

CONCRETE ZERO

Why is the Cement and Concrete Industry Taking a Leadership Role on Net Zero and Sustainability?

Adam Auer – Cement Association of Canada

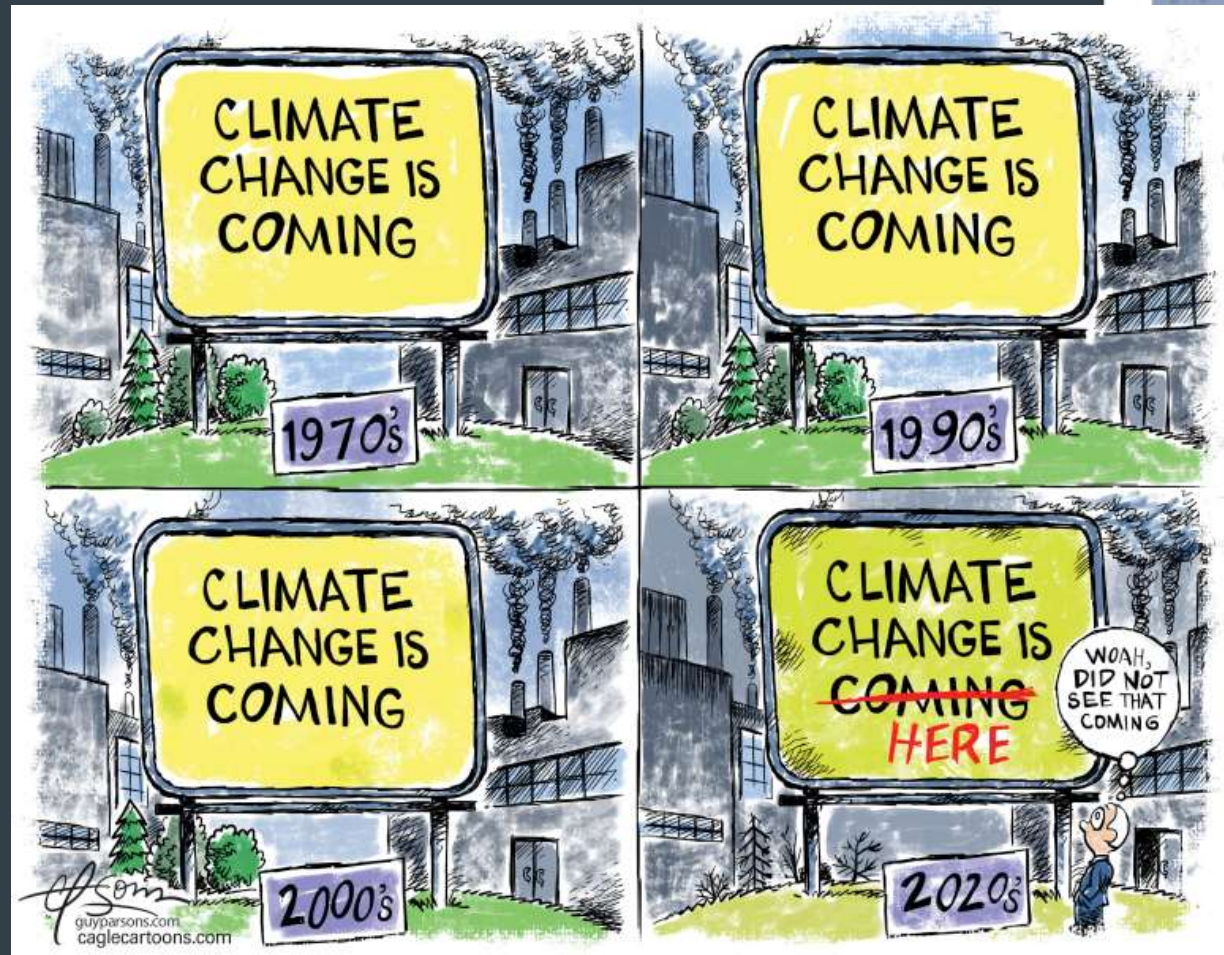


Key Items to be Addressed

- **Why do we care?**
- **What are we doing about it?**
 - **Action Plan**
 - **Practical progress**
- **What are the key challenges we are facing?**



Why do we care?



Climate change is here

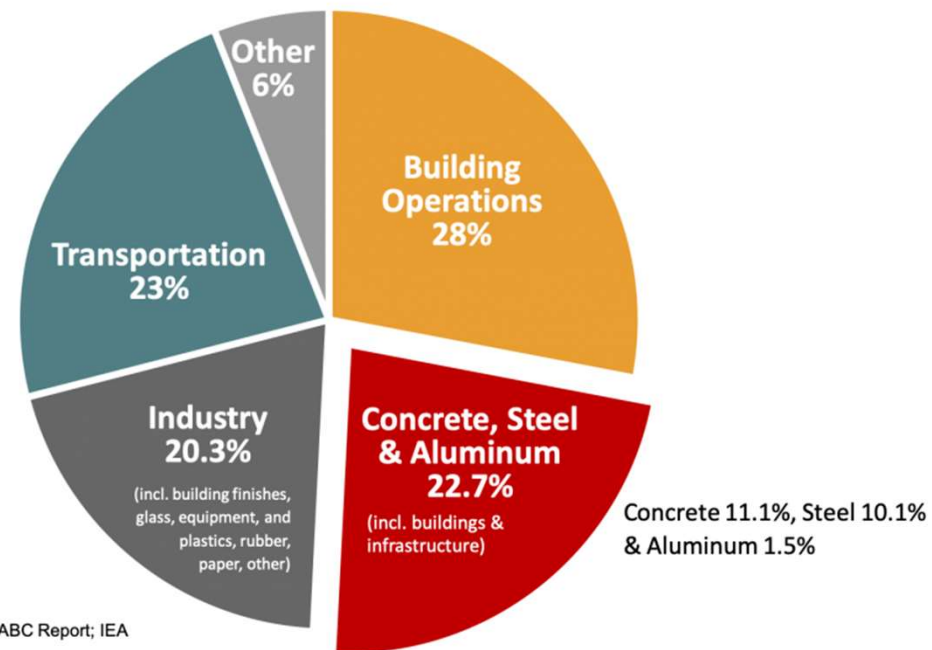
- Impacts are becoming more visible, more serious and more costly
- As the window for action closes, measures will become more draconian



We are a **BIG** part of the problem

- Concrete is the most used construction material in the world.
- Cement and Concrete are responsible for up to 11% of Global Emissions
- Construction of buildings and infrastructure account for 42% of global emissions

Global CO₂ Emissions by Sector



Source:
2018 Global ABC Report; IEA

Our competitiveness hangs in the balance

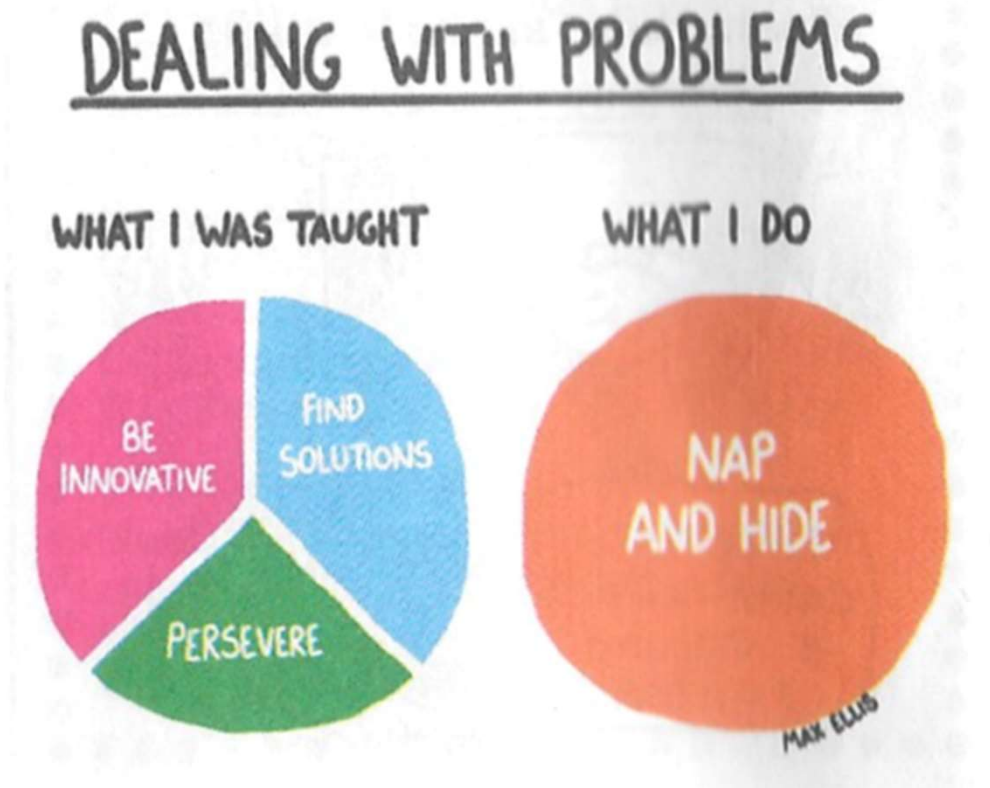
- There is a global move to address the climate crisis - if we don't define what net zero and sustainability mean to our sector, others will define it for us.
 - *Prescriptive regulatory interventions*
 - *Prescriptive owner, architect and engineering polices and specifications*
 - *Poorly considered support for unproven and at times marginal technologies*
 - *Loss of social license, loss of market share to competing materials*



Illustration by Alexandre Magnin - Sustainabilityillustrated.com

Leaning in offers business flexibility and opportunity

- There is no one-size-fits-all solution
- Major capital investments in cement and concrete decarbonation will be required
- Our climate leadership means:
 - *preserving business flexibility*
 - *focusing on performance not prescriptive solutions*
 - *maintaining competitiveness and attracting private and public investment*



We have solutions, so do our competitors

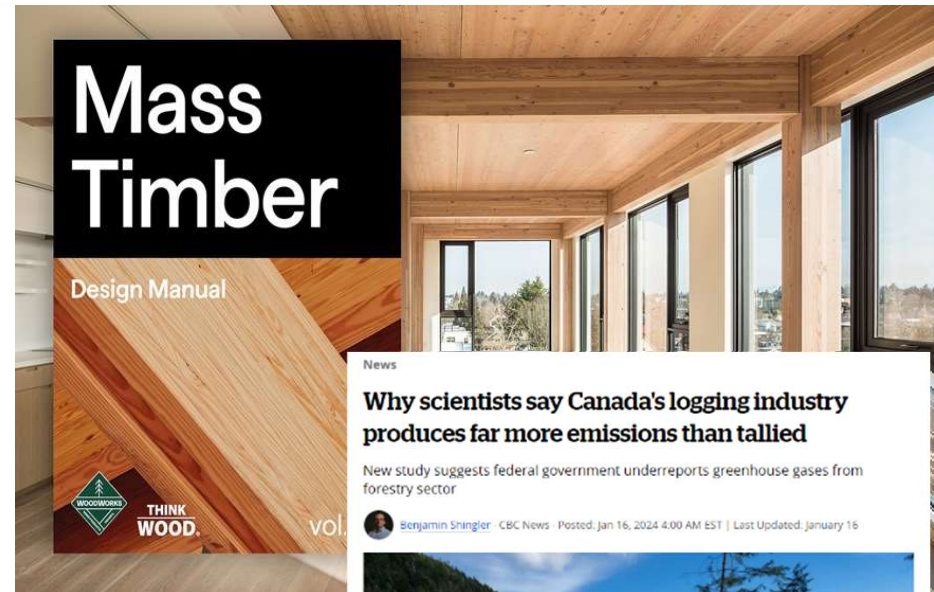


In competition with other materials, we are stronger together

- *We need an army of “boots on the ground” to showcase our role in addressing climate change*



Concrete provides durable, resilient, safe and sustainable solutions for buildings and infrastructure

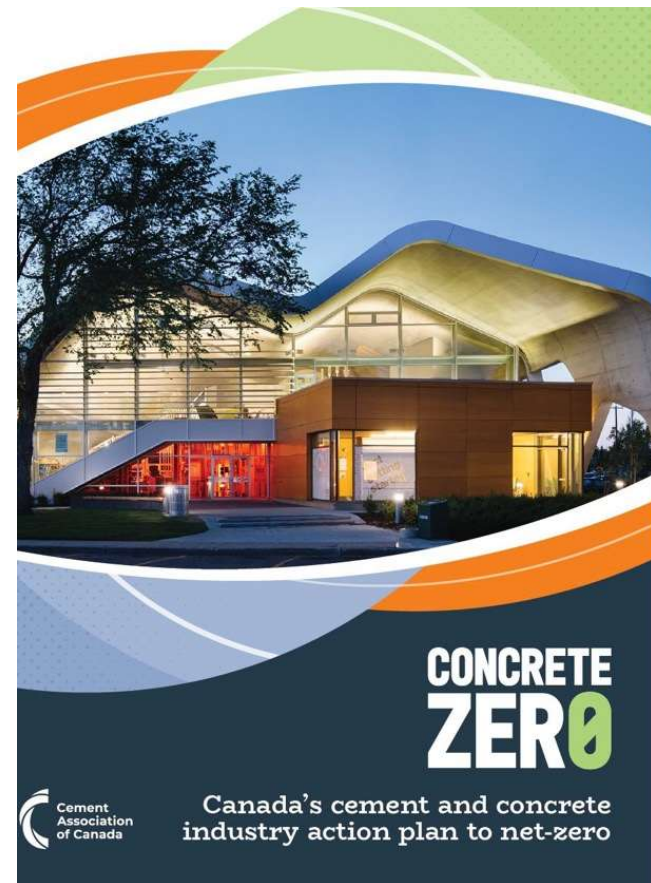


Fresh cut sawdust is seen from a tree cut from a cut block, an area of land authorized for harvest, in the Fairy Creek logging area near Port Renfrew, B.C., on Oct. 4, 2021. (Jonathan Hayward/The Canadian Press)

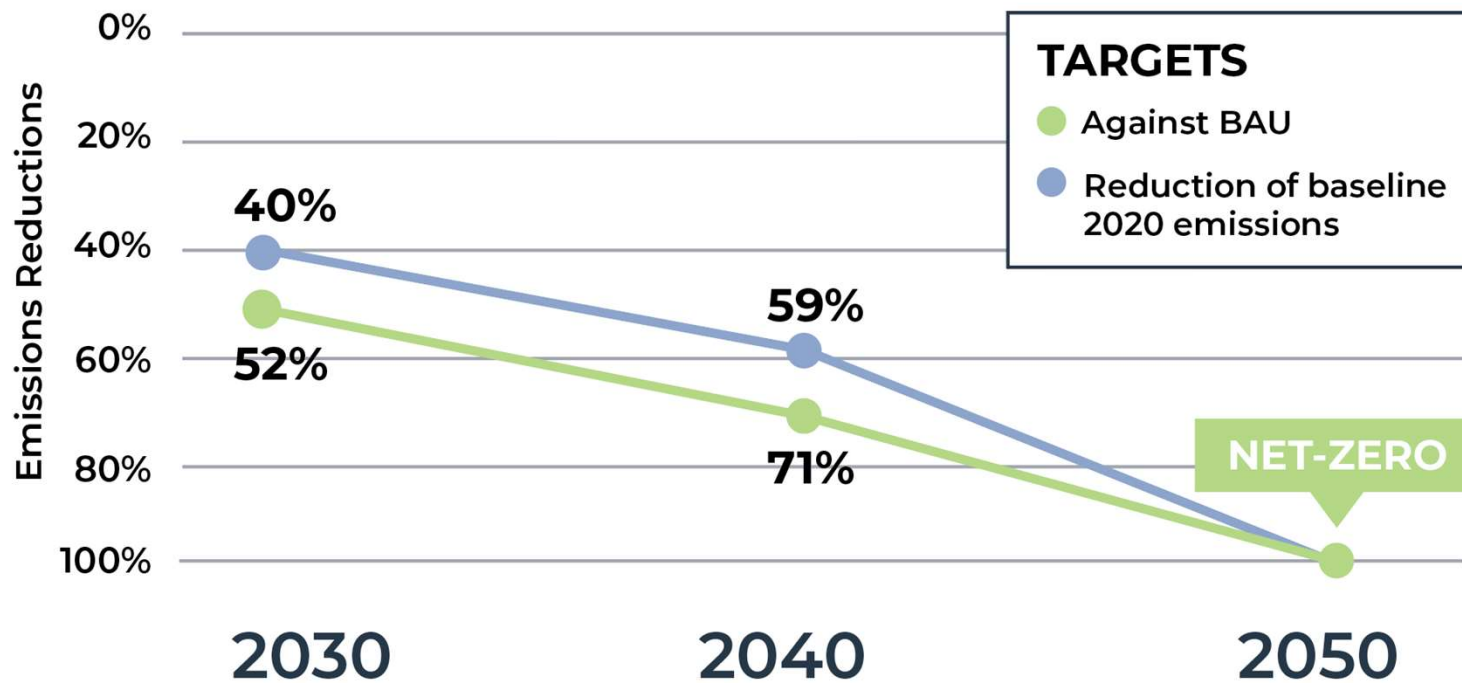
Time to Lead: What we're doing to support our industry

CONCRETE ZERO

Concrete Zero is a **call to action** to our partners in government and the construction sector to work with us to **support opportunities and remove barriers** to securing and improving the value of concrete and concrete products in **a changing environment and economy**.



Our Road to Net-Zero



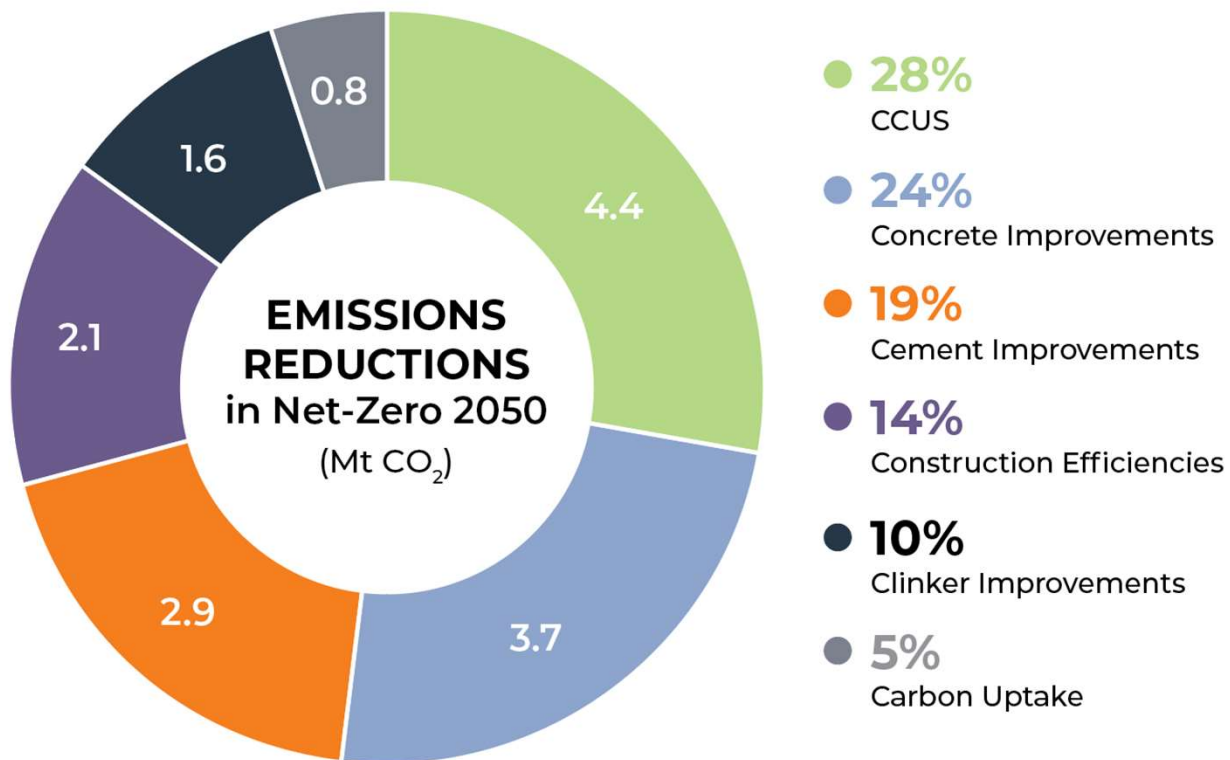
The 5 C's



- **Clinker:** The primary ingredient in cement
- **Cement:** A mineral binder
- **Concrete:** A critical construction material
- **Construction:** Designing and building
- **Carbon Uptake:** Concrete as a CO₂ sink

- The 6th C: **Carbon Capture, Utilization and Storage**

Our Road to Net-Zero

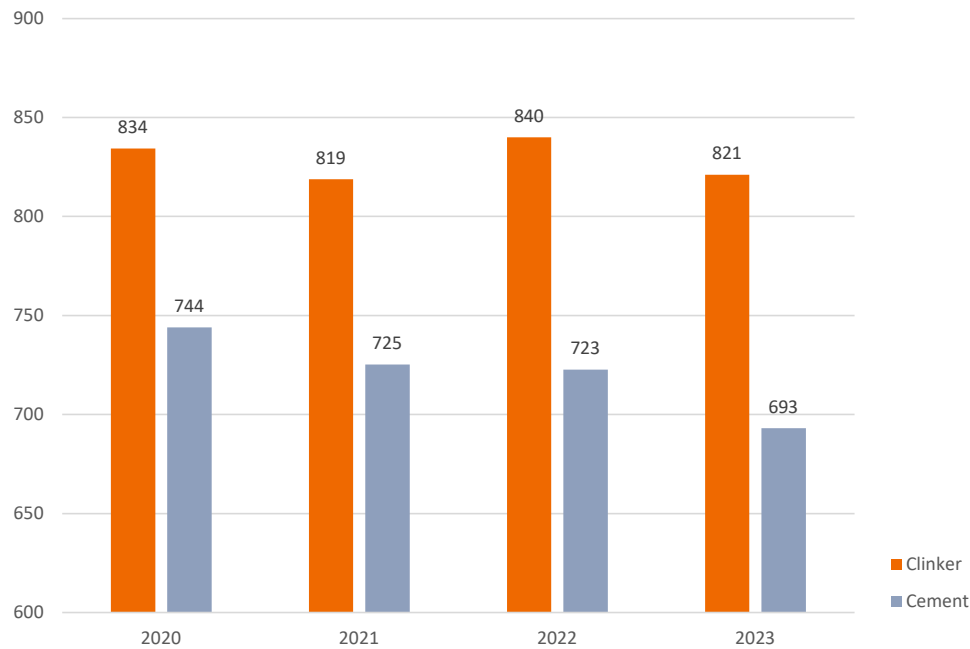


Concrete Zero Action Plan Update

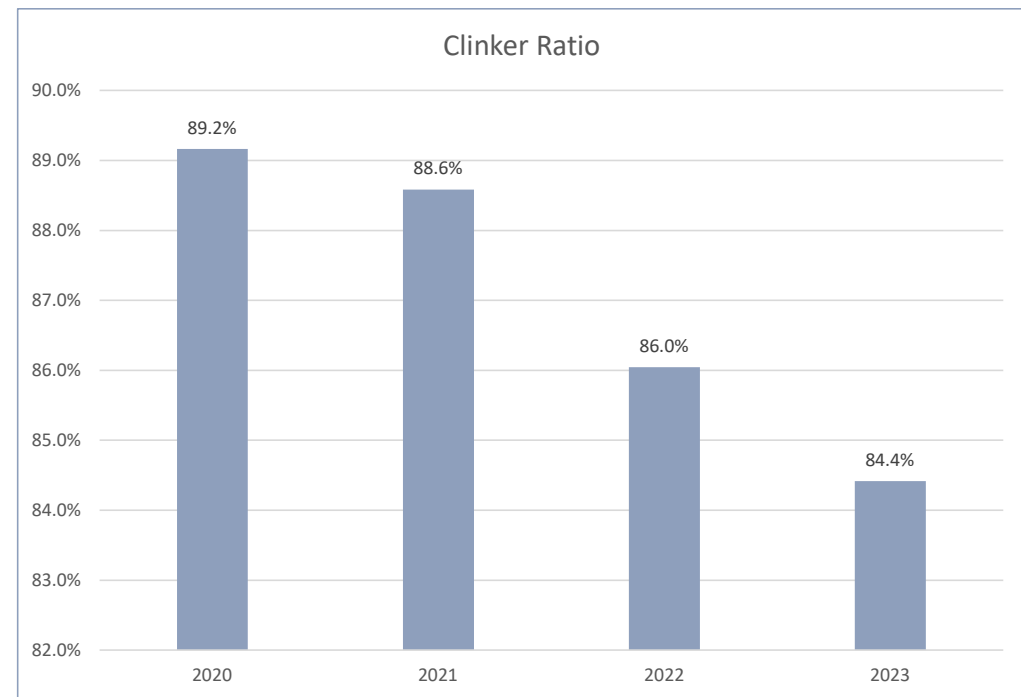


(Estimate based on updated data from 12/13 member facilities and excluding CQI & Federal White)

Carbon Intensity (CO₂/MT)



Clinker Ratio



In Practice: What we're doing to support our industry

CONCRETE ZERO

Key areas of action

- **Working with governments to shape industrial policy**
 - *Carbon pricing*
 - *Financial supports*
 - *Procurement Policy ...*
- **Carbon accounting, transparency and disclosure**
 - *EPDs*
 - *Modernization of PCRs*
 - *Fairness in reporting*
- **Education & Engagement**
 - *Internal: Equipping our industry with the tools and resources they need to talk about our net-zero ambition and solutions.*
 - *External: What is low carbon concrete? How do you specify it? Performance issues? Costs?*



Building Success: Implementing Effective Buy Clean Policies

March 2024
Prepared by: Clean Energy Canada

BUY CLEAN INDUSTRY ALLIANCE:



BLUEGREEN

Aluminum
Association
of Canada



GSPA ACPA

FPAC.ca
APFC.ca

EllisDon
We build on great ideas™



CONCRETE ZERO

Specifying Low Carbon Concrete



PRESCRIPTIVE

It is highly discouraged to specify any mix proportions, including material quantities (e.g., admixtures, aggregates, cementitious materials, and water), as the mix design becomes prescriptive, and the owner assumes full responsibility for the concrete performance.

Using prescriptive mix designs can not only negatively impact the performance of the concrete but can also very likely negatively impact the realization of carbon reduction goals on the project since the specifier will not be aware of the raw materials used by each individual concrete producer or plant.



PERFORMANCE

Performance-based specifications offer the specifier the ultimate peace of mind that the ready mixed producer is responsible for the performance of the concrete as delivered.

They also give the ready mixed producer flexibility in optimizing mix designs.

This flexibility becomes critically important when a ready mixed producer needs to use multiple CSA-approved approaches in designing mixes to meet a variety of requirements including strength, durability, constructability, and carbon/sustainability.

Performance-based specifications are critical to specifying low carbon concrete AND to achieving low carbon concrete.

Treasury Board of Canada – Low Carbon Concrete Standard



- Effective **December 31, 2022**, all federal projects budgeted at or above \$10 million, using a minimum 100 m³ of ready mixed concrete
- Disclosure of Type II or Type III EPDs
- **10% reduction from the total project GHG emissions** from ready mixed concrete, using the GWPs of the baseline mixes in the Regional Industry Average Environmental Product Declaration (EPD) for the strength class of each mix and the volume of mix placed



Treasury Board of
Canada Secretariat

CONCRETE ZERO

Treasury Board of Canada – Low Carbon Concrete Standard



- Where specialized concrete mixes are required for **high early strength, high or ultra-high performance, and/or cold-weather applications, the baseline used for those mixes shall be 130% of the baseline mix** in the Regional Industry Average EPD for that strength class



Treasury Board of
Canada Secretariat

National and Regional Industry Average EPDs for Cement and Concrete



- Reports developed by Athena and funded by the National Research Council Canada
- Third-party verification completed by ASTM
- Working with GCCA to develop a cost effective “On-Demand” Type II EPD Calculator for all Canadian Concrete producers
 - Allows producers to determine GWP for any mix design based on industry average data
- Options for Type III EPD verification

Environmental
Product
Declaration



Concrete BC Member Industry-Wide EPD for
READY-MIXED CONCRETE



CONCRETE ZERO

Helping the industry speak with one voice



Internal Education and engagement

- Why does this matter?
- What are our key messages and what resources do you need to deliver them?
- “ConcreteZero Certification” for technical and sales staff

Why is the cement and concrete industry taking a leadership position on net-zero and sustainability?



In the face of increasing impacts from climate change, governments and the public are focused on reducing carbon emissions. Cement manufacturing alone contributes 7%¹ of global emissions, with the construction of buildings and infrastructure responsible for some 42%². Cement, concrete and other building materials are targeted for regulatory and other interventions that collectively threaten our competitiveness, even as they offer opportunities for our sector to grow and thrive from decarbonization investments.

What have we done?

For decades, the cement and concrete industry has improved its value to society, augmenting the quality of our products by focusing on long-term durability, using high-quality local construction materials, and investing in sustainability.

Recently, we have brought this leadership into the spotlight with the development of a [first of its kind net-zero partnership with the federal government](#) as well as the release of [Concrete Zero: Canada's cement and concrete action plan to net-zero](#), an industry-leading action plan that offers an ambitious, transparent, and data-driven assessment for how our industry will help Canada achieve its net-zero carbon goals while continuing to benefit from concrete as a versatile, durable, cost-effective, resilient and essential construction material.

Why are we doing it?

Concrete Zero is a call to action to our government and construction sector partners to work with us to support opportunities and remove barriers to securing and improving the value of concrete and concrete products in a changing environment and economy.

This directly enables us to address three challenges:



1. If we don't define what net-zero and sustainability mean to our sector, others will define it for us.

Some governments, environmental and economic think tanks, and third-party technology companies are attempting to prescribe their vision and solutions for cement and concrete production. These efforts range from prescriptive regulatory interventions, prescriptive procurement policies and specifications, poorly considered support for unproven or marginal technologies, and efforts to promote other materials at the expense of a balanced approach to material performance considerations. While the market is increasingly looking for net-zero solutions, it lacks the detailed product knowledge needed to specify concrete under a performance specification model.

¹ [Global Cement and Concrete Association](#)

² [Architecture 2030](#)

Educating the market



A Guideline for Low Carbon Construction

- Highlights the levers that the Concrete Industry can pull to reduce carbon emissions
- Outlines how to utilize the Federal Treasury Board Approach to show carbon reductions
- Uses the Ontario Industry Average EPDs as the baseline values for all calculations



CONCRETE ZERO

Industry Market Perception Survey

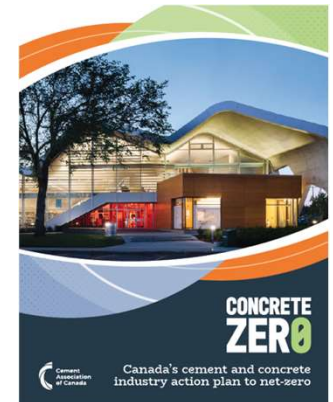


- Monitoring progress in changing perceptions of the industry among key audiences
 - Procurement managers (supply chain) (for public and private horizontal and vertical infrastructure projects)
 - Architects
 - Construction industry (Infrastructure contractors and large-scale developers)
 - Engineers working in the construction sector
 - Environmental Groups (ENGOS)
 - Sustainability experts / think tanks

Success in national policy alignment



- **Low Carbon Assets through Life Cycle Assessment (LCA)² Initiative**
- Greening Government Strategy: **Buy Clean** Low Carbon Construction
- **National Standard on Embodied Carbon** in Construction
- **Roadmap to Net-Zero Carbon Concrete** by 2050
- **Concrete Zero** Canada's cement and concrete industry action plan to net-zero
- **Canada Net-Zero Challenge**
- COP28: Canada assumes Chair of International **Cement and Concrete Breakthrough** Initiative

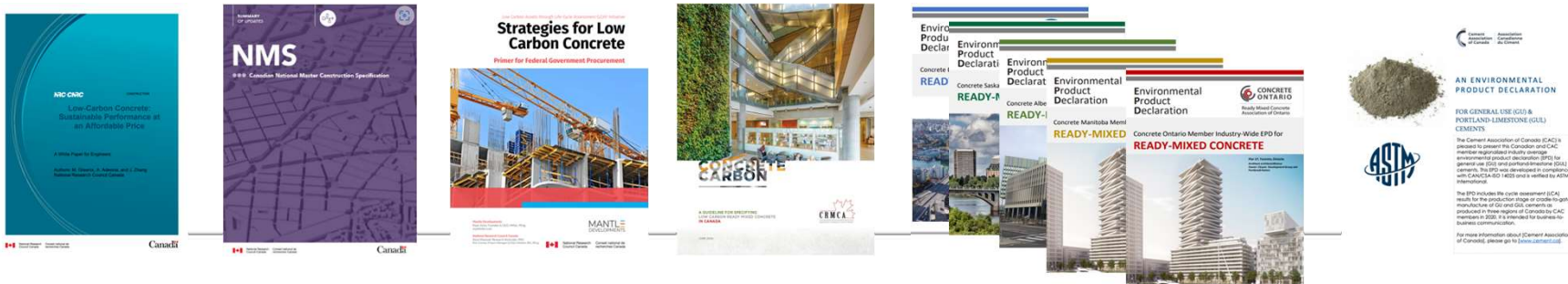


CONCRETE ZERO

National successes through funding (> \$1M)



- EPD development (\$350k) for cement ready mix, precast, and masonry
- Low carbon concrete primer for federal government (\$40k)
- Update to the National Master Specifications (NMS) to include low carbon concrete (\$40k)
- Carbon Accounting Taxonomy (\$60 - \$460k)
- ConcreteZero Certification program development (\$300k - TBC)
- R&D funding envelope (\$ TBC)



A structured, predictable, funded partnership to deliver Cement's agenda



Opportunity

- Build on our success at aligning with the Government of Canada
- Evolve away from *ad hoc* projects and funding
- Develop a structured sectoral program for cement and concrete, like ones that exist with forestry (e.g. FP Innovations).

NRC Platform to Support the Decarbonization of the Construction Sector at Scale

- \$180 million program with a 7-year timeline (2023/24) that has 3 focus areas that is focused on low carbon construction and regulatory solutions.
- Including a mandate to support the ISED Roadmap to Net-Zero Carbon Concrete by 2050

Cement & Concrete Innovation Program - Proposed Design



***Objective:** increase the acceptance and uptake on lower carbon cement / concrete, with the following Program Elements:*

- 1. A turnkey solution to low-carbon procurement** across Canada (private & public)
 - Model procurement policy template (based on existing TBS project-based carbon budgeting and targets)
 - Performance-based specification model template (hybrid between prescriptive and performance)
 - Implementation pathways / data & reporting (web-based submission and reporting system, i.e. EC3)
 - Design practices (design primers)
- 2. Demonstration pilot projects and case studies** that align and support the low carbon policy model.
- 3. Comprehensive “ConcreteZero Certification”** education and engagement platform that supports the dissemination of the above, the “How To”.
- 4. R&D funded and focused on innovation and adoption of low carbon cement and concrete**, aligned with the ISED roadmap and the Cement Breakthrough.

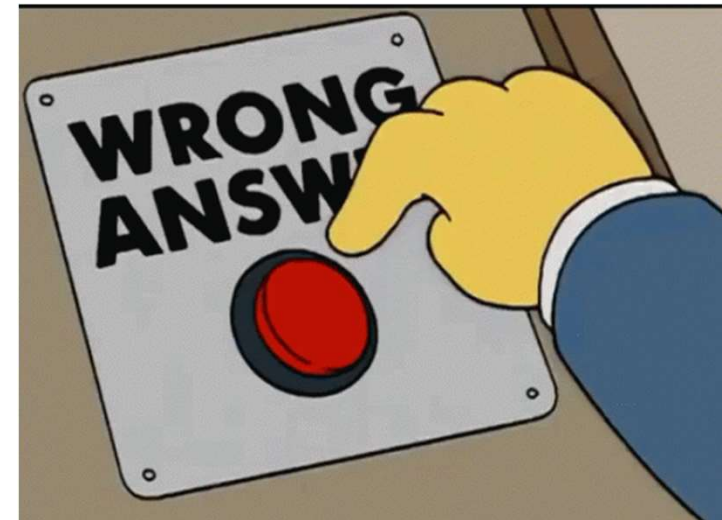
Challenges

CONCRETE ZERO



What answers are they coming up with?

- Eliminate all parking garages
- Eliminate all basements
- Move from 12 to 18 story wood construction
- Reduce concrete use by 30%
- Require a 50% GWP reduction on all structural concrete
- Just use **WOOD!**



What happening in the market now?

- Federal Treasury Board requirements being ignored
- LEED developing their own Low Carbon Construction Specifications
- City of Toronto implementing carbon limits based on floor area
- Prescriptive solutions be proposed everywhere



What can you do today?

- Be aware of the industry tools
- Be ready with answers on how you can reduce your carbon intensity
- Highlight projects where you have implemented significant carbon reductions
- Work through your Association to identify and help develop the materials and tools you need



What about Competing Materials



How do we Address the Wood Industry Sustainability Claims?

- Highlight the numerous concerns about under-reporting
- Ensure the discussion focuses on the full lifecycle of all construction products
- Remind people that there is more than one performance requirement

News

Why scientists say Canada's logging industry produces far more emissions than tallied

New study suggests federal government underreports greenhouse gases from forestry sector



Benjamin Shingler · CBC News · Posted: Jan 16, 2024 4:00 AM EST | Last Updated: January 16



Fresh cut sawdust is seen from a tree cut from a cut block, an area of land authorized for harvest, in the Fairy Creek logging area near Port Renfrew, B.C., on Oct. 4, 2021. (Jonathan Hayward/The Canadian Press)

CONCRETE ZERO

What about Competing Materials

Highlight the Many Performance Requirements

- Strength
- Sound transmission
- Fire Resistance
- Impacts of water infiltration
- Resiliency
- Insurance costs
- Carbon intensity



Summary

- **What are your thoughts on how we need to address this issue?**
- **What is your company currently doing?**
- **What successes have you seen?**
- **What would help you be more successful in managing a transition to Net Zero?**



CONCRETE ZERO

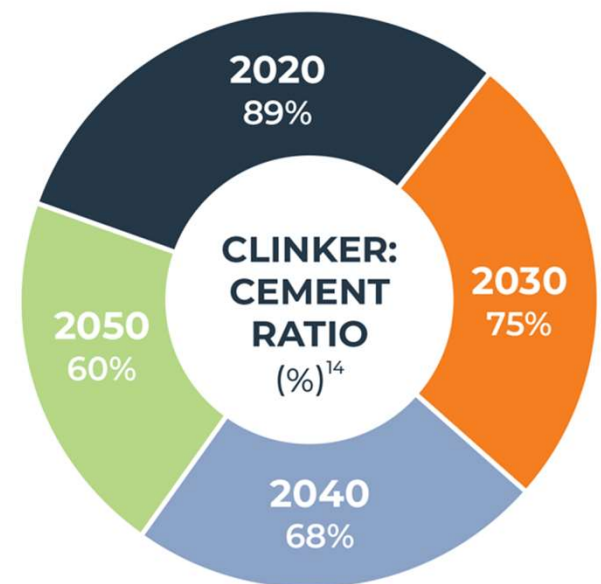
Canada's cement and concrete industry is committed to doing our part to help Canada build a better, cleaner future. **Working together, we can deliver concrete zero.**

Detailed Action Plan Slides

CONCRETE ZERO

Clinker

- The most GHG intensive component of cement
- Clinker is the key ingredient that gives cement its binding properties.
- **Main drivers of emissions reductions:** replacing fossil fuels, clinker substitution, and carbon capture (with utilization or storage)
- **Acknowledgements for:** thermal efficiency, decarbonated raw materials, and novel clinker chemistries



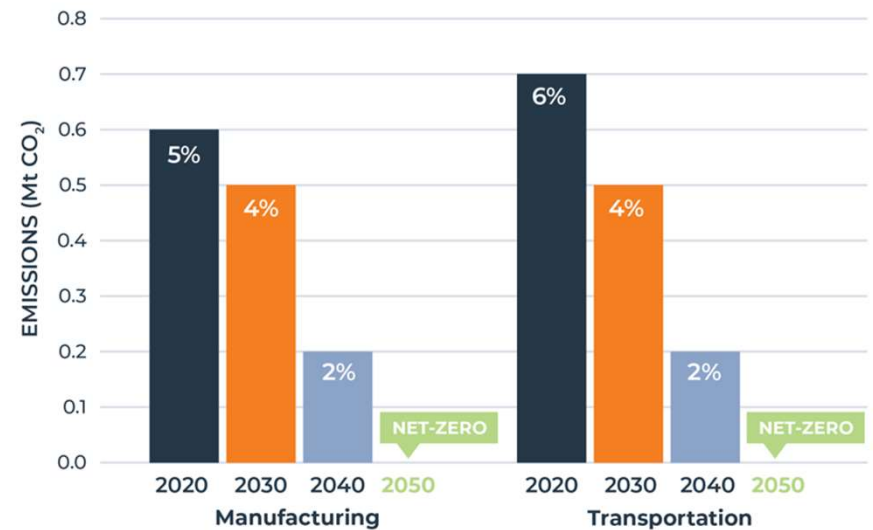
Cement

- The most energy-intensive phase of the concrete value chain occurs at the cement plant
- Main drivers of emissions reductions: new cement blends
 - Portland-limestone cement
 - Supplementary cementitious materials
 - Blended cements

2030	2040	2050
Blended Cements (% of market)		
25%	35%	50%
SCM in Blended Cement (%)		
20%	20%	20%
CO₂ Burden of SCMs (Mt CO ₂)		
0.09	0.1	0.2

Concrete

- As an essential building material, concrete must be produced to ensure quality and performance while reducing emissions.
- **Main drivers of emissions reductions:** concrete mix optimization (chemical admixtures, recycled concrete aggregate, etc.), optimized concrete design to ensure not over specifying strength and durability requirements, powering concrete with clean energy.



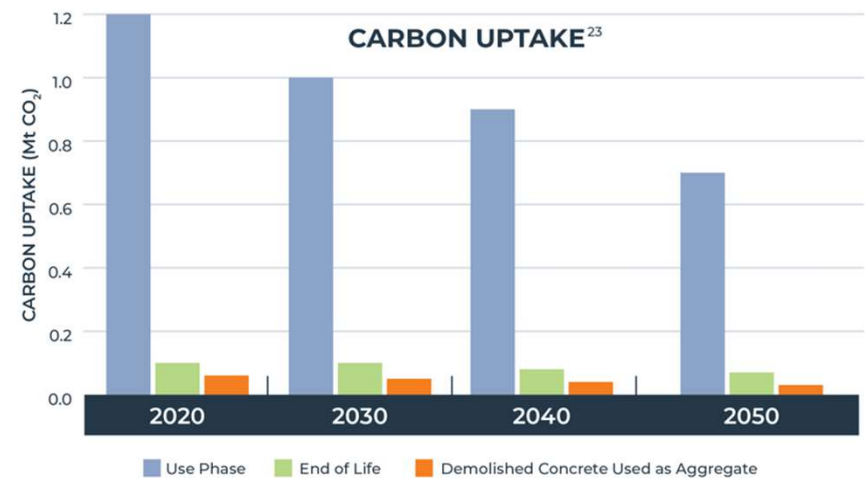
Construction

- There are opportunities to reduce emissions through design and construction.
- Emissions reductions in construction is outside of the direct control of the cement and concrete industry, so it requires partnership, as well as education and awareness with the construction industry.
- **Main drivers of emissions reductions:** optimization in design through material efficiency (i.e., voided slabs, column spacing, etc.), and waste reduction

	2030	2040	2050
Savings from Material Efficiency (millions m ³ of concrete)	3.6	5.9	7.9
CO₂ Reduced at the Construction Stage (in year concrete produced) (Mt CO ₂)	0.7	0.9	0.8

Carbon Uptake

- Concrete naturally sequesters CO₂ from the atmosphere, permanently capturing it
- Swiss research finds an average of 20% of the CO₂ process emissions can be permanently sequestered when a concrete structure has been built
- During the design phase of a project, a good strategy to maximize CO₂ uptake is for architects and engineers to ask to use exposed concrete wherever possible.



Carbon Capture, Utilization and Storage

- The scale-up of carbon capture, utilization and storage (CCUS) is vital to the cement and concrete industry reaching net-zero.
- Deploying CCUS technology at full scale during cement manufacturing could eliminate process and remaining combustion emissions almost entirely.
- Today, there is no other technology or process that can eliminate process emissions.

2030	2040	2050
Emissions Remaining for CCUS (Mt CO ₂)		
7.6	6.1	4.4
Emissions Reduced via planned or announced CCUS projects (Mt CO ₂)		
1.5	2.0	2.0