Global Cement and Concrete Association

CONCRETE FUTURE

Cement & Concrete Industry Net Zero Action & Progress Report 2025/26

An update of global action and progress of the GCCA and its member companies – as we advance on our net zero journey.

Contents

Foreword

Cement and concrete are the backbone of our modern world. They are the essential materials for building everything that our world needs to function and prosper – from the homes, offices and buildings that secure us, to the roads, rail networks and bridges that enable us to move, trade and go about our lives. They also support vital infrastructure that delivers our water and underpins our energy systems.

As our global population grows and urbanises, our sector is uniquely positioned to provide the materials needed for sustainable and resilient development.

Action and progress are not only possible but taking place before our eyes, in line with the commitments we have made to decarbonise our industry. As you read this report, along with those we have published annually since we launched our roadmap in 2021, you will see that action across our sector has accelerated right around the world. Our industry is collaborating and innovating across every aspect of our manufacturing – finding new ways to work and deploying exciting technologies that are already making a genuine step change.

However, if we are to achieve the industrial scale transformation that our world needs, we cannot do it by ourselves – our industry needs the support of governments, policymakers, stakeholders, and our allies across the built environment right now, today, in our developing and emerging markets. Delay is not an option.

Regulations and incentives need to be put in place to set the market conditions for lower carbon cement and concrete – from waste management and alternative fuels for cement kilns, to recycling, low carbon procurement, CCUS, and carbon pricing.

Together we can deliver lower carbon products all the way to decarbonised products to build the sustainable and resilient future our world needs. We count on your support.

Dominik von Achten
GCCA President and Chairman of the Managing Board of Heidelberg Materials

We are now four years on from the launch of our 2050 Net Zero Roadmap, and our industry's commitment to decarbonisation remains firm. The breadth of activity we are seeing across our membership is truly inspiring, with great examples of projects and work across all seven decarbonisation levers highlighted in this report.

This progress is also reflected in our latest industry figures, which we measure and transparently publish every year. A 25% reduction in CO_2 intensity of cementitious materials has been achieved since 1990. It is a figure which solicits reflection. Is it progress? Yes. Is it enough progress? No. And that is why in the pages of this report, yes we highlight all examples of innovation and action our members are making across all the levers of our roadmap, but we are also clear, as our President outlines, that we need the support of many to rally the progress in the years ahead.

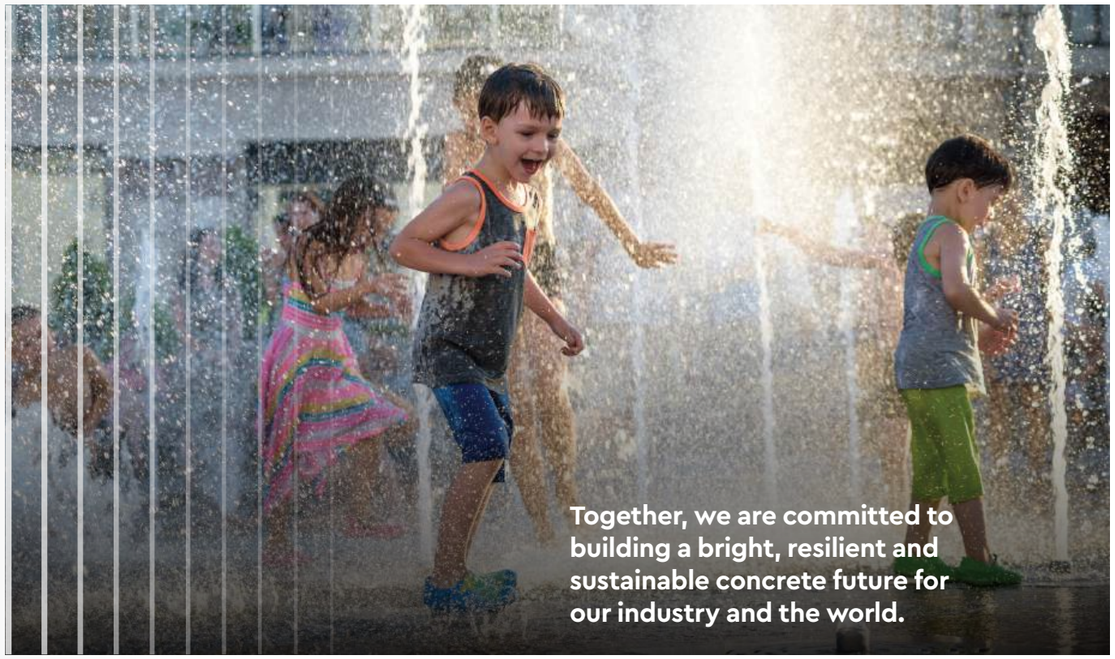
In these pages you will see the clear policy asks we are outlining – some are simple, some perhaps are more complex, but they are all logical. Why is it, for example, that in some countries our kilns can replace more than 90% of fossil fuel use by recovering the energy and mineral content of societal and industrial waste, but in many parts of the world, waste goes to landfill or, worse, is dumped in streets and rivers? Why are blended and lower carbon materials allowed to be safely used in some parts of the world, but not in others? What are the mechanisms that can unleash green demand and incentivise the green investment that we need?

Despite our strong progress, we know that firm policy action across the world is fundamental to enabling us to accelerate our reductions. 80% of cement production is in the global south – so all that we achieve needs to be done so right across the world. The GCCA is a genuine collaboration platform because we know it will take the combined work of industry, government, stakeholders and the wider value chain to enable our vision of a fully decarbonised industry.

Thomas Guillot
Chief Executive, GCCA

Our Mission

Concrete Future: Building a Net Zero World



Executive Summary

From Sydney to Stockholm, São Paulo to Seoul, Nairobi to Naples, and Toronto to Taipei, a global transformation is underway. Across the globe, cement and concrete producers are rethinking how they make the world's essential building materials in pursuit of a shared mission: delivering net zero concrete.

Decarbonisation is advancing at an industrial scale, driven by innovation, investment, and technology. This report highlights inspiring examples of progress from across our sector, showing how new thinking and execution are reshaping production, processes, and performance.

Concrete is the backbone of modern life. From durable homes and resilient infrastructure to clean water systems, transport networks, and renewable energy, it underpins every aspect of sustainable development. No material can replace concrete at the scale the world requires, nor the cement that binds it – which is why our member companies, as custodians of these vital materials, are united in their commitment to a net zero future.

The industry has a strong record of environmental leadership: it was the first heavy industry to measure and report its emissions and the first to commit globally to net zero, setting out a 2050 Roadmap in 2021. Between 1990 and today, we have already reduced CO_2 intensity by 25%. And now, these next years to 2030 are crucial for accelerating progress – including the use of supplementary cementitious materials, alternative fuels, and co-processing to reduce fossil fuel dependence.

Deep decarbonisation technologies are also coming to life. Carbon Capture, Utilisation and Storage (CCUS) is going to be vital. The technology works – in 2025 the world's first net-zero commercial scale cement plant, capturing CO_2 at source and storing it safely underground, became fully operational and is already producing net zero cement.

To realise the full potential of these advances, stronger policy support is vital. We call on governments worldwide to help stimulate demand for low-carbon materials, enable waste-derived fuels, promote circularity, and back the deployment of carbon capture technologies. By working together – industry, policymakers, and investors – we can deliver the transformation needed for a net zero future.

The essential role of concrete and the need to decarbonise

Concrete is a key enabler of a resilient and sustainable built environment.

Concrete (and its key binding ingredient of cement) is the backbone of modern society. It is the essential building material that lays the foundation for everything from homes, schools, offices, transport networks and critical infrastructure – all of which are and will continue to be crucial to global development. As our world's population grows and increasingly urbanises, concrete will be crucial in providing society the foundations of what it needs to grow and prosper.

Concrete's inherent properties – it's durability, resilience to climate related and natural disasters, cost-effectiveness and widespread availability and versatility – are the reasons why it is the second most used material on the planet after water. Without it, much of the modern world would not exist as we know it – 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 the UN sustainable development goals.

Our Net Zero Mission

Accounting for approximately 7% of the world's carbon emissions, the global cement and concrete sector collectively committed to reaching net zero by 2050, as set out in our 2050 Net Zero roadmap. The GCCA and its members account for the majority of global cement production capacity outside of China, as well as a growing number of leading Chinese manufacturers, all of which have committed to reducing and ultimately eliminating CO_2 emissions in concrete across seven key levers that together will reach net zero. Since the launch of the roadmap in 2021, progress has been strong but there is much work still to do.

The journey towards decarbonisation is complex and requires continued collaboration. Achieving our goals will depend not only on innovation and dedication within the industry but also on active support and partnership from all stakeholders and policymakers across the built environment to set the market conditions and regulatory frameworks to enable us to achieve our goals.

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01


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01: **Chek Poh Wong (@saslwp), Guangzhou, China**
02: **Joko Dwiwahyudi**
03: **Urban Flow by Anvar Sadath TA**
04: **Utoyo d Radar @oetophoto_**
05: **Agung Lawerissa, Merah Putih Bridge in Indonesia**
06: **@kiezerzack, Indonesia**

Our Members

Our members, which represent the majority of the global cement industry volume outside of China, including some key Chinese manufacturers, operate in almost every country of the world.

We are committed to strong, decisive action across the value chain so that together we will reach net zero.

Our members

Asia Cement Corporation
Arkan
Breedon Group
BUA Cement
Buzzi SpA
Cementir Holding
Cementos Argos
Cementos Pacasmayo
Cementos Progreso
CEMEX
Cimenterie Nationale
Çimsa Cimento
City Cement
CNBM
CRH
Dalmia Cement
Dangote
Fletcher Building
GCC
Heidelberg Materials
Hima Cement
Holcim
Huaxin Cement
JK Cement
JSW Cement
Kartuli Cement
Limak Çimento
Moctezuma
Medcem
MISR Cement Group
Molins
Nesher Israel Cement Enterprises
Norm Cement
Northern Region Cement Company
Orient Cement
PT Solusi Bangun Indonesia
SCHWENK Zement
Secil
Siam Cement Group
Siam City Cement
Taiheiyo Cement
TCC Group Holdings – Taiwan
TITAN Group
TPI Polene
UltraTech Cement
UNACEM
Vassiliko Cement
Votorantim Cimentos
Yura Cement

Our national and regional association partners

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

We are proud to work with a range of external organisations and partners, including:

ACI and NEU
AECOM
Amazon
Asia Development Bank
American Concrete Institute
The Biodiversity Consultancy
Bolton Consulting Group (BCG)
Business for Nature
BusinessGreen
Build Change
C40 Cities
CCS Knowledge Center
China Building Materials Federation (CBMF)
Clean Air Task Force (CATF)
Clean Energy Ministerial (CEM) CCUS Initiative
CEM Industrial Deep Decarbonisation Initiative
Climate Action
Climate Club
Climate Champions
Climate Economist
Climate Imperative
The Climate Group
ClimateWorks Foundation
Concrete Transition Capital
Confederation of Indian Industry
Convention on Biological Diversity
Decarb Connect North America
European Bank for Reconstruction and Development (EBRD)
EPFL
European Climate Foundation
European Roundtable on Climate Change and Sustainable Transition (ERCST)
Federation International Beton
F6S
German International Development Agency
Gensler
GHG Protocol
Global Alliance for Buildings and Construction (GABC)
Global Industry Hub
Global CCS Institute
Habitat for Humanity
ICLEI
International CCS Knowledge Center
International Chamber of Commerce
International Code Council
International Negotiating Committee on Plastic Pollution
International Energy Agency (IEA) and IEA GHG
International Emissions Trading Association (IETA
International Finance Corporation (IFC)
International Fire Safety Standards Coalition
Intergovernmental Panel on Climate Change (IPCC)
LBR&A Arquitectos
LeadIT
Ministry of Foreign Affairs of Denmark
Mission Possible Partnership – Industrial Transition Accelerator
MSP – End Open Waste Burning
Net Zero Banking Alliance
OECD
OGCI
Race to Zero
RILEM
RMI
SBTI
Sequoia Foundation
SINTEF
Switch Asia
TEN Arquitectos
The Energy and Resources Institute (TERI)
The iMasons Climate Accord
United Cities and Local Governments of Africa (UCLGA)

United Nations:

- Secretary General and Climate Action team
- UNEP-UN Environment Programme
- UNEP Global Mercury Partnership and UNEP Global Mercury Cement Partnership
- UNIDO – UN Industrial Development Organisation
- Economic and Social Commission for Asia and the Pacific (UN ESCAP)
- Office for Disaster Risk Reduction
- Global Champions Office

UNCTCN
Urban Land Institute
The World Business Council for Sustainable Development (WBCSD)
We Mean Business Coalition
World Economic Forum
World Green Building Council
WorldSteel

Dynamic Collaboration and working with partners

At a time when some of the consensus on climate action is under pressure, the world can count on our industry to continue to play a leading role in building a sustainable and resilient future for our planet.

But the transformation challenge it is too big, too complex for just one player or even a sector to do it by itself.

That is why dynamic collaboration sits at the heart of everything we do.

Working with stakeholders and multilateral organisations is key to building the policy framework, investment and infrastructure we need to drive progress.

As we enter the second quarter of the twenty-first century, the international community must reflect on the shared human values that hold us together: peace and prosperity, hope and renewal, consideration and gratitude, unity and connection, resilience and optimism, generosity and kindness, diversity and inclusion. These values underscore our collective spirit in a century that will test our species' ability to adapt and innovate in building a common future.

Extract from First Letter of the President of COP30,
Ambassador André Corrêa do Lago

UNFCCC COP and High-Level Champions

The GCCA has official observer status for the UNFCCC and the climate COPs.

Working with a range of UN bodies and initiatives, we continue to ensure our industry is represented at the climate COPs and the most important climate gatherings. The GCCA and our sector will continue to play a leadership a role.

As the Brazil-led COP30 implements a comprehensive review of delivery mechanisms including objectives, themes and initiatives, and how they all work together to drive positive action, we are pleased it builds on existing initiatives where the GCCA is already working with key partners.

Furthermore, the GCCA is proud to be fully involved to ensure our industry and its roadmap commitments and pathways sit at the heart of deliberation and actions.

The GCCA has secured a seat at two key global activation groups on accelerating zero and low-emission technologies in 'hard-to-abate' sectors, and on sustainable and resilient constructions and buildings.

United Nations Framework Convention on Climate Change

UN CLIMATE CHANGE HIGH-LEVEL CHAMPIONS

COP30 BRASIL AMAZÔNIA BELÉM 2025

UNIDO

The work UNIDO is executing is a great example of progress that collaboration can achieve following the MOU UNIDO and the GCCA signed in 2023.

Substantial projects have been implemented or are on the way:

- IDDI collaboration led to the development of a global scheme for low carbon ratings for cement and concrete that is available to help drive private and public green procurement across the world
- The project in Thailand is on the way with very positive outcomes on all levers of our decarbonisation pathway
- The financial support for roadmap developments in Argentina, Kenya or Philippines

Many other projects are in discussion to further accelerate thanks to the support of specific government and independent initiatives like Climate Club, NZ partnership, GEF, MAF and others including philanthropy matching organisations like Climate Works.

Given UNIDO's leadership role on the climate action agenda as part of the COP30 priorities on industrial decarbonisation, we will collaborate to help ensure that activity is focused and effective in making tangible progress, and includes a strong focus on the global south.

We believe aligning all this key activity on a common pathway is essential to effectively decarbonising our industry by 2050.

Cement and concrete account for 8% of global greenhouse gas emissions, but they are also critical to our infrastructure and for the realities of increasing urbanization. Green solutions are necessary, and the good news is that they exist – we have the knowledge and the technologies to decarbonise these key sectors. I am very proud that UNIDO, together with the GCCA, is transforming both supply chains and markets to foster low-carbon cement and concrete. We need to make sure that these technologies are available to all, because there is no time to waste when it comes to industrial decarbonization to protect our planet.

Gerd Müller,
Director General, United Nations Industrial Development Organization

UNIDO

Cement and Concrete Breakthrough

Concrete is at the heart of the world's growing economic ambitions and infrastructure needs, from housing to roads to energy and trade hubs. As demand is accelerating, industrial decarbonization has never been more important.

Canada is proud of the work and achievements of the Cement and Concrete Breakthrough, and COP30 marks an opportunity to deliver on progress made towards our first set of Priority Actions.

Canada and the United Arab Emirates co-chair the Cement and Concrete Breakthrough, which is now endorsed by 13 governments. The Global Cement and Concrete Association has been a driving force in global decarbonization, and Canada is grateful for its support of the Breakthrough and for the partnerships forged under it. These efforts will help make near-zero emission cement the preferred choice in global markets by 2030.

As we prepare to renew our commitments at COP30 with refreshed Priority Actions, we aim to accelerate work in critical areas—from scaling up existing technologies to plotting a path to 2050 with clear decarbonization goals. Canada is doing its part, forging on with the Roadmap to Net-Zero Carbon Concrete by 2050.

Canada remains steadfast in advancing the important work of the Cement and Concrete Breakthrough, working alongside its co-chair and member countries while supporting organizations to drive action towards these ambitious goals.

The Honourable Mélanie Joly,
Minister of Industry and Minister responsible for Canada Economic Development for Quebec Regions

Government of Canada

The United Arab Emirates has entered a new phase of industrial transformation, driven by sustainability, innovation, and advanced technologies, shaping a global model for growth that promotes economic progress while reducing emissions and protecting the environment.

The cement and concrete industry are central to global development. This presents a critical opportunity for decarbonization. Achieving near-zero emissions in this sector is not only an environmental goal; but also an economic, technological imperative for sustainability growth.

We commend the Global Cement and Concrete Association (GCCA) for its leadership in driving innovation. Through the Cement & Concrete Breakthrough, co-chaired by Canada, and the UAE, we strengthen collaboration to accelerate investment, scale clean technologies, and harmonise standards for low-carbon production.

Through initiatives such as "Operation 300bn" and "Make it in the Emirates", the UAE is establishing an integrated industrial ecosystem, empowering innovators, and drives low-carbon, smart manufacturing, supported by AI.

Together, collaboration and global partnerships, can transform heavy industries into engines of sustainable growth.

His Excellency Dr. Sultan Al Jaber,
Minister of Industry and Advanced Technology

United Arab Emirates

Making Progress

The Cement and Concrete Breakthrough, launched at COP28 in Dubai, is centered on the UNFCCC COP process, and is endorsed by thirteen partner governments, including: Australia, Austria, Egypt, Germany, Ireland, Kenya, Kingdom of Saudi Arabia, the Republic of the Congo, Switzerland, Türkiye, and the United Kingdom.

The Cement and Concrete Breakthrough aims to make clean cement the preferred choice in global markets, with low and near-zero emission cement production established and growing in every region of the world by 2030.

Since its launch, the Breakthrough has established a track record of organizing successful events and delivering results. In particular, the Cement and Concrete Breakthrough has organised five thematic dialogues with member countries and supporting initiatives, facilitating discussions critical to decarbonizing the sector.

In June 2024, the Breakthrough, developed a set of inaugural Priority Actions focused on: Definitions and standards; Demand creation; Collaboration, Education, Innovation and scale-up of existing technologies; and, Finance and investment. These Priority Actions will be updated at COP30.

Knowledge-sharing is a central focus for the Cement and Concrete Breakthrough given its key role in improving and aligning best practices and showcasing the efficacy and efficiency of existing and emerging solutions. Since June 2024, members have been invited to attend five Thematic Dialogues, on key topics such as enhancing circularity in the sector by increasing alternative fuel usage, and the important role of carbon capture, utilization, and storage in decarbonizing the cement and concrete sector. More events are planned in coming months.

The Cement and Concrete Breakthrough works with coalitions of leading public, private, and public-private global initiatives to deliver its Priority Actions. Since its launch, the Cement and Concrete Breakthrough has supported the transition to a low-carbon construction sector by promoting globally interoperable definitions and ratings for low-carbon and near-zero emission cement and concrete. Through work with international organizations such as Clean Energy Ministerial Industrial Deep Decarbonisation Initiative (CEM IDDI) and First Movers Coalition (FMC), the Breakthrough is fostering a strong demand signal that drives large-scale production of, and investment in, low and near-zero emission cement and concrete. Scaled-up financial and technical assistance programs have also been enabling a critical mass of low-carbon cement and concrete projects across all regions. By strengthening local capacity and expanding access to resources, the initiative is also working to ensure that every region can participate in the global transition to near-zero emission cement and concrete, advancing shared progress toward COP30 goals.

Implementation partners include: the Global Cement and Concrete Association (GCCA) acting as secretariat: Industrial Deep Decarbonization Initiative (IDDI); First Movers Coalition (FCM); ConcreteZero; Climate Club; IEA Working Party on Industrial Decarbonisation (IEA WPID); Mission Innovation Net Zero Industries Mission (MI NZI); Leadership Group for Industry Transition – (LeadIT); Mission Possible Partnership (MPP); Industry Transition Accelerator (ITA); and the United Nations Industrial Development Organization) (UNIDO).

COP30 and moving forward

Guided by the outcomes of the first Global Stocktake, COP 30 aims to mobilise all levels of society – from governments to non-state actors like businesses and investors – to implement existing pledges more quickly and effectively. The COP30 Climate Action Agenda is developed by the COP30 Presidency in collaboration with the UNFCCC and Climate high-Level Champions. It focuses on transforming climate agreements into tangible action across six key areas, aiming to align global efforts to deliver on the Paris Agreement.

As part of these efforts, the COP30 Presidency invited the Cement and Concrete Breakthrough to take on a leadership role within Objective 2, focusing on accelerating zero and low-emission technologies in hard-to-abate sectors. Together with the GCCA, the Cement and Concrete Breakthrough is developing a plan to identify how the global cement and concrete sector can increase the use of low and near-zero-emission cement and concrete by the next Global Stocktake.

We are just over halfway to the 2030 global goal to halt and reverse nature loss, and the urgency has never been greater. Governments and businesses share a historic responsibility to act now. The new It's Now for Nature Pulse shows encouraging trends – with more corporates building nature into their decision-making and growing leadership from the cement and concrete sector. But we need many more companies to scale up action, protect, restore and sustainably use nature, and drive the shift to a truly nature-positive economy.

Eva Zabey,
CEO, Business for Nature

RILEM has recently launched the RILEM Green Commitment statement, outlining the association's new steps towards sustainability and climate responsibility. Cement and concrete remain at the forefront of RILEM's research topics, recognising their significant impact on the carbon footprint of the built environment. The RILEM's partnership with Global Cement and Concrete Association (GCCA) is strategic to bridge the gap between researchers and practitioners, academia and industry, to accelerate the adoption of sustainable practices and innovations in construction.

Prof. Nele De Belie,
President, RILEM

Cement and concrete are among the key in-scope industrial sectors of the First Movers Coalition, reflecting both their vital role in global development and the scale of the challenge to reduce emissions. Decarbonising these essential materials is central to achieving our collective climate goals. The World Economic Forum, through the First Movers Coalition, is proud to collaborate with the Global Cement and Concrete Association on this important agenda. By working to create strong demand signals for low-emissions cement and concrete, we can accelerate innovation and encourage investment in and adoption of breakthrough solutions.

We look forward to deepening our joint efforts with the GCCA to ensure that the cement and concrete sectors play a critical role in fostering sustainable economic growth and the transition to net zero.

Pedro Gomez,
Head of Industry Agenda, Centre for Nature and Climate; Member of the Executive Committee at the World Economic Forum

Net Zero Value Chain Partners

A key partner group to help us unlock our net zero mission is closer to home. It is the organisations across our own broad value chain, from manufacture to use of our materials.

That is why we have recently launched a brand new type of membership – our Net Zero Value Chain Partners. This programme aims to bring together organisations from the wider cement and concrete value chain, such as equipment suppliers, admixture companies, industrial infrastructure partners for carbon capture, utilization and storage, and other solutions providers, to share expertise, innovation and ideas, and key engagement to help decarbonise the industry.

Value chain companies partner with the GCCA's 50 world leading cement and concrete producers, participating in activities, working groups, key events and programmes, and deepening collaboration across the industry.

The cement and concrete industry counts on the support of partners to bring vital expertise on our shared mission of delivering a more sustainable and resilient future.

For more information, please visit
https://gccassociation.org/nzvcp/

Above: **The first six Net Zero Value Chain Partners**

We are very pleased to join the GCCA as a Net Zero Value Chain Partner... We look forward to collaborating with global partners, sharing expertise, and accelerating the transition towards a sustainable future together.
Dr. Sui Tongbo, VP of Sinoma International

The transformative potential of turning underutilised and discarded materials into catalysts for decarbonization is immense for the cement and concrete industry. This is not just collaboration, the Net Zero Value Chain Partners program is a bold step towards reshaping our joint future.
Darren Eastwood, Strategic Development Director of CDE

We highly welcome the GCCA's approach to open the membership for value chain partners, because we know that innovation projects in the cement industry can only be successful when cement producers and technology suppliers cooperate intensely.
Matthias Mersmann, Chief Technology Officer of KHD

We are very pleased to join the GCCA as a Net Zero Value Chain Partner... This initiative is key in bringing the main stakeholders to the table and working together towards achieving this important goal. Master Builders Solutions is honored to be a partner, and we look forward to what we will accomplish together.
Paul H. Seiler, Vice President of Marketing of Master Builders Solutions

Saint-Gobain is proud to join the GCCA's 'Net Zero Value Chain Partners' initiative, reinforcing our Group's commitment to sustainable construction... By engaging in this collective effort, we aim to accelerate progress across the value chain and help build a more sustainable future, in line with Saint-Gobain's purpose: 'Making the world a better home'.
Gustavo Blazquez, Specialty Construction Chemicals Business Line Director of Saint-Gobain

The road to decarbonization demands not only ambition but also collective action, and we believe technology is the catalyst that turns vision into reality. Together with the GCCA and its members, we are determined to deliver measurable outcomes for the industry and society. By joining forces, we will create lasting Impact — driving efficiency, resilience, and sustainability across the entire value chain on the journey to net zero.
Maxime Ramael, Global Business Development Manager, Green Cement of Schneider Electric

Our progress

CO_2 emissions*

25%

Reduction in net CO_2 emissions per tonne cementitious (1990 baseline)

Energy**

18%

Energy efficiency improvement (1990 baseline)

Fossil fuel

22%

Reduction in fossil fuel consumption (1990 baseline)

Our latest GNR figures (outlined above) show that our industry is making progress, but we call for urgent global government action to help accelerate the advancement that is possible.

Every year the GCCA publishes our latest industry GNR data. The GNR is a global database that collects (through a credited third party, PwC) and transparently publishes a set of key industry sustainability data. The data is collected according to the Cement CO_2 and Energy Protocol, and available data goes back to 1990 as a reference point so we are able to assess the progress that is underway.

The headline CO_2 intensity reduction of 25% since 1990 shows that progress is not only achievable but underway, but we acknowledge that there is a lot more to do and less time to achieve it. That is why we are calling on government and stakeholders to act now to help us move further and faster.

Outlined on the immediate next pages are the key enablers that can truly unlock the decarbonised and circular future which we are ready to deliver, but we need the right policies, investment and infrastructure support to make happen.

To find out more about the GNR visit https://gccassociation.org/gnr/

* Note 25% is a rounded figure – actual figure is 25.07%.
** Note 18% is a rounded figure – actual figure is 17.6%.

Our key policy requirements

To drive progress

We call on governments and policymakers to support us across these five key policy areas:

Supplementary Materials 01

Use of blended cements and Supplementary Cementitious Materials (SCMs) can be increased now through policies that ensure government procurement permits SCMs and latest material standards are available. In the short term policies need to promote and enable access to relevant materials and establish government funding programmes to develop material standards, including performance based standards. Read more on p31.

Carbon Pricing 02

An appropriate carbon price, as well as long-term predictability of the carbon price, allows companies to make the investments needed to reduce their CO_2. Policymakers must ensure that use of carbon pricing does not lead to distortions of competition between domestic producers and importers. The transition towards carbon neutral economies is dependent on the acceptance of carbon constraints and costs by all actors along economic value chains.

Carbon Capture Use and Storage 03

Policy across all geographies is not yet strong enough to drive the number and scale of projects needed for cement manufacturing to be on track to meet net zero by 2050. Policy needs to address public financing, recognition of carbon removal, transport and storage infrastructure, access to decarbonised electricity, carbon pricing and demand for low carbon product. Read more on p29.

Waste Treatment in Cement Kilns 04

The right policies enable the industry to replace the majority of fossil fuels with energy recovered from waste. In addition, recycling of mineral from waste is also achieved. And yet globally less than 10% of energy needed in cement kilns comes from waste. Policies need to recognise and implement the fact that waste treatment in kilns is more sustainable than landfill and incineration. Read more on p27.

Low Carbon Procurement 05

The demand side can drive supply side decarbonisation through low carbon procurement. GCCA provides an EPD tool to calculate the carbon impact to compare with the definitions. Policymakers need to build on this foundational work with demand side pledges such as Clean Energy Ministerial's Industrial Deep Decarbonisation Initiative (www.unido.org/IDDI). Read more on p35.

For all policies visit www.gccassociation.org/gcca-policies/

Country Roadmaps

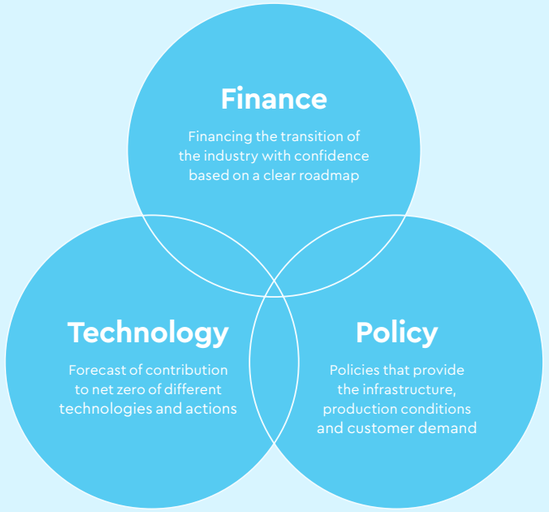
The GCCA Net Zero Country Roadmap Accelerator Programme helps national cement and concrete industries develop their own roadmaps in line with the GCCA's 2050 Net Zero Global Roadmap that was developed with ECRA and published in October 2021.

The GCCA provides the methodology and ongoing support for the national industry to drive, deliver and thereby own their national roadmap. The GCCA, with the support of ECRA, ensures that there is a consistency in application of the methodology and provides expertise including transferring experience from one country to another.

The Accelerator Programme helps to identify the local barriers to decarbonisation and recommends key actions. The national roadmaps follow the key principles of the GCCA global roadmap of reaching zero emissions by 2050 with milestones at 2030, cover the whole life of cement and concrete and describe the necessary enabling policies.

The Net Zero Roadmap Accelerator aims for each country, to:

- Convene all stakeholders across the whole life of cement and concrete to increase the understanding of the roles that each can play to deliver decarbonisation
- Identify the contributing technologies and actions to decarbonise by 2050
- Describe the enabling policies
- Bridge the dialogue between policymakers and the industry towards policy engagement to facilitate the implementation of decarbonisation actions
- Capture the attention of the financial institutions to finance sustainable projects
- Help our members progress on their decarbonisation transition through a credible industry technology roadmap, enabling policies and financing

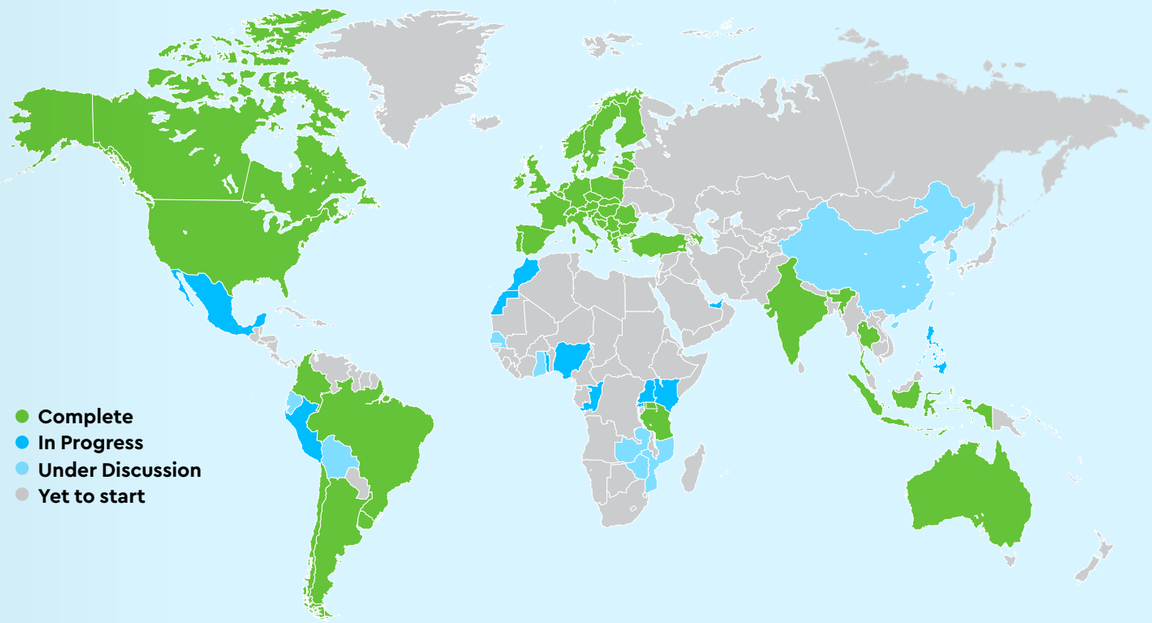


Above: **Net Zero Accelerator Country Roadmaps: deliver the technology forecasts and policy enablers that underpin increased financing of the transition to net zero**

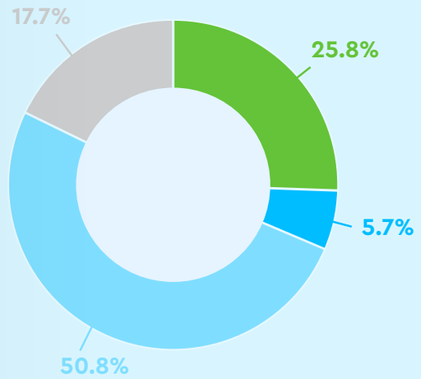
Above: **Global and national roadmaps are used by companies to help develop their own roadmaps. Dangote's roadmap case study is explained on p57**

Above: **FICEM has developed the Argentina Roadmap for the cement and concrete sector with UNIDO and the Argentine Association of Portland Cement Manufacturers (AFCP) and its member**

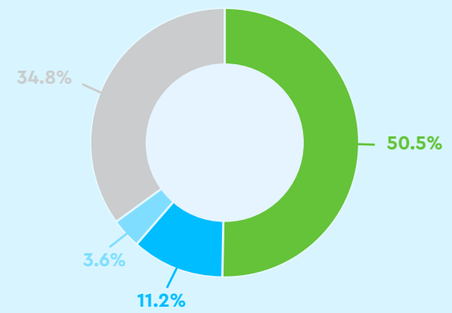
Net Zero Accelerator Map – October 2025



Percentage of world cement production covered by roadmaps



Graph showing percentages (excluding China)



Low Carbon Ratings

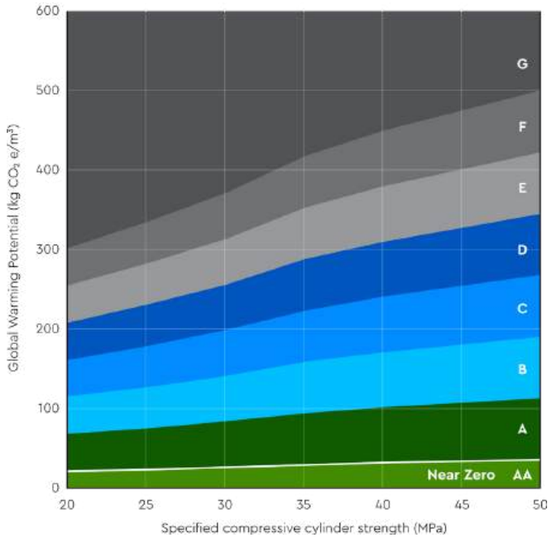
As global construction continues to increase, green procurement will be vital to ensuring that growth will be done sustainably. Transparency around the carbon footprint of our building materials is more critical than ever, so we can make informed decisions to best protect our environment.

That is why in April 2025, the GCCA launched its Low Carbon Ratings (LCR) for Cement and Concrete – a first-of-its-kind transparent global rating system that will enable cement and concrete to be identified based on their carbon footprints. The ratings help customers prioritise sustainability when selecting construction materials by using a clear and intuitive AA to G scale. The Low Carbon Ratings are a foundational building block of effective low carbon procurement.

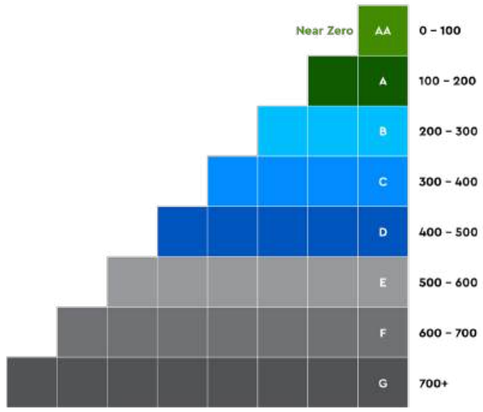
The LCR were developed with the Clean Energy Ministerial's International Deep Decarbonation Initiative (IDDI) and offers a simple, transparent, and adaptable tool that helps builders, architects, governments, planners, and consumers everywhere in the world to make more informed and sustainable choices. It is designed to be easily recognisable – with a simple visual graphic that clearly indicates a product's rating. The carbon rating system for cement and concrete provides consistency and comparability.

The ratings are based on standardised rules for environmental product declarations (EPDs) which include carbon footprint as a metric. Countries can adopt the global ratings as they are, or adapt them if local carbon accounting differs from global norms. This adaptation, as already done in the UK, retains international comparability between ratings. The ratings enable all stakeholders in the complex value chain of construction to communicate on carbon footprint in a simplified method in targets, client briefs, project requirements and specifications. Use of precise EPDs carbon values is expected to be often done in parallel with the simplified rating system, to enable whole life and whole building carbon footprinting and similar detailed reporting.

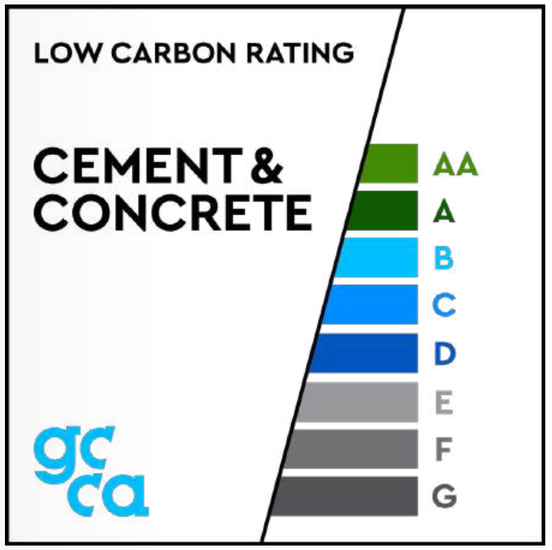
For more information visit https://gccassociation.org/lcr/

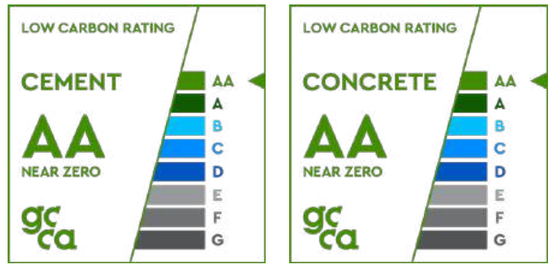


Above: **Global Low Carbon ratings for Concrete. Harmonised values for ratings are ready to use globally.**

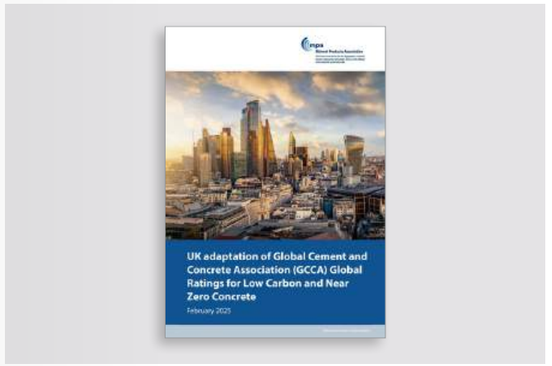


Above: **Global Low Carbon Ratings for Cement. Countries choose a constant to determine rating values. Example values shown in image.**

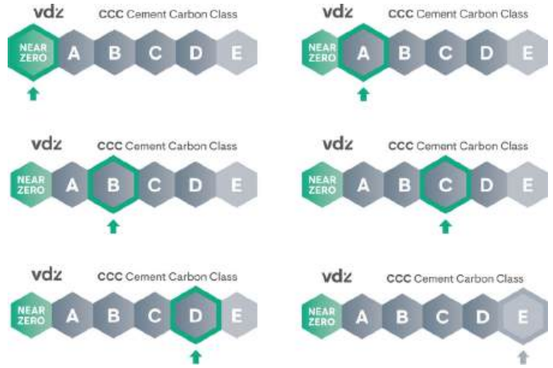




Above: **GCCA Low Carbon Rating Labels: Example labels for adoption or adaption atcountry level to meet local regulatory requirements**



Above: **Concrete Example: MPA has published a UK adaptation of LCR to account for different EPD carbon accounting in the UK. The LCR allows this and the method retains global comparability of ratings**



Above: **Cement example: VDZ Cement carbon class was developed in parallel with and fully aligned with the GCCA Low Carbon Ratings**

GCCA EPD Tool

Streamlining Environmental Product Declarations

What is an EPD?

An Environmental Product Declaration (EPD) is an independently verified report on the environmental impact of a product throughout its life cycle. The impact of the product is calculated via a Lifecycle Assessment (LCA) which conforms to the requirements of the relevant Product Category Rules (PCR).

EPDs are fundamental to low carbon procurement. They are the construction industry's means of standardised and consistent calculation of indicators such as global warming potential across scope 1 ,2 and 3. The EPD calculation outputs can be used in other forms of communications or labels.

What is the GCCA EPD Tool?

A web-based application designed to simplify the creation of draft Environmental Product Declarations (EPDs) for:

- Aggregates
- Clinker
- Cement
- Concrete
- Precast elements

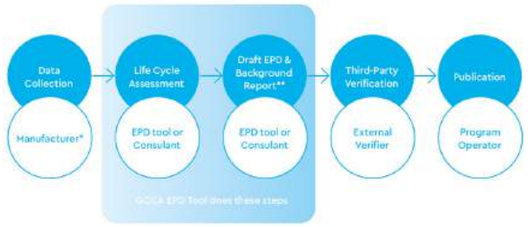
Why the GCCA has an EPD tool

The cement and concrete industry has been at the forefront of transparent, consistent responsible reporting of environmental performance. At a production level almost a quarter of all plants globally report through the GNR system. See page 14. At a product level, relatively speaking, EPD reporting has only just begun, but the cement and concrete sector has published more EPDs than any other material sector. So far EPD reporting is in limited locations.

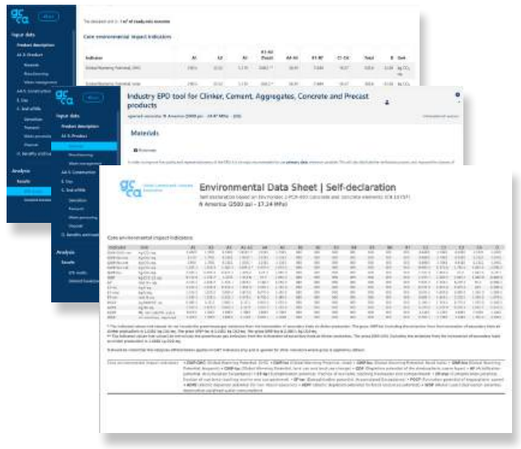
To enable product environmental impact reporting in a cost effective and consistent manner, GCCA provides an EPD software tool to members and non-members at cost to maximise ability of all producers. Dating back to 2014 the GCCA tool is updated to latest EPD standards, underlying data sets and software technology.

Key Benefits for Users

- **Simplify EPD Creation** Streamlined process reduces time and cost of generating EPDs.
- **Reduce Verification Costs** Pre-verification can lower third-party EPD verification cost by up to 50%.
- **Enhance Credibility** Support sustainability claims with robust, third-party verified data.
- **Meet Market Demands** Fulfill growing client and regulatory requirements for EPDs



Above: **EPD development process using the GCCA tool**



Above: **GCCA EPD TOOL interface**

Innovation

Innovation is fundamental to the cement and concrete industry's future. Many of the technologies needed to reach net zero need to be developed, nurtured and accelerated. It is therefore crucial to drive, support and advocate for innovation in the sector at all stages.

The GCCA, on behalf on the industry, runs three world-class innovation platforms under its Innovandi arm to accelerate and foster innovation.

Innovandi Global Cement and Concrete Research Network

Launched in 2020, the Innovandi Global Cement and Concrete Research Network is a consortium which brings together academia (leading global institutions) and industry (cement and concrete manufacturers, admixture companies, equipment and technology suppliers) to collaborate on essential actionable pre-competitive research, in areas such as calcined clays, concrete recycling, kiln electrification and carbonation.

The network connects over 450 scientists in the field of cement and concrete, and the value of its research is worth approximately ten million Euros per year (80 PhDs). It also directly funds around 1.2 million Euros per year in research solely focussed on reducing the CO_2 footprint of concrete.

Under the network, academic partners and industrial partners collaborate on research projects, of which there are over 60 currently being worked on in the network, and more than six new have applied and are under review to join. The network meets at bi-annual (Spring Week and Autumn Week) meetings to present updates and results on their cutting-edge research, as well as determine the direction for future projects.

All the core projects and PhD researchers can be found on our website: https://gccassociation.org/innovandi-gccrn-projects/

The network also runs the Nanocem PhD prize which recognises the best global PhD on cementitious materials. Dr Shiva Shirani was named as the winner for research using 4D nano-technology to help improve low-carbon cement in 2024.

Above: **Innovandi GCCRN Industrial Partners**

Innovandi Open Challenge

The Innovandi Open Challenge is a global programme which brings together tech start-ups and the world's leading cement and concrete companies to help accelerate the next wave of innovations in decarbonisation technologies. The programme sources the world's most exciting start-ups, and after a series of pitches it partners them with GCCA members to form consortia.

Selected start-ups will gain unique access to plants and labs through this programme, as well as expertise and infrastructure of nearly 50 members across the world to showcase innovation status: move from ideas to prototype, pilot-tests, proofs of concepts, business cases. In other words, the programme will provide start-ups with the access they need to grow.

We are in the fourth year of our successful Innovandi Open Challenge that has been running since 2021. Topics for the past challenges were Carbon Capture, Use and Sequestration (CCUS) and new materials for low carbon concrete. During this time, over 300 start-ups have applied, and 11 consortiums have been formed so far and new ones will be announced soon.

Above: **Open challenge start-ups**

Innovandi Entrepreneur Network

The Innovandi Entrepreneur Network is open to startups, interested in collaborating to support our shared net zero mission. Membership provides a platform to access the Innovandi mentorship programme and network with peers and GCCA members, as well as access first-hand information on the Innovandi Open Challenge.

Fifteen startups have joined since its launch in 2024, and have attended various webinars and events including the annual GCCA conference in Mexico in 2025.

Above: **Entrepreneur Network start-ups**

Roadmap to Zero:
Technology levers and policy enablers

The GCCA 2050 Cement and Concrete Industry Roadmap for Net Zero Concrete, published in 2021 is the collective commitment of the world's leading cement and concrete companies to fully contribute to building the sustainable world of tomorrow.

The roadmap sets out a net zero pathway to help limit global warming to 1.5ºC. The sector is committed to producing net zero concrete by 2050 and is committed to acting now. Even prior to the roadmap publication, the industry had already made progress with proportionate reductions of CO_2 emissions in cement production of 20% from 1990 to 2020.

The roadmap highlights three milestones for 2030: application of carbon capture technology at industrial scale at 10 plants; 20% reduction in CO_2 per tonne of cement by 2030 from 2020; and, a proportionate 25% reduction in CO_2 emissions per cubic metre of concrete.

2030 Milestone: Carbon capture progress

Carbon capture technology is applied at industrial scale in

10 plants

to contribute to delivering net zero concrete

2030 Milestone: CO_2 Reduction

(Compared with 2020 Baseline)

Cement
20%
CO_2 reduction per tonne of cement by 2030

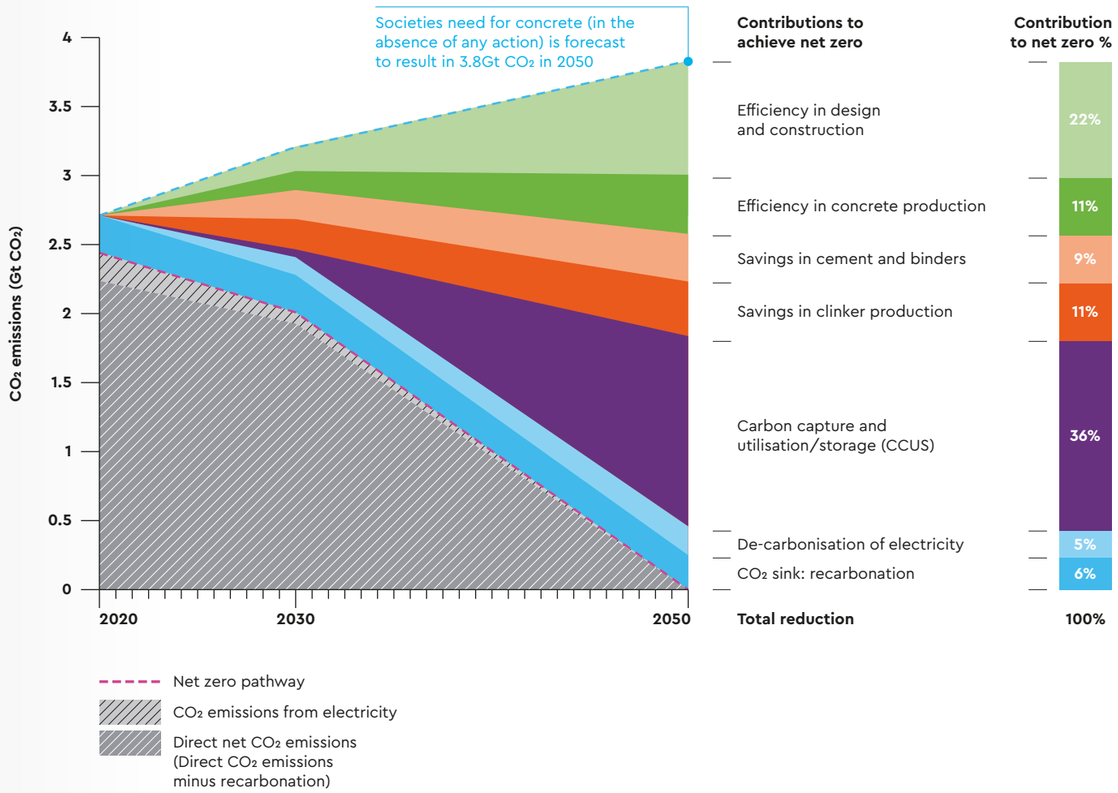
Concrete
25%
CO_2 reduction per m^3 of concrete by 2030

The industry is on track to deliver CCUS technology at an industrial scale at 10 plants by 2030.

Tracking CO_2 reductions of 100% of the global cement production is not currently possible. However leading companies have been reporting plant level data for many years as part of GNR (see below). GNR is a good trend indicator of all committed players in the cement and concrete sector. Due to legal requirements, data reporting is delayed by two years, so the latest data available is from 2023. Three years into this decade, the reduction in CO_2 per tonne of cement is 4.4%, which represents a doubling of the annual carbon reduction rate over the previous decade, but further acceleration is required to meet the 2030 milestone.

GNR data is yet to be extended to concrete, although this is currently being implemented. It is reasonable to conclude that concrete progress is closely aligned to that of cement.

The net zero pathway



The roadmap sets out the levers to achieve net zero across the whole lifecycle from cradle to grave. It also highlights that success requires the right policy support to be in place to shape demand for low carbon products (economic viability), enable a transition of the sector and making full use of circular economy opportunities, as well as supporting the development and implementation of innovations and key infrastructure.

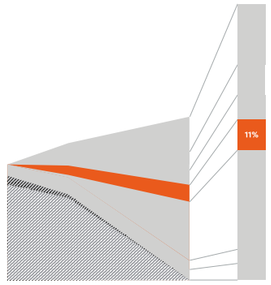
Total global CO_2 emissions from the sector in 2020 were in excess of 2.5Gt. Emissions are primarily direct CO_2 emissions which in turn are primarily from the decarbonation of limestone itself (approx. 60%) and combustion of the fuels used in the cement kiln and other plant processes (approx. 40%). Electricity used by the sector contributes further CO_2 emissions.

There are multiple levers that will be implemented to reduce CO_2 emissions at different stages of the whole life of cement and concrete. Our roadmap process evaluated the role that each of these levers will play to reach net zero.

The global average is presented in the graph above. Across the world, each lever will be implemented in accordance with local factors.

In the following pages, each lever will be described from the perspective of the technology and the required policies to enable the transition to happen. For the first time, and where possible, indications of progress are reported.

Clinker



11% contribution to Net Zero and 410Mt CO_2 emission savings in 2050

Savings in Clinker production:
- savings from waste fuels ("alternative fuels")
- use of decarbonated raw materials
- thermal efficiency
- use of hydrogen as a fuel

During the clinker production stage, CO_2 reductions are possible through use of waste materials ("alternative fuels") to replace fossil fuels, use of decarbonated raw materials, energy efficiency measures and innovations such as use of hydrogen and kiln electrification.

Alternative fuels are derived from non-primary materials i.e. waste or by-products and can be biomass, fossil or mixed (fossil and biomass) alternative fuels. There are current examples of cement kilns operating with nearly 100% alternative fuels, which demonstrates the potential of this lever. The industry provides a waste management option that combines energy recovery with mineral recycling. It can treat waste that is otherwise non-reusable and non-recyclable from a range of sources, for example, municipal, agricultural, chemical and food production. The extremely high temperatures and residence times reached in cement kilns ensure these are managed in a safe and environmentally sound way.

On average globally, alternative fuel use is forecast to increase from 6% in 2020 to 22% and 43% by 2030 and 2050 respectively. The leading companies have significantly higher use of alternative fuels than these global production averages. GNR data for 2020 and 2023 respectively shows an increase from 19% to 24%. This increase is in line with the forecast increase across total production.

Use of decarbonated raw materials to replace some of the limestone in the kiln reduces the total emissions from decarbonation of the limestone. By definition the decarbonated materials, such as the fine material from recycled concrete and crystalline slag, do not emit CO_2 when heated because they have already had the CO_2 removed. Globally this is forecast to provide a 2% reduction in total emissions from the sector.

Thermal energy efficiency measures are already widely implemented across the globe through deployment of existing state-of-the-art technologies in new cement plants and retrofitting existing facilities. With many newer energy efficient cement plants in emerging economies, this is an area where these regions have already made good progress. It is to be noted that with an increase in the use of alternative fuels, there can be a decrease in thermal energy efficiency.

Innovations such as the use of hydrogen and kiln electrification are forecast to play a small role from 2040, providing 10% of energy needs by 2050. The Innovandi Global Cement and Concrete Industry Research Network (GCCRN) has a core project "Meta-analysis on the use of electric energy for cement production" and a partner project on use of hydrogen in cement kilns. For more information and article references on GCCRN Projects/ Clinker Production visit: https://gccassociation.org/innovandi-gccrn-projects/

> Our industry provides a unique waste management option that combines energy recovery with mineral recycling – treating waste that is otherwise non-reusable and non-recyclable.

CRH's cement plant in Rohožník, Slovakia has made clinker efficiencies through the replacement of 20% raw materials with alternatives as well as increased use of alternative fuels and installation of waste heat recovery.
Read more on p56

Policy enablers

In the context of clinker production, the policy support that can have the most significant and most immediate decarbonisation, and broader sustainability benefit, relates to enabling treatment of waste in cement kilns.

To increase use of alternative fuels requires implementation of policies that allow access to suitable waste and secondary material streams, such as biowaste, by reducing the landfilling of waste that can be co-processed in cement kilns. Policies must also encourage the segregation of waste streams to improve resource flow and ensure streamlined environmental permit-issuing processes for cement plants. There also must be a level playing field in the access and use of biomass across all sectors of the economy.

To aid in this policy development, countries should require and implement monitoring and accounting of the share of materials which are effectively recycled through co-processing as part of their recycling targets. It is also recommended that there is formal recognition of the simultaneous energy recovery and mineral recycling characteristics of 'co-processing' in waste policy frameworks. At international level, this should be through the addition of a dedicated code (R15) for co-processing under Annex IV of the Basel Convention.

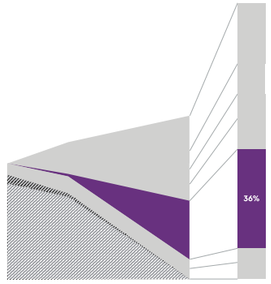
Alongside the above policies, there should be strong regulatory measures, including permit issuance and compliance procedures to ensure implementation of Best Available Technologies (BAT) when implementing co-processing in the cement industry.

Votorantim Cimentos has pioneered in Turkey the use of biomass waste. At its Yozgat plant the alternative fuel in the main burner is primarily corn stalks. At its Hasanoğlan plant, biomass is used in the calciner line.
Read more on p83

Cementos Argos is leveraging AI-powered digital twins to revolutionise cement and concrete plants. In cement production, digital twins improve heat recovery and kiln productivity, directly reducing fuel use and emissions.
Read more on p44

At **Çimsa**'s Bunol plant in Spain, the high temperatures and specific processes required in white cement production make the use of alternative fuels more challenging. To address this, it has introduced the use of green hydrogen.
Read more on p51

Carbon Capture Utilisation and Storage (CCUS)



36% contribution to Net Zero and 1,370Mt CO_2 emission savings in 2050

Savings in CCUS:
- carbon capture at cement plants

CCUS is a critical lever to decarbonise cement and concrete, because unlike other sectors, switching to renewable energy is not sufficient to deliver decarbonisation. This is because the CO_2 emissions from the cement sector are not only due to energy use. Two thirds of the CO_2 emitted is from the calcination of limestone. Whilst there is work on alternatives to clinker (see Cement and Binders on p30), the scale of demand for buildings and infrastructure can only be met by Portland clinker cements.

The contribution of carbon capture and utilisation/storage to decarbonisation is forecast to become significant beyond 2030 when commercial viability and the necessary infrastructure have been established. Good progress has already made this decade from fundamental studies of CO_2 storage sites through to the first industrial scale facility opening in Norway.

The GCCA Net Zero Roadmap set a milestone of 10 plants having applied carbon capture technology at an industrial scale by 2030. Publicly announced projects are collated and made available on the GCCA/LeadIT green cement technology tracker. In October 2025, of the 77 projects, 33 of them are commercial scale (>0.1 million tonnes captured). Over and above publicly announced projects on the GCCA/LeadIT tracker, there are 18 additional projects reported of which 7 are commercial scale. Of the 95 projects, 40 are commercial scale, and 25 of these are reported as due to be completed in 2030 or before, and on average will capture 1 million tonnes CO_2 per year.

Also of note are the different technologies across a number of regions. Among the 36 projects (demonstration and commercial) to be completed by end of 2030, 4 different specific carbon capture technologies are being applied.

Storage and Utilisation
Once captured, the CO_2 will be permanently stored primarily in geological storage or utilised. If utilised, this may be within the cement and concrete industry or by other industries. Utilisation of captured CO_2 within the cement and concrete industry includes injection into wet concrete, curing of hardened concrete and in the manufacturing of aggregates from waste products. Further commercial development and expansion of these uses of captured CO_2 is under way. Fundamental research is also ongoing, including that by the Innovandi Global Cement and Concrete Research Network (GCCRN).

Relevant projects and references can be found in both the CCUS and Recarbonation/Recycling sections of the GCCRN online library. Innovandi GCCRN projects can be found at gccassociation.org/innovandi/gccrn/

> CCUS technology works and we are seeing an increasing number of pilots and industrial scale projects gather pace across the world in our sector.

Policy enablers
Policy levers need to be extended across the world to drive the number and scale of CCUS projects required for cement manufacturing to be on track to meet net zero by 2050.

Policy support in Europe, USA and Canada has enabled the industry to be on track for its 2030 target of 10 plants at an Industrial scale. However, even here further policy development is required to enable a robust business case for the essential deployment from 2030. The policy landscape needs to be in place as soon as possible to ensure the necessary ramp up in carbon capture in the 2030s, for the sector to stay on track.

Policies are required to support the implementation of CCUS technologies through financial, infrastructural, and regulatory measures. Policies must also foster innovation and demand for carbon-neutral solutions.

The key policy items are:

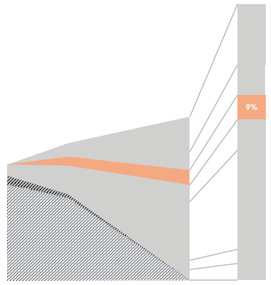
1. Use appropriate carbon pricing mechanisms to create a level playing field on carbon costs and avoid carbon leakage through adequate carbon pricing mechanisms.
2. Integrate CCUS in public financing mechanisms that covers in particular the initial investments and early operational abatement costs to allow for an investable business case.
3. Provide fair recognition of all carbon removal measures, both where the CO_2 is ultimately stored or used in products, either by acknowledging them as part of regional/national emissions trading systems or by developing tailored accounting rules. Include negative emissions savings through the use of CCUS combined with biomass fuels in the accounting rules.
4. Provide transport infrastructure and storage to move captured carbon to where it can be used or stored. In particular, speed up permitting processes to allow for the construction of carbon storage facilities. In addition, the infrastructure needs to be regulated in such a way that dispersed sites are not disadvantaged when it comes to access and costs.
5. Provide reliable access to sufficient and competitively priced decarbonised energy.
6. Establish public-private partnerships to speed-up CCUS developments, including shared investment in CO_2 transport and storage networks.
7. Support R&D including for new uses in other sectors of CO_2 captured by the cement and concrete industry.
8. Enable the integration of CO_2 performance in public procurement, building standards and construction codes alongside traditional criteria to create the demand for carbon-neutral products.

Heidelberg Materials' Brevik Norway CCS captures 50% of the plant's CO_2 emissions, which are then transported to permanent storage under the North Sea. The public launch of this first full scale facility was in June 2025.
Read more on p60

JSW Cement is delivering two test bed projects that received approval from the Department of Science & Technology (DST) – "Special Call on Carbon Capture Utilisation (CCU) deployment in the Cement Sector".
Read more on p64

TITAN's first CCS facility at the Kamari cement plant near Athens will capture 1.9 million tonnes of CO_2 annually. Supported by a €234 million EU grant, the project was added to Greece's Strategic Investments framework in 2025.
Read more on p78

Cement and Binders



9% contribution to Net Zero and 350Mt CO_2 emission savings in 2050

Savings in Cement and Binders:
- Portland clinker cement substitution (also expressed through clinker binder ratio)
- alternatives to Portland clinker cements

At the cement plant or the concrete plant, fly ash, ggbs, ground limestone and other materials, known as supplementary cementitious materials (SCMs) can be added to Portland clinker cement to deliver concretes with reduced CO_2 emissions whilst maintaining required performance. In some applications the concrete performance is enhanced.

Availability of suitable materials around the world varies now, and will into the future. For example, fly ash comes from coal-fired power stations and ggbs from the steel industry's blast furnaces, and these industries are also transitioning. As a result, recovery of fly ash stockpiles through a process called beneficiation is becoming more common. In the coming decades there will be increased use of ground limestone and calcined clays to both compensate for reduced supply of fly ash and ggbs, and further reduce the Portland clinker to binder ratio. Progress in production of calcined clay can be seen on p39.

Whilst availability of SCMs can be a limitation for reducing clinker binder ratio, client acceptance and standards are barriers to fully exploiting this lever in some developed and emerging economies. On average globally, the clinker binder ratio in 2020 was estimated as 0.63. It is projected to reduce to 0.58 and 0.52 by 2030 and 2050 respectively. Regional and even country variations are inevitable due to differing SCM availability and market requirements.

GNR data is available for use of SCMs in the cement manufacturing process with a parameter known as clinker to cementitious ratio. This is higher than clinker to binder ratio because it does not account for SCMs added in the concrete plant. GNR has shown a progression from 0.78 down to 0.75 in clinker to cementitious ratio from 2020 to 2023 respectively.

> In the coming decades there will be increased use of ground limestone and calcined clays to further reduce the Portland clinker to binder ratio.

Alternatives to Portland Clinker Cements

Alternatives to Portland clinker cements have been the subject of much research but their impact is not forecast to be significant primarily because of fundamental lack of availability of raw materials at the scale required. Typically, they have CO_2 emissions about half of current common cements. On average globally it is forecast that alternatives to Portland clinker cements will be 1% and 5% of cement in 2030 and 2050 respectively and in 2050 contribute a 0.5% reduction in overall CO_2 emissions.

To speed up the progress on novel cements, the GCCA's 2023 and 2025 Innovandi Open Challenge focussed on new materials and ingredients for low carbon concrete. Over 130 start-ups were sourced and 32 were invited to pitch over the two years. After in-depth pitching and discussions, 4 consortia have been formed between start-ups and GCCA member companies in 2023 and are currently finalising 4+ consortia for 2025 that will be announced soon. For more information visit: www.gccassociation.org/innovandi/openchallenge2023/

Policy enablers

Specific policies are required to unlock the full circular economy potential and prioritise the use of, and improve access to, waste and by-products as supplementary cementitious materials.

Use of blended cements and SCMs can be increased in the immediate term with governments and policy makers acting as follows:

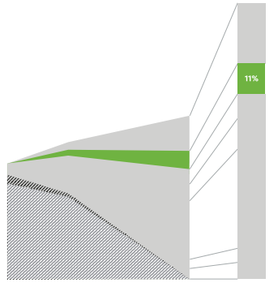
1. Ensure necessary support for review, approval and publication of standards to ensure latest standards are available.
2. Ensure cement, concrete, design and construction codes and standards, and building regulations where applicable, are aligned and congruent. For example, construction codes must refer and default to latest available material standards.
3. Ensure government and its agencies take the lead in public projects by specifying low carbon cements and concrete, through use of blended cements and SCMs, while taking into account the whole life carbon and performance of projects. We recommend major government agencies responsible for construction, are asked to review specifications to ensure they permit use of blended cements, SCMs and latest material standards.
4. Promote formal construction and more industrialised uses of cement, understanding that they offer a better scenario to leverage a more efficient, safe, and optimised use of SCMs.
5. Provide policy measures that encourage, incentivise and train clients and specifiers to use low carbon cement and concrete, through use of blended cements and SCMs, in construction projects, based on a whole life carbon and performance assessment.
6. Enable access and avoid barriers to sourcing SCMs both from overseas and domestically. Whilst taking into account the transport carbon impacts, no blanket prevention of importation should be introduced. Domestically, regulations should enable access to materials that are valuable for input into the cement/concrete value chain.
7. Establish government funding programmes to support development of material standards that will widen and accelerate the use of SCMs and blended cement.
8. Establish government funding programmes for product development and innovation for new SCMs.
9. Establish government funding programmes for development of test methods to enable more performance-based approaches firstly for known constituents and then for new, alternative constituents.

TCC Group Holdings' subsidiary CIMPOR is at the forefront of African calcined clay production. Its new Ivory Coast facility is now producing 250kt/a, and further facilities in Cameroon and Ghana are due to open by the end of 2025, which will more than treble production. Read more on p76

Limak in Turkey has successfully utilised Construction Demolition Waste as a mineral additive in the commercial production of CEM II/A-F 52.5 N type cement, in compliance with the EN 197-6 standard, to reduce clinker factor.
Read more on p66

Molins has commercialised limestone calcined clay cement into the Spanish market delivering more than 122,000m³ of concrete and mortar by July 2025; products which are in the B/C ranges in the GCCA carbon ratings.
Read more on p68

Concrete



11% contribution to Net Zero and 430Mt CO_2 emission savings in 2050

Efficiency in Concrete production:
- continue to industrialise manufacturing
- optimised mix design
- optimisation of constituents
- quality control

In terms of concrete production, industrialisation is the most significant specific decarbonisation lever. Moving from small project site batching of concrete using bagged cement to industrialised processes offers significant CO_2 emissions savings because of the adherence to mix specifications and quality control.

In some emerging economies such as India, the vast majority of concrete production is currently on project sites and the continued growth in industrialised production offers the prospect of significant savings in cement use. For some countries in which bagged cements have relatively high use of SCMs, and bulk cements do not, then greater industrialisation may have the perverse effect of increasing clinker binder ratios. This should be guarded against by raising awareness of the benefit of blended cements and SCMs.

More broadly, utilisation of admixtures and improved processing of aggregates are good opportunities for CO_2 emissions savings in concrete production through the more efficient use of binders. These savings have already been implemented by parts of the industry, but broader and deeper application will deliver further savings.

On average globally, optimisation of concrete production in terms of binder utilisation is forecast to lead to binder demand reductions of 5% and 14% in 2030 and 2050 respectively compared with 2020.

The GNR data collection and reporting for cement production is being extended to include concrete production. A pilot data collection has been conducted and refined the reporting guidelines that are now being more broadly rolled out. To maximise global coverage of the concrete industry, which is local by nature, the plan is to work with national concrete association partners so that their data collection is aligned to facilitate aggregation and reporting of global trends.

> Concrete is the essential material for delivering progress and building the resilient and sustainable communities our world needs.

Policy enablers

Changes to standards and public procurement policies are necessary to accelerate the adoption of low carbon concrete products. Low carbon concrete products arise from carbon reduction measures along the value chain, and so these procurement policies are also important for decarbonisation of clinker and cement and enabling CCUS.

Low Carbon Procurement Policies will stimulate demand for low-carbon and near zero carbon cement and concrete products. Policies should recognise the following:

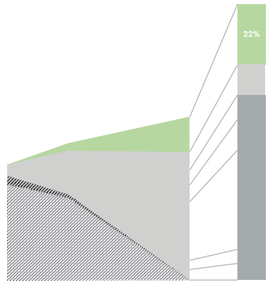
1. Low carbon procurement of products should be based on comparison of products with the same functional performance using recognised EPDs.
2. Targets for reduction compared with current CO_2 performance should be:
   - stretching to deliver demand signal wanted by manufacturers and challenging enough to be credible drivers
   - realistic to ensure customers can find suppliers
   - congruent with GCCA global roadmap taking into account national opportunities/challenges, or national roadmaps where they exist.

Taiheiyo's new CARBOCATCH system is being trialled on a public construction project in Japan. Lower carbon concrete is being produced by using waste materials that have absorbed CO_2 through the CARBOCATCH system.
Read more on p74

Holcim and Seqens have built the Recygénie 220-unit social housing complex in Paris using a custom concrete in which all components – cement, aggregates and water – have been made from recycled resources.
Read more on p62

Betonhuis has trialled aggregate packing innovations. The pilot project achieved a 10% reduction in clinker content, maintaining performance while lowering embodied carbon by approximately 8kg CO_2/m^3.
Read more on p85

Design and Construction



22% contribution to Net Zero and 840Mt CO_2 emission savings in 2050

Efficiency in Design and Construction:
- client brief to designers to enable optimisation
- design optimisation
- construction site efficiencies
- re-use and lifetime extension

The project team of architect, engineer, contractor, project manager and quantity surveyor, together with the client (or their representative) have important roles to play to help decarbonise the whole life of cement and concrete.

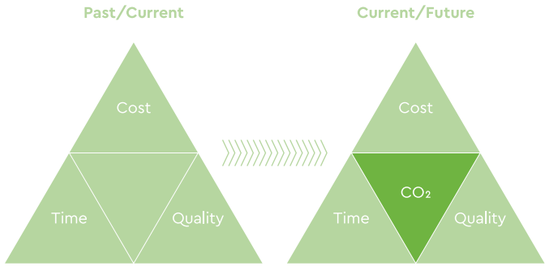
They are responsible for:

- Material specification: specification with CO_2 as a criteria results in lower CO_2 solutions. Either lower carbon mixes with same performance requirements, or higher strength mixes with higher per unit volume carbon footprint outweighed by volume savings.
- Material procurement: low carbon procurement is a key enabler for the industry to decarbonise production. (See Concrete on p32)
- Efficiency in design and construction of elements and whole projects: This can be achieved by applying many specific levers. These levers are able to be applied with current standards and regulations.

The primary means of unlocking design levers is ensuring that reduction of CO_2 emissions becomes a design parameter in addition to the current parameters of cost, time, quality and specific project client requirements.

Across all projects globally, the CO_2 emissions reductions achievable through design and construction levers is forecast as 7% and 22% in 2030 and 2050 respectively.

Project teams need to have CO_2 emission reduction in the design constraint triangle



Designers are familiar with working to constraints of cost, time and quality. Clients and funders must give designers the opportunity to design to an additional constraint of whole life carbon, whilst retaining requisite quality standards (which includes durability, safety and resilience).

Designers of buildings, with support of clients, can achieve CO_2 emission reductions through their choice of concrete floor slab geometry and system, choice of concrete column spacing and optimisation of concrete strength/element size/reinforcement percentage. This can be achieved whilst still obtaining all the performance benefits of concrete construction. Infrastructure projects offer similar opportunities.

> The primary means of unlocking design levers is ensuring that reduction of CO_2 emissions becomes a design parameter.

Policy enablers

The Clean Energy Ministerial Industrial Deep Decarbonisation Initiative calls on governments to commit to low carbon procurement of projects. Level two of their pledge includes: "Starting no later than 2030, conduct whole project life cycle assessments for all public construction projects, and, by 2050, achieve net-zero emissions in all public construction projects."

Adoption of this pledge, implementation as soon as practical, and extension to privately funded construction will facilitate realisation of the potential design and construction decarbonisation savings.

Concrete design and construction can be optimised to reduce CO_2 impact, but there are often systemic barriers and practical constraints preventing this potential from being realised. For example:

- demands on speed of construction meaning low-carbon mixes are less economical
- fragmented value chains meaning the possibility and responsibility to reduce CO_2 is spread across different actors with diverging incentives
- the pace of change in revision of standards and building codes which (justifiably) prioritise avoiding risk

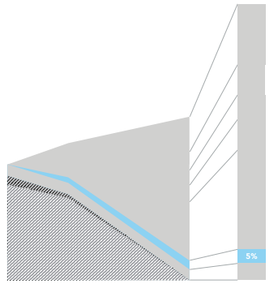
Policy enablers are required to tackle (non-regulatory) systemic barriers to enable the optimisation of concrete design and construction and prioritisation of CO_2 performance alongside other objectives at the procurement, design and construction stages.

Siam City Cement has worked with construction company VINCI in Cambodia to deliver approximately 22,000m³ of concrete with reduced carbon footprint, supported by a data driven approach using the GCCA EPD tool.
Read more on p71

Cementos Pacasmayo in Peru has extended Cement Soil Stabilisation beyond pavements into riverbank defences to protect vulnerable communities from extreme weather events, saving 20% of CO_2 emissions.
Read more on p46

The forthcoming Australian Adoption of the GCCA Low Carbon Concrete Rating System, by **CCAA** will enable the design and construction community to design lower carbon concrete projects.
Read more on p86

Decarbonisation of Electricity



5% contribution to Net Zero and 190Mt CO_2 emission savings in 2050

Savings in Decarbonisation of Electricity:
- decarbonisation of electricity used at both cement plants and in concrete production

Demand for electricity from the cement sector will increase as we move towards 2030 in line with increased total production and as we move towards 2050 primarily due to electricity demand of carbon capture. This increase in demand is countered by decarbonisation of electricity production. Decarbonisation of electricity across the globe over coming decades will result in emissions from generation of electricity used in cement and concrete production to reduce to zero.

The IEA reported in October 2024 that clean energy transitions have accelerated rapidly in recent years, but need to move much faster to meet climate goals. In 2023, renewables provided 30% of global electricity supply. (1)

1. IEA, World Energy Outlook 2024, www.iea.org/reports/world-energy-outlook-2024

> In 2023 renewables provided 30% of global electricity supply (1).

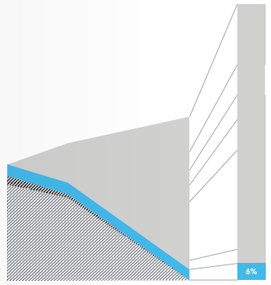
Policy enablers
The cement and concrete sector are not alone in calling for policies to boost the supply, distribution, availability and affordability of renewable energy.

There remains a gap between the stated policies scenario and the net-zero emissions scenario for the energy sector generally and electricity in particular. Read more in IEA report (1).

UltraTech has operationalised a 7.5 MW behind-the-meter renewable energy project in Gujarat. First of a kind in India, it integrates solar and wind energy alongside battery storage, co-located on site, to provide uninterrupted energy.
Read more on p80

Cemex in Croatia has met 6% of its electricity demand through rooftop solar using existing infrastructure without additional land use, and in the next phase a further 8% through ground-mounted solar on rehabilitated quarry land.
Read more on p48

Recarbonation



6% contribution to Net Zero and 240Mt CO_2 emission savings in 2050

Savings in Recarbonation:
- natural uptake of CO_2 in concrete over whole life – a carbon sink

Recarbonation is a natural process of CO_2 uptake by concrete. It has been well understood by engineers and has been incorporated into engineering standards for decades. In addition, to being recognised in the IPCC 2006 Guidelines for GHG Inventories, It has most recently been highlighted in the IPCC 6th assessment report published in August 2021.

In the GCCA roadmap, tier 1 of the IVL methodology has been used. This permits a 20% value for recarbonation to be adopted, with this being applied to the theoretical maximum carbonation possible for a tonne of clinker (525kg CO_2/tonne). This is a lower bound conservative value within the IVL methodology.

From 2020 to 2050, the clinker binder ratio decreases (see Cement and Binders on p30). The reduced clinker per m³ of concrete, and total clinker volume globally results in a slight decrease in recarbonation over the coming decades.

This forecast is intentionally conservative because it was the first global roadmap to include recarbonation and work is still progressing on more detailed evaluation of recarbonation and efforts to enhance recarbonation through active exposure of crushed concrete to CO_2 at end of life.

National government reporting of Carbon Uptake
The natural uptake of CO_2 in concrete at a national scale is of significance and merits reporting as part of country submission to IPCC. Detailed studies using the IVL methodology (1) have been completed in Denmark, Sweden, UK and Brazil. Work is ongoing or soon to be initiated in India, China and Australia.

1. www.ivl.se/projekt/co2-concrete-uptake/calculation-models.html

Policy enablers
Policies should recognise the natural CO_2 uptake in concrete over its lifetime as a permanent CO_2 sink. They should facilitate access to concrete demolition waste to enable the industry to maximise CO_2 uptake through enhanced recarbonation. Evaluation and reporting of carbon uptake should be part of national greenhouse gas accounting and in project/product lifecycle analysis.

> The IVL methodology (1) for national reporting to IPCC of natural carbon uptake in concrete has been applied and completed in Denmark, Sweden, UK and Brazil.

Green Cement Technology Tracker

Leadit
LEADERSHIP GROUP FOR INDUSTRY TRANSITION

gcca Global Cement and Concrete Association

Where have Carbon Capture projects been announced?

Disclaimer: No claims are being made regarding the sovereignty or status of any territories displayed on this map.

Lastly updated: October 13, 2025

Where have Clay Calcination Kiln projects been announced?

Disclaimer: No claims are being made regarding the sovereignty or status of any territories displayed on this map.

Lastly updated: October 13, 2025

GCCA Member Action

Our members are demonstrating climate action today, with projects that exemplify CO_2 reductions across the world.

The following pages highlight some of the standout projects that are taking place across our members and association partners today.

Member Companies

Breedon
- CCUS – UK

Cementir Holding
- CCUS – Denmark

Cementos Argos
- Clinker & Concrete Production – AI
- Cement and Binders – Calcined Clay & Pozzolans
- Circular Economy

Cementos Pacasmayo
- Sustainable Concrete Construction
- Biodiversity
- Cement and Binders

Cemex
- Sustainable Concrete Construction
- Decarbonisation of Electricity
- Clinker Production – Biofuels

Çimsa
- Clinker Production – Co-processing & Hydrogen

CNBM, Sinoma Int'l
- CCUS
- Cement and Binders – Calcined Clay
- Clinker Production – Circular Economy
- Clinker Production – Efficiency

CRH
- Clinker Production – Co-processing & WHR

Dangote
- Company roadmap

Fletcher
- Clinker Production – Co-processing

GCC
- Clinker Production – Co-processing
- Cement and Binders
- CCUS USA

Heidelberg Materials
- Cement and Binders – Calcined Clay
- Circular Economy
- CCUS UK
- CCUS Norway

Holcim
- Concrete Production – Circular Economy
- CCUS – Europe
- Concrete Production – Biochar

JSW
- Clinker Production – C- processing
- CCUS – India

Limak
- Cement and Binders – recycled demolition waste

Moctezuma
- Tepetzingo: New Alternative Fuel Installation

Molins
- Cement and Binders – Calcined clay

Norm
- Cement and Binders
- Clinker Production – Co-processing

SCC
- Sustainable Construction – Use of GCCA EPD tool

SCG
- Cement and Binders – Calcined clay
- 3D printing
- Ultra-High Performance concrete

Taiheiyo
- Cement and Binders
- Concrete Production

TCC Group Holdings
- Cement and Binders – Calcined clay
- Cement and Binders – Limestone cements
- Climate Policy Actions

TITAN Group
- Cement and Binders – Calcined clay
- Clinker Production – Co-processing
- CCUS – Greece

UltraTech
- CCUS – India
- Decarbonisation of Electricity
- Sustainable Transport
- Clinker Production

UNACEM
- Clinker Production – Co-processing
- Clinker Production – Co-processing

Votorantim Cimentos
- Cement and Binders
- Clinker Production – Co-processing

National and Regional Association Partners

Betonhuis
- Concrete Production – Aggregate packing

Cement Concrete & Aggregates Australia
- Procurement Advocacy
- Procurement – Low Carbon Ratings Adoption

Cement Europe
- Regional roadmap and Project Tracker

FICEM
- Regional and Country Roadmaps
- Co Processing – Methane avoidance
- Production Carbon Calculator

FIHP
- Low Carbon Concrete Promotion

JCA
- Obtaining financial support for industry specific costs in CCS

MPA
- Cement and Binders – recycled demolition waste

Oficemen
- National Roadmap

TCMA
- Climate Policy Advocacy

Breedon

CCUS – Peak Cluster and NZM Partnership

Following the public launch of the Peak Cluster project in 2023, Breedon has continued to be a key partner in the Peak Cluster Carbon Capture and Storage project. Key steps taken this year have been:

- The formation of Peak Cluster Ltd: a joint venture between a number of investors: Breedon, Tarmac CRH, Holcim UK and SigmaRoc from the cement & lime sector as well as Progressive Energy, Sumitomo Energy Evolution Ltd and National Wealth Fund.
- Securing £28.6M of equity investment from the National Wealth Fund.
- Building a strategic partnership with Spirit Energy as a key player in their Morecambe Net Zero (MNZ) project which has capacity to permanently store the CO_2 produced by the Peak Cluster partners.
- Progression of Front-End Engineering & Design (FEED) for the pipeline which will transport the CO_2 from the Peak District to the store.
- Development of the planning consent strategy for the project, including appointment of key contract partners.

The on-going collaboration between competitors as well as investors and the MNZ project continues to reduce project risk, building certainty across the full chain for a project which will decarbonise 40% of the UK's cement and lime industry.

£28.9M

Securing £28.6M of equity investment from the National Wealth Fund.

BREEDON

Cementir Holding

ACCSION – Driving the Future of LowCarbon Cement

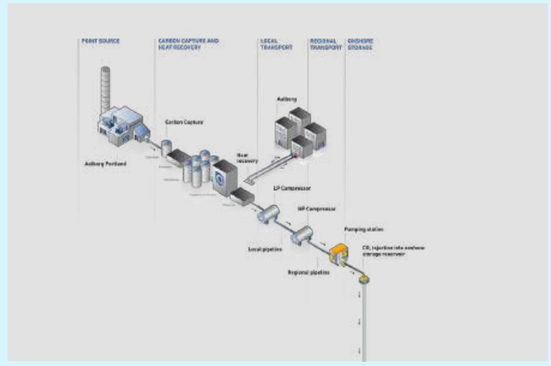
Cementir subsidiary, Aalborg Portland, is taking a decisive step toward net zero cement with ACCSION LowCarbon, one of Europe's first fullscale onshore carbon capture and storage (CCS) projects. Developed with Air Liquide as technical partner, ACCSION deploys Cryocap™ technology to capture up to 1.4 million tonnes of CO_2 per year from grey and white cement production – creating one of the largest capture initiatives in the global cement industry. The captured, high purity CO_2 will be conditioned and transported for permanent storage, establishing an advanced CCS value chain onshore.

Beyond deep emissions cuts in a hard to abate sector, ACCSION delivers system benefits. Surplus heat from the capture process will be recovered to supply energy to over 20,000 local households, supporting regional sustainability and resilience.

Backed by the EU Innovation Fund, the project aligns with Europe's industrial decarbonisation agenda and anchors Aalborg Portland's climate roadmap, which prioritises largescale carbon capture to reduce Scope 1 emissions. ACCSION is a long term investment in the future of cement – ensuring this essential material can meet society's needs while rapidly lowering its carbon footprint.

Impact at a glance:

Large scale CO_2 capture, advanced CCS value chain, community heat recovery, and a scalable pathway towards net zero cement.



> ACCSION deploys Cryocap™ technology to capture up to 1.4 million tonnes of CO_2 per year from grey and white cement production

cementirholding
CALTAGIRONE GROUP

Cementos Argos

Digital twins

At Argos, we're leveraging AI-powered digital twins to revolutionise our cement and concrete plants, boosting efficiency, cutting energy consumption and reducing our carbon footprint by lowering the clinker-to-cement ratio.

Lever: Efficiency in concrete production and savings in clinker production

For more than six years, at Argos we have been developing and refining digital twin technology in our cement and concrete plants. These advanced virtual models, powered by artificial intelligence and data analytics, are transforming the way we operate optimizing production and enhancing efficiency in real time.

The primary goal is clear: sustainability and operational excellence. In cement production, digital twins improve heat recovery and kiln productivity, directly reducing fuel use and emissions. In concrete, they ensure higher-quality, more consistent products with less variability, advancing efficiency across the value chain.

The results are already tangible:

- 2 percentage point reduction in clinker-to-cement ratio.
- 4.5% increase in average mill throughput.
- 7% decrease in specific electrical energy consumption in the mills.
- 11kcal/kg reduction in specific calorific value in clinker production.

This project strengthens two critical levers of our industry's decarbonization roadmap: efficiency in concrete production and savings in clinker production. By harnessing digital technology, Argos is not only improving operational performance but also laying the foundation for scalable, data-driven solutions that bring the cement and concrete industry closer to its 2050 decarbonization targets.

> Virtual models, powered by artificial intelligence and data analytics, are transforming the way we operate.

Calcined clays and pozzolans

Scaling calcined clays, pozzolans and basalt across our network reduced clinker use and CO_2 intensity, delivering record clinker-to-cement factors and targeting 50% reduction at selected plants.

Lever: Savings in cement and binders (SCMs/blended cement)

In 2024, we expanded supplementary cementitious materials across our network. We scaled optimised calcined clays in structural cements, deployed pozzolans with chemical activators, and increased basalt in general use cement.

In Colombia, we increased the addition of calcined clays to our Structural Max cement, which reduced the clinker-cement factor by 1.5% vs. the previous year, reaching the best historical value for this cement in operation.

In Honduras, we implemented the use of pozzolans and an activating additive in cement production. This reduced the clinker cement factor by 1 percentage point from 54% to 53%. Also, with an investment of USD 7 million, we began installing a pozzolan dryer to improve cement formulation. After stabilization of the process, an overall clinker-cement factor of 49.8% is expected to be achieved. And in Puerto Rico, we implemented an initiative to maximise the use of basalt for general purposes and EcoMasonry cements, broadening the reach of lower-carbon products.

The payoff is clear. We have less clinker per tonne, lower CO_2 intensity, and record low clinker-to-cement factors, with sub-50% targets at selected plants. The program also strengthens cost resilience and resource efficiency while maintaining quality.

Green Sacks Program

Using our innovative reverse logistics program "Green Sacks" to collect over 19 million bags in the last decade, transforming more than 3,100 tonnes of paper into new raw materials.

Lever: Efficiency in design & construction

At Argos, our Green Sacks program is transforming waste management for cement, ready-mix, and lime bags. For over a decade, we've used a circular approach, collecting empty bags from our customers at no cost and giving them a new life in other industries. This initiative not only simplifies waste management for our clients but also reinforces our commitment to sustainability.

Through our innovative reverse logistics model, we use the same vehicles that deliver our products to collect the empty bags, making our supply chain more sustainable and reducing the environmental impact of our operations and our customers'.

The results speak for themselves:

- 10+ years of operation, with over 500 customers enrolled.
- More than 19 million empty bags collected, which is over 3,100 tonnes of paper diverted from landfills.
- These bags have been transformed into raw materials for products like paper pulp and fiber cement.
- In 2024 alone, we collected 711 tonnes of paper, which is the equivalent of saving approximately 7,110 trees and preventing 190,000kg of CO_2 emissions.

This project showcases our dedication to a circular economy, turning waste into valuable resources.

Cementos Pacasmayo

Innovation and circular economy to drive a more sustainable Peru

The Riverbank Defenses Project for the La Leche and Motupe rivers, on Peru's northern coast, represents a landmark achievement in applying Cement-Soil Stabilization (CSS) to hydraulic infrastructure.

Traditionally applied to strengthen soil bases in pavements, CSS was reimagined and adapted by Pacasmayo through targeted research and development. This effort led to a simpler and more refined process – enhancing the technique's sustainability, durability, and productivity while making it suitable for large-scale infrastructure challenges.

The project applied MH cement – a material with moderate heat of hydration and a low clinker-to-cement ratio – combined with a specialised additive that improved the soil-cement microstructure. This innovation ensured low permeability and robust resistance against the erosive force of river flows.

Unlike conventional methods by leveraging the soil available on-site, the project eliminated the need for quarry extraction, long-distance hauling, and soil disposal. The result was a more efficient execution, lower environmental footprint, and longer-lasting riverbank protection. Importantly, the approach avoided around 20% of CO_2 emissions compared to conventional methods.

Through this initiative, Pacasmayo has extended CSS beyond pavements into critical infrastructure, demonstrating its potential as a replicable, resilient, and climate-conscious solution to protect vulnerable communities from extreme weather events.

> By reinforcing the existing soil with cement, this approach minimises the need for extensive excavation and new materials, enabling the construction of more roads that can connect rural areas efficiently.

Pacasmayo

Biodiversity Conservation

Cementos Pacasmayo has implemented strategic conservation actions to safeguard critical ecosystems in northern Peru, including the Virrilá Estuary, the Illescas National Reserve, and the Santa Julia Wetlands.

In 2014, the company committed to keeping the Virrilá Estuary—a coastal wetland in Sechura internationally recognised for its biodiversity—free from mining operations. This commitment led to the creation of its Management Committee in 2018 and its designation as a Ramsar Site in 2021. Since 2022, as the Technical Secretariat, the company has led projects benefiting more than 120 species through the installation of 15 demarcation markers, the construction of infrastructure for park rangers, cleanup campaigns that have removed over 20 tonnes of waste, and the organization of educational activities with more than 3,000 participants.

Additionally, Cementos Pacasmayo chairs the Management Committee of the Illescas National Reserve, a habitat for sea lions, Humboldt penguins, seabirds, and notably the Andean condor. The company promotes sustainable tourism across more than 36,000 protected hectares. It also drives the recovery of the Santa Julia Wetlands in the city of Piura, strengthening water regulation and the conservation of migratory birds. These actions integrate biodiversity conservation with tangible benefits for local communities and ecosystems.

Cement and Binders

Cementos Pacasmayo continues to implement its decarbonization strategy with the goal of progressively reducing the clinker-to-cement factor while ensuring the quality and performance of its main products in northern Peru: Extraforte (Type ICo Cement) and Fortimax (Type MS/MH Cement).

These improvements were achieved by increasing the use of supplementary cementitious materials (SCMs) like limestone, natural pozzolans, and granulated blast-furnace slag. Additionally, the company used functional additives and optimised the cement grinding process. In 2024, these actions led to a clinker factor reduction of 1.2% for Extraforte and 3.2% for Fortimax, with an additional 2.5% reduction achieved for the latter. This brings Fortimax's total accumulated reduction to over 5% since the optimization program began.

As a result, Pacasmayo's cements with additives have achieved a reduction of more than 26% in the clinker factor compared to traditional Ordinary Portland Cements (OPC). This progress directly contributes to lowering emissions associated with clinker production and reflects a model of continuous optimization. Through operational committees, the company is driving improvements in clinker reactivity, adjusting the granulometry of the cement produced, and incorporating more reactive SCMs. This consolidates the eco-efficiency of its operations and its transition toward a low-carbon future.

Cemex

Coastal resilience project from Alabama connected to hybrid solutions and circularity topics

In collaboration with The Nature Conservancy, a coastal series of breakwaters protecting part of Alabama's shoreline is being restored using mineralised recycled rip rap. This green-gray solution helps protect the shoreline, leverage construction demolition materials, rebuild marine habitats and enhance resilience for nearby communities.

Objectives

- Leveraging its sustainable construction expertise, Cemex is delivering a custom concrete mix incorporating construction demolition materials (CDM) with the resistance attributes needed to break waves and limit coastal erosion. This innovative product also creates a durable foundation for marine habitat restoration, attracting oysters and mussels, and supporting ecosystem recovery.
- This project aims to address the current challenges facing coastal regions. On the Florida Gulf Coast alone, a predicted 1-meter sea level rise by 2100 could affect 5 million people and impact $770 billion in property value. Communities on the U.S. coast also support more than 58 million jobs. Alabama's shoreline is receding by as much 12 feet per year, putting more than 7,000 properties at risk from frequent tidal flooding. As a global hotspot of biodiversity, Alabama faces significant threats from climate change, with 20 percent of all species in the Gulf facing high or very high overall vulnerability. A 50–85% decline in oysters from historic levels in the Gulf is affecting its water quality, as 1 oyster can filter 190 liters per day. This decrease has negative effects on the entire ecosystem, as well as coastal protection and the fishing industry.

Benefits

- Improve the built environment to create a lasting, positive impact on cities and communities worldwide
- Cemex hopes to actively enhance resilient infrastructure that safeguards natural environments and strengthens emergency preparedness and response capacities
- Limit shoreline erosion with possible shoreline accretion by adding ~1.5ft of material, increasing vertical relief, protecting 7,500 citizens at Swift Tract and 5,100 citizens on Fort Morgan
- Achieve at least 10 bivalves per m^2 by providing substrate material for settlement
- ~20 tonnes of CO_2 to be permanently stored in coastal breakwaters
- Repurposing 2,100 tonnes of used materials into coastal breakwater structures
- Creating a circular, green-gray solution demonstrating our capabilities in a growing market

Process

- Raised by 1ft eroded 567m coastal breakwaters at Swift Tract (May) and 70m coastal breakwaters on Fort Morgan (October) with CDEM creating 6 alternate sections with mineralised and non-mineralised CDEM
- 2,100 tonnes of CDEM was used in total, 50% mineralised with 70 tonnes of CO_2 purchased locally with a treatment time of 3 days
- Mineralization via Cemex R&D-owned Neustark specialised equipment, shipped from Spain to Alabama in 2 months

Key metrics

The Nature Conservancy will provide expertise on nature-based solutions and monitor changes in shoreline position and bivalve settlement, testing the hypothesis of whether oyster settlement in mineralised reef sections is higher, for a minimum of 3 years. The measurements are:

- Annual bivalve monitoring, using ¼ m quadrats
- Reef elevation post-construction
- Shoreline position
- TNC also monitors the reef breakwaters after storm events to document any impacts

Solar Plants in Croatia

In 2024, Cemex Croatia commissioned a comprehensive solar power initiative across its production sites in Sveti Juraj and Sveti Kajo, significantly advancing its decarbonisation strategy. The project includes rooftop photovoltaic installations on 26 industrial buildings and canopies, utilising existing infrastructure without additional land use. The solar panels were installed on clinker halls, administrative buildings, mechanical workshops, crushing plants, warehouses, and other auxiliary industrial facilities

These systems deliver 6.56MWp of installed capacity and generate 8.95GWh of electricity annually, reducing Scope 2 emissions by 1,424.86 tonnes of CO_2 and cutting total electricity consumption by 6%.

For this year the plan is to install additional solar power plants in Sveti Juraj Quarry and plant, adding 1,49MWp of capacity and generating 1,914GWh annually. This will further reduce emission by 296,34t CO_2.

In the next phase, Cemex Croatia will construct two large-scale ground-mounted solar plants on rehabilitated quarry land, adding 12.96MWp of capacity and generating 21.63GWh annually. This will further reduce emissions by 3,439.17 tonnes of CO_2 and cut electricity consumption by 14%.

This will enable the company to cover approximately 21.66% of its total internal electricity consumption through its own sources, resulting in an annual Scope 2 emissions reduction of approximately 5,160.37t CO_2.

This project represents one of the largest integrated solar systems in the industry in Croatia and marks a significant step toward achieving climate goals and transitioning to more sustainable production.

Key Metrics

- Total installed capacity: 21.01MWp
- Annual renewable electricity generation: 32.5GWh
- Annual Scope 2 CO_2 emissions reduction: 5,160.37t CO_2
- Share of internal electricity consumption covered by solar: ~21.66%
- Total area covered: 57,000m²

ALBA & Cemex Germany

Cemex and recycling service provider ALBA have formed a joint venture – ALCE Biokohle GmbH – to construct a pioneering biofuel facility at Cemex's Rüdersdorf cement plant near Berlin. The project aligns with Cemex's global "Future in Action" strategy and Cemex Germany's specific Carbon Neutral Alliance master plan, which targets carbon-neutral cement production by 2030. The fully automated plant will convert biogenic waste into biochar, a carbon-neutral fuel, significantly reducing reliance on fossil fuels in cement manufacturing.

Cemex holds a 49% stake in the venture, reinforcing its commitment to climate protection and industrial sustainability. The ALCE torrefaction plant is expected to be operational by the end of 2027.

Key Metrics

- Biofuel to replace fossil fuels in cement production.
- Cemex and ALBA have worked together on lower-carbon alternative fuels since 2005.
- The ALCE plant is expected to be operational by the end of 2027.

Above: **The photo shows the normal wood (raw material) and then the product that is to be produced in the new plant.**

49%

Cemex holds a 49 % stake in the venture, reinforcing its commitment to climate protection and industrial sustainability.

Çimsa

Savings in clinker production (savings from waste fuels, use of hydrogen as a fuel)

As Çimsa, we are committed to reducing carbon emissions through concrete actions. In line with our SBTi targets, we annually update our investment needs and integrate them into our long-term strategic plans. Compared to the 2021 base year, we have reduced our cementitious product emission intensity by 14.5%; this progress shows that we are on track with our reduction targets of 39.3% in Scope 1 and 86.8% in Scope 2.

Energy transition through the integration of alternative energy sources plays a critical role in achieving our goals. We use low-carbon secondary materials such as biomass, refuse-derived fuel, and end-of-life tyres as thermal energy sources. To enable this energy transition, in 2024 we took significant steps at our Buñol and Mannok plants to develop alternative fuel preparation, storage, and feeding systems.

In 2024, 28% of the thermal energy at our Buñol plant was supplied from alternative fuels, with a target of reaching 40% by 2030. However, the high temperatures and specific processes required in white cement production make the use of alternative fuels more challenging. To address this, we introduced an innovative breakthrough technology: the use of green hydrogen.

Hydrogen stands out as a catalyst that can replace fossil fuels and increase the share of alternative fuels. In this project, by using green hydrogen in white clinker production, we improved combustion efficiency, increased the alternative fuel ratio to 50%, and set a target of reducing CO_2 emissions by 30,000 tonnes annually.

Mannok Cement, which has recently joined Çimsa and operates a grey cement production line, has also made strong progress. While 20% of its total thermal load was previously supplied from alternative fuels with the existing feeding and combustion systems, this rose to 43% with the FUELFLEX® Phase 1 project implemented in 2023, and to 51% with the commissioning of the JETFLEX® Satellite Burner in 2024. With the completion of the FUELFLEX® Phase 2 project in January 2025, the plant reached a capacity of up to 65% alternative fuel use. Altogether, these investments are expected to deliver approximately 60,000 tonnes of CO_2 reduction.

> We have reduced our cementitious product emission intensity by 14.5%; this progress shows that we are on track with our reduction targets of 39.3% in Scope 1 and 86.8% in Scope 2.

CNBM – Sinoma Int'l

World's First Industrial Demonstration of Large-scale Cement Oxy-Fuel Combustion Technology Integrated with Carbon Capture

CNBM Equipment Group Co., Ltd, a subsidiary of SINOMA INTERNATIONAL collaborated with leading universities and scientific research institutes to develop the world's first key oxy-fuel combustion technology and equipment tailored for the cement industry.

The breakthrough has been successfully applied in the demonstration project of 200,000 tonnes CO_2/a in Qingzhou, Shandong Province, China, providing crucial CCUS technical support and a pioneering demonstration model for industries dealing with low-concentration flue gas source.

It is the first CCUS demonstration project within the CNBM Group's cement sector, It is also the first large-scale demonstration application of low-energy carbon capture technology coupled with oxy-fuel combustion in the cement industry. The project successfully passed the performance test in August 2024. All technical indicators met or exceeded the contract assessment requirements.

The project's success has bridged a number of critical technical gaps:

- The CO_2 concentration dry basis in the flue gas exiting the preheater increased dramatically from 20–30% of that of conventional air combustion to over 80%, establishing the foundation for energy-efficient physical capture.
- The temperature of flue gas has dropped from over 300 of conventional air combustion to below 200, achieving an industry first.
- The comprehensive energy consumption per unit CO_2 product is reduced to below 1.6 GJ/t CO_2, which is over 40% lower than that of conventional chemical absorption method.

> The project successfully passed the performance test in August 2024. All technical indicators met or exceeded the contract assessment requirements.

CNBM | sinoma

Technical Research and Engineering Application of Clay Flash Calcination

SINOMA INTERNATIONAL, has developed a flash calcination system to produce calcined clay. It has the following characteristics:

1. suspension preheating system: uses 4–5 stage preheater to preheat raw materials from ambient temperature to 600–700.
2. suspension calcination system: controls temperatures inside the calciner at 750~850 to calcined clay into reactive metakaolin.
3. suspension cooling system: two independent cooling subsystems, to cool the calcined product to below 100.

The first application was in He'nan Province in China to produce 400,000 tonnes calcined clay/a. Actual production rates achieved are exceeding design capacity by almost 20%.

The final product and energy demand of the process has met or exceeded requirements. The activity index of the calcined clay is over 120% based on the strength test method. The content of dissolved aluminum, is within range of good quality product (about 2–3% higher than that of rotary kiln technology). The average heat consumption of the demonstration project is about 400kcal/kg.cc, which is about 20% lower than that of rotary kiln technology.

400Kt

The first application was in He'nan Province in China to produce 400,000 tonnes calcined clay/a. Actual production rates achieved are exceeding design capacity by almost 20%.

Complete Substitution of Limestone with Industrial by-product Gypsum in Cement Production

SINOMA INTERNATIONAL has built the world's largest mass-production facility and application unit: the Wengfu phosphogypsum resource recycling project (referred to as "1468" Project). The project covers an area of 340 acres, with an annual processing capacity of about 1.4 million tonnes of phosphogypsum (dry basis), an annual output of 650,000 tonnes of sulfuric acid, and 800,000 tonnes of cement. The project can save 800,000 tonnes of limestone primary resources per year and reduce CO_2 emissions by approximately 300,000 tonnes annually from limestone decomposition.

At the same time, the new generation of intelligent technology fully empowers the entire production process, innovatively applying large-scale equipment and core processes such as low resistance and high-efficiency preheater, energy-saving rotary kiln, and new grate cooler. The comprehensive utilization rate of phosphogypsum has achieved a historic breakthrough, and energy-saving, consumption reduction, and production operation indicators are leading globally: the clinker quality is qualified and stable, with SO_2 concentration in the flue gas ranging between 12% and 13%, and the heat consumption of clinker burning is approximately 1200kcal/kgcl.

This technology enables 100% substitution of limestone with phosphogypsum in cement production, coupled with sulfuric acid co-production. It delivers lots of benefits: resolving phosphogypsum stockpiling, conserving primary resources minimizing quarrying, and cutting CO_2 emissions, thereby meeting the cement industry's green and low-carbon development requirements.

100%

This technology enables 100% substitution of limestone with phosphogypsum in cement production, coupled with sulfuric acid co-production.

Improved Clinker Production Efficiency through Plant Upgrade

CUCC (Xuzhou) 10,000t/d cement production line I was put into operation in 2004. Its fuel consumption, power consumption and emission did not meet China's policy requirements of dual control of energy consumption under the national "double carbon (carbon peaking, carbon neutrality)" strategy.

SINOMA INTERNATIONAL has fully demonstrated the pollution and carbon reduction of upgrading the five-stage preheater to a six-stage preheater.

Upgrading started on March, 2022, and was finished on August 4th. It modified the preheater to a six stage preheater, the calciner to a self-denitrification type and replaced the cooler by a new 13000t/d Sinowalk cooler with middle crusher. Commissioning finished by the end of August.

The clinker capacity was improved from 10000t/d to as high as 13000t/d. The outlet temperature of preheater was 262 reduced by 83 with a lower dust and CO concentration.The heat recovery efficiency of cooler was improved. The fuel consumption was reduced by 98kcal/kg.cl, the electricity consumption was reduced by 6.5kW·h/t.cl, and the burning efficiency was increased from 55.0% to 63%. The fuel consumption was 4% lower than Level-1 as required in GB 16780–2021. Meanwhile, it has achieved ultra-low NOx emissions, saving 43000 tonnes of standard coal and 10000 tonnes ammonia, reducing CO_2 emissions by 108000 tonnes each year. The upgrade promotes the green and sustainable development of cement manufacturing enterprises.

63%

The fuel consumption was reduced by 98kcal/kg.cl, the electricity consumption was reduced by 6.5kW·h/t.cl, and the burning efficiency was increased from 55.0% to 63%.

CRH

Integrated decarbonisation strategy drives results at Rohožník Cement Plant

CRH's cement plant in Rohožník, Slovakia stands as an example of how multiple decarbonisation levers can be applied in tandem as part of an integrated carbon reduction strategy. Combining fuel substitution and material replacement with advanced technologies and process optimisations, the Plant which is operated by CRH's Danucem business has made significant strides in reducing the carbon footprint of the material it produces, as well as its own operations.

Savings in Clinker Production

Danucem uses alternative fuels at the Plant to help reduce its dependence on traditional fossil fuels. Alternative fuel use at Rohožník increased by almost 20% between 2021 and 2024. Key to achieving this increase was the installation of an innovative new dryer system to eliminate moisture in the fuel, thereby enhancing combustion efficiency, which in turn reduces fuel consumption levels while also minimizing the production of excess flue gasses.

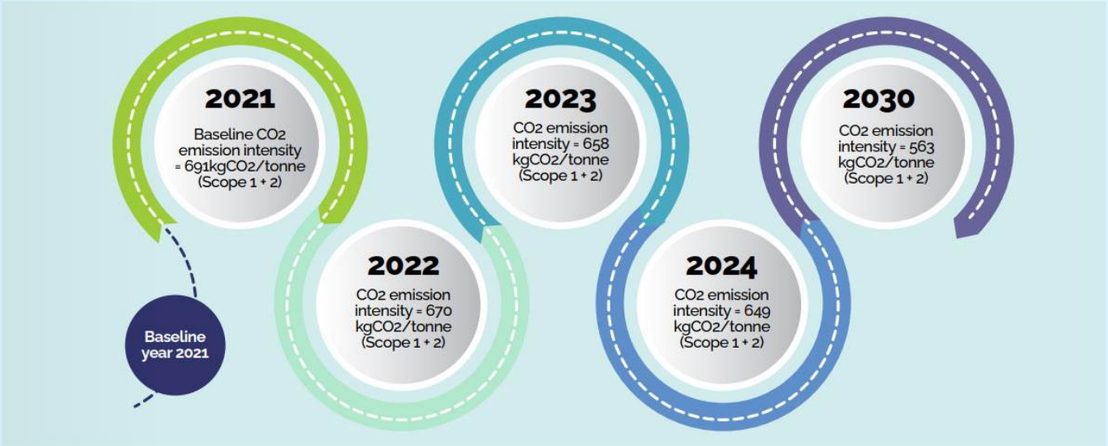
In parallel, Rohožník has also increased its use of alternative raw materials through the replacement of limestone with recycled alternative raw materials (ARMs) including fly ash, steel slag and other mineral-rich wastes. These materials contribute to the chemical composition needed to produce clinker. Approximately 20% of Rohožník's raw materials are now ARMs, reducing the overall carbon emissions of the cement manufactured there by approximately 7%.

Decarbonising electricity

In addition to the use of alternative fuels and raw materials the Plant has also implemented new process efficiencies including a new Organic Rankine Cycle (ORC) system, which harnesses excess hot air from the cement production process to generate electricity. This waste heat recovery technology now supplies up to 10% of the Plant's electricity needs, improving energy efficiency while also reducing water consumption compared to traditional steam-based systems.

The decarbonisation activities at Rohožník demonstrate the combined impact that technology, material and process improvements can have in delivering meaningful performance improvements in carbon reduction, supporting the industry's commitment to net zero concrete by 2050.

Dangote



Launch of Dangote Cement Decarbonisation Roadmap

Dangote Cement Plc (DCP) has committed to reducing 20% of its Scope 1 and 2 CO_2 emissions by 2030, in line with its Net Zero ambition. The DCP roadmap aligns with levers in the Global Cement and Concrete Association (GCCA) Roadmap to Net Zero.

Targets ranging from 5% to 43% have been set for each plant, based on plant capacity, all contributing to the group target. From the baseline of 2021 to 2024, DCP has cumulatively reduced its carbon emissions by 1,174,000 tonnes CO_2e, representing a 6.1 % decrease. As of July 2025, we have already achieved 96.5% of our 2025 emissions target.

To drive this commitment, reduction targets have been set for process emissions, power generation, fuels consumption in kilns, raw materials drying and vehicles. Proposed and ongoing projects include:

- ~5% decrease in clinker factor portfolio-wide in 2024.
- Equivalent to ~80,000 tonnes of clinker saved annually (based on estimated production scale).
- Reduction translates into ~45,000 tonnes of CO_2 emissions avoided per year.

Fletcher

Alternative Fuels in Cement Production

Golden Bay, New Zealand's only fully integrated cement manufacturer, is on the road to 100% coal substitution. With alternate fuels total substitution rates exceeding 65%, we're demonstrating how legacy operations can be transformed to deliver low carbon solutions in the cement industry, helping to enable the NZ Concrete Association's roadmap to Net Zero by 2050 and playing a pivotal role in diverting waste from landfill.

Golden Bay's alternative fuels journey began in 2004, with the introduction of biomass to replace coal in the calciner. Today, biomass accounts for approximately 30% of the total fuel mix, with a large portion sourced from construction wood-waste that would otherwise be destined for landfill.

In 2021, we took a significant leap forward by incorporating end-of-life tyres into our fuel strategy. With a view of fully eliminating coal from calciner, additional handling and feed equipment was installed that has allowed chipped tyre to be used at up to 40% substitution rates providing a consistent, high-temperature and stable energy source. As a result, we have effectively zero coal going in to heating the back end, marking a major milestone in the plant's decarbonisation roadmap, and taking our coal substitution to 60%.

The current phase of the programme is focused on displacement of coal from our main burner, which requires high calorific waste streams. Since early 2025, Golden Bay has been feeding hard-to-recycle plastics, expired medical waste, light filmy plastics, and high-concentration industrial and commercial waste streams as a main burner fuel. This has led to us to a consistent substitution rate of over 65% alternative fuels.

To support this next phase, Golden Bay has invested in new handling and feeding equipment tailored for front-end firing. This infrastructure will enable the safe and efficient use of complex waste streams, while maintaining fuel quality and kiln stability.

> Since early 2025, Golden Bay has been feeding hard-to-recycle plastics, expired medical waste, light filmy plastics, and high-concentration industrial and commercial waste streams as a main burner fuel. This has led to us to a consistent substitution rate of over 65% alternative fuels.

GCC

From Waste to Sustainable Solutions

At present, one of GCC's primary approaches to reducing emissions is by promoting a circular economy through alternative fuels. As part of our commitment to circularity, in 2024 we successfully reclaimed and repurposed materials from the Waste Tyre Disposal monofill in Pueblo, Colorado, converting over 60,000 tonnes of waste tires into tire-derived fuel (TDF).

Given the energy intensity of cement manufacturing, the use of TDF offers important benefits, including lower emissions than traditional fuels, reduced reliance on conventional energy sources by up to 25%. This approach also diverts scrap tires from landfills, recovers energy from raw materials and mitigates environmental challenges associated with waste management.

Blended Cements with a Lower Clinker Factor

Reducing the clinker factor in cement using alternative cementitious materials is a key lever in the GCCA 2050 Roadmap. Lower clinker content translates into a smaller carbon footprint for cement products.

At GCC, this commitment is reflected in our innovation strategy, which includes raising limestone content and incorporating supplementary cementitious materials (SCMs) such as natural pozzolans and calcined clays. In 2024, we achieved a record clinker factor of 83.7%, our third consecutive annual reduction. This milestone was supported by the full conversion of our Pueblo plant to Portland Limestone Cement (PLC). We are enhancing our research capabilities through strategic collaborations to drive future innovation in sustainable binders and cement solutions.

GCC's Carbon Capture, Utilization, and Storage Project

Recognizing the transformative potential of carbon capture, utilization and storage (CCUS), GCC began developing its carbon capture strategy in 2020. The initial phase involved a comprehensive screening of different technologies, evaluating factors such as efficiency, resource requirements (water, steam, power), technology readiness, CO_2 removal capacity, and vendor experience.

Results of the screening study, the Odessa Plant was identified as the most viable site for advancing carbon capture projects. In 2024, a Front-End Engineering Design (FEED) study was launched for the Odessa site, in collaboration with a leading technology provider, with ongoing assessments of scalability and feasibility.

In parallel, GCC continues to refine its screening criteria to guide future investment decisions and support the broader deployment of CCUS solutions across its operations.

Heidelberg Materials

Above: **Calcined clay plant in Tema, Ghana**

Scaling calcined clay technology for low-carbon cement in Ghana

In May 2025, Heidelberg Materials and JV partner CBI Ghana Ltd completed the construction of the world's largest industrial-scale flash calciner for clay in Tema, Ghana. By enabling the large-scale production of calcined clay cement, reducing reliance on imported clinker, and supporting local resource utilization, this initiative addresses the challenge faced by West African countries with limited limestone reserves.

It offers a sustainable alternative to traditional cement production by replacing traditional clinker with calcined clay: This can reduce the carbon footprint of cement by up to 40%. Additionally, the project has generated over 300 local jobs, supporting economic growth in the region.

The installation boasts a capacity of over 400,000 tonnes of calcined clay per year and is now operational. With cement demand in Ghana projected to double in the next 15 years, this project positions Heidelberg Materials at the forefront of sustainable construction, enabling a significant reduction in CO_2 emissions and fostering a transition to sustainable building solutions.

Above: **Enforced carbonation pilot facility at Heidelberg Materials' cement plant in Górażdże, Poland**

Heidelberg Materials' ReConcrete process: Closing the carbon and materials loop

Heidelberg Materials has launched an industrial pilot facility for enforced carbonation in Górażdże, Poland, advancing the large-scale implementation of its patented ReConcrete process. The project's objective is to combine circularity and decarbonisation by treating recycled concrete paste (RCP) from its Katowice recycling plant. Through enforced carbonation, RCP absorbs and permanently binds CO_2 from kiln exhaust gases, turning waste concrete into a carbon sink and a supplementary cementitious material (SCM). This innovative process supports both resource efficiency and significant carbon footprint reduction.

The enforced carbonation process can reduce CO_2 emissions by approximately 900 to 1,000kg per tonne of RCP used – 100 to 150kg is permanently bound in the material, and 750 to 850kg is avoided by replacing clinker in composite cements. Heidelberg Materials' advanced separation technology also ensures complete recycling of old concrete, yielding high-quality raw materials.

ReConcrete demonstrates Heidelberg Materials' integrated approach to sustainability and serves as a blueprint for future circular, low-carbon cement production across the Group.

Above: **Heidelberg Materials' Padeswood cement plant in North Wales, UK**

Padeswood CCS – the UK's first carbon capture-enabled cement plant

Heidelberg Materials UK is building the world's first carbon capture facility that enables the fully decarbonised production of cement at its Padeswood cement plant in North Wales. The main objective is to decarbonise cement production by capturing emissions at source and storing them safely under the seabed.

Following the recently opened Brevik CCS facility with 50% capture capacity, the new facility in Padeswood is designed to capture nearly all of the plant's CO_2 emissions and will be operational by 2029. This will significantly increase the availability of Heidelberg Materials' carbon captured near-zero cement, evoZero, across Europe.

Once operational, the Padeswood CCS facility aims to capture up to 800,000 tonnes of CO_2 per year. It is part of the HyNet industrial cluster, which targets annual savings of up to 10 million tonnes of CO_2. The project will secure over 200 jobs and create around 50 new ones, as well as up to 500 jobs more during construction.

Padeswood CCS is a vital step toward Net Zero, providing yet another blueprint for global decarbonisation of cement following the example set by Brevik CCS.

Above: **Formal opening of Brevik CCS in June 2025**

evoZero – the world's first carbon captured near-zero cement at scale

Under the evoZero brand, Heidelberg Materials has launched the world's first carbon captured near-zero cement at scale. Enabled by the Brevik CCS plant in Norway, evoZero cement delivers the same high performance and versatility as traditional cement, but with a significantly reduced carbon footprint. The product is fully compliant with existing building codes, requiring no new approvals, and is being delivered to sustainability-minded customers across Europe since October 2025.

Brevik CCS is designed to capture 50% of the plant's CO_2 emissions, which are then transported to permanent storage under the North Sea. evoZero customers can choose between physical delivery from Brevik or a virtual option, where local cement is paired with a certified carbon reduction from Brevik. Each tonne of CO_2 is tracked through a robust three-layered assurance system: Heidelberg Materials' own Carbon Bank, blockchain-like technology, and third-party verification, ensuring full traceability and preventing double-counting.

evoZero sets a new benchmark for sustainable construction materials, offering a competitive edge and building customer trust while accelerating the transition to Net Zero in the built environment.

Holcim

Efficiency in design & construction: World's first fully recycled concrete building enabled by Holcim's ECOCycle® circular technology

The Recygénie 220-unit social housing complex in Paris, France is the world's first building built using 100% recycled concrete. Built by Holcim and Seqens, it uses a custom concrete: a concrete in which all components – cement, aggregates and water – have been made from recycled resources, saving more than 6,000 tonnes of primary materials.

This unique recycled concrete was produced using ECOCycle®, Holcim's proprietary circular technology platform that recycles construction demolition materials (CDM) into new building solutions. All products with ECOCycle® inside – cement, concrete or aggregates – contain from 10% to 100% recycled CDM.

As populations grow and people move to urban areas, the world is building the equivalent of a new Madrid every single week. That makes circular solutions like the one used for Recygénie essential for us to preserve our planet's primary materials and build sustainably.

Through this circular construction, it is possible to transform waste into valuable resources to build cities from cities. Urban mining of this kind represents a huge opportunity for the industry, with some countries in the European Union failing to recycle over 90% of construction demolition materials. By 2030, Holcim intends to be recycling more than 20 million tonnes of CDM a year.

CCUS: Decarbonizating Europe from North to South with Carbon Capture and Storage

Holcim's carbon capture and storage projects are putting innovation and partnerships to work to advance Europe's decarbonization and the Clean Industrial Deal.

In northern Europe, the GO4ZERO project at Holcim's plant in Obourg, Belgium will transform cement manufacturing at every stage of the process. It aims not only to sustain current production capabilities, but also to significantly contribute to the decarbonization of the construction industry in the Benelux region and northern France. By 2029, the new Obourg cement plant will produce close to 2.3 million tonnes of near-zero cementitious materials. Awarded a grant by the European Commission's Innovation Fund in 2023, GO4ZERO will deploy an innovative air-oxyfuel switchable kiln with carbon purification technology. The CO_2 will then be sequestered under the North Sea.

In southern Europe, OLYMPUS in Milaki, Greece is another flagship project in Holcim's European decarbonization portfolio. OLYMPUS will lead to the development of storage capacity in southern Europe. It uses a highly innovative technology combination that merges OxyCalciner and Cryocap™ FG. With a target operational date of 2029, the project aims to produce 2 million tonnes of near-zero cement per year. The project was selected for a grant from the EU Innovation Fund in 2024.

CO_2 sink – recarbonation: Biochar turning buildings into carbon sinks

To accelerate the decarbonization of construction, Holcim is deploying biochar – an innovative carbon-sink technology applicable for multiple solutions, from cement to mortars and concrete.

At the end of life, organic matter releases CO_2 into the atmosphere. By converting it into a charcoal-like material called biochar through pyrolysis, carbon that would have been released as CO_2 is permanently sequestered. Acting in this way as a carbon sink, biochar can be added to low-carbon formulations of building materials including cement, mortars and concrete to further reduce their CO_2 footprint, with no compromise in performance. One kilogram of biochar prevents the release of up to 3kg of CO_2.

During the 2025 Architecture Biennale in Venice, Holcim partnered with Pritzker Prize-winning architect Alejandro Aravena and his firm ELEMENTAL to create a special net-zero concrete* using biochar for a resilient housing prototype. The innovative concrete mix also incorporated circularity, with 100% recycled aggregates inside.

*Scope of concrete production phases (A1-A3 cradle to gate) in Life Cycle Assessment. Assumes average transportation distance of 300km for cement and filler and 100km for aggregates.

> Holcim's carbon capture and storage projects are putting innovation and partnerships to work to advance Europe's decarbonization and the Clean Industrial Deal.

JSW Cement

Progressing towards Net-Zero through enhancing AFR

Objective and Benefits

JSW Cement's AFR (Alternative Fuels and Raw Materials) initiatives intend to minimise reliance on fossil fuels and lower carbon emissions by co-processing waste into its cement kilns. This will help us to reach a target of net zero concrete by 2050 and, adhering to the GCCA India's Decarbonisation Roadmap. By using alternative fuels, JSW Cement not only reduces environmental effect but also improves energy security and cost efficiency.

Implementation and Results

In FY 2024–25, JSW Cement co-processed about 168,000T which includes 1,57,000 tonnes of RDF at its Nandyal and Shiva plant locations. This intervention resulted in achieving a Thermal Substitution Rate (TSR) of 16.5%, representing a significant rise from 7% in FY24. Using AFR led to a CO_2 emissions avoidance by over 1,20,000 tonnes, lowering the company's Scope 1 net CO_2 intensity to 230kg/ tonne of cementitious material from 241kg/ tonne. This is significantly lower than national and global averages.

Key Metrics	
AFR Used	1,68,000 tonnes
TSR Achieved	16.5%
CO_2 Emissions Avoided	~1,20,000 tonnes
Scope 1 CO_2 Intensity	230kg/tonne
Total Net CO_2 Intensity	258kg/tonne

JSW Cement
The Leaders' Choice

From vision to action – Piloting CCU Testbeds

Objective and Benefits

Carbon Capture, Utilisation and Storage is one of the levers of decarbonisation, with the highest potential of CO_2 reduction to reach net zero commitment. The progress on this lever is at nascent stage in India. However, in July 2024, the Department of Science & Technology (DST) released a "Special Call on Carbon Capture Utilisation (CCU) deployment in Cement Sector" to promote Carbon Capture, Utilisation, and Storage (CCUS) technologies for decarbonizing hard-to-abate sectors like cement, focusing on demonstration of technologies and promoting domestic production. JSW cement participated in this call in collaboration with academic institutes and submitted two testbed projects and both were approved.

Implementation and Partnerships

The initial testbed, in conjunction with Indian Institute of Technology (IIT) Kanpur, is on mineralisation, converting CO_2 to stable carbonates using steel slag. The second testbed/project, developed with Council of Scientific and Industrial Research –Indian Institute of Petroleum (CSIR – IIP), IIT Tirupati, and Indian Institute of Science (IISc), utilises vacuum swing adsorption to absorb CO_2 from kiln gases and incorporate it into construction materials. These technologies not only cut emissions, but they also promote circular economy concepts by valorising industrial byproducts.

These testbeds are a significant step forward in JSW Cement's decarbonisation journey, confirming the company's leadership in sustainable manufacturing and its role in building India's low carbon future.

Key Metrics	
No. of CCU Testbeds Approved	2
Partner Institutions	IIT Kanpur, CSIR-IIP, IIT Tirupati, IISc
CO_2 Capture Technologies	Mineralisation and Vacuum Swing Adsorption
Strategic Impact	Supports India's net-zero goals and GCCA Roadmap
Scalability	Designed for replication across the cement sector

Limak

Introduction of Green Product Groups

As Limak Cement, we focus on product design activities to reduce the carbon emissions of products by prioritizing industrial symbiosis, sustainable production and environmental compliance targets.

The ongoing project works in our Central R&D Laboratory, Cement Mortar Laboratories and Accredited Ready-Mixed Concrete Laboratories under the roof of Limak Cement Central Technical Organization (LCTO) have been accelerated in the first quarter of the year. As a result of this, we have developed our products and categorised them under the brands “CEM PLUS+”, “ECO CEM PLUS+”, “ECO2 CEM PLUS+” according to their emission intensity.

CEM PLUS+ products will meet customers' demands for sustainable products, support green building projects, and help achieve low carbon footprint targets as the products that complying with environmental regulations and local legislations.

Inspired by our corporate motto of "now must say new things", we will continue our works by motivating all our employees, suppliers and stakeholders with the inclusive motto of "now must think/research/create/develop new things" towards achieving the net zero targets through the CEM PLUS+ product.

Pioneering the Path to Net Zero Emissions with Sustainable Innovation

The latest studies highlight that construction and demolition waste (CDW) constitutes approximately 30–40% of global solid waste. The recycling and reuse of CDW within industrial applications are no longer optional but a necessity, given their potential to conserve natural resources by upcycling these waste materials into value-added industrial products.

To address this critical issue, we have made a groundbreaking achievement in this critical field, becoming the first cement company in Türkiye to reach the highest strength class. Following extensive research and development, CDW has been successfully utilised as a mineral additive in the production of CEM II/A-F 52.5 N type cement, in compliance with the EN 197–6 standard. This innovative and environmentally friendly product features a reduced carbon footprint, contributing to the preservation of natural resources through valorization of CDW in cement production.

Being the first 3D mortar producer in Türkiye, LCTO has further expanded its innovative studies by developing mortar mixes for 3D concrete printing, incorporating both recycled aggregates from CDW and cement produced utilizing CDW. By integrating materials sourced from CDW, this technology demonstrates the effective application of low-carbon, sustainable construction materials within circular economy principles in modern construction, while also paving the way for more sustainable building practices in the future.

Limak Cement now must say new things

Moctezuma

Tepetzingo: New Alternative Fuel Installation

Moctezuma, committed to contributing to Mexico's sustainable development and continuing to pursue the goal of limiting global warming to below 2°C by 2050, still invests in projects that benefit the plant's surroundings and the country.

The success story specifically pursued by the 2030 strategy is the new alternative fuel installation at the Tepetzingo plant located in Morelos State where we operate 2 kilns.

This facility, unique in its kind in the country due to its automation, is capable of processing more than 150,000 tonnes of WDF (waste derived fuel) per year, equivalent to what more than 300,000 people currently generate each year.

Instead of using fossil fuels, taking advantage of alternatives will contribute to a significant reduction of emissions in cement production.

A highlight of this project was the good collaboration with the state government where the plant is located. They, concerned about the urgency of the waste issue in the state, found a reliable ally in Moctezuma.

Our goal for Tepetzingo Plant is to achieve a 30% co-processing rate by 2030, as part of our Sustainability Roadmap.

MOCTEZUMA®

Molins

Molins has successfully launched a new lower-carbon cement based on calcined clay and limestone, reducing CO_2 emissions by more than 20–30% compared to traditional cements.

In Spain traditional supplementary cementitious materials (SCMs) such as slag, fly ash or natural pozzolans are not locally available. To reduce the clinker-to-cement ratio and cut emissions, Molins initiated a three-year research program to explore the use of locally abundant resources: limestone and calcined clay.

In March 2025, Molins launched its new CEM II/B-M (Q-L) 42.5 R cement aligns with the GCCA carbon rating in the D range for cements. This cement has now been implemented across 12 ready-mix concrete plants operated by the company. By July 2025, more than 122,000 m^3 of concrete and mortar had already been produced with this innovative cement. By GCCA criteria, this concretes fall in the B/C ranges for carbon rating.

The results are significant: products made with this new binder achieve over 20% CO_2 reduction compared to CEM II/A-L 42.5 R, and more than 30% compared to traditional CEM I. Beyond lowering emissions, the project leverages local raw materials, reducing transport-related impacts and enhancing resource efficiency.

Molins' purpose is for all concrete and other cement-based products, except in cases of specific regulatory requirements, to be manufactured with the new CEM II/B-M (Q-L) 42.5 R cement by 2026. This initiative demonstrates how innovation and local solutions can accelerate decarbonisation in regions with limited access to conventional SCMs.

> Molins initiated a three-year research program to explore the use of locally abundant resources: limestone and calcined clay.

Molins has developed the new "R3PANOT" for Barcelona, a more sustainable paving solution that reduces CO_2 emissions by up to 71% by using recycled aggregates, renewable energy and low-carbon cement while preserving the city's iconic design.

In 1906, the urban landscape business of Molins won the competition to design Barcelona's paving blocks, the iconic tiles called popularly as "panot" that still define the city's urban landscape today. More than a century later, Molins partnered with the Barcelona City Council and the BIT Habitat Foundation to rethink the "panot "for the 21st century, placing sustainability at its core.

The result is R3PANOT, a new generation of paving slabs and blocks that combine heritage with innovation. Molins delivers an innovative and holistic solution, integrating its low-carbon cements, incorporating recycled raw materials, and featuring an exclusive design. The design incorporates 30% recycled aggregates in the "panot" and 14.65% in the paving block, uses 100% renewable energy in production, and employs low-carbon cements from steel slag and others. These innovations deliver a 71% reduction in the carbon footprint of the panot, compared with traditional materials.

Beyond decarbonisation, the R3PANOT is designed for circularity: 100% of residues are recyclable and up to 90% of pieces can be directly reused in case of repair. The project demonstrates how local innovation, circular economy principles, and low-carbon materials can reshape urban infrastructure while keeping the cultural identity of Barcelona intact.

71%

These innovations deliver a 71% reduction in the carbon footprint of the panot , compared with traditional materials.

Norm

Clinker Factor Reduction and Low-Carbon Product Innovation

In 2025, Norm advanced its decarbonization efforts through two pathways: clinker factor reduction and sustainable product innovation. The company applied advanced process optimization technologies and innovative approaches to recipe optimization, resulting in an approximate 5% reduction in the clinker factor across its cement portfolio. This achievement directly lowered process-related CO_2 emissions while maintaining the quality, strength, and durability of the products.

A major highlight was the launch of KLASS EKO, a new-generation low-carbon cement with a clinker factor of just 53%, considerably below conventional market standards. KLASS EKO is a cement type widely used in masonry, it ensures substantial carbon savings while maintaining the mechanical performance characteristics required for plastering works in construction.

By expanding the availability of lower-clinker cements, Norm is demonstrating tangible progress in aligning with the GCCA 2050 Net Zero Roadmap and contributing to Azerbaijan's broader climate commitments. The initiative illustrates how innovation, environmental responsibility, and industrial competitiveness can converge within the cement industry, strengthening Norm's leadership and setting a benchmark for sustainable cement manufacturing in the region.

Progress in other levers of decarbonization

Alternative Fuels
Norm Cement Plant has completed trial burns of oil sludge, with all required permits in place. The plant has recently started using oil sludge, and Net CO_2 emission reduction will be reflected in the near future.

Solar Power
Norm has signed a balancing agreement with "Azerenerji" OJSC and Enerso Jabrayil to purchase renewable energy from a Solar Power Plant in the future. Once implemented, this initiative will help reduce Scope 2 emissions and support the company's decarbonization goals.

Recycled Concrete Fines

- ~5% decrease in clinker factor portfolio-wide in 2024.
- Equivalent to ~80,000 tonnes of clinker saved annually (based on estimated production scale).
- Reduction translates into ~45,000 tonnes of CO_2 emissions avoided per year.

Low-Carbon Product – KLASS EKO

- Clinker factor: 53% (~40% less clinker factor compared to CEM I).
- Designed to meet AZS EN 413–1–2009 standard.

Impact

- Contribution towards GCCA 2050 Net Zero Roadmap milestones.

National Climate Alignment

- Supported Azerbaijan's COP29 climate agenda.
- Alignment with national targets for industrial decarbonization.

> Norm reduced its clinker factor by ~5% across its portfolio and launched KLASS EKO cement with only 53% clinker, reaffirming its commitment to low-carbon cement in Azerbaijan.

NORM

Siam City Cement

Chip Mong Insee Cement Leverages GCCA EPD Tool to Deliver Low Carbon Cement for French-Led Water Treatment Project in Phnom Penh

Chip Mong Insee, the joint venture between Siam City Cement and Chip Mong Group, has taken a major step forward in sustainable construction by actively utilizing the GCCA Environmental Product Declaration (EPD) tool. This innovative tool enables on-demand, transparent calculation of CO_2 footprints for cement products, supporting the industry's shift toward low-carbon solutions.

Recently, a French construction company working under VINCI on a large-scale water treatment project in Phnom Penh, Cambodia, sought cement with the lowest possible carbon footprint. While all Chip Mong Insee products are already EPD certified, the project's sustainability goals prompted the development of a new cement blend incorporating additional mineral component replacements.

Using the GCCA EPD tool, Chip Mong Insee calculated the CO_2 footprint of this new composition with precision and transparency. This data-driven approach not only demonstrated the environmental benefits of the new cement but also played a decisive role in securing the contract with VINCI. The project will use approximately 22,000 m^3 of concrete, all supplied with Chip Mong Insee newly formulated sustainable cement. This collaboration highlights how digital tools and innovative product development can align with global climate goals and meet the evolving demands of environmentally conscious construction.

> A major step forward in sustainable construction by actively utilizing the GCCA Environmental Product Declaration (EPD) tool.

อินทรี SIAM CITY CEMENT

SCG

Above: **Harudot Khaoyai by Nana Coffee Roasters, Nakornratchasima, Thailand**

Above: **Similan Islands National Park, Panggna Province, Thailand**

LC3 Cement: A Game-Changing Low-Carbon Innovation

SCG has become the first producer in Thailand and region to develop and demonstrate Limestone Calcined Clay Cement (LC3), marking a transformative step toward low-carbon construction in Southeast Asia. By utilising locally sourced clay and advanced kiln technology, LC3 offers comparable strength and enhanced durability while reducing CO_2 emissions by more than 30% today, with the potential to reach a 50% reduction compared to Ordinary Portland Cement (OPC).

LC3 was applied in both structural and decorative uses, including the Harudot Khaoyai café by Nana Coffee Roasters – the first project in ASEAN to feature LC3-finished concrete. This milestone demonstrates LC3's versatility and market readiness across diverse applications.

As part of SCG's broader Net Zero Cement & Concrete 2050 vision, LC3 exemplifies the company's commitment to cutting clinker intensity, scaling alternative fuels and renewable energy, and delivering next-generation cements that enable sustainable construction. By advancing LC3 technology, SCG not only reinforces Thailand's transition toward a low-carbon economy but also contributes to the GCCA Net Zero Roadmap, setting a benchmark for the global industry.

3D Mortar Printing: A Technology Pioneer of Sustainability

SCG has pursued dedicated research in 3D concrete printing since 2014, evolving from material and process innovation to full-scale applications that position the company as a regional technology leader.

In 2024, SCG introduced the first 3DP Mortar-LC3 Base, a low-carbon cementitious material formulated for additive manufacturing. By replacing clinker with calcined clay, it cuts CO_2 emissions by up to 30% while ensuring reliable performance.

SCG has also extended 3D printing innovation to marine conservation, partnering with Thailand's Department of Marine and Coastal Resources and Department of National Parks, Wildlife and Plant Conservation to create 3D-printed artificial reefs. These structures mimic natural formations, support coral regeneration, and enhance marine biodiversity. Since 2020, more than 2,000 units of 3D-printed artificial coral reefs have been installed along the Thai coast.

Together, these initiatives show how 3D printing can deliver low-carbon, resource-efficient, and nature-positive solutions, advancing GCCA's Net Zero Roadmap and shaping a sustainable future for construction and the environment.

SCG

UHPC Concrete: Shaping Future Sustainable Infrastructure

SCG–CPAC has introduced Ultra-High-Performance Concrete (UHPC) to deliver breakthrough solutions in bridge design and sustainability. At its headquarters in Bangkok, the company completed Thailand's first post-tensioned UHPC bridge. With a challenging low-arch profile across a 28-metre span, UHPC's exceptional compressive, tensile, and shear strength enabled a slender, reinforcement-free deck that overcame conventional structural barriers while reducing material intensity. The project earned international recognition, with SCG's UHPC innovation previously receiving an American Concrete Institute (ACI) award, underscoring its global credibility.

In 2024, SCG also deployed UHPC link slabs for wildlife corridor bridges in Rayong and Chantaburi provinces – the first of their kind in the region. Conventional modular expansion joints in such structures are prone to deterioration and water leakage, leading to costly and complex repairs. Maintenance is even more difficult for wildlife bridges, where interventions risk disturbing fragile ecosystems. The UHPC link slab provides a superior alternative: its flexibility accommodates large deformations without macro-cracking, ensuring watertightness under repeated loading. Combined with high tensile and fatigue resistance, the jointless design delivers long-term durability with minimal maintenance, while reducing noise and vibration to protect both users and surrounding wildlife.

These pioneering applications demonstrate how UHPC can simultaneously advance engineering performance, durability, and sustainability. By reducing resource use and enabling resilient infrastructure that integrates with the natural environment, SCG's innovation contributes to the GCCA Net Zero Roadmap and sets a new benchmark for future-ready construction.

Above: **Arch Bridge at SCG Head Quarter, Bangkok, Thailand**

Combined with high tensile and fatigue resistance, the jointless design delivers long-term durability with minimal maintenance, while reducing noise and vibration to protect both users and surrounding wildlife.

Taiheiyo

Two new carbonation technologies: CARBOFIX and CARBOCATCH

CARBOFIX is an innovative cement that emits less CO_2 during its manufacturing process and hardens through a chemical reaction with CO_2. In comparison to traditional Portland cement, CARBOFIX can incorporate a greater proportion of recycled materials as raw materials, thereby contributing not only to the reduction of CO_2 emissions but also to the establishment of a circular economy. Both roadway interlocking concrete blocks and property boundary concrete blocks made from CARBOFIX cement have been selected for a municipal public works project. In manufacturing these blocks, CO_2 captured from exhaust gas from our cement plant was used for forced carbonation curing.

CARBOCATCH is a system designed to efficiently absorb CO_2 into waste concrete materials. Concrete sludge, in particular, poses a significant challenge, with approximately 3 million tonnes wasted annually in Japan. In this system, a sludge slurry circulates within a sealed container filled with CO_2 gas, where the CO_2 is converted into solid carbonate. By partially replacing conventional concrete materials with this carbonated slurry, CO_2 can be effectively incorporated into the concrete. The amount of CO_2 absorbed by 1 tonne of concrete sludge solid is approximately 200kg. This technology has been applied for a trial public construction project in Japan.

Above: **Concrete blocks made from CARBOFIX cement**

Above: **Overview of CARBOCATCH**

> In comparison to traditional Portland cement, CARBOFIX can incorporate a greater proportion of recycled materials as raw materials.

TAIHEIYO CEMENT

TCC Group Holdings

CIMPOR is a subsidiary of TCC

CIMPOR Global: Scaling Calcined Clay for Decarbonisation in Cement

CIMPOR Global has positioned itself as a pioneer in the development of calcined clay as a key supplementary cementitious material (SCM) for decarbonising cement production. Following the successful commissioning of the world's first greenfield integrated calcined clay cement plant in Abidjan, Ivory Coast, the company expanded capacity up to 72tpd while achieving a specific heat consumption below 600kcal/kg and up to 50% thermal substitution with biomass. The proprietary product, branded DeOHclay, offers consistent quality with advanced cooling and color control.

Building on this success, CIMPOR is extending its footprint with the world's first large-scale flash calciner line in Kribi, Cameroon (720tpd), a 1,280tpd flash calciner in Tema, Ghana, and Europe's largest calcined clay facility in Souselas, Portugal (1,500tpd, >65% thermal substitution).

By 2025, these projects will deliver a total of 1.5 million tonnes of calcined clay capacity annually. Replacing clinker with calcined clay at this scale will mitigate an estimated 1.2 million tonnes of CO_2 emissions annually while saving over 40,000MWh of energy – driving both environmental and operational benefits.

Above: **Cameroon – Kribi Plant**

Above: **Ivory Coast – Abidjan Plant**

> CIMPOR Global is pioneering large-scale calcined clay production across Africa and Europe, targeting 1.5 million tonnes annual capacity by 2025 and mitigating potential of nearly 1.2 million tonnes of CO_2 emissions per year.

Above: **TCC's electric tractor trucks, transportation of cement products**

Above: **TCC DAKA Renewable Resources Center: Built with TCC's In-house Low-Carbon Building Materials**

A Pioneer in Localizing Low-Carbon Products for the Cement Industry

In 2024, TCC Group Holdings officially began mass production of Portland Limestone Cement (PLC) to replace Ordinary Portland Cement (OPC) for use in concrete. To ensure confidence among all the design and engineering firms, TCC collaborated in the same year with academic institutions—the Taiwan Concrete Institute and the Taiwan Construction Research Institute to conduct tests and compile a handbook entitled "Handbook for Portland Limestone Cement Concrete," which provides tangible guidelines for green construction.

TCC has contributed to the global construction industry's net-zero goals by producing 492,000 metric tonnes of PLC and 2,316,960m³ of PLC concrete between 2024 and the first half of 2025. After one and a half years of market supply, both PLC and PLC concrete have completed ISO 14067 verifications. By the end of 2025, TCC expects to obtain the Carbon Footprint Label from Taiwan's Ministry of Environment, as well as the Green Building Material and Low-Carbon Circular Building Material labels from the Ministry of the Interior, and further advance Taiwan's goals for low embodied-carbon construction. To consolidate its supply chain efforts, TCC led the establishment of the "Low-Carbon Construction Pioneer Alliance," to bring together partners from the construction industry to jointly promote low-carbon building materials. To date, TCC has held 300 promotional seminars and exchanged technical, marketing, and trend knowledge with clients. A notable example of this remarkable success is the commitment by the Taiwanese enterprise, Kedge Construction of Kindom Development Group to fully transition all its projects to PLC products.

TCC Group Holdings' Engagement in the Government Climate Policy

Aligning with the GCCA's position on carbon pricing, TCC Group Holdings is actively shaping Taiwan's climate policy. We assisted the Taiwan Cement Manufacturers' Association in drafting a Taiwanese CBAM bill, that led the government to announce mandatory carbon reporting for cement imports by 2026. As that industry's representative in the "Green Growth League", we are also co-designing Taiwan's 2026 pilot Emissions Trading System (ETS).

We advocate for a benchmark-based allocation in ETS, which requires removing existing regulatory barriers before any implementation. Otherwise, companies will face a dilemma where tightening their benchmarks may conflict with regulations that block decarbonization. To build a positive foundation for an effective ETS, we have proposed three key enabling policies to the government for its next five-year Sectoral GHG Reduction Action Programs. They are:

1. Mandate the use of low-carbon cement in Green Public Procurement.
2. Revise the Public Construction Commission's specifications to remove undue restrictions on low-carbon cements.
3. Link the Commodity Tax to climate policy, thereby ensuring a significantly lower tax rate for low-carbon cement.

We believe that implementing these foundational measures is a very effective pragmatic pathway to ensure a fair and efficient carbon market and guide the industry steadily toward a net-zero future.

TITAN Group

Harnessing supplementary cementitious materials for low-carbon building materials

TITAN is committed to delivering high-performance, low-carbon building materials and solutions that address the growing challenges of building safer, more resilient, and sustainable cities. By combining innovation with responsibility, TITAN develops products that create value for customers, society, and the environment.

A key strategy for expanding its low-carbon product portfolio is reducing clinker content in cement by increasing the use of supplementary cementitious materials (SCMs), such as fly ash, slag, natural pozzolans, and finely ground limestone. Recent initiatives include a strategic partnership to source ponded fly ash from the former Fiddler's Ferry power station in the UK, a joint venture in India, and collaborations with Aegean Perlites in Greece, Vezirhan Pozzolan in Türkiye, and Ecocem.

To accelerate the use of cementitious, TITAN also invests in startups such as Carbon Upcycling, Everox (formerly C2CA), and Concrete.ai through its Venture Capital initiative, advancing activating technologies, innovative upcycling solutions, and digital optimization tools.

In addition, TITAN's subsidiary Separation Technologies LLC (ST) supplies valorised fly ash for concrete, further decarbonizing the construction value chain. In 2024, TITAN reduced its clinker-to-cement ratio to 76.5%. In Greece, its Kamari, Thessaloniki, and Patras plants expanded pozzolanic cement CEM IV/B(P-W) 32.5R, replacing CEM II/B-M in bagged markets and offering it in bulk.

Above: **Fiddler ponded fly ash lagoon, UK**

> The project involves the construction of a cutting-edge carbon capture facility in Athens that will capture approximately 1.9 million tonnes of CO_2 per year.

Above: **Calciner in Kamari cement plant, Athens**

Decarbonizing cement manufacturing with low-carbon alternative fuels

TITAN Group has made significant strides in decarbonizing cement production through the expanded use of alternative fuels, such as biomass, refuse-derived fuel, and industrial waste streams. This approach aligns with the Group's Decarbonization Roadmap and the principles of circular economy, optimizing resource efficiency while reducing fossil fuel dependency.

In 2024, TITAN achieved an average thermal substitution rate (TSR) of 21.2%, with standout performances at Kamari (Greece), reaching nearly 60% TSR, and three other plants – Alexandria (Egypt), Thessaloniki (Greece) and Zlatna Panega (Bulgaria) – exceeding 30%. At Kamari, the upgrade of kiln 1 from a four-stage preheater to a modern precalciner kiln improved thermal efficiency and enabled higher alternative fuel use. Similarly, the upgraded RDF feeding system at the Beni Suef plant (Egypt) enhanced thermal performance and boosted TSR.

By replacing traditional fuels with low-carbon alternatives, TITAN reduces Scope 1 emissions while diverting waste from landfills. To accelerate progress, a series of strategic investments exceeding €75 million over the next three years are currently at various stages of development. Through these initiatives, TITAN strengthens long-term competitiveness, improves energy security, and delivers measurable CO_2 reduction, setting a benchmark for sustainable cement manufacturing.

Above: **CCUS at TITAN's Kamari cement plant will capture 1.9m tonnes of CO_2 annually**

IFESTOS carbon capture project: Zero-carbon cement for a net-zero future

IFESTOS, TITAN Group's flagship carbon capture project, represents the largest initiative of its kind in Europe, marking an important leap forward in TITAN's ambitious decarbonization journey. The carbon capture facility, which will be located at the Kamari cement plant near Athens, will capture 1.9 million tonnes of CO_2 annually. The captured CO_2 will be transported, liquefied, and stored in permanent geological formations, enabling the production of 3 million tonnes of zero-carbon cement to meet growing demand for sustainable construction. Supported by a €234 million EU Innovation Fund grant, the project entered the Front-End Engineering Design (FEED) phase in 2024 and, in 2025, was included in Enterprise Greece's "Strategic Investments" framework.

This pioneering initiative showcases TITAN's commitment to breakthrough decarbonization technologies while fostering collaboration across the carbon capture and storage (CCS) value chain. IFESTOS is a critical step toward achieving net zero by 2050 and will serve as a scalable model for the cement industry.

UltraTech

UltraTech partners with IIT Madras and BITS Pilani Goa for CCU pilot in cement sector

UltraTech Cement Limited is collaborating as an industrial partner with IIT Madras and BITS Pilani Goa as the knowledge partners, on a Carbon Capture and Utilisation (CCU) test bed aimed at capturing and utilising carbon emissions in the cement sector.

This project is being implemented under the aegis of the Department of Science and Technology (DST), Ministry of Science and Technology, Government of India, as part of the Academia-Industry Initiative for CO_2 capture in the cement sector. It aims to establish a carbon capture plant with 1 Tonne Per Day capture capacity, integrated with an existing cement plant, as well as mineralisation and curing strategies to utilise the captured CO_2.

As an industrial partner, UltraTech will contribute 25% of the total project cost and assist in the setup and implementation of a prototype at one of its cement manufacturing plants. The project will span three years and aims to develop indigenous CCU-based technology for the decarbonisation of the Indian cement industry.

UltraTech operationalises India's first-of-its-kind on-site hybrid RTC renewable energy project

UltraTech Cement Limited has operationalised a 7.5MW round-the-clock (RTC) hybrid renewable energy project at its integrated cement manufacturing unit, Sewagram Cement Works, located in Gujarat. This innovative solution integrates solar using bifacial modules with trackers and wind energy alongside battery storage, co-located on-site, to provide uninterrupted energy during the cement manufacturing process without any reliance on grid power.

Installed as a behind-the-meter system, the project marks the country's first in industrial power consumption and showcases what advanced system integration can achieve in terms of emissions reduction and energy cost optimisation at scale. The project, which has been executed with the objective of providing uninterrupted clean energy, represents a new benchmark in India's clean energy transition, demonstrating the power of customer-led design and integrated system engineering.

UltraTech is leveraging green energy as a key enabler for the decarbonisation of its operations, in line with its 2050 Net Zero goal. In FY25, UltraTech became one of the first companies in the industrial category in India to commission 1GW of renewable energy (RE) capacity for captive use, and aims to increase the share of green energy in its total power mix to 85% by 2030. As part of its RE100 commitment, UltraTech aims to meet 100% of its electricity requirement through renewables sources by 2050.

UltraTech boosts sustainable transport by leveraging inland waterways

UltraTech is leveraging inland waterways to transport mineral gypsum via National Waterway 1 (the Ganga-Bhagirathi-Hooghly river system) through a pilot project. UltraTech is the first cement company in India to utilise National Waterway 1 for gypsum transport at scale. The consignment was shipped from Haldia port in West Bengal to Gaighat terminal in Patna, Bihar and then transported to Pataliputra Cement Works, UltraTech's cement grinding unit located in Patna district, Bihar.

Use of inland waterways over roadways and railways will result in significant carbon emissions reduction. It also helps decongest roads and rail routes. UltraTech's participation in the pilot provides a boost to the Government of India's (GoI) efforts to promote use of inland waterways in the country. The project was enabled by the GoI's revised Cargo Movement policy, in line with Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047.

In April 2023, UltraTech had also leveraged inland and coastal waterways to transport 57,000 metric tonnes of phosphogypsum from Paradeep port in Odisha to UltraTech's integrated manufacturing unit Gujarat Cement Works located in Amreli, Gujarat, in a first-of-its-kind initiative in India. Guided by its Sustainable Supply Chain Framework, UltraTech aims to cultivate a resilient supply chain that supports its business and mitigates risks.

UltraTech collaborates with UCLA to advance cement industry decarbonisation

In FY25, UltraTech announced the signing of a collaboration agreement with the Institute for Carbon Management (ICM) at the University of California, Los Angeles (UCLA) to pilot a groundbreaking new technology – the Zero Carbon Lime (ZeroCAL) developed by ICM that can significantly reduce carbon dioxide emissions from cement production. ICM, in partnership with UltraTech, will build a first-of-a-kind demonstration plant for the technology at one of UltraTech's integrated cement manufacturing units.

The ZeroCAL process can eliminate nearly 98% of carbon dioxide emissions associated with limestone decomposition in cement manufacturing. UltraTech will be the first company globally to implement the ZeroCAL process at scale through a demonstration plant that will produce several metric tonnes of zero-carbon lime per day. UltraTech's partnership with UCLA aligns with its broader sustainability goals and with its focus on developing and adopting innovative technologies to decarbonise its operations.

To accelerate its decarbonisation efforts, UltraTech is also collaborating with technology startups to explore the use of emerging decarbonisation technologies, including kiln electrification and carbon capture & storage.

98%

The ZeroCAL process can eliminate nearly 98% of carbon dioxide emissions associated with limestone decomposition in cement manufacturing.

UNACEM

Project "Energy Circularity" in Ecuador

Through the Energy Circularity initiative, UNACEM Ecuador has progressively transformed its energy matrix by replacing traditional fossil fuels with alternative and waste-derived fuels. These include used mineral oils from lubrication centres, biomass from agro-industrial and forestry sectors, refuse-derived fuel (RDF) from non-hazardous industrial and municipal waste, and end-of-life tires (NFU). In 2024, these alternative fuels represented 56.9% of the total thermal energy used in clinker production, reducing dependency on fossil sources such as bunker and petcoke.

The shift toward alternative fuels has contributed to significant energy efficiency improvements and carbon footprint reduction. Compared to 2021, the company achieved a decrease of 106kg CO_2e per tonne of cement, supporting its decarbonization pathway. Additionally, the implementation of the ISO 50001:2018 Energy Management System has enhanced both thermal and electrical efficiency across operations.

Complementing these efforts, UNACEM Ecuador has implemented water recirculation systems to reduce freshwater demand—from 0.68m³/t of cement in 2012 to 0.32m³/t in 2024—further strengthening resource efficiency in its production process.

The Energy Circularity project demonstrates UNACEM Ecuador's leadership in integrating circular economy principles into energy use. It aligns with Grupo UNACEM's Roadmap toward carbon neutrality by 2050, while contributing to Ecuador's national circular economy strategy. These achievements have earned the company recognition under the Ecuador Carbono Cero Program, the Punto Verde Eco-Efficient Company Certification, and acknowledgment from the Ministry of Environment, Water and Ecological Transition of Ecuador.

Alternative Fuels Project in the United States

UNACEM North America is advancing its decarbonization roadmap through the implementation of biomass co-processing at its Drake (Arizona) and Tehachapi (California) cement plants. This initiative supports the Group's 2030 goal of reducing net emissions to 500kg CO_2 per tonne of cement, in alignment with the Getting the Numbers Right (GNR) methodology.

In December 2024, both plants began substituting fossil fuels such as coal and pet-coke with renewable biomass sources, including wood chips and pistachio shells. This transition marks a significant step toward increasing the share of renewable energy in cement production and promoting circular economy practices.

The project was implemented in three phases: preparation and infrastructure setup, initiation of biomass use, and consolidation for long-term scaling. Drake cement plant, commissioned a full biomass fuel system equipped with unloading, crushing, and handling equipment, achieving a 3% fossil fuel replacement in early 2025, with a target of 5% by year-end. Tehachapi cement plant developed a complete system for receiving, grinding, and feeding pistachio shells, reaching a 7% replacement rate in 2024 and projecting 17% in 2025.

Through biomass co-processing, UNACEM North America reduces its dependence on fossil fuels, lowers Scope 1 emissions, and strengthens its contribution to a sustainable energy transition. These efforts reflect the Group's global commitment to climate action and to achieving certified carbon neutrality by 2050, and our specific commitment on our Tehachapi cement plant, according to the California State regulation.

Votorantim Cimentos

Shift to cement with less clinker

After the devastating earthquake in 1999 (which killed 17 thousand people), Türkiye's building sector shifted towards using pure cements. In recent years, our Technical Sales Force has provided guidance to customers about the technical benefits of incorporating additives into cement, replacing the clinker content with cementitious materials. As a result, CEM I products have disappeared from our portfolio, and the consumption of more sustainable cements has increased, such as CEM II/A 42.5 or CEM II/B 42.5.

Through the substitution of clinker with cementitious materials, the use of grinding aids (in collaboration with RMC operations and the quality department), and the incorporation of specific products into concrete, we have successfully lowered the overall KKC ratio by 5p.p. This achievement corresponds to an emissions decrease of 25 kilograms of CO_2 per tonne of cementitious material produced.

Pioneers in biomass use in Türkiye

Decarbonization stands at the heart of our 2030 Sustainability Commitments and is a top priority for Votorantim Cimentos. A cornerstone of our decarbonization strategy is co-processing waste for use as fuel.

As part of this journey, we have led the way in adopting biomass as an alternative fuel in Türkiye, leveraging the rich agricultural resources of Central and Eastern Anatolia. At our Yozgat plant, we pioneered the country's first project to use biomass waste – primarily corn stalks – as an alternative fuel in the main burner. This initiative achieved an emissions reduction of 41 kilograms of CO_2 per tonne of cementitious material produced. Meanwhile, at our Hasanoğlan plant, utilizing biomass in the calciner line resulted in an emissions decrease of 27 kilograms of CO_2 per tonne.

> Decarbonization stands at the heart of our 2030 Sustainability Commitments and is a top priority for Votorantim Cimentos.

Betonhuis

Netherlands Association

Clinker Reduction and Aggregate Packing

In the past 12 months, the Cement & Concrete Institute has closely aligned its decarbonisation initiative with the Betonhuis CO_2-Reduction Roadmap, leveraging its guidance to trial aggregate packing innovations that optimise particle distribution and reduce clinker intensity in concrete. The pilot project achieved a 10% reduction in clinker content, maintaining workability and strength while lowering embodied carbon by approximately 8kg CO_2/m^3.

Looking ahead, the outcomes of the Korrelpakking working group, scheduled for 6 November 2025, are expected to further benefit the Dutch cement and construction sector. This national-level collaboration aims to establish best practices and scale aggregate-packing strategies across industry partners, potentially multiplying the carbon reduction impact starting in 2026.

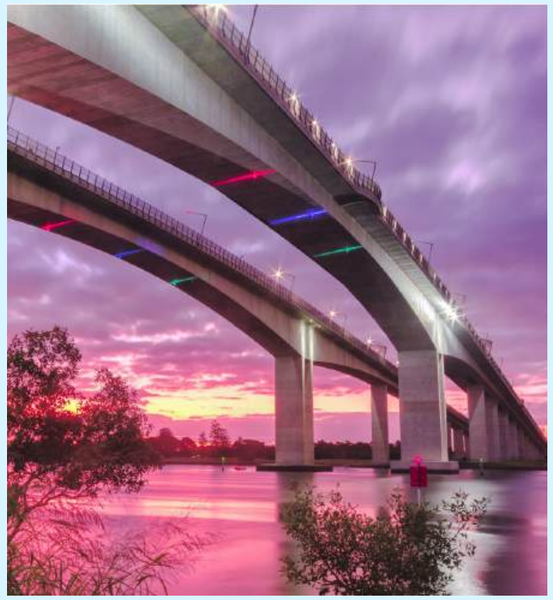
Since the adoption of the Betonhuis CO_2-Reduction Roadmap, the Cement & Concrete Institute has piloted advanced aggregate packing methods to significantly reduce clinker usage, with further sectoral impact expected from the Dutch Korrelpakking working group meeting on 6 November 2025.

> The pilot project achieved a 10% reduction in clinker content, maintaining workability and strength while lowering embodied carbon by approximately 8kg CO_2/m^3.

Betonhuis
Constructief Prefab

CCAA

Cement Concrete & Aggregates Australia



Above: **The Gateway Bridge at sunset in Brisbane, Queensland, Australia**

National Sustainable Procurement in Infrastructure Guideline

The National Sustainable Procurement in Infrastructure Guideline provides the enabling policy framework to embed lifecycle carbon assessment and accelerate decarbonisation across Australia's infrastructure sector.

In May 2025, the Australian Government released the National Sustainable Procurement in Infrastructure Guideline – Technical Guidance Document, a landmark policy that integrates sustainability and decarbonisation into public infrastructure procurement. The Guideline establishes consistent approaches for measuring and reporting embodied carbon, aligning with international best practice and the Australian pathway levers for net zero.

The objectives are to harmonise procurement requirements across jurisdictions, drive demand for lower-carbon construction materials, and provide industry with the certainty needed to invest in innovation. By embedding lifecycle carbon assessment (LCA) and recognising Environmental Product Declarations (EPDs) as a key evidence base, the Guideline directly supports industry levers such as clinker substitution, recycled aggregates, and fuel switching.

Key metrics:

- Over $120 billion in planned public infrastructure projects now aligned with sustainability benchmarks.
- EPD adoption projected to increase by 50% by 2026, reducing verification costs by up to 50%.
- First consistent national framework for measuring embodied carbon in infrastructure procurement.

This policy is intended to enable decarbonisation of the construction materials supply chain, creating clear pathways for industry to demonstrate progress toward net zero while maintaining competitiveness and credibility.

CEMENT CONCRETE & AGGREGATES AUSTRALIA

Above: **A view of Melbourne from Albert Park**

New Sustainable Procurement Group to Drive Net Zero in Australia

CCAA has established a new Sustainable Procurement Working Group (SPWG) under the governance of the CCAA National Sustainability & Technical Committee, reinforcing our commitment to industry leadership in decarbonisation.

The SPWG will focus on driving procurement reform as a critical enabler of lower-carbon construction materials, targeting the adoption of updated standards and specifications, promotion of lifecycle carbon assessment and Environmental Product Declarations (EPDs), and embedding circular economy principles. It will also address procurement risk factors to support innovation and uptake of lower-carbon concrete across the sector.

This work complements CCAA's announcement on the planned release of The Australian Adoption of the GCCA Low Carbon Concrete Rating System, providing a consistent approach to understanding embodied carbon in concrete. Together, these initiatives align directly with the National Sustainable Procurement in Infrastructure Guideline released by the Infrastructure and Transport Ministers Meeting (ITMM), bridging policy with practical solutions towards our Net Zero goal.

See more on https://www.ccaa.com.au/CCAA/CCAA/Public_Content/SUSTAINABILITY/Sustainable%20Procurement.aspx?hkey=9fa1be68-f108-45bd-aa05-b4ad3d727124

CCAA prepares for upcoming release of the Australian adoption of the GCCA Low Carbon Concrete Rating System

CCAA has announced the upcoming release of The Australian Adoption of the GCCA Low Carbon Concrete Rating System, to be published under CCAA industry branding.

This guide will adopt the GCCA – Global Cement and Concrete Association internationally recognised AA-G concrete carbon rating framework for launch in Australia.

Combined to be used with verified Environmental Product Declarations (EPDs), it will provide a clear, transparent benchmark for measuring and comparing the embodied carbon of concrete, helping governments, procurers, and industry make lower-carbon choices with confidence.

The planned release aligns with the National Sustainable Procurement in Infrastructure Guideline and the Embodied Carbon Measurement for Infrastructure: Technical Guidance, released by the Infrastructure and Transport Ministers Meeting.

As Australia's infrastructure and transport sectors work towards net zero, this tool will bridge national policy with practical, on-the-ground solutions – supporting harmonised procurement, technical innovation, and measurable carbon reduction in the materials that build our future.

50%

EPD adoption projected to increase by 50% by 2026, reducing verification costs by up to 50%.

Cement Europe

The European Cement Association

Regional Roadmap and Project Tracker

By 2050, the cement sector aims to achieve carbon neutrality along the full value chain – clinker, cement, concrete, construction, and (re)carbonation – otherwise known as our 5C approach. More information about the 5C approach can be found in our updated 2050 Net Zero Roadmap.

Cement Europe has developed an interactive map that demonstrates ongoing projects and investments in technologies in the cement industry across Europe.

This interactive map will serve as a tool to showcase different ventures and a wide range of decarbonisation technologies across the European arena.

The interactive map will be updated regularly, as more projects are announced in the European cement industry.

Cement Europe

FICEM

La Federación Interamericana del Cemento
(LatAm Association)

As a regional leader in the decarbonization of the cement and concrete sector, FICEM is proud to present the key milestones achieved over the past year – clear evidence of its unwavering commitment and tangible progress toward Carbon Neutrality by 2050, in alignment with the GCCA's global objectives.

Carbon Neutrality Roadmap 2050 LA&C

Launched in October 2025, the FICEM Carbon Neutrality Roadmap 2050 provides a clear, actionable framework for decarbonizing the cement sector across Latin America and the Caribbean. It guides the industry toward a sustainable future by aligning regional challenges with strategic opportunities. The roadmap promotes three key levers for transformation:

- Scaling up waste co-processing
- Reducing clinker content in cement
- Optimizing material use in construction

Its implementation ensures access to essential materials for climate adaptation and infrastructure development, while accelerating the Circular Economy and unlocking two high-impact drivers:

1. Nature-based solutions to counter deforestation, land-use change, and biodiversity loss.
2. Methane emissions reduction in the waste sector via expanded co-processing.

This initiative positions the cement industry as a regional leader in carbon neutrality, proving the viability of deep decarbonization and supporting national climate agendas.

> It guides the industry toward a sustainable future by aligning regional challenges with strategic opportunities.

FICEM
FEDERACIÓN INTERAMERICANA DEL CEMENTO

Argentina Roadmap for Cement and Concrete

In strategic collaboration with UNIDO, the Argentine Association of Portland Cement Manufacturers (AFCP) and its members, FICEM has developed the Argentina Roadmap for the cement and concrete sector – an emblematic case for the region. The roadmap sets measurable targets aligned with Argentina's climate commitments for 2030 and 2050. It provides a solid foundation for sustainable transformation, strengthens industry–government dialogue, and offers a replicable framework for other CO_2-intensive, hard-to-abate sectors.

A key outcome has been the identification of enabling policy and regulatory shifts, along with a clear context for accessing international climate finance.

Methodology for Quantifying Methane Avoided through Co-processing

FICEM is spearheading a new methodology to quantify methane emissions avoided by co-processing municipal solid waste (MSW) in cement kilns. Aligned with Article 6 of the Paris Agreement, it seeks international recognition of avoided methane – a gas with 27 to 80 times the global warming potential of CO_2. By using organic waste as alternative fuel, the cement industry prevents methane formation in landfills and replaces fossil fuels, achieving full thermal and material recovery.

This initiative integrates co-processing into the global methane agenda, enabling access to carbon markets and economic instruments for cement stakeholders. It also advances Circular Economy goals and supports waste sector decarbonization in Latin America and the Caribbean – where emissions are double the global average – helping prevent ecosystem contamination from open burning and poor disposal practices.

FICEM 3C Carbon Footprint Calculator

The FICEM 3C Calculator is a state-of-the-art tool reshaping how the cement and concrete industry in Latin America and the Caribbean tracks and manages its carbon footprint.

By integrating data management, CO_2 calculation algorithms, and decarbonization pathways into a single platform, it delivers precise, traceable, and verifiable results. It enables real-time, data-driven decisions – allowing companies to simulate actions, assess impact, and streamline inputs for EPD tools.

The calculator helps users prioritise improvements, set cost-effective emission targets, and benchmark against global indicators. It has also played a key role in shaping the FICEM Carbon Neutrality 2050 Roadmap and national strategies.

FIHP

Federación Iberoamericana del Hormigón Premezclado
(LatAm Association)

Standards, codes and netzero concrete: Understanding barries and opportunities in Latin America

We led a workshop on technical standards and building codes specifically to identify barriers and opportunities for working with designers, builders, and suppliers to reduce emissions. This workshop included key industry stakeholders such as sustainable building councils and organizations like FICEM, ACI International, ASTM International, WorldGBC, Oneplanet Network and the academia.

Promoting low carbon concrete in Latin America

FIHP Board of Directors established as a priority the promotion of low-carbon concrete demand in the region. A specific working group was established with representatives from companies in several countries. Progress has been made establishing emissions baselines for concrete under the Concrete Sustainability Council protocol for CO_2 certification. This group is also working in the popularization and quality of information for environmental product declarations in the region using the GCCA tool. Likewise, the FIHP annual survey of concrete indicators, conducted with the participation of near 50 producers of the region, incorporated for the first time a section specifically focused on sustainability indicators aligned with the netzero roadmap to start measuring progress in specific aspect related to concrete production.

Optimization of mix design as a driver to reduce emissions

FIHP conducted a pilot project on concrete mix optimization with medium-sized companies to measure opportunities for improving CO_2 emission reduction by applying continuous improvement processes. With the results of this project and the understanding of technological advances for the sector, FIHP started to build capacity within the members to apply artificial intelligence tools for mix design, seeking to accelerate decarbonization.

> FIHP started to build capacity within the members to apply artificial intelligence tools for mix design, seeking to accelerate decarbonization.

JCA

Japan Cement Association

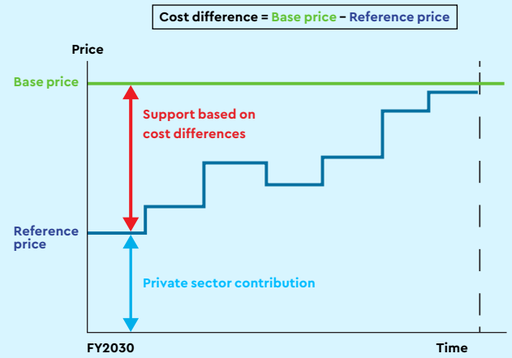
Obtaining financial support for industry specific costs in CCS

As well known, CCS is an important tool for achieving decarbonization in hard-to-abate industries, and is an essential tool in the cement industry as well.

CCS is also being promoted in Japan. The legislation for CCS projects was enacted in 2024. A government expert committee is working to establish support measures to accelerate CCS projects.

JCA has argued in this committee that government support is needed for measures specific to the cement industry in addition to CAPEX and OPEX. This argument was taken up by the committee, and it was decided that costs related to each project could be eligible for support. This has made it easier to enter the CCS business, and it can be said that JCA's efforts have promoted decarbonization in the cement industry.

The progamme will support all elements necessary to launch a value chain, focusing on the costs associated with capture, transportation, and storage for each project. Specifically, the programme will focus on the cost difference between the price (1. separation and capture costs (CAPEX and OPEX related to separation and capture) + (2. transport and storage fees (CAPEX and OPEX related to transport and storage) per tonne of CO_2) and the reference price (carbon price).



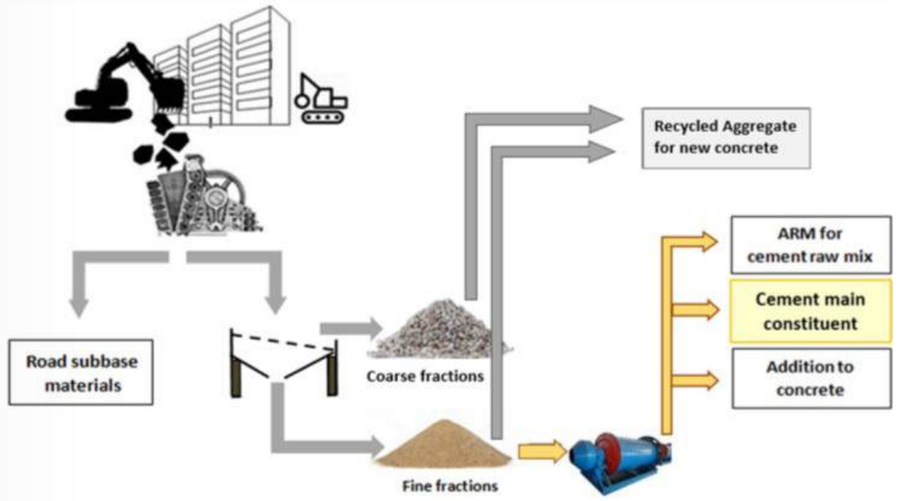
Base price
This price is the sum of the 'separation and collection cost' the appropriateness of which is assessed based on domestic and international technological trends, and the 'transportation and storage fee' which is determined through an auction. if there are multiple separation and collection companies involved in a single project, the price is set for each separation and collection company.

Reference price
Each fiscal year, the carbon price under the previous year's carbon pricing system will be referenced. The carbon price benchmark to be adopted will need to be adjusted depending on the future system design of the GX-ETS.

一般社団法人 セメント協会

MPA

Mineral Products Association
(UK Association)



Recycled Concrete Fines

The UK generates over 70 million tonnes of construction and demolition waste per year, and about 7 million tonnes of this is RCF that can potentially be used as a partial CEM I replacement for decarbonising concrete. This is backed by early research and a recent European standard EN 197-6. However, to maximise clinker substitution levels, RCF must undergo treatments to improve reactivity.

MPA has joined a consortium with the Materials Processing Institute, Aston University and Mott MacDonald in this 100% UK government funded project.

The work will investigate two methods of treatment – calcination or carbonation -- as a means to improve reactivity. The project will develop new cement and concrete formulations using RCF and investigate how RCF use can be optimised via treatments to maximise CEM I replacement. Importantly the work includes all the testing required to update British Standard BS 8500 to include RCF and enable its commercial deployment.

This project aims to achieve CEM I substitution rates of up to 50%, which could reduce carbon emissions from cement production by up to 35%.

mpa essential materials sustainable solutions

Oficemen

The Spanish Cement Association

New Decarbonization Roadmap for the Spanish Cement Industry: Towards Net Negative Emissions

The objectives are to harmonise procurement requirements across jurisdictions, drive demand for lower-carbon construction materials, and provide industry with the certainty needed to invest in innovation. By embedding lifecycle carbon assessment (LCA) and recognising Environmental Product Declarations (EPDs) as a key evidence base, the Guideline directly supports industry levers such as clinker substitution, recycled aggregates, and fuel switching.

- Ambitious targets for 2030: a 42% reduction in CO_2 emissions per tonne of cement.
- New intermediate target for 2040 that will completely transform the cement industry. The combination of all the proposed levers projects an 83% reduction in CO_2 emissions per tonne of cement by 2040.
- Potential for negative emissions by 2050: if the 2030 and 2040 targets are met, the sector could achieve net negative CO_2 emissions by 2050, reaching -114% per tonne of cement, using carbon capture and utilization (CCU) technologies and biomass.

This new Roadmap maintains the 5C methodology to achieve net zero emissions throughout the cement and concrete value chain, and it is the first in Spain to be validated by a certification body, Aenor, in accordance with the UNE-ISO IWA 42:2022 Net Zero Guidelines, validating both the calculations and the methodology employed.

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Agrupación de fabricantes de cemento de España

TCMA

Thai Cement Manufacturers Association

Policy for Decarbonization

TCMA makes a continuation of the active efforts for country policy development on decarbonization through various process, which could support policy decision making.

Unlocking restrictions for investment promotion: In collaboration with Board of Investment, the measure on 'Smart and Sustainability' including clean technology, green technology, renewable energy, and carbon capture, utilization and storage (CCUS) has been announced for cement industry.

Jointly develop Thailand NDC 3.0: In collaboration with Department of Climate Change and Environment, the proposal of ambitious target with condition of Thai cement industry to decarbonise industrial processes and product use (IPPU) and energy transition has been included in Thailand NDC 3.0 for submission to UNFCCC, ahead of COP30.

Jointly develop Thailand Taxonomy Phase 2: In collaboration with Bank of Thailand and Department of Climate Change and Environment, TCMA's recommendations on industrial processes and product use (IPPU) received a positive respond into Thailand Taxonomy Phase 2 that will be timely create financing opportunities for industry transition in line with Thailand 2050 Net Zero Cement & Concrete Roadmap.

Collaborative Network for Decarbonization

2025 TCMA Technical Conference and Exhibition: TCMA successfully hosted two-day conference with theme 'Decarbonisation Technology: Advancing the Cement Industry towards Net Zero 2050' brought together nearly 250 key figures from the Thai cement industry, global organizations e.g. UNIDO, INNOVANDI, GIZ, ADB, AFCM, etc. and 10 countries of leading innovator/ technology provider across the globe to exchange insights and strengthen collaboration to accelerate decarbonization

in cement industry. This event reflected the continuing effort of Thai cement industry in decarbonization path, including marked a significant collaborative action among all stakeholders in the country and global partnerships, particularly underscored the industry's commitment to 'determined collaboration' on the path towards Net Zero 2050, its experience can inspire the region and beyond.

Sarabusi sandbox low carbon city: TCMA, with support of Global Cement and Concrete Association (GCCA) in partnering with the government and UNIDO kicking off a green grant fund support from the Environment and Climate Change Canada (ECCC), is implementing prototype low-carbon project in SARBURI SANDBOX. The result of this collaborative action will bolster Thai cement industry's pathway towards ambitious climate change targets, support Saraburi Province transition to a low-carbon economy and be a model of sharing knowledge across industries, including ASEAN and other regions globally to strengthen climate action.

> TCMA's efforts are ongoing to leverage collaborative action among all stakeholders in the country and global partnerships for the achievement of Thai cement industry decarbonization path.

TCMA
THAI CEMENT MANUFACTURERS ASSOCIATION

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