The Opportunity to Lead on Clean Concrete

Procurement and performance-based specifications to support the clean cement and concrete industry in British Columbia

December 2024

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PEMBINA Institute

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Executive summary

Concrete is the most widely used building material in the world, but also one of the most carbon intensive due to the cement used in its production. Portland cement, the main binder used in the production of concrete, can account for 80% of concrete's carbon footprint. The manufacturing of cement is an energy-intensive process, which contributes to approximately 7% of global greenhouse gas emissions.

The province of British Columbia has accepted the use of a lower-carbon cement, Portland-limestone cement (PLC), for most of its building and infrastructure projects. PLC can reduce emissions by about 10% from Portland cement, and still produces concrete of equivalent strength and durability. B.C. has been reluctant to use lower-carbon alternatives in government projects, but the province has an opportunity to be a leader in reducing carbon in construction projects through government leadership and sustained investment.

B.C. has recognized the importance of reducing embodied carbon and put in place strong targets for emissions reductions, but these cannot be achieved without the decarbonization of the cement sector. Actions such as modifying the existing codes and standards, and broader acceptance of recycled materials in concrete mixtures, will lead to buildings and infrastructure projects that have lower emissions than those built with traditional concrete.

To achieve its decarbonization goals, this report recommends that B.C.:

- adopt the Federal Standard on Embodied Carbon in Construction
- remove prescriptive specifications
- implement a Buy Clean policy
- sustain industry supports

1. Introduction

Concrete can be found in nearly every aspect of the built environment, from housing to roadways.[1] Its durability, versatility, and affordability have made it one of the most-used materials on the planet, second only to water.[2] It also happens to be one of the most carbon-intensive materials on the planet.[3] The cement needed to make concrete accounted for approximately 1.5% of Canada's overall greenhouse gas (GHG) emissions and 7% of global GHG emissions in 2019.[4] Getting our buildings and infrastructure to net-zero and meeting overarching climate targets will not be possible without the use of increasingly lower-carbon concrete in construction.

1.1 About cement and concrete

Cement, the binding agent for concrete, makes up 10 to 15% of the volume of the average concrete mix yet it is responsible for close to 80% of concrete's carbon emissions.[5] The carbon intensity of cement is due to the reaction that occurs when limestone is heated to make its primary ingredient, clinker, (Table 1). Approximately 40% of the carbon pollution emitted during clinker production comes from fossil fuel combustion to reach the required temperatures, while the remaining 60% comes directly from the chemical reactions within the kiln.[6]

The carbon emissions associated with concrete production are referred to as the embodied emissions of the concrete.

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[1] Cement Association of Canada and Innovation, Science and Economic Development Canada, *Roadmap to Net Zero Carbon Concrete by 2050* (2022), 1. https://ised-isde.canada.ca/site/clean-growth-hub/en/roadmap-net-zero-carbon-concrete-2050

[2] Global Cement and Concrete Association, "About Cement & Concrete." https://gccassociation.org/our-story-cement-and-concrete/

[3] Nature, "Concrete needs to lose its colossal carbon footprint", September 28, 2021. https://www.nature.com/articles/d41586-021-02612-5

[4] *Roadmap to Net Zero Carbon Concrete by 2050*, 1, 2

[5] *Roadmap to Net Zero Carbon Concrete by 2050*, 1.

[6] Veena Singla and Sasha Stashwick, "Cut Carbon and Toxic Pollution, Make Cement Clean and Green," Natural Resource Defense Council, January 18, 2022. https://www.nrdc.org/bio/veena-singla/cut-carbon-and-toxic-pollution-make-cement-clean-and-green

Table 1. Components of concrete

Component	How it is made	Role
Clinker	Limestone and other raw minerals are heated to over 1500 degrees Celsius and undergo a calcination reaction.[7]	Key binding material in cement
Cement	Finely ground clinker is mixed with other materials to meet specified performance needs of the concrete.	Makes up 10% to 15% of a concrete mixture by volume
Concrete	Cement is mixed with aggregate materials and hardens over time.	Construction

1.2 About this report

This report summarizes advances made by British Columbia's concrete sector and describes decarbonization supports provided by the province. It also proposes policy recommendations for the government to seize its opportunity to become a leader in clean cement.

This report is a companion piece to the Pembina Institute report Carbon-*f*ree Concrete, which outlines technical measures and policy levers to support the industry in the transition towards net zero.[8] Technical measures can include reducing the amount of clinker needed by replacing it with limestone, or reducing the amount of cement needed in concrete mixtures by adding supplementary materials such as fly ash and slag (byproducts of steel production, for example). Key levers governments can pull include providing funding for research and development into decarbonization technologies and stimulating demand for lower-carbon concrete products through Buy Clean policies and programs. The report also provided an overview of the actions taken to date by the governments of Canada, British Columbia, and Ontario, regions where the concrete sector has a strong economic impact and which have ongoing decarbonization initiatives.

[7] Cement Association of Canada, *Concrete Zero: Canada's cement and concrete industry action plan to net-zero* (2023), 16. https://cement.ca/wp-content/uploads/2023/05/ConcreteZero-Report-FINAL-reduced.pdf

[8] Rachel Sutton and Emily He, *Carbon-free Concrete: Building a net-zero foundation for Canada* (Pembina Institute, 2024). https://www.pembina.org/pub/carbon-free-concrete

2. Cement and concrete in British Columbia

British Columbia has targets to reduce GHG emissions by 60% by 2040 and 80% by 2050 from its 2007 baseline and taken significant action towards reaching these[9] but more work is needed, including in the cement sector. In 2021, cement production was responsible for 2% of B.C. carbon emissions.[10] Low-carbon concrete plays a role in both British Columbia's economy and its path to meeting its climate goals through sustainable jobs and reducing emissions from a highly carbon intensive product.

2.1 Economic importance

In British Columbia, $11 billion dollars of direct, indirect, and induced economic impact and 10,000 direct and indirect jobs are generated from the cement and concrete sector, annually.[11] In 2022, 8% of the province's GDP growth was related to the cement and concrete sector.[12]

There are two cement manufacturing plants in B.C., one operated by Lafarge Canada in Richmond and the second by Heidelberg Materials in Delta.[13] Concrete BC lists 81 ready-mix concrete producers as members, spread out across the Lower Mainland/Fraser Valley, Kootenays, northern British Columbia, Sunshine Coast/Whistler, and Vancouver Island. They also list a number of associates and affiliates along the value chain, including admixture companies, supplementary cementitious materials suppliers, construction material suppliers, concrete finishers, concrete pumpers, truck and equipment suppliers, and mobile mixers.[14]

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[9] Government of British Columbia, "Climate action and accountability." https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action

[10] Government of Canada, *2023 National Inventory Report* (2023), Part 3, Annex 12: Provincial and Territorial Greenhouse Gas Emission Tables by Canadian Economic Sector, 1990–2021, Table A12–11. https://publications.gc.ca/collections/collection_2023/eccc/En81-4-2021-3-eng.pdf

[11] Cement Association of Canada, "A vital contributor to Canada's economy." https://cement.ca/the-cement-and-concrete-industry/industry-overview/

[12] Ministry of Innovation, Science and Industry, "Summary – Canadian Industry Statistics", May 25, 2023. https://ised-isde.canada.ca/app/ixb/cis/summary-sommaire/3273

[13] Ken Carussca, "Contempra/ Portland Limestone Cement (PLC) and its use in Lower Carbon Intensity Concrete," presented at the Climate Change Symposium, 2017. Available at https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/symposium/2017/02_contempra_and_plc_ken_carussca.pdf

[14] Concrete BC, "Concrete Producers." https://concretebc.ca/our-members/#concreteproducers

With the growing demand for infrastructure projects, new homes, and retrofitting for buildings, there is a significant opportunity to increase the use of lower carbon concrete. On average, British Columbia is expected to see a 5% increase in manufacturing jobs, which includes cement and other advanced manufacturing.[15]Protecting and growing jobs related to lower carbon concrete will depend on how much of a financial risk carbon is deemed to be by companies and how rapidly the sector can decarbonize their operations.[16]

2.2 Lower-carbon concretes in B.C.

Portland-limestone cement (PLC), also known as general use limestone cement (GUL), is a newer type of concrete that promises lower embodied emissions. It uses limestone in place of a portion (6% to 15%) of the clinker that would be used in traditional Portland cement. This results in up to 10% lower emissions while maintaining structural equivalence.[17,18]

The Canadian Standards Association recognizes Portland-limestone cement as a suitable substitute for conventional Portland cement. The specifications for using PLC in manufacturing concrete are contained in CSA standard A23.1 Concrete Materials and Methods of Concrete Construction Standard.[19] PLC was integrated into the 2010 version of Canada's National Building Code and following B.C.'s adoption of this code, PLC became acceptable for use in B.C. projects.[20] Despite PLC's long track record — it has been used for over 25 years in Europe and since 2006 in the United States[21] — B.C.'s Ministry of Transportation and Infrastructure was only using Portland-limestone cement on a case-by-case basis until 2022. At that time, the Canadian Highway Bridge Design Code permitted use of PLC in all structures, except in prestressed concrete elements.[22]

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[15] Smart Prosperity Institute, PLACE Centre, and Future Skills Centre, *Ready for Green Jobs*, 19. https://placecentre.smartprosperity.ca/wp-content/uploads/2023/07/Ready-for-Green-Jobs-FSC-EN-edited.pdf

[16] Environment and Climate Change Canada. *A Healthy Environment and a Healthy Economy*, 35.

[17] British Columbia Ministry of Environment and Climate Change, *LEED v4 and Low Carbon Building Materials* (2017), 4. https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/resources/lcm-comprehensive-guide.pdf

[18] *Concrete Zero*, 22.

[19] The specifications for using PLC in manufacturing concrete are contained in CSA standard A23.1 Concrete Materials and Methods of Concrete Construction Standard. Cement Association of Canada, *Technical Introduction to Portland-limestone Cement for Municipal and Provincial Construction Specification* (2023). https://cement.ca/expertise_center/report/introduction-to-portland-limestone-cement-for-municipal-provincial-construction/

[20] World Cement, "Cement Association of Canada launches Contempra," https://www.worldcement.com/the-americas/07102011/cement_association_of_canada_launches_contempra/

[21] "ContempraTM / Portland Limestone Cement (PLC) and its use in Lower Carbon Intensity Concrete."

[22] ACEC British Columbia, "ACEC-BC Member Bulletin: Transportation Committee– GUL Cement," https://acec-bc.ca/2023/10/transportation-committee-gul-cement/

Lower-carbon concrete products that can achieve well beyond a 10% carbon reduction are currently available in British Columbia. Two examples include Lafarge's ECOPact and Heidelberg's EvoBuild. ECOPact is an engineered concrete with carbon emissions 30% to 90% lower than traditional Portland cement. The cement mix is tailored to project needs using innovative technologies and supplementary cementitious materials, and it meets Canadian Standards Association requirements.[23] EvoBuild can similarly be tailored to achieve a 30% to 85% lower carbon footprint than traditional concrete, by modifying the cement mix or using recycled materials.[24]

The emissions reductions of these concrete products can be easily verified using environmental product declarations (EPDs), which use a life cycle assessment to provide a standardized analysis of the environmental impact of a product or material. Examples of these are included in Appendix A. All cement producers now offer environmental product declarations to facilitate evaluation of the emissions reductions opportunity each product offers.

[23] Concrete Ontario Awards, "ECOPact Specialty Construction Applications." https://www.concreteawards.ca/wp-content/uploads/2021/09/ECOPact-Specialty-Construction-Applications.pdf

[24] Heidelberg Materials, "Sustainable Solutions with EVOBUILD." https://www.heidelbergmaterials.us/products/ready-mixed/evo-build-lcc

3. Codes, standards and specifications

3.1 Federal standards

The federal Standard on Embodied Carbon in Construction was introduced in 2022 to support the implementation of the Buy Clean objectives that are part of the federal government's Greening Government Strategy. The standard applies to projects that use over 100 cubic metres of ready-mix concrete and are valued at over $5 million. It requires that the embodied carbon from concrete used on the project to be reduced by 10% from the regional industry average baseline, and be reported on and verified by Type III EPDs.[25] [26] The standard is performance based, so how the 10% is achieved is up to the project team; they may choose to use a lower-carbon concrete or they may simply change the design so that less concrete is needed. A primer outlines eight strategies that can be used to lower the embodied carbon of concrete at low or no cost and can be applied to meet the standard; it also breaks down misconceptions about increased costs and risks that come with using lower-carbon concrete.[27]

Industry has supported the design and implementation of the standard, with groups such as the Cement Association of Canada and the Canadian Ready Mix Concrete Association participating in extensive consultations. Academia and the public also had the chance to consult on the development through a formal process. The standard's performance-based approach is considered best-in-class. Overall, this embodied carbon target is extremely well designed with a great deal of supporting resources, and it could be easily adopted by other levels of government including British Columbia.

3.2 Specifications

Historically used for regulating acceptable concrete products, **prescriptive** specifications stipulate the composition of a concrete mix such as a minimum cement content or a maximum

[25] Type III EPDs are standardized and third-party verified, which is critical to avoid misleading, incomparable, and comprehensive data about the emissions of a building material. Use of Type III EPDs ensures that the carbon intensity of materials such as cement is accurately report and overall embodied carbon can be determined.

[26] Government of Canada, "Standard on Embodied Carbon in Construction." https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=32742

[27] National Research Council, *Low-Carbon Concrete: Sustainable Performance at an Affordable Price* (2023). https://nrc-publications.canada.ca/eng/view/ft/?id=0e307bed-5034-4fe0-bc50-0aacd1722b5c

supplementary cementitious materials content.[28] They tend to stifle innovation; and can negatively impact sustainability, cost, and performance (Table 2). In contrast, allowing for design based on **performance** factors such as strength, durability, and serviceability invites use of a wider range of lower-carbon products. These products are tested just as rigorously to ensure they meet specified objectives.[29]

In 2022, British Columbia's Ministry of Transportation moved from prescriptive specifications to performance-based specifications for concrete highway barriers. This allowed barriers to be made with a variety of cement mixtures, including ones that had a greater amount of supplementary cementitious materials, such as slag, that would not only reduce the product's embodied carbon but would also enhance strength.[30] For example, Surespan, a civil construction and infrastructure company in B.C., was able to increase the amount of slag used in their concrete highway barriers, resulting in a reduction of 46 kg of carbon emissions per barrier, or 138,000 kg of carbon emissions per year.

The B.C. Ministry of Transportation and Infrastructure's Standard Specifications for Highway Construction still contain prescriptive requirements for concrete. Section 211.04.02: Portland Cement Concrete limits the amount of fly ash that can be included in cement mixtures, while Section 582: Concrete Curb and Gutter and Storm Drainage and Section 942 Precast Concrete Interlocking Modular Blocks both specify a minimum amount of cement to be used.[31] These would benefit from being revised to performance-based standards.

[28] Carbon Cure, "Concrete Expert Dr. Michael Thomas Makes the Case for Performance-Based Specs," September 24, 2020. https://www.carboncure.com/concrete-corner/concrete-expert-dr-michael-thomas-makes-the-case-for-performance-based-specs/

[29] Canadian Cement Association, "Performance-based specifications." https://cement.ca/expertise_center/cement-and-concrete-materials/performance-based-specifications/

[30] Concrete BC, "Get Lower Carbon Concrete with Performance Specifications," video, May 11, 2023. https://www.youtube.com/watch?v=ib6PPYTIFvs

[31] Government of British Columbia, *2024 Standard Specifications for Highway Construction,* 147. https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/highway-specifications/2024_dbss_volume_1.pdf

Table 2. Impact of prescriptive specification on sustainability, performance and cost

Specification	Impact		
	Sustainability	Performance	Cost
Restrictions on type and source of cement	🔴	🟢 / 🔴	🔴
Specifying higher strength than required for design performance	🔴	🟡	🔴
Restrictions on quantity of supplementary cementitious materials	🔴	🔴	🔴
Not permitting recycled aggregates and materials	🔴	🟢 / 🔴	🟢 / 🔴
Same class of concrete for all members in a structure	🔴	🟡	🔴

Legend: 🟢 Positive impact; 🔴 Negative impact; 🟡 Neutral impact

Data source: Concrete BC[32]

The City of Vancouver is already on the path to requiring low-carbon materials in construction. In the first phase of implementation, the city's performance-based building code requires embodied carbon reporting for large, complex (i.e., building code Part 3) buildings; they also provide a set of guidelines and a design report template.[33] Vancouver is not alone in its confidence in the structural performance of low-carbon concrete in regions where resilience to major seismic events is top of mind. In 2020, Marin County, California, introduced the Low-Carbon Concrete Code with performance standards aimed at reducing carbon embodied within buildings and infrastructure.[34]

[32] Concrete BC, "Specifying Sustainable Concrete." https://concretebc.ca/sustainable-construction/#single/0

[33] City of Vancouver, *Zero Emissions Buildings*. https://vancouver.ca/green-vancouver/zero-emissions-buildings.aspx#embodied-carbon

[34] Building Green, "Marin County First to Adopt Low-Carbon Concrete Code," January 7, 2020. https://www.buildinggreen.com/newsbrief/marin-county-first-adopt-low-carbon-concrete-code

4. Recycled materials

Reducing waste and recycling concrete products are key ways to reduce embodied carbon emissions, by reducing the overall need for new materials. For example, wet concrete mix leftovers can be reclaimed by separating aggregate (the solids) from the slurry water (which includes cement and additives). The slurry water is then reused in preparing ready-mix concrete while the aggregate can be used in future concrete production.[35] Cured (solid) concrete can be recovered, such as during demolition, and crushed into gravel and powder for re-use.[36]

Despite growing support for reusing material and reducing waste (a "circular economy"), recycled concrete aggregates are still not commonly used. There are often concerns about quality control and performance, but these concerns are misinformed. Concrete can be made just as durable when up to 35% of the mix includes recycled concrete aggregates. In some cases, supplementary cementitious materials, such as fly ash, are added to help boost strength performance.[37] Although British Columbia permits the use of recycled aggregates, the Ministry of Transportation and Infrastructure has preferred cement and concrete products containing only raw materials.[38] This specification strains supply chains, and in places such as the Lower Mainland, where demand commonly outpaces supply, materials must frequently be imported.

To support the use of recycled aggregates and encourage more sustainable use of natural resources, countries such as the United Kingdom tax extracted aggregates (rock, sand, and gravel).[39] The U.K. also has a landfill tax to help divert waste and encourage recycling. Together, these policies are credited with reducing the use of raw aggregates in construction by approximately 40% between 2000 and 2014.[40] Tax policies that encourage recycling also help make the business case for recycled aggregates and drive uptake.

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[35] Concrete BC, "Recycled Concrete," video, March 14, 2023. https://www.youtube.com/watch?v=DetrjThj4M4

[36] Specify Concrete, "Using Recycled Concrete Aggregate," February 28, 2019. https://www.specifyconcrete.org/blog/using-recycled-concrete-aggregate

[37] "Using Recycled Concrete Aggregate."

[38] Metro Vancouver, *Increasing Recycled Material Use: Exploring the Economic Benefits of using more Recycled Concrete Aggregate and Recycled Asphalt Pavement in Construction and Rehabilitation Projects in MetroVancouver* (2015), 3. https://open.library.ubc.ca/media/stream/pdf/52966/1.0103555/2

[39] Xeinadin, "Navigating the Aggregates Levy: What You Need to Know". https://xeinadin.com/services/environmental-taxes/aggregates-levy

[40] Institute for European Environmental Policy, *Aggregates Levy in the United Kingdom* (2022), 3. https://ieep.eu/wp-content/uploads/2022/12/UK-Aggregates-Levy-final.pdf

5. Procurement

Government procurement plans that do not include targets for embodied carbon or emissions reductions are a key barrier to widespread use of lower-carbon concrete products.[41] Governments purchase 50% of building materials used across the country[42] and the government of British Columbia buys 22% of the cement and concrete used within the province.[43] Governments have valuable opportunities to leverage their spending and drive market growth by integrating embodied carbon targets into procurement plans and bid requirements for major infrastructure projects.

5.1 Procurement guidelines

In 2018, B.C. released its first procurement strategy. It included social purchasing guidelines for procurement under $75,000 and guidelines for environmentally responsible procurement. B.C. followed up in 2024 with a new procurement plan that builds on these guidelines and showcases the critical role government can play by leveraging their purchasing power to achieve environmental, social, and governance objectives.[44] Departments are encouraged to opt for goods and services that make a positive environmental and social impact through waste reduction and energy efficiency, but no hard targets are in place.[45] These steps are aligned with actions being taken by other west coast jurisdictions. Washington State, for example, adopted a Buy Clean program in early 2024. It requires reporting and tracking carbon content of wood, steel and concrete built into state-owned buildings and identification of opportunities to reduce embodied emissions.[46]

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[41] Adam Auer and Sarah Petrevan, "Delivering decarbonization with demand-side initiatives", *Cement Association of Canada,* October 2022. https://cement.ca/delivering-decarbonisation-with-demand-side-initiatives/

[42] Steve Morrissey, "The Canadian Cement and Concrete Industry: Accelerating the Circular and Low Carbon Economy." https://institute.smartprosperity.ca/sites/default/files/steve-morrisey.pdf

[43] Clean Energy Canada, *Money Talks* (2022), 18. https://cleanenergycanada.org/wp-content/uploads/2022/10/CEC-MoneyTalks-Final-Web.pdf

[44] British Columbia Ministry of Citizens' Service, *British Columbia Procurement Plan 2024*, (2024), 11. https://www2.gov.bc.ca/assets/gov/bc-procurement-resources/bc_procurement_plan_feb2024_low_res_final.pdf

[45] British Columbia Ministry of Procurement, *Guidelines for environmentally responsible procurement* (2024). https://www2.gov.bc.ca/gov/content/bc-procurement-resources/policy-and-strategies/government-policy-and-guidelines-do-not-alter-content/guidelines-for-environmentally-responsible-procurement

[46] Washington State Office of Financial Management, "Buy Clean and Buy Fair", August 31, 2023. https://app.leg.wa.gov/billsummary?BillNumber=1282&Initiative=false&Year=2023

5.2 Major infrastructure projects

Most procurement for the Government of B.C. is overseen by the Ministry of Citizens' Service. However, major infrastructure projects are largely managed by the Ministry of Transportation and Infrastructure (MTI). Neither ministry has embodied carbon reduction targets or requirements to use lower-carbon materials. Furthermore, when manufacturers propose using lower-carbon cement and concrete in provincial infrastructure projects, MTI is reluctant to consider this, especially for structural elements. Paradoxically, MTI cites lack of previous use on government projects as the reason. Lynn Connectivity Project is an example where lower-carbon concrete is being used for lower risk phases of the project but not for the main structural elements.

6. Other provincial actions

6.1 Carbon pricing

As one of the first provinces in Canada to implement a carbon pricing system, B.C. has been a leader in helping heavy emitting industries to decarbonize.[47] In 2024, the province began a shift to an output-based pricing system (OBPS). Facilities that emit over 10,000 tonnes of carbon emissions per year must participate in OBPS. Companies pay a price on any carbon they emit above the acceptable threshold set for that facility.

The OBPS uses reduction factors to exempt some process emissions that are extremely hard to abate, either because the technology is not commercially available or because it is too costly for industry to adopt at scale. A reduction factor of 90% is applied to B.C. cement production, meaning the emission limit is calculated for 90% of the annual production emission total.[48]

Revenue from pricing carbon is reinvested in decarbonization actions through the Climate Action Tax Credit and the CleanBC Industry Fund. Together, the OBPS and the reinvestment of its funds into industrial decarbonization incentivizes industry to lower emissions while also providing financial supports for innovation in carbon reduction.

Cement manufacturers are decarbonizing operations with funding from the CleanBC Industry Fund.[49] For example, Lafarge Canada received an additional $7 million in 2024, which has allowed them to increase the co-processing of alternative fuels, decrease the amount of fossil fuels used at their Richmond plant, and develop carbon utilization technology.[50]

6.2 Guides and standards around embodied carbon

In 2017, B.C. published the *Low-Carbon Building Materials Guide*, which outlines building material carbon content, including for Portland-limestone cement and supplementary

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[47] Government of British Columbia, *Consultation Backgrounder – Carbon Pricing*, 2. https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/legislation/carbon-pricing-bg.pdf

[48] Government of British Columbia, *Getting Started with the B.C. Output-Based Pricing System* (2024), 9. https://www2.gov.bc.ca/assets/gov/environment/climate-change/ind/obps/guidance/bc_obps_guidance.pdf

[49] Government of British Columbia, "B.C. invests in innovative technology in cement industry" media release, May 15, 2023. https://news.gov.bc.ca/releases/2023PREM0027-000735

[50] Government of British Columbia, "B.C. supports innovation for a cleaner industrial future," media release, June 11, 2024. https://news.gov.bc.ca/releases/2024ENV0026-000901

cementitious materials.[51] The guide explains how the use of lower-carbon building materials can earn credits toward LEED certification, which has been the favoured certification system for sustainable buildings across North America for the past 20 years.[52]

In the fall of 2021, B.C. released the CleanBC Roadmap to 2030, which outlines plans to lower emissions contributing to climate change. A key part of this plan is finding ways to reduce the carbon footprints associated with buildings and infrastructure, including carbon embodied in building materials such as concrete. CleanBC committed to developing a Low Carbon Building Materials Strategy by 2023, which would facilitate implementation of embodied carbon reduction targets. It would also ideally include milestone targets for the province to evaluate progress on its goals. As of the writing of this report, such a strategy had not been published.[53]

[51] Government of British Columbia, *Low-Carbon Building Materials Guide* (2017). https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/resources/lcm-public-sector-guide.pdf

[52] British Columbia Ministry of Environment and Climate Change, LEED v4 and Low Carbon Building Materials (2017). https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/resources/lcm-comprehensive-guide.pdf

[53] Government of British Columbia, *CleanBC Roadmap to 2030* (2021), 43. https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf

7. Recommendations

Our research has shown that durable policies and programs are needed over the long term to provide the industry with the confidence to invest in clean cement and concrete. B.C. needs to:

- **Adopt the Federal Standard on Embodied Carbon in Construction**: Harmonizing regulatory frameworks with Canadian jurisdictions provides the consistency and transparency needed to create predictable market conditions and product demand. Members from the Ministry of Transportation and Infrastructure, the Ministry of Environment and Climate Change Strategy, and the Ministry of Energy, Mines, and Low Carbon Innovation should participate in the Federal Buyers for Climate Action group to ensure harmonized targets can be implemented.
- **Remove prescriptive specifications**: Removing prescriptive specifications that require a minimum cement content or put a cap on the amount of supplementary cementitious materials that can be used will allow for broader use of lower-carbon concretes. This helps build sector capacity as designers, engineers, manufacturers, and all involved learn from the experience and projects can become a guide for others.
- **Implement a Buy Clean policy**: A Buy Clean policy would send a strong signal to producers within the province that there will be demand for clean cement from a major purchaser. Use it to set targets and assign accountability for monitoring and advancing progress.
- **Sustain industry supports**: Leverage the cement and concrete industry commitment to decarbonization with financial resources to support research and development, capital upgrades, capacity building, and product awareness among decision makers. To achieve the full benefit of investment in innovation, governments must also support the commercialization of lower carbon concrete products.

Appendix A. Environmental product declarations

Concrete BC

- *Concrete BC Member Industry-Wide EPD for Ready-Mixed Concrete*
  https://concretebc.ca/wp-content/uploads/2022/10/810.CRMCA_EPD_BC.pdf

The Canadian Precast/Prestressed Concrete Institute
https://www.cpci.ca/en/sustainability/enviromental_product_declarations

- *A Regionalized Industry Average EPD for Architectural Precast Panel Concrete*
- *A Regionalized Industry Average EPD for Insulated Precast Panel Concrete*
- *A Regionalized Industry Average EPD for Structural Precast Concrete*
- *A Regionalized Industry Average EPD for Below Grade Precast Concrete*

Canadian Concrete Pipe & Precast Association
https://ccppa.ca/environmental-product-declaration/

- *A Regionalized Industry Average EPD for Concrete Pipe*
- *A Regionalized Industry Average EPD for Concrete Manholes and Catch Basins*
- *A Regionalized Industry Average EPD for Precast Box Structures*

Canadian Concrete Masonry Producers Association

- Canadian Masonry Concrete Block Environmental Product Declaration
  https://ccmpa.ca/resources-publications/environmental-product-declaration/

Appendix B. Low-carbon concrete resources

Canadian Ready-Mix Concrete Association, *Concrete Carbon: A Guideline for Specifying Low Carbon Ready Mixed Concrete in Canada* (2024). https://concretebc.ca/wp-content/uploads/2024/06/Concrete-Carbon-National-Guide_June-2024_with-BC-case-study-addition.pdf

- Provides a guideline for designers and specifiers to support carbon reductions for Canadian projects, which includes regional case studies, including in British Columbia.

National Research Council, *Low-Carbon Concrete: Sustainable Performance at an Affordable Price* (2023). https://nrc-publications.canada.ca/eng/view/ft/?id=0e307bed-5034-4fe0-bc50-0aacd1722b5c

- Provides information on general approaches that have been well-known or widely used in lowering the cost and embodied carbon of concrete materials without compromising performance or safety. It addresses common perceived risks of using low-carbon concrete and discussed how current standards support low-carbon concrete materials in construction projects.

ZGF Architects, Fast+Epp, EllisDon and Lafarge, *Concrete: A Pragmatic Approach to Lowering Embodied Carbon* (2023). https://www.zgf.com/ideas/5474-download-low-carbon-concrete-guidelines

- Provides pragmatic options at key project decision points to support low-embodied carbon concrete solutions and an interactive tool designed to support identification of low-embodied carbon concrete through building project phases based on a typical concrete building project delivery in the Lower Mainland of British Columbia.

Cement Association of Canada, *Technical Introduction to Portland-Limestone Cement for Municipal and Provincial Construction Specifications* (2023). https://cement.ca/expertise_center/report/introduction-to-portland-limestone-cement-for-municipal-provincial-construction/

- Assists agencies in their due diligence assessment for product adoption in local specifications. This report provides an overview of the performance of Portland-limestone cement-based concretes compared with traditional Portland cement concretes (i.e., strength, workability, sulphate resistance, etc.), including information on its use across North America, complete with project examples.

Photo: iStock.com/benedek

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