Global Cement and Concrete Association

CONCRETE FUTURE

ACTION & PROGRESS

2050 Net Zero Roadmap – 1 year on

An update of action and progress of the GCCA and its member companies, 1 year on following the launch of its Concrete Future 2050 Roadmap for net zero concrete.

GCCA member actions

GCCA members actions are driving decisive progress on our industry mission to fully decarbonise. In the last year a myriad of actions, projects, investments are underway. Find out more in this document.

Breedon Group – CEM II /A-L rollout

CANACEM – Mexico-FICEM 2030 Roadmap

Cementos Argos – Technical and Financial Roadmap

Cementos Moctezuma – Replacing Clinker

Cementos Pacasmayo – EcoSaco – Sustainable Packaging

CEMEX – Solar Clinker

Cimsa Cement – Optimising clinker and fuels

CNBM – New WHR Power Generation technology

CPCI – 2030/2050 Net-zero Roadmap Initiative

CRH – ZIN Project in Brussels

Heidelberg Materials – CCUS driving deep decarbonisation

Holcim – Calcinated Clays

JK Cement – Steps Towards Net Zero

JSW – Decarbonisation efforts towards net zero

MPA – State of the Art Net Zero Fuel Mix

Orient Cement – Renewable and Alternative Fuels

SCG – 3D Printed Coral Reef

SECIL – The Clean Cement Line

Shree Cement – Biomass Utilisation and Green Energy

Taiheiyo Cement – Carbon Circulation Technology

Taiwan Cement Corp. – Ultra-High Performance Concrete

TCMA – Working with Stakeholders

UltraTech Cement – Harnessing Green Energy

VICAT – 3D Printed Concrete

Votorantim Cimentos – Renewable Energy

YTL Cement – Net Zero Initiatives

Our action and progress towards a net zero future

This report outlines some of that great work and highlights the ongoing progress the cement and concrete industry is making towards net zero.

5000
$MtCO_2$

The roadmap actions between now and 2030 will prevent almost 5 billion tonnes of CO_2 emissions from entering the atmosphere compared to a business-as-usual scenario.

In 2021, the GCCA launched its 2050 Cement and Concrete Industry Roadmap for Net Zero Concrete, setting out the positive vision for how the cement and concrete industry will play a major role in building the sustainable world of tomorrow.

The 2050 roadmap represented the collective commitment of the world's leading cement and concrete companies – 80% of global cement industry volume outside of China and some key Chinese companies – to decarbonise. We were the first global industry to set out such a detailed pathway.

Our roadmap outlines the levers and milestones in an achievable net zero pathway to help limit global warming to 1.5°C. Forty of the world's leading cement and concrete manufacturers joined forces to accelerate the shift to greener concrete by pledging to cut CO_2 emissions by a further 25% by 2030, marking a decisive step in the race to net zero concrete by 2050.

Building on the decarbonisation progress our industry has made over the past three decades, we are confident of achieving our goal, and our industry is demonstrating meaningful climate action today.

Our member actions are driving decisive progress on our industry mission to fully decarbonise. In the last year alone myriad actions, projects, investments are underway.

There is a long way to go to and we call on the wider built environment, governments and all with an interest in the built environment to join us towards building the sustainable world of tomorrow.

Thomas Guillot
CEO of GCCA

The key levers are set out here and to read the full roadmap, please visit gccassociation.org/concretefuture

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

Our Members

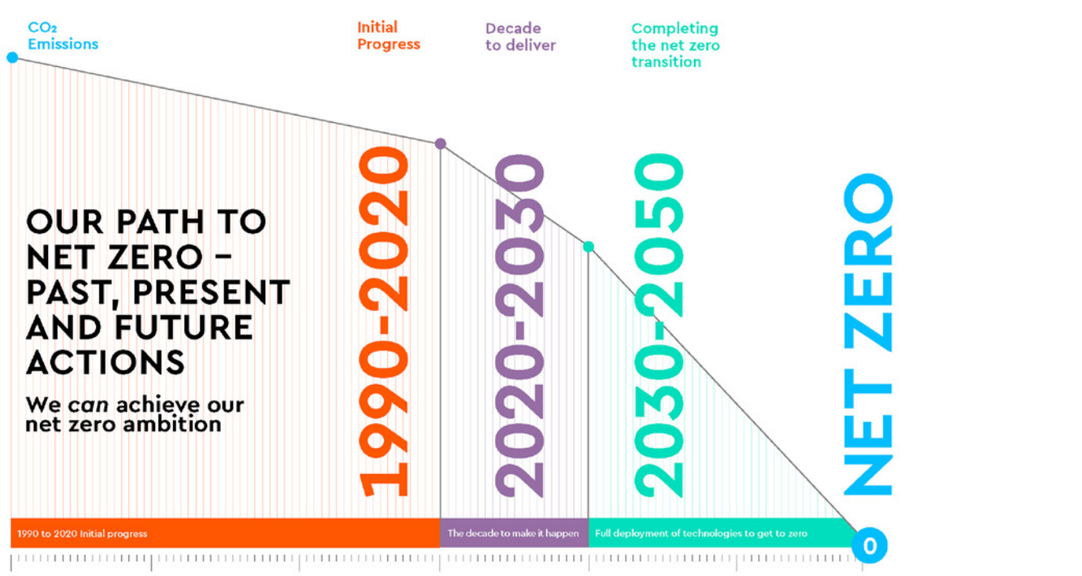
- Asia Cement Corporation
- Breedon Group
- Buzzi Unicem
- Cementir Holding
- Cementos Argos
- Cementos Moctezuma
- Cementos Molins
- Cementos Progreso
- Cementos Pacasmayo
- CEMEX
- China National Building Materials
- CIMSA CIMENTO
- CRH
- Dangote Group
- Dalmia Cement
- Fletcher Building
- GCC
- Heidelberg Materials
- Holcim
- JK Cement
- JSW Cement
- Medcem Madencilik
- Nesher Israel Cement Enterprises
- Norm Cement
- Orient Cement
- PT Solusi Bang Indonesia Tbk
- Schwenk Zement
- SECIL
- Shree Cement
- Siam Cement Group
- Siam City Cement
- Taiheiyo Cement
- Taiwan Cement Corporation
- Titan Cement Group
- Ultratech Cement
- Unión Andina de Cementos (UNACEM)
- Vassiliko Cement Works Public Company
- Vicat
- Votorantim Cimentos
- West China Cement
- YTL Cement

Our Affiliates – partner national and regional industry associations

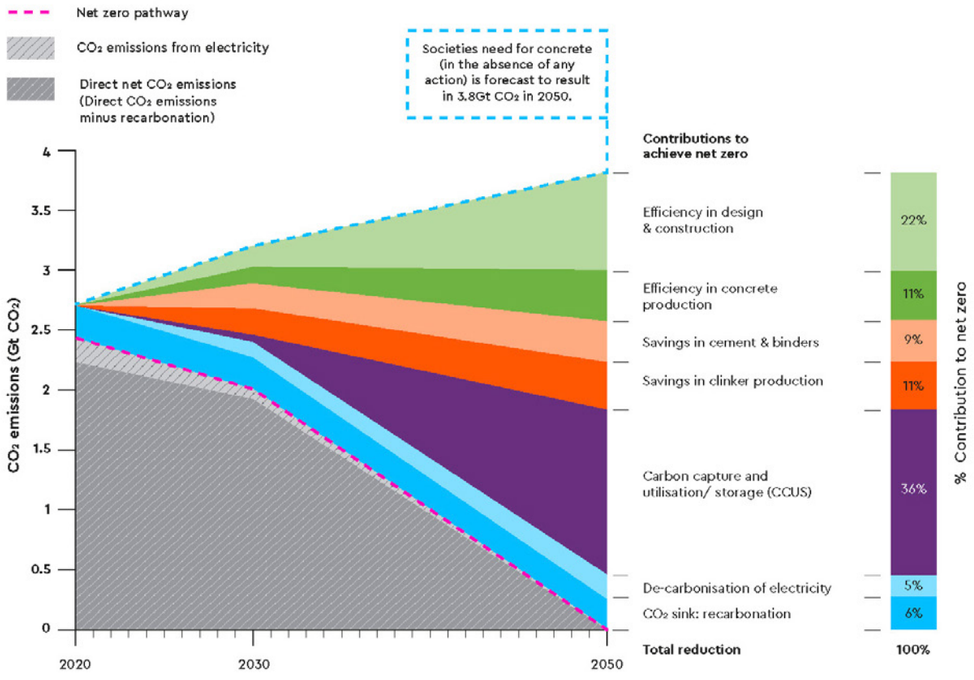
- Asociación de Fabricantes de Cemento Portland (AFCP) – Argentina
- Asociación de Productores de Cemento (ASOCEM) – Peru
- Associção Brasiliera de Cimento Portland (ABC/SNIP) – Brazil
- Association of German Cement Manufacturers (VDZ) – Germany
- Association Professionnelle des Cimentiers (APC) – Morroco
- Betonhuis – Netherlands
- Federation of the European Precast Concrete Industry (BIBM)
- Cámara Nacional del Cemento (CANACEM) – Mexico
- European Cement Association (CEMBUREAU)
- Cement Concrete & Aggregates (CCA) – Australia
- Cement Association of Canada (CAC)
- Cement Industry Federation (CIF) – Australia
- Cement Manufacturers Association (CMA) – India
- Cement Manufacturers Ireland (CMI/IBEC)
- Concrete NZ – New Zealand
- European Ready Mixed Concrete Organisation (ERMCO)
- European Federation Concrete Admixtures (EFCA)
- Federacion Interamericana del Cemento (FICEM) – LatAm
- Federacion Iberoamericana del Hormigon Premezclado (FIHP) – Colombia
- Japan Cement Association (JCA)
- Korea Cement Association (KCA)
- Mineral Products Association (MPA) – United Kingdom
- National Ready Mixed Concrete Association (NRMCA) – USA
- Portland Cement Association (PCA) – USA
- Thai Cement Manufacturers Association (TCMA)
- The Spanish Cement Association (Oficemen) – Spain
- Turkish Cement Manufacturers Association (Turkcimento)

GCCA 2050 Roadmap

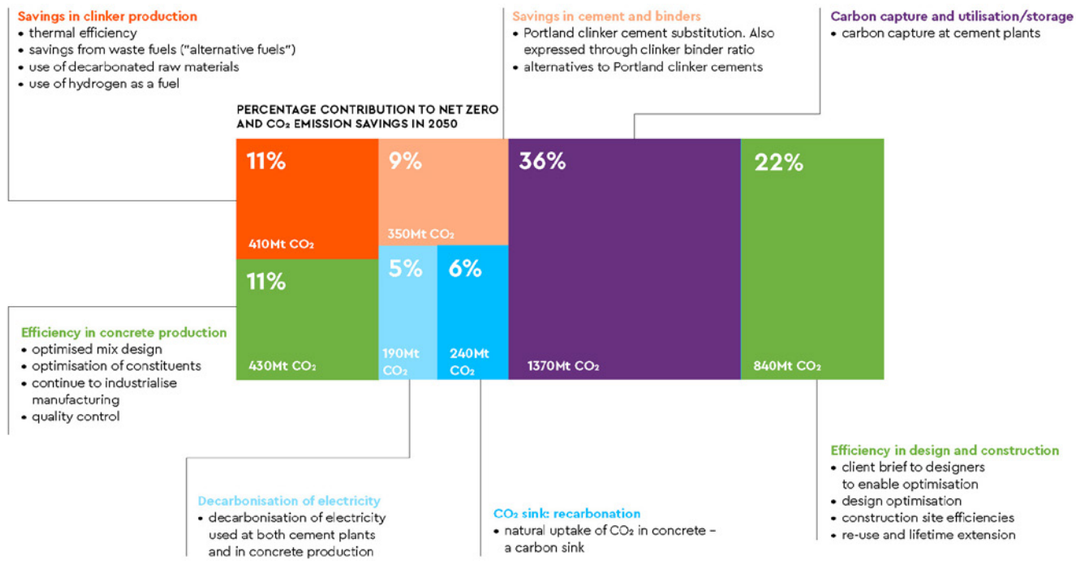
Our path to net zero – past, present and future actions



The net zero pathway



Actions to a net zero future



The decade to make it happen

2020–2030

In this key decade, we will accelerate our CO_2 reductions through the following actions and initiatives:

- increased clinker substitution – including fly ash, calcined clays, ground granulated blast-furnace slag (ggbs), 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

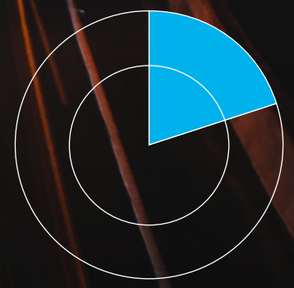
In addition, we will strive for and collaborate in establishing a policy framework to achieve net zero concrete.

2030 CO_2 reduction milestones:
(Compared with 2020 baseline)

Concrete

25%

CO_2 reduction per m^3 of concrete by 2030



Cement

20%

CO_2 reduction per tonne of cement by 2030

Full deployment of technologies to get to zero

2030–2050

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_2 emissions. Alternatives to Portland clinker cements may also play a role in decarbonisation, albeit limited, perhaps around a 5% of the market.

Ultimately, our process emissions mean that whilst we will do all we can to reduce them, CO_2 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 scale to ensure that we can achieve net zero by 2050.

Deployment of carbon capture technology at full scale during cement manufacturing could fully eliminate its process emissions. This, in conjunction with 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.

> Only by working together with stakeholders across the value chain can we achieve net zero."

Join our collective industry mission

The launch of the 2050 roadmap was a milestone moment – the cement and concrete sector was the first of the so-called 'heavy' industries to release a net zero roadmap, receiving backing from global policymakers and stakeholders including the United Nations, World Economic Forum and many more.

A year on from the launch of our roadmap, our industry has made good progress, and is on track to deliver the sustainable world of tomorrow. However, much more needs to be done. Our industry is playing its part today – investing, innovating and evolving to reduce emissions across all practices.

But we won't be able to get there on our own. Lasting success depends on working together with partners across the value chain.

Partnerships and collaboration

We are proud to work with a range of leading organisations and initiatives to help deliver our positive and sustainable concrete future. And we now want to work more closely with all major players across our value chain including equipment manufacturers or admixture producers, consultancy services, and concrete and aggregate producers.

Endorsements and Commentary

António Guterres
Secretary-General, UN

"Three quarters of the infrastructure that will exist in 2050 has yet to be built. The United Nations stands ready to support you in accelerating the transformation of your industry. Let us together lay the foundations for a world of health and prosperity for all. I invite all cement companies to join this vital endeavour."

Nigel Topping
High Level Champion for Climate Action COP26

"Great to see GCCA and its members launch this ambitious agenda. This comes at the right time as we mobilise global support across all industry sectors to deliver real progress in the race to zero emissions. No sector can do this alone but if we all stand up together, support each other and demonstrate bold leadership, then we can ensure a green recovery in which "clean" and "growth" go hand in hand. We need to see action now – to ensure the health and prosperity of people and planet for now and future generations."

UN CLIMATE CHANGE CONFERENCE UK 2021

Diane Hoskins
Co-CEO of Gensler – the world's largest architecture firm

"We are now facing global climate challenges in the built environment, from the raw materials supply chain crisis to the challenge of carbon elimination; from construction procedures to the lack of green technology investments in developing countries. It is critical and urgent that we come together across the full built environment value chain. From the building material we will use, to the efficient design and construction practices, and to the circular economy principles we can adopt – such as reuse and recycle – this full scale collaboration will ensure that, together, we can build the sustainable world of tomorrow."

Gensler

Peter Bakker
President and CEO World Business Council for Sustainable Development

"WBCSD commends the launch of the 2050 Climate Ambition by the cement and concrete sector and we will actively support companies in this sector to engage with the full value chain to decarbonise the built environment as a system. As this ambition statement highlights, it is critical to foster dialogue and collaboration with investors, developers, architects and construction companies to drive the demand for low-carbon solutions and achieve a net-zero built environment."

wbcsd

Brad Crabtree
Assistant Secretary for Fossil Energy and Carbon Management in the U.S. Department of Energy

"The cement and concrete industry has a crucial role to play in an industrial transformation which is essential to achieving our net-zero goals. They are leading efforts to further expand and accelerate emission reductions, both globally and at the national level. But industry can't do it alone. Government has a critical role to play, and we welcome the opportunity to partner with the cement and concrete industry to reduce emissions and decarbonize a critical economic sector."

U.S. DEPARTMENT OF ENERGY | Fossil Energy and Carbon Management

Anthony Hobley
Chair, Advisory Board, Mission Possible Partnership

"Ambitious business and industry action led leadership is vital to achieving the climate targets that the world needs to survive and thrive. We know that concrete is so important to many of the challenges humanity faces but we also know it needs to be delivered more sustainably. We are delighted by the important step of articulating the ambition for carbon neutral concrete."

MISSION POSSIBLE PARTNERSHIP

Eva Zabey
Executive Director for Business For Nature

"It's fantastic to see the cement and concrete industry taking such leadership to tackle the climate and biodiversity crises. Accelerating emissions reductions and investing in protecting, restoring, and sustainably managing land and nature are crucial. We need to work together, in partnership, across industries and borders, to scale and speed up the action needed to live within planetary boundaries."

BUSINESS FOR NATURE

Matt Rogers
CEO, Mission Possible Partnership

"Our work is progressing well, and we look forward to releasing a detailed pathway to net-zero cement and concrete in the coming months. MPP's collaboration with GCCA members sends a clear signal on behalf of this industry's most ambitious companies that momentum is building to decarbonise this important sector. Our Sector Transition Strategy (STS) will turn widely shared ambition into action, mapping a transition pathway that is operationally relevant and industry-backed. We know how to reduce emissions, starting with deploying resources and technology that are available today. The imperative is to act now, in this decade. Working with industry, customers, supply chains and finance, our collaboration will deliver the clear thinking, policy reform and near-term action to make net zero viable."

MISSION POSSIBLE PARTNERSHIP

Key Progress:
CO_2 Reduction – GNR

The GCCA, through an independent third party, gathers key data from the industry in order 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.

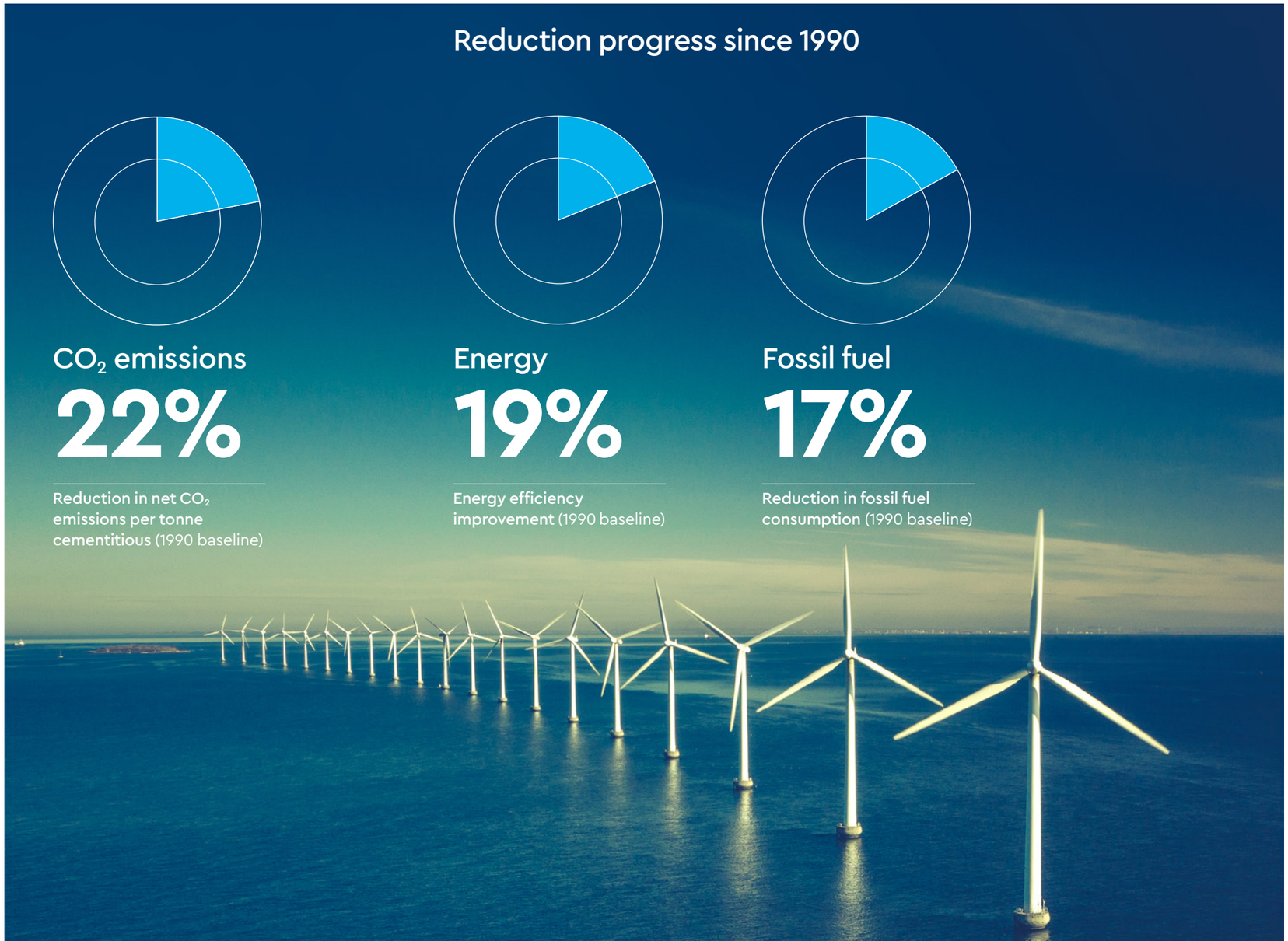
*Note due to legal constraints there is a delay in what data can be reported. June 2022 was the most recent data release, at which the end of 2020 data could be made public)

Latest data available in 2022*

The headline findings of the latest data – 2020 GNR Data are as follows:

- The 2020 Cement Industry GNR data shows a 22% reduction in CO_2 per tonne of cementitious has been achieved since 1990. This compares with the previous year's data that showed a 19.2% reduction
- Energy efficiency has improved by 19% compared with 18.5%.

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.



Key Progress:
CCUS Progress

CCUS is a key lever in our roadmap, accounting for a total of 35% emissions reductions by 2050. As such, our members have shown great initiative in pioneering this technology, with several pilot plants and projects well underway all across the world.

Our roadmap sets out the goal of having 10 fully operational plants by 2030. Across our members, we have over 35 projects publicly announced and underway, and up to a hundred more in the pipeline.

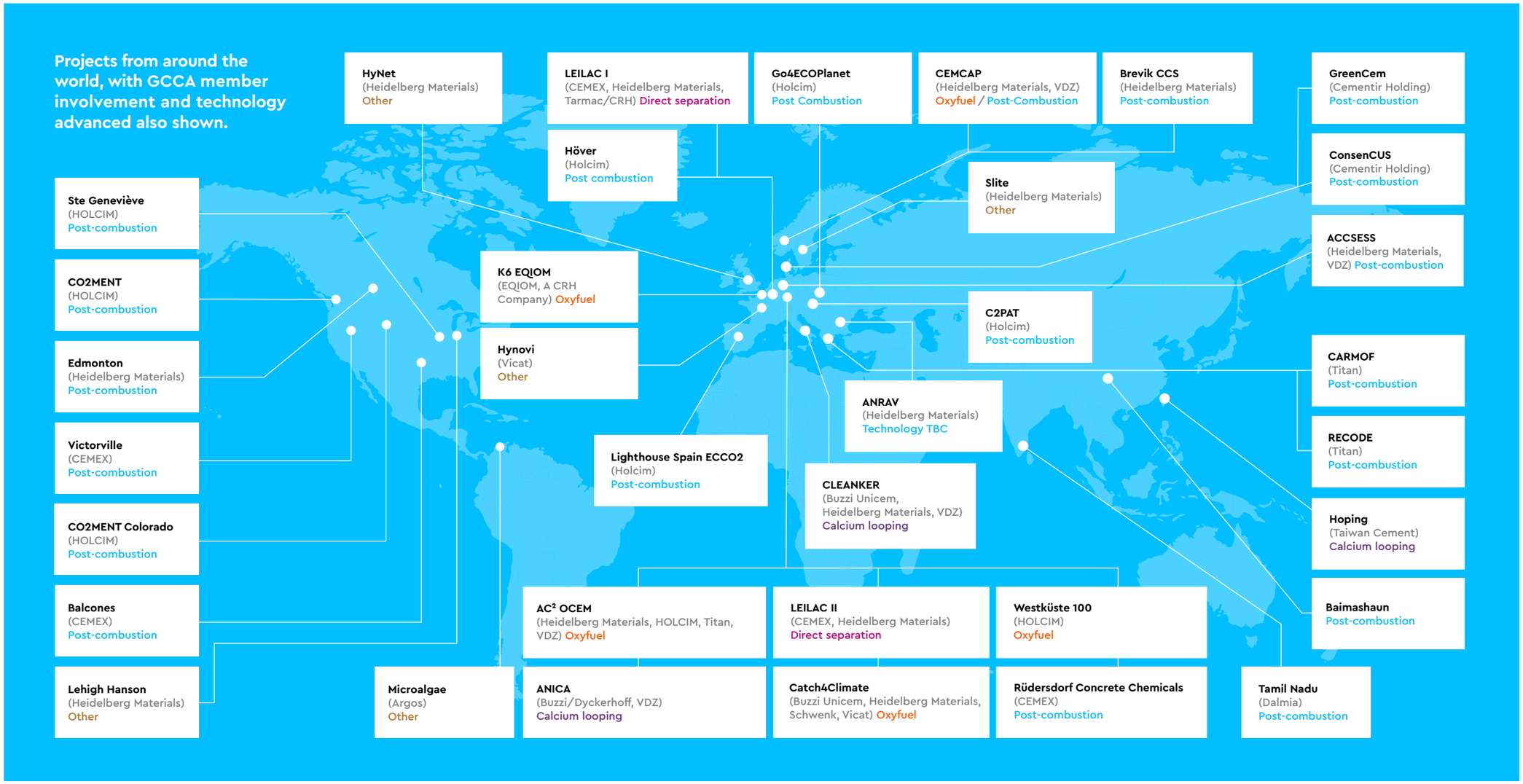
We are proud to have an MOU with the Clean Energy Ministerial CCUS to help drive progress in CCUS across our industry and the world.

-35%
CO_2 emissions

CCUS is a key lever in our roadmap, accounting for a total of 35% emissions reductions by 2050

10
plants by 2030

Our roadmap sets out the goal of having 10 fully operational plants by 2030.



Monitoring our progress

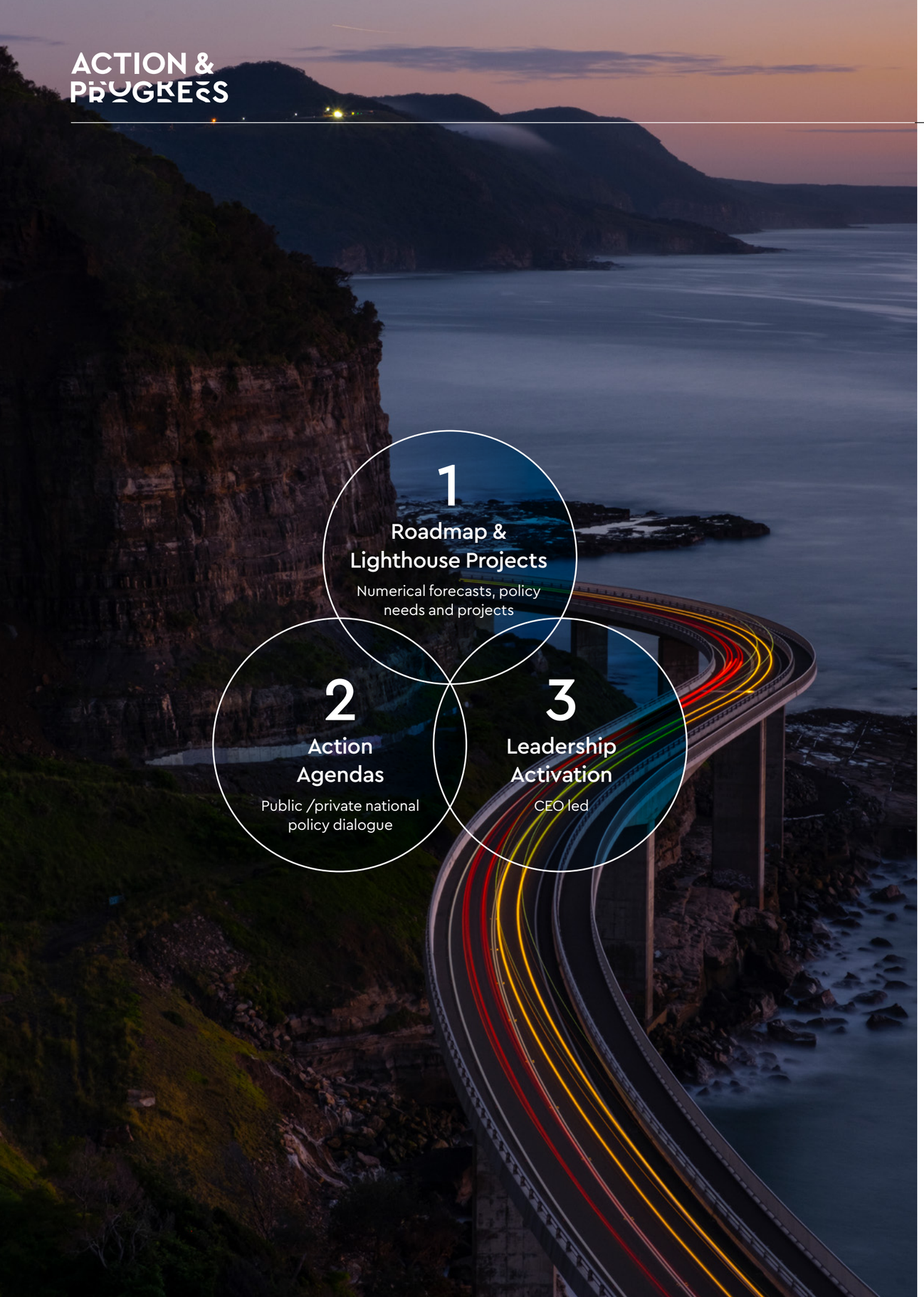
The GCCA recognises the need to monitor progress and to clearly communicate performance to all stakeholders.

Our Sustainability Guidelines provide industry and stakeholders with a means to document and improve the sustainability performance of the global cement and concrete sector against the GCCA Sustainability Charter.

The seven guidelines include simple, reliable and representative key performance indicators against which full member companies must monitor and report on their sustainability performance across key activities.

The current GCCA guidelines on CO_2 monitoring do not yet encompass CO_2 in concrete, but this is under development.

GCCA intends to put in place detailed mechanisms to monitor progress across all roadmap levers and milestones.



Our collective action: Net Zero Accelerator

In early 2022, the GCCA launched its Net Zero Roadmap Accelerator initiative, to help national cement and concrete industries decarbonise in line with the GCCA's 2050 Net Zero Global Industry Roadmap.

GCCA at UNFCCC MENA Climate Week

GCCA and FICEM at UNFCCC LatAm Climate week

GCCA at UNFCCC Africa Climate Week

The Net Zero Accelerator was the start of the national and regional phase of the GCCA's 2050 Net Zero Global Roadmap, which emphasises the importance of local action and policymaking to help the cement and concrete industry achieve its decarbonisation commitments.

While the GCCA 2050 Roadmap was a global commitment, many of the levers need to be implemented on a national or regional basis. Under the accelerators, the GCCA is working with local industry and policymakers to identify the local levers and challenges and recommending key actions.

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 fully eliminate emissions over the next decades, such as carbon capture utilisation and storage technologies.

First phases of the Roadmap Accelerator Programme include focus across the global south to help decarbonisation progress where building and infrastructure needs have been called the most pressing.

Accelerator program includes national roadmaps and government dialogues in **Egypt, India, Thailand, and Colombia** kicking off local phase of 2050 net zero global commitment.

Phase 2 countries are already underway and will be announced soon.

National and regional cement and concrete associations are helping to progress decarbonation activity across the globe. Whole life cement and concrete decarbonisation roadmaps already exist in Europe, UK, Germany, USA and Australia.

Our collective action: Innovation

Innovation is a key part of the cement and concrete industry's journey to net zero and is a key part of our 2050 Roadmap.

"The Innovandi GCCRN brings together industry and academia to collaborate on pre-competitive research in areas such as alternate clinker and new binders."

The GCCA runs two innovation programmes under its Innovandi programme

- Innovandi Global Cement and Concrete Research Network (GCCRN)
- Innovandi Open Challenge

Innovandi Global Cement and Concrete Research Network

The Innovandi GCCRN brings together industry and academia to collaborate on pre-competitive research in areas such as alternate clinker and new binders. Since its launch in 2019, the network has grown, with several core projects underway between collaborators that show great promise.

Innovandi Open Challenge

Launched in 2021, the Innovandi Open Challenge is a global programme to bring together tech start-ups and GCCA member companies to drive innovation and help solve the climate challenge.

It partners our members with exciting start-ups to accelerate technology that will be essential in our decarbonisation journey.

This year we have six consortia formed between start-ups and members, and the results of these partnerships are due to be announced in October 2022.

The six consortia are:

CarbonOrO

CarbonOrO (The Netherlands)

- Carbon capture technology using unique bi-phasic amine with a lower cost of capture.
- Supported by CEMEX, Holcim, SCG, Titan Cement, UltraTech Cement and Votorantim Cimentos.

coomtech clean technologies

Coomtech (UK)

- Coomtech has developed a low energy, low cost drying technology using managed turbulent air, creating kinetic energy to remove moisture.
- Revolutionising a 100-year-old process, a single Coomtech-enabled plant can cut CO_2 emissions by the equivalent of more than 600,000 mature trees per year and is 75% cheaper to operate.
- Supported by Buzzi Unicem, CRH, JSW Cement and UltraTech Cement.

MOF Technologies

MOF Technologies (UK)

- Nuada carbon capture technology uses Metal-Organic Frameworks (MOFs) to deliver energy-efficient CO_2 removal at a fraction of the cost of conventional amines.
- Supported by Buzzi Unicem, Cementir Holding and Heidelberg Materials

Carbon Upcycling technologies

Carbon Upcycling Technologies (Canada)

- Using a patented, low-energy process, Carbon Upcycling Technologies chemically activates and captures CO_2 within solid waste materials to produce a range of supplementary cementitious materials, to create low carbon cement and concrete.
- Supported by Cementos Argos, CEMEX, CRH, Holcim, Shree Cement and Taiheiyo Cement.

FORTERA
Low CO_2 Cement Inspired By Nature

Fortera (USA)

- Fortera's technology captures CO_2 emissions from cement plants, combining it with calcium oxide to make reactive calcium carbonate. It is stable in dry powder form and its cementitious properties are activated when wetted.
- Supported by Cementos Argos, CRH, Holcim, JSW Cement, Taiheiyo Cement and Ultratech Cement.

CARBON BIOCAPTURE

Carbon BioCapture (USA)

- Carbon BioCapture patented a scalable microalgal point-source capture technology that is unique in that industrial gases require no pre-treatment; i.e., it works with "raw gas" diverted from the stack via a pipeline to the PBR array or "carbon farm".
- Argos, CEMEX, CRH and Holcim.

GCCA Member Action

Our members are demonstrating climate action today, with projects that exemplify CO_2 reductions across the world. These are just some of the standout projects that are taking place across our members and affiliates today.

GCCA Member Action
continued

Breedon Group

20m
Miles

If all the cement produced for Breedon's concrete plants was CEMII/A-L, it would result in an annual reduction of CO_2 from cement production, equivalent to over 20 million miles driven by our cement tankers.

CEM II /A-L rollout

CEMII/A-L is a type of cement that incorporates between 6–20% limestone, reducing the portion of clinker and subsequently the embodied CO_2. It can also be used to produce blends with supplementary cementitious materials, which further reduces the embodied CO_2.

By mid-year, over 20 Breedon concrete plants were successfully stocking and selling CEMII/A-L concretes, with some sites converting over 50% of their supply.

To further increase the supply of lower carbon mixes, Breedon are making a multimillion-pound investment to increase the number of silos and capacity across their ready-mix portfolio.

Switching from CEMI production to CEMII/A-L at their cement works, would result in significant carbon reduction per tonne produced from the cement plant. Increasing the use of SCMs in conjunction with CEMII/A-L to create new ternary cements will enable even further embodied CO_2 reductions. Ultimately, if all the cement produced for Breedon's concrete plants was CEMII/A-L, it would result in an annual reduction of CO_2 from cement production, equivalent to over 20 million miles driven by our cement tankers.

CANACEM

"The Mexico-FICEM 2030 Roadmap outlines the global and national context regarding climate change and CO_2 emissions."

Mexico-FICEM 2030 Roadmap

The affiliates of Mexico's National Cement Chamber (CANACEM, by its Spanish acronym) have been collaborating with the Inter-American Cement Federation (FICEM, by its Spanish Acronym) to develop the Mexico-FICEM 2030 Roadmap for the country's industry, based on the Cement Sustainability Initiative and the International Energy Agency Roadmap.

The Mexico-FICEM 2030 Roadmap outlines the global and national context regarding climate change and CO_2 emissions, along with the country's commitments to climate change mitigation including the achieved reduction in carbon dioxide emissions over the last decades and the sector's ambitions to further reduce said emissions towards 2030.

GCCA Member Action
continued

Cementos Argos

-29%
CO_2 emissions

Cementos Argos has devised its own technical and financial roadmap to reduce CO_2 emissions by 29% by 2030

Technical and Financial Roadmap to reduce CO_2 emissions by 29% in our cement operations by 2030.

Cementos Argos has devised its own technical and financial roadmap to reduce CO_2 emissions by 29% by 2030. Its levers include:

- The evaluation of operational continuity of processes with a lower performance in terms of CO_2 emissions.
- The optimisation of caloric consumption including the implementation of oxygen-enriched combustion and hydrogen-injection technology in the clinker kilns.
- The diversification of the fuel sources including alternative fuels.
- The optimisation of the clinker/cement factor through the diversification and expansion of the company's portfolio with low-carbon products (Green Solutions – Conscious Innovation).

Replacement of clinker with supplementary cementitious material and grinding additive.

Cementos Moctezuma has made two important steps in 2021 to reduce CO_2 in order to meet our 2030 targets.

1. Developed a grinding additive in its Tepetzingo Plant to reduce clinker by 5% in one of its products called CPC 30 R RS.
2. Added a supplementary cementitious material known as zeolite was incorporated into the grinding process.

These have achieved an 8% reduction in the clinker-cement factor (from January 2021 to July 2022). This reduction has two major effects:

- 6% reduction in energy consumption.
- Reduction of 9% of CO_2 emissions, which means -55 kg CO_2/t_cem_eq

Cementos Moctezuma

-8%
Clinker-cement factor

Achieved an 8% reduction in the Clinker-cement factor (from January 2021 to July 2022)

GCCA Member Action
continued

EcoSaco – sustainable packaging for less waste and emissions

Cementos Pacasmayo has developed EcoSaco, a package that can be introduced directly into the concrete mixer without having to open it. The packaging becomes part of the concrete mix without generating waste, contributing to the environment and without affecting the quality or strength of the structures. Among the main benefits of this new packaging is the reduction of waste, making 70% of the hull of a construction site more sustainable.

In its first year almost 16 million fewer bags will be discarded, which translates into 3,500 tons less waste in our landfills, and a 14,000 tons reduction of equivalent CO_2. It also improves productivity in construction and better health care for workers, through less exposure to cement dust by preventing the bags from opening, making the work cleaner and more organised.

Cementos Pacasmayo

3,500t
less waste

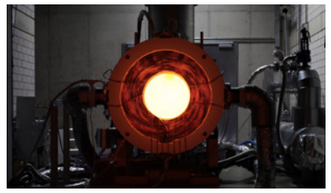
In its first year almost 16 million fewer bags will be discarded, which translates into 3,500 tons less waste in our landfills, and a 14,000 tons reduction of equivalent CO_2

Pacasmayo

CEMEX

-40%
CO_2 emissions

If scaled, this technology would be able to abate nearly 40% of all CO_2 emissions in the cement production process.



CEMEX and Synhelion develop solar Clinker

CEMEX and Synhelion successfully decarbonised a key step in the cement production process by creating the world's first-ever batch of solar clinker proving that fossil fuels can be entirely replaced with high-temperature solar heat in the cement manufacturing process.

The CEMEX R&D and Synhelion teams installed a pilot unit at the Very High Concentration Solar Tower of IMDEA Energy in Spain where they connected the clinker production process with the Synhelion solar receiver. Synhelion's technology enabled extraordinary temperature levels of solar heat beyond the 1,500°C needed to produce clinker.

If scaled, this technology would be able to abate nearly 40% of all CO_2 emissions in the cement production process.

CEMEX

GCCA Member Action
continued

Cimsa Cement

-2000t
CO_2 annually

Investing 52 million TL to establish one of the largest solar power plants in the Turkish cement industry saving 2000 tons of CO_2 annually

Cimsa Cement has been focusing on three main areas to achieve net zero by 2050.

- Carbon Light project – optimising the clinker ratios in its products. In 2021, Cimsa used 170,000 tons less clinker compared to the previous year, reduced CO_2 emissions by 135,000 tons.
- From Grey to Green project – reducing the use of fossil fuels and natural resources Cimsa is using different products such as waste-derived fuels, end-of-life tires, production wastes from other industries and process wastes. This resulted in CO_2 reductions of 160,000 tons in 2021.
- Energy efficiency and renewable energy usage – at its Afyon Plant Cimsa started to invest 52 million TL to establish one of the largest solar power plants in the Turkish cement industry with 3.3 MW planning to save 2000 tons of CO_2 annually.

CNBM subsidiary uses New WHR Power Generation technology for Decarbonisation

Sinoma Energy Conservation Co. Ltd, a subsidiary of CNBM has designed and built low-temperature waste heat power generation systems for more than 400 clinker production lines in and out of China.

Sinoma Energy Conservation's third-generation waste heat power generation technology was implemented for CNBM's Waste Heat recovery Project for Huaikan South Cement Plant.

This has resulted in an annual power generation capacity of 79.29 million kWh, which is equivalent to saving 24,423 tons of standard coal and reducing carbon dioxide emissions by 51,419 tons per year.

CNBM

79.29
million kWh

producing an annual power generation capacity of 79.29 million kWh, which is equivalent to saving 24,423 tons of standard coal and reducing carbon dioxide emissions by 51,419 tons per year

GCCA Member Action
continued

CPCI

CPCI.ca
CANADIAN PRECAST/PRESTRESSED CONCRETE INSTITUTE

Canadian Precast/Prestressed Concrete Institute Launches a 2030/2050 Net-zero Roadmap Initiative

In early 2022 the CPCI Board of Directors launched a new initiative to develop a detailed roadmap for a decarbonised precast concrete industry by 2050, with the roadmap expected to be published by Fall/Winter 2022.

Five industry working groups were established:

Benchmarking Work Group:
will identify realistic assumptions for percentage improvements throughout the lifecycle of precast concrete (2030, 2040, and 2050) and the remainder that may need to be achieved through CCUS.

Production Work Group:
will develop a plan to execute reductions at the precast concrete facilities.

Design and Construction Work Group:
will develop a plan to execute reductions through design improvements that optimise or accelerate construction, and that ultimately reduce the related carbon emissions during the use phase of a structure.

Carbonation Work Group:
will investigate carbonation of precast concrete from cradle to cradle, and how this can be included in future precast concrete PCRs and EPDs.

Narrative and Communications Work Group:
will communicate the Precast Concrete 2030/2050 roadmap to the general public and the AEC community in Canada and abroad.

CRH

Division(s)
Europe Materials

Business Type(s)
Infrastructural Concrete

Location
Brussels, Belgium

The challenge
The dismantling of the WTC left 30,000 tonnes of rubble to be disposed of, raising the challenge of how this would be done in a sustainable manner, while simultaneously meeting the exacting construction demands of this massive infrastructure project.

The solution
CRH Companies Ergon and Prefaco teamed up to deliver Belgium's first circular concrete elements for the project. To do this, the 30,000 tonnes of rubble from the demolished WTC was collected and processed into 3,500 tonnes of high-quality aggregates. These aggregates were then recycled into the concrete elements used for the new ZIN building, including the floors, stairs, balconies and columns. This was the first time this process has been used on such a scale on a Belgian construction project.

All told, about 30% of the concrete used in the structure came from recycled sources – a remarkable example of sustainable, circular construction in action. For this, Ergon and Prefaco were jointly awarded the 'Cradle to Cradle' silver certificate, "the global standard for products that are safe, circular and responsibly made".

30%
recycled

About 30% of the concrete used in the structure was from recycled sources.

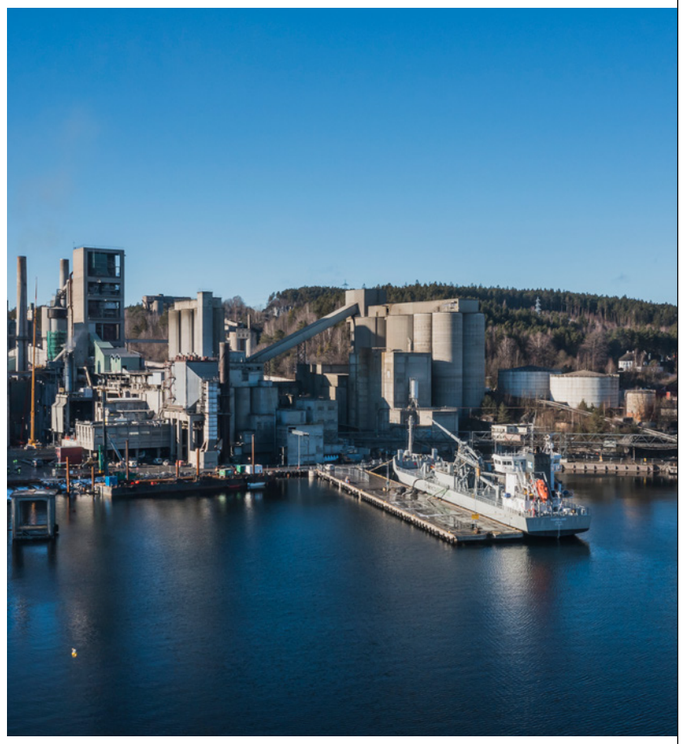
CRH

ZIN Project in Brussels – A landmark in sustainable/ circular construction

The ZIN is a massive, multifunctional project that has replaced the old World Trade Centre (WTC) towers in downtown Brussels. The development comprises more than 14 storeys of modern design, fully integrated into Brussels' existing urban ecosystem. It includes 111 apartments, a hotel with 240 rooms and more than 72,000m_2 of office space, as well as spaces for sports, recreation, retail and catering.

GCCA Member Action
continued

Heidelberg Materials



CCUS: Heidelberg Materials drives deep decarbonisation

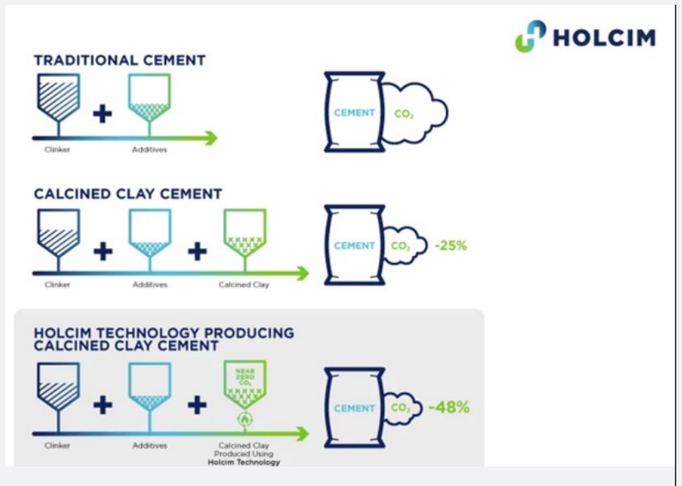
Heidelberg Materials has pledged to cut CO_2 emissions by 10 million tonnes cumulatively by having several CCUS projects already underway by 2030. The strategic approach: Creating a large portfolio of new initiatives, and scaling them up fast, focussing on gaining experience with all major carbon capture techniques, and on collaboration with leading partners to maximise the pace of development and create valuable synergies.

Work on Heidelberg Materials' flagship CCUS facility in Brevik, Norway, is today well underway, with the goal of starting CO_2 separation from the cement production process already by 2024. With 400,000 tonnes of CO_2 to be captured annually and transported for permanent storage, Brevik CCS will be the first large industrial-scale carbon capture and storage project at a cement production plant in the world.

The company is also rapidly progressing on a number of other large scale CCUS initiatives around the globe. Between now and 2030, further projects will be launched in Edmonton in Canada and Padeswood in the UK, among others. The recently announced ANRAV project in Bulgaria is the newest addition to the portfolio. ANRAV aims to be the first full-chain CCUS project in Eastern Europe. It will link carbon capture facilities at the Bulgarian cement plant of Heidelberg Materials' subsidiary Devnya Cement through a pipeline system with offshore permanent storage under the Black Sea.

Heidelberg Materials

Holcim



Calcinated Clays

One of the ways Holcim is decarbonising cement is by increasing the use of innovative low-emission raw materials, such as calcined clay. The company has developed a patent-pending technology that allows the clay calciner to run 100% with alternative fuels, leading to a very efficient calcination process with close to zero CO_2 emissions. Current technology emits 200kg of CO_2 (per ton), but in 2022 this was brough down to almost zero using its technology. Traditional clinker emits 800kg of CO_2 per ton on average and existing calcined clay technologies emit only 200kg per ton.

In the coming decades Holcim expects calcined clay and granulated limestone to gradually replace traditional mineral components such as slag or fly ash, and succeeding in producing it with nearly zero carbon emissions this year is a great breakthrough for accelerating this transition. Holcim's first calcined clay cement was launched in France in July 2021 as part of its ECOPlanet range.

100%
alternative fuels

The company has developed a patent-pending technology that allows the clay calciner to run 100% with alternative fuels.

HOLCIM

GCCA Member Action
continued

JK Cement

-17.2%
CO_2 emissions

In the last three years, it has reduced emissions by 17.2% to 563 kgCO_2 /t cementitious (both Scope-1 and 2 emissions).

Steps Towards Net Zero

JK Cement has committed to a reduction of carbon emissions in line with the SBTi. In the last three years, it has reduced emissions by 17.2% to 563 kgCO_2 /t cementitious (both Scope-1 and 2 emissions). In addition, it has joined the UNFCC's "Race to Zero" under the GCCA, committing to net zero concrete by 2050. Its major focus areas are to decarbonise are reducing the clinker factor, replacement of fossil fuel with AFR, replacement of fossil power with clean energy, improving energy efficiency and increasing afforestation.

Transition Towards Green Energy: JK Cement's green energy mix has increased to 42.9%. To increase this to 50% by FY 2025, it is increasing the capacity of existing Waste Heat Recovery Systems (WHRS), installing new WHRS systems and increasing its renewable energy consumption.

Circular Economy: Clinker factor has been reduced to 65% by using industrial waste such as fly ash and slag etc. By replacing fossil with alternative fuel, raw materials and biomass, it has increased its Thermal Substitution rate to 11.2% and aims to reach 35% by 2030.

Energy Efficiency: it has reduced the power consumption from 73.6 kWh/t cement in 2020 to 63 kWh/t cement in 2022.

Sustainable Mining: JK cement follows GCCA biodiversity guidelines and has implemented the world's best sustainable mining practices and runs 5 star rated mines.

JKCement

JSW

Decarbonisation efforts towards Net Zero Future

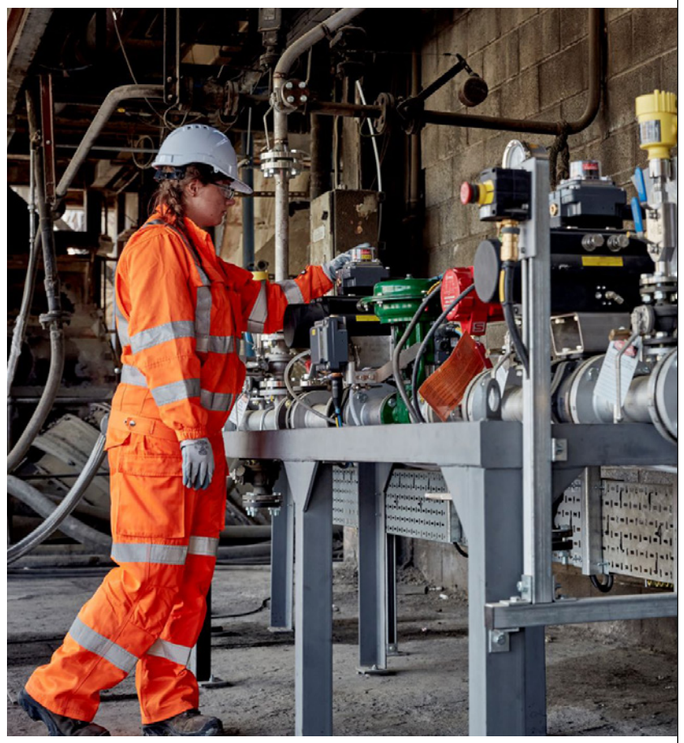
JSW cement is working on many levers as a part of its decarbonisation roadmap contributing to its Net Zero commitment by 2050. Last year, JSW cement commited to all three initiatives RE100, EV100 and EP100 in one go. It also signed up to the UN Energy Compact, setting a target of reaching 30% Thermal Substitution Rate (TSR) by 2030.

1. At its integrated plant – Nandyal, it has been co-processing various types of waste including liquid hazardous waste, plastic waste, biomass waste like rice husk etc. for the past few years. Last year, it co-processed almost -35000 T including -9000 T of Biomass waste which led to not only reduction of their net CO_2 emissions by -40,000 T but also helped them save -15000 T of coal.
2. At its Fujairah clinkering plant in UAE, in 2021, it installed the starter kit system for solid waste along with a storage shed. In April 2022, it started waste co-processing Refuse Derived Fuel (RDF), shredded tyre chips, burnt sugar and carbon black which helped to achieve -7% TSR from Nil in the previous year.
3. Last year, it used 15.2 million units of Renewable Energy at the Salboni and Nandyal plant which has helped increase its RE portfolio to -4% as compared to 3% in previous year.
4. In 2021–22, JSW has undertaken activities for commissioning WHRS of 36 MW at three plants – Nandyal, Shiva and Fuzairah. Once completed, they will serve 60% of their power requirement and help reduce scope 2 emissions.

JSW Cement
The Leaders' Choice

GCCA Member Action
continued

MPA



> If hydrogen could be cost effectively deployed alongside high proportions of biomass, annual CO_2 emissions in the UK cement sector could be reduced by up to 875ktCO_2."

State of the art net zero fuel mix for UK cement production: Hydrogen, Plasma, Biomass Demonstration.

This demonstration was funded by the UK Government. It aimed to test a net zero fuel mix of hydrogen and biomass in a main kiln burner and plasma/biomass in a calciner. The use of hydrogen was highly successful with no obvious impact on clinker or cement quality.

However, the cost, particularly of hydrogen was very high. If hydrogen could be cost effectively deployed alongside high proportions of biomass, annual CO_2 emissions in the UK cement sector could be reduced by up to 875ktCO_2 (based on 2019 levels of production).

Unfortunately, the plasma torch failed after only 30 minutes but no evidence of damage to the 'head' of the plasma torch was observed. The high efficiency of plasma to generate heat makes it worth investigating further in future.

mpa Mineral Products Association

Orient Cement

> Orient Cement is committed to Net Zero Concrete by 2050."

Renewable and Alternative Fuels

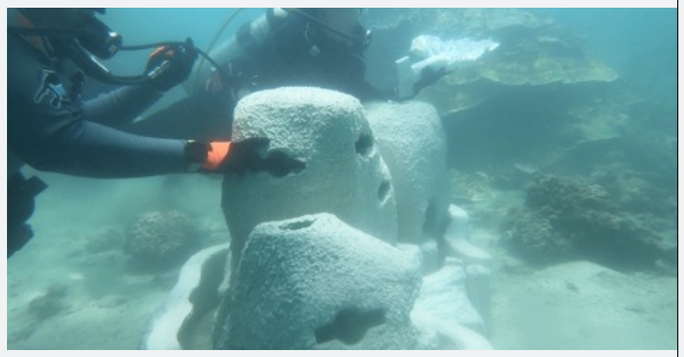
Being a member of GCCA, Orient Cement is committed to Net Zero Concrete by 2050 and a few of initiatives it implemented last year include:

- To enhance the usage of AFR, various infrastructure facilities developed across its integrated plants. Installed a LAF system (Liquid Alternative Fuel), upgraded the capacity of feeding equipment's and new alternative fuels into AF bucket i.e., RDF, MSW etc. and these initiatives contributed to increase the AFR to 15.1 % during FY22 as compared to AF consumption @ 10.6% during FY21 period.
- Under renewable energy lever: Company had agreement with AMP solar system to fulfil the 50% of energy requirement of its Jalgaon plant.
- Waste heat recovery (WHRS) project @ 10.1 MW for its Chittapur plant is under progress.
- Consistent usage of Low grade lime stone @ 27% towards conservation of natural resources by optimisation of process.
- It is constructing fly ash unloading system at its Chittapur plant to minimise scope-3 emissions and to increase the blended cement percentage.

ORIENT CEMENT

GCCA Member Action
continued

SCG



SCG, DMCR, and CU-VET Develop Coral Larval Settlement with 3D Cement Printing; Innovareef Wins National Innovation Awards 2020.

SCG by Cement and Construction Solution Business has further strengthened its partnership with the Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, and the Faculty of Veterinary Science, Chulalongkorn University by developing coral larval settlement with 3D Cement Printing Technology to fulfil the mission of restoring marine and coastal resources suitably.

The project or "Innovareef" has made yet another remarkable achievement by winning the National Innovation Awards 2020 for Product and Service Design. Innovareef is designed to enhance coral larval settlement and metamorphosis, coming with coral-like shapes and biodegradability that is not harmful to the environment and marine ecosystem. It is yet another milestone of using technology to restore the marine and coastal resources of Thailand.

With this accomplishment, SCG by Cement and Construction Solution Business will continue to foster partnership and support natural resource conservation efforts. And it will engage more with civil groups for further implementation to raise awareness and lead sustainable marine and coastal resource conservation efforts.

SECIL

The Clean Cement Line

The Clean Cement Line (CCL) is a research, development and innovation project which will transform the Secil-Outão plant into one of the most advanced cement plants in the world.

Through complex engineering work that started in 2021, this project aims to develop and demonstrate the concept of new cement production technology on an industrial scale to reduce factory CO_2 emissions by at least 20%, increase energy efficiency by 20% and generate 30% electricity using an innovative hybrid generation system through heat recovery from the manufacturing process and concentrated solar thermal energy.

This project, along with project PIN – Project of National Interest, Project ID&T and the largest project of the Portugal 2020 programme, is divided into four sub-projects, which aim to eliminate dependence on fossil fuels, increase energy efficiency, adopt digitalisation and reduce CO_2 emissions. These four innovations aim to lead to the development of low carbon clinker production and consequently the creation of a range of cements with a low ecological footprint.

The CCL project is already at an advanced stage, with complex engineering and metal-mechanical assembly operations, and is expected to be operational in December 2022, with this phase of development and results-monitoring extending to August 2023.

GCCA Member Action
continued

Shree Cement

"Shree Cement has installed power plants (thermal, wind, solar, waste heat recovery based) of aggregate capacity of 771 MW and has increased the share of green power in the total power consumption at 48.2%."

Shree Cement has been progressing towards net zero in a number of areas

Enhanced AFR and Biomass utilisation

- Shree Cement aspires to enhance TSR progressively within the upcoming years. For this, it has invested for the enhancement of its waste utilisation capacities with state of the art technologies from Denmark & Italy to be commissioned by FY 2022–23. This would not only increase the usage of Plastic Waste & Municipal Waste – RDF in Cement Kilns, but will also lead to lower GHG emissions by reduction in consumption of fossil fuels.
- It has started using Agricultural Waste (Crop-residue) in its Ras Power Plants and scaled it to more than 100 MT per day. They are progressing to double its usage by Dec'22. Use of biomass as a renewable source of energy helps in reducing CO_2 emissions as well as providing income to the nearby farming community.
- Its 3 grinding units in North region (Bulandshahar, Panipat & Khuskhera) have switched to cleaner fuels and replaced 100% fossil fuels. This initiative is being replicated to all grinding units of the group.

Green Energy

- Shree Cement has installed power plants (thermal, wind, solar, waste heat recovery based) of aggregate capacity of 771 MW and has increased the share of green power in the total power consumption at 48.2%. It continues to invest in expanding its green energy portfolio and plans to install 33 MW WHRS Plant at its upcoming Nawalgarh plant and 106 MW Solar power plants at various locations.

Taiheiyo Cement

Development of Carbon Circulation Technology for the Cement Industry

Taiheiyo Cement Corporation has completed installations to conduct demonstration tests for its project "Development of Carbon Circulation Technology for the Cement Industry" which is funded by the New Energy and Industrial Technology Development Organisation (NEDO) of Japan.

The goal of the project is to establish technologies to circulate and reuse CO_2 from the cement manufacturing process as cement raw materials or construction materials at cement plants and in neighbouring communities, thereby creating innovative decarbonisation technologies in the cement industry.

Taiheiyo has been conducting the following 4 tests for the utilisation of the captured CO_2:

1. Sent to an externally heated rotary kiln for sequestration in demolished concrete
2. Sequestrated in concrete sludge in a slurry mixer to be added to a finishing mill in the final process of cement production
3. Carbon curing equipment is used to sequestrate CO_2 in precast concrete products made of low-CO_2 cement developed by Taiheiyo Cement
4. Sequestrated in ready-mixed concrete with CO_2 dissolution equipment.

During the NEDO demonstration period, completed at the end of FY2021, they achieved all the initial goals of each test, and now they are continuing with additional tests for the next few before rolling out full scale installations.

GCCA Member Action
continued

Taiwan Cement Corporation

Ultra-High Performance Concrete (UHPC), reducing 40% of carbon emissions compared to metal material of the same size.

Taiwan Cement Corporation (TCC) launched its newly formulated Ultra-High Performance Concrete (UHPC) in 2021, featuring:

- Ultra-high durability and high mechanically-compressive strength
- Fire and explosion resistance
- Low thermal conductivity

With its properties, UHPC can extend the life span of buildings from 50–70 years to 100–120 years, which reduces building reconstruction and avoids construction wastes generated in the interest of carbon reduction.

Meanwhile, a patented UHPC energy storage cabinet was developed. Compared to the traditional metal shell of the same size, the UHPC cabinet can reduce around 40% of carbon emissions.

-40%
CO_2 emissions

Ultra-High Performance Concrete (UHPC), reducing 40% of carbon emissions compared to metal material of the same size.

Thai Cement Manufacturers Association

"With intensive implementing of a clear roadmap and collaboration with all sectors both domestically and internationally together with strong support from the government, we will contribute more on GHG emissions reductions and expect to achieve net zero emission target by 2050."

TCMA is committed to collaborating with all sectors towards net zero emissions. Two outstanding achievements have been made in line with GCCA Concrete Future Net Zero Roadmap:

1. Announcement of 'MISSION 2023' – Continuation of the first achievement to reduce 300,000 ton-CO_2in 2021, TCMA joined forces with government, professional, industrial, and academic sectors with support of 6 ministries to further reduce greenhouse gas emission from clinker substitution measure by implementing low carbon cement (hydraulic cement) in all construction nationwide. This will help increase the country's potential in reducing GHG emission to 1,000,000 ton-CO_2 in 2023.
2. Thailand Chapter: Net Zero Cement and Concrete Roadmap 2050 – TCMA, in collaboration with Thailand Concrete Association and with close advice of GCCA has developed 'Thailand Chapter: Net Zero Cement & Concrete Roadmap 2050', Thai cement and concrete, with intensive implementing of a clear roadmap and collaboration with all sectors both domestically and internationally together with strong support from the government, will contribute more on GHG emissions reductions and expect to achieve net zero emission target by 2050 in line with global climate targets.

GCCA Member Action
continued

UltraTech Cement

17.64%
Total power consumption

At its manufacturing plants, it has commissioned 269 MW renewable energy contracted capacity which contribute to 17.64% of our total power consumption.

Harnessing Green Energy for a sustainable future

UltraTech targets 100% of its electricity requirement generated by renewable sources by 2050. In the last two years, UltraTech has scaled up its contracted renewable energy capacity by 2.5 times and has set a target to scale up its green energy mix to 34% of its total power requirement by 2024.

The company plans to scale up its solar power generation to 300 MW in the next two years. UltraTech currently has a cumulative green energy capacity of 436 MW, which includes 167 MW of WHRS installed capacity and 269 MW of contracted renewable energy.

At its manufacturing plants, it has commissioned 269 MW renewable energy contracted capacity which contribute to 17.64% of its total power consumption. It is exploring new avenues such as using power supply from renewable energy projects under the Inter-State Transmission System (ISTS) network, hybrid power projects with high-capacity utilisation factor (CUF), solar power plants, rooftop solar plants at colony, schools, and other onsite solar installations among others.

VICAT

-50%
CO_2 footprint

Lithosys 3D printing technology, can reduce by up to 50% the carbon footprint of a wall, reduce building site waste and improve biodiversity.

3D Printed Concrete

Over the past year, VICAT has worked on optimising 3D printed concrete, in accordance with its commitment on reducing the quantity of concrete in structures.

Lithosys 3D printing technology, can reduce by up to 50% the carbon footprint of a wall, can reduce building site waste and improve biodiversity. Lithosys concrete mix-design is engineered to a precise viscosity to allow the pumping and deposition of matter while guaranteeing mechanical and durability performances once concrete has hardened. 3D designs are converted into robot paths so to use only the "necessary" quantity (between 40 to 60% compared to conventional modes). Depending on the object to print, the thickness of concrete layers and time between layers can vary.

Concrete 3D printing could be used as a stand-alone technology or in association with more conventional ways of building. In both cases, this technology will impact the construction sector in terms of design (freedom of shape), structural engineering (new modelling) and production of concrete buildings (less arduous work).

GCCA Member Action
continued

Votorantim Cimentos

Renewable Energy

Climate change is at the core of Votorantim Cimentos' strategy and guides every step of its present and future investments and innovation efforts.

A priority in its strategy is the generation of clean energy, which gained momentum with its decision to invest in solar and wind power plants, in different regions where we operate.

Today it has its own hydroelectric plants, waste heat recovery systems, Power Purchase agreements on renewable energy and is making relevant investments in solar and wind power, aiming to reach 45% of self-production renewable energy sources by 2030.

45%
renewable energy

Aiming to reach 45% of self-production renewable energy sources by 2030.

Votorantim Cimentos

YTL Cement

Net Zero Initiatives

YTL Cement is undertaking a number of actions to drive towards sustainable construction.

Among action taken are:

- Involving architects and project specifiers in discussions on how products are used and embedding sustainability into project designs.
- Engaging with regulatory bodies such as the Construction Industry Development Board and Ministry of Environment and Water to lead the change.
- Driving awareness and initiating conversations on sustainable construction through webinars and seminars with YTL Cement Seminar Series, which provides a platform for experts and industry practitioners to discuss, share and gather insights to collectively elevate the construction industry across the region and advance towards sustainable construction.
- To date it has organised 44 seminars, attended by 4,800 participants.

4,800
Participants

To date it has organised 44 seminars, attended by 4,800 participants.

YTL CEMENT

2023 and beyond – call to Action

The cement and concrete industry is already playing a decisive role on the journey net zero – our members are showing great examples of climate action today across all of the key decarbonisation levers.

2023

The industry continues to work to achieve full decarbonisation and recognises the need to accelerate its actions today. It also recognises that the industry must have an active role in encouraging and engineering lower-carbon products and processes and in ensuring that our products are only used when they are needed. But the industry won't be able to get there on its own. Lasting success depends on a set of specific policy actions at local, national and international levels, which help to:

- make low-carbon cement manufacturing investable
- stimulate demand for low-carbon concrete products, and
- create the infrastructure needed for a circular and net zero manufacturing environment.

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

Global Cement and Concrete Association

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