

Business Breakthrough Barometer 2024

Cement and Concrete



World Business
Council
for Sustainable
Development

BAIN & COMPANY 

29 October, 2024

Key messages

- **More than half of business believe the cement and concrete sector is off course for net-zero; but frontrunners are optimistic about path ahead**
 - 64% of businesses feel that the cement and concrete sector is not on track to reach net-zero
 - 71% of sector leaders report increased confidence in the government's ability to drive and support the cement transition over the past three years
- **Half of business doubt they can eliminate fossil fuels by 2050 as low-carbon cement only account for 2.5% to 10% of the market—driven mainly by Eur. Frontrunners**
 - Heidelberg Materials and Holcim reporting 39% and 19% of net sales volumes coming from low carbon cement, respectively
 - But the pace of transition across the industry is slow: only 50% of cement and concrete of those working largely at the forefront of the industry believe they will be fossil fuel free by 2050
 - Current estimates for low carbon market share range from 2.5 – 10%, with European producers setting the bar
- **The focus of most leading companies is on reducing clinker volumes, the most carbon intensive aspect of cement production**
 - Leading cement businesses have steadily been reducing the clinker ratio of their cement
 - The industry global average clinker ratio has been slowly decreasing past decade to ~70%, with decreases driven by utilization of supplementary cementitious materials
 - Businesses need policy support to drive adoption and accelerate deployment of low clinker cement to reach IEA targets 65% by 2030 and 57% by 2050
- **Cement manufacturers have long utilized fly ash as a cost effective SCM, but supply is dwindling as industry decarbonizes so businesses must explore alternatives**
 - Businesses are increasingly pessimistic about the availability of fly ash due to the declining use of coal-fired power plants
 - Leading players see calcined clay and natural pozzolans becoming most used SCM by 2030
 - Procurement and consistent supply of quality clinker substitutes like calcined clay are not yet fully established and businesses don't believe industry in on track to reach ambitious IEA targets
- **The industry recognises the critical need for breakthrough technologies, but are not optimistic about the timeline for solutions**
 - Emergent technologies (e.g., concrete recycling, calcium silicate-based concrete, carbon curing) have potential to drastically reduce process emissions, but are years from commercial deployment
 - Startup scene has catalysed investment with deal count and volume in low carbon cement space drastically increasing past 5 years
 - Overall funding volume remains quite low relative to the emissions profile
- **Given the challenges in more fundamental technology transition, most business leaders believe CCUS need to play a fundamental role**
 - Although there is progress and deployment of CCUS tech. tailored to the cement industry, businesses are increasingly concerned policy support is insufficient to secure ROI and bolster pipeline
 - Even if current pipeline fully materializes only 1% of cement emissions will be covered by CCUS, Currently 12 additional projects with a combined annual capacity of 8.5 MtCO₂ are planned with no completion date
 - Significant investment increase is required to reach IEA 2030 target 170 MtCO₂ captured per year
- **Businesses are sceptical of green hydrogen and electricity as near-term kiln power sources, but also cite supply constraints for cost effective biomass and waste**
 - Industry sceptical of green hydrogen and electricity as near-term kiln fuels, but also cite supply constraints for cost effective biomass and waste
 - Businesses are hesitant to commit the substantial CAPEX required to retrofitting kilns
 - Businesses trying to secure supply of biomass and waste fuel, expecting share of fuelling to increase 20% by 2030
 - Developed markets have infrastructure in place for waste management leading to sector concerns for fuel supply in emerging markets
- **Business point to business model, infrastructure and technology as key barriers**
- **In response, key policy focus areas for next 12 months include aligning on certifications, standards, and testing for low carbon cement and concrete, providing financing mechanisms, and driving early-stage demand through public procurement initiatives**

More than half of business believe the cement and concrete sector is off course for net-zero; but frontrunners are optimistic about path ahead



64%

64% of businesses feel that the **cement and concrete sector is not on track to reach net-zero**

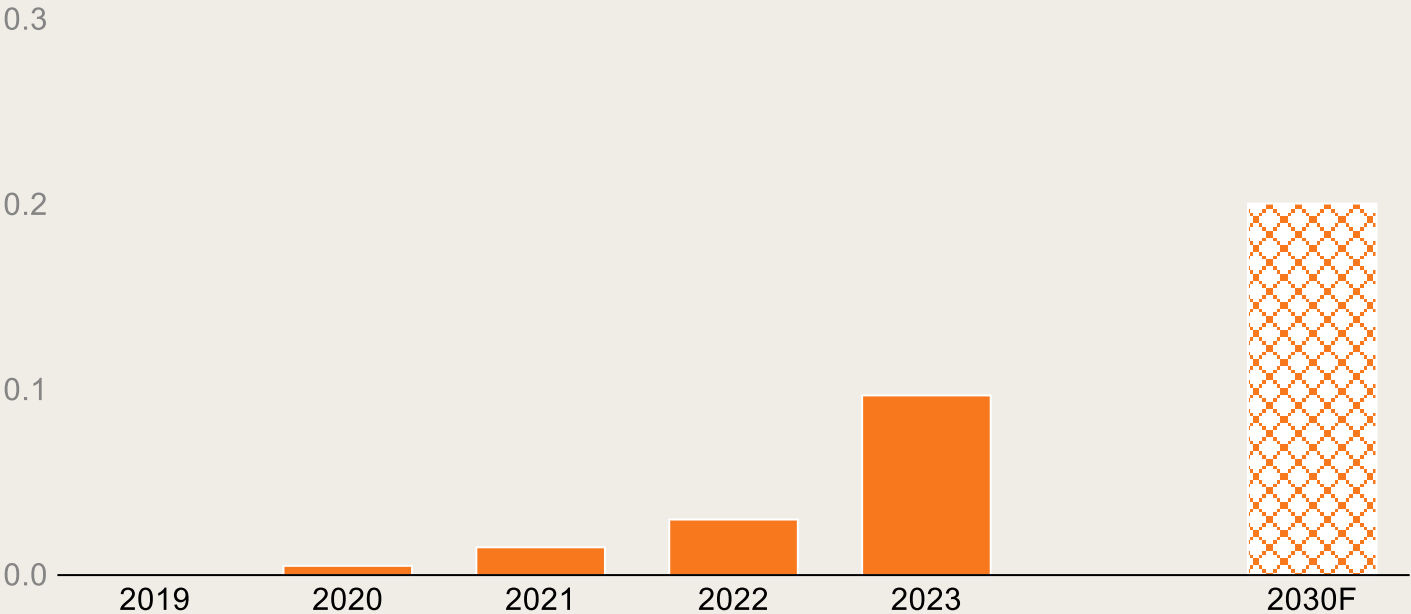
71%

71% of **sector leaders report increased confidence in the government's ability** to enable and support the cement transition over the past three years

Source: Business Breakthrough Barometer Sector Survey (N=250)

30% of business leaders report feeling little to no confidence in meeting 2030 Breakthrough Agenda goal

Global low carbon cement production (billion tonnes)



- Low-carbon cement only accounts for 2.5% to 10% of the market—driven mainly by European frontrunners
- The past year has shown steady but incremental progress for the cement sector - Heidelberg Materials and Holcim have boosted low carbon sales to 39% and 19% of their portfolio
- Adding to the complexity, businesses point to significant regional variability and market fragmentation

“We reduced our emissions over 5% from 2020 to 2023. Over the past 10 months we’ve further reduced. So, the progress is real, but the global pace needs to be improved.”

DIRECTOR, ESG, BUILDING MATERIALS COMPANY

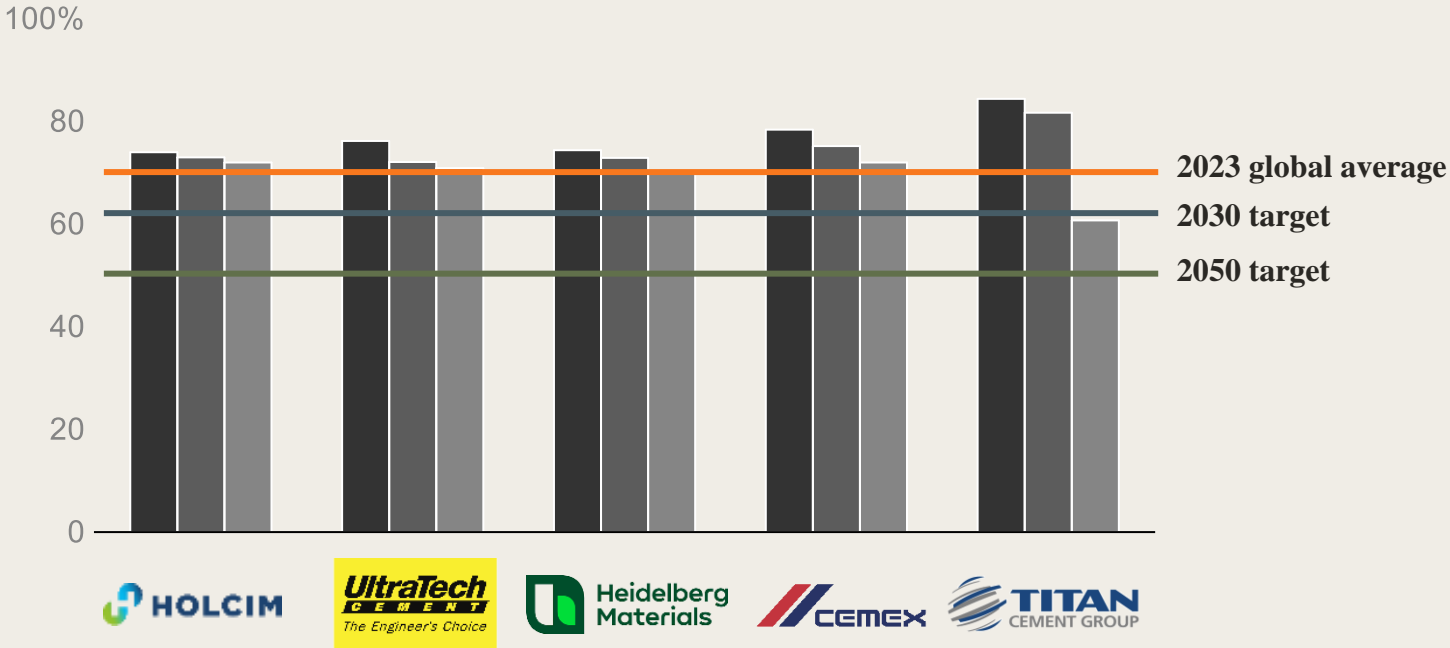
Note: Low carbon cement as defined by individual companies; cost premium for low carbon cement is assumed to be between 40 – 120% versus conventional; annual production capacity assumed to equal volume sold; Heidelberg Materials and Holcim report 39% and 19% of net sales volumes coming from low carbon cement respectively; 2030F for low carbon cement based on publicly available targets from world’s largest 5 cement producers (N=2); Holcim and Heidelberg Materials assumed growing at market rate towards 2030; Producers assumed to reach 2030 target of low-carbon cement as 50% of net sales; Source: Company sustainability reports, RMI, Statista, IEA; WBCSD; USGS, World Cement Association, International Cement Review



The majority of the industry is focussed on reducing clinker ratio, the most carbon-intensive element in cement production

Clinker factor (%)

■ 2016 ■ 2021 ■ 2023



- Leading cement businesses have steadily **reduced clinker ratios in their products**
- The global average fell to ~70% in 2023 driven by use of **supplementary cementitious materials**
- However, reaching the IEA's target of 65% by 2030 and 57% by 2050 will require **more aggressive reductions**
- Businesses are calling for **stronger policy support to drive adoption** and scale deployment of low-clinker cement

“Clinker is the most expensive part of the whole value chain, so removing that saves money, and you charge a green premium.”

VP, PUBLIC AFFAIRS,
 CEMENT AND CONCRETE
 MANUFACTURER

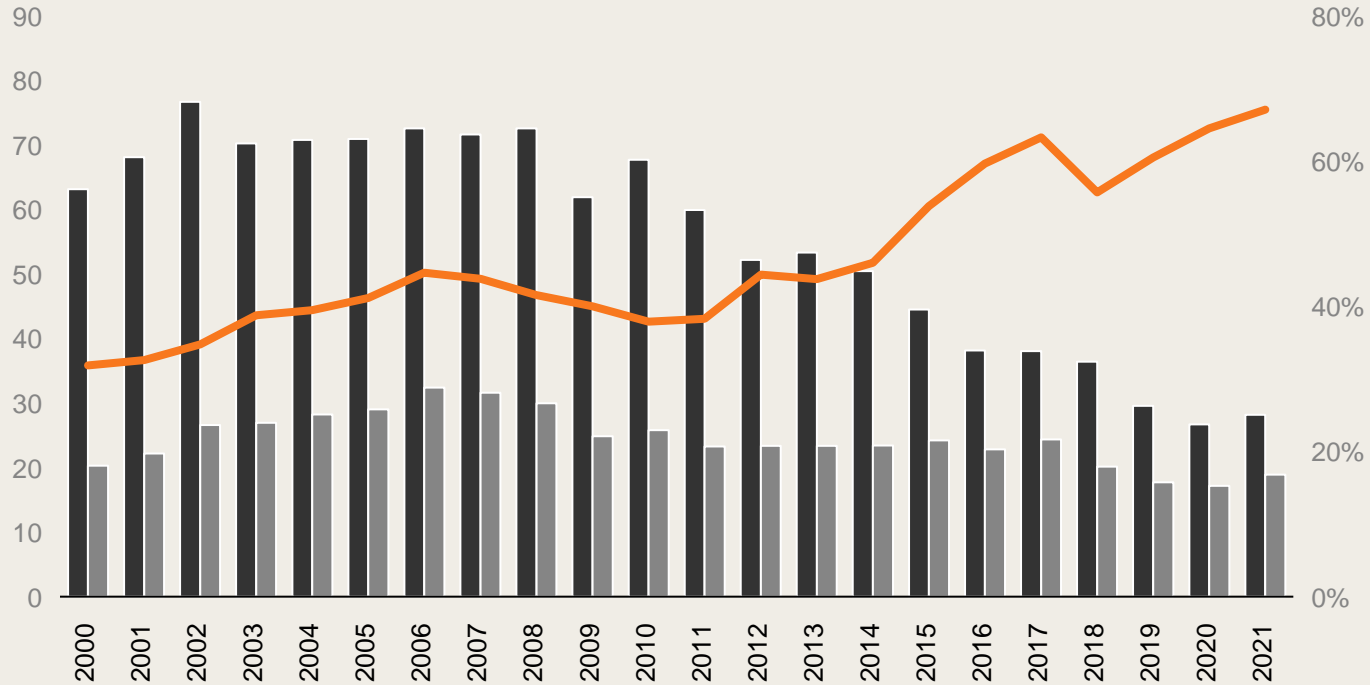
Source: IEA, Annual and sustainability reports

Businesses are uncertain if the current pace of progress can be maintained as the supply of key clinker alternatives dwindles

Fly Ash (Millions of Short Tons)

Percent used (%)

■ Produced ■ Used — Percent used



Source: American Coal Ash Association Survey

- The declining availability of fly ash, driven by the phase-out of coal-fired power plants, as well as blast furnace slag is fuelling pessimism
- Leading players see calcined clay and natural pozzolans playing a more important role by 2030
- However, businesses see significant challenges in building reliable supply chains for these alternatives, creating uncertainty about future progress

“5 years ago, using fly ash as a substitute cementitious material was seen as the way forward, but the supply has dried up and as industry gradually decarbonizes it won’t come back.”

CTO, CEMENT MANUFACTURER

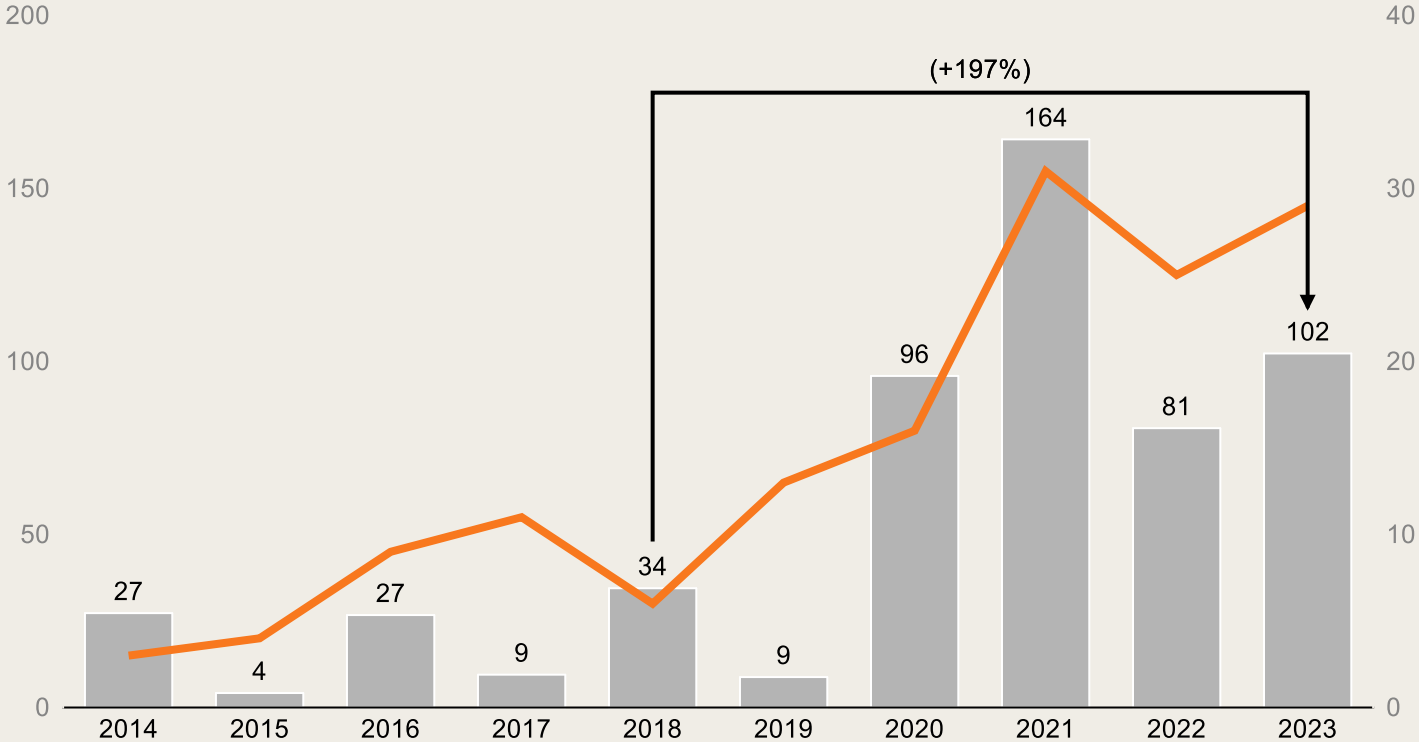
“Calcined clay plus natural pozzolans, which are widely available in quantities that don’t compete with other industries, are seen as major substitutes. We’re putting a lot into them as replacements for declining fly ash, but supply chains are still not fully developed.”

DIRECTOR, ESG, BUILDING MATERIALS COMPANY



Some business leaders acknowledge the urgent need for breakthrough technologies but remains sceptical about the timeline for delivery

Total VC deal value within low carbon cement and concrete (USD M)



Deal count (#)

- **Innovative technologies** (e.g., concrete recycling, calcium silicate-based concrete, carbon curing) have potential to drastically reduce process emissions, but industry estimates put them **5 – 10 years from commercial deployment**
- Venture capital has flowed into the low-carbon cement space, with **deal activity rising sharply** over the past five years
- However, **businesses feel overall funding remains low** relative to the scale of the sector's emissions challenges

“The level of investment flowing into low carbon cement and concrete technology is in the order of **70 times lower than electric vehicles**. If you take a step back the level of **investment is quite low relative to the emission profile of the industry.**”

STRATEGY LEAD, CEMENT PRODUCER

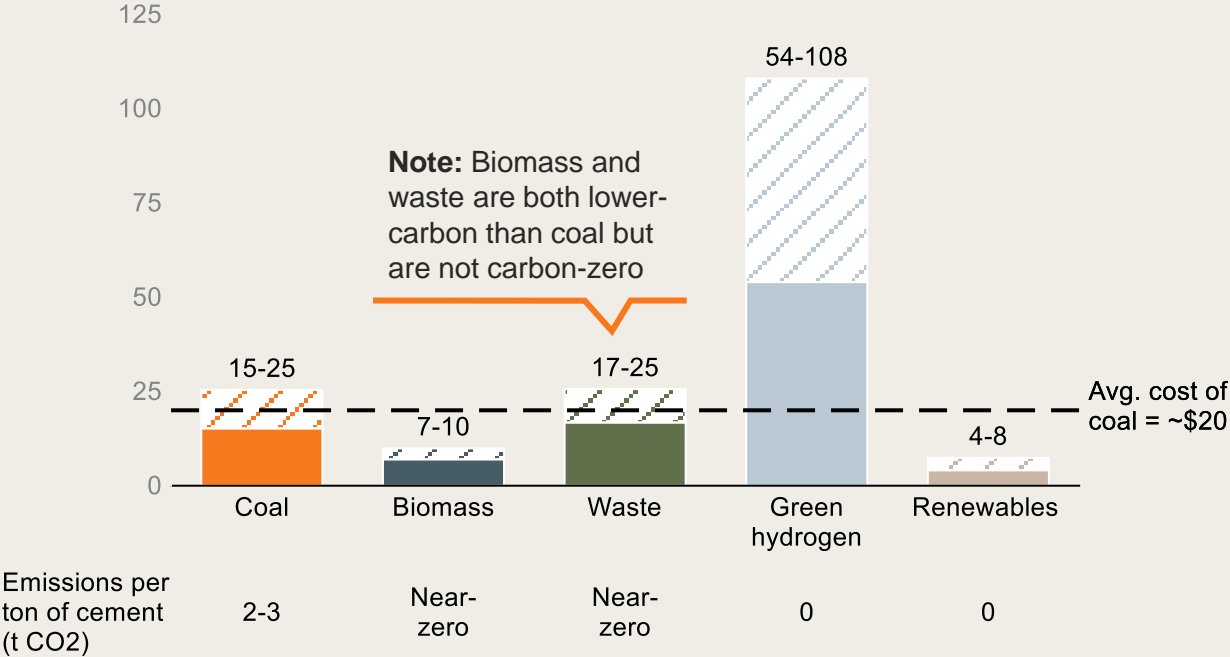
Source: Company press release, CORE, Pitchbook VC database (keywords: low carbon cement / concrete , sustainable cement / concrete, clean technology, zero emission; deal types: all VC stages; Retrieved 14/06/2024)



Businesses are struggling with the complexities of transitioning away from fossil fuel-based kiln heating, a key step in reducing emissions

Average fuel cost in 2024 (\$/ton of cement)

▨ Indicates range of potential costs



- The industry remains **sceptical about green hydrogen and electricity** as near-term kiln fuel solutions, citing availability and technology as main barriers, respectively
- While businesses turn to biomass and waste fuels, access is uneven, **with supply shortages particularly acute in emerging markets**
- Developed markets have **better waste management infrastructure**, but securing reliable fuel remains a challenge
- Additionally, **businesses are wary of the substantial CAPEX** needed to retrofit kilns
- Despite these hurdles, companies expect biomass and RDF to make up **20% of fuel use by 2030**

*"We see the use of biomass not as a risk, but as an opportunity to keep our OpEx down. The battle, however, will be in **securing sustainable biomass** and for that we're going to need accepted industry definitions."*

VP, PUBLIC AFFAIRS,
CEMENT AND CONCRETE MANUFACTURER

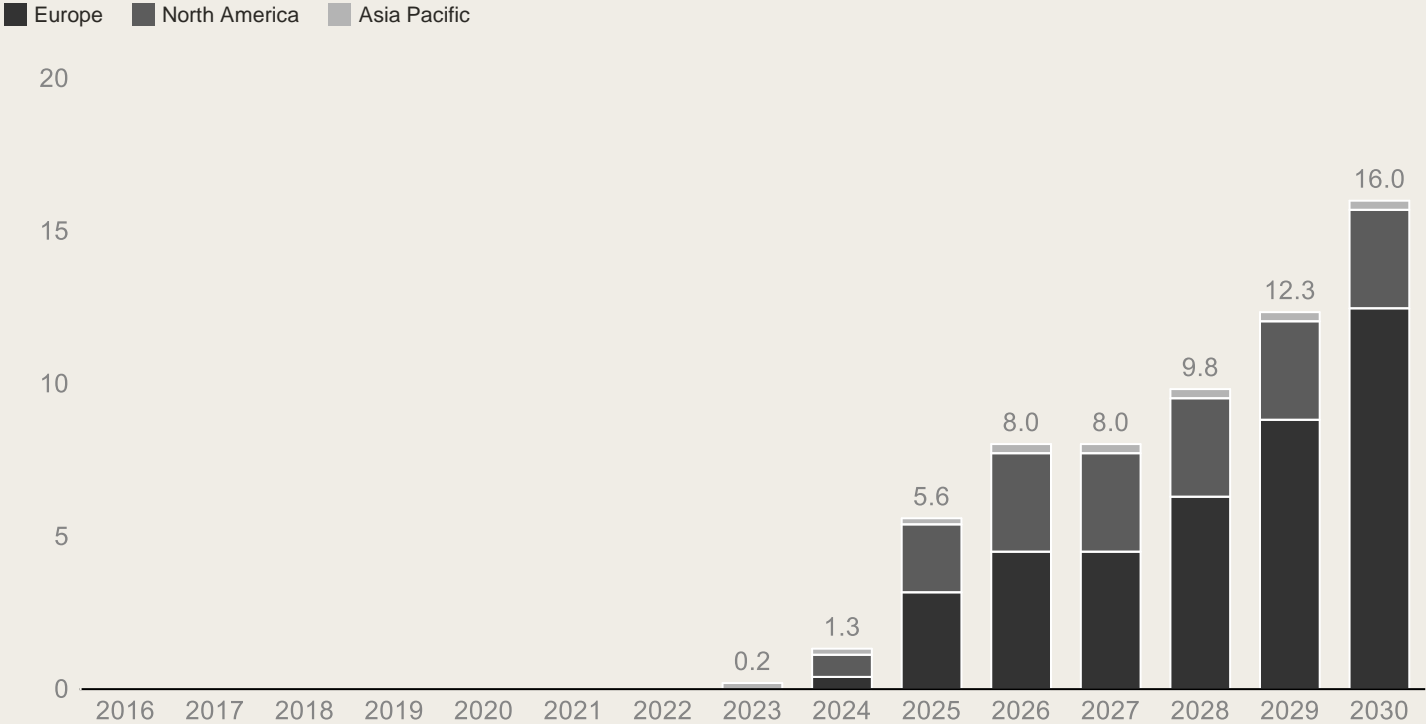
*"We have R&D underway for electrified kilns, but they are more than 10 years out, and even then, the access to energy is insufficient. On the other hand, **hydrogen is technically feasible, but supply and cost are prohibitive.**"*

DIRECTOR, ESG, BUILDING MATERIALS COMPANY

Source: RMI; World Cement; IEA 2021 report; GNR; UK Government, Economic Times, Kahawalge, A. "Opportunities and challenges of using SRF as an alternative fuel in the cement industry"

Business leaders see significant growth in project pipeline, but are concerned about speed and scale relative to emissions profile

Actual and planned CCUS cement capacity (MtCO₂/yr)



- Despite some progress, businesses remain concerned about the **lack of policy support to ensure a return on investment and scale projects**
- Even if current pipeline fully materializes only **1% of cement emissions will be covered by CCUS**
- 9 existing and 7 planned projects are **without specified full potential capture capacity**
- **An additional 6.8 MtCO₂/year capacity is in the pipeline, with no announced online year**
- Businesses stress that without major investment, the **industry will miss the IEA's NZE 2030 target of 170 MtCO₂ captured annually**
- **Geologic carbon storage capacity** varies greatly by region

*“The only solution right now seems to be putting up a **tail-end solution like carbon capture to avoid changing the whole process.**”*

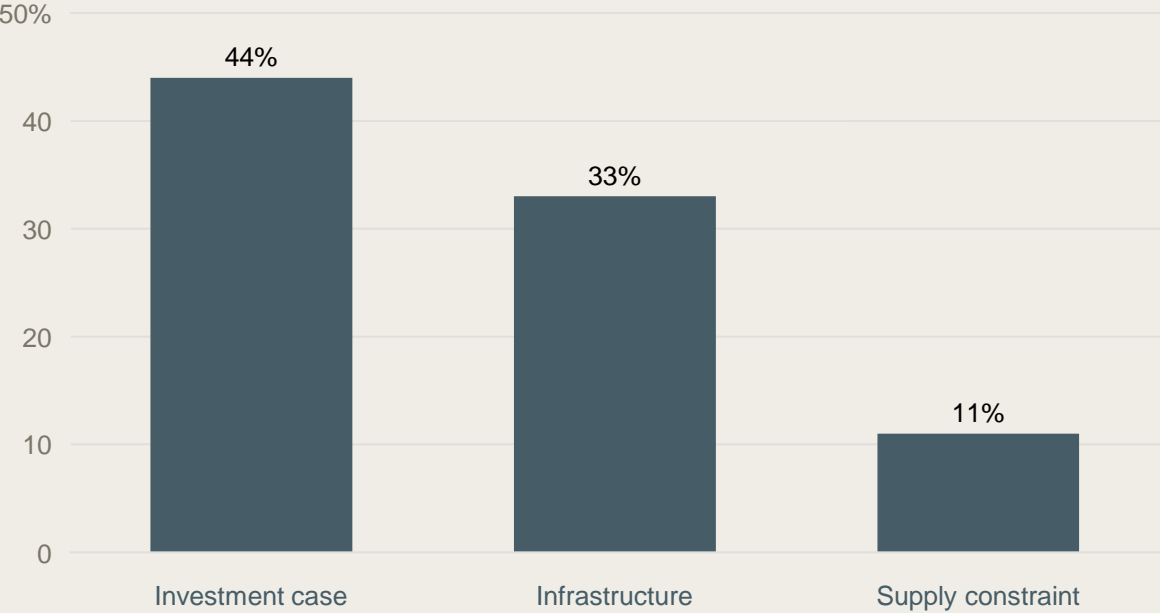
CTO, CEMENT MANUFACTURER

Note: Capacity based on GCCA estimate; pipeline estimates based on planned, and under construction projects with announced operation year and capacity; 2024 announcements up April; cement CO₂ emissions based on 0.59 factor
 Source: GCCA Green Cement Project Tracker 2024

Majority of cement and concrete players cite business model and lack of mandates and standards as key barriers holding back low carbon mixes

Which of the following do you view as the cement sector's largest barriers towards accelerating and investing in the development and deployment of low emission cement and concrete?
Please select the top 3 most impactful barriers

Share of survey responding barrier in the top 3 (%)



Source: Business Breakthrough Barometer Sector Survey (N=250)



INVESTMENT CASE

- Despite limited contribution to overall building material cost envelope, companies cite limited voluntary demand at a premium for low carbon cement and concrete as key barrier; production costs currently rise 40 - 120% for low carbon cement, but translate to a small 1 - 2% increase in total material cost
- Venture funding is also lagging, especially relative to the emissions profile of cement with volume of VC investment many multiples smaller than, for example, batteries



INFRASTRUCTURE

- The lack of unified standards for low- and zero-carbon cement, coupled with reliance upon recipe-based versus performance-based approval, is slowing adoption
- Delays in onshore and offshore carbon storage infrastructure, as well as varying carbon storage capacity by region, is delaying the deployment of large scale decarbonization efforts

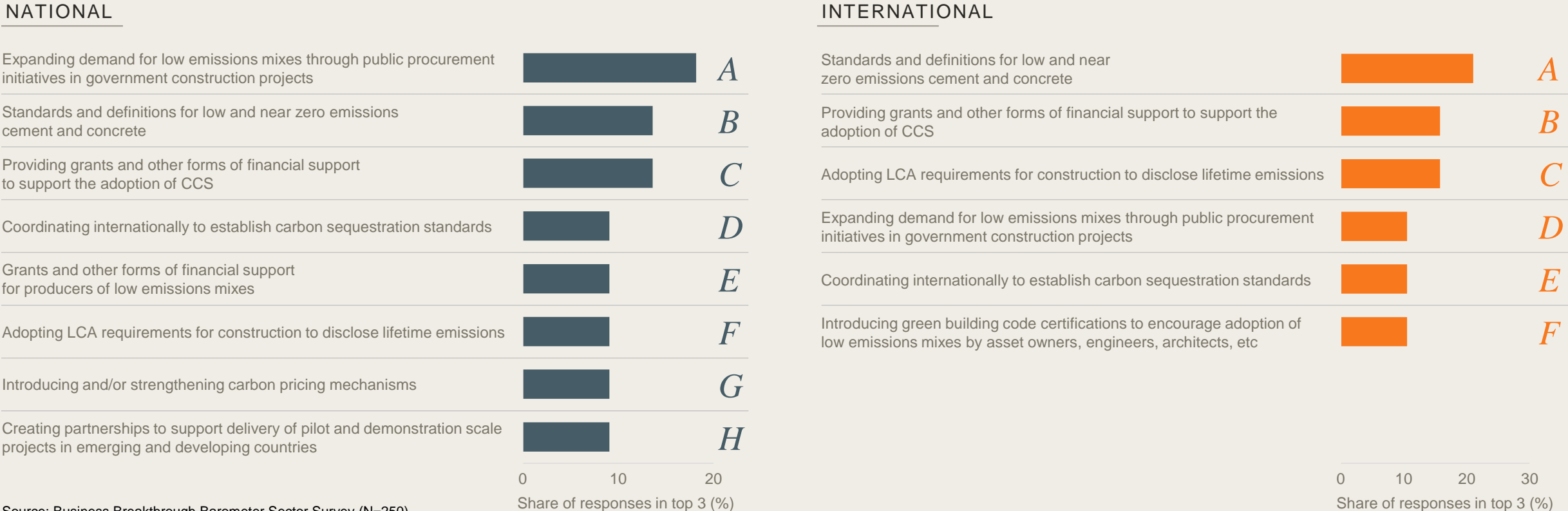


SUPPLY CONSTRAINT

- Businesses noted cost optimized supplementary cementitious materials (e.g., fly ash, blast furnace slag) becoming constrained as coal and steel industries decarbonize, and that alternatives (e.g., calcined clay) are promising but lack fully established supply chains
- Alternative fuels such as biomass and refuse derived fuels are in high demand and/or lacking sufficient waste management systems, while future access to green hydrogen is uncertain

Sector sees key policy focus as combination of standards and LCA, financial support, and public procurement

WHAT ARE THE TOP THINGS REGULATORS SHOULD FOCUS ON IN THE NEXT 12 MONTHS TO ACCELERATE INVESTMENT IN THE DEVELOPMENT AND DEPLOYMENT OF KEY TECHNOLOGIES AND SOLUTIONS TO ENABLE THE NET ZERO TRANSITION WITHIN THE CEMENT AND CONCRETE SECTOR?



Source: Business Breakthrough Barometer Sector Survey (N=250)



Businesses are calling for policy interventions by governments within financial support, standards and testing, and public procurement

Policy focus

National  International 






Financial support

-  Given the limited green premiums currently available for low carbon cement and concrete, businesses are calling for financial policies from governments to accelerate and support deployment
-  Leaders note that incentives and tax credits for producers to invest in green manufacturing assets will ease transition to low emission production





Standards & certifications

-  Businesses are stressing that the lack of common standards for cement and concrete (e.g., low carbon vs net zero) is stifling industry cooperation and broader understanding for end users
-  Beyond that, pioneers are urgently calling for expedited and performance-based assessments of low-emissions mixes to speed R&D to deployment timeline



Public procurement

-  Past that, sector calls for the use of green cement and concrete in public projects (e.g., roads, bridges, buildings) to create stable and predictable demand
-  Beyond demand, pilot projects serve to showcase application of low carbon cement and concrete in various public infrastructure to provide data and demonstrate feasibility to broader market

Thank
You



World Business
Council
*for Sustainable
Development*

BAIN & COMPANY 

Geneva | Amsterdam | London | New York City | Singapore