



Decarbonizing Cement and Concrete

October 2026



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Summary

- **Why is decarbonizing cement and concrete important?**

Cement and concrete is the second-largest source of industry emissions, at 2.6 billion metric tons of CO₂-equivalent (tCO₂e) per year, or 6% of global emissions. 80% of concrete emissions arise from cement production. 63% of cement emissions arise from the process reactions, followed by combustion heat (27%) and electricity (10%). Since process emissions dominate, grid decarbonization cannot address them, and emissions are projected to stay between 1.4 billion and 2.8 billion tCO₂e in 2050.

- **How could efforts to decarbonize cement and concrete reduce greenhouse gases?**

Supplementary cementitious materials, such as calcined clay, are a commercialized technology that can partially replace clinker (the carbon-intensive ingredient of cement) in cement formulations, reducing emissions by up to 40% while also cutting costs. Deep-decarbonization technologies are still emerging—carbon capture, utilization, and storage is the most advanced, but remains costly. Electrochemical processes and electric kilns represent potential breakthrough technologies, but have yet to be proven at scale.

- **What do our findings suggest are the most promising philanthropic sub-strategies for reducing cement and concrete emissions?**

Based on our evaluation of scale, feasibility, and funding need, we think the most promising philanthropic sub-strategies to reduce cement and concrete emissions are supporting additional government innovation funding, supporting government low-carbon procurement commitments, supporting governments to establish regulatory frameworks, facilitating corporate low-carbon procurement commitments, and facilitating early-mover plant construction.

- **Is there room for more funding?**

We estimate that efforts to decarbonize cement and concrete receive ~\$8 million USD in philanthropic funding per year, equivalent to less than 1% of total philanthropic climate funding—disproportionately low against cement's share of global emissions.

We are unsure how much public and private funding is directed specifically at cement and concrete. However, industrial decarbonization as a whole received \$29 billion in 2024, just 1.5% of total climate finance. Even if it absorbed all of this funding, we think efforts to decarbonize cement and concrete would remain severely underfunded.

- **Are there major co-benefits or potential risks?**

Decarbonizing cement and concrete has the co-benefits of reducing air pollution and facilitating technology spillover by supporting the scaling of carbon capture, utilization, and storage (CCUS) technologies and infrastructure.

- **What are the key uncertainties and open questions?**

Our key uncertainties include whether philanthropic dollars spent on cement innovation could achieve more in sectors that are easier to abate, whether the sector can fully decarbonize given that no pathway is yet proven and affordable, and whether we are underrating demand-side levers.

- **What is the bottom line, and what are the next steps?**

Given cement's position as the second heaviest-emitting industrial sector, the gap between current low-carbon capacity and net-zero-aligned trajectories, and the very low funding the sector receives, we think it is important to direct more philanthropic funding toward decarbonizing cement and concrete.

We recommend that philanthropists consider funding organizations that are working to address the challenges outlined in this report and consider grants aligned with the strategies we have laid out.

The findings in this report will inform the grantmaking strategy for the [Giving Green Fund](#) and our list of [Top Climate Nonprofits](#). Therefore, donors interested in progressing this work can choose to donate directly to the Giving Green Fund.

Giving Green's cost-effectiveness analysis for this strategy is still being finalized and will be added to the report when completed.

Introduction

The cement and concrete subsector is the second-largest source of industry emissions behind [iron and steel](#), accounting for 2.6 billion tCO₂ per year or 6% of global annual emissions.¹ Future emissions are highly uncertain and sensitive to levels of economic growth and population dynamics, but under a business-as-usual trajectory, are projected to lie between 1.4 billion and 2.8 billion tCO₂e in 2050 (central estimate: 2.1 billion tCO₂e) (**Figure 1**). According to ClimateWorks Foundation data, the annual mitigation potential from decarbonizing cement and concrete will grow over time, from about 275 million tCO₂e in 2030 to 2.9 billion tCO₂e in 2050, to 3.6 billion tCO₂e in 2100.²

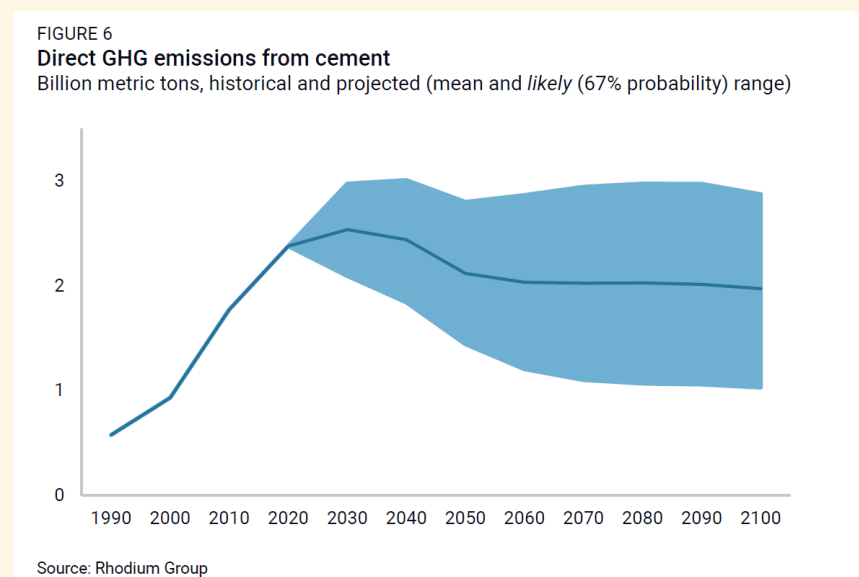


Figure 1: Projected cement emissions through to 2100.³

Concrete is a widely used building material composed of cement, water, and aggregates. Cement's main purpose is to bind the other concrete ingredients together. Its production accounts for around 80% of concrete emissions, while making up just 15% of concrete by volume (**Figure 2**). As such, we focus the rest of our strategy on reducing cement emissions.

¹ "The concrete and cement industry emits roughly 2.6 gigatonnes (Gt) of CO₂ per year" [Mission Possible Partnership, 2023](#); "Today, cement is responsible for 6% of global GHG emissions" [Rhodium Group, 2024](#)

² We define mitigation potential as all potential emissions reductions from a given sector or strategy, not exclusively emissions reductions attributable to philanthropic funding. We exclude impacts of greening the electricity grid from this calculation, since we attribute those mitigation impacts to the [power sector](#). We source the majority of our [mitigation potential estimates](#) from ClimateWorks Foundation.

³ Figure 6 [Rhodium Group, 2024](#)

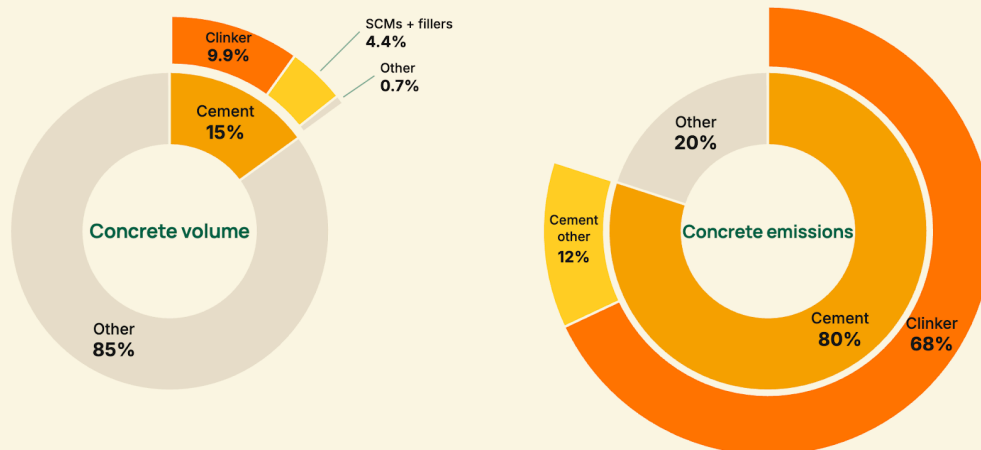


Figure 2: Components of concrete by volume and associated emissions (global average).⁴

The main sources of cement emissions are:⁵

- 1) Process emissions from the calcination reaction used to turn limestone into clinker (63%)
- 2) Direct combustion emissions to produce heat (27%)
- 3) Electricity production (10%)

Importantly, because electricity production accounts for only 10% of cement emissions, we cannot expect advances in grid decarbonization to meaningfully reduce cement emissions.

When looking across the entire concrete life cycle, the embodied emissions of concrete are more important than construction and raw materials, which make up just 1% each of emissions.⁶ However, it is significant that concrete reabsorbs ~10% of its life-cycle CO₂ emissions through a process called recarbonation.

Green cement commercialization is severely off-track to decarbonize at rates consistent with net-zero roadmaps. As of 2026, only 500,000 metric tons per year of near-zero primary green cement capacity is operational, a tiny fraction of the global grey cement market of 4.1 billion metric tons per year.⁷ The current pipeline of primary commercial-scale deep decarbonization plants at final investment decision (FID) would add a further 2 million metric tons per year, but would still meet less than 1% of global cement demand.⁸ Because of long plant lifetimes (~40 years), 2050 is just one investment

⁴ Adapted from [WRI, 2024](#)

⁵ Figure 8 [Rhodium Group, 2024](#)

⁶ Excluding recarbonation; Exhibit A [MPP, 2023](#)

⁷ "The Brevik plant has annual production capacity of just over one million tons of cement, around half of which will be produced under the evoZero brand." [Reuters, 2025](#); Grey steel demand: Figure: Pipeline capacity vs existing grey market vs passed FID, per sector [MPP, 2026](#)

⁸ Figure: Pipeline capacity vs existing grey market vs passed FID, per sector [MPP, 2026](#) Note: MPP defines deep decarbonization as a minimum emission reduction of 70-80%.

cycle away, which makes action to shift the course of cement emissions especially urgent.⁹

Pathways to Decarbonize Cement and Concrete

Summary of key pathways to reduce cement and concrete emissions

Our view is that the main bottleneck to decarbonizing cement and concrete is the lack of proven, cost-effective deep-decarbonization technologies. We prioritize SCMs, electrochemical processes, electric kilns, and CCUS as key pathways to decarbonize cement and concrete.

- **Supplementary cementitious materials (SCMs)** can be mixed into cement to reduce its emissions. We see SCMs such as calcined clay as an important near-term win, since they can reduce cement emissions by up to 40%, are compatible with 75% of existing cement plants, and save 15-25% of production costs, while performing as well or better than ordinary Portland cement.
- **Electrochemical processes** are an alternative to cement kilns. These processes use electrolyzers that can operate at ambient temperature, reducing heat emissions, and can use feedstocks that do not contain carbon, thereby eliminating process emissions.
- **Electric kilns** replace fossil-fuel combustion in cement kilns with electricity. Electrifying kilns reduces direct emissions and also makes CO₂ easier to capture, but does not reduce process emissions.
- **Carbon capture, utilization, and storage** is the pathway that is projected to mitigate the most cement emissions (~36% of cumulative abatement by 2050) and the only deep decarbonization pathway with an operational commercial-scale plant. However, it has a high abatement cost estimated at ~\$160 per tCO₂. Therefore, we see it as a last resort for decarbonizing cement, should other options fail to commercialize.

Based on a geographic assessment of future cement production and current

⁹ "Immediate action is necessary: The year 2050 is just one investment cycle away owing to the industry's long-lasting capital assets" [MPP, 2023](#); "Steel and cement plants have typical lifetimes of around 40 years" [IEA, 2020](#)

innovation, we prioritize work in China, Africa, India, Europe, the U.S., and additional emerging markets in Asia.

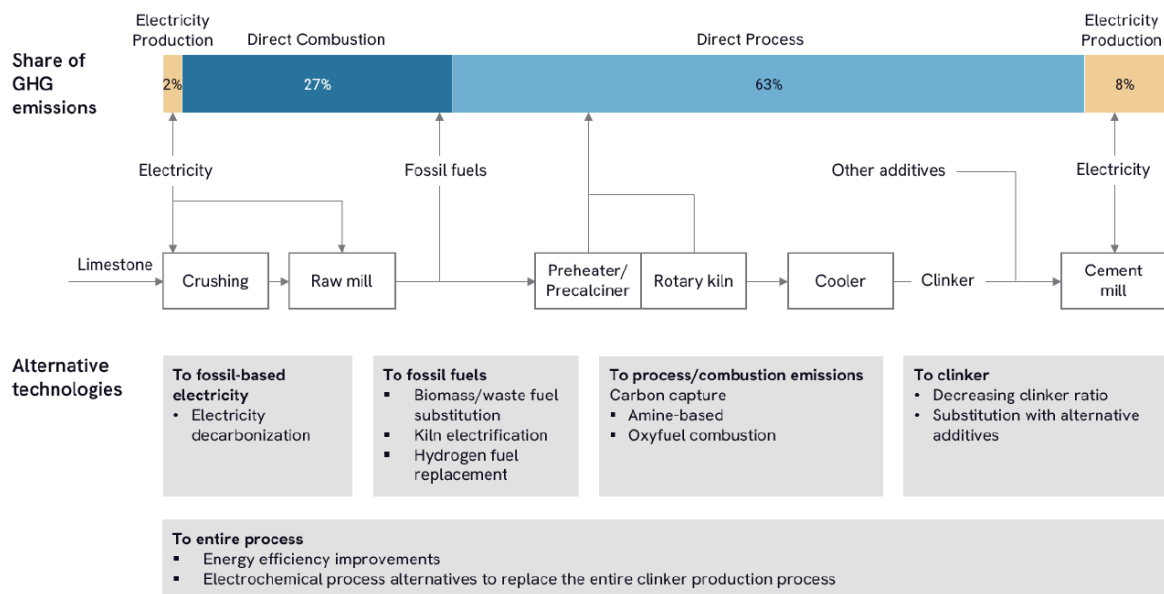
In their review of 37 studies of cement and concrete decarbonization strategies, [Busch et al.](#) found a clear consensus on the key technological measures to decarbonize cement:¹⁰ Energy efficiency; fuel switching; carbon capture, utilization, and storage (CCUS); clinker content reduction; alternative binders; material and construction efficiency; and CO₂ uptake. We deprioritize energy efficiency strategies because companies are already aware of and well incentivized to maximize efficiency to increase profits. We also deprioritize material and construction efficiency strategies because we see them as downstream of industrial material production, so they fall outside the scope of this report.

We briefly outline some of the most relevant pathways for scaling up the remaining measures in the following sections.

FIGURE 8

The cement production process and cleaner alternatives

Process steps, global average emissions contribution, and technology alternatives



Source: Rhodium Group

Figure 3: Cement production processes, emissions, and alternative technologies.¹¹

¹⁰ "The review yielded 37 studies from peer-reviewed articles and technical reports. Analysis showed consensus on the primary technical measures to decarbonize." [Busch et al., 2022](#)

¹¹ Figure 8 [Rhodium Group, 2024](#)

Supplementary Cementitious Materials (SCMs)

Clinker is produced by heating limestone and clay in a cement kiln, which is then ground up to make cement. The clinker ratio is the mass ratio of clinker to cement, and it can be reduced by substituting a portion of clinker with supplementary cementitious materials (SCMs). The global average ratio is 71% but could be reduced to 50% using commercialized substitutes and even further with emerging technologies.¹²

SCMs include waste materials from coal and steel plants, ground limestone, and, more recently, calcined clay. Several SCMs are cheaper than conventional cement, and they are already mainstream in some regions. The availability of coal and steel waste is expected to decline as those sectors decarbonize, since green energy and steel do not produce the same waste.¹³

Novel SCMs, such as Limestone Calcined Clay Cement (LC3), have greater availability and potential emissions benefits compared to waste materials. Calcined clay is globally available, and its use is expected to increase significantly.¹⁴ We see calcined clay as an important quick win to decarbonize cement, since it can reduce cement emissions by up to 40% and is compatible with 75% of existing cement plants, while saving 15-25% of production costs and performing as well or better than ordinary Portland cement (OPC).¹⁵ Further research demonstrates that clinker ratios of 35–40% can retain the structural properties of OPC while roughly halving emissions.¹⁶ Reductions to as low as 25% have also been demonstrated for some clay types.¹⁷ The company [Ecocem](#) claims a two-thirds reduction in GHG intensity compared to OPC, by replacing up to 70% of clinker.¹⁸ Using SCMs like calcined clay would also reduce heat-related emissions from cement, since they use lower-temperature kilns (~700-800°C).¹⁹

¹² "Clinker-to-cement ratio (tonne per tonne); 0.71" [IEA, 2023](#)

¹³ [ibid.](#)

¹⁴ [ibid.](#)

¹⁵ "This systematic review highlights limestone calcined clay cement (LC3) as a low-carbon alternative to ordinary Portland cement (OPC), reducing carbon dioxide emissions by 30 % to 40 % while maintaining similar or superior performance."; "with production costs estimated to decrease by 15–25 % when employing a 50 % clinker replacement with calcined clay and limestone, make LC3 a competitive choice" [Ghazy et al., 2025](#); "About 75 per cent of cement plants worldwide can produce LC3 with slight adjustments in their production lines and with their current infrastructure and abundantly available materials." [LC3, 2022](#)

¹⁶ "LC3-40-CaO achieves a 28-day compressive strength of 52.5 MPa, equivalent to LC3-50, while utilizing 10% less clinker."; "15-20% embodied CO2 reduction versus LC3-50 through combined clinker reduction and waste valorization"; "Environmental performance indicators demonstrated 16% reduction in embodied CO2 per MPa compared to LC3-50" [Ahmad et al., 2026](#); halving emissions: LC3-50 reduces emissions on OPC by 40%, a further 16% reduction on LC3-50 emissions results in 50.4% the emissions of OPC.

¹⁷ "The environmental performance indicator showed that LC3-50 and LC3-35 prepared by MK30, and LC3-50, LC3-35 and LC3-25 prepared by MK50 can be treated as ideal systems, as they presented much lower environmental impact and also maintained the desired compressive strength." [Zhang et al., 2024](#)

¹⁸ "By replacing up to 70% of clinker — the key polluting ingredient in cement — with low-carbon SCMs (Supplementary Cementitious Materials), ACT significantly lowers the carbon footprint of cement (approximately 200 kg eqCO2/t compared to 600 kg eqCO2/t)" [Ecocem, n.d.](#) [accessed August 2026]

¹⁹ "Significant energy savings are achieved because calcined clays to be more malleable and are heated at approximately 700-800°C" [LC3, 2022](#)

Emerging Near-Zero-Emission Technologies

Mature and cost-competitive technological options for near-zero cement emissions do not currently exist. Rhodium Group predicts that without further technological innovation, only a predicted 28% of 2050's cement emissions can be mitigated through electricity decarbonization, clinker ratio reduction, and efficiency gains (**Figure 4**).²⁰ We think new evidence on reducing the clinker ratio makes us more optimistic than this estimate, however, **we still see innovation as very important to decarbonizing cement (Figure 4).** We briefly describe some near-zero emissions technologies below.

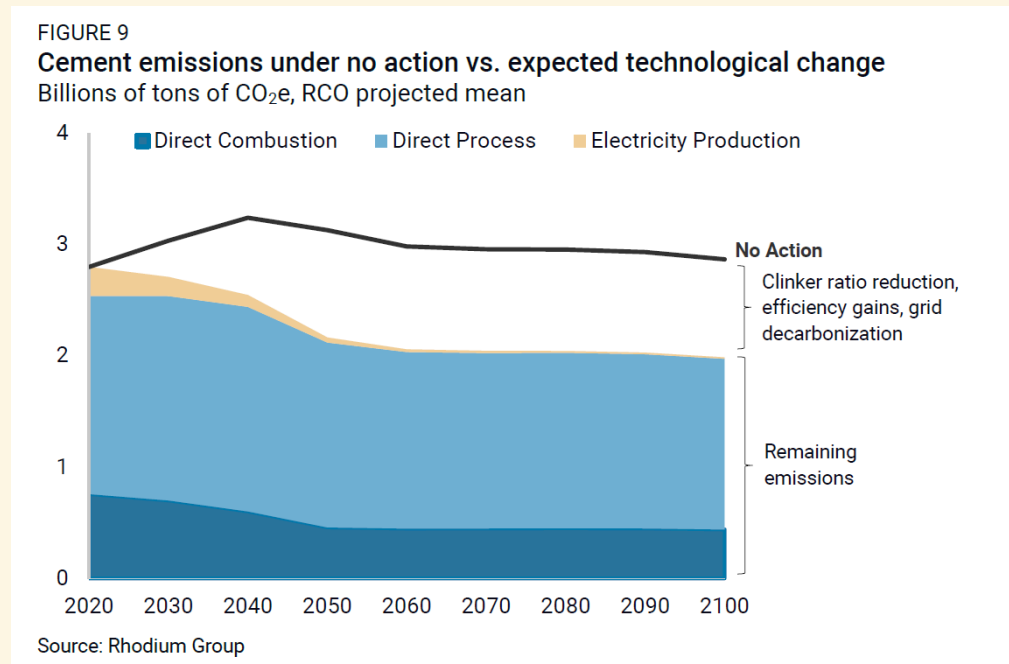


Figure 4: Cement emissions under no action vs. expected technological change²¹

²⁰ "These improvements drive a 28% reduction in emissions by 2050 relative to the expected level given no action or change in the industry" [Rhodium Group, 2024](#)

²¹ Figure 9 [Rhodium Group, 2024](#); RCO: Rhodium Climate Outlook

Emissions intensity of emerging cement technologies in 2050 under expected policy and net zero electricity scenarios
Kilograms of CO₂e per ton of cement

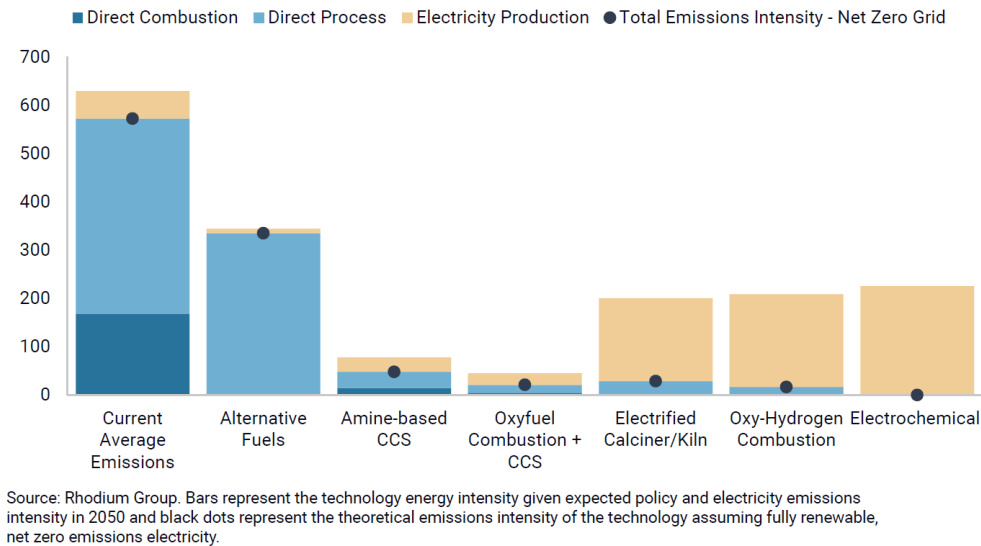


Figure 5: Emissions intensity of emerging cement technologies in 2050²²

Carbon Capture, Utilization, and Storage (CCUS)

CCUS is the pathway that is projected to mitigate the most cement emissions (~36% of cumulative abatement by 2050) by both the Global Cement and Concrete Association and Mission Possible Partnership (MPP).²³ **Amine-based carbon capture (Technology Readiness Level: TRL 9) is the most mature pathway and can be retrofitted to existing plants, but has a relatively low capture rate.**²⁴

The world's only commercial-scale near-zero cement facility, [Brevik CCS](#), has been in operation since 2025 and claims to capture 400,000 tCO₂ annually at a capture rate of 50%.²⁵ Capture rates can theoretically reach above 95%, but the facility is currently constrained by the amount of waste heat it generates, which powers the capture unit.²⁶

Oxyfuel carbon capture (TRL 6) is more energy efficient and can theoretically achieve up to 99% capture rates, but is expensive and difficult to retrofit onto existing plants.²⁷

It is the cement decarbonization technology that achieves the greatest reduction in emissions intensities, given the current rate of power sector decarbonization. However,

²² Figure 10 [Rhodium Group, 2024](#)

²³ Page 24 - The Net Zero Pathway [GCCA, 2022](#); Exhibit B [MPP, 2023](#)

²⁴ [Technology Readiness Levels](#)

²⁵ "Demonstration plant; 400.000 tons per year; 55 tons per hour; 50% capture rate" [Heidelberg Materials, 2026](#)

²⁶ "The technology incorporates heat integration, using waste heat from the downstream CO₂ compressor as well as from the cement process to provide much of the energy needed for the capture system. Indeed, waste heat availability was chosen as the basis for the capture capacity specified." [Global CCS Institute, 2026](#)

²⁷ Exhibit C [MPP, 2023](#); "Alternatively, oxyfuel CCS, in which combustion occurs in an oxygen-rich environment to produce a flue gas stream with high CO₂ purity, can achieve higher capture rates of 90-99% and is less energy intensive." [Rhodium Group, 2024](#); "However, it requires greater adaptation of the overall kiln process, has higher electricity requirements and overall costs" [Rhodium Group, 2024](#)

electrochemical processes would have even greater reductions on a fully renewable grid (**Figure 5**).²⁸

A major drawback of CCUS is its high abatement cost, estimated at ~\$160 per metric ton of CO₂.²⁹ Because of this high cost, we see CCUS as a backstop option for decarbonizing cement and believe it is worth investing in breakthrough technologies, such as electrochemical processes, to determine whether more cost-effective solutions are viable.

Electrochemical Processes

Electrochemical processes (TRL 8) are a more energy-efficient alternative to cement kilns based on electrolysis with no process emissions.³⁰ For example, Sublime Cement's pathway uses an electrolyzer at ambient temperature to break down raw feedstocks into cementitious materials and critical minerals, which are then converted into a direct replacement for OPC.³¹ Since their feedstock, calcium silicate, does not contain carbon, there are no process emissions. Sublime claims that their process is more energy-efficient than OPC and that it is the cheapest near-zero emissions cement pathway.³²

Electric Kilns

Cement kilns are fired at the high temperature of 1,450°C, placing them out of reach for existing commercialized clean heat technologies.³³ **Electric kilns (TRL 4-5) replace fossil-fuel combustion with electricity,³⁴ resulting in 1) lower energy emissions if renewable electricity is used, and 2) elimination of combustion gases, resulting in a purer process-only stream of CO₂ emissions that are more easily captured.** The process could fully decarbonize the 35% of heat-related cement emissions, leaving process emissions unabated (unless coupled with, e.g., CCUS).³⁵ MPP reports that electric kilns have a cheaper abatement cost compared to CCUS if the electricity price is less than \$32 per MWh.³⁶ Current industrial electricity costs between \$36 and \$123 per MWh, so we see reaching this cost threshold as a realistic possibility in some geographies.³⁷

²⁸ "Given expected levels of power sector decarbonization, it achieves the greatest emission reductions of all technologies analyzed." [Rhodium Group, 2024](#)

²⁹ "CCUS is the most expensive lever among all solutions, with an abatement cost of \$160 per ton of CO₂." [RMI, 2023](#)

³⁰ Exhibit C [MPP, 2023](#)

³¹ Our Process [Sublime Systems, n.d.](#) [accessed August 2026]

³² "This, plus the increased energy efficiency of our process, offers the lowest cost path to clean cement." [Sublime Systems, n.d.](#) [accessed August 2026]

³³ "Thirty-five percent of the sector's CO₂ emissions comes from burning fuels to reach the 1,450°C required for the mineralogical transformation of the limestone with the other raw materials inside the rotary kiln." [MPP, 2023](#); "Large-scale industrial heat pumps are well established to deliver heat up to 150 °C, while electric boilers can generate steam up to 350 °C." [IEA, 2025](#)

³⁴ Exhibit C [MPP, 2023](#);

³⁵ *ibid*

³⁶ "Breaks even with carbon capture if electricity price is less than \$32/MWh" [MPP, 2023](#)

³⁷ Figure: Estimated final electricity price for large industrial customers in energy-intensive industries, 2019-2025 [IEA, 2026](#)

Hydrogen-based kilns (TRL 4) are another alternative to fossil-fuel kilns.³⁸ We deprioritize this pathway because of its low expected energy efficiency and because we think scarce green hydrogen resources are better applied to end-uses that are dependent on it as a feedstock, such as steel and ammonia production.³⁹

CO₂ Uptake

About 10% of cement and concrete's lifecycle emissions are recarbonated into concrete blocks.⁴⁰ **Total recarbonated emissions can be increased by a) fixing CO₂ into concrete during the curing stage (TRL 6) or b) accelerating the natural re-carbonation process that occurs during end-of-life,** either through crushing demolished concrete to increase its surface area, or extending the exposure time of demolished concrete to air before it is disposed of.⁴¹

Since recarbonation occurs regardless of intervention, only the increment above that baseline counts as abatement, and we think typical industry claims that instead credit total uptake are overstated.⁴² [Ravikumar et al.](#) found that once the emissions generated by the CCU process itself, uncertainty over how much CO₂ the concrete actually takes up, and any loss of compressive strength are accounted for, CCU concrete is more likely than not to increase net emissions rather than reduce them:⁴³ 56 to 68 of 99 published experimental datasets showed a net CO₂ increase, depending on the source of the CO₂.⁴⁴ They noted that increasing compressive strength and improving the energy efficiency of the curing process could increase the net CO₂ benefit.

Based on our assessment of cement's technological decarbonization pathways, we prioritize those that focus on innovating and scaling SCMs, electric kilns, CCUS, and electrochemical processes.

³⁸ Exhibit C [MPP, 2023](#)

³⁹ Figure 6 [FCA, 2024](#); "Therefore, hydrogen must first be prioritized for sectors that are currently or will be dependent on it as a feedstock, such as refineries, chemicals, and steel." [FCA, 2025](#)

⁴⁰ Exhibit A [MPP, 2023](#)

⁴¹ "Carbon utilization technologies can be used during the concrete curing stage to fix some CO₂"; "Measures at the concrete life cycle end-of-life point toward enhancing the natural recarbonation process whereby CO₂ uptake by concrete occurs. Processes for enhancing this process include crushing end-of-life materials to increase their surface area and extending the time that demolished material is exposed before final disposition" [Busch et al., 2022](#)

⁴² For example, as of August 2026, [CarbonCure](#) claims 800kt of total emissions abated but do not specify what emissions would be abated through natural recarbonation

⁴³ Compressive strength matters because weaker concrete means more of it is needed to do the same structural job

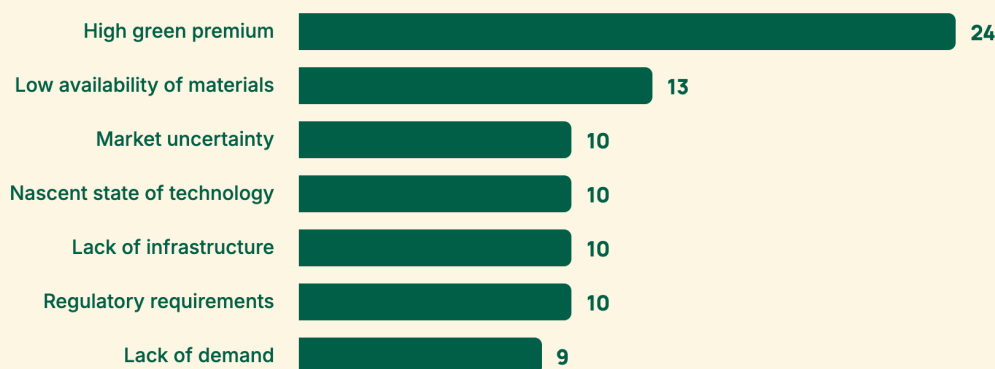
⁴⁴ "The results demonstrate a higher likelihood of the net CO₂ benefit of CCU concrete being negative i.e. there is a net increase in CO₂ in 56 to 68 of 99 published experimental datasets depending on the CO₂ source. Ensuring an increase in compressive strength from CO₂ curing and mixing and decreasing the electricity used in CO₂ curing are promising strategies to increase the net CO₂ benefit from CCU concrete." [Ravikumar et al., 2021](#)

Barriers and Policy Pathways to Decarbonizing Cement

Near-zero plant announcements stalled in 2025, with just 12 CCUS projects announced globally and only three at commercial scale, dropping from their peak of 15 in 2024.⁴⁵ In their review, [Busch et al.](#) also identified the most commonly cited barriers to decarbonizing cement and concrete: high green premiums and limited material availability (**Figure 6**).

The most cited barriers to reducing cement and concrete emissions

Number of mentions for each barrier from 37 green cement and concrete roadmaps



Data: Busch et al., 2022

Figure 6: The most cited barriers in cement and concrete decarbonization roadmaps from the [Busch et al.](#) review

Although some technologies, such as SCMs, are cheaper than OPC, green premiums for near-zero-emission cement remain significant, ranging from 75-150% across regions. The impact of green premiums is minimal at the final product level, dropping to just 1-2% for houses, 1-2% for railways, and 2-5% for roads.⁴⁶

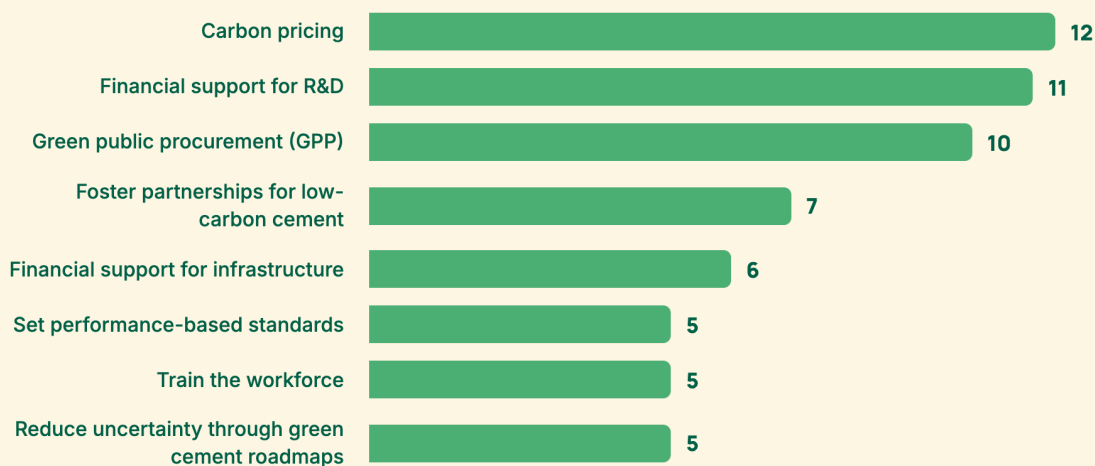
All deep decarbonization options for cement production remain pre-commercial and require policy support to scale up and achieve cost competitiveness. [Busch et al.](#) analyzed proposed policy actions, noting that there was no clear consensus for the top policy priorities. The most cited policy pathways were carbon pricing, financial support for research and development (R&D), and green public procurement (**Figure 7**).

⁴⁵ We take CCUS plant announcements as a proxy for the progress of broader near-zero cement plants, since there are just a handful of announced non-CCUS projects that qualify under this definition, and they are not tracked in LeadIT's database. "After years of steady growth, new cement carbon capture project announcements slowed sharply in 2025, with just 12 projects announced globally. Only three of these were commercial scale, down from a peak of 15 in 2024." [SEI, 2026](#)

⁴⁶ Figure: Cost premiums for initial projects are significant, but the impact on end products is more manageable [IEA, 2026](#)

The most cited policy pathways to reduce cement emissions

Number of mentions for each policy pathway from 37 green cement and concrete roadmaps



Data: Busch et al., 2022

Figure 7: The most cited policy priorities in cement decarbonization roadmaps from the [Busch et al.](#) review

We agree with Busch et al.'s finding that carbon pricing, financial support for R&D, and green public procurement (GPP), are the most important policy pathways to promote green cement. Further analysis of these pathways can be found in Section: 'Assessment of Philanthropic Substrategies.'

Key Geographies

We prioritize efforts to decarbonize cement in 1) regions with the greatest projected cement demand, and 2) countries that are likely to be policy and technology leaders, since their progress could lead to global spillover effects. Nearly all of cement production is used domestically, while just 2.6% is traded.⁴⁷ As such, we do not see trade policy as an important lever for decarbonizing cement.

Cement is mostly used for buildings and other infrastructure. Infrastructure build-out, and therefore cement emissions, has peaked in most high-income countries. However, the industry is expected to see rapid growth in low- and middle-income countries (LMICs), driven understandably by economic growth. Cement demand outside the Organisation for Economic Co-operation and Development (OECD) and China is expected to double through 2100, accounting for 56% of demand in 2050 and 84% in 2100 (**Figure 8**).⁴⁸

⁴⁷ "We focus here on demand because nearly all cement production has been used to meet domestic demand and very little cement—only 2.6%—is traded." [Rhodium Group, 2024](#)

⁴⁸ "depending on the pace of economic growth, global cement emissions outside of OECD countries and China are likely (67% probability) to remain persistently high and even double through the end of the century."; "demand outside China and the OECD is expected to rise from its 30% share of the global total today to reach 56% by 2050 and 84% by 2100" [Rhodium Group, 2024](#)

Based on the Rhodium Group's modeling, we prioritize **Africa, India, China, and non-OECD Eurasia given projected cement demand**. Although China's cement emissions are expected to fall, we still prioritize it because it accounts for a very large share of cumulative demand through 2100. The International Energy Agency (IEA) reports that emerging markets are already a leader for calcined clay plants, housing eight of the 15 full-scale plants currently in operation.⁴⁹

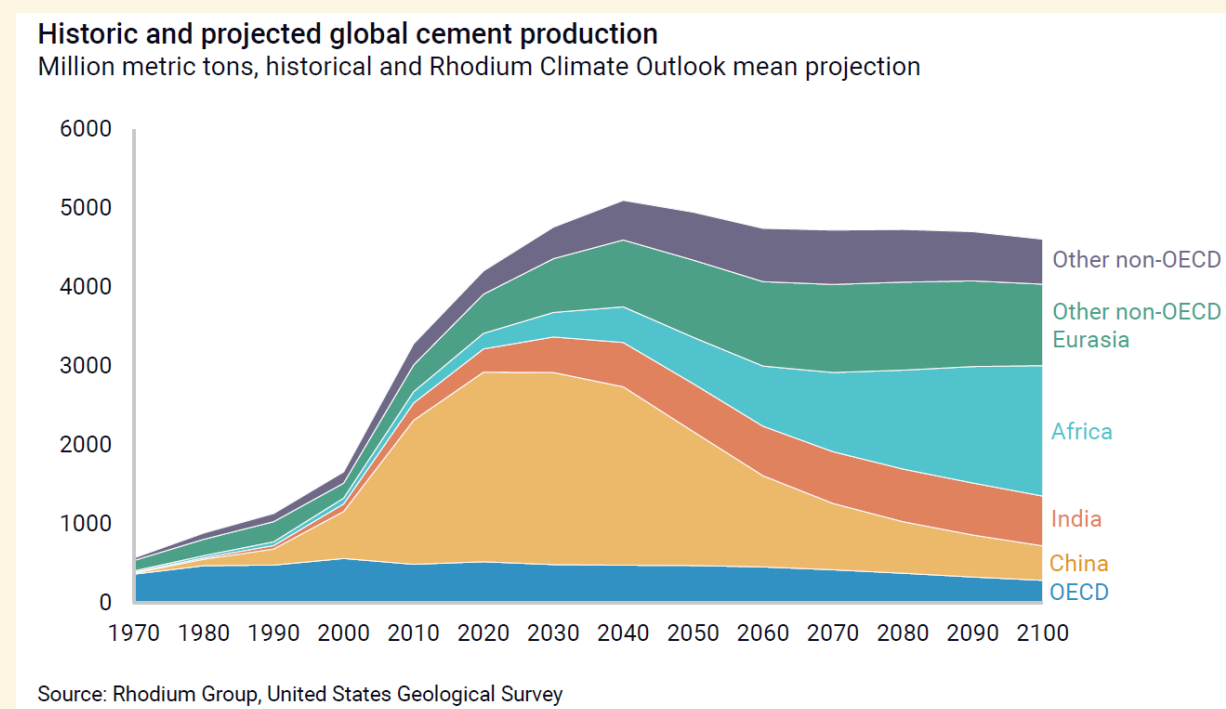


Figure 8: Historic and projected global cement production⁵⁰

We use LeadIT's carbon capture project announcement [dataset](#) as a proxy for technology leadership, which highlights **Europe, Asia (primarily China and India), and North America as key technological leaders (Figure 9)**. This dataset captures only carbon capture projects and omits other emerging technologies, but we think it is a good enough proxy for informing our geographic prioritization because, to our knowledge, the development of other emerging technologies to decarbonize cement has a similar geographic distribution. Though Asia overtook Europe in announcements in 2025, all large-scale projects are still in Europe.⁵¹

⁴⁹ "Of the 15 full-scale calcined clay plants in operation today, eight are in EMDEs." [IEA, 2026](#)

⁵⁰ Figure 4 [Rhodium Group, 2024](#)

⁵¹ "Asia led in total announcements for the first time, overtaking Europe, although all large-scale projects were still in Europe." [SEI, 2026](#)

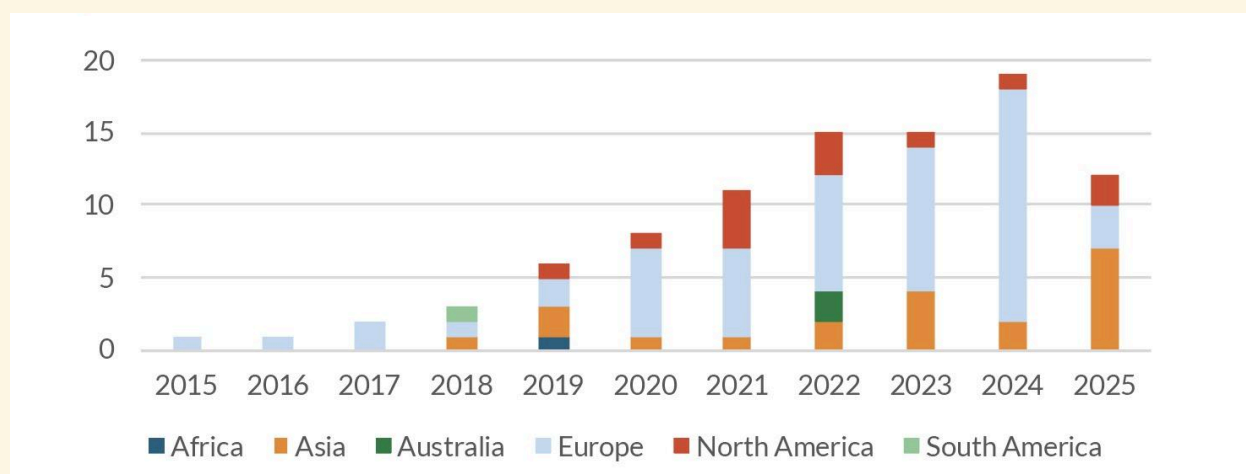


Figure 9: Total carbon capture project announcements in cement plants by year and continent⁵²

Assessment of Philanthropic Sub-Strategies

We identified six promising philanthropic sub-strategies and evaluated each sub-strategy's scale, feasibility, and funding need (see **Table 1**). For more information on these metrics and our research process, see [Giving Green's Research Overview](#).

Table 1: Scale, feasibility, and funding need of approaches nonprofits use to decarbonize cement and concrete

Sub-strategy	Scale	Feasibility	Funding Need
Supporting additional government innovation funding	High	High	High
Supporting government low-carbon procurement commitments	High	Medium	High
Supporting governments to establish regulatory frameworks	High	Medium	High
Facilitating corporate low-carbon procurement commitments	High	Medium	Medium
Facilitating early-mover plant construction	High	Medium	Medium
Building green cement/concrete coalitions	Medium	Medium	Medium

We chose to center sub-strategies with no low rating and at least one high rating in our strategy. Based on the above evaluations, we think the most promising philanthropic sub-strategies are: Supporting additional government innovation funding, supporting

⁵² Figure 1 [LeadIT, 2026](#)

government low-carbon procurement commitments, supporting governments to establish regulatory frameworks, facilitating corporate low-carbon procurement commitments, and facilitating early-mover plant construction.

We expand on our reasoning for prioritizing these strategies in the following section. Further information on our reasoning for deprioritizing the remaining strategy is available on [Giving Green's Research Dashboard](#).

Note: We could not find conclusive data about philanthropic funding at the sub-strategy level. Therefore, we hold our funding need ratings with low certainty. We think that, in general, cement decarbonization has a very high funding need, and we think it is plausible that we have underestimated the funding need of several of our 'medium' strategies, given our limited information about funder activity.

Supporting additional government innovation funding

Scale	● ● ● High
Feasibility	● ● ● High
Funding need	● ● ● High

Scale: High. Because most deep decarbonization technologies are not yet commercialized, innovation is especially critical to decarbonize cement. SCMs like calcined clay can cut emissions intensity by at least 40%, but reaching near zero will require further research on innovative SCMs, new clinker chemistries, alternative feedstocks, or carbon capture.⁵³ LeadIT found government support to be a decisive factor in early-mover projects. For example, Brevik CCS—the world's only commercial-scale near-zero cement facility—received government funding to cover over 80% of its capital costs, while projects in Sweden and California were delayed or canceled after failing to secure government funding.⁵⁴

Funding vehicles include the EU's Innovation Fund (~\$46 billion USD across industry), Japan's Green Innovation Fund (up to ~\$350 million USD), and the U.K.'s low-carbon concrete cohort (~\$15 million USD).⁵⁵ We have found fewer funds for cement/concrete than for some other industry sectors, such as steel, suggesting that education and support to create such funds may be bottlenecks.

Feasibility: High. Funding commitments from governments across the world demonstrate that innovation funds are seen as a priority to retain industrial competitiveness and

⁵³ "LC3 can reduce CO2 emissions by up to 40%" [Limestone Calcined Clay Cement](#) (accessed August 2026)
"given the high share of unavoidable process emissions due to calcination, the deployment of CCS is essential to achieve net-zero targets." [Varnier et al., 2026](#)

⁵⁴ "The LeadIT analysis finds that government support is a decisive feature of early full-scale carbon capture projects in the cement sector. The Brevik facility in Norway, for example, benefited from a funding model covering more than 80% of capital costs. Conversely, projects in Sweden and California have been delayed, paused or cancelled after failing to secure, or losing government finance." [LeadIT, 2026](#)

⁵⁵ "€40 billion From 2020 - 2030" [European Commission](#) (accessed August 2026); "Budget Up to 56.64B¥" [Green Innovation Fund Projects](#) (accessed August 2026); "Innovate UK, part of UK Research and Innovation (UKRI), will invest up to £11.5 million to create a cohort of ambitious businesses, across a two-stage competition, to accelerate concrete decarbonisation." [UK Government](#) (accessed August 2026)

achieve climate commitments.⁵⁶ We think activities to improve the efficiency of fund deployment are especially feasible, since they maximize benefits for governments without increasing their budgets.

We think this sub-strategy is most feasible in higher-income geographies, which have more discretionary funding to spend on innovation. One counterexample is the U.S., which has pulled back on its innovation funding mechanisms.⁵⁷

Because of the high costs of CCUS, we prioritize innovation funding to reduce the clinker ratio and commercialize breakthrough technologies, such as electrochemical processes.

Funding need: High. Our impression is that advocacy for innovation funding attracts somewhat less philanthropic funding than demand-side levers and regulation, and that its funding need has arguably grown due to substantial cuts to public innovation funding in the U.S. and the stalling of new green cement plant announcements.⁵⁸

Supporting government low-carbon procurement commitments

Scale ●●● High

Feasibility ●●● Medium

Funding need ●●● High

Scale: High. Public projects are a major share of cement and concrete demand, estimated at around 25% of global construction revenue.⁵⁹ Difficulty securing demand was highlighted as the key barrier to reaching final investment decisions on 70 industry plants representing \$140 billion in investments.⁶⁰ Therefore, we view procurement commitments as a key mechanism to unlock early markets for low-carbon cement at meaningful scale.

Feasibility: Medium. The [World Economic Forum](#) found four key challenges to green public procurement (GPP) from four civil society actors in the space: 1) consolidating and navigating decentralized procurement systems, 2) managing the green premium, 3) modernizing procurement frameworks, and 4) balancing immediate gains and lasting impacts. Of these four challenges, we think nonprofits are well placed to solve 1) and 3),

⁵⁶ "We have 50+ CCUS projects in development worldwide, of which 11 flagship projects. 7 European projects have been awarded grants from the EU Innovation Fund; these are planned to be operational by 2030."

-Holcim" [MPP, 2025](#)

⁵⁷ "A total of 356 awards across six DOE offices have been terminated, amounting to \$12.5 billion in federal funding." [NRDC, 2026](#)

⁵⁸ "After years of steady growth, new cement carbon capture project announcements slowed sharply in 2025, with just 12 projects announced globally. Only three of these were commercial scale, down from a peak of 15 in 2024." [SEI, 2026](#)

⁵⁹ "Public procurement is estimated to be responsible for 25% of global construction revenue." [United Nations Industrial Development Organization \(UNIDO\), 2023](#)

⁶⁰ "Our analysis now shows that around 70 more projects are 'poised' to secure funding and unlock the benefits that investment will bring. These projects use better-known technologies and have already secured a portion of their offtake and/or part of their financing. The Final Investment Decision now often depends on securing additional volumes of offtake, which in turn requires effective and predictable implementation of announced policies incentivising demand, and on securing permits and access to critical infrastructure. If realised, that would represent around \$140 billion of investment and the biggest step change in clean industry to date, potentially matching half of the last decade's progress in a fraction of the time." [MPP, 2025](#)

given that these are mainly coordination and informational challenges that do not involve compromising on different national priorities. We also think nonprofits can sometimes shift perspectives on 4) by using strategic communications to make lasting impacts more tangible to policymakers and voters. However, we think 2) is not easily solved by nonprofits and, in fact, has been the main bottleneck in some of the advocacy efforts we have observed. A notable hurdle to GPP is securing budget-holder support (e.g., finance or treasury ministries) to fund green premiums.⁶¹ Therefore, our conclusion is that nonprofit engagement can lead to more GPP a) in regions where the green premium is low, or b) from governments motivated to meet climate targets.

Our impression is that there is greater traction for GPP in high income countries, as LMICs may understandably be less inclined to allocate funding for lower-carbon industry products, given that they already spend a larger share of their budgets on public procurement. Public procurement accounts for only around 12% of GDP in OECD countries but up to 30% in lower-income countries.⁶²

Funding need: High. We have observed some coordinated initiatives already working on GPP, in partnership with the U.N. Industrial Development Organization, but we think substantial philanthropic funding can be used to widen country coverage and raise the ambition of existing pledges.⁶³

Supporting governments to establish regulatory frameworks

Scale ●●● High

Feasibility ●●● Medium

Funding need ●●● High

Scale: High. Regulatory frameworks such as carbon pricing and emission standards shape the economics of the entire cement/concrete market rather than individual plants. Carbon pricing was the most mentioned policy in the review by [Busch et al.](#) and has been cited as the most effective individual policy to reduce emissions in developed economies, as well as having strong co-benefits with other policies (e.g., by raising revenues for innovation funding).⁶⁴

Outdated procurement codes and specifications also block the use of low-cement concrete in many jurisdictions, and reforming these codes can remove barriers to market

⁶¹ "Estimated abatement costs are around \$60/tCO₂ for steel and \$110-130/tCO₂ for cement — the cost gap GPP programs must fund." [Clean Energy Ministerial, 2021](#)

⁶² "Public procurement wields enormous purchasing power, accounting for an average of 12 percent of gross domestic product (GDP) in OECD countries, and up to 30 percent of GDP in many developing countries." [UN Environment Programme, "Sustainable Public Procurement," n.d.](#)

⁶³ Example initiatives: [UNIDO, 2025](#); [UNIDO, 2021](#)

⁶⁴ "In the industry sector, pricing plays a prominent role. It is most effective individually in developed economies (43%) and shows the most synergy with other policies in developing economies (50%). However, subsidies can be effective complements in both contexts." [Stechemesser et al., 2024](#)

entry.⁶⁵ Because nearly all cement is consumed domestically, we prioritize domestic regulation in high-demand countries over trade policy.⁶⁶

Many concrete standards are prescriptive—specifying minimum cement content, maximum water-to-cement ratios, and permitted compositions—thereby blocking lower-clinker and novel binders even though performance can match or beat OPC.⁶⁷ Shifting to performance-based standards that assess strength, durability, and emissions rather than dictating a recipe would allow lower-emissions cement to enter the market.

Feasibility: Medium. The establishment of emissions trading systems (ETS) covering cement in the EU, China, Korea, and India demonstrates momentum behind regulations, and we observe ongoing opportunities to influence policy windows, such as the EU's 2026 ETS review.⁶⁸ We think that regulatory policy is more difficult to influence and more likely to face political opposition than procurement and innovation policy, since it penalizes large legacy manufacturers for their emissions and can be seen as distorting markets. For example, ahead of the EU's July 2026 ETS review, industry voices were split on support for and against strengthening regulations.⁶⁹

Although we observe that nonprofits are strongly engaged with governments, we have low certainty that such engagement is a primary influencer of policy adoption. Our reasoning is that attribution and counterfactuals are typically opaque and policymakers must trade off among a wide range of stakeholder priorities. Our experience from tracking advocacy campaigns and speaking to policy and nonprofit stakeholders is that many of these engagements do not lead to substantial change.

Still, we have seen strong evidence from some nonprofits that demonstrates that they can counterfactually affect policy outcomes. Our observation is that the most successful nonprofits find ways to provide clear value to policymakers by helping them achieve their stated aims, such as by 1) educating policymakers about and providing design support for cost-effective policies that allow them to meet their climate and/or other goals, 2) providing technical knowledge of decarbonization pathways, 3) coordinating and collecting support for regulations from climate-forward businesses and financial institutions, and 4) gathering evidence and building narratives to support implementation of cost-effective policies.

One area that we see as relatively easy to execute is to move from prescriptive- to performance-based standards.⁷⁰ In Europe, the revised EN 197-5 standard now permits

⁶⁵ "Many countries still use prescriptive cement standards based on fixed input compositions, which often limit the broader use of low-carbon blended cements... countries can update standards and construction codes to expand these allowances or adopt performance-based approaches." [UNIDO, 2025](#)

⁶⁶ "Nearly all cement production has been used to meet domestic demand and very little cement—only 2.6%—is traded." [Rhodium Group, 2024](#)

⁶⁷ "This systematic review highlights limestone calcined clay cement (LC3) as a low-carbon alternative to ordinary Portland cement (OPC), reducing carbon dioxide emissions by 30 % to 40 % while maintaining similar or superior performance." [Ghazy et al., 2025](#)

⁶⁸ International Carbon Action Partnership maintains a [list of global ETSs](#).

⁶⁹ [Open letter](#) against strengthening the ETS by ArcelorMittal, Thyssenkrupp etc.; [Counter letter](#) defending the ETS from Stegra, SSAB, etc.

⁷⁰ Prescriptive standards define cement by its composition and ingredients. Performance-based standards define it by how it performs, such as by strength and durability, and are therefore more inclusive towards

LC3-type cements with up to 50% clinker substitution and is being adopted at the national level in major markets including the U.K., Germany, and Spain; in the U.S., the American Concrete Institute released ACI 323, its first low-carbon concrete code, in 2025.⁷¹

Funding need: High. Our impression is that industrial climate regulation attracts philanthropic attention, but that the field can absorb much greater funding, especially in neglected geographies like Africa, which is projected to be the largest cement emitter by 2100.⁷²

Facilitating corporate low-carbon procurement commitments

Scale ●●● High

Feasibility ●●● Medium

Funding need ●●● Medium

Scale: High. Corporate offtake often underpins reaching FID on early industry plants.⁷³ Existing commitments remain small relative to global cement demand. However, due to the low scale of current green cement production and commercial immaturity of deep decarbonization technologies, small-volume commitments remain significant in advancing toward commercialization milestones such as FID. For example, the Sustainable Concrete Buyers Alliance (SCoBA), which has founding members such as Amazon, Meta, and Prologis, issued its first request for proposals (RFP) in 2026 for multi-year offtake supporting plants that reduce emissions by at least 67% compared to the industry baseline.⁷⁴ Microsoft also agreed to purchase 622,500 metric tons of cement from Sublime Systems, which claims to reduce emissions by over 90% compared to the baseline.⁷⁵

Feasibility: Medium. In general, we believe corporations are aware of existing profit-making opportunities, and the economics of many industry products can make it

alternative, low carbon cement mixes. "Countries can update standards and construction codes to expand these allowances or adopt performance-based approaches. These assess durability, safety, structural strength, and emissions performance, rather than prescribing specific material inputs." [UNIDO, 2025](#)

⁷¹ "The EN 197-5 standard can already be found as an equivalent standard in major European cement markets including Germany, UK, and Spain"; the cement combinations "enable up to 50% clinker substitution." [ECOS](#) (accessed August 2026); The American Concrete Institute's ACI 323 low-carbon concrete code "employs a carbon budget approach and emphasizes the use of Environmental Product Declarations (EPDs) for benchmarking." [American Concrete Institute, 2024](#)

⁷² GPP Pledge progress: [UNIDO, 2025](#); Regional demand growth: Rhodium/USGS projections of global cement production. [Rhodium Group, 2024](#)

⁷³ "The Final Investment Decision now often depends on securing additional volumes of offtake." [MPP, 2025](#)

⁷⁴ "SCoBA, launched by RMI and the Center for Green Market Activation with founding members Amazon, Prologis and Meta, is the first buyers group to collectively procure environmental-attribute certificates for low-carbon concrete." [Center for Green Market Activation, 2025](#); "The inaugural RFP is open globally to products meeting the Global Cement and Concrete Association's low-carbon cement definition of Band B or better, roughly equivalent to at least a 67% emissions reduction compared with today's industry reference level." [RMI, 2026](#)

⁷⁵ "Microsoft have signed a first-of-its-kind offtake agreement for up to 623K tons of low-carbon cement to be deployed over a six- to nine-year period. [...] Third-party validation for its technology's ability to reduce CO2e emissions by >90% compared to ordinary portland cement (OPC)." [First Movers Coalition, 2025](#)

difficult for low-carbon switches to be profitable without transition support.⁷⁶ We observe momentum in companies' willingness to commit to financing deep decarbonization plants to reduce their climate impacts. For example, members of SCoBA include several hyperscalers facing large embodied-carbon footprints from construction, which have signed direct offtake deals with next-generation cement startups.⁷⁷

We have seen nonprofits play significant roles in supporting demand commitments by providing infrastructure to facilitate demand commitments, brokering deals between groups of buyers and early-mover plants, vetting and educating companies about low-carbon facilities, and directly engaging with corporate executives.⁷⁸ We think these strategies are likely to be impactful because they aim to help companies achieve their stated aims at minimal cost, which is important given that the economics of near-zero emissions cement produced today render it uncompetitive without transition support.⁷⁹

We are less certain about the effectiveness of applying pressure on companies to implement demand commitments. We think consumer-facing campaigns are difficult in the cement sector, since products are largely upstream of consumer purchasing decisions. We think advocacy campaigns have some impact in raising the salience of decarbonization within companies and moving the Overton window, but see them as less likely to be among the most promising philanthropic opportunities. We will continue monitoring the progress of ongoing campaigns and update our views accordingly.

Funding need: Medium. We have observed a handful of organizations already convening buyer coalitions. Our impression is that the bottleneck is not funder interest, but the number of companies willing to participate in ambitious procurement commitments. We think securing offtake commitments is especially important for emerging deep-decarbonization technologies, which—in contrast to SCM plants—do not already have a strong business case.⁸⁰

Facilitating early-mover plant construction

Scale	●●●	High
Feasibility	●●●	Medium
Funding need	●●●	Medium

⁷⁶ Difficulty of low-carbon switches: "Steel, cement, and chemicals are the top three emitting industries and are among the most difficult to decarbonize, owing to...economic factors including low profit margins, capital intensity, long asset life, and trade exposure." [Brookings Institute, 2021](#)

⁷⁷ SCoBA members include Amazon, Google, Meta, and Prologis. [Center for Green Market Activation](#) (accessed August 2026)

⁷⁸ For example, the [Sustainable Steel Buyers Platform](#) and the [Center for Green Market Activation](#) broker offtake agreements for vetted plants and allows companies to make verified emission accounting claims.

⁷⁹ "Steel, cement, and chemicals are the top three emitting industries and are among the most difficult to decarbonize, owing to...difficult to influence and more likely to face political opposition than procurement and innovation policy, since it penalizes large, legacy manufacturers for their emissions and can be seen as distorting margins, capital intensity, long asset life, and trade exposure." [Gross, Brookings, 2021](#).

⁸⁰ "with production costs estimated to decrease by 15–25 % when employing a 50 % clinker replacement with calcined clay and limestone, make LC3 a competitive choice" [Ghazy et al., 2025](#)

Scale: High. Securing early-mover plants is the central bottleneck for green cement: just one commercial-scale plant currently operates with near-net-zero production, and the announced pipeline would meet only ~1% of global cement demand.⁸¹ Each successful demonstration would derisk emerging technologies and drive learning-by-doing cost declines.

Feasibility: Medium. Building early-mover plants is inherently difficult from both engineering and financial perspectives due to their operational complexity, high capital costs, and unproven nature. Cement plants face additional challenges because there are limited retrofit options, and high green premiums limit options for offtake agreements.⁸² Current conditions seem to be especially challenging, given that new CCUS cement project announcements fell from a 2024 peak of 25 to 17 in 2025.⁸³

Nonprofits can support various pathways to accelerate FIDs for early-mover plants, for example, by stimulating demand through corporate and/or public offtake commitments, securing permits and access to critical infrastructure, and sharing knowledge with project developers.⁸⁴ We think nonprofits are well-placed to execute this work because it involves coordinating different stakeholders who may not have the resources or incentives to lead it themselves. Reported wins from nonprofits validate plausible influence in raising the likelihood of early-mover success.⁸⁵

Funding need: Medium. The financing gap for first-of-a-kind plants is large, as evidenced by the weak pipeline of commercial-scale plants. However, we think nonprofits can also facilitate early-mover construction through more leveraged sub-strategies, such as supporting innovation funding and green procurement.

Theory of Change for Philanthropic Engagement

Based on our assessment of the most promising sub-strategies, we developed a high-level theory of change for how philanthropic actors can reduce emissions from the cement and concrete sector (Figure 10). Theories of change enable us to better understand the pathways of influence, the likelihood of each pathway, and the avenues of greatest impact for philanthropic and civil society efforts.

⁸¹ Figure: Project pipeline capacity by sector and project stage, Mtpa, April 2026; Figure: Clean industry rising: 161 landmark commercial-scale, deep-decarbonisation projects are now financed or built worldwide, with a further 800+ in development. [MPP, 2026](#)

⁸² "As the U.S. data center buildout surges, with construction beginning on multibillion-dollar facilities from Texas to Wisconsin, tech companies are becoming buyers of low-carbon concrete." [Tech Xplore, 2026](#)

⁸³ "I estimate that a 75% increase in the price of low-carbon cement increases the cost of a house by around 1%." [Ritchie, 2024](#); Project announcements: [LeadIT Tracker](#) (accessed May 2026)

⁸⁴ "Across sectors, progress depends on stimulating demand through effective and predictable implementation of announced policies and on securing permits and access to critical infrastructure, such as grid connections" [MPP, 2025](#)

⁸⁵ Reported wins from nonprofits: [Sustainable Aviation Buyers Alliance, 2026](#); [MPP, 2025](#)

We evaluate the main assumptions underlying the theory of change and rate our certainty in each as **low**, **medium**, or **high**.⁸⁶ Our assessment is based on both primary and secondary evidence, as well as our general impression of the assumption's plausibility.

Theory of Change: Decarbonizing Cement & Concrete

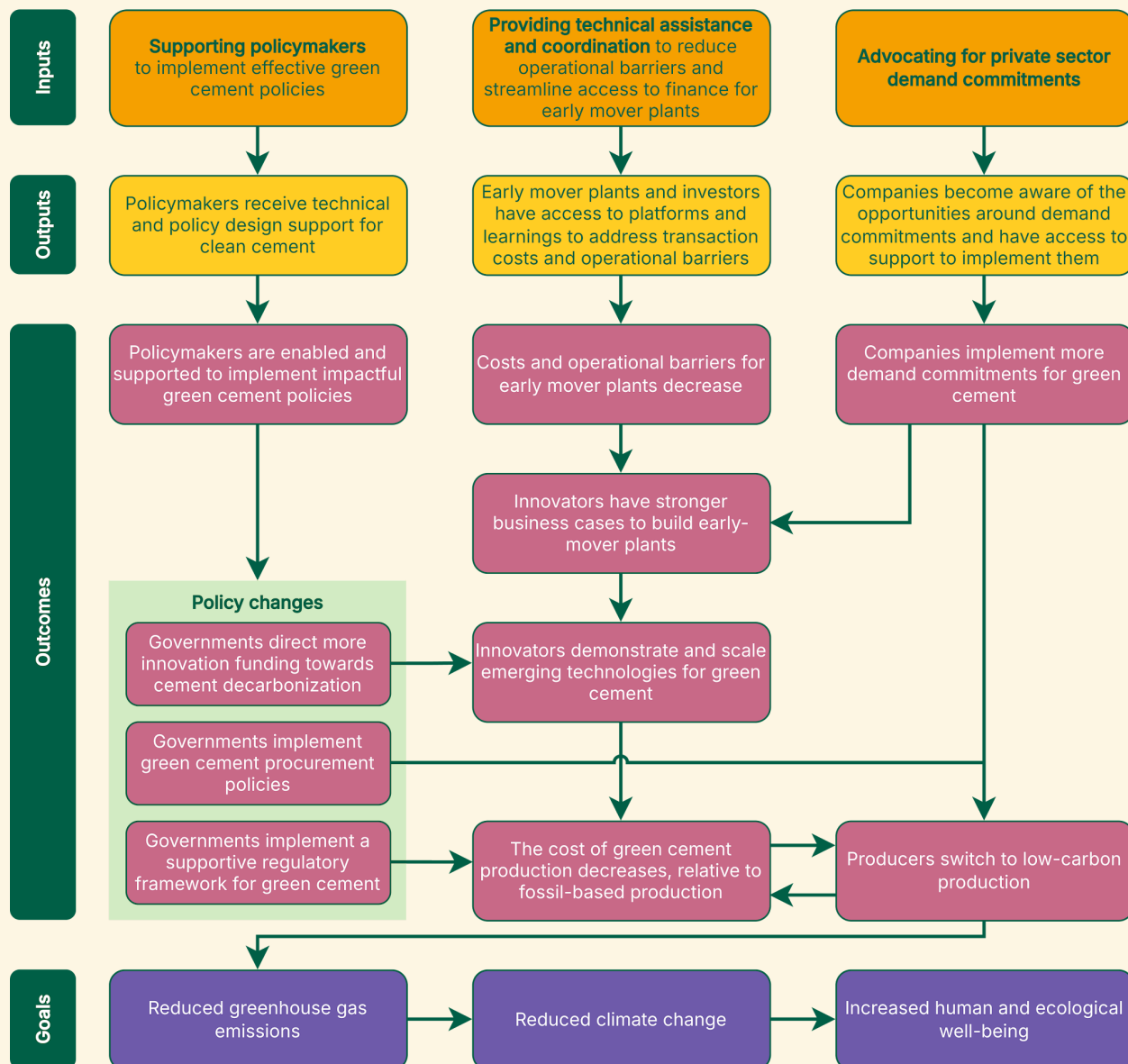


Figure 10: Theory of change diagram for decarbonizing cement and concrete

⁸⁶ We describe our certainty as low/medium/high to increase readability and avoid false precision. Since these terms can be interpreted differently, we use rough heuristics to define them as percentage likelihoods the assumption is, on average, correct. Low = 0-60%, medium = 60-80%, high = 80-100%

Evaluating Key Assumptions

- 1. There will be significant market demand for green cement, even when there is a large green premium (medium certainty)

There is a substantial and growing precedent for low-carbon procurement from governments and the private sector. We list several examples in **Table 2**, and also note that the EU also plans to introduce sustainability criteria into its public procurement framework in 2026, as part of the [Clean Industrial Deal](#).⁸⁷ Though procurement commitments more commonly cover technologies that are already cost-competitive, several governments and companies have already committed to, or stated that they will commit to, near-zero-emission technologies.

Hyperscalers such as Google, Microsoft, and Amazon are especially influential. They have been the major offtakers for early-mover plants because materials like cement, used to construct rapid data center build-out, are a key source of Scope 3 emissions.⁸⁸ These companies also have the financial runway and market power to commit to multi-year offtakes of near-zero-carbon cement. They have committed to support several first-of-a-kind plants—such as facilities from Brimstone, Sublime, and Fortera—which carry significantly more risk than proven technologies like SCMs.⁸⁹ We have high certainty that rapid data center growth will continue, though we are less certain that companies will continue to prioritize decarbonization as they do so.

Table 2: Buyer groups committed to existing private and public procurement initiatives. 'Low-emissions' and 'low-carbon' tend to refer to modest reductions achievable through lower clinker content and efficiency strategies, while 'near-zero' emissions cement refers to the adoption of emerging technologies such as CCUS and electrochemical techniques.

Buyer group	Pledge type	Participants (as of 2026)
Industrial Deep Decarbonization Initiative's Green Public Procurement Pledge	Pledge ambition ranges by level. Pledge level 1 commits just to emissions disclosure, ramping up to level 4, where countries 'require procurement of a share of cement and/or	Co-leads: U.K. & India Participants: 9 countries including Brazil, Canada, U.S., Germany, and Saudi Arabia.

⁸⁷ "[The EU public procurement framework revision (2026)] will also introduce resilience and sustainability criteria in public procurement to boost demand for low-carbon products and revise the Public Procurement Framework in 2026." [Morgan Lewis, 2025](#)

⁸⁸ "Cement, the key ingredient that binds concrete together, accounts for 8% of global CO2 emissions, and is a major driver of hyperscaler's scope 3 emissions." [Heatmap, 2026](#)

⁸⁹ "Brimstone, another low-carbon cement company, also landed a major hyperscaler deal last year."; "In return, the tech giant secured the right to procure Fortera's low-carbon cement and its associated environmental attribute certificates"; "Last May, Microsoft signed an offtake agreement with Sublime to purchase up to 622,500 metric tons of cement from the company's future demonstration plant in Holyoke, Massachusetts, as well as a yet-to-be-sited full-scale facility" [Heatmap, 2026](#)

	crude steel from near zero emission material production'	
ConcreteZero	By 2030, procure 50% of total concrete consumption from low-carbon sources By 2050, procure 100% of concrete from net-zero sources	35 companies including Buro Happold, Skanska UK, and Laing O'Rourke
First Movers Coalition	By 2030, 10% of procurement is low-carbon	Seven companies including General Motors, Vattenfall, and Ørsted
Sustainable Concrete Buyers Alliance (SCoBA)	Buyers group formed to facilitate first-of-a-kind low-carbon cement and concrete plants through offtake agreements	Tech companies such as Amazon, Prologis, and Meta
Individual hyperscaler deals	Bilateral offtake agreements to facilitate early-mover plants producing near-zero-emission cement	Hyperscalers such as Microsoft and Amazon

- Given scale and continued investment, over time the green premium for cement will drastically decrease or be eliminated (**low certainty**)

SCMs are already cheaper than OPC and can reduce emissions by at least 40%.

Stakeholders we have spoken to have high certainty that further reductions can be achieved at a similar price point through further SCM development.

Near-zero green cement technologies currently carry a significant cost premium of 75–150% on a base production cost of \$50 to \$120 per metric ton, depending on geography.⁹⁰ We think it is quite possible that technological and policy efforts to reduce the green premium do not trigger a tipping point at which the private sector adopts green cement at scale. We examine the main pathways to reducing the green premium below:

We think that research, development, and demonstration (RD&D) will lead to a modest decline in the green premium. Highly complex, capital-intensive technologies like low-carbon cement are not expected to benefit from the rapid cost declines seen for

⁹⁰ Figure: Cost premiums for initial projects are significant, but the impact on end products is more manageable [IEA, 2026](#)

solar panels and electric vehicles.⁹¹ [Malhotra and Schmidt](#) found that the cost reduction per doubling of cumulative installed capacity was ~5% for CCS (not specific to cement), versus ~20% for solar panels.⁹² Development cycles are also much longer for cement than for solar, further slowing cost decline. Even so, we expect some reductions from this pathway, particularly as many technologies have not yet reached the demonstration-plant stage.

We are confident that regulation will raise the cost of conventional cement, but only in some geographies. In the EU, the simultaneous phase-out of free ETS allowances and rising carbon prices will significantly increase the cost of emissions. At a base cost of €126 per metric ton in 2030 (GMK Center's median forecast), the additional emissions cost of clinker-based cement rises to €42 per metric ton by 2030 (~\$49 per metric ton) from near zero in 2025.⁹³ As of 2026, 40 regional, national, or state-level ETSs cover the industry sector.⁹⁴ However, the EU's is among the strongest, so this effect will likely be weaker globally, particularly in LMICs, where cement emissions are projected to grow fastest but carbon-pricing schemes are less common than in high-income countries.

We expect falling renewable electricity costs to improve the marginal economics of electrochemical pathways and electric kilns. Renewable generation is already the lowest-cost source of new electricity, and installed costs are projected to fall further, though at a slower pace and unevenly across regions.⁹⁵

Taken together, we think it is plausible that these three effects could reduce the green premium sufficiently for near-zero cement to be adopted at scale, though we have low certainty about this outcome. We also note that because the premium is already small at the end-product level (1–5%), the cement-level premium may not need to be eliminated entirely for products to be competitive.⁹⁶ We will continue to monitor the evidence base and update our views.

What Is Decarbonizing Cement and Concrete's Cost-Effectiveness?

Our cost-effectiveness estimates for decarbonizing cement and concrete, expressed in dollars per metric ton of CO₂-equivalent reduced or avoided, are being finalized and will be added to the report upon completion. We have a more general [cost-effectiveness](#)

⁹¹ "high uncertainty, high cost of experimentation, long product development cycles, and high cost of coordination in large value chains act as barriers to learning-by-doing and inter-project spillovers." [Malhotra & Schmidt, 2020](#)

⁹² Figure 2 [Malhotra & Schmidt, 2020](#)

⁹³ Calculation: $(€62.18 \times 126 / 185) = €42/t$ We took the cost of €62.18/t modelled by [Manke & Stephan, 2026](#) and adjusted it down because they assume a carbon price (€185/tCO₂e) significantly higher than the consensus price (€126/tCO₂). Data from Table 11 and [GMK Center, 2026](#)

⁹⁴ [ICAP, n.d.](#) [accessed August 2026]

⁹⁵ "Looking ahead, total installed costs are projected to decline further – although at a slower pace – as learning rates and economies of scale continue to drive efficiency gains." [IRENA, 2025](#)

⁹⁶ Figure: Cost premiums for initial projects are significant, but the impact on end products is more manageable [IEA, 2026](#)

[analysis \(CEA\)](#) to estimate the cost-effectiveness of efforts to decarbonize heavy industry, last updated in 2025.

Is There Room for More Funding?

Cement and concrete draw under 5% of funding for industrial decarbonization, or ~\$8 million per year.⁹⁷ A further ~\$80 million per year (~40% of funding for industrial decarbonization) goes toward cross-sector initiatives that could also support cement decarbonization, such as policy advocacy for carbon pricing.

Cement decarbonization draws less than 1% of annual climate philanthropy, which reached an estimated \$11.7 billion to \$18.4 billion in 2024.⁹⁸ This level of funding is disproportionately low, given cement and concrete's 6% share of global emissions.

Beyond philanthropy, we are unsure of the level of public and private funding going toward cement decarbonization. However, given that total funding toward industry decarbonization accounted for just 1.5% of the total \$2 trillion in climate finance in 2024 (\$29 billion), we are confident that it also receives a disproportionately low share of non-philanthropic funding.⁹⁹ MPP's net-zero cement scenario requires \$370 billion of cumulative investment (~\$13 billion per year) more than the business-as-usual case between 2022 and 2050, amounting to a total investment of ~\$51 billion per year.¹⁰⁰ This investment need is largely driven by the high cost of CCUS, and could be lowered through the development of alternative pathways.¹⁰¹

Reduced funding levels have particularly affected the commercialization of early-stage technologies. In 2025, the U.S. Department of Energy canceled \$280 million in grant funding from two leading innovators, Sublime and Brimstone. Sublime has since laid off two-thirds of its workforce, though Brimstone claims that it will still be able to finance its upcoming demonstration plant.¹⁰²

Based on this data, we think much more private, public, and philanthropic funding is needed to accelerate the commercialization of green cement.

⁹⁷ Confidential data accessed through an industry funder consortium

⁹⁸ "\$11.7 billion to \$18.4 billion estimated total given by foundations and individuals globally to climate change mitigation efforts in 2024" [Climateworks, 2026](#)

⁹⁹ Landscape of Climate Finance in 2024 [CPI, 2026](#)

¹⁰⁰ Exhibit H [MPP, 2023](#)

¹⁰¹ "The vast majority (\$390 billion) of decarbonisation investments are associated with the installation of carbon capture equipment on existing cement plants, which costs an extra \$150 million to \$300 million per plant." [MPP, 2023](#)

¹⁰² "Brimstone, having netted over \$80 million to date, "had effectively raised the money that we needed, regardless of the grant."" "That sent Sublime into a tailspin: In December, it paused plans for its demo plant, and in March it laid off roughly two-thirds of its workforce." [Heatmap, 2026](#)

Within cement and concrete, philanthropic funding is spread globally, distributed across Asia and Oceania (~40%), Global (~27%), North America (~20%), and Europe (~13%).¹⁰³ We think this geographic distribution targets some of the most important regions for cement and concrete decarbonization, but more support is needed for Africa and other low-income regions, where cement demand is expected to rise sharply and where funding for cleantech is generally less available (see Section: 'Key Geographies'). We are unsure of the funding gap, since these regions are also bottlenecked by their lower numbers and smaller nonprofit sizes compared to the U.S. and EU, as well as legal restrictions on the funding nonprofits can accept.

Are There Major Co-Benefits or Potential Risks?

Co-Benefits

Reduced air pollution: Cement is one of the major air-polluting sectors, owing to its dependence on fossil-based energy.¹⁰⁴ Switching to green cement would reduce global air pollution and improve livelihoods in areas with traditional cement manufacturing or processing facilities. Furthermore, cement plants are often located close to low-income or disadvantaged communities, so there are likely environmental justice benefits to switching to green cement.¹⁰⁵ We expect air pollution co-benefits from CCUS-based pathways, as well as direct decarbonization pathways. A modeling assessment found that adding carbon capture to large industrial facilities, including cement plants, can lead to substantial public health benefits.¹⁰⁶ We are less certain about the scale of air quality benefits of CCUS-based pathways compared to electricity-based or alternative-chemistry pathways because CCUS leaves the combustion and calcination processes that generate pollutants in place and relies on capture and pre-treatment to abate them.

Technological spillover: Green cement plants are a key use case for CCUS. Scaling green cement would help scale CCUS technologies and infrastructure, which would, in turn, benefit adjacent applications of CCUS, such as decarbonizing plastics and carbon removal methods such as direct air capture and storage.

¹⁰³ Confidential data accessed through an industry funder consortium

¹⁰⁴ "In addition to being one of the most energy-intensive industries, cement manufacturing also involves processing of raw materials that typically contain nitrogen and sulfur and depends heavily on fossil fuels as the primary energy source which leads to cement production being one of the major air polluting industries worldwide." [Global Efficiency Intelligence, 2022](#)

¹⁰⁵ "Industrial manufacturing facilities such as cement plants are often located close to low-income, disadvantaged communities exposing them to significant pollution" [Global Efficiency Intelligence, 2022](#)

¹⁰⁶ "Installing carbon capture systems at large industrial facilities such as refineries and cement plants can reduce conventional air pollutant emissions like sulfur dioxide (SO₂) and soot (particulate matter) and, in some cases, nitrogen oxides (NO_x), and produce substantial additional public health benefits from these reductions." CATF, 2023

Local jobs and value chains: Many countries lack suitable limestone deposits, or find it cheaper to import clinker than to produce it, and therefore rely on imported clinker for domestic cement production. Major clinker importers include African countries such as Ghana, Côte d'Ivoire, and Uganda and South and Southeast Asia countries like Bangladesh, the Philippines, and Sri Lanka.¹⁰⁷ Replacing imported clinker with LC3 can reduce dependence on global supply chains and utilization of locally sourced clay which in turn enable creation of domestic jobs and material value chains, cut foreign-currency spending, and reduce exposure to volatile global clinker prices.¹⁰⁸ We are uncertain about the scale of these benefits across countries as it may vary depending on availability of suitable clay deposits.

Key Uncertainties and Open Questions

- **Cost-effectiveness of innovation funds:** Other than SCMs, abatement costs for the pathways we prioritize are high. For example, CCUS costs around \$160 per tCO₂. Since philanthropic leverage on innovation funding ultimately buys mitigation at the cost of the underlying technology, we are uncertain whether these dollars would achieve more in sectors that are easier to abate. We will continue to monitor cost data from early-mover plants and update our views.
- **Feasibility of scaling technologies to decarbonize cement and concrete:** Cement is among the hardest sectors to decarbonize, and we do not think a clear, viable technological pathway has yet emerged. CCUS remains expensive, SCMs deliver only partial abatement, and the remaining near-zero pathways are unproven at commercial scale. We think that a possible scenario is that the cement sector cannot fully decarbonize, and our philanthropic dollars could be better spent on funding carbon removal to neutralize these emissions. Because no single technology looks clearly best to us, we deliberately prioritize a broad set of pathways rather than concentrating on one.
- **Underrating demand-reduction levers:** Given our limited confidence in the scalability of green cement and concrete technologies, reducing demand may be a more impactful lever than decarbonizing supply pathways. In general, we think demand reduction pathways are less promising because they either a) already make financial sense, so do not need philanthropic support, or b) require substantial behavior change, so are difficult to scale. However, we are uncertain

¹⁰⁷ Based on table 'Cement clinkers imports by country in 2024'. [World Bank WITS, 2024](#)

¹⁰⁸ "By adopting LC3 technology and replacing a substantial part of clinker with local resources, African countries and those across the Global South can create world-class local industries and reap the economic and employment benefits. This will reduce the need to import clinker with foreign currency and allow the construction of housing and infrastructure at lower costs, all while limiting CO2 emissions." [EPFL, 2023](#)

whether these conditions hold for the cement and concrete sector, so plan to explore these pathways further in future reports.

Bottom Line and Next Steps

Given cement and concrete's position as the second-heaviest-emitting industrial sector, the gap between current low-carbon capacity and net-zero-aligned trajectories, and the very low level of transitional funding this sector currently receives, we think it is important to direct more philanthropic funding toward decarbonizing cement and concrete. Based on our research into relevant mitigation sub-strategies, we think the most promising philanthropic sub-strategies to decarbonize cement and concrete are:

- Improving and accelerating the allocation of government innovation funds.
- Supporting government low-carbon procurement commitments.
- Supporting governments in establishing regulatory frameworks.

We also see strong potential for philanthropic funds to facilitate corporate low-carbon procurement commitments and early-mover plant construction.

We plan to consider organizations working on these topics for our [Top Climate Nonprofits](#) and as potential grantees for the [Giving Green Fund](#).

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Giving Green was founded to help donors cut through the complexity of climate philanthropy and direct their resources for maximum impact.

Our founder, Dan Stein, Ph.D., spent 15 years developing evidence-based strategies in global philanthropy. He saw people eager to fight climate change but paralyzed by its scale. In 2019, with support from IDinsight, he launched Giving Green to rigorously evaluate solutions and share clear guidance.

What began as a side project is now a team directing tens of millions of dollars to high-impact initiatives. Our success is shared—with donors ranging from kids donating allowances to retirees investing in a better future. We believe anyone can start small and still make a huge difference.

Thank you for joining us on the path to net zero.
Together, we keep moving forward.