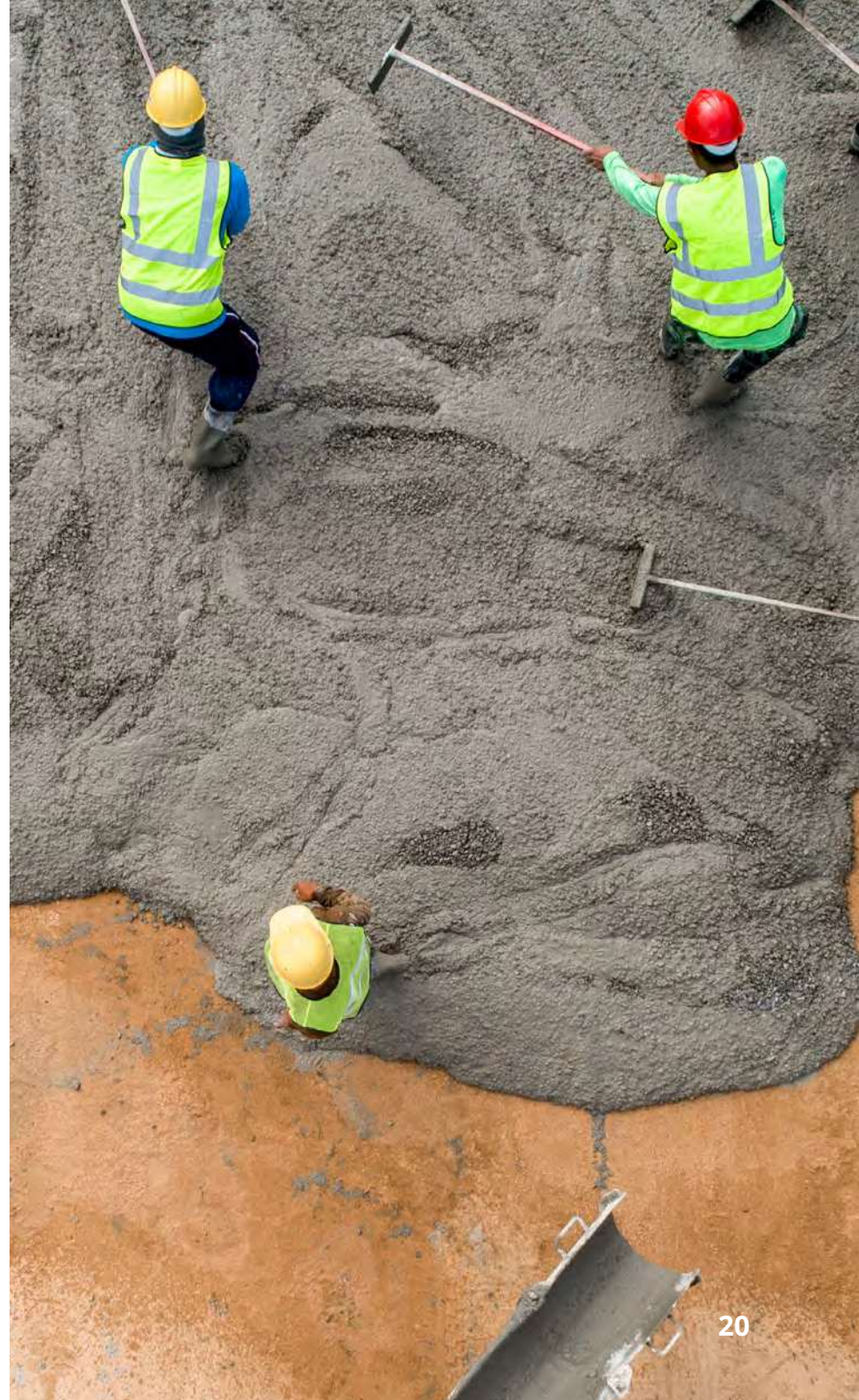
Producers can play a key role in unleashing embodied carbon reductions in the built environment by helping to drive the shift to [performance-based concrete specifications](#), which remove innovation barriers created by outdated prescriptive specifications. This can be done by engaging with local industry associations and architecture, engineering, and construction communities.

In the past, concrete producers have often experienced barriers to engaging directly with structural engineers; the shift to reduce embodied carbon has resulted in structural engineers being more open to these conversations and collaborations.

Reach out to structural engineers who have signed the [SE2050.org](#) signatory and are aligned on a mission to eliminate embodied carbon by 2050. These structural engineers are open to collaborating with experts, including product manufacturers, to figure out how to design more sustainably.

Finally, producers should empower their quality control teams to evaluate new solutions to optimize concrete mixes with innovative technologies.

The time to act is now.



Call to Action for Builders and Designers

The [Carbon Leadership Forum](#) is accelerating transformation of the building sector to reduce and ultimately eliminate the embodied carbon in building materials and construction. As influencers and decision makers in the construction process, building owners, designers, engineers, and contractors play a critical role in reducing embodied carbon. Start talking about embodied carbon early in your planning phase and create measurements for embodied carbon data in your design and material selection decision making process. Don't forget to include material suppliers, especially concrete producers, in these discussions due to their expertise and large positive impact they can have on the project.

The primary barrier to using CarbonCure on commercial building applications is prescriptive concrete specifications that require a minimum cement content or improperly use a maximum water/cement ratio. Structural engineers are encouraged to adopt performance-based concrete specifications that empower concrete producers to reduce carbon impacts while ensuring the delivery of the quality of concrete required for the project.

[The World Green Building Council](#), [Structural Engineers 2050](#), [Architecture 2030](#), and [Carbon Leadership Forum](#) are leading industry groups that support structural engineers and architects to adopt specification best practices for reducing embodied carbon. The easiest way to make a difference is to remove prescriptive specification barriers, set embodied carbon reduction targets and start specifying mineralized concrete in your building projects.

The time to act is now.



Call to Action for Government & Policymakers

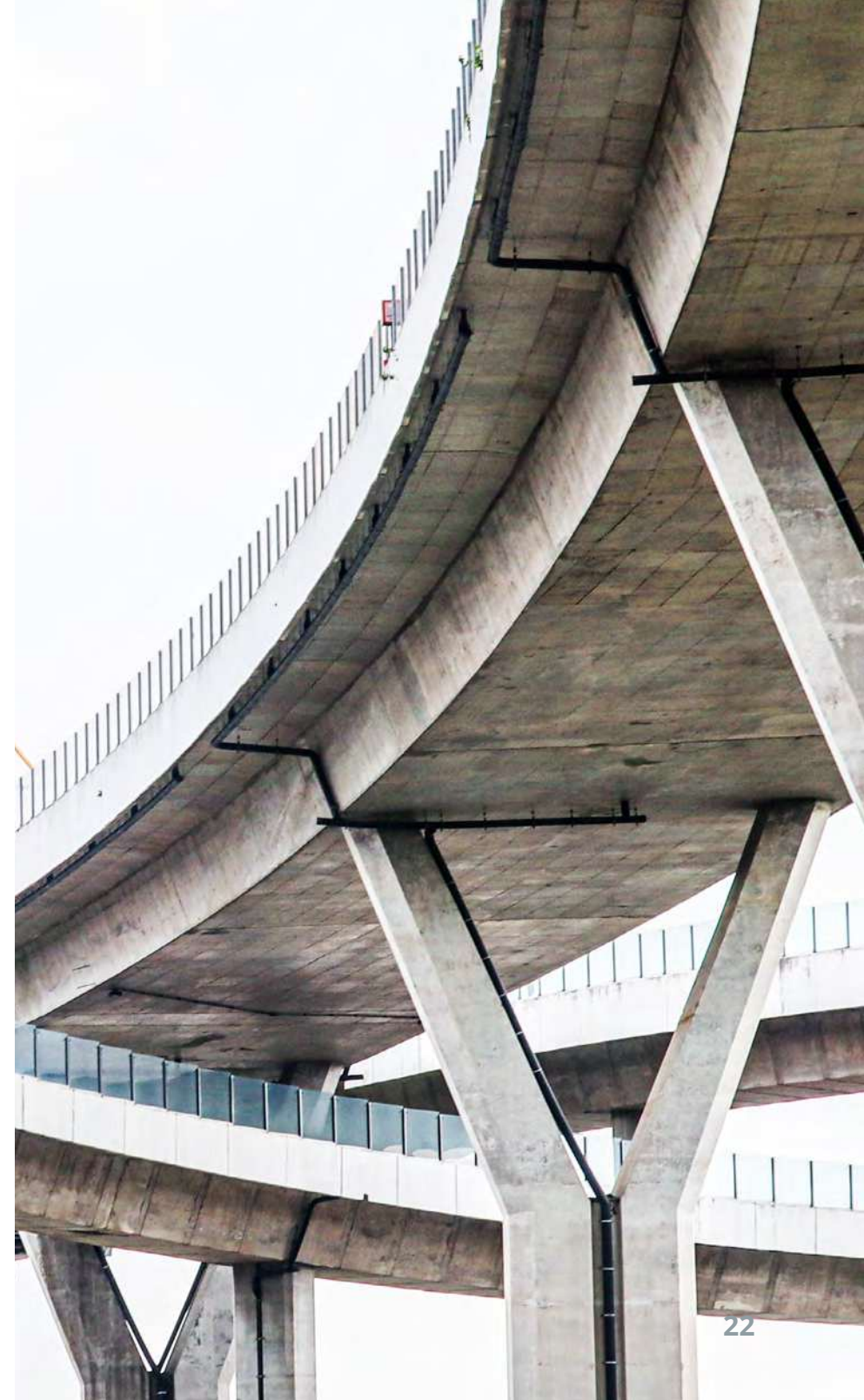
Efforts by carbon removal technology innovators are hindered by regulatory requirements for prescriptive concrete specifications. The outdated practice of using prescriptive specifications originated decades ago when concrete production quality control standards were not as robust as they are today.

Composition-based or prescriptive standards are often the biggest hurdle for the introduction of products with a smaller CO₂ footprint. Switching to performance-based standards for concrete procurement empowers concrete producers to provide the best products that meet the required performance requirements (strength, durability, workability, etc.) compliant with the engineering needs of the particular application of the concrete. It would also create the opportunity for producers to introduce new innovations into their concrete manufacturing processes.

Beyond regulatory power, governments and their agencies have enormous buying power and the ability to influence their local markets. For many concrete plants, public spending is a key contributor to continued profitability — public projects are estimated to consume approximately 37% of all concrete sold in North America. CarbonCure encourages policymakers to review existing codes and standards and to revise public procurement policies to promote low-carbon products. For governments, using CO₂ to make concrete products is the most durable and economic option for reusing waste CO₂ currently available.

Within the past year, new procurement policies and legislation targeting low-carbon concrete have been introduced in [Portland, Marin County, Hawaii, Austin](#), and [New York State](#). There is also a revived interest in including concrete in the [State of California's Buy Clean Act](#). Stay updated on the policy shift towards low-carbon concrete procurement by visiting our [policy page](#).

The time to act is now.



Call to Action for Industry

Within the construction industry, it's not just **concrete producers** who are committing to emissions reduction. In September 2020, the Global Cement and Concrete Association (GCCA) launched its **Climate Ambition**, which aims to have carbon-neutral cement and concrete by 2050.

Organizations from every sector can get involved in this mission. Almost **one-quarter of the world's top companies** have already made a public commitment that they are (or will be) carbon neutral, using 100% renewable power, or meeting a science-based internal emission reduction target. This represents an increase of almost 300% since the **Paris Agreement** was signed in 2015.

In particular, technology companies like Amazon, Microsoft, Shopify and Stripe are leading by example. Amazon's Climate Pledge is targeting **net zero carbon by 2040**, a decade ahead of the Paris Agreement. Microsoft is not just committing to becoming carbon neutral by 2030, it also intends to **remove all the carbon** created directly or indirectly by its products since the company was founded in 1975 by 2050. **Shopify's Sustainability Fund** commits the company into spending a minimum of \$5 million USD annually on low-carbon solutions, such as carbon sequestration, and maintaining carbon-neutral operations via carbon offset purchases. And rather than setting internal carbon targets, **Stripe** has invested directly in **negative emissions technology (NET) projects** like those with CarbonCure. What defines these commitments is that they go beyond target setting. These companies have implemented transparent plans that match their specific corporate capabilities (e.g. supply chain, green building, carbon removal offsets, direct investment, renewable energy purchasing, etc.). Other organizations can draw from these models and develop the right plan that fits their own capabilities.

One common theme is that companies are prioritizing carbon removal solutions as part of their climate plan. According to the **National Academies of Sciences, Engineering, and Medicine**, "If the goals for climate and economic growth are to be achieved, negative emissions technologies will likely need to play a large role in mitigating climate change by removing globally 10 gigatonnes of CO₂ per year by midcentury and 20 gigatonnes of CO₂ per year by century's end." Carbon removal solutions not only have the potential to reverse climate change, but are also an enormous economic growth opportunity.

The time to act is now.

"If the goals for climate and economic growth are to be achieved, negative emissions technologies will likely need to play a large role in mitigating climate change by removing globally 10 Gt CO₂/year by midcentury and 20 Gt CO₂/year by century's end."

National Academies of Sciences, Engineering, and Medicine, 2019



CarbonCure concrete was supplied for the construction of LinkedIn's Middlefield Campus in California.

Reducing CO₂ by 500 Mt Annually with CarbonCure



1. Enhance producer competitiveness with added profitability and sales differentiation



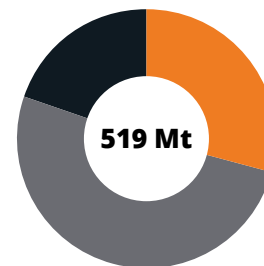
2. Rapid plant retrofits with very low barriers to adoption



3. Stackable integration with existing low-carbon solutions, regulations, and supply chains



4. Continuous innovation of complementary low-carbon, digital, and circular technologies



80.7 Mt
CarbonCure for Recycled Aggregate



143 Mt
CarbonCure for Ready Mix, Masonry, and Precast



294.9 Mt
CarbonCure for Reclaimed Water



5. Win-win global partnerships across the construction value chain, government, and industry

Building A Greener Future Together

The concrete industry can reduce 500 Mt of CO₂ per year by 2030 — and eventually decarbonize the entire industry — through the adoption of existing and future carbon removal technologies.

This guide outlines a tangible path toward these goals. However, success will be reliant on a collaborative approach from all industry stakeholders: concrete producers, construction specifiers, governments, and industry innovators.

As we continue on our journey, we hope we can encourage all stakeholders across the industry and government to join us on this important mission.

Visit carboncure.com for more information or contact us at info@carboncure.com to get in touch for collaboration opportunities.

