



# Cement Industry Net Zero Progress Report

An update of global action and progress of the GCCA and its member companies, two years on following the launch of its Concrete Future 2050 Roadmap for net zero concrete.



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## Foreword

Fernando González



**This is the decade to deliver, and my number one priority is to facilitate the GCCA Roadmap levers, designed to make full decarbonisation of our industry possible."**

Our industry can be proud of its efforts to decarbonise over many decades. For example, we were the first industry to define, monitor, and transparently report our CO<sub>2</sub> emissions, and today we are making real progress in reducing them.

But there is much still to do. Our mission is to become a net zero industry by 2050 with an important waystation of progress in 2030. While we have made important progress, we must accelerate our decarbonisation efforts now!

This is the decade to deliver, and my number one priority is to facilitate the GCCA roadmap levers, designed to make full decarbonisation of our industry possible. We want to work closely with the international community, institutions, multilateral organisations, other business networks, our own industry colleagues, and anyone else who can contribute to establishing or improving the appropriate regulatory frameworks that foster a more circular and lower-carbon economy.

We need regulations that promote the use of municipal and industrial waste as sustainable alternative fuels for cement kilns, as well as using construction demolition waste as recycled aggregates. We need to see building codes that encourage the wider adoption of blended cement and concrete products and establish market-driven national carbon pricing mechanisms, that incentivise decarbonisation and investment in clean innovation. And we need to see greater collaboration and funding to develop new technologies to decarbonise manufacturing processes and speed up the rollout of carbon capture, utilisation, and storage. Also, we look to develop additional sources of renewable energy.

We are pleased to present this report, which captures the progress our industry is making towards net zero. It will; however, take the combined efforts of industry, governments and societies around the world to deliver on this commitment. I know this goal is achievable and critical for the future of our planet, and our industry stands ready to work with all parties to achieve this goal.

**Fernando González**  
CEO of Cemex and GCCA President



## Foreword

Thomas Guillot



**Our Net Zero Roadmap was the first net zero commitment of any of the so-called heavy industries."**

The launch of our 2050 Net Zero Roadmap was a landmark moment for the cement and concrete industry. Forty of the world's leading cement and concrete producers, representing 80% of global production outside of China (and some key Chinese companies), collectively announced their commitment to provide society with net zero concrete by 2050 and play a positive role in sustainable development.

This roadmap was the first net zero commitment of any of the so-called heavy industries, and sets out the detailed pathways, levers and milestones required to achieve this ambitious target. Together, the industry is committed to accelerating the shift to green concrete by cutting CO<sub>2</sub> emissions by a further 25% by 2030, and full decarbonisation by 2050.

This report highlights the key progress we have made across a number of areas – from emissions reductions, to innovation, policy and nature, as well as showcasing our growing collaborations with wider stakeholder organisations such as the Canadian Government, LeadIT and Mission Innovation that will be crucial to delivering net zero.

Our initial progress is promising, but there is still a way to go. The benefits of our wider collaborations are beginning to emerge, and we continue to call on all policymakers, governments and stakeholders in the built environment and beyond to support and work with us as we continue to make progress on our essential decarbonisation mission.

**Thomas Guillot**  
CEO of GCCA



## Foreword

H.E. Razan Al Mubarak



### High Level Climate Champions

The decarbonization of heavy industry is a crucial step in our journey to a resilient net zero emission future. While this investment-heavy transition has been slow to begin, promising changes are taking hold – and the cement industry’s progress is a key part of that.

This report delves into the pathways to decarbonizing cement production, highlighting innovative technologies and strategies to reduce emissions and support sustainable development. The report is a testament to the collaborative efforts of industry leaders, policymakers, and advocates. They need to work together to implement sustainable practices, drive innovation, and promote the adoption of cleaner technologies.

All this must be done in an inclusive and equitable way, and with an emphasis on ending the loss of nature and biodiversity, and harnessing the value of natural assets, within this decade.

No organization and no company alone can drive the heavy industry’s transition to net zero. That is why the High-Level Champions are supporting it with a strong focus on additionality, inclusion and geographic diversity. We are pleased to have welcomed key industry players in the Race to Zero campaign, which is mobilizing businesses, investors, cities and regions behind robust, credible and science-based goals to halve emissions by 2030 and reach net zero by 2050. We look forward to welcoming more companies soon.

As the United Nations’ first-ever Global Stocktake of progress on the Paris Agreement makes clear, the world is far off the track to limiting global warming to 1.5 degrees Celsius. But COP28 will bring national and local governments, businesses, investors, youth, workers and others from around the world together to galvanise action by 2030. We welcome the launch of the Breakthrough on Cement and Concrete at COP28 to drive international collaboration on priority actions in response to the Breakthrough Agenda report.

**H.E. Razan Al Mubarak**  
UN Climate Change High-Level Champion,  
from the COP28 Presidency



## Foreword

Hon. François-Philippe Champagne



### Government of Canada

Cement and concrete are indispensable in our everyday lives. They are the most used construction materials on Earth and a vital part of the world economy, but they also have a significant carbon footprint. We must now seize the day to work together to make green cement and concrete a global reality.

Canada is pleased to co-lead the Breakthrough on Cement and Concrete along with the United Arab Emirates. This initiative will allow like-minded countries to share best practices on a wide range of measures to cut carbon emissions in the cement and concrete sector. It will also highlight the role of industry in helping to lead the shift that is now underway in many parts of the world and needs to accelerate.

Interested countries, businesses and organizations are welcome to support this initiative and team up with us to drive decarbonization in this key sector.

**The Honourable François-Philippe Champagne**  
Minister of Innovation, Science and Industry  
Government of Canada



**We must now seize the day to work together to make green cement and concrete a global reality."**





## Foreword

Per Andersson and Elvira Lutter



### LeadIT

It is clear that no single actor can decarbonise the global cement industry or other heavy industries. While progress is being made in industrialised economies towards decarbonisation, only through a global transition and support for the decarbonisation of the cement industry in emerging economies, can we achieve the goals of the Paris Agreement. International collaboration and partnerships will therefore play a key role in sharing the risks and opportunities, as well as the knowledge, lessons and best practice, to drive implementation.

**Per Andersson**  
Head of LeadIT Secretariat



### Mission Innovation

Net-zero emissions in energy-intensive is a global challenge. Innovation will be most efficient if companies are able to share some of the very high development risks.

Given the multitude of potential net-zero industry model solutions, Mission Innovation Net-Zero Industries will bring together stakeholders from industry, research, policy, finance, and civil society to identify the most successful models and facilitate cross-fertilisation of knowledge. The aim is to maximise synergies, avoid duplication of work, identify unaddressed innovation gaps and initiate joint research and innovation projects across national borders.

**Elvira Lutter**  
Mission Innovation Net-Zero Industries Director



## Foreword

Gerd Müller



### UNIDO

Concrete will continue to be crucial for global development, particularly in the Global South. UNIDO, as the Secretariat of the Industrial Deep Decarbonization Initiative (IDDI), is working with ten member governments to drive action on the decarbonization of heavy-emitting industrial sectors in developed and developing countries. Together, we are advocating for public and private procurement commitments to stimulate the demand for low, and near-zero, emissions cement, concrete and steel as well as harmonizing systems for carbon reporting and benchmarking of industrial products.

International collaboration amongst all actors involved, including business and policymakers, is vital to ensure that real decarbonization happens in all corners of the world.

**Gerd Müller**  
Director General of the United Nations Industrial Development Organization (UNIDO)



Together, we are advocating for public and private procurement commitments to stimulate the demand for low, and near-zero, emissions cement, concrete and steel as well as harmonizing systems for carbon reporting and benchmarking of industrial products."





## Industry Commitment



# 80%

GCCA members account for 80% of the global cement industry volume outside of China – and include several leading Chinese manufacturers.

In 2021, the cement and concrete industry came together to commit to a shared vision of reaching net zero by 2050 under the GCCA's Cement and Concrete Industry Roadmap for Net Zero Concrete.

Backed by all its members who operate in almost every country of the globe, the roadmap set out the levers, pathways and milestones to fully decarbonise and ensure the industry will play a major role in building the sustainable world of tomorrow. This marked the cement and concrete industry as the first so-called hard to abate sector to launch a net zero roadmap to help limit global warming to 1.5°C.

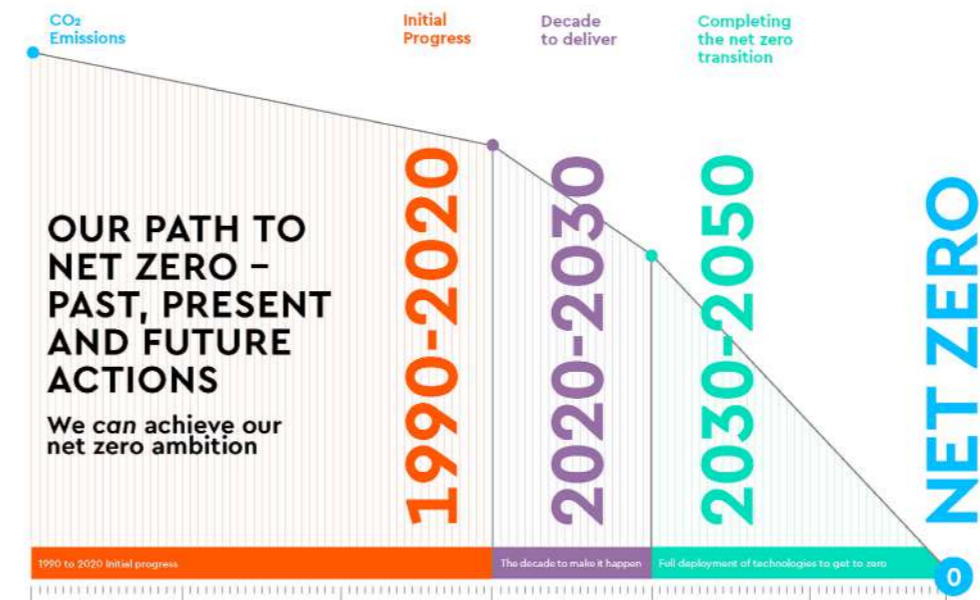


# The Levers

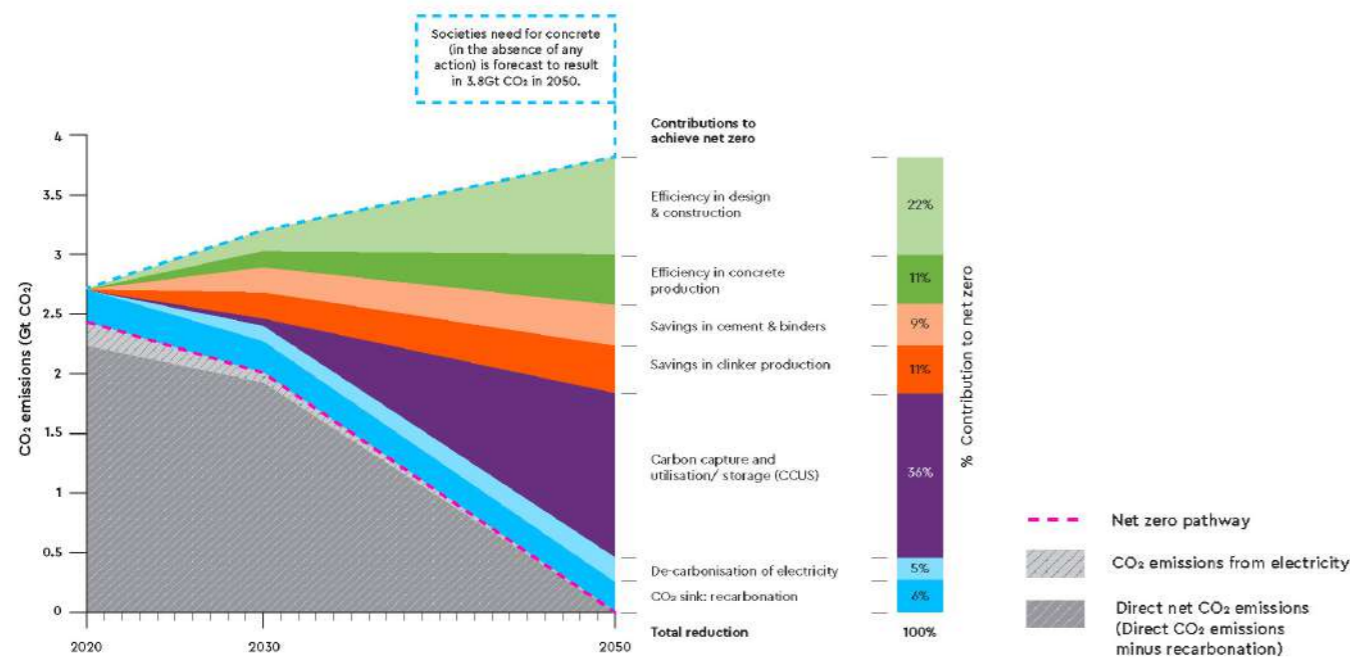
## GCCA 2050 Roadmap



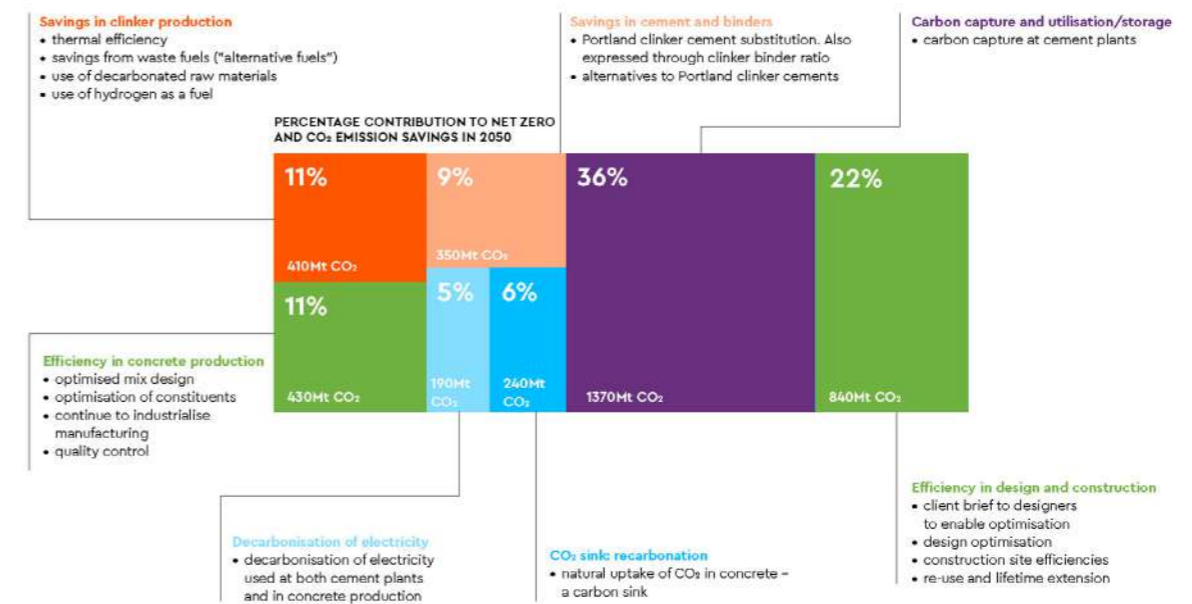
## Our path to net zero – past, present and future actions



## The net zero pathway



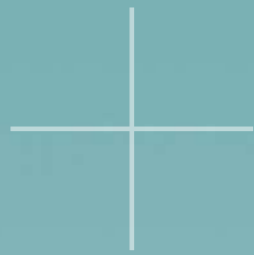
## Actions to a net zero future





# 2020-2030

The decade to make it happen



In this key decade, we will accelerate our CO<sub>2</sub> reductions through the following actions and initiatives:

- increased clinker substitution – including fly ash, calcined clays, ground granulated blast-furnace slag (ggbfs), and ground limestone
- fossil fuel reductions and increased use of alternative fuels
- improved efficiency in concrete production
- improved efficiency in the design of concrete projects and use of concrete during construction, including recycling
- investment in technology and innovation
- CCUS technology and infrastructure development

In addition, we will strive for and collaborate in establishing a policy framework to achieve net zero concrete.



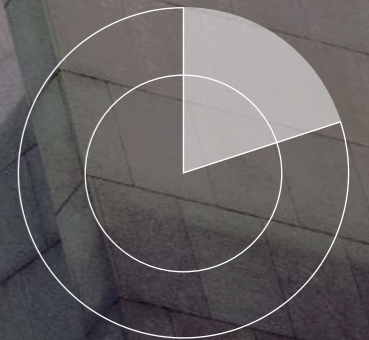
2030 CO<sub>2</sub> reduction milestones:  
(Compared with 2020 baseline)



Concrete

**25%**

CO<sub>2</sub> reduction per m<sup>3</sup>  
of concrete by 2030



Cement

**20%**

CO<sub>2</sub> reduction per tonne  
of cement by 2030



# 2030-2050

**Full deployment of technologies  
to get to zero**

**In this period, we will continue to build on the progress in the previous decade.**

Clinker substitution will continue. Whilst recognising that supplies of fly ash and ggbs will likely decline, ground limestone and calcined clay will increase in availability and be deployed as a key tool.

Even into the 2030s there will still be scope for the further use of alternative fuels to drive down CO<sub>2</sub> emissions. Alternatives to Portland clinker cements may also play a role in decarbonisation, albeit limited, perhaps around 5% of the market.

Ultimately, our process emissions mean that whilst we will do all we can to reduce them, CO<sub>2</sub> will need to be captured, re-used if possible, or stored. Having established by 2030 the capability and commercial case, and with infrastructure development in place, we will be at the start of deployment of CCUS at a scale to ensure that we can achieve net zero by 2050.

Deployment of carbon capture technology at full scale in cement manufacturing, could fully eliminate its process emissions. This, in conjunction with sustainable biomass and recarbonation could potentially result in the future delivery of carbon negative concrete for our world.

Additionally, our members' investment, collaboration and focused work on innovation through our Innovandi programmes could also unleash new technologies in our mission to decarbonise. For example, green/clean hydrogen and kiln electrification are forecast to play a role from 2040.



## The Cement Breakthrough

### A Chapter by the Government of Canada

Canada, like many countries, recognizes that the transition to a cleaner, more prosperous economy needs to be both an immediate priority and a sustained effort in the years ahead. As average global temperatures continue to rise, it is imperative that governments explore new avenues to achieve deeper reductions in greenhouse gas (GHG) emissions all across the economy. Foundational industries, such as the cement and concrete sector, account for about one-tenth of total global GHG emissions. They will play an instrumental role in preventing the worst impacts of climate change.

Concrete and cement are indispensable materials for infrastructure and the built environment. However, reducing GHG emissions, while efficiently producing enough cement to meet increasing international demands, will be challenging. A recent report by the International Energy Agency suggests that the construction sector needs to achieve a 3% average annual decline in the CO<sub>2</sub> output of cement production by 2030 to achieve net-zero by 2050. The joint leadership of government and industry – through collaborative efforts like Canada's Roadmap to Net-Zero Carbon Concrete by 2050 – can support actions vital to reaching this goal.

Cement and concrete decarbonization must be global in scope. Regional and international efforts to strengthen collaboration between the private and public sectors is necessary to make green solutions affordable, accessible and attractive for all involved.

At COP26 in Glasgow, Scotland, in 2021, global leaders launched the Breakthrough Agenda, providing a framework for like-minded countries to join in and enable stronger decarbonization actions in key sectors of the economy. At COP27 in Sharm el-Sheikh, Egypt, the cement and concrete sector was incorporated into this framework.

Now, Canada, the United Arab Emirates – COP28's host nation – and other partners are looking to advance the Breakthrough on Cement and Concrete and make clean cement the preferred choice in global markets, with near-zero emission cement production established and growing in every region of the world by 2030.



Our combined efforts aim to increase international cooperation on a broad range of measures within the cement and concrete sector – including policies, regulations and technologies, such as carbon capture, utilisation and storage. This will drive investments worldwide in the decarbonization of the industry, accelerating our progress and reducing the cost of achieving net-zero by 2050.

The growing number of countries participating in the breakthrough will be the first to consolidate existing international initiatives that target the cement and concrete sector under one umbrella. Among the breakthrough's priorities are to assess any gaps in actions and identify where greater collaboration is required. By creating new avenues for dialogue, governments, businesses and other partners will more quickly adopt best practices, better address regional differences and unlock corporate investments.

On a practical level, the Breakthrough on Cement and Concrete will mirror other breakthrough groups and develop priority actions among signatory countries in response to the 2023 Breakthrough Agenda report. These actions will guide the work of the breakthrough through 2024 and will be revised cyclically.

The Breakthrough on Cement and Concrete will provide an avenue to identify ways to encourage the adoption of innovative technologies, voluntary actions and policy measures. Its partners may choose to showcase new investments in cement and concrete decarbonization that offer long-term sustainable returns.

Above all, the breakthrough will engage a diversity of partners to ensure it is ambitious, feasible and inclusive, while providing meaningful support to the cement and concrete industry around the world, to promptly achieve our net-zero goals.



# Built Environment and the Role of Concrete



# 92%

UNOPS, a UN agency, has published a report which identified that the built environment supports society in reaching 92% of the 169 targets in the 17 UN SDGs.

Concrete is a key enabler of a resilient and sustainable built environment. Concrete combines **durability, resilience** to climate-related and natural disasters, **cost-effectiveness and widespread availability**.

Without it, much of the modern world would not have been built – and much of what is still required to achieve sustainable development could not be built.

### UN Sustainable Development Goals

UNOPS, a UN agency, has published a report which identified that the built environment supports society in reaching 92% of the 169 targets in the 17 UN SDGs. This 92% figure derives from consideration of all parts of the built environment: infrastructure (water, waste, energy, transport and digital communications), buildings and facilities. Concrete is fundamental to these assets and hence concrete is key to delivering the vast majority of UN sustainable development goals.





## Built Environment and the Role of Concrete

continued



### Infrastructure

All infrastructure is reliant on concrete, not least because its versatility means it can be used to construct foundations, wind turbine masts, bridges and pavements etc.

An example of infrastructure for which concrete is essential is that it is needed to meet the targets under SDG6 "Clean Water and Sanitation". Concrete has the requisite inherent properties that enable it to be used for dams, reservoirs, water treatment works and pipelines for potable water and wastewater. Concrete is also available at the scale required and is cost effective.

### Housing

Provision of safe and resilient housing in emerging economies is an important and significant challenge. At its simplest, it is the provision of concrete floors to replace dirt floors. This has been shown by the World Bank to be one of the most cost effective ways to help alleviate poverty and raise health outcomes. In one such initiative launched in 2022, GCCA Partner, Inter-American Cement Federation (FICEM) in alliance with Habitat for Humanity and other partners, has already benefited more than 4,000 families in Colombia, Ecuador, Guatemala, Honduras, Nicaragua and the Dominican Republic and improved the health and quality of life for 21,000 people.



# 4,000

An initiative launched in 2022 by FICEM, in alliance with other partners, has already benefited more than 4,000 families in Colombia, Ecuador, Guatemala, Honduras, Nicaragua and the Dominican Republic.



### Resilience and Concrete

The choice of construction material can impact on whole project resilience in a manner that is not always recognised or understood. The most used man-made substance is concrete and one of the reasons for this is its inherent resilience against many hazards. It can resist fire, wind and water. It will not rot, warp or be eaten. Engineered structures built using concrete perform well when subjected to impact, blast and extreme weather events, such as hurricanes, typhoons, cyclones and tsunamis. It is also the most durable of major structural materials. Concrete's durability results in reduced ongoing maintenance and lower replacement rates compared with other materials.



### Environmental Product Declarations (EPDs)

EPDs allow producers to transparently and objectively show the environmental impact of their products across a number of key metrics, including global warming potential, which is commonly referred to as carbon footprint.

EPDs are fundamental to low carbon procurement such as the UN sponsored Industrial Deep Decarbonisation Initiative (IDDI) in which the GCCA is playing a key role, through development of definitions for concrete with low carbon emissions and near zero carbon emissions.

The GCCA has developed an Industry EPD Tool. It is a web-based calculation tool for EPDs of aggregates, clinker, cement, concrete, and precast elements. It is fully verified as complying with relevant standards.

From July 2023, WAP Sustainability, a GCCA partner, began providing an EPD on-Demand service which uses the GCCA's EPD calculation engine.

More information:





## Importance of Nature



Our industry's impact on nature is a key focus for us, and efforts to conserve and reduce our impact have been undertaken for many years – we have a longstanding commitment to nature.

Our efforts continue to increase, particularly in light of COP15 and the adoption of the Kunming-Montreal Global Biodiversity Framework (GBF), which set out an ambitious pathway to reach the global vision of a world living in harmony with nature by 2050.

Our concept and definitions of nature have expanded from biodiversity and quarry rehabilitation to encompass much broader areas, such as land, ocean, freshwater, climate change, atmosphere, ecosystems, circularity, as well as overall business operations, including both upstream and downstream activities.

On behalf of the industry, the GCCA has set up a dedicated Nature Task Group, which helps the sector stay ahead of the curve and align with the latest trends in the field of nature conservation and discussion on key topics such as GRI standards for biodiversity, TNFD and WEF Cement and Concrete Sector report.

### Commitment to biodiversity

In addition, GCCA members are committed towards the achievement of Net Positive Impact in their cement, concrete and aggregates operations.

Good practices on land stewardship and biodiversity are embedded into the GCCA Sustainability Charter and the principles of the Sustainable Development Goals into our actions, outlining four specific actions:

- Formulate and execute effective and progressive Quarry Rehabilitation Plans (QRP) and Biodiversity Management Plans (see GCCA Sustainability Guidelines for Quarry Rehabilitation and Biodiversity Management.) These deliver significant environmental and social benefits to the environment around our operations.
- Track, monitor, report, and establish assurance of information through Key Performance Indicators, that provide valuable, reliable, easy-to-understand and verifiable information. This allows comparison and measurement of progress (see GCCA Sustainability Guidelines for Quarry Rehabilitation and Biodiversity Management.)
- Highlight concrete's strong sustainability characteristics, such as high versatility with infinite mixes and shapes, which enables utilisation in the most material efficient manner aligned with Nature Based Solution initiatives.
- Work in partnership to scale up efforts, building close ties with civil society organisations including national, regional and local governments, NGOs, local communities, academia, peers of the cement, concrete and aggregate sector, as well as other industry sectors, to ensure measures are appropriate and deliver the best outcomes.





## International Collaboration

### Mission Innovation – Net-Zero Industries

Mission Innovation Net-Zero Industries (MI NZI) brings together an ambitious alliance of countries to work closely with businesses, investors, research institutes and international organisations, to drive the development of cost-effective solutions for the decarbonisation of energy-intensive and hard-to-abate industries.

Whether it be iron and steelmaking, production of cement and lime, the chemicals and refining industry, or other associated energy intensive industries like aluminium and alumina, decarbonisation requires multiple technical solutions, and a new way of supporting these industries in the investments and risks they must undertake, if they are to meet the targets society demands for 2030 and 2050 in achieving net-zero.

The Mission was launched by Australia and Austria at the Global Clean Energy Action Forum in September 2022, in collaboration with Canada, China, the European Commission, Finland, Germany, the Republic of Korea and the United Kingdom, as well as the United States of America as a support member.

Through our role as a government-to-government initiative, MI NZI will ensure, through actions of our members and partners, that key technical solutions are developed and demonstrated by 2030, to enable an effective and efficient decarbonisation of energy intensive industries by 2050, across multiple regions of the world.

Priority innovation topics include:

- process optimisation & efficiency improvement
- fuel & feedstock switch
- electrification of end use activities
- carbon capture utilisation & storage
- digitalisation and flexibilisation
- sector coupling and circular economy

To reach the ambitious goal, a Mission Roadmap has been developed by the Mission member states and associations, aligned with a common vision and strategic objectives. Based on this vision (Joint Mission Statement), the most promising RD&D themes and technology pathways within specific sectors and cross-sectorial areas are identified along with specific technologies for investigation. Our Action Plan identifies the timeline and pathways, investment scale required, and framework conditions and measures, which enable the development and deployment of technologies.

Key actions to achieving this will be:

- Facilitating the exchange of information, experience and best practice among policy makers and experts, to support the development of effective national research and innovation frameworks for industrial deep decarbonization, regulatory frameworks or market incentives.
- Realizing a portfolio of aligned national and/or joint multi-national calls, that can showcase net-zero emissions industry model solutions, based on common interests and priorities of MI NI member states.
- Public campaigns establishing MI NZI as a source and communicator or Project Knowledge (not a creator) – including live seminars and reference publications.
- Identifying and harvesting existing demonstration projects for speakers, seminars and fact sheets –lifting national knowledge to an international audience.
- Partnering with research and operational knowledge communities to mitigate the technical and commercial risks involved.

Our scope is across research, development, demonstration, and deployment, to focus global stakeholder efforts on a common goal of accelerating industry uptake of decarbonisation technologies.

More information:



### LeadIT

In recent years, perceptions have begun to shift on the feasibility of abating carbon emissions from the cement industry. This shift has partly occurred due to international collaboration within the private sector and the proliferation of industry, and government-led decarbonisation roadmaps, which have set the vision and pathways for deep decarbonisation. In addition, there has been an evolving offer of support for cement decarbonisation from a myriad of international decarbonisation organisations, research institutes and initiatives.

With regards to the thematic focus of international collaboration, several decarbonisation initiatives at COP27 highlighted the need to collectively act to accelerate the rollout of demonstration projects and systematically strengthen the international offer of assistance available to all countries, in particular, emerging markets and developing countries, where the largest growth in emissions is expected. To this end, progress has been made by international initiatives throughout 2023 including First Movers Coalition's cement workshop in India, supported by the Leadership Group for Industry Transition; Mission Innovation Net-Zero Industry Mission's target to implement large-scale demonstrations of low-emissions cement production; the development of UNIDO's technical assistance facility; and the development of the Climate Investment Funds' industry decarbonisation programme.

Nevertheless, these efforts have involved limited coordination among international initiatives and as a result, the international assistance on offer for cement decarbonisation in emerging markets remains too weak and fragmented to be truly effective. The opportunity, therefore, remains to join complementary efforts of countries and assistance providers focusing on industry decarbonisation, to improve the coordination and effectiveness of financial and technical assistance on offer. In doing so, progress on the demonstration projects needed in the cement industry can be accelerated.



Throughout 2023, IEA, OECD, LeadIT and UNIDO have been working together to design improved mechanisms for the coordination of international assistance along two tracks. Firstly, the establishment of in-country industry hubs in emerging markets under the LeadIT initiative, to deliver targeted international assistance for projects that enable the mobilisation of private capital. Secondly, the establishment of a global matchmaking mechanism for international assistance under the Climate Club. Both tracks are expected to be announced, along with detailed workplans and partners at COP28.

COP28 will also provide an opportunity to launch the Cement Breakthrough Agenda under the leadership of the Government of Canada, which will provide another mechanism for coordinating the activities of international initiatives, focusing on cement decarbonisation. This follows the successful establishment of the initial Breakthrough Agenda, as launched at COP26 in 2021, which aims to coordinate decarbonisation efforts in other key economic sectors.



There has been an evolving offer of support for cement decarbonisation from a myriad of international decarbonisation organisations, research institutes and initiatives."



## The Global Net-Zero Accelerator



GCCA and FICEM at UNFCCC LatAm Climate week



GCCA at UNFCCC Africa Climate Week

### National technology and policy roadmaps

The Net Zero Roadmap Accelerator was started in early 2022 to help national cement and concrete industries decarbonise, in line with the 2050 GCCA Net Zero Global Roadmap.

This launch was the start of the national and regional phase of the GCCA Roadmap, focusing on local action and policymaking to help the cement and concrete industry achieve its decarbonisation commitments.

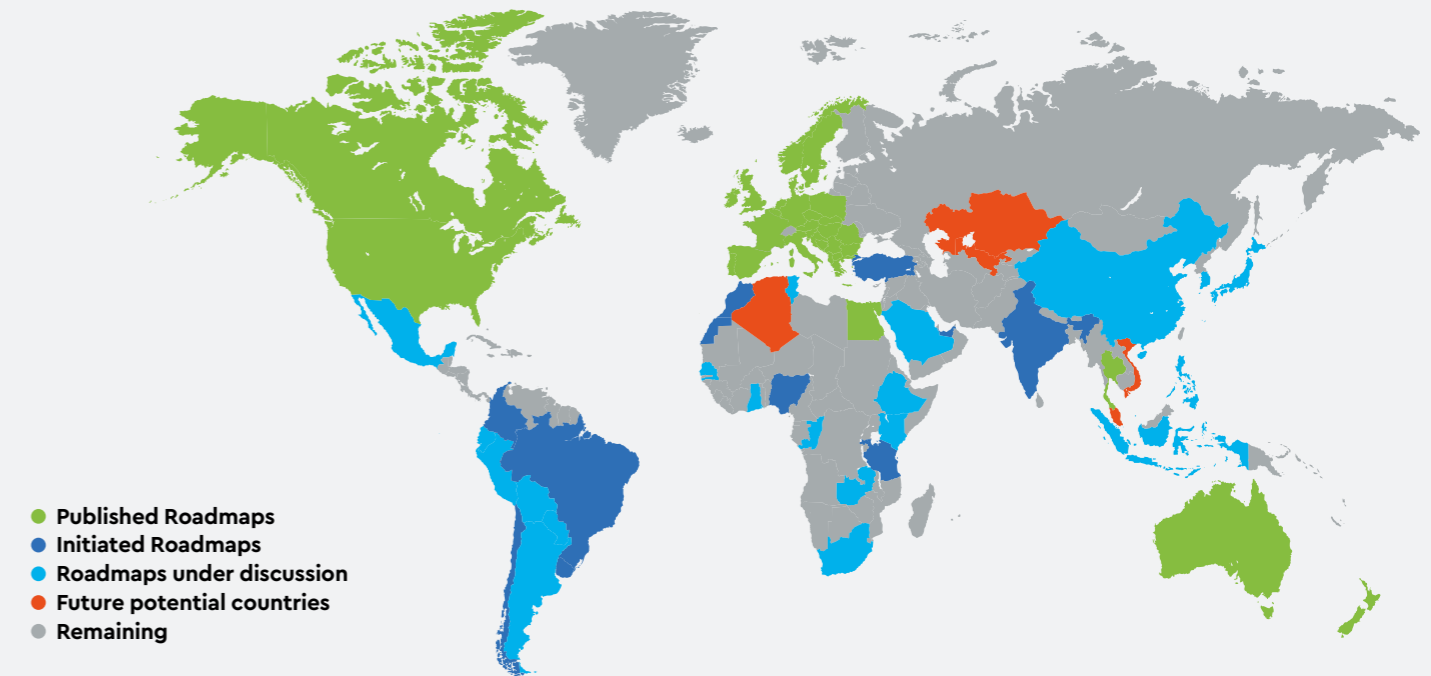
The accelerators involve working with local industry and policymakers, to identify the local levers and challenges and recommending key actions, to implement the global roadmap levers on a regional basis.

This includes encouraging government policies that can have an immediate impact, such as better recycling, the use of waste as an alternative to fossil fuels, and other circular economy practices. It also includes identifying lighthouse projects that can eliminate emissions over the next decades, such as carbon capture utilisation and storage technologies.

Roadmaps have been completed or are soon to be complete in Thailand, Egypt, New Zealand, India, Colombia, Brazil and Chile. Action has commenced in Morocco, Nigeria, Tanzania and the UAE. We are also working with colleagues in Turkey, where EBRD are funding a cement focused roadmap. Discussions have also progressed in China, Philippines, Indonesia, Tunisia, Kenya, Senegal and South Africa.

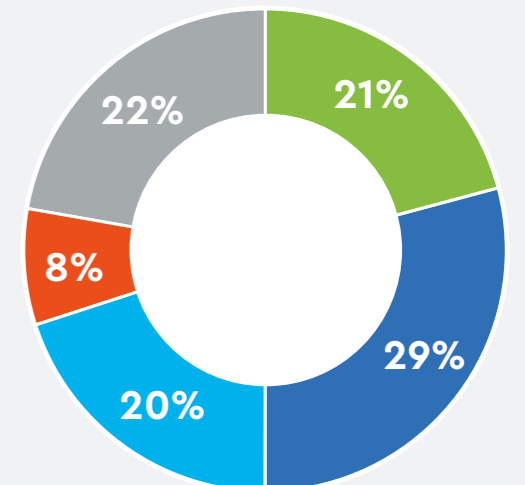
## Whole Life Cement and Concrete Country Roadmaps

- 2030 milestones
- Net zero concrete by 2050



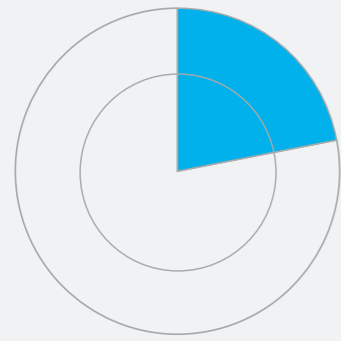
## Percentage of global cement production covered

(Excluding China)



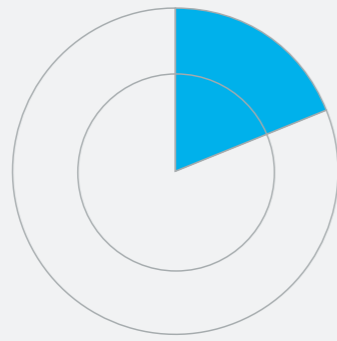


## Industry Emissions Reduction Progress



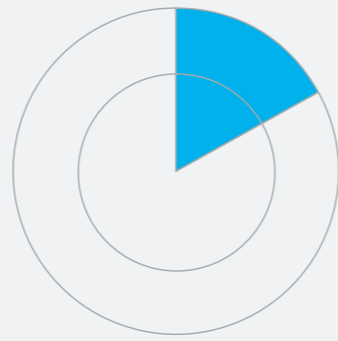
CO<sub>2</sub> emissions  
**23%\***

Reduction in net CO<sub>2</sub> emissions per tonne cementitious (1990 baseline)



Energy  
**19%**

Energy efficiency improvement (1990 baseline)



Fossil fuel  
**18%**

Reduction in fossil fuel consumption (1990 baseline)

Figures from GCCA GNR.

\* Note 23% is a rounded figure – actual figure, accurate to 1 decimal places, is 22.7.

### Qualitative reporting

The GCCA, through an independent third party, gathers key data from the industry to transparently report annual progress in delivering sustainability commitments. This is called GNR ("GCCA in Numbers") and is a key tool in how key sustainability progress is monitored and reported.

The headline findings of the 2021\* GNR data are as follows:

- The 2021 Cement Industry GNR data show a 23%\* reduction in CO<sub>2</sub> per tonne of cementitious has been achieved since 1990
- The proportion of alternative fuels used is 10 times greater than in 1990
- Energy efficiency has improved by 19%

It is important to note here that the GCCA GNR data does not cover the whole industry. While it is not a 100% coverage of the progress our industry as a whole has achieved against the milestones set out in our roadmap, it is a reliable indicator that our sector is moving very much in the right direction.

\*Latest data available in 2023.

More information:



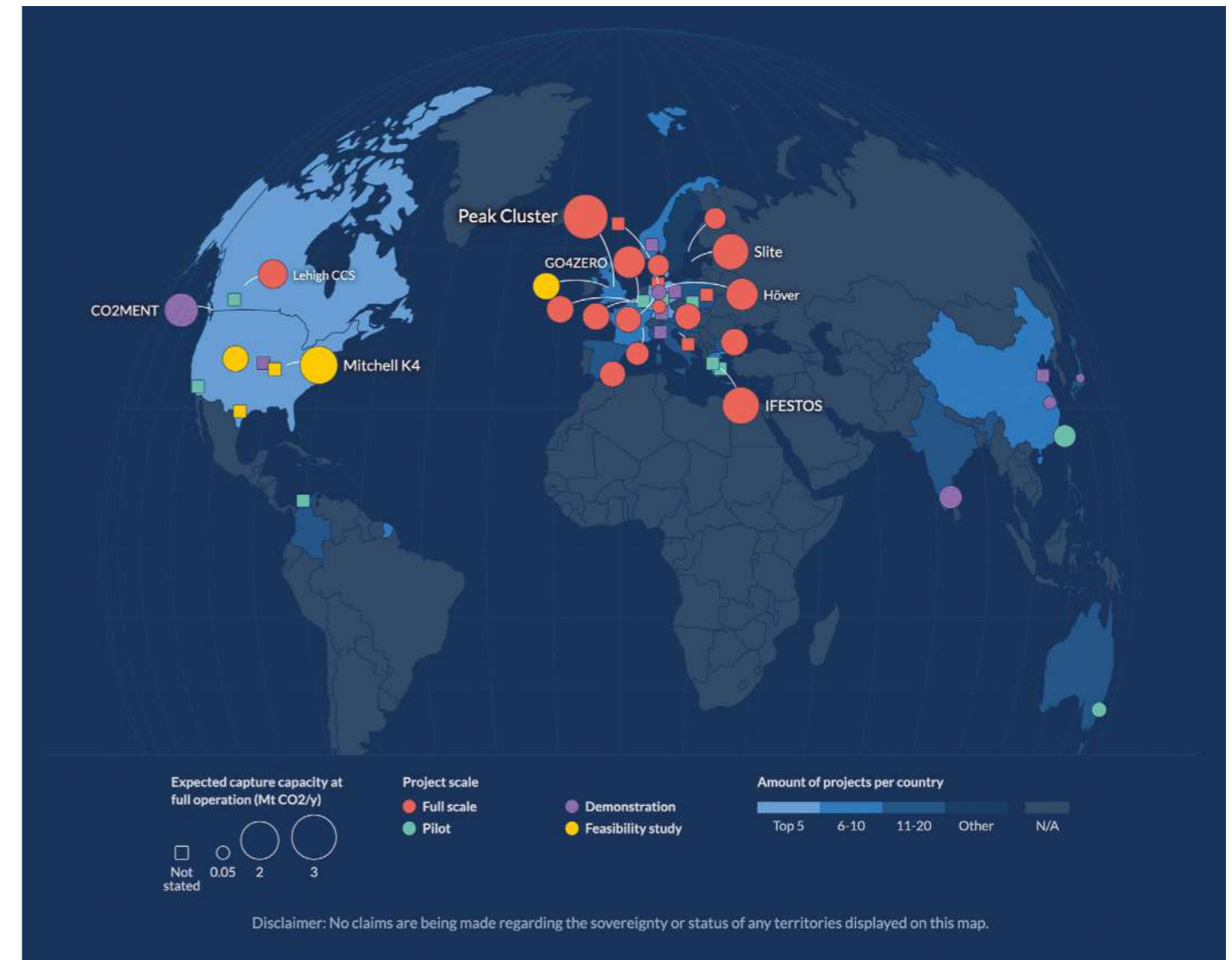
### SBTi membership

The Science-Based Targets initiative (SBTi) is a collaborative programme, that assists companies and organisations in establishing and reaching greenhouse gas (GHG) emissions reduction targets, that are rooted in scientific principles. This initiative offers a structured framework and guidelines for entities to synchronise their emission reduction objectives with climate science, particularly in accordance with the goals of the Paris Agreement

GCCA members who are participating in SBTi committed to formulating targets that are in harmony with the most up-to-date scientific understanding of climate change. This involves crafting precise and measurable objectives for reducing their carbon emissions, which are then evaluated and endorsed by the SBTi, to ensure they are genuinely science-based.

As of 2023, the GCCA has a strong base of 42 member companies out of which 45% (20 members) are committed to SBTi.

Out of 20 members who have committed to SBTi, 25% (5 members) of them have their 1.5 degrees target validated and 55% (11 members) have their targets validated for well below 2 degrees. The remaining 20% (4 members) have committed to the SBTi and are in the process of submitting their targets for SBTi validation.



**36%**

Carbon Capture Utilisation and Storage (CCUS) account for 36 percent of planned reduction levers in the GCCA 2050 Roadmap.

GCCA 2050 Roadmap for Net Zero Carbon Concrete:



### The Green Cement Technology Tracker

In 2023, the GCCA partnered with Leadership Group for Industry Transition (LeadIT) to develop The Green Cement Technology Tracker, which tracks public announcements of low-carbon cement breakthrough technologies, aligned to corporate climate goals, consistent with the Paris Agreement.

The Green Cement Technology Tracker currently includes carbon capture technologies. Carbon Capture Utilisation and Storage (CCUS) accounts for 36 percent of planned reduction levers in the GCCA 2050 Roadmap for Net Zero Concrete. The tracker will be expanded to include other technologies such as calcined clays, designed to reduce emissions from cement manufacturing.



## Enabling Public Policy

Public policy has an important role to in enabling the cement and concrete industry to play its part in wider society delivering a circular economy and net zero transition, whilst also addressing the biodiversity emergency and wider nature agenda.

Development of necessary policy will be a joint endeavour by industry, policymakers and governments.

GCCA policy and position statements outline how the outcomes that both society and industry want, can be achieved through policy changes and industry action. Documents published thus far focus on climate change, circular economy and biodiversity.

- Circular Economy – achieving a circular economy in the built environment will require the collaboration of governments and policy makers at municipal, regional, national, and global level to implement enabling policies. For example, the cement industry can enable the waste industry to close the loop by using waste as input into kilns. This “co-processing” has several benefits including safely treating waste and replacing fossil fuels whilst reducing CO<sub>2</sub> emissions.
- Carbon Pricing – an approach to reducing carbon emissions that uses market-based mechanisms to pass the environmental cost of emitting on to producers and consumers. Putting a price on carbon can create a financial incentive to reduce emissions and encourage lower-carbon behaviour and can also raise money that can be used to finance low-carbon investment and climate adaptation. The use of carbon pricing must not lead to distortions of competition between domestic producers and importers. Clear monitoring, reporting and accounting rules are needed and a competitive level playing field on carbon cost must prevail.

- Biodiversity – policy makers, construction clients (including governments and their agencies when acting as clients), designers and contractors should require construction materials to be responsibly sourced with respect to biodiversity by using available tools.
- Material Neutrality – the most sustainable outcomes can be achieved by policies, codes and regulations that avoid explicit or implicit preference for one construction material over another.
- Low Carbon Product Procurement – the implementation of policies that send clear and workable demand signals through the complex construction value chain to stimulate a green premium for low carbon and near zero carbon products, thereby enabling the materials industry to have requisite confidence to bring these products to market.



**GCCA policy and position statements outline how the outcomes that both society and industry want can be achieved through policy changes and industry action."**

Presented here is a summary of GCCA policy documents that are available in full at: [gccassociation.org/gcca-policies/](http://gccassociation.org/gcca-policies/)



**We continue to invite policymakers and stakeholders, from across the built environment, to work with us to help build the sustainable world of tomorrow.**

### The Brazil experience – co-processing

Brazil has a co-processing resolution that supports policy ambitions on circular economy, low carbon economy, and the use of natural resources. Co-processing is an effective method of reducing global CO<sub>2</sub> emissions by diverting waste away from landfills, which in turn prevents methane emissions from landfills and dumpsites. A noteworthy development is the mandatory closure of all “dumpsites” by 2024, coupled with the requirement for all municipalities to impose fees or taxes for waste management services. This is a significant step towards establishing a viable business case for co-processing.

### The Thailand experience – blended cements

At the cement plant or the concrete plant, fly ash, ggbs, ground limestone and other materials can be added to deliver concretes with reduced CO<sub>2</sub> emissions but still the required performance. However, the right policies regulations and standards need to be in place to enable the industry to utilise this technology in the products they supply.

In Thailand, the industry worked hard in engaging with government so as to enable this technology to be adopted at scale. The industry is now able, in confidence, to utilise the fly ash from the energy sector to blend with its ordinary Portland cement, because government policy has created a demand for this blended cement product.



## UNIDO: The Need for Action in Emerging Economies

Carbon emissions are released from all built assets, including buildings and infrastructure, not only during their operational life, but throughout their entire lifecycles – the raw material extraction, manufacturing, transportation, construction, and end-of-life phases of building materials.

These emissions, known as “embodied carbon,” have been historically overlooked. Cement, which accounts for 7–8% of global emissions and makes up a significant portion of concrete, the second most consumed material in the world after water, must be decarbonised in order to achieve building emissions reduction goals.<sup>1</sup>

Working with the Council of Engineers for the Energy Transition, UNIDO has examined the situation of cement and concrete in light of the urgency to reduce global warming. Key challenges faced by the sector include:

- 90% or more of cement will be used in the Global South in the coming decades to 2050. Most importantly, use will shift from China (presently >50%) to other countries and regions of the Global South, most notably Africa, where the amount of cement used is forecasted to increase nearly five-fold.
- It is impossible to reduce the emissions associated with cement and concrete to zero without employing some degree of carbon capture and storage (CCS). However, installation of sufficient capacity will be technically challenging and expensive, increasing the cost of production by two to four times. In developing regions, large-scale deployment before 2050 will be challenging.
- Limestone, the essential raw material to produce clinker, is scarcely available in many parts of the developing world (e.g., parts of Africa, India, and Bangladesh). These regions must import clinker, effectively importing CO<sub>2</sub>e.

Compounding these challenges, renewable technology for cement production is still not available at scale globally, and economic incentives for industry to invest in much needed R&D are limited. Reaching net-zero CO<sub>2</sub> emissions for these sectors will require reducing demand for these materials, more and higher value recycling, and switching to clean energy sourcing for primary production.

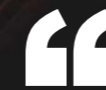
To respond to some of these challenges, UNIDO as the Secretariat of the Industrial Deep Decarbonisation Initiative (IDDI), is working with 10 member governments<sup>2</sup> as partners to drive additional actions for the deep decarbonisation of industrial sectors in developed and developing countries, by advocating for public and private procurement commitments to stimulate the demand for low, and near-zero emissions cement, concrete and steel, and harmonising systems for carbon reporting and benchmarking of industrial products.

Alongside all of this, is the need for a collective, long term and aspirational vision of the pathway for net-zero CO<sub>2</sub> emissions cement and concrete industry, one that is wholeheartedly supported by government, national industry and civil society.

Leveraging the insights gained from the deep-dive analysis of the industries and in consultation with governments and industries, UNIDO is developing mid- to long-term roadmaps for industrial decarbonisation in Brazil, Kenya, Vietnam and Morocco. The aim is to identify decarbonisation pathways for heavy industries such as steel, cement and concrete, in line with the objectives of the Paris Agreement and Sustainable Development Goal 7 (SDG 7). The roadmap's four pillars are energy efficiency, low-carbon raw materials and energy sources, renewable technologies and CCS.

In addition to these ongoing initiatives, UNIDO has a robust history of addressing the challenges within the cement and concrete industry. For instance, UNIDO's project in India focused on enhancing productivity in the cement sector by strengthening the capacity of the National Council for Cement and Building Materials, a pivotal technical institution in the field. Meanwhile, the “Eco-industrial Park Initiative for Sustainable Industrial Zones in Vietnam 2014–2019” delved into the potential of co-processing alternative fuels and raw materials from industrial parks in cement plants, contributing valuable insights. Moreover, UNIDO's project in Egypt aimed at improving industrial energy efficiency, employing an integrated approach that combines capacity building and technical assistance interventions at both policy and project levels. These endeavours underscore UNIDO's commitment to driving positive change and sustainable practices in the cement industry, aligning with global goals such as the Paris Agreement.

1. Council of Engineers for the Energy Transition (CEET). (2023). Cement and Concrete Sector Issue Brief: Decarbonizing the cement and concrete sector.  
2. Brazil, Canada, Germany, India, Japan, Saudi Arabia, Sweden, United Arab Emirates, United Kingdom and United States.



Leveraging the insights gained from the deep-dive analysis of the industries and in consultation with governments and industries, UNIDO is developing mid- to long-term roadmaps for industrial decarbonisation in Brazil, Kenya, Vietnam and Morocco.”



# Innovation

Innovation is crucial for the cement and concrete industry. It is a key part our journey to net zero – we must develop and accelerate the technologies required to reach our goal.

The GCCA runs two innovation programmes under its Innovandi programme.

- Innovandi Global Cement and Concrete Research Network
- Innovandi Open Challenge

### Innovandi Global Cement and Concrete Research Network

The network connects 450+ scientists in the field of cement and concrete, runs about 75 PhDs and invests around 1.2 million Euros per year in research solely focussed on reducing the CO<sub>2</sub> footprint of concrete.

Academic partners bring their knowledge and in-kind projects to the network, aligned with the Innovandi Research Roadmap created by Industrial Partners. The projects showcase the latest research to Industry, facilitating a two-way dialogue. The network can then influence the projects, bringing global and industrial perspectives. To date, 62 partner projects have been accepted to the network and 19 have been finalised.

**INNOVANDI**  
Global Cement & Concrete  
Research Network

**INNOVANDI**  
Open Challenge

**450+**

The Innovandi Global Cement and Concrete Research Network connects 450+ scientists in the field of cement and concrete.



### Innovandi Open Challenge

Launched in 2021, the Innovandi Open Challenge is a unique industry accelerator which brings together tech start-ups and GCCA member companies to drive innovation and help solve the climate challenge. It partners GCCA members with exciting start-ups in consortia, where they provide resources and facilities, to accelerate technology, that will be essential in our decarbonisation journey.

Under the Open Challenge, start-ups gain unique access to industry plants, labs, key networks and the expertise and infrastructure of the GCCA's 40+ members from around the world. They also receive guidance from the GCCA and its members to help them with the development of new technology and business cases.

The first Open Challenge ended in October 2022 and saw partnerships between six exciting start-ups and our member companies in the carbon capture and concrete recycling areas. The successful results of each of the consortia were shown at a 'Demo Day' in Düsseldorf, which included promising carbon reductions in all six start-ups.

The second Open Challenge launched in March 2023, and is for start-ups working on the development of new materials and ingredients for low carbon concrete – a major step towards the ultimate goal of net zero concrete. The sourcing for our second Innovandi Open Challenge closed at the end of May 2023 and GCCA member companies are now in discussion with 18 selected startups for onboarding in our accelerator programme (15 startups selected for pitch day and 3 made it through a last chance bracket). We are delighted that over 70 Start-ups from around the world applied for our Innovandi Open Challenge. Successful startups will partner with GCCA member companies. The results of these collaborations will be unveiled at a Demo Day later in April 2024.



'Demo Day', Düsseldorf



## GCCA Member Action

Our members are demonstrating climate action today, with projects that exemplify CO<sub>2</sub> reductions across the world. These are just some of the standout projects that are taking place across our members and association partners today.





## GCCA Member Action



(54-11) 4576 7695    WWW.AFCP.ORG.AR    afcp@afcp.org.ar



### AFCP

#### Sustainability Indicator Reports

As a sign of the commitment of its companies, the AFCP periodically provides updated reports on the evolution of consolidated indicators related to environmental, industrial and labour performance, whose historical comparison with similar data from previous periods makes visible the improvements achieved, as well as establishing guidelines for future improvements.

#### Argentina-FICEM Net Zero Roadmap Concrete 2050

The AFCP, together with its partners, are collaborating with Inter-American Cement Federation (FICEM) to update the Argentine Roadmap 2030 for the country's industry. During 2024, the adaptation of the current Roadmaps will be carried out from the 2DS trajectories to 2030 towards the 1.5DS trajectories to 2050 (Carbon neutrality), with the reference to the GCCA's Concrete Future 2050 Net Zero Roadmap.

In line with the development of the Roadmap Concrete 2050 and with the aim of providing information to the decarbonisation of the cement sector in Argentina, AFCP is carrying out a study on recarbonation of cement-based materials (CO<sub>2</sub> capture during service life) together with the National University of the Center of the Province of Buenos Aires (UNICEN). Likewise, together with FICEM, the life cycle analysis for waste management in Argentina is being carried out.

#### Update of the IRAM 50,000 standard (Cement. Cements for general use. Composition and requirements)

The standard defines the different types of cements for structural use based on their composition and the physical, chemical and mechanical requirements of each of them. AFCP, together with its associates and The National Institute Of Industrial Technology (INTI), is working in the Argentine Institute of Standardization and Certification (IRAM) Cement Subcommittee to update the standard by incorporating a new type of composite Portland cement, which would allow a content of mineral additions of between 35 and 50%, reducing the content of clinker and consequently CO<sub>2</sub> emissions.



Asia Cement Eco-park is the first choice for visitors to Hualien of all generations.



Asia Cement will be a positive force for environmental friendliness, pass it on to the outside world, and implement the goals of sustainable development."

### Asia Cement Corporation

#### Carbon reduction and environmental restoration

Asia Cement is committed to energy conservation, carbon reduction and environmental conservation, making substantial contributions to maintaining the earth's ecological balance and responding to climate change.

In terms of carbon reduction performance, Asia Cement Corp. actively promotes the circular economy and reduces carbon emissions in the clinker production process. Taking 2022 as an example, by reusing 400,000 tons of alternative raw materials and 30,000 tons of alternative fuels, approximately 100,000 tons of carbon dioxide emissions will be saved; and it will be the first in Taiwan to produce low-carbon bulk Portland limestone cement and bagged masonry cement, effectively reducing carbon emissions by 10% and 18%.

Since 1969, the Asia Cement ecological restoration team has been working on biodiversity conservation, using innovative natural afforestation methods to promote greening of mine sites. After more than 20 years of restoration, it can be restored to the original forest level and wild animals return to their original habitat. At the same time, we have invested great efforts in off-site restoration and set up an ecological park near the factory to cultivate butterflies, stick insects, and Taiwanese native plants. It is now a very famous ecological and environmental education site in Taiwan. Asia Cement will be a positive force for environmental friendliness, pass it on to the outside world, and implement the goals of sustainable development.





## GCCA Member Action continued

### Decarbonisation Pledge



### The Federation of the European Precast Concrete Industry (BIBM)

#### Decarbonisation Pledge

In October 2023, BIBM launched its Decarbonisation Pledge representing a concerted effort to minimise the environmental impact across the entire lifespan of precast concrete products. It aims to lead the path in reducing carbon emissions in the construction sector, emphasising the crucial role the industry plays in global environmental stewardship.

Developed by the BIBM Brussels office in close collaboration with the BIBM Environment and Communication Commissions, the pledge is a result of collective expertise and dedication to driving positive change within the industry.

#### BIBM Decarbonisation Pledge core commitments:

- **Decarbonisation of the construction work:** BIBM highlights the need to consider the decarbonisation of the full construction work during its entire lifecycle (minimising the CO<sub>2</sub>eq emissions per square metre of structure and per year) whilst giving the possibility to precasters and all actors of the value chain to optimise the means to achieve it.
- **Circular Economy for Reduced Whole-Life Carbon:** Applying circular economy principles to precast concrete design, manufacturing, and end-of-life processes minimises the environmental impacts. This approach optimises material use, reduces waste, and aligns with the circular economy model's aim to decouple economic growth from resource use.
- **Stakeholder Cooperation:** BIBM commits to championing sustainable practices throughout the precast concrete lifecycle, encompassing the design, manufacturing, and distribution processes. This commitment ensures that every step in the value chain contributes to the overarching goal of decarbonisation.
- **Enabling Policy Framework:** Collaboration between stakeholders and policymakers is crucial for achieving decarbonisation in the built environment. BIBM advocates for an enabling policy framework to facilitate the transition toward carbon neutrality in Europe, based on science and material neutrality.

“Our Decarbonisation Pledge aims to lead the path in reducing carbon emissions in the construction sector, emphasising the crucial role the industry plays in global environmental stewardship.”



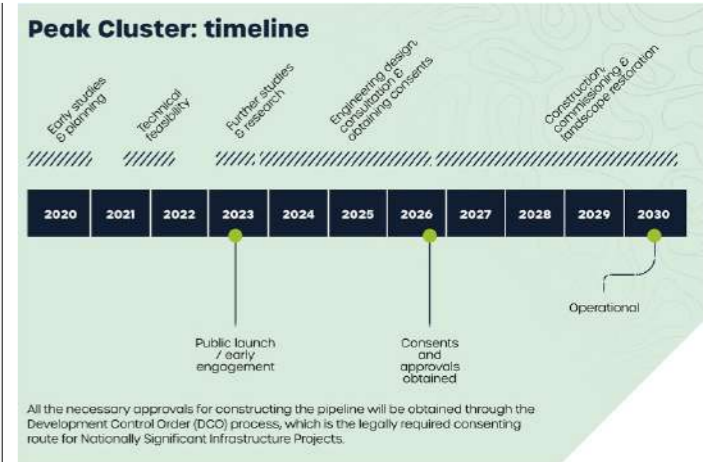
### Breedon

#### Breedon plays key role in securing a sustainable future in the Peak District

In May 2023, Breedon played a pivotal role in the launch of the Peak Cluster project, a world-first initiative with key partners working together to create a net zero future for the cement and lime industries in the Peak District.

#### The key elements of this project are:

- **Carbon emission reduction:** the innovative project will remove over three million tonnes of carbon dioxide emissions each year by 2030, a move that will reduce total emissions from the industry by 40% in the UK.
- **Carbon emissions storage:** the project will see carbon dioxide emissions captured and transported from industrial plants in Derbyshire, Staffordshire and Cheshire before permanently storing the carbon dioxide beneath the Eastern Irish Sea, with additional storage options including Liverpool Bay CCS, or the recently announced Morecambe Net Zero project.
- **Unprecedented collaboration for the benefit of the broader industry:** in an industry first, Breedon will work closely with the Lostock Sustainable Energy Plant in Cheshire and four other cement and lime plants in the Peak District and Staffordshire Moorlands, including sites owned by Tarmac, Lhoist and Aggregate Industries.



Peak Cluster aims to cut over three million tonnes of CO<sub>2</sub> emissions by 2030, making a key contribution to the region's net zero ambitions and supporting the transition to carbon neutral products made by local communities.

More information:





**GCCA Member Action**  
continued



**15%**

The 45-acre solar panel field is estimated to generate up to 15% of the plant's yearly power consumption.

**Buzzi**

**Alamo Cement Company Launches solar power system in Texas**

Alamo Cement has announced the completion of their new solar power system in San Antonio, Texas, advancing the company's commitment to reduce carbon emissions and align itself with the cement industry's goal of reaching carbon neutrality.

The company has made a significant investment in this renewable power project, which has the capacity to generate up to 17,800 megawatt-hours (MWh) per year. The 45-acre solar panel field is estimated to generate up to 15% of the plant's yearly power consumption while reducing emissions and electricity costs.

Full use of this renewable energy system within the group in the USA is estimated to reduce carbon dioxide emissions by 8,000 tons per year.

Installing the largest customer-owned solar power system contributes to reduce the local demand for energy, reducing use by 7.5 megawatts by the end of 2023. Alamo took this important step to improve its sustainability performance and continues with its present and long-term plans to reduce overall greenhouse gas emissions.



**CANACEM**

In March 2023, CANACEM and its affiliates published the Mexico-FICEM 2030 Roadmap, under the FICEM standard, which is based on the Cement Sustainability Initiative and the International Energy Agency Roadmap. This implied the consolidation and third-party verification of industry data, estimation of GHG emissions, and the evaluation of reduction potentials to determine an emissions reduction strategy for contributing to the mitigation of climate change.

According to the gathered data, in 2016, the direct specific emission was 629 kg of CO<sub>2</sub> per ton of cement. Mexico's cement industry aims to reach 520 kg of CO<sub>2</sub> per ton of cement. This translates to a 17% decrease in direct specific emissions.

This emissions reduction strategy is based on three decarbonisation levers: Co-processing, low-carbon cements, and thermal efficiency. Circularity is one key aspect of this roadmap, given that co-processing and low-carbon cement imply the use of waste as fuel in co-processing or as additions to reduce the clinker factor.

CANACEM is committed to leading the necessary actions for achieving the defined objectives. However, harnessing the potential of each decarbonisation lever depends on regulatory frameworks, green financing, and collaboration between academia, industry, and governments, among other stakeholders.

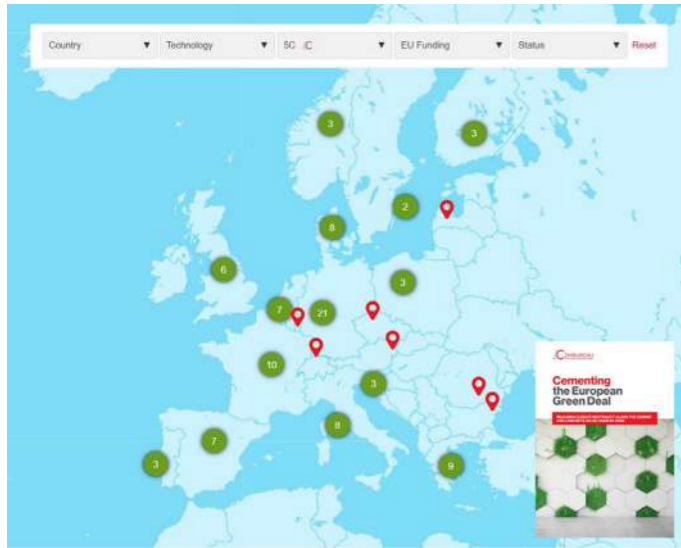


Circularity is one key aspect of this roadmap, given that co-processing and low-carbon cement imply the use of waste as fuel in co-processing or as additions to reduce the clinker factor."





## GCCA Member Action continued



### CEMBUREAU

#### CEMBUREAU Roadmap towards carbon neutrality by 2050 / Time for execution

Following the publication of its Carbon Neutrality Roadmap, CEMBUREAU has published on its website an interactive map of decarbonisation investments, which references 100 projects for which information is publicly available. Further projects are added to the map on a regular basis.

#### Time for execution is now

The project list is testimony to the industry's climate commitment. It also demonstrates that we are moving from concepts and target-setting to execution. This requires a strong focus on the facilitating measures to ensure each of these projects is built on a viable business case. "Access" will be the key word in our advocacy going forward, access to (i) sufficient non-fossil based energy sources; (ii) alternative raw materials and clinker substituting materials as well as to sustainable biomass, (iii) public funding and financing schemes to de-risk investments and (iv) pipelines and storage sites as well as viable CO<sub>2</sub> use applications for CO<sub>2</sub> captured from cement plants.

#### Updating our ambition

Each of the claims set out above will need to be substantiated by facts and figures and more detailed information about concrete bottlenecks to project implementation. CEMBUREAU is now proceeding with a fact-finding exercise combined with an update of its 2050 Roadmap. A dedicated group of experts has initiated work to update the Roadmap and assess progress made on the decarbonisation levers, with the objective of adjusting them where needed and adding a 2040 target on the 2030-2050 path, already set out. It is our intention to present the updated Roadmap in time for the newly elected European Parliament and new European Commission in 2024.



CEMBUREAU has published on its website an interactive map of decarbonisation investments, which references 100 projects for which information is publicly available."



CORT



ConsenCUS

# 1ton

The primary aim of this CCS value chain is to capture and transport 1 ton of CO<sub>2</sub> per day.

### Cementir Holding

#### CORT, ConsenCUS and CASPER: pilot testing facilities at Aalborg Portland

These pilot projects, running from October 2023 to March 2026 at Aalborg Portland, assist in evaluating technologies for full-scale implementation by the company to meet the target of 400,000 tons of CO<sub>2</sub> per year.

The aim of CORT is to test innovative solvents and process equipment in order to optimize operational capture conditions. This will result in the identification of the best suited solution for emissions reduction with our specific fluegas. As a follow-up, the project CASPER involves liquefying CO<sub>2</sub> and temporarily storing it in ISO containers, which will then be transported to a facility for testing CO<sub>2</sub> injection into a 5km pipeline. The primary aim of this CCS value chain is to capture and transport 1 ton of CO<sub>2</sub> per day while assessing the quality of CO<sub>2</sub> and identifying suitable conditions for pipeline transport.

Finally, the pilot from ConsenCUS aims to test a CCU value chain utilizing a distinct technology. It involves CO<sub>2</sub> capture through absorption in an alkaline solution, followed by electrochemical regeneration of the absorbent, culminating in the production of potassium formate. The primary objective of this pilot is to evaluate a technology with the potential to significantly decrease the overall energy consumption of the process, operating entirely on electricity.



## GCCA Member Action continued



Hydrogen injection in Piedras Azules Plant, Honduras



Co-processing in Cartagena Plant

**+3%**

The trial achieved a 3% kiln productivity increase and 2% reduction in energy consumption.



### Cementos Argos

#### Hydrogen injection, co-processing and low carbon cement

At Cementos Argos we understand the call to contribute to mitigating the effects of climate change by reducing CO<sub>2</sub> emissions in our production processes and developing new and better products and solutions.

We have successfully increased kiln output and reduced emissions through a hydrogen injection trial in Honduras.

#### Key points:

- **Hydrogen Success:** injecting hydrogen into the kiln's main burner improved productivity and reduced CO<sub>2</sub> emissions.
- **Positive Outcomes:** the trial achieved a 3% kiln productivity increase and 2% reduction in energy consumption. It is financially feasible with a \$5.5 million net present value (NPV) and 204% internal rate of return (IRR).

With the co-processing in our Cartagena plant, we have achieved a certification for around 20,000 carbon bonds, making it one of Colombia's first industrial sector emission reduction projects. We used diverse waste sources and plan to expand, expecting over 30 tons of annual emission reductions.

In Argos North America, we are reducing our carbon footprint by adopting Portland Limestone Cement (EcoStrong PLC) in place of traditional cement. This transition has lowered CO<sub>2</sub> emissions significantly by reducing the clinker cement factor from 89% in 2021 to 80% in 2022. PLC is more environmentally friendly and improves production capacity and sales margins.



**At our alternative raw materials facilities, we provide a second life for industrial waste, generating high-quality and sustainable products."**

**Carlos Martinez**  
Chief Strategy and Sustainability Officer, Cementos Molins

### Cementos Molins

#### Alternative Raw Materials

Our alternative raw materials plant has reached a significant milestone in its first year of operation, recovering more than 75,000 tonnes of industrial and construction water and reincorporating it into the value chain.

Covering more than 3,250 square metres, the plant prevents waste from ending up in landfills and converts it into valuable resources, for the manufacture of building materials, thus promoting the circular economy.

We apply two treatments to the waste that we receive. Crushing and sifting processes are used, chiefly for the waste generated at our concrete plants, turning it into high quality and CEO-marked recycled aggregates. Moreover, a waste dosing and homogenisation process is applied, to produce the alternative materials that will be used in the manufacture of our cements, replacing natural resources.

The alternative raw materials plant has enabled us to significantly increase the replacement of raw materials with alternatives, which currently accounts for 12.7% of the manufacture of our cements. All this allows us to offer our customers more competitive products in terms of efficiency and sustainability.

Our commitment to the circular economy, a pillar of our 2030 Sustainability Roadmap, reduces our carbon footprint and gives a second life to a high percentage of the materials that we use.

The alternative raw materials plant asserts the commitment of Cementos Molins to the development of sustainable and innovative products for the construction industry.





## GCCA Member Action continued



# 95%

The objective is to achieve a projection where, by 2028, 95% of the company's cement sales are from blended varieties.

### Cementos Pacasmayo

#### New Cement in Perú with lower carbon footprint than OPCs

High Early-Strength (HE) cement is Cementos Pacasmayo's latest addition to its product line, intended to gradually replace traditional Portland cement. This novel cement formulation adheres to the ASTM C1157 standard and has a reduced clinker content, with approximately 8% reduction when compared to the traditional Type I cement.

Therefore, this results in an embedded CO<sub>2</sub> reduction of around 9%. The development of this cement is in constant improvement, thus it has the potential to incorporate supplementary cementitious materials or even process additions in the future.

Initially, HE is targeted at the handcrafted precast segment, but is part of an ambitious product development strategy to expand its use across other business units.

Currently, 85% of Cementos Pacasmayo's sales derive from blended cements. The objective behind these new cement types is to achieve a projection where, by 2028, 95% of the company's cement sales are from blended varieties. This aligns with the Peruvian Cement Industry Roadmap, that the company has endorsed.



### Cementos Progreso

#### Co-processing of solid and liquid waste

In 2023, a new alternative fuels feeding system that allows the co-processing of tyres began to operate at San Gabriel Plant, adding to the already installed co-processing capacity of San Miguel Plant. In 2022 and so far in 2023, both plants together have co-processed 25,228.03 tons of waste, generating a total of approximately 695 TJ of energy.

Of the total amount of energy generated from alternative fuels, 22 TJ came from the co-processing of municipal waste recovered from the Motagua River, one of the most important and extensive rivers in Guatemala, and also, unfortunately, one of the most polluted in the world.

This project has been considered a shining example in the region, since it has made it possible to learn about the benefits of co-processing, generating sustainable and viable solutions for the integral management of solid waste.

In addition to the reduction of emissions that the co-processing allows, this project prevented tons of solid waste from entering the ocean, having a direct impact in the proper disposal of waste, the adequate management of water resources and the recovery of polluted water bodies. This demonstrates that an adequately oriented decarbonisation strategy can impact several economic and social development targets, according to the specific needs and circumstances of each country.

2022-2023

Type	Co-processed amount (t)	Energy generated (GJ)	Avoided emissions per petcoke substitution (tCO <sub>2</sub> )
Liquid waste	1,596.81	59,081.97	5,760.49
Tires	6,775.74	189,720.72	18,497.77
River solid waste	845.43	22,403.90	2,184.38
Other solid waste	16,010.05	424,266.33	41,365.97
<b>Total</b>	<b>25,228.03</b>	<b>695,472.91</b>	<b>67,808.61</b>

# 695 TJ

In 2022 and so far in 2023, both plants together have co-processed 25,228.03 tons of waste, generating a total of approximately 695 TJ of energy.



#### News links:

[Alianzas del MARN contribuyen al saneamiento del río Motagua:](#)



[MARN, al rescate del río Motagua:](#)



[MARN y Cementos Progreso trabajan en la limpieza del Río Motagua:](#)





## GCCA Member Action continued



The CERO2 carbon footprint measurement tool is the result of years of development efforts by Cemex and calculates the detailed environmental impact of the products."

### Cemex

#### Providing environmental impact disclosure for all its products globally

Cemex is making progress on our industry's commitment to full product transparency by providing environmental impact information, including CO<sub>2</sub> emissions, for all its core products in all its main markets around the world.

The information is customised by each location, providing critical data for architects, engineers, contractors, and customers in general looking to develop more sustainable construction. The information is accessible through Environmental Product Declarations (EPDs) or from Cemex's proprietary environmental measurement tool called CERO2. Both processes have a third-party validation. The CERO2 carbon footprint measurement tool is the result of years of development efforts by Cemex and calculates the detailed environmental impact of the products.



Çimsa Afyon Solar Power Plant



Çimsa's commitment extends to technological advancements, evident in the efficient operation of the WHR Facility and the establishment of a Solar Power Plant in Afyon."

### Çimsa Cimento

#### ÇİMSA 1 Year Action Progress

Çimsa has made significant strides in its sustainability journey, emphasizing a commitment to a low-carbon future. The company successfully increased the utilisation of alternative resources, surpassing 26% in 2022 and aiming for over 30% in alternative fuel usage by 2023. In 2022, 3% of alternative raw materials were incorporated into production processes, showcasing a dedication to eco-friendly practices.

A primary focus on process optimisation has resulted in a commendable 21% reduction in absolute emission values, underscoring Çimsa's dedication to environmental responsibility. Energy efficiency and renewable energy initiatives have yielded impressive results, with the company achieving substantial energy savings of 7.1 TJ thermal and 1,617 MWh electrical energy. Notably, 58% of energy comes from renewable sources, including Waste Heat Recovery (WHR), Solar Energy Supply (SES), and I-REC Certification.

Çimsa's commitment extends to technological advancements, evident in the efficient operation of the WHR Facility and the establishment of a Solar Power Plant in Afyon. Strategic investments, including the planned Organic Rankine Cycle (ORC) WHR Facility in Eskişehir, position Çimsa as a leading player in the Calcium Aluminate Cement (CAC) market.

The company's dedication to sustainability is further emphasised by its diverse and sustainable product portfolio, with products like Flycrete aligning with the EU Taxonomy. These achievements underscore Çimsa's holistic approach to sustainability, positioning it as a forward-thinking and responsible industry leader.





## GCCA Member Action continued



### CNBM

#### Rehabilitating the environment

Huzhou South Mining Ltd., is one of the subsidiaries of CNBM and focuses on limestone mining for cement plants. The Dameishan Quarry of Huzhou South Mining, with a capacity of 2.8-million-tonnes of limestone per year, has started mining since 1983 and formed three final slopes with a total area of 121,600 square meters. CNBM have invested over \$1 million in rehabilitation of these final slopes.

After the completion of the rehabilitation project, vegetation recovery has greened the mining area, established ecological species and communities, and gradually shifted from preliminary greening to ecological harmony.



# \$1m+

We have invested over \$1 million in rehabilitation of these final slopes.



CNBM



### CRH

#### New waste co-processing facility helping to decarbonise clinker production at CRH

Among the emissions reduction levers the GCCA's 2050 Roadmap is targeting, is reducing the use of fossil fuel in clinker production, through the increased use of alternative fuels. One example of this in action is CRH's new waste processing facility in Romania. In a first of its kind, the plant processes non-recyclable waste into alternative fuel specifically for cement production.

Operating a fully closed system from collection to processing, the Sapphire Fagaras plant processes industrial waste such as plastics, paper, cardboard and textiles, which would otherwise go to landfill. Once processed, this waste can be used to replace carbon intensive fossil fuels in cement plants, with lower carbon options, contributing to emissions reduction. The plant has an installed capacity of 50,000 tonnes per year with potential to be scaled up in the future.



# 42.4m

In 2022, CRH used 42.4 million tonnes of wastes and by-products from other industries as raw materials and alternative fuels.

The use of alternative fuels in cement production is an important part of CRH's decarbonisation roadmap and the Sapphire facility is helping Romcim, a CRH Company in Romania, to increase the rate of fossil fuel substitution at its Hoghiz cement plant. The Plant has been using alternative fuels for over twenty years and the additional alternative fuel being provided by Sapphire has helped the Plant increase its substitution from 40% to 52% in 2023.

Driving decarbonisation and reducing waste are key pillars of CRH's sustainability framework. In 2022, CRH used 42.4 million tonnes of waste and by-products from other industries as raw materials and alternative fuels. The company's Scope 1 and 2 absolute carbon emissions decreased by 7%, from 36.0 million tonnes in 2021 to 33.6 million tonnes in 2022. CRH also saw an improvement in its cement specific net CO<sub>2</sub> emissions per tonne of cementitious product, which reduced to 566kg (from 586kg in 2021), a 27% reduction on 1990 levels.





## GCCA Member Action continued



Bamboo plantation

# +50%

The project aims to promote sustainable farming practices among the target group, with an anticipated increase in income of 50%.



### Dalmia Cement

#### Using Bamboo for Sustainable Development of Dalmia Cement and its stakeholders

Dalmia Cement has launched a project in partnership with GIZ aimed at fostering bamboo cultivation as a climate-resilient and sustainable source of livelihood for farmers, and simultaneously using the bamboo as a means of decarbonisation, by incorporating it into its cement plants as an alternate fuel. It is being implemented around the three integrated cement plants of Dalmia, in Umrangso (Assam), Rajgangpur (Odisha) and Dalmiapuram and Ariyalur (Tamil Nadu).

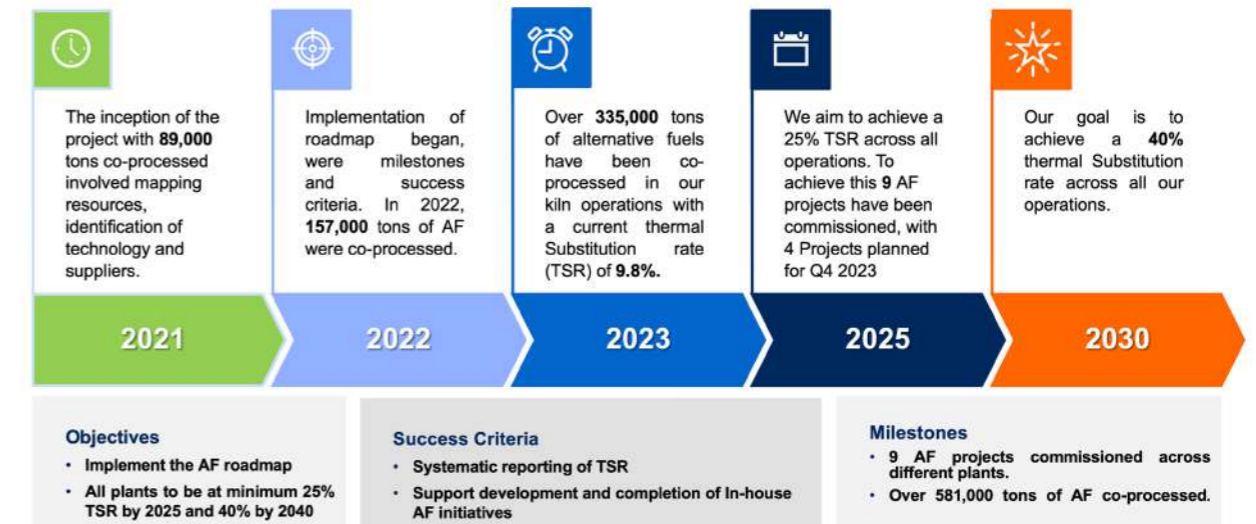
Bamboo is an economically and ecologically very viable regenerative alternate fuel, as on average, one acre of Bambusa Balcooa cultivation can sequester around 4,800 kgs of CO<sub>2</sub> from its third year of plantation. India has the second-largest bamboo resources in the world. It can be planted on areas with poor soil quality, and is not labour intensive, thus becoming a solution for additional agricultural income even for marginalised small farmers. It is also a rapidly regenerative energetic alternative to coal for industries with high energy consumption, with a calorific value comparable to coal (6,900 – 7,000 kcal/kg compared to 7,800 – 8,000 kcal/ kg).

An estimated 120,000 tons of bamboo will be made available annually from third year of cultivation, with a saving of around 30% on the cost of the traditional fuel it would replace. Additionally, from the third year of plantation, a minimum 14.40 million kgs of CO<sub>2</sub> will be sequestered annually through this project.

Approximately 4,000 farmers will adopt the newly acquired pre and post harvest cultivation practices for bamboo plantations. Additionally, 3,000 farmers will become members of six newly established farmer's collectives (FPOs). The project also aims to promote sustainable farming practices among the target group, with an anticipated increase in income of 50% along with shift towards sustained long-term source of income.

The project started with a pilot in Umrangso, Assam in 2020. Already, more than 1.3 Lakh saplings have been planted in 600 acres of land. The project is being implemented with community participation and involves mobilisation, training and regular consultation and coordination with farmers. Seven hundred farmers are currently involved with the project.

### Our Alternative Fuel Journey so far



As a foundational member of the GCCA, we follow technology developments in the industry to support decarbonization initiatives."

### Dangote

Dangote Cement is Africa's largest cement producer with a production capacity of 52 million tonnes per year across ten countries in Sub-Saharan Africa. Through regional integration our vision is to help the continent to become self-sufficient cement. As a foundational member of the GCCA, we follow technology developments in the industry to support decarbonization initiatives, including our Alternative Fuel project.

On our decarbonisation journey, we have made progress through the adoption of the alternative fuels project for reducing our environmental footprint. Since the project commenced in 2021, over 581,000 tons of alternative fuels have been coprocessed. Currently at 9.8%, thermal substitution rate with AF is steadily progressing toward our 2025 and 2030 targets of 25% and 40%.

As the population of Africa expands, the region urgently needs infrastructure which creates an opportunity to serve a population of about 1.3 billion people while protecting the planet.





## GCCA Member Action continued



Yellow Crowned Kākāriki

# 115k

Winstone Aggregates plants  
approx. 115,000 trees per year.



### Fletcher Building

**Positive Biodiversity by 2030 – Winstone Aggregates, the first quarrying company in Australasia to commit to a Positive Biodiversity Programme**

Winstone Aggregates is committed to kaitiakitanga – being excellent custodians of the planet – both now and for generations to come. As a leader in sustainability, over the past few years it has rehabilitated 110ha of land, planting approx. 115,000 trees per year, translocated wildlife to new habitats, has more than 100ha under active pest control, and reduced its carbon emissions by 19%. The company has bold ambitions to keep building on the work it has already doing to rehabilitate the environments and ecosystems it works in, which is why it has launched a Positive Biodiversity Programme. This involves supporting local people and communities, and constantly resetting the standard for sustainability that others will aspire to.

Its goal is to impact the environment in a positive manner, through restoring its existing forest ecosystems around Aotearoa. To do this it has developed a framework with the company Nature Positive, that is consistent with the International Union for Conservation of Nature (IUCN) and the Biodiversity Indicator and Reporting System (BIRS). It's also working with Mana Whenua to weave in Mātauranga Māori frameworks, which will further strengthen the strategy. This will enable the company to reach positive biodiversity by 2030.

Winstone Aggregates will undertake 270ha of voluntary, long term pest control and develop four biodiversity management plans at its Otaika, Whitehall, Hunua and Belmont quarries. These management plans will set out the baseline and detail how biodiversity values will be enhanced, tracked and managed. Alongside this, it will be funding initiatives to help support the recovery of the Yellow Crowned Kākāriki, a beautiful parrot that has been declining at an alarming rate across Aotearoa.



Heidelberg Materials' Geseke cement plant  
©Steffen Hoefft for Heidelberg Materials



Rendering of the carbon capture installation  
©Heidelberg Materials



**The GeZero carbon capture project will fully decarbonise cement production at the company's Geseke plant."**



### Heidelberg Materials

**Pioneering a full CCS value chain solution in Germany: Heidelberg Materials' newly launched GeZero project**

To reach international climate goals, first full-scale capture plants in the cement sector need to be operational before 2030, and Heidelberg Materials is taking responsibility as a frontrunner. Its newly launched GeZero carbon capture project will fully decarbonise cement production at the company's Geseke plant in Germany.

Showcasing an entire CCS value chain solution for an inland location, the first-of-its-kind project aims to capture 700,000 tonnes of CO<sub>2</sub> annually from 2029. The holistic approach of the GeZero project also considers the possibility that a pipeline infrastructure might not (yet) be operational by 2029. As the Geseke plant already has a functional rail loading facility, the CO<sub>2</sub> will be initially transported via train which allows an even faster implementation of the project and a unique opportunity to demonstrate the feasibility for other inland locations.

Support for GeZero is also expressed by the EU Innovation Fund, one of the world's largest funding programmes for innovative low-carbon technologies, which recently selected the project for Grant Agreement Preparation. With about a dozen CCUS projects already underway, Heidelberg Materials aims to reduce its CO<sub>2</sub> emissions by 10 million tonnes by 2030.



**GCCA Member Action**  
continued



**100%**

Oxyfuel technology captures almost 100% of CO<sub>2</sub> emissions during cement production.



**Holcim**

**Decarbonizing our operations with CCUS**

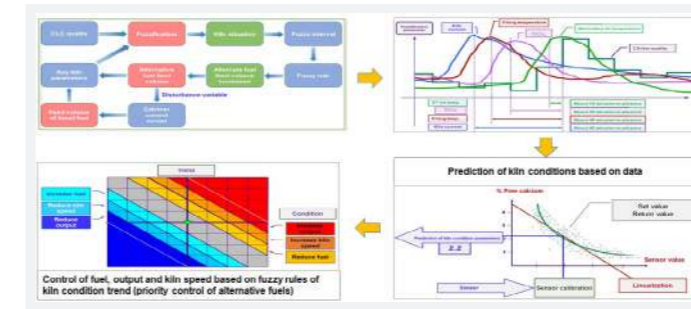
The Carbon2Business project aims to capture CO<sub>2</sub> from Holcim's plant at Lägerdorf and repurpose it as an industrial raw material. From 2029, the project will capture more than 1 million tons of CO<sub>2</sub> emissions annually, making cement production at the Lägerdorf plant entirely net zero.

The captured CO<sub>2</sub> can be processed into e-methanol through methanol synthesis or reprocessed as a raw material, for example to produce plastics. With this utilisation project, Holcim is creating new value chains and developing technologies to enable the decarbonisation of industrial companies beyond the cement industry. The project was awarded a grant from the European Union Innovation Fund in 2022.

**The technology behind the project**

The €109.8 million investment from the EU will be used to build a new kiln line with an innovative oxyfuel process. Combustion air is substituted with pure oxygen resulting in a CO<sub>2</sub>-rich flue gas, which is then cooled down, purified and liquified in a Carbon Processing Unit (CPU).

Alternative capturing concepts in the cement industry are based on so-called end of pipe solutions, where CO<sub>2</sub> needs to be separated and processed. Oxyfuel technology allows an integrated approach which is more energy efficient. The technology captures almost 100% of CO<sub>2</sub> emissions during cement production. The flue gas is then further processed into a high-purity CO<sub>2</sub> gas as a feedstock for the chemical industry and used as a raw material for other industries.



The company is working to realise the large-scale use of alternative raw materials and fuels in cement plants for long-term stable operation."

**Huaxin**

**Development and Application of Key Technologies for Intelligent Low-Carbon Manufacturing of Cement**

Huaxin Cement is developing intelligent technology for low-carbon manufacturing of cement, including an advanced intelligent control system for low-carbon manufacturing of cement under complex raw materials and fuels, an intelligent joint storage material processing system based on unmanned driving technology, an intelligent on line quality control system for cement driven production processes using quality data, and an intelligent equipment monitoring and optimisation system for comprehensive monitoring of production equipment and safety.

These systems have been widely promoted and applied in the Huaxin cement plant, and the alternative fuel substitution rate has increased by over 5%. As of now, The TSR of alternative fuels (mostly RDF) of the entire group has reached 22.5%, with Huaxin Huangshi plant exceeding 40%, which is significantly better than the Chinese cement industry average of 2%. The company is working to realise the large-scale use of alternative raw materials and fuels in cement plants for long-term stable operation, and significantly reduce carbon emissions.

**40%**

The TSR of alternative fuels of the entire group has reached 22.5%, with Huaxin Huangshi plant exceeding 40%.





**GCCA Member Action**  
continued



JK Cement, Muddapur, India

**35%**

The new investments will power the unit to replace more than 35% of fossil fuel with alternative fuels.

**JK Cement**

**Clean Energy is empowering the JK Cement Muddapur, Karnataka India in achieving Climate Targets**

JK Cement has an SBTi Target of reducing its CO<sub>2</sub> emissions by 21.7%, from FY2020 level of 680 kg CO<sub>2</sub>/t cementitious material to 532 kg /t cementitious material by FY2030. The company is Improving energy efficiency, green power share, use of clean fuel and increasing the Blended Cement to achieve the climate target.

One of the integrated units located at Muddapur in Karnataka India has played a major role in reducing 17% of the group GHG emission target by FY2023 from FY2020 base value. The Muddapur unit has increased its green power consumption to 78% in FY2023 and is at the final stage of installing a WHRS plant, which will soon make it India's first unit operating on 100% clean electrical energy.

The energy consumption portfolio of the unit consists of 9% electrical and 91% thermal energy consumption. They have been continuously investing in new technologies such as an improved AFR feeding system and chlorine by-pass system to overcome the hurdles in consuming AFR. The Muddapur kiln has increased the TSR rate by 19.6% by FY2023. The new investments will power the unit to replace more than 35% of fossil fuel with alternative fuels.



Clinker

**90%**

The company is producing primarily the GGBS and PSC, using Blast Furnace (BF) Slag, which accounts for almost 90% of its total product portfolio.

**JSW**

**Using Al-killed slag in clinker production leading to CO<sub>2</sub> reduction**

Nandyal is an integrated unit of JSW Cement works. The company, built on the philosophy of the circular economy, is producing primarily the GGBS and PSC, using Blast Furnace (BF) Slag, which accounts for almost 90% of its total product portfolio.

The company has a dedicated R&D department which works aggressively towards utilisation of different types of slags in its manufacturing operations. In 2022-23, the company started to explore the possibility of adding slags to the raw ingredients for the production of clinker, without affecting its quality parameters. After conducting a few trials around raw mix optimisation, the company is currently using Al-killed Slag - another type of by-product, beside BF slag, from steel plants, at its Nandyal plant. This has led to not only a reduction of CO<sub>2</sub> emissions but also resulted in the conservation of virgin raw materials, such as limestone. In FY 23, the company has used ~43000 T of Al-killed Slag partly substituting Limestone and Alumina and has avoided ~7000 T of CO<sub>2</sub> emissions.



Al-killed Slag





## GCCA Member Action continued



### MPA

#### Mineral Products Association trials of calcined clay in cement could reduce carbon by up to 40 per cent

A new project trialling the use of calcined clay in cement and concrete manufacture could lead to carbon savings of up to 40 per cent and a more sustainable use of resources, if implemented across the UK.

The Mineral Products Association (MPA) has been appointed lead partner for the research, which will demonstrate how calcined clay can be used to both utilise by-products from other industries and create low carbon cements.

Funded by an Innovate UK grant award, the two-year project will use two main sources of clay materials – one arising from overburden at mineral extraction sites and another from brick manufacturing. Calcined clays from these sources have the potential to divert 1.4 million tonnes of material from potential waste streams and cut the embodied CO<sub>2</sub> of cement by an expected range of 20–40 per cent, compared to the market leading CEM I cement.

Using clay also requires less, or in some cases no heating (for example when using waste brick) when compared to cement clinker production.

Clay is a naturally abundant material in the UK, which can offer an alternative to other industrial by-products, including ground granulated blast-furnace slag (GGBS) and fly-ash which are being successfully used to lower embodied carbon within cement.

Two heating methods are being trialled to prepare the clay for use in cement and concrete. These are a rotary kiln, a commonly used technique, and innovative 'flash heating'.

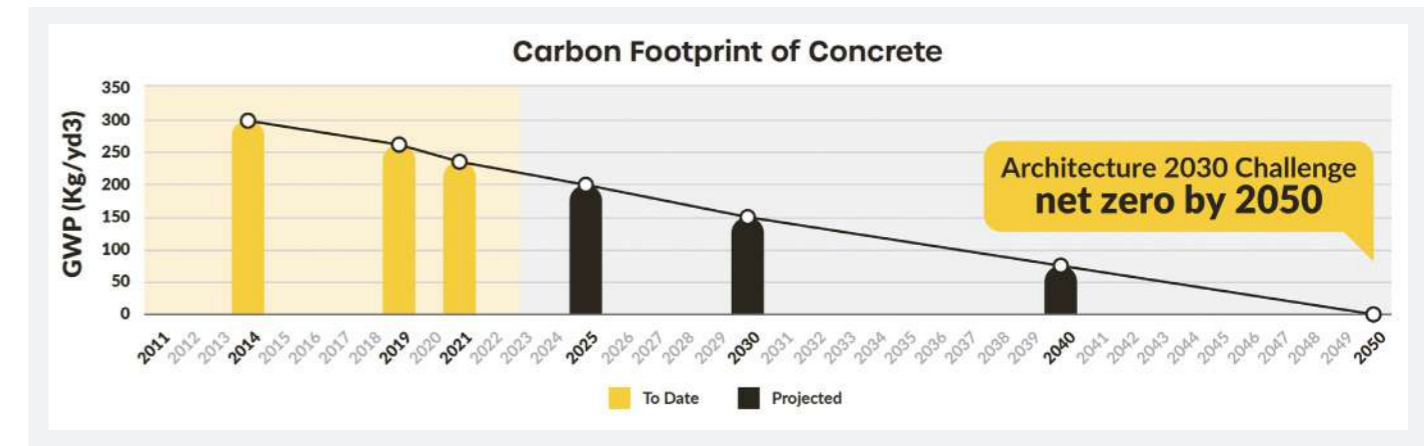
This project will be supported by industry partners Tarmac, Hanson, Imerys and Forterra, with research partners from the University College London and the University of Dundee.

Once the research project is completed, the MPA will share the results to drive adoption of this technology by cement manufacturers across the UK.

Low carbon cements and concretes represent one of seven key levers in MPA UK Concrete's Roadmap to Beyond Net Zero. Published in 2020, the roadmap sets out the UK concrete and cement industry's own commitments to achieving net zero, having already decarbonised by 53 per cent since 1990.



Clay is a naturally abundant material in the UK, which can offer an alternative to other industrial by-products including ground granulated blast-furnace slag (GGBS) and fly-ash."



### NRMCA

#### Concrete's Journey to Carbon Neutrality

In 2012, the National Ready Mixed Concrete Association (NRMCA) adopted the Architecture 2030 Challenge, which has goals to reduce operational carbon and embodied carbon from the built environment to net zero by 2050. NRMCA has been tracking its members' environmental impacts since 2014 when it published its first LCA and benchmark report. Measuring carbon footprint over time is a major strategy for meeting a 2050 carbon neutrality goal for the concrete industry.

#### The Top 10 Ways to Reduce Concrete's Carbon Footprint:

- Communicate carbon reduction goals
- Ensure good quality control and assurance
- Optimize concrete design
- Specify innovative cements
- Specify supplementary cementitious materials
- Specify admixtures
- Set targets for carbon footprint
- Don't limit ingredients
- Sequester carbon dioxide in concrete
- Encourage innovation

Through extensive research and groundbreaking technologies, the concrete industry is at the forefront of environmental stewardship. Concrete has one of the lowest carbon footprints of any building material on a per-unit weight basis, and we strive every day to continue reducing our carbon emissions through product innovation, transparency, research, education and collaboration. NRMCA collaborates with design and build teams through its Build With Strength initiative, to adopt innovative products that improve building performance at lower cost, with a reduced carbon footprint.



Through extensive research and groundbreaking technologies, the concrete industry is at the forefront of environmental stewardship."

Build With Strength:



NRMCA Sustainability:





**GCCA Member Action**  
continued



**13.2%**

During 2022–23, Orient Cement achieved TSR of 13.2% by consuming 72591t of alternative fuels by replacing 55900t of fossil fuels.

**Orient Cement**

**2030 Targets**

Orient Cement recognises its responsibility towards the planet and its people. It aspires to achieve the following targets by the year 2030:

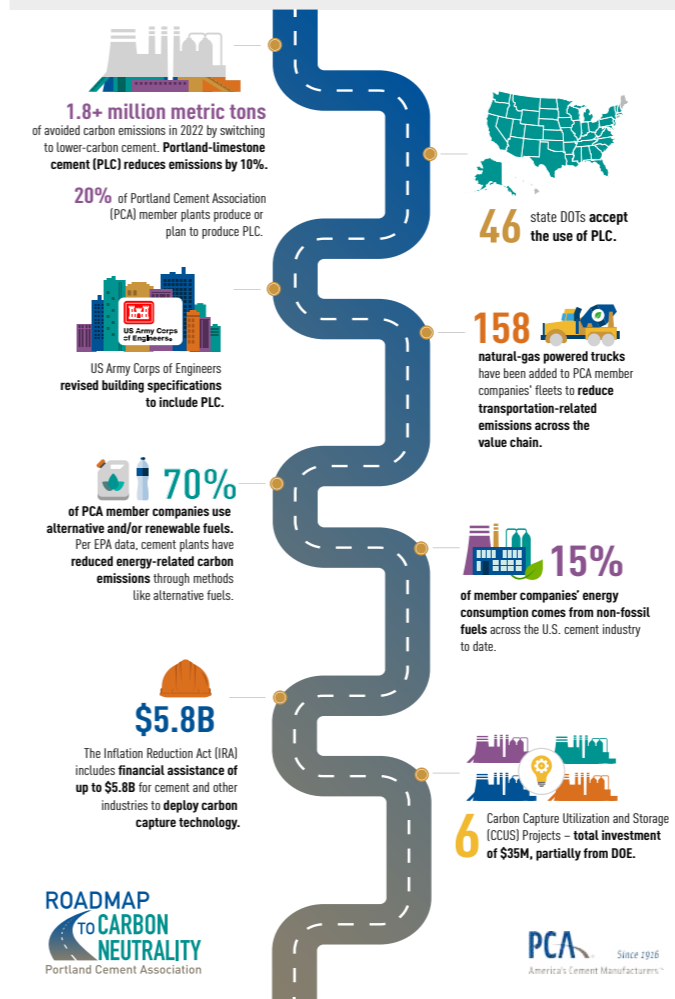
- 25% TSR
- 50% of the total energy to come from renewable energy and WHRS.
- achieve 40% reduction in Specific Net Scope 1 and 2 CO<sub>2</sub> emissions, with the base year 2020–21.

During 2022–23, Orient Cement achieved TSR of 13.2% by consuming 72591t of alternative fuels, by replacing 55900t of fossil fuels. During the same period, it doubled its share of renewable energy to 14.4% of the total energy mix, compared to 2021–22. It has also commissioned 10.4MW WHRS at its Chittapur plant and launched Birla A1 Orient Green, which has a 15% lower carbon footprint than the industry average.

All these efforts have helped Orient Cement in achieving Total Scope 1 and Scope 2 emission intensity / T of cementitious material of 587 Kgs.



**HOW AMERICA'S CEMENT INDUSTRY IS CUTTING EMISSIONS**



**PCA**

The Portland Cement Association, representing the majority of America's cement manufacturers, celebrates the second anniversary of its Roadmap to Carbon Neutrality this fall. In less than two years, the Roadmap is steadily navigating the U.S. cement industry toward decarbonisation. In 2022, more than 1.8 million metric tons of carbon were avoided by the increased adoption of lower-carbon cement in the U.S.

What's more, lower-carbon portland-limestone cement attained a significant milestone in the U.S. in June. It is now the most common hydraulic cement in the U.S. for general concrete construction. According to U.S. Geological Survey data, the market share for blended cements reached 54.5% in June, and PLC's share of blended cement was 95%, marking the first time PLC represented more than 51% of the portland and blended cement market in the U.S. Additionally, more than 70% of PCA member companies use alternative and/or renewable fuels, and six carbon capture and utilisation (CCUS) projects are underway.

Looking ahead, the PCA sees a substantial upswing in efforts to combat climate change. Notably, the PCA is currently spearheading the development of voluntary guidelines for low-carbon cement and concrete. This initiative aims to streamline and enhance sustainability practices across the industry, a crucial step in the industry's journey towards net zero.

More information:





## GCCA Member Action continued



Figure 1  
PPP-Saraburi Sandbox: A Low Carbon City Model



### SCG

#### Thailand Cement Manufacturers Association (TCMA) PPP-SARABURI SANDBOX: A LOW CARBON CITY

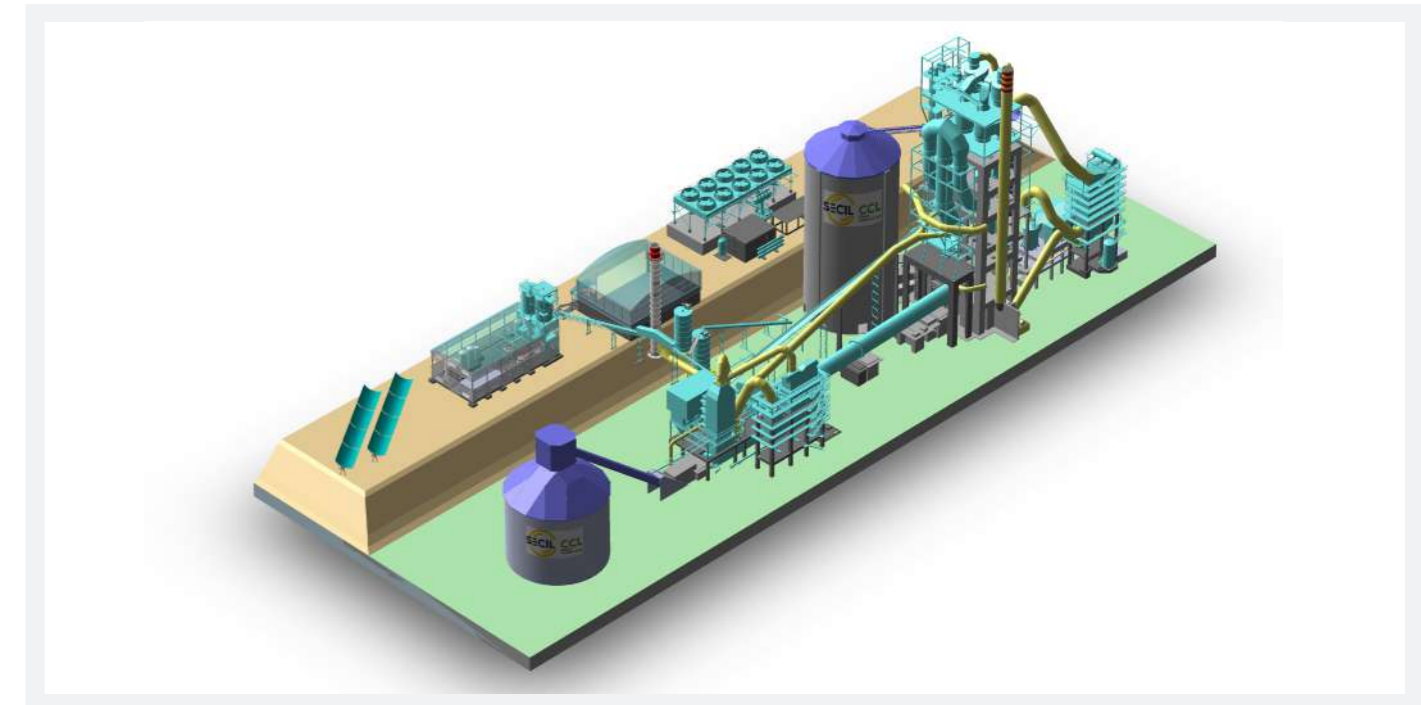
Thailand Cement Manufacturers Association (TCMA) in collaboration with Saraburi province and 23 supporting organisations from government, professional, industry, private society, and business sectors, has introduced the PPP-Saraburi Sandbox, as the nation's pioneering a low-carbon model city with great support from seven ministries as shown in fig.1.

The ultimate goal is to bring GHG emissions practices into line with the Thailand's 2050 Net Zero Concrete and Cement Roadmap, publicly launched last year at COP27, in order to support Thailand's Nationally Determined Contribution (NDC) including energy, industrial process and product use (IPPU), waste management, agriculture, land use, change, and forestry (LULUCF). Thus, a series of pilot projects are being tested and operated under specific collaborative frameworks.

Not only is this sandbox test area like a miniature version of Thailand, but it also helps the industry address key challenges and concerns proactively, and leverage key success factors from the outcomes of such trials. By doing so, this endeavour will help to convert Saraburi into a smart and low-carbon city, to help foster an improved quality of life for its residents and stimulate economic growth and to ensure no one is left behind during the transition.



**Not only is this sandbox test area like a miniature version of Thailand, but it also helps the industry address key challenges and concerns."**



# 20%

The Clean Cement Line Project aims to reduce CO<sub>2</sub> emissions by at least 20%.

### SECIL

#### SECIL'S "Clean Cement Line Project"

The Clean Cement Line Project aims to develop and demonstrate, on an industrial scale, a new cement production technology at the Outão Cement Plant in Portugal. This nearly €90 million project includes four R&D sub-projects aimed at: eliminating the dependence on fossil fuels, increasing energy efficiency including the self-generation of electricity, integration of digitalisation in the production process and the reduction of CO<sub>2</sub> emissions by at least 20%. These innovations will promote the development of the production of a low carbon clinker and consequently the creation of a range of a low carbon footprint line of cements.

More information:





## GCCA Member Action continued



C2SP Kiln



The goal of the project is to develop the world's first calciner to efficiently capture CO<sub>2</sub>, and will include a methanation system suitable for cement production."

### Taiheiyo Cement

#### Development of CO<sub>2</sub> Capture Technology for the Cement Production Process

Taiheiyo Cement Corporation will soon complete a pilot plant to demonstrate technology for CO<sub>2</sub> capture during the cement production process, under a project funded by the New Energy and Industrial Technology Development Organisation.

The goal of the project, which is one of the Green Innovation Funding Projects launched by the Ministry of Economy, Trade and Industry, is to develop the world's first calciner to efficiently capture CO<sub>2</sub>, and will include a methanation system suitable for cement production as follows:

- Development of the CO<sub>2</sub> Capture cement production process (C2SP kiln)
  - This project aims to develop an efficient CO<sub>2</sub> capture technology by installing a unique "CO<sub>2</sub> capture calciner" where oxygen enriched gas is used as a combustion aid to ensure that highly concentrated CO<sub>2</sub> can be captured in a compact device. Existing preheater and rotary kiln equipment can be used without major modification, resulting in high thermal efficiency and maintaining the volume of recycled raw materials that can be utilised.
- Development of the methanation system
  - The captured, highly concentrated CO<sub>2</sub> can be converted to methane (CH<sub>4</sub>) by contact with hydrogen, and the methane obtained can be used as an alternative thermal energy source for cement production and city gas.



### Taiwan Cement

#### Taiwan Cement Corporation's Yingde plant completed "Solar power +" the largest BESS in China's Cement Industry"

From 2022 to 2023, Taiwan Cement Corporation's Yingde Plant completed the construction of PV systems, exceeding 8MWp in capacity, as well as the largest 43.2MW/107.3MWh Battery Energy Storage System in China's cement industry. Led by NHOA Energy, a subsidiary of Taiwan Cement Group known for its technological expertise, it was successfully deployed and connected to the grid. The project's key features including:

- Robust Energy Storage: it consistently stores energy from the grid or renewables, reducing carbon emissions from power applications.
- Peak saving: charges during off-peak hours, reducing reliance on the grid during peak demand, minimising impact of fluctuating electricity prices and achieving significant cost savings.
- Grid Resilience: acts as a reliable resource during grid emergencies, ensuring critical processes continue uninterrupted.

#### Key Indicators:

Annual storage capacity of 46 million kWh.





**GCCA Member Action**  
continued



IFESTOS has garnered recognition at the highest level, having been selected by the EU Commission for grant agreement preparation as part of the third call for large-scale projects under the EU Innovation Fund."

**TITAN**

**IFESTOS: Pioneering Carbon Capture Project for Zero Carbon Cement Production**

IFESTOS is a pioneering Carbon Capture project that not only seeks to propel TITAN Group's decarbonisation journey but also plays a pivotal role in expediting the sector's green transition, and substantially contributing to promoting carbon capture technology throughout the continent. IFESTOS has garnered recognition at the highest level, having been selected by the EU Commission for grant agreement preparation, as part of the third call for large-scale projects under the EU Innovation Fund.

The project involves the construction of a large-scale carbon capture facility at TITAN's flagship Kamari plant near Athens, Greece. This facility will enable the decarbonisation of cement manufacturing and the offering of innovative green building materials in TITAN's markets. TITAN will be producing about 3 million tonnes/year of zero-carbon cement, to serve the growing needs for green construction in the metropolitan area of Athens and beyond.

Kamari will be retrofitted with cutting-edge carbon capture technology, aiming to avoid over 1.9 million tons of CO<sub>2</sub> emissions yearly, potentially ranking it among Europe's largest carbon capture facilities. This project will integrate with a broader ecosystem, uniting carbon capture with sea transportation and storage infrastructure.



Bulk carrier with phosphogypsum consignment berthed at UltraTech jetty

**18%**

The company has also witnessed an increase of 18% in the use of recycled materials compared to FY22.



**Ultratech Cement**

**UltraTech boosts circular economy through novel use of waterways**

In a major boost to the circular economy, UltraTech Cement Limited has leveraged inland and coastal waterways to transport a consignment of 57,000 metric tons (MT) of phosphogypsum in a bulk cargo carrier across India. The stockpile was transported from Paradeep port in Odisha, in the north-eastern part of the country to reach the jetty of Gujarat Cement Works (GCW) on the western coast of the country, on April 26, 2023. This pioneering initiative has demonstrated the use of a multimodal supply chain as a cost-viable and safe transport option for other cement companies to replicate.

A circular economy provides an opportunity to reduce the use of fossil fuels, limestone, and clinker to make cement, and lowers emissions of GHG. UltraTech is constantly building on its efforts to reduce the environmental burden of plastic waste, industrial waste, and municipal waste by using them in cement manufacturing operations.

In FY2023 alone, UltraTech has used more than 29 MMT of alternate fuel, raw materials, and recycled materials in cement production. The company has also witnessed an increase of 18% in the use of recycled materials compared to FY22.

UltraTech's CO<sub>2</sub> net intensity has declined by 12% from the base year of 2017 to net 557 kg CO<sub>2</sub>/tonnes of cementitious products in FY 2022-23. In FY23, UltraTech achieved a plastic negativity of 2.44 times.



## GCCA Member Action continued

Component	Concrete standard 2022 "Concrete 1"	CEM X-technology "Concrete 2"
	kg/m <sup>3</sup>	
Cement	240 (CEM III/A)	365 (28 % clinker, 38 % slag, 34 % limestone filler)
Limestone filler	125	---
Water	127	
w/c	0.53	0.34
Aggregates	1901	
Admixtures (ref. to cement weight)		
Master Glenium 700	1.0 %	0.6 %
Master Suna SBS 6080	1.0 %	0.6 %
CO <sub>2</sub> -content	130	
CSC benchmark DE	300	
CO <sub>2</sub> saving	57 %	

Table 1: EDGE East Side Berlin, CO<sub>2</sub>-optimized concrete: Composition acc. to German concrete standard 2022 and acc. to future CEM X-technology

### VDZ

#### CO<sub>2</sub> efficient concrete for a new high-rise building in Berlin

It has been shown that durable concrete with a clinker content of 20%, 30% slag and 50% unburned limestone can be achieved on a lab scale, if the concrete composition (low w/c) is adapted accordingly.

Based on this research, CO<sub>2</sub>-optimised concrete (CEM X) was used on the 32nd and 33rd floors of a new high-rise building in Berlin.

Cement with a minimum clinker content of 20% and a main constituent content of up to 50% unburned limestone, could have significantly increased CO<sub>2</sub> efficiency. For the time being these cements will be called CEM X.

The case study[1] shows that a further significant reduction in the clinker content in cements with a high proportion of unburned limestone would be possible if the concretes are composed accordingly. With the same amount of slag, fly ash and calcined clay on a global scale, a much greater volume of sustainable and durable concrete can be produced.

During the construction of the EDGE East Side Berlin, CO<sub>2</sub>-optimised concrete was used on the 32nd and 33rd floors. The composition of the concrete C40/50 is given as "Concrete 1" in Table 1. In comparison to the CSC benchmark for a C40/50 in Germany, a CO<sub>2</sub> reduction of 57% and 50% in relation to the average C40/50 was achieved. This is due to the fact that Concrete 1 has an amount of ~ 103 kg Portland cement clinker per cubic meter, whereas the average C40/50 in Germany has a clinker content of 274 kg per cubic metre.



**Cement with a minimum clinker content of 20% and a main constituent content of up to 50% unburned limestone, could have significantly increased CO<sub>2</sub> efficiency."**

Around 500 m<sup>3</sup> of concrete were placed on 12 concreting days. Some of the concrete was pumped at 25 m<sup>3</sup>/h over a distance of up to 285 m. As the concrete had a low water content the stability against segregation and the sensitivity against temperature was an issue. Therefore, an AI-based, accompanying (online) quality assurance system was installed (2, 3, 4). In the future the combination of CEM III/A and limestone filler will also be produced as a factory-made cement called "CEM X" (see "concrete 2" in Table 1).

1. Palm, S.; Müller, C.; Proske, T.; Rezvani, M.; Graubner, C. A.: Concrete application of clinker-efficient cements. *Advances in Cement Research*, Volume 31 Issue 5, 2019, pp. 225-234
2. Leopold Spenner, lecture given at the VDZ annual conference 2022 in Düsseldorf
3. <https://www.meistertipp.de/aktuelles/news/co2-reduzierter-beton-fuer-berliner-vorzeigebau-edge-east-side>



4. <https://www.master-builders-solutions.com/de-de/%C3%BCber-uns/project-references/project-reference-edge-east-side-berlin-tower>



### Votorantim Cimentos

In September 2022, the Votorantim Cimentos cement plant in Alconera (Badajoz, Spain) started a transformative decarbonization journey as it achieved a remarkable 45% thermal substitution rate (TSR) in just six months by incorporating the use of alternative fuels, such as RDF and biomass. This remarkable accomplishment, which typically may take years to achieve, demonstrates the company's commitment to progress. Votorantim Cimentos' goal to this plant is to reach an 80% TSR by 2027.

This success is attributed to the expertise of Votorantim Cimentos' team, combined with a substantial investment, solidifying the company's role as a pioneer in sustainable operations.

Additionally, Votorantim Cimentos' strategic commitment to increasing the use of alternative fuels and the creation of a dedicated team to source these materials have played a pivotal role in this achievement. Strong communication among all the parties in the whole value chain has also been a key factor in achieving a high TSR in a short period of time.

This important effort in co-processing combined with different process improvements and other decarbonization levers have resulted in a significant reduction in CO<sub>2</sub> net emissions, which have decreased from 639 kg CO<sub>2</sub>/ton cementitious in 2022 to 557 kg CO<sub>2</sub>/ton cementitious currently, aiming to reach 398 kg CO<sub>2</sub>/ton cementitious by 2028.

This journey reflects the transformative impact of fast adaptation, strategic investment, and the company's unwavering dedication to shaping a sustainable and thriving future.



## Our global reach

### Reach

# 80%

GCCA members account for 80% of the global cement industry volume outside of China – and include several leading Chinese manufacturers.

Our member companies and association partners operate in almost every country of the world

### Our Members

Adani Cement (pending application)	Huaxin Cement
Asia Cement Corporation	JK Cement
Breedon Group	JK Lakshmi Cement (pending application)
Buzzi S.p.a	JSW Cement
Cementir Holding	Medcem
Cementos Argos	Misr Cement Group
Cementos Moctezuma	Nesher Israel Cement Enterprises
Cementos Molins	Norm Cement
Cementos Pacasmayo	Orient Cement
Cementos Progreso	PT Solusi Bangun Indonesia
Cemex	SCHWENK Zement
Cimenterie Nationale	Secil
Çimsa Cement	Siam Cement Group
CNBM	Siam City Cement
CRH	Taiheiyo Cement
Dalmia Cement	Taiwan Cement Corporation
Dangote	TITAN Cement Group
Emirates Steel Arkan	UltraTech Cement
Fletcher Building	UNACEM
GCC	Vassiliko Cement
Heidelberg Materials	Votorantim Cimentos
Holcim	YTL Cement

### National & Regional Association Partners

Asociación de Fabricantes de Cemento Portland – Argentina	European Cement Association (CEMBUREAU)
Asociación de Productores de Cemento – Peru	European Federation Concrete Admixtures
Associação Brasileira de Cimento Portland – Brazil	European Ready Mixed Concrete Organisation
Association of German Cement Manufacturers (VDZ) – Germany	Federación Iberoamericana del Hormigón Premezclado – LatAm
Association Professionnelle des Cimentiers – Morocco	Federación Interamericana del Cemento (FICEM) – LatAm
Betonhuis – Netherlands	Japan Cement Association
BIBM – Europe	Korea Cement Association
CANACEM – Mexico	Mineral Products Association – United Kingdom
Canadian Precast Prestressed Concrete Institute	National Ready Mixed Concrete Association – USA
Cement Association of Canada	Portland Cement Association – USA
Cement Concrete & Aggregates Australia	Thai Cement Manufacturers Association
Cement Industry Federation – Australia	The Spanish Cement Association (Oficemen)
Cement Manufacturers Association – India	Turkish Cement Manufacturers Association (TürkÇimento)
Cement Manufacturers Ireland	
Concrete NZ – New Zealand	





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