Global Cement and Concrete Association

CONCRETE FUTURE

Key Developments for the Concrete Industry: A workshop for trade associations

06 December 2022
12:30 -14:30 (GMT)

Key Developments for the Concrete Industry

A workshop for trade associations

Speakers

Paul Adeleke, Strategy, Communications and Policy Director, GCCA

Nicolas Antoniou, Sustainable Design and Construction Manager, GCCA

Apologies

Dr Andrew Minson, Concrete and Sustainable Construction Director, GCCA

Agenda

1. The GCCA
2. Cement and Concrete Roadmaps to net zero by 2050
3. Environmental Product Declarations
4. Concrete CO_2/m^3: Company/ Industry Reporting Guidelines
5. Low Carbon Procurement
6. Potential for Concrete Decarbonisation Technology papers (ECRA Cement Technology papers)
7. Concrete Sustainability Council Certification

1. The GCCA

80%

GCCA members account for 80%
of the global cement industry volume
outside of China - and includes some key
Chinese manufacturers.

CONCRETE FUTURE

OUR MISSION

Concrete Future
Building a Net Zero World

Together, we are committed to building a bright, resilient and sustainable concrete future for our industry and for the world.

CONCRETE FUTURE

Our members and affiliates operate in almost every country of the world

The GCCA is a CEO led organisation, grouping industry sustainability leaders from around the world. Our members are committed to and report against a comprehensive sustainability charter.

Our Members

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

CONCRETE FUTURE

Our members and affiliates operate in almost every country of the world

Our Affiliates are partner national and regional industry associations.
We collaborate in our activities to support the sustainability progress of the production industry, to drive sustainability in the use of cement and concrete, and to advocate for supportive policies.

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

SEAT AT THE POLICY TOP TABLE

United Nations Secretary General – whose office we work with- – welcomed the launch of our Net Zero Concrete Roadmap and has called on all cement companies to join us.

GCCA is the first industry association to partner with the **UN Race to Zero** as an accelerator.

GCCA has **official observer status at the UN Climate COP** – where we run a programme of engagements.

We are welcomed as a **'knowledge partner' in the First Movers Coalition** – led by US Climate Secretary John Kerry.

We are one of just two industry associations to have a strategic collaboration with the **Clean Energy Ministerial on CCUS** - initiate of the world's key economies at a government level.

In 2021 we partnered with the **World Economic Forum** and Mission Possible Partnership to launch the multi stakeholder initiative Concrete Action for Climate.

GCCA Innovation Platforms
Addressing CO_2 footprint of cement and concrete

INNOVANDI

Global Cement and Concrete Research Network

RESEARCH NETWORK

WHAT: Pre-competitive research

WHO: Consortium of 75 Partners:

- 33 industrial partners (GCCA members, equipment suppliers, technology suppliers & admixture producers)
- 42 academic partner institutions

GCCRN Academic Partners

GCCRN Industrial Partners

INNOVANDI

Open Challenge

CONNECTING START UPS WITH INDUSTRY

WHAT: Identification of new technologies and establishing agreements between start ups and consortia of companies

WHO: Open to any one to submit projects & all GCCA members

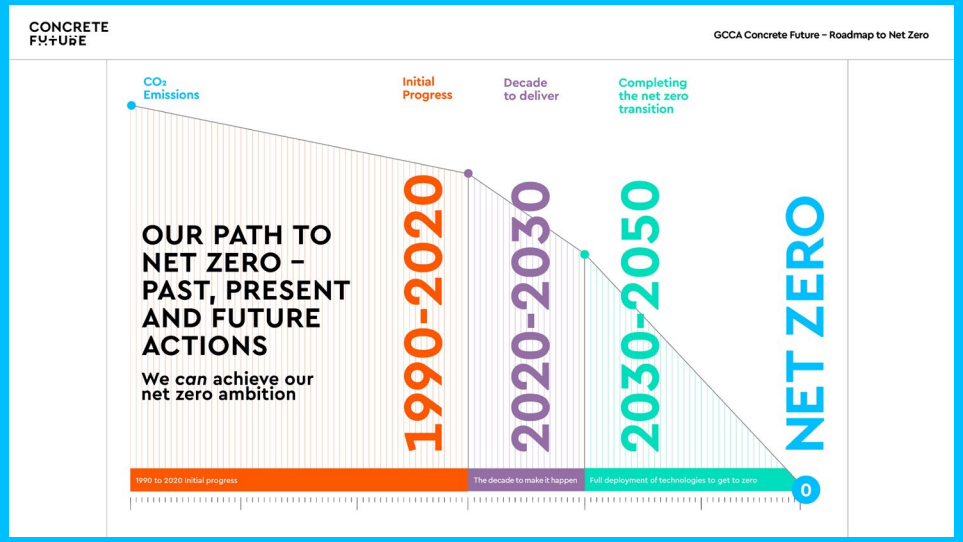
35 projects already publicly announced
>100 projects under developments

2. Cement and Concrete Roadmaps

OUR COMMITMENT AND PATHWAY TO BUILDING A NET ZERO WORLD

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

- Our roadmap sets out a net zero pathway to help limit global warming to 1.5°C.
- The industry has already made progress with proportionate reductions of CO_2 emissions in cement production of 20% over the last three decades.
- This roadmap highlights a significant acceleration of decarbonisation measures achieving the same reduction in only a decade. It outlines a proportionate reduction in CO_2 emissions of 25% associated with concrete by 2030.
- Our roadmap represents a decisive moment for our industry and the world, demonstrating that it is possible.
- The roadmap sets out the levers and milestones needed to achieve net zero across the whole lifecycle from cradle to cradle.
- We will succeed with the right policy support in place.



Developing Global Net Zero Roadmap

>100
Individuals

Individuals involved by region:

Name	Region
Eunice Simpson	Africa
Francesco Brambilla	Africa
James Adenuga	Africa
Maged Moustafa	Africa
Marios Katsiotis	Africa
Medhat Stefanos	Africa
Mmema Joshua	Africa
Peter Anagbe	Africa
Remo Diethelm*	Africa & Middle East
Alvaro Lorenz	ALyC
Ana Maria Uribe*	ALyC & North America
Camilo Sanchez	ALyC
Carlos Medina Ayala	ALyC
Elvira Isabel Tovar	ALyC
Fabio Cirilo	ALyC
Gloria Perafan	ALyC
Gonzalo Visedo	ALyC
Gustavo Beltran	ALyC
Lisseth Sandoval	ALyC
Ludwin Alvarez	ALyC
Manuel Lascarro	ALyC
Ricardo Pareja	ALyC

Name	Region
Rogelio Gonzales	ALyC
Vicente Saiso	ALyC
Yanina Navarro	ALyC
Bart De Leeuw	Asia/Oceania
Chang Wei Lin	Asia/Oceania
Edward Huang	Asia/Oceania
Jae Kang	Asia/Oceania
Jason Nairn	Asia/Oceania
Lorraine Qua	Asia/Oceania
Margie Thomson	Asia/Oceania
Michael Ison	Asia/Oceania
Naoki Aoki	Asia/Oceania
Phiny Hung	Asia/Oceania
Rob Davies	Asia/Oceania
Sheng Yu Lin	Asia/Oceania
Sherjing Wang	Asia/Oceania
Wilasa Vichit-Vadakarn	Asia/Oceania
Yoshito Izumi	Asia/Oceania
Bin Wang	China
Tongbo Sui	China
Olga Bukhtoyarova	CIS
Mihail Polendakov	CIS

Name	Region
Alessio Rimoldi	Europe
Antonio Carrillo*	Europe & others
Asli Ozbora Tarhan	Europe
Charo Martinez	Europe
Francesco Biasoli	Europe
Grazia Bartagnoli	Europe
Jordi Altet	Europe
Marco Borroni	Europe
Patrick Liebmann	Europe
Richard Leese	Europe
Rob van der Meer	Europe
Akbelen Barış	Middle East
Amit Marmur	Middle East
Berrak Avcioglu	Middle East
Bruno de Robert	Middle East

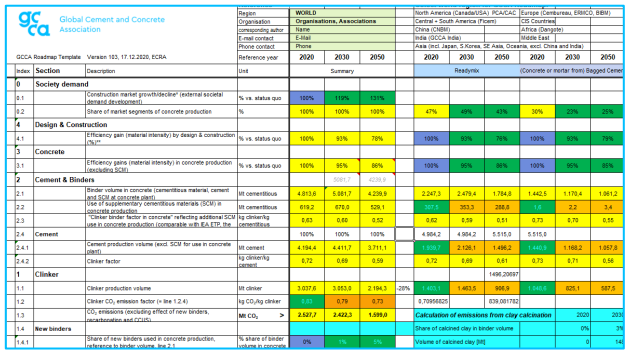
Name	Region
Cağdas Gültekin	Middle East
Canan Gencel	Middle East
Erdi Ekinci	Middle East
Gülden Dogan	Middle East
Adam Swercheck	North America
Brian Cook	North America
Gina Lotito	North America
Massimo Paris	North America
Michael LeMonds	North America
Nick Popoff	North America
Rick Bohan	North America
Steve Morrissey	North America
Travis Reed	North America
Virgilio Barrera	North America

GCCA Global Cement and Concrete Association

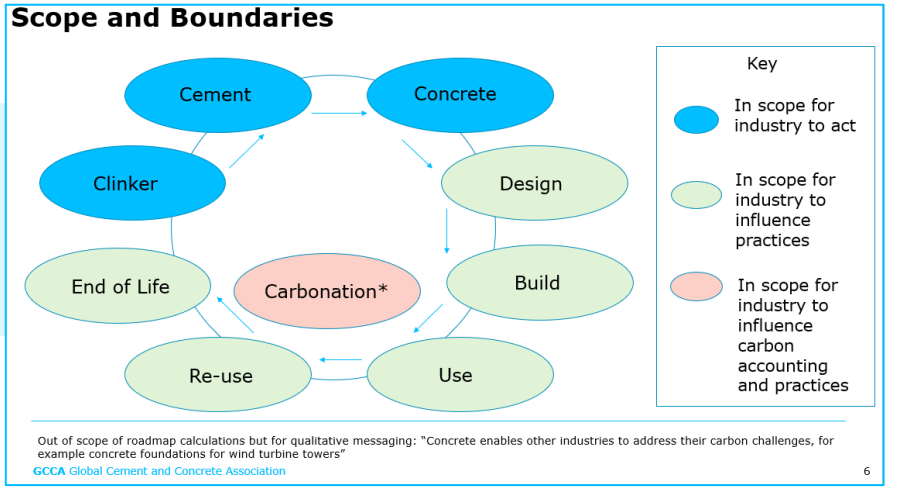
5
Task Groups

ecra
european cement research academy

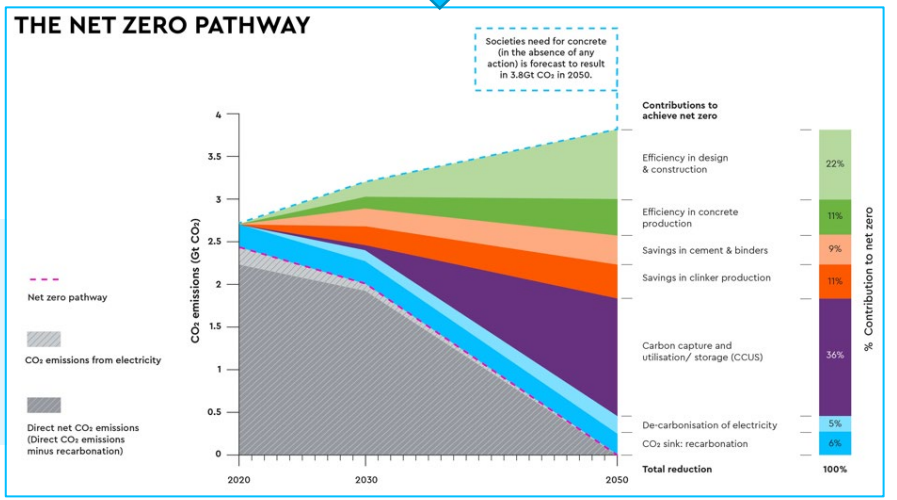
9
Regions



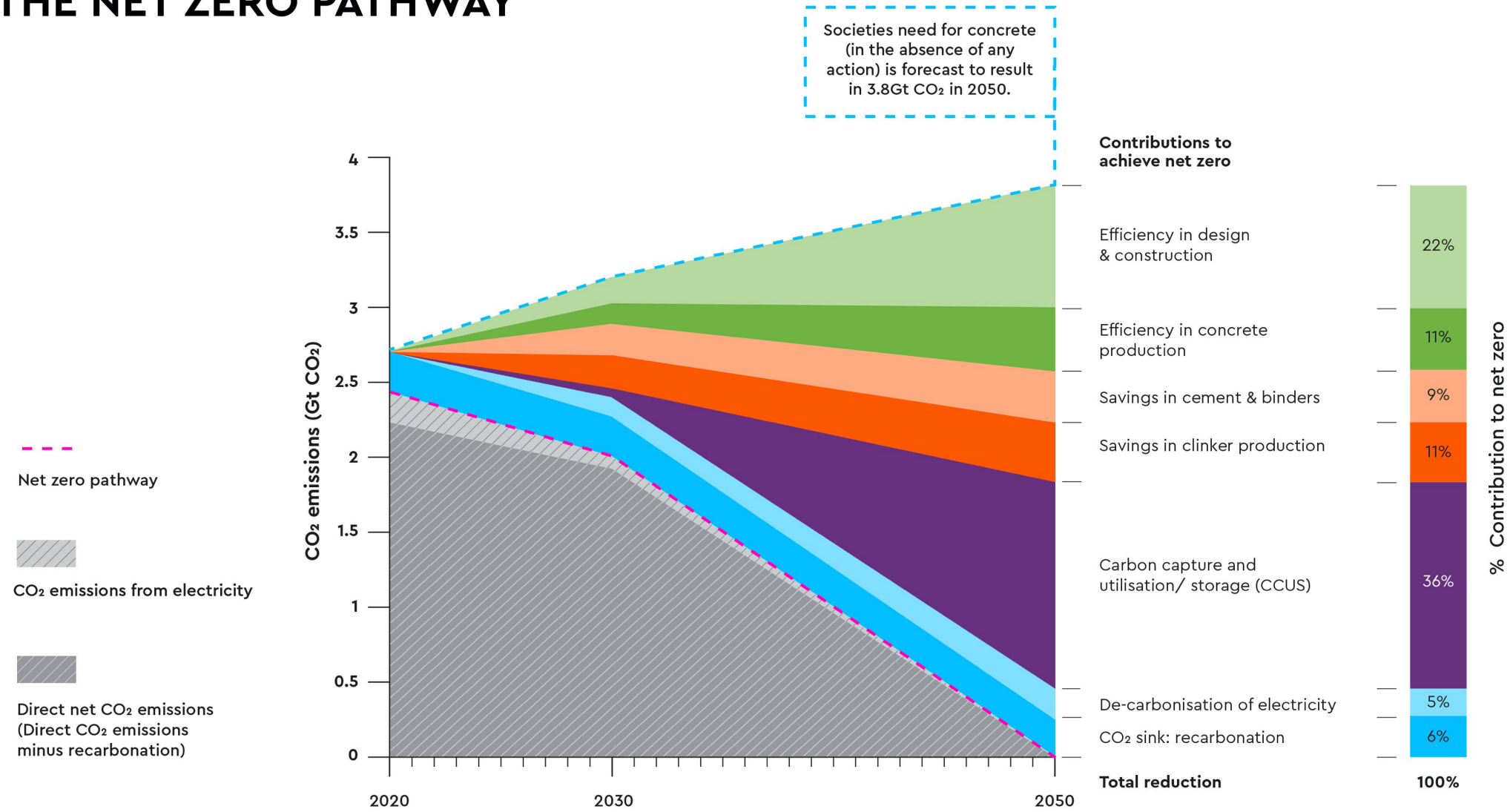
100%
Member Commitment



Africa	America Latina y el Caribe (ALyC)	Asia & Oceania
China	CIS	Europe
India	Middle East	North America



THE NET ZERO PATHWAY



National Roadmaps: From Global Commitment to Local Action

Three focus areas:

Led by national associations and companies

Supported by international partnerships & communication:

- UN, Secretary General/ agencies and bodies
- High Level Champions
- Clean Energy Ministerial
- IDDI (procurement)
- OECD
- WEF/MPP
- IFC and EBRD
- LeadIT

National Roadmaps– Country Progress

Phase 1	Phase 2	
• Thailand: launched • Egypt: to be finalised shortly • India: in progress • Colombia: in progress	• Brazil: commenced • Chile: confirmed with FICEM support • UAE • Morocco: EBRD funding confirmed • Mexico: tbc • Argentina: tbc	**Africa countries: funding to be found** • Nigeria • Kenya • Congo • Senegal • Ethiopia • Tanzania Indonesia: Q1 2024 is hoped for if agreement can be reached

3. Environmental Product Declarations

Environmental Product Declaration (EPD)

An 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).

An official EPD typically consists of:

- The public EPD document summarising the environmental impact of the product
- The private Background Report used by verifiers and program operators to verify the results

Why are EPDs important?

- EPDs are fundamental to low carbon procurement
- EPDs support the embodied carbon challenge by making the environmental impact of products and materials more visible
- Most clients want manufactures to provide them with sustainable building products and increasingly request EPDs
- EPDs help designers develop lower carbon solutions
- EPDs help manufacturers to measure and reduce their environmental impact and benchmark their performance
- EPDs are an open and objective way to demonstrate the manufacturer’s commitment to environmental impact transparency

GCCA EPD tool

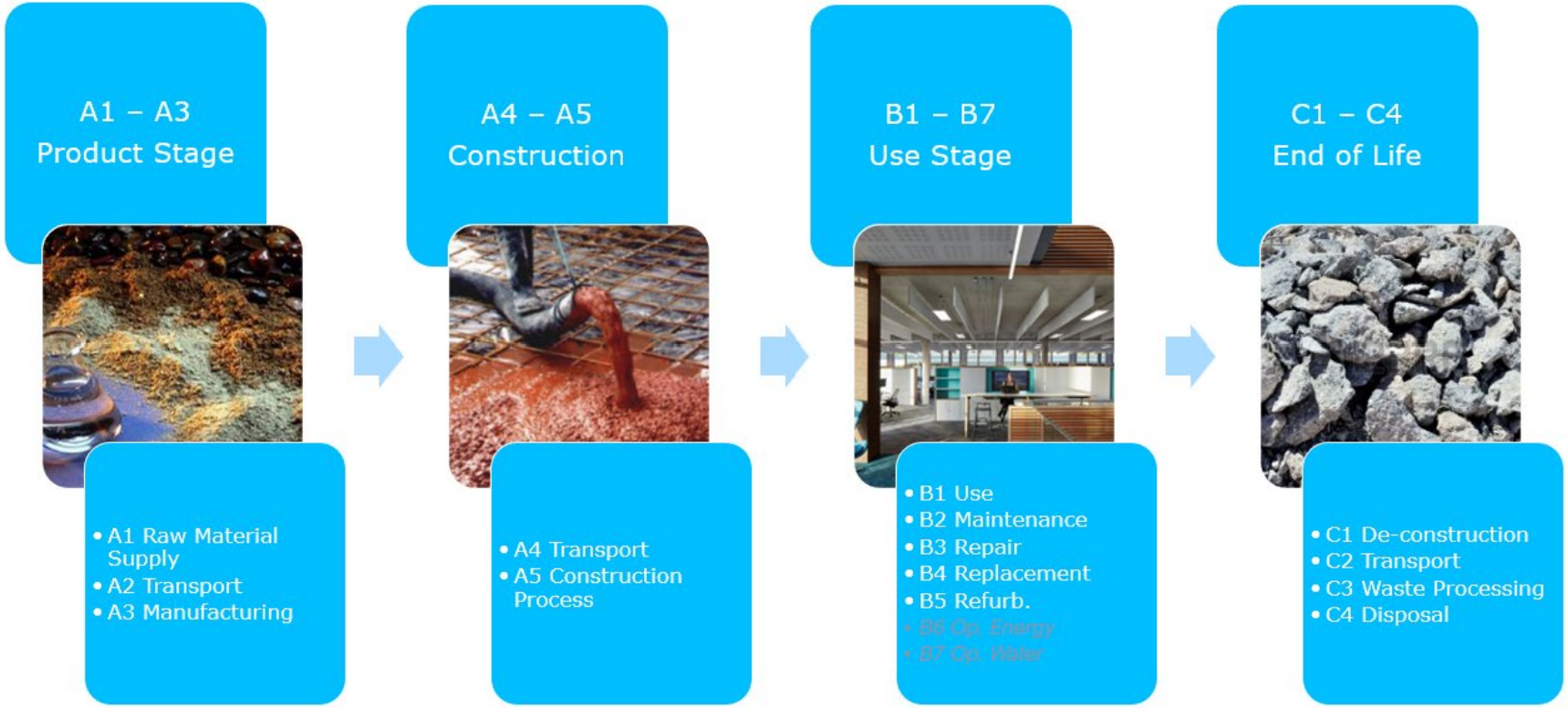
- Launched in 2014 as part of the ongoing industry efforts to reduce environmental impact and support global sustainability goals
- Developed by Quantis (Based in Europe with N American footprint, LCA and systems experts)
- Web-based calculation tool for EPD indicators for clinker, cement, concrete and precast elements
- International and N American versions available
- Both versions comply with the respective EPD standards and PCRs

GCCA EPD tool: Standards

Version	EPD standard	PCRs	LCA standard	Independent verification standard	Independent Verifier
International	ISO 21930	• PCR 2019:14 - Construction Products (EN 15804+A2) • PCR-001 - Cement and building lime(EN 16908) • PCR-003 - Concrete and concrete elements (EN 16757)	ISO 14040 ISO 14044	ISO 14025	STUDIO FIESCHI & SOCI sostenibilità su misura
North American		• PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements (NSF International) • PCR for Concrete (NSF International)			Athena Sustainable Materials Institute

GCCA EPD tool: Stages covered

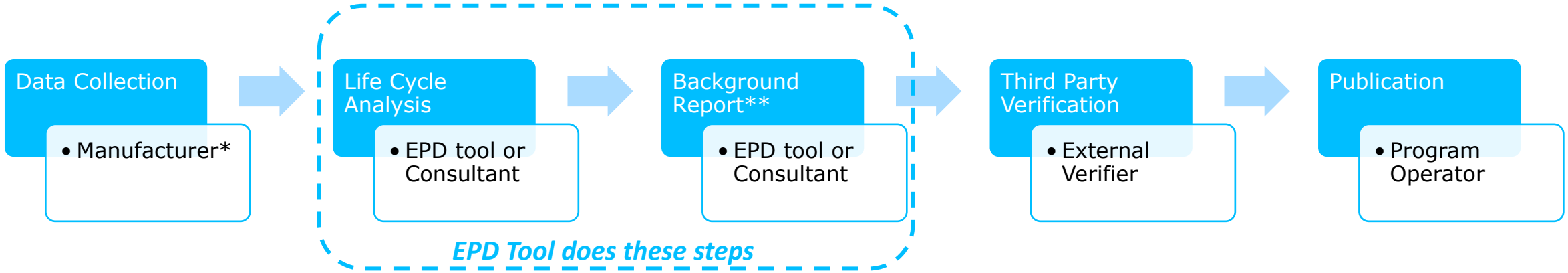
- **“Cradle-to-gate”** (A1-A3) environmental impact assessment for **clinker and cement**
- **“Cradle-to-grave”** (A1 to C4) environmental impact assessment for **concrete and precast products**



GCCA EPD tool: Output

The two major outputs of the GCCA EPD tool are:

- Self-declaration (not a validated official EPD), containing the main general information and the environmental indicator values (LCA results)
- Background report with the complete set of input data and results required to produce an EPD and allow a third-party verification

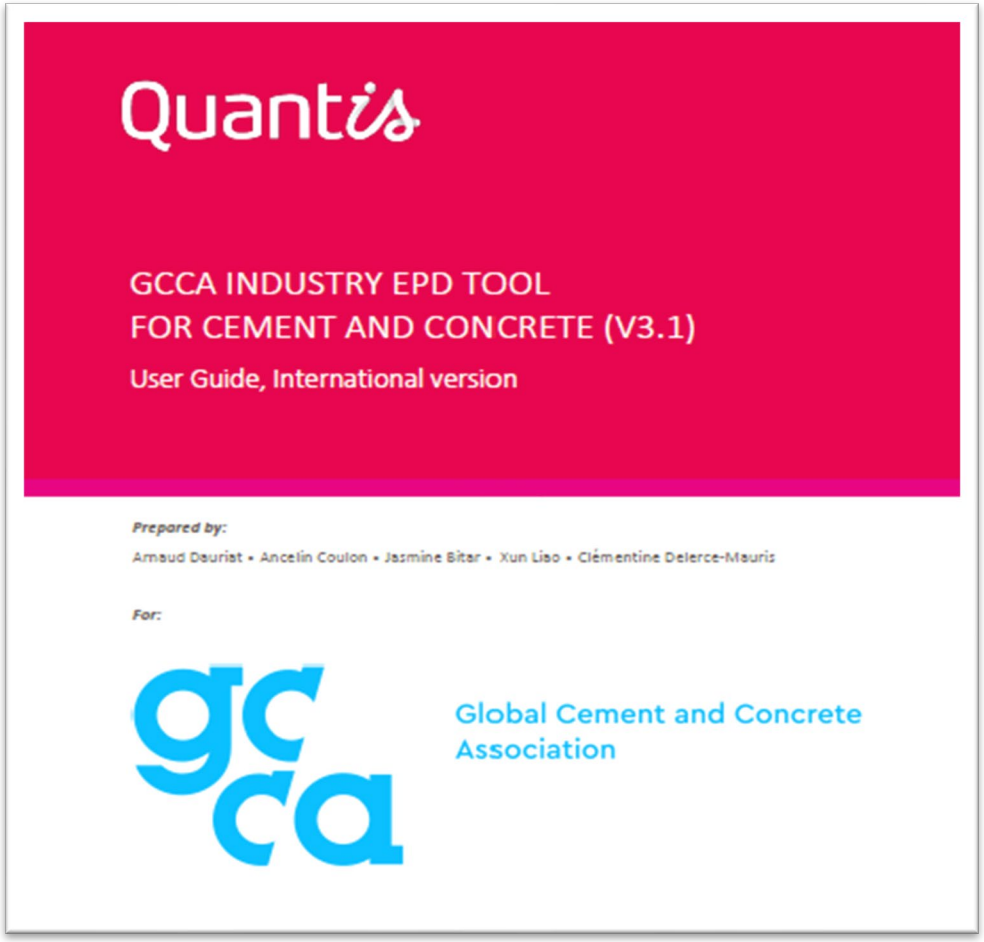


*Manufacturer manages all stages and liaises with many point of contacts

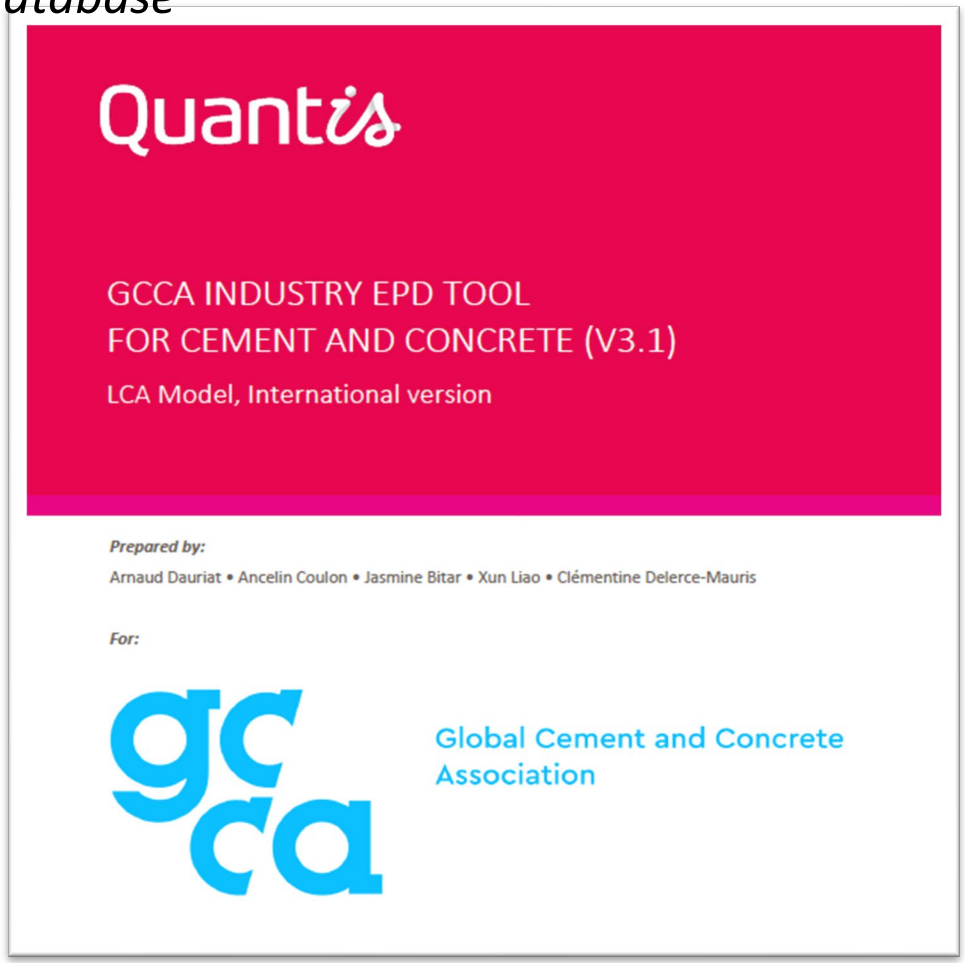
Traditional EPD Process

GCCA EPD tool: Available Documentation

- **User Guide**



LCA model: *Describes the LCA core model and database*



How to get a Licence

- The EPD tool is available to GCCA-members and affiliates for free
- Non-GCCA members can purchase an annual license
- A 50% discount is provided to companies which are members of a GCCA affiliate
- To find out more or get access to the tool visit our website:

https://gccassociation.org/sustainability-innovation/environmental-product-declarations/

GCCA EPD Tool updates

Version 3.2 (end of December 2022)

- Alignment with GPI v4.0 and EN15804 + A2 v1.2
- ILCD+EPD format export
- Inclusion of GNR 2020 data
- Clarification on Net and Gross GWP, alignment of PENRT + ADPF indicators and correction of NHWD indicator
- Further clarifications in the supporting documents (LCA model and User manual)

Version 4.0 (February 2023)

- Application Program Interface (API)
- Possibility to create aggregates EPDs
- Possibility to import third party EPDs and associate them to a specific category (incl. warning)
- New KPIs about GHG emissions in the manufacturing section
- Project control and management by company administrator
- Project share among company users
- Update of North-American version to better integrate Canada

EPD on-Demand

- An **EPD on-Demand** service, allows ready mixed concrete producers to instantly produce and publish a verified EPD
- The service is available in North America for Ready Mix Concrete EPDs and will soon become available in Europe
- The pre-verification and locking of all plant level data allows the ready-mix plant to develop verified EPDs for different mixes
- The verified EPD is then published on EC3
- **Athena Sustainable Materials Institute**, a GCCA partner, will be providing an EPD on-Demand service which uses the GCCA's EPD calculation engine

4. Concrete CO_2/m^3: Company/ Industry Reporting Guidelines

GNR – GCCA in **N**umbe**r**s
A Unique tool

The GNR is an independently managed database of CO_2 and energy performance of the global cement industry

It provides UNIFORM, ACCURATE and VERIFIED DATA on cement industry key CO_2 EMISSIONS and DRIVERS

Based on:

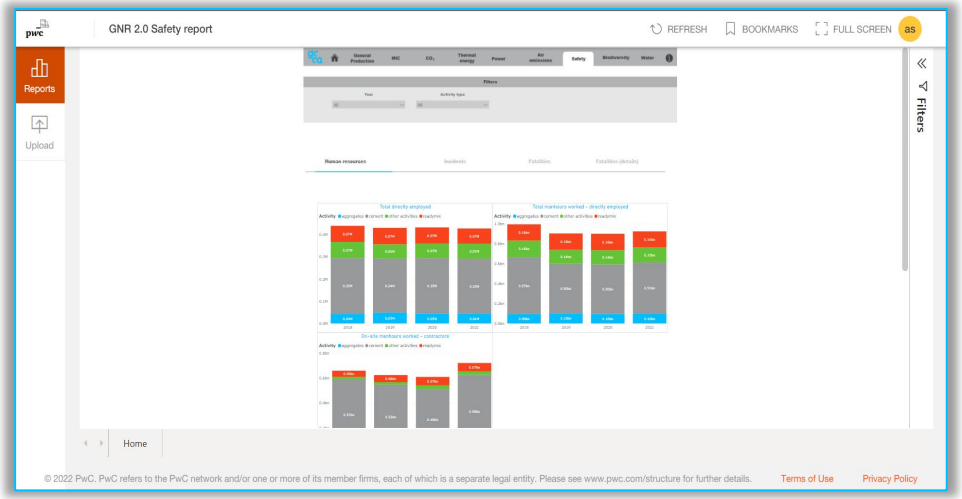
- a RIGOROUS protocol **http://www.cement-co2-protocol.org/en/**
- External validation
- Independent data aggregation

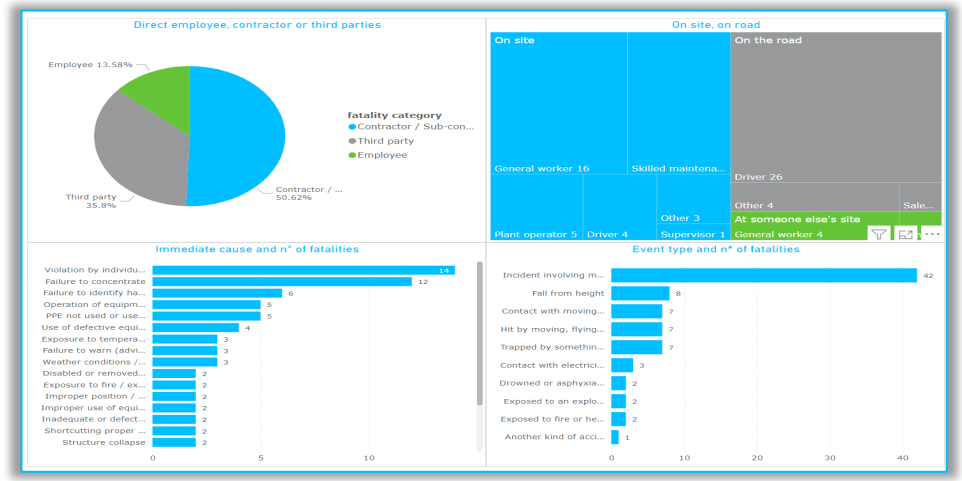
The GNR 2.0 provides

- **For companies:** state of the art data and analysis of cement industry's global and regional performance allowing participants to benchmark their own performance, track their emissions inventories and develop sound data based responses to climate issues.

- **For trade associations:** a credible source of verified industry-wide and regional information to anchor discussions about climate policies and their potential impacts with their respective governments.

- **For external stakeholders** such as academia, NGOs, governments, international organisations: access to verified industry annual data





GCCA Concrete and CO_2 Guidelines

- In summary, the guidelines require the collection of parameters to allow reporting of CO_2 emissions per m^3 of concrete due to:
  - Cement in Concrete
  - Energy use at concrete plant (electrical and non-electrical)
  - Transport of product from plants to sites

- Additional metrics to enhance description and detail are required (e.g. average concrete strength, cement to binder ratio, cement and binder consumption per m^3 of concrete etc)

5. Low Carbon Procurement

Low carbon procurement of cement, concrete and construction: GCCA position

GCCA Policy on Sustainable Procurement

- Assed at scale of whole project building or infrastructure asset over whole life
- based on robust data and account for performance, economic and technical issues

To define **product baselines**:

- Concrete is more than one product - use sub-categories of concrete - strength and product type (precast).
- Concrete varies geographically - use country and sub country regions
- Consistent baseline methodology - for each sub category of concrete, calculate reference using OPC/CEM1 (2020) mix
- To calculate baselines - use Cement and Concrete Industry Associations

Target progressive reduction in carbon footprint of purchased concrete in alignment with global (or national) roadmap

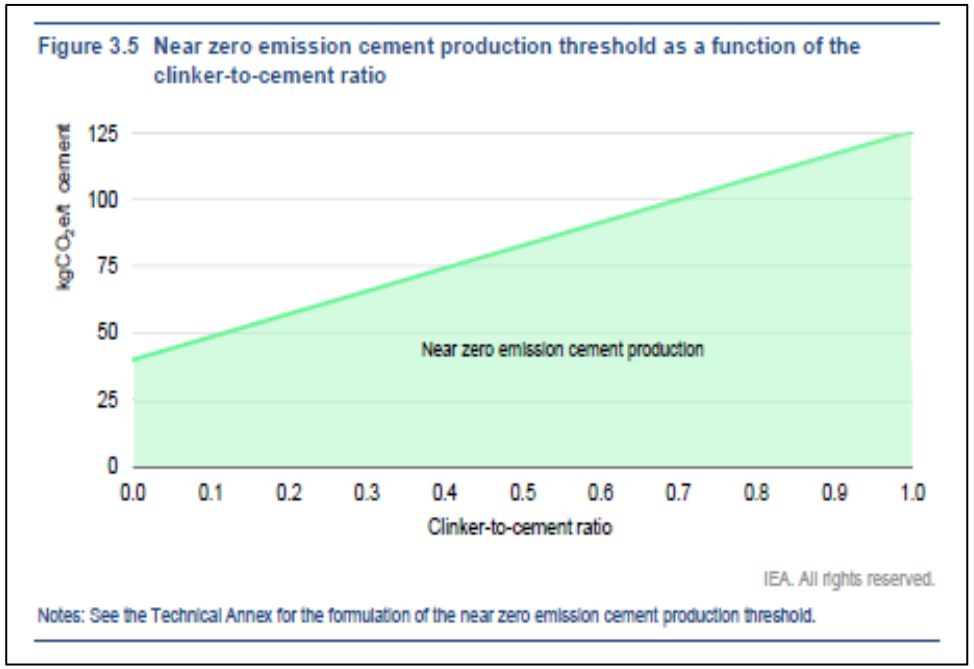
Global Low Carbon Procurement Schemes

1. Industrial Deep Decarbonisation Initiative (IDDI)

- The IDDI is developing a public procurement framework for adoption by countries. It will be on project, concrete and cement levels.
- Current members are Canada, Germany, India, Saudi Arabia, United Arab Emirates, United States, and the United Kingdom
- For concrete and project levels, definitions and frameworks are still being developed
- For cement level, IDDI has adopted the IEA methodology for setting bands and defining low emission cement

IDDI: IEA methodology for cement level

- The IEA method has at its core a clinker/cement ratio sliding scale for setting bands and defining low emission cement and near zero cement
- The GCCA rejected this methodology because it removes the incentive to use more SCMs to reduce clinker volumes hence carbon emissions
- In recognition of the points raised by the GCCA, an *Explanatory Note* was added to the pledge, providing the option for member countries to choose between a sliding scale for the clinker ratio OR a static clinker-to-cement ratio.



IEA Report: "Achieving Net Zero Heavy Industry Sectors G7 Members", May 19th 2022

Explanatory notes (4/6)

Near zero emission production definition: A stable and absolute definition based on a fixed emissions intensity has been identified. For the purpose of this pledge, the near zero emissions definition will be applied encompassing both direct and indirect emissions. Direct emissions are defined according to internationally recognised frameworks for energy and emissions accounting, such as the IEA World Energy Balances and the IPCC□s Guidelines for Greenhouse Gas Emissions Accounting. Indirect emissions included are be limited to those arising from clearly defined steps in the production process. To be truly □near zero, the emission intensity thresholds are set to allow only a limited amount of residual emissions.

The thresholds for near emissions zero steel and cement production take account of the share of scrap use in the case of steel, and the clinker ratio in the case of cement. **For the purpose of this pledge, however, governments may choose to apply a static clinker-to-cement ratio, for example based on average values** (the global average being 0.7, according to the IEA study, page 121), in order to acknowledge different national circumstances and technology options.

Global Low Carbon Procurement Schemes

2. First Movers Coalition (FMC)

- FMC announced their cement and concrete procurement methodology and commitment by 5 private sector companies at COP27.
- These private sector companies have committed that by 2030, 10% of the concrete they purchase will be near zero, defined as 85% (TBC) reduction on 2020 (TBC) values

First Movers Coalition (FMC)

First Movers Coalition

Overview of FMC

65 total **member companies** making demand commitments

…bringing us to a…

$8T **market cap[1]** of all FMC members

…supported by…

10 **governments** including India, Japan, Sweden, Denmark, Italy, Germany, Norway, Singapore, U.K., & the United States

1. Capital IQ, data as of Nov 3 2022

Aluminum

Apple*
Ball Corp*
Bang & Olufsen*
Constellium*
Ford Motor Company*
Novelis*
PepsiCo*
Trafigura*
Volvo Group*

Aviation

Airbus
Apple
Autodesk*
Aveva*
Bain & Company
Bank of America
Boeing
Boston Consulting Group
Deloitte
Delta Airlines
Deutsche Post DHL Group
EY*
FedEx*
Fortescue Metals Group
Nokia
PWC*
Rio Tinto*
Salesforce
Schneider Electric*
United Airlines
Vattenfall

Carbon Removal

AES*
Alphabet*
Boston Consulting Group*
EGA*
Microsoft*
Mitsui O.S.K. Lines*
Salesforce*
SwissRe*

Cement / Concrete

Etex*
General Motors*
Ørsted*
RMZ*
Vattenfall*

Trucking

Agility
Cemex
Dalmia Cement
Fortescue Metals Group
HeidelbergCement*
Holcim
National Grid*
PepsiCo*
Rio Tinto*
Scania
SSAB Swedish Steel
Vattenfall
Volvo Group

Shipping

A.P. Møller – Mærsk
Agility
Aker ASA
Amazon
BHP*
Fortescue Metals Group
Höegh Autoliners*
Mitsui O.S.K. Lines*
Rio Tinto*
Trafigura
Western Digital
Yara International

Steel

Aker ASA
CCC*
Ecolab*
Enel*
Engie
Ford Motor Company*
Fortescue Metals Group
Invenergy
Johnson Controls
Mahindra
Ørsted
ReNew Power
Scania
Trane Technologies
Vattenfall
Vestas*
Volvo Group
ZF Friedrichshafen AG

***New members since COP26** *Additional commitments made since COP26

Today, FMC companies are making the most ambitious pledges in history to buy near-zero carbon cement & concrete

We commit to purchasing at least 10% (by volume) of our cement / concrete per year as near-zero cement / concrete inclusive of any SCMs by 2030 and excluding fossil-based SCMs by 2035

Cement	
FMC near-zero cement threshold (kg CO2/ton cementitious)	184

Concrete	
Specified compressive strength (f'c in psi)[1]	FMC near-zero concrete threshold (kg CO_2e/m^3)
0 - 2500 psi	70
2501 - 3000 psi	78
3001 - 4000 psi	96
4001 - 5000 psi	117
5001 - 6000 psi	124
6001 - 8000 psi	144

etex

general motors

Ørsted

RMZ Corp

VATTENFALL

Technological pathways

Solutions may include (but are not limited to):

- **CCUS**
- **Non-fossil-based SCMs**
- **Fuel switching**
- Renewable electricity
- Efficiency improvements
- Decarbonated raw materials
- Alternative cement chemistries
- CO_2 mineralization during curing

Out-of-scope:

- [By 2035] Fossil-based SCMs (i.e., GGBS and fly ash)
- Carbon offsets

Bolded abatement technologies seen as most critical to meeting FMC targets according to FMC research

Global Schemes and GCCA Input

Global Low Carbon Procurement Initiatives: Sept 1, 2022

	IDDI: Industrial Deep Decarbonisation Initiative : Multi Governmental Initiative	**FMC: First Movers Coalition. John Kerry Initiative, WEF secretariat, BCG consultants**
Public /Private	Public Procurement	Private procurement (but governments involved)
Products	Cement defined; Concrete under development (RMX and blocks only)	Cement and Concrete (RMX only)
Timing of commitment(s)	2025 and 2030	2030 with all SCMs in scope 2035 excluding GGBS and flyash*
Baseline Year/ data origin	2020 / IEA analysis* (see IEA report for G7 , 19th May 2022, in which new sliding clinker ratio scale used)	2021* / US Industry data only applied globally*
Baseline /Target	Cement: IEA non-EPD baseline*; Concrete yet to be developed (GCCA on task group)	Cement baseline (91.4% clinker ratio) (PCA data implied tbc) Ready Mix Concrete: by strength (NRMCA data)
Calculation method	IEA method but detail to be developed.* Mention of harmonising EPDs. GCCA Note: Lack of clarity here by IDDI – a work in progress.	EPDs (BUT with amend from 2035 when GGBS and fly ash are out of scope)
Launch date/consultation period	Sept 23rd 2022; 12 month consultation period	COP27 Nov 2022 first companies announced (see next slides)

*Counter to GCCA recommendation: Baseline year preferred as 2020; country (or sub-country) baselines should be set; EPDs should be adopted (albeit we welcome pressure to harmonise across countries); all SCMs should be in scope

Now available

Low-Carbon Concrete and Construction: A Review of Green Public Procurement Programmes

This report was created to:

- Assist policy makers and procurement offices in designing green public procurement programs for concrete and construction
- Highlight the role of the private sector in participating in green public procurement ecosystems
- Identify critical topics which need further attention from the public and private sectors

missionpossiblepartnership.org/action-sectors/concrete-cement

Our approach: A review of 6 countries leading in low-carbon procurement of concrete and construction

- A series of interviews with public and private sector representatives
- Analysis of existing frameworks, tools and policies

Netherlands

Sweden

Germany

France

United Kingdom

USA

https://missionpossiblepartnership.org/wp-content/uploads/2022/06/LowCarbonConcreteandConstruction.pdf
https://gccassociation.org/events/

6. Potential for Concrete Decarbonisation Technology Papers (ECRA Cement Technology papers)

The ECRA Technology Papers 2022

- The European Cement Research Academy (ECRA) was commissioned by the Mission Possible Partnership (MPP) and the GCCA to update their technology papers.
- ECRA technology papers describe and evaluate technologies which may contribute to increasing energy efficiency and reducing greenhouse gas emissions from global cement production today, and in the medium and long-term future.
- They also provide the financial aspects of the different decarbonisation levers and cluster them in state-of-the-art documents, also addressing the maturity and the technology readiness levels of the different technologies concerned.

THE ECRA TECHNOLOGY PAPERS 2022

- In total, **62 articles** are examined, and topics include:
  - Energy efficiency and management
  - Alternative fuels, electrification, use of hydrogen
  - Waste heat recovery
  - Use of SCMs and recycled materials
  - Low carbonate clinkers
  - Carbonation
  - Carbon Capture

No	Title
1	Improving raw mix burnability e.g. through mineralisers
2	Change from long kilns to preheater/precalciner kilns
3	Preheater modification through cyclones with lower pressure drop
4	Additional preheater cyclone stage(s)
5	Increase of kiln capacity
6	Retrofit mono-channel burner to modern multi-channel burner
7	Oxygen enrichment technology
8	Efficient clinker cooler technology
9	Waste heat recovery: Steam
10	Waste heat recovery: ORC
11	Waste heat recovery: Kalina Cycle
12	Alternative de-carbonated raw materials for clinker production
13	Fuel switch (coal/petcoke to oil/gas)
14	Alternative fuels replacing conventional fossil fuels
15	Pre-treatment of alternative fuel (grinding, drying)
16	Pre-combustion chambers and gasification
17	Hydrothermal Carbonisation (HTC) and Torrefaction
18	Use of hydrogen as fuel
19	Electrification, plasma and other technologies
20	Recycled concrete fines as raw material for clinker production
21	Advanced plant control and AI-supported control systems
22	Variable speed drives for fans
23	Auxiliary system efficiency
24	Energy management
25	Optimised cement plant operation with renewable power
26	Cement grinding with vertical roller mills and roller presses
27	High efficiency Separators
28	Optimisation of operating ball mills
29	Separate grinding of raw material components
30	Advanced grinding
31	Separate ultra-fine grinding and blending of cements

No	Title
32	Increased cement performance by optimised particle size distribution (PSD)
33	Optimised use of grinding aids
34	Reduction of clinker content in cement by use of granulated blast furnace slag
35	Reduction of clinker content in cement by use of natural pozzolanas
36	Reduction of clinker content in cement by use of natural calcined pozzolana
37	Reduction of clinker content in cement by use of limestone or other materials
38	Cements with very high limestone content
39	Impact of very high/very low lime saturation factor
40	Recycled concrete fines as a cement constituent
41	Reduction of clinker content in cement by use of fly ash
42	Reduction of CO2 by efficient use of concrete
43	Alkali-activated binders
44	Cements based on carbonates or on carbonation of calciumsilicates
45	Other low carbonate clinkers: Pre-hydrated calcium silicates
46	Other low carbonate cements - Belite cements
47	Other low carbonate clinkers: (Belite) calcium sulfoaluminate clinker
48	Oxyfuel technology for carbon capture
49	Post-combustion capture using absorption technologies
50	Post-combustion capture using membrane processes
51	Post-combustion capture - Physical separation processes
52	CO2 capture using solid sorbents: Ca looping (CaL)
53	Indirect calcination for carbon capture
54	Post-combustion capture using solid sorbents: Mineral carbonation
55	CO2 use: Basic chemicals, urea, formic acid, polymers
56	CO2 use: Power-to-gas (CH4)
57	CO2 use: Power-to-liquids (Methanol)
58	CO2 use: Enhanced Oil or Gas Recovery (EOR/EGR)
59	CO2 use: Algae capture and fuel production, biofuels
60	Natural Carbonation
61	Enforced (re)carbonation/mineralisation

THE ECRA TECHNOLOGY PAPERS 2022

- Most papers refer to carbon neutrality in the production of clinker and cement
- The following 4 are of relevance to concrete:
  - Recycled concrete fines as raw material for clinker production
  - Recycled concrete fines as a cement constituent
  - Energy management
  - Reduction of CO_2 by efficient use of concrete

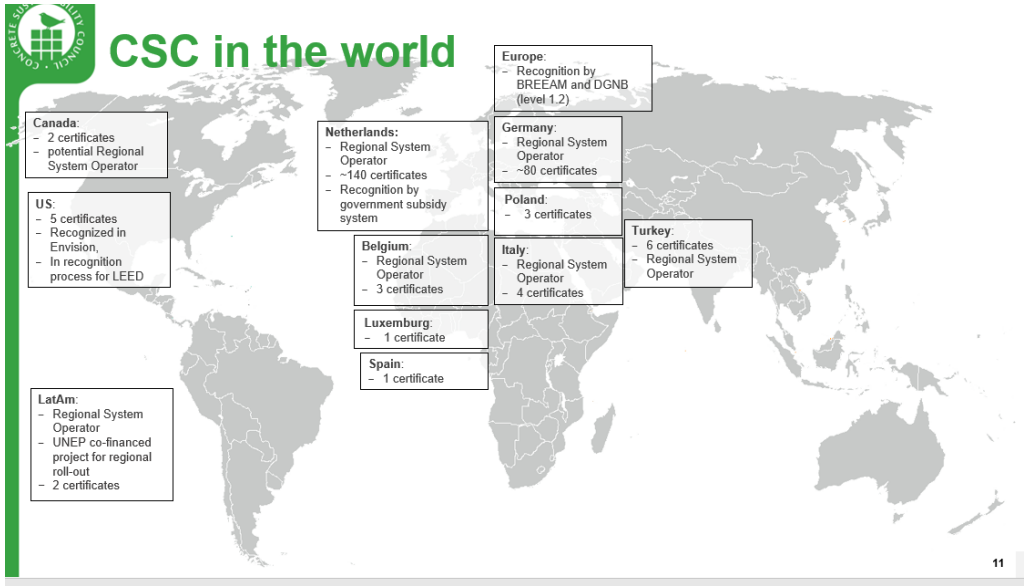
Question: Do we as the concrete part of GCCA want to have the equivalent technology papers but for concrete?

7. Concrete Sustainability Council Certification

What is the CSC?

A Global Responsible Sourcing Certification System for Concrete

- designed to help concrete, cement and aggregate companies obtain insight in the level to which a company operates in an environmentally, socially and economically responsible way.
- Designed to enable informed decision in construction.



Benefits of the CSC-Certification

By delivering and promoting a credible and globally recognised responsible sourcing scheme for concrete, CSC makes a key contribution to:

- **Promoting concrete as the sustainable construction material of choice**
- Pro-actively shaping the public perception of the concrete industry to secure the overall market share of concrete in construction
- Conveying of a firm <u>positive</u> positioning against other building materials: Mainly wood (generally perceived as THE MOST SUSTAINABLE CONSTRUCTION MATERIAL) and steel

Benefits of the CSC-Certification

For **certifying companies** CSC certification provides image- and cash / tangible benefits, e.g.

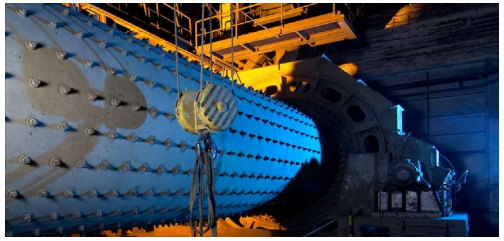
- Entering into a **credible in-depth dialogue on sustainability** with customers and a broad range of other stakeholders

- **Opportunity to differentiate and to perform in Green Building Labels and in Public Procurement**:
  - CSC certification is increasingly gaining recognition in Green Building Labels
  - Clearly above average growth of the Green Buildings' market: Transaction volume was ~ 10.1 bio. € in GER in 2018; higher growth rate than market average

What Plants can be CSC-certified?

Cement

Integrated



Grinder

Concrete

Stationary
Precast and RMX

Mobile

Aggregates

Natural & manufactured

Crusher

Recycled

Marine

Supply chain weighting

CEMENT

CONCRETE

AGGREGATES

CSC Supply Chain Certificate for Responsibly Sourced CEMENT

Contribution CEMENT up to **25%**

Contribution CONCRETE up to 60%

Contribution AGGREGATES up to **15%**

CSC Supply Chain Certificate for Responsibly Sourced AGGREGATES

CSC Certificate for Responsibly Sourced CONCRETE

CSC-certificate family

Level	Min. CO_2 reduction vs. local baseline
1 Star	30
2 Stars	40
3 Stars	50
4 Stars	60

CSC-Certificate

PREREQUISITES
- P1 Ethical and Legal Compliance
- P2 Human Rights
- P3 Indigenous People Rights
- P4 Environmental and Social Impact
- P5 Traced Materials

MANAGEMENT
- M1 Sustainable Purchasing
- M2 Environmental Management
- M3 Quality Management
- M4 Health & Safety Management
- M5 Benchmark

ENVIRONMENTAL
- E1 Life Cycle Impact
- E2 Land Use
- E3 Energy & Climate
- E4 Air Quality
- E5 Water
- E6 Biodiversity
- E7 Secondary Materials
- E8 Transport
- E9 Secondary Fuels

SOCIAL
- S1 Local Community
- S2 Health Product Information
- S3 Occupational Health & Safety
- S4 Labor Practices

ECONOMICS
- B1 Local Economy
- B2 Ethical Business
- B3 Innovation
- B4 Feedback Procedure

CHAIN OF CUSTODY
- C1 Cement
- C2 Aggregates

Level	Min. volume-% R-material
1 Star	10
2 Stars	20
3 Stars	40
4 Stars	80

CO_2-Module

Plant Requirements

L1 CSC certification Silver+

L2 75% coverage of the cement supply chain

L3 Monitoring of GHG emissions
CSC certification criterion E3.02 fulfilled

L4 Quality Management: QMS

Product Requirements

L5 Concrete Mix with CO2 reduction vs. baseline >= 30%

The R-Module and the CO_2 Module are **voluntary product add-ons** to the traditional CSC-certificate and

- aim at creating transparency and credibility
- can be used as a marketing tool for concrete to lead the circularity dialogue and the low CO_2 definition of concrete

R-Module

Plant Requirements

R1 CSC certification Silver+

R2 Traced R-material supply

R3 R-material Consumption

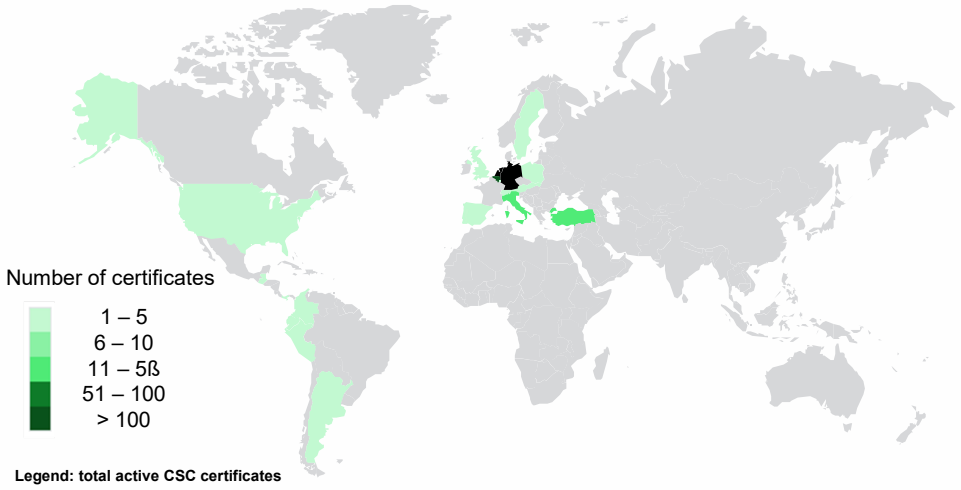
R4 Quality management
QMS, Use of certified R-material

Product Requirements

R5 Concrete mix with minimum R-material content >= 10%

Global Roll-out

> 670 active certificates in 20 countries/regions globally
~ 160 projects in progress



Supported by competent and strong partners

- Belgium: Fedbeton
- Germany: BTB
- Italy: Federbeton
- LatAm: FIHP
- Netherlands: Betonhuis
- Turkey: THBB
- USA: NRMCA
- Global: GCCA

Achieving recognition in leading Green Building Labels

BREEAM

- Official recognition of CSC V2.1 in the responsible sourcing of construction products credit:
  - Bronze at “score level 4”
  - Silver at “score level 5” (same level as FSC-Mix wood),
  - Gold at “score level 6”
  - Platinum at “score level 7” (same level as FSC 100% wood)

DGNB, ÖGNI

- Official recognition of certificates in the responsible sourcing credit
  - Silver, Gold and Platinum at QL 1.2 (same as FSC-Mix wood)
  - R-module recognition at QL 2.2

Envision

- Official recognition in the US infrastructure certification system developed by the Institute for Sustainable Infrastructure (ISI)

LEED

Pilot credit

- Recognition in “Social equity within the supply chain” credit
- Ongoing dialogue with USGBC to achieve permanent recognition in “Responsible sourcing of raw materials” credit”

Thank you