Global Cement and Concrete Association

CCUS in the cement sector
CCUS and EIIs Workshop

Claude Lorea, Cement Director

GCCA Membership from across the globe

Working towards 50% of global cement production capacity

Members – Asia Cement, Breedon, Buzzi Unicem, Cementir Holding, Cementos Argos, Cementos Molins, Cementos Pacasmayo, Cementos Progreso S.A., Guatemala, CEMEX, Ciments De L'Atlas (CIMAT), Çimsa Çimento, CNBM, Corporacion Moctezuma S.A.B. DE C.V., CRH, Dalmia Cement, Dangote, Eurocement, Grupo Cementos de Chihuahua SAB de CV (GCC), HeidelbergCement, Intercement, JSW Cement, LafargeHolcim, Medcem Madencilik, Nesher Israel Cement Enterprises Ltd, Orient Cement Ltd, SCG Cement, Schwenk Zement KG, SECIL, Shree Cement Ltd, Siam City Cement Ltd, Taiheiyo Cement, Taiwan Cement Corporation, Titan Cement, Ultratech, Unión Andina de Cementos S.A.A (UNACEM), Vassiliko Cement Works Public Company Ltd., Votorantim, West China Cement

Affiliates - Cámara Nacional del Cemento (Mexico), CEMBUREAU (the European Cement Association), Cement Association of Canada, Cement Concrete and Aggregates (Australia), Cement Industry Federation (Australia), Cement Manufacturers Association of India, Cement Manufacturers Ireland (CMI), European Concrete Platform, Federación Iboamericana del Hormignon Premezclado (FIHP) – Latin America and the Iberian Peninsula, Federación Interamericana del Cemento (FICEM) (Latin-American Region), Japan Cement Association, Mineral Products Association (United Kingdom), National Ready Mixed Concrete Association – United States, Portland Cement Association (USA), SNIC/ABCP (Brazil), Spanish Cement Association (Oficemen) (Spain), Union of Cement Producers – Soyuzcement (Russia), VDZ (Germany)

Future of construction and the role of concrete

We shall ensure that the global concrete sector meets the demands of a fast evolving and dynamic construction market

- As the world continues to urbanize many countries will face challenges in meeting the needs of their growing urban populations, including for housing, transportation, energy systems and other infrastructure, as well as for employment and basic services such as education and health care.

- Close to three in five cities worldwide with at least 500,000 inhabitants are at high risk of a natural disaster. Collectively, these cities are home to 1.4 billion people or around one third of the world's urban population.

UN Nations

68% of the world population are projected to live in urban areas by 2050

Concrete : the sustainable building material of choice

Concrete is essential in shaping our world, concrete is crucial for the transition towards SDGs and more generally for clean energy development and energy efficient buildings

Non-flammable, Rust-resistant, rot-proof, insect-proof, flood-resistant, no-emissions, water-safe, heat-reflective, water-permeable, recyclable, vehicle emissions reducing, thermal mass, range of densities possible, compressive strength, tensile strength, available, affordable, whole-life benefits

A few numbers…

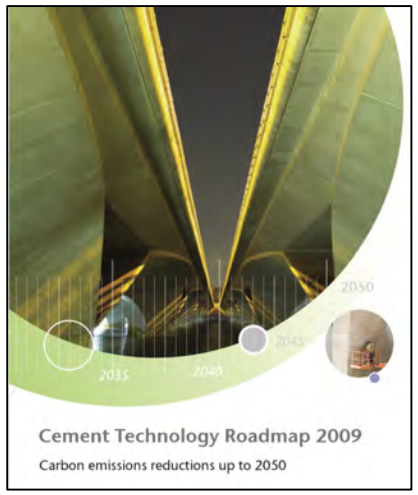
- The cement sector is the 3rd largest industrial energy consumer in the world, consuming 7% of industrial energy use
- The cement sector is responsible for 7% of global CO2 emissions [IEA]
- The 2017 GNR data show that the cement industry has achieved significant CO2 reduction since 1990 i.e. 18.3% reduction in CO2 per tonne cementitious
- The % of alternative fuels has increased x8.8 between 1990 and 2017
- **Today's world production is 4.1 billion tonnes**.
  The top 10 producers are China (52%), India (6.2%) and EU28 (5.3%) followed by US (1.9%), Turkey, Indonesia, Brazil, Russia, South Korea and Saudi Arabia. This means that most of the cement production is (and will keep on being) outside OECD (this is probably the industry where the share of production outside OECD is the largest: around 70%).

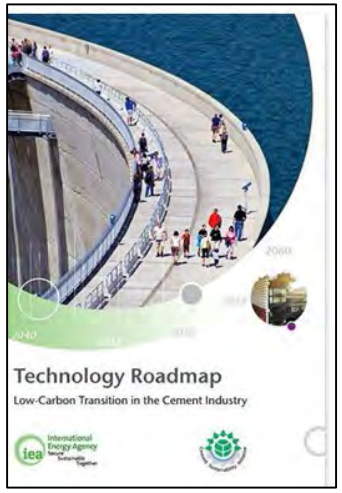
- 18.3% (net)
CO_2 reduction per tonne cementitious

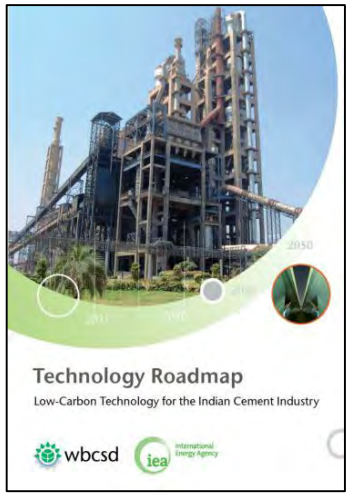
x 8.8
Fossil Fuel substitution

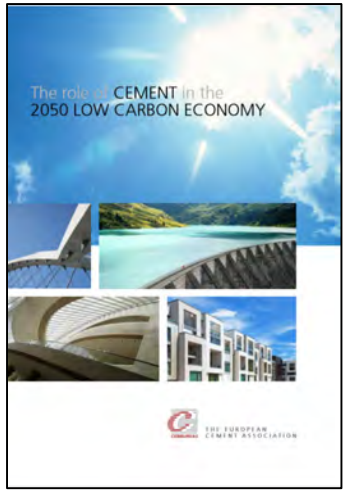
- 18.4%
energy efficiency improvement

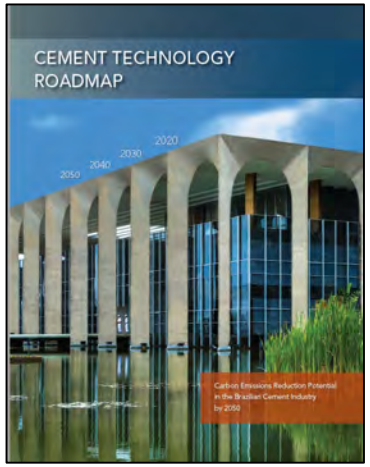
Global roadmaps and regional collaborative efforts



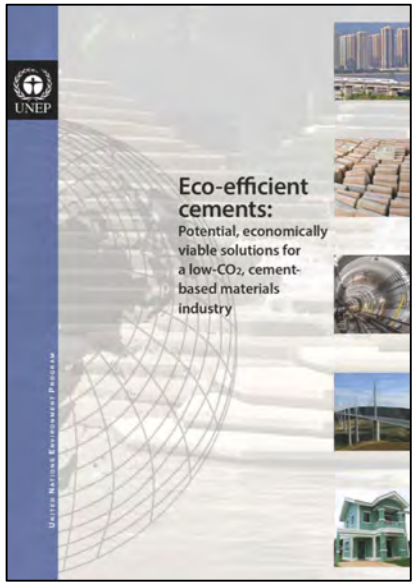


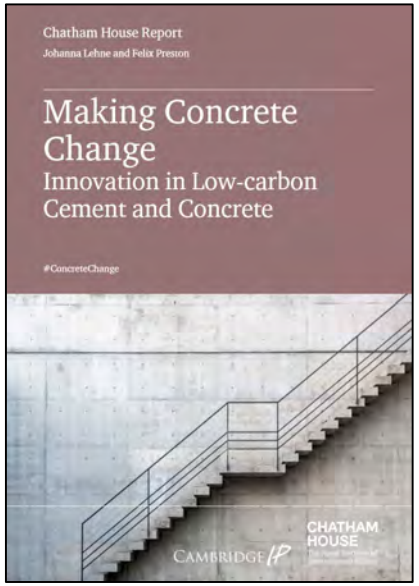


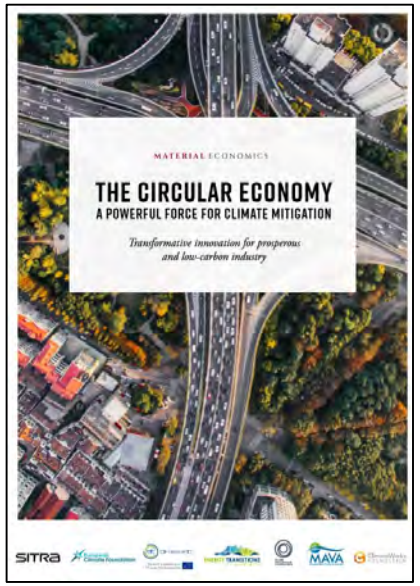


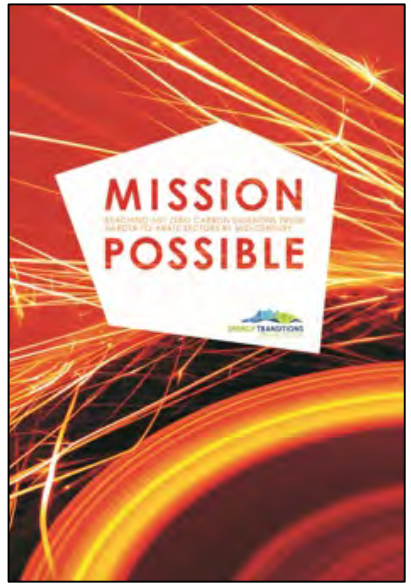


Think-tanks and stakeholders



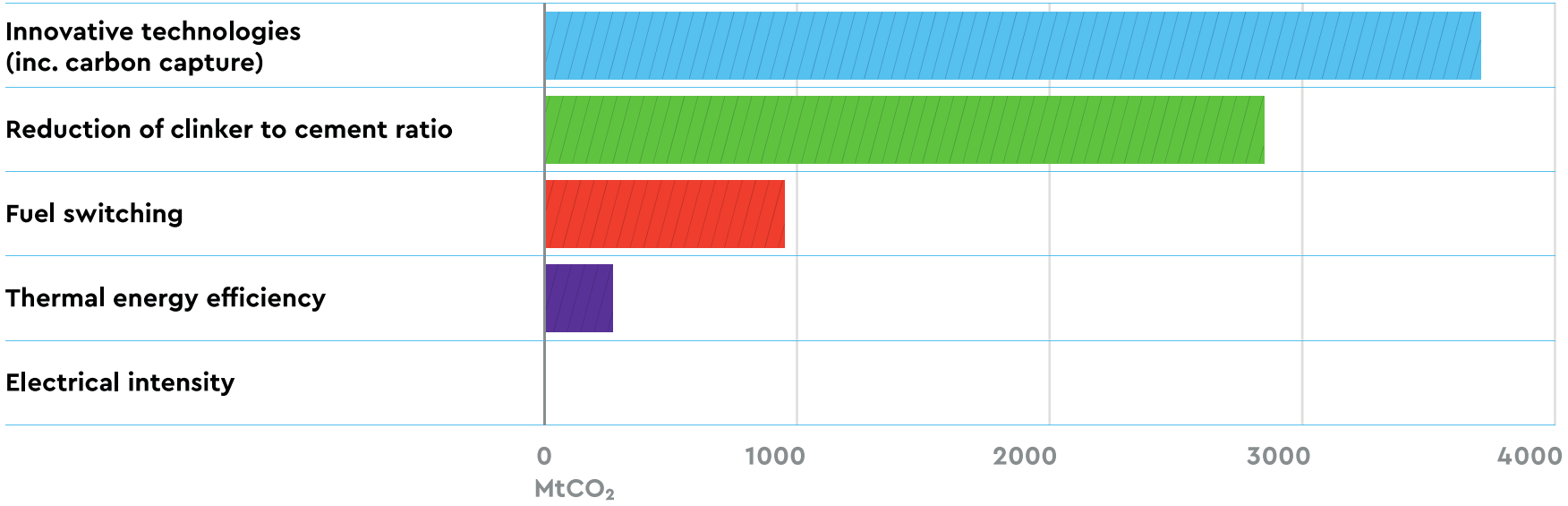






IEA Cement Roadmap

Global cumulative CO_2 emissions reductions by applying the roadmap vision (2DS) compared to the RTS



Key message:
Innovative technologies including carbon capture (CO_2 emissions reduction of 48%) and reduction of the clinker to cement ratio (CO_2 emissions reduction of 37%) lead the way in cumulative CO_2 emissions reductions in cement making in the roadmap vision compared to the RTS by 2050.

Note: Cumulative CO_2 emissions reductions refer to the period from 2020 to 2050 and are based on the low-variability case of the scenarios.

https://www.iea.org/newsroom/news/2018/april/cement-technology-roadmap-plots-path-to-cutting-co2-emissions-24-by-2050.html

Key indicators – IEA Roadmap vision

Roadmap Vision (2DS)
Low variability case

	2014	2030	2040	2050
Cement production (Mt/y)	4171	4250	4429	**4682**
Clinker to cement ratio	0.65	0.64	0.63	**0.60**
Thermal energy intensity (GJ/tonne clinker)	3.5	3.3	3.2	**3.1**
Electricity intensity (kWh/tonne cement)	91	87	83	**79**
Alternative fuels usage (%)	5.6	17.5	25.1	**30.0**
CO_2 captured and stored (tCO_2/tcement)	–	14	173	**552**
Direct process CO_2 intensity (tCO_2/tcement)	0.34	0.33	0.30	**0.24**
Direct energy related CO_2 intensity (tCO_2/tcement)	0.20	0.19	0.16	**0.13**

https://www.iea.org/newsroom/news/2018/april/cement-technology-roadmap-plots-path-to-cutting-co2-emissions-24-by-2050.html

Reduction pathways

Manufacturing

- Enhance the coverage of GNR as to allow benchmarking
- Enhance overall energy efficiency - reduction of the thermal energy intensity towards BAT and reduction of thermal electricity demand, excess heat recovery and renewable power generation
- Enhance use alternative fuels and raw materials
- Further reduce the clinker content
- Integrate innovative technologies including CCUS
- Develop new products/new binders

"Improving energy efficiency, switching to AFR, reducing the K/C and integrating CCSU are the main carbon mitigation levers. The integration of emerging and innovative technologies and reducing of the clinker content in cement are identified to provide the largest cumulative CO_2 emissions reductions in the 2DS compared to the RTS by 2050, with 48% and 37% contributions, respectively. The remainder of the reduction arises from switching to lower-carbon fuels and, to a lesser extent, energy efficiency."
(IEA Roadmap)

Reduction pathways

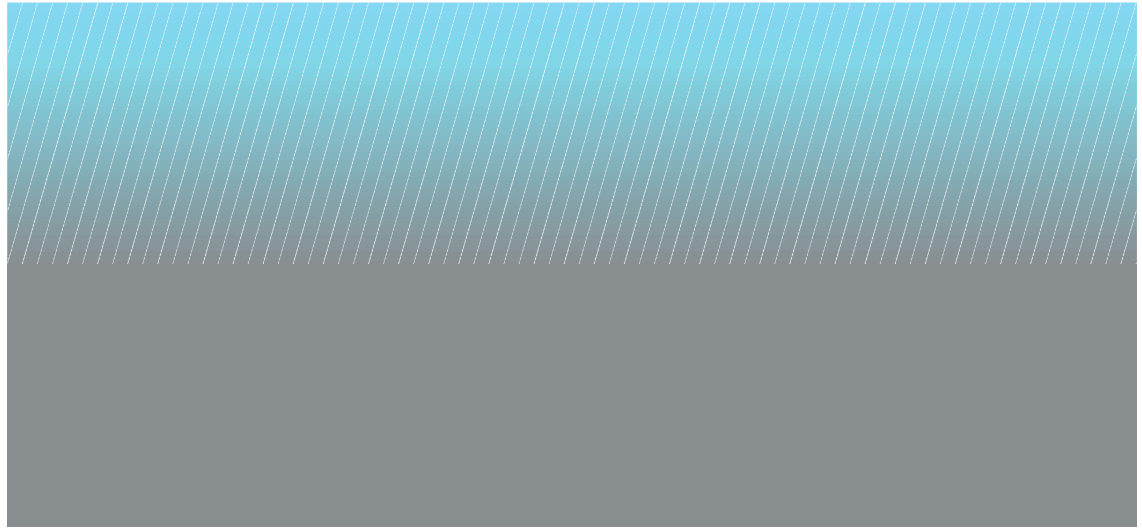
Value chain

Adopting a whole life-cycle approach and working collaboratively along the whole construction value chain offers additional opportunities for carbon emissions reductions beyond the cement manufacturing boundary

- Optimising the use of concrete:
  - reducing waste, optimise mix,
  - maximise structural efficiency,
  - ensure re-use (whole structure or elements),
  - design for longevity and disassembly
- Use concrete for more than structure: heating & cooling, finishes

Concrete contribution to the low carbon economy and to carbon removals

- Concrete delivers savings in our lives
  - Transport & infrastructure (roads vehicles emissions, bridges)
  - Energy (wind turbines, hydro,…)
  - Buildings operational energy
- Concrete is a carbon sink
- Concrete is a CCU option delivering permanent storage



CARBON CURE

Solidia Technologies

Technologies of the future

GCCA Vision

Clinker substitutes = conventional additions	New binders	CCU / S
Slags, fly ash, natural and artificial pozzolan, silica fume, limestone filler, calcined clays, rice husk ash,...	Geopolymers, CSA(B) (belite calcium sulfoaluminte), Belite cement, Activated slags, Mg-Si-Binders, Wollastonite (or carbonation hardening), Biominerals, Pre-hydrated calcium silicates	Calcium looping, cleanker, oxyfuel, amines, direct separation, mineral absorption] and CO_2 use technologies (enhanced concrete recarbonation, mineralisation,...)

UN Climate Action Summit – Cement and Concrete pathway

Cement Industry Carbon Capture Projects

Norway
NORCEM
Post-Combustion

Europe
Horizon 2020
- CEMCAP
- Leilac
- AC² OCEM
- CLEANKER
- ANICA

India
Dalmia Tamil Nadu
500,000t CO_2/a
Post-Combustion

China
Anhui Conch
Baimashaun
50,000t CO_2/a
Post-Combustion

Taiwan
Taiwan Cement
450,000t CO_2/a
Full Scale CaL

Company Commitment

Dalmia cement
FUTURE TODAY

Dalmia Cement (Bharat) aims to become 'carbon negative' by 2040; to build large scale carbon capture facility

Dalmia Cement (Bharat) has signed a MoU with UK-based Carbon Clean Solutions for the same.

By *Vatsala Gaur*, ET Bureau | Sep 19, 2019, 09.21 PM IST

A+

BCCL

Cement industry is one of the largest contributors to global carbon dioxide levels. I

MUMBAI: Aiming at becoming 'carbon negative' by 2040, homegrown cement maker Dalmia Cement (Bharat) on Thursday announced that it will be building a large scale carbon capture facility at its cement plant in Tamil Nadu.

The facility which will have a capacity of 500,000 tonnes is being built with technology shared by UK based Carbon Clean Solutions (CCSL) , a company engaged in the low-cost carbon dioxide separation technology. Dalmia Cement (Bharat) has signed a MoU with CCSL for the same.

Company Commitment

HEIDELBERGCEMENT

WE MEAN BUSINESS

Business Policy Insights Systems

HeidelbergCement targets zero-carbon construction future with science-based target

Jennifer Gerholdt, corporate engagement director at the We Mean Business coalition

Fostering Innovation

Accelerate ideas

- Leverage global perspectives
- Bring new ideas forward
- Share new thinking
- Encourage best practice
- Accelerate new technologies

INNOVANDI

Global Cement and Concrete Research Network

GCCA Global Cement and Concrete Association