Reducing Embodied Carbon in Canada's Buildings

Results of the inaugural National Embodied Carbon Summit on identifying gaps, addressing barriers, and charting a path forward

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About this white paper

The inaugural National Embodied Carbon Summit, hosted by the Canada Green Building Council (CAGBC), was held on June 4, 2024. The Summit brought together a diverse group of over 60 professionals committed to advancing sustainable building practices through embodied carbon reductions.

Summit participants engaged in insightful discussions around embodied carbon reductions, identifying the highest-priority gaps and barriers, proposing solutions, and outlining the next steps for continued collaboration. Prior to the Summit, participants filled out a survey to help organizers better understand the current national landscape for embodied carbon and capture useful insights and references.

This white paper provides a summary of the Summit discussions and deliberations. The Summit Planning Committee hopes it will be a key step in advancing a national conversation on embodied carbon reductions in the built environment.

Summit Participants

CAGBC thanks all participants for freely sharing their knowledge and ideas. This report captures the concepts that received the greatest support; however, not every participant formally endorsed each individual statement or solution offered.

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Participants in the National Embodied Carbon Summit, 2024.

Executive Summary

Charting a path forward

There is a growing awareness that to achieve Canada's climate goals, industry must address embodied carbon in buildings. While there has been a surge of information and action on embodied carbon, greater collaboration is needed to connect separate initiatives and more effectively and identify and address barriers. Acknowledging these issues, a group of leaders pressed for a Canada-wide, cross-industry conversation. The inaugural National Summit on Embodied Carbon took place on June 4, 2024, in conjunction with the Canada Green Building Council's (CAGBC) Building Lasting Change™ conference.

The goals of the Summit were to establish a national embodied carbon conversation to develop a common understanding of current gaps and barriers, establish next steps to resolve barriers, and outline how the conversation can continue. The Summit brought together representatives from leading architectural firms, engineering companies, construction management firms, sustainability consultants, and building material industry associations, as well as governments, agencies, non-governmental organizations (NGOs), and academic institutions.

The sixty invited participants identified over 600 gaps and barriers. These findings were consolidated and prioritized, and corresponding solutions were developed. The work has been further honed and organized for this report, to provide guidance to the industry as it moves forward together to accelerate embodied carbon reductions.

The building sector continues to evolve rapidly. Since the Summit, progress has been made to address some identified barriers. Most notably, the National Research Council Canada released detailed guidance for whole building life cycle assessment (wbLCA), and the Embodied Carbon Harmonization and Optimization (ECHO) Project released recommendations and guidance for metrics and reporting.

Accelerating reductions in embodied carbon will require ongoing, coordinated efforts across all industry stakeholder groups. CAGBC will continue to support efforts to reduce embodied carbon by convening stakeholders and supporting industry initiatives. CAGBC will provide outreach, develop training, and align LEED® and Zero Carbon Building Standards™ requirements, guidance and tools with industry norms, as well as share data and insights gained from certified projects.

Summary of findings

Gaps / Barriers	Solutions
Framework for whole building life cycle assessment (wbLCA)	
Lack of a harmonized wbLCA framework	Develop and adopt a standardized and harmonized wbLCA framework, including metrics, methodologies, definitions, and reporting templates
Tools and Data	
No 'approved' national database of Life Cycle Inventory (LCI) data and Environmental Performance Declarations (EPDs)	Develop a national database of LCI data and EPDs
Need for consistent and harmonized wbLCA tools	Align tools with national wbLCA Framework
Need for a national wbLCA results database	Create a national wbLCA results database
Lack of clear and uniform product category rules (PCRs)	Establish clear and uniform requirements for product category rules (PCRs)
Need for wbLCA parametric analysis tools and the data to support them	Develop, expand and refine wbLCA parametric analysis tools with enhanced data
Over reliance on tools and profession-based silos	Adopt a systems-oriented approach including integrated design and circular economy principles
Lack of standard approaches and templates for building specifications to address lower embodied carbon materials	Update National Master Specification with low-carbon requirements
Awareness, Training and Education	
Lack of awareness and understanding by industry and decision makers	Pro-actively drive increased awareness and understanding amongst industry stakeholders
Shortage of education, training and credentialing	Scale embodied carbon education, training and credentialing
Need for better information sharing / accepted central source	Enhance industry communication and engagement strategies
Lack of public awareness regarding embodied carbon	Establish public awareness campaigns and tools
Embodied Carbon Requirements	
Lack of embodied carbon requirements within national and provincial codes	Enable earlier adoption of National Model Codes proposed changes
Lack of adoption of green building certifications	Promote the pursuit of green building certifications

Gaps / Barriers	Solutions
Economics	
Lack of a costing framework for low embodied carbon options	Facilitate collection and use of costing data for low embodied carbon materials/products and designs
Lack of financial support for EPD creation	Provide financial support to encourage the creation of EPDs
Short-term financial decision making	Make decisions based on longer-term financial benefits and life cycle costing
Lack of financial incentives	Provide financial incentives for low carbon products and buildings
Limited supply of salvaged building materials	Support the growth of the salvaged materials industry and circularity
R&D and Commercialization	
Limited research and development focused on low-carbon materials/products and designs, and their financial impacts	Accelerate research and development
Challenges in applying research findings to real-world projects	Facilitate swift application of research findings
Slow speed of code and standard adaptation	Provide a streamlined process to address new products and building designs within codes and standards
Availability of Verified Low Carbon Products	
Lack of available low carbon products	Provide real estate industry support for the manufacturing sector Provide financial support for modernizing and expanding manufacturing Increase market demand for verified embodied carbon data Provide financial support for EPDs

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Introduction

Embodied carbon refers to the greenhouse gas (GHG) emissions associated with the production, transportation, assembly, maintenance, and end-of-life of building materials, as well as all construction activities. Reducing embodied carbon is crucial to achieve Canada's climate goals, mitigate climate change impacts and promote sustainable building practices.

While leading building professionals have long understood the importance of addressing embodied carbon, the significant impact of building materials has only begun to be fully appreciated by the wider construction industry. In 2013, recognition of whole building Life Cycle Assessment (wbLCA) in LEED v4 alerted many professionals to the impact of material selection. The Canada Green Building Council (CAGBC) immediately supported industry with workshops and other forms of training, and in 2017 the CAGBC's Zero Carbon Building Standards brought additional attention to embodied carbon. Two years later, the World Green Building Council and supporting Councils called on industry to target a 40 percent reduction in embodied carbon by 2030.[1]

Regulators have also recently focused on embodied carbon. The City of Vancouver and the City of Toronto have added requirements for conducting wbLCA and reducing the embodied carbon of new buildings. The federal government has committed to action through the Greening Government Strategy, and has begun to establish procurement requirements focused on targeted material reductions. The Canadian Board for Harmonized Construction Codes (CBHCC) also plans to introduce embodied carbon into the National Model Codes in 2030.[2]

Given the significant improvements made to the energy efficiency and operational carbon of new buildings, the relative impact of embodied carbon is growing. In fact, in many regions of Canada, the embodied carbon emissions of an efficient all-electric building outweigh the cumulative operating emissions over the entire lifespan of the building, as shown in Figure 1.[3]

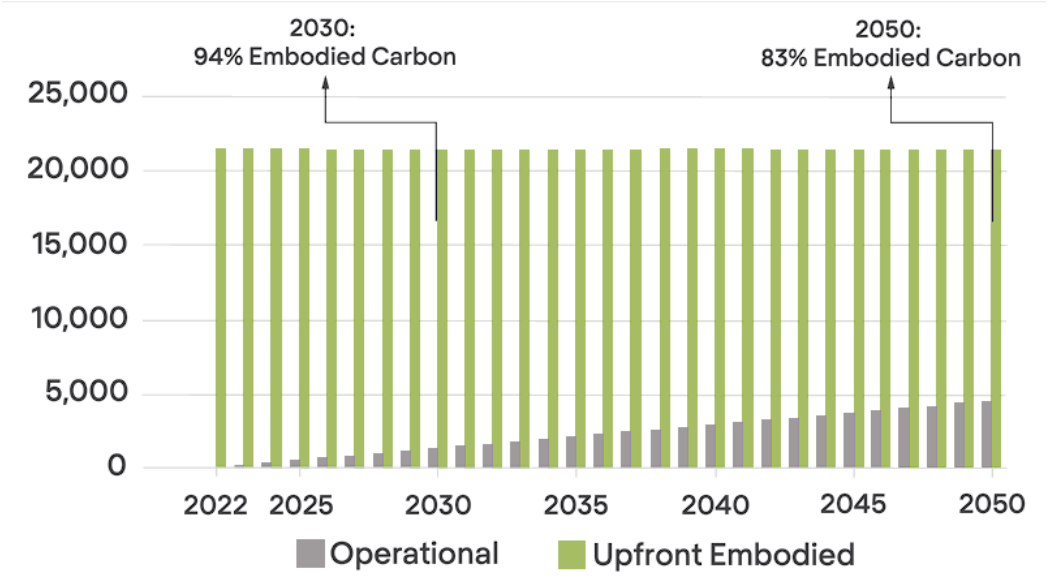

Figure 1: Example of high-performance buildings in Toronto. | Source: CAGBC's *Embodied Carbon: A Primer for Buildings in Canada, 2022*

[1] World Green Building Council. Accessed 2024-07-15. *Bringing Embodied Carbon Upfront.* https://worldgbc.org/article/bringing-embodied-carbon-upfront/

[2] Canadian Board on Harmonized Construction Codes (CBHCC). Accessed 2024-07-15. *CBHCC Policy Positions on Developing and Implementing Greenhouse Gas Emissions Provisions in the National Model Codes.* https://cbhcc-cchcc.ca/en/cbhcc-policy-positions-on-developing-and-implementing-greenhouse-gas-emissions-provisions-in-the-national-model-codes/

[3] Derived from: Canada Green Building Council. (2024) *Zero Carbon Building – Design v4 Standard*, derived from CAGBC (2021). *Embodied Carbon: A Primer for Buildings in Canada*.

Given that the timeframe for meaningful climate action is shrinking, reducing emissions created during the production and construction phase of a building project (a subset of embodied carbon referred to as upfront carbon which happens before a building is operations) is a critical step to limit emissions in the short-term and help avoid triggering feedback loops that exacerbate global warming.

Acknowledging that multiple, unconnected initiatives to address embodied carbon are active in Canada, industry recognized a need for a comprehensive conversation, and the National Embodied Carbon Summit was conceived. Its goal was to develop a common vision for reaching 2030 targets, establish next steps, and outline how industry alignment can expand the conversation.

The resulting Summit took place in Toronto on June 4, 2024, with sixty invited participants from a broad and diverse range of expertise. The Summit was structured to encourage collaboration and knowledge exchange, emphasizing practical solutions and actionable insights. This white paper is the result of that one-day Summit, and it is meant to capture the gaps, barriers and solutions discussed. It is not meant as a detailed plan of action, but as a stepping stone to further collaboration and the development of an industry roadmap.

Participants in the National Embodied Carbon Summit, 2024.

1. State of the Landscape

The current state of the industry must be understood to recognize the gaps and barriers faced by industry today, and to develop solutions. Summit participants participated in an advance survey to gather information on Canada's embodied carbon landscape. With the industry evolving rapidly, this is not an exhaustive account but captures key highlights. Some post-Summit developments have been reflected.

1.1. What's currently driving action to reduce embodied carbon in Canada?

Government Leadership:
Two of the three largest cities in Canada, Vancouver and Toronto, have measures in place to address embodied carbon emissions.

- **Vancouver:** This municipality is a North American leader for its bylaws addressing embodied carbon. Since October 2023, all new Part 3 buildings are required to report embodied carbon emissions for structure and enclosure through life cycle stages A1-5, B1-5, C1-4, and ensure that embodied carbon is no more than 800 kg CO_2e/m^2 of gross floor area (GFA), excluding underground parking area. Alternatively, projects can use the baseline path to ensure their embodied carbon is no more than double that of a functionally equivalent baseline. In 2025, requirements will be strengthened; it is anticipated that all Part 3 buildings above 1,800 m^2 will need to be below 360 kg CO_2e/m^2 GFA or demonstrate a 10% reduction from a functionally equivalent baseline.

- **Toronto:** Tiers 2 and 3 of the Toronto Green Standard (TGS) V4 establish upper limits for upfront carbon emissions (stages A1-A5). For Part 3 buildings, Tier 2 requires upfront carbon to be less than 350 kg CO_2e/m^2 for commercial office and residential buildings, and less than 400 kg CO_2e/m^2 for other buildings. The Tier 2 requirements are mandatory for City-owned new construction projects, and voluntary for others. Tier 3 requirements are less than 250 kg CO_2e/m^2 for commercial office and residential buildings, and less than 275 kg CO_2e/m^2 for other buildings. While the targets are assessed using GFA, the floor area includes underground parking; this floor area is now being called Built Floor Area (BFA) in the industry.

- Other cities are considering addressing embodied carbon as well, such as Mississauga, which recently approved a program following Toronto's methodology.

Government of Canada: As part of plans to transition to net-zero emissions and climate-resilient operations by 2050, the Treasury Board of Canada Secretariat has commitments to disclose and reduce the embodied carbon of its major construction projects by 30 percent by 2025. The Standard on Embodied Carbon in Construction was established in 2022 to support this commitment with an initial requirement to demonstrate a 10 percent reduction in the embodied carbon of ready-mix concrete. Since the Summit, the federal government has published the Canada Green Buildings Strategy, which includes a Buy Clean policy approach. The Buy Clean policy approach builds on the government's commitments, starting with a focus on targeted material reductions and efforts to develop data and guidance to support life cycle assessment and pilot whole building lifecycle assessments in project design. The Buy Clean policy approach also aims to reduce embodied carbon from federal investments in public infrastructure assets (such as by integrating related requirements into funding programs for green buildings); support market transformation through disclosure, guidelines and demonstration projects; and decarbonize the construction industry through complementary measures, such as research, development, demonstration, and deployment.

Certification Programs:
LEED v4/4.1 for Building Design and Construction (LEED v4/4.1 BD+C): LEED has had a significant impact on industry. The rating system rewards projects for both measuring and reducing impacts from embodied carbon. Currently 25 percent of the LEED v4/4.1 BD+C certified projects in Canada achieve points through wbLCA. It is expected that LEED v5, to be released in 2025, will require that all projects perform a wbLCA, and more emphasis will be placed on reducing embodied carbon.

Zero Carbon Building - Design Standard (ZCB-Design): Since the launch of the first version of the Standard in 2017, ZCB-Design has rapidly introduced increasingly ambitious requirements for reducing embodied carbon. The latest version, released in June 2024, introduced limits of 350 CO_2e/m^2 of built floor area for warehouse projects and 425 CO_2e/m^2 for all other projects.

Corporate Commitments:
Several property owners and other organizations are setting their own net-zero commitments, which include addressing embodied carbon in their building projects.

Industry Commitments:
Many Canadian firms have signed onto commitments created by their professions, such as AIA 2030 Commitment, MEP 2040 Committing to Zero, and SE2050.

Industry Leadership:
Carbon Leadership Forum (CLF): After 14 years with the University of Washington, the CLF became an independent non-profit organization in April 2024. The organization has been a centre of research and information on embodied carbon. Local chapters in British Columbia, Toronto, Ottawa, and Alberta provide peer networking.

Zero Emissions Innovation Centre (ZEIC): Created through an endowment by the Government of Canada as part of the LC3 Network, this British Columbia non-profit was designed to help catalyze and advance ambitious and innovative climate action. ZEIC's portfolio of GHG reduction initiatives includes the management of the CLF BC chapter, which aims to build capacity to reduce embodied carbon emission in the province.

US Government Leadership:
Canada benefits from programs driven by the government of the United States of America. Through the Inflation Reduction Act, they are addressing the embodied carbon of construction materials. The US Environmental Protection Agency (EPA) is also working to improve and expand environmental product declarations (EPDs), and create a low carbon construction labelling program.

1.2. New information in the market

In the last two years, there has been an explosion of new guidance available in the market, such as:

- Universities and Industries have collaborated on joint research, such as the work of the Centre for Sustainable Built Environment and the Mass Timber Institute.
- Organizations have worked together to produce useful design guides, such as Concrete: A Pragmatic Approach to Lowering Embodied Carbon (2023) and Concrete Carbon, first published by Concrete Ontario in late 2022, and updated for national coverage in June 2024.
- New standards such as the United Kingdom's RICS Whole Life Carbon Assessment Standard and the American ASHRAE's draft 240P have been available to provide stronger methodology direction.
- CLF is undertaking an exercise to update their early 2017 benchmarking work; the first portion with an analysis of 30 buildings in California was released in early 2024.
- Multiple research reports have been released, covering topics such as Wood: Is it still good? (2024) from Building Green and Advancing the LCA Ecosystem (2023) from CLF.
- Primers such as CLF's seven policy factsheets and LETI's (Low Energy Transformation Initiative) Embodied Carbon primer.

1.3. Education and training

Currently, embodied carbon education and training is limited, but that is beginning to change with micro-credentials such as the comprehensive four-part Whole-Building Life Cycle Assessment program offered by British Columbia Institute of Technology (BCIT). This program is an important step towards ensuring that professionals have the knowledge required to conduct wbLCAs.

CAGBC developed a Low Carbon Training Program (2023-2024) that included an introduction to embodied carbon, in partnership with the Canadian Construction Association (CCA), Climate Risk Institute (CRI), Royal Architectural Institute of Canada (RAIC), Building Owners and Managers Association (BOMA), and the Real Property Association of Canada (REALPAC). It was partially funded by the Government of Canada and provided to the industry at no cost.

The National Research Council Canada (NRC) also recently provided funding for RAIC to offer one day wbLCA workshops, and CAGBC recently launched the Zero Carbon Building – Essentials Micro-Credential, which covers embodied carbon.

In the last couple of years, the market has seen an increase in webinars addressing embodied carbon as well, from organizations such as CLF, CAGBC, and RAIC. CLF released a series of free embodied carbon training videos in January 2025 providing basic information on assessing and managing embodied carbon.

1.4. Methodology and Alignment

Data Schema and Reporting Requirements:
Unlike energy efficiency and operational carbon, embodied carbon is still new to the industry, and direction on what to measure, how to measure, and how to compare is changing fast. It can be difficult to navigate the differences between metrics and terminologies. At the same time, leaders cannot be held to the "lowest common denominator" of assessment as the industry evolves. To address this concern, several organizations in the United States formed the Embodied Carbon Harmonization and Optimization (ECHO) Project in 2023, with CAGBC joining early in 2024. The ECHO Project completed their first two projects in the months following the Summit.

- Project Life Cycle Assessment Requirements — ECHO Recommendations for Alignment (October 2024): Summarizes ECHO's findings and recommendations around requirements for project life cycle assessment (also referred to as wbLCA) to drive alignment in modelling and reporting. These recommendations leverage a review of 29 commitments, certification programs, standards, policies, and benchmarking initiatives, including five from Canada.[4] From this work, recommendations for ten areas were considered: (1) impact categories, (2) life cycle stages, (3) reference study period, (4) normalization unit, (5) floor area, (6) project elements, (7) classification system, (8) data sources and uncertainty, (9) material and asset reuse, and (10) biogenic carbon reporting.
- ECHO Reporting Schema (September 2024): Aims to streamline data reporting, reduce inconsistencies, and support seamless data exchange across various LCA tools, platforms, and databases.

Methodology:
In June 2024, the NRC released the National Whole-Building Life Cycle Assessment Practitioner's Guide: Guidance for Compliance Reporting of Embodied Carbon in Canadian Building Construction (or in short, the National wbLCA Practitioner's Guide). This is now the foundational wbLCA methodology document for Canada and should be used by all wbLCA practitioners. It also serves as a valuable resource for jurisdictions and organizations setting out new policies. The guide leverages work done by the City of Vancouver, and enables greater consistency in the methodologies, boundaries, and assumptions (e.g., defaults, baselines) used in wbLCAs for Part 3 buildings. By creating a common Canadian methodology, it streamlines the work for practitioners and begins to allow for program comparisons. It is meant to complement NRC's National Guidelines for Whole-Building Life Cycle Assessment (2022). The draft of the National wbLCA Practitioner Guide was reviewed during the development of ECHO's LCA requirements project, resulting in considerable alignment between the two.[5]

[4] The five Canadian commitment programs reviewed by the North American ECHO Project were CAGBC's Zero Carbon Building – Design Standard v4 (2024), City of Vancouver Embodied Carbon Guidelines v1.0 (2023), Toronto Green Standard v4 (2022), NRC National Guidelines for WBLCA (2022), and NRC National WBLCA Practitioner's Guide (2024).
[5] The NRC National wbLCA Practitioner's Guide meets all ten minimum recommendations and four of the six 'strongly recommended' requirements of ECHO's Project Life Cycle Assessment Requirements: ECHO Recommendations for Alignment, Version 1.0.

2. Gaps, Barriers and Solutions

Identifying gaps and barriers is crucial to accelerating the reduction of embodied carbon in Canadian buildings. Understanding these obstacles allows interested parties to develop targeted strategies and solutions to overcome them. CAGBC gathered insights into these gaps and barriers as part of the Summit's comprehensive discussions and surveys with experts from various sectors. Summit attendees then created solutions to systematically address the identified gaps and barriers, aiming to provide comprehensive and actionable ideas for the industry. The parties best suited to move these solutions forward were also identified, enabling their expertise and ongoing efforts to ensure the successful implementation of these strategies.

CAGBC organized the discussions and insights into seven key themes to systematically address the complexities of reducing embodied carbon in the construction industry. These themes include (1) Framework for wbLCA, (2) Tools and Data, (3) Awareness, Training and Education, (4) Embodied Carbon Requirements, (5) Economics, (6) R&D and Commercialization, and (7) Availability of Verified Low Carbon Products. By categorizing the challenges and opportunities within these themes, we can provide a clear and structured approach to tackling the multifaceted issue of embodied carbon, ensuring that all relevant aspects are considered and addressed comprehensively.

The resulting gaps and solutions collected here represent the fruitful and insightful discussions from the one-day Summit, however, we recognize that additional time and analysis could improve on the quality and comprehensiveness of the solutions explored.

2.1 Framework for wbLCA

Gaps/Barriers	Solutions
Lack of a harmonized wbLCA framework The most significant gap identified is the lack of a harmonized framework for wbLCA. Without a unified approach, interested parties struggle to measure and compare their efforts accurately and consistently, both within regions and across national portfolios, leading to fragmented and often inefficient practices. Furthermore, there is a need for harmonization between the United States and Canada. Several jurisdictions have stepped up as leaders within Canada and beyond. Given the field is still new, what to measure and how to report are changing fast, and to be a leader means stepping away from the status quo.	**Developing a standardized and harmonized wbLCA framework including common metrics, methodologies, definitions, and reporting templates** Developing and adopting standardized metrics, methodologies, definitions, and reporting tools will streamline efforts and ensure that outcomes are comparable and verifiable. The development of a harmonized framework requires the active participation of a wide range of interested parties, including government departments and agencies, industry, and academic institutions to ensure the resulting framework is comprehensive, addresses industry's diverse needs and inspires broad support and adoption. It was suggested that harmonization with the United States be considered due to our interconnected economies, and this work is already underway. While there might be interest from firms operating internationally to consider more global alignment (e.g., with Europe), national and North American alignment remain the priority.

However, this has led to inconsistencies[6] for organizations that operate across jurisdictions, as they are required to meet different reporting requirements.

Four areas were identified as critical to a harmonized framework:

(a) **Metrics** for comparison of information,
(b) **Methodologies** (or standards) on how to perform wbLCA (e.g., scope, boundaries, elements, defaults, baseline assumptions, etc.),
(c) **Definitions of terms** utilized in wbLCA,
(d) **Reporting templates** (e.g., documentation required) for tracking and documenting embodied carbon for certifications, jurisdictional requirements, and other programs.

Progress has already been made since the Summit, and it is important to acknowledge and promote these new resources. As a first step, all organizations could consider aligning with these recently released reports.

Metrics: Many concerns about aligning metrics were recently addressed in the North American Embodied Carbon Harmonization and Optimization (ECHO) Project, (see section 1.4). In October 2024, they released Project Life Cycle Assessment Requirements: ECHO Recommendations for Alignment (version 1). Jurisdictions should consider these in their programs.

Methodologies: Many questions about methodologies were addressed with the release of the NRC's National Whole-Building Life Cycle Assessment Practitioner's Guide (June 2024). As highlighted in section 1.4, this is now the foundational wbLCA methodology document for Canada and should be used by all wbLCA practitioners.

Definitions: Both the above documents provide clear definitions that are generally in alignment and should be adopted by the wider industry.

Reporting Templates: Every program creates templates aligned with their required metrics. To help organizations to at least use similar terminology and fields in their data collection, ECHO released V1.0 ECHO Schema Fields and Descriptions (Excel) alongside a white paper titled An Introduction to the ECHO Reporting Schema, as highlighted in section 1.4.

[6] There are key differences in how leading jurisdictions and programs assess embodied carbon. For example:

- The Government of Canada's Standard on Embodied Carbon in Construction includes requirements for the carbon intensity of specific materials, currently limited to ready-mix concrete (kg CO_2e/m^3 of concrete).
- The Toronto Green Standard considers upfront embodied carbon (A1-A5) intensity of the entire building's structure and envelope (kg CO_2e/m^2) and includes parking area in the denominator (also called the "normalization unit").
- The City of Vancouver's Bylaw looks at the cradle-to-grave embodied carbon (A1-A5, B1-B5, C1-C4) intensity or relative reduction of the entire building's structure and envelope, while excluding parking structures from the denominator.
- CAGBC's Zero Carbon Building - Design Standard aligns with the City of Vancouver's bylaw in assessing cradle-to-grave embodied carbon (A1-A5, B1-B5, C1-C4) intensity or relative reduction of the entire building's structure and envelope. However, the standard moved from excluding parking structures from the area denominator under version 3 (like the City of Vancouver), to including this area in the denominator for version 4 (June 2024). It aligns methodology with the new NRC National Whole-Building Life Cycle Assessment Practitioner's Guide.
- LEED, administered in Canada by the CAGBC, also looks at cradle-to-grave embodied carbon (A1-A5, B1-B5, C1-C4), however it only assesses relative reductions and not intensity. Additionally, LEED v4.1 allows project teams to exclude A5 and various stages from B and C if data cannot be obtained. LEED v5 will expand the scope of assessment to include site hardscape, which is currently not being considered by any jurisdiction in Canada.

Relevant Parties	
	National Research Council Canada (NRC): The NRC is responsible for publication of the two current wbLCA guides: NRC National Guidelines for WBLCA in 2022 and NRC National WBLCA Practitioner's Guide, launched at this Summit. It is anticipated that they will continue to produce nationally needed guidance. **Governments and others setting embodied carbon building policies**: As new jurisdictions look to address embodied carbon in buildings, they should look to align with national guidelines and other jurisdictions as much as possible to avoid confusion and additional effort for the industry. **Green building certification organizations:** The CAGBC can work to ensure their Zero Carbon Building (ZCB) standards continue to evolve to help foster industry alignment on the assessment and reporting of embodied carbon. Additionally, with responsibility to administer LEED in Canada, the CAGBC can continue to work to ensure the next evolution of LEED (version 5) aligns with Canadian methodologies wherever possible. CAGBC can continue to participate in the North American ECHO project, and foster progress by convening stakeholders, communicating information, and providing education and training as appropriate. **wbLCA Practitioners**: These professionals should adopt the latest practices and actively encourage others to do so. Leading professionals can also offer their expertise to participate in the development of the national wbLCA framework.

2.2 Tools and Data

Gaps / Barriers	Solutions
No 'approved' national database of LCI data and EPDs Participants felt there is limited access to comprehensive, consistent, and regionally appropriate life cycle inventory (LCI) data that is accurate and updated. LCI data is not only used to perform the life cycle assessments (LCAs) that inform EPDs; it can also be used directly to compare options and make informed decisions about reducing embodied carbon. In turn, the same challenges of quality and availability exist for EPDs, which should be third party verified (Type III) and as specific as possible to the product purchased (product, manufacturer, and production facility). Participants noted that the current data landscape is fragmented and often lacks transparency and consistency. As a result, practitioners aren't sure what is the most up-to-	**Develop a national database of LCI data and EPDs** A central 'approved' national dataset of LCI and EPD data that stakeholders can access to obtain accurate and up-to-date information is desired. Other countries have created similar datasets (e.g., INIES in France) which allow embodied carbon and life cycle assessments to be more comparable. All datasets should be continually updated with regionally appropriate background LCI data as well as valid third party verified (Type III) EPDs (including both industry-average and product/manufacturer/facility-specific). Efforts to bring together data and databases are already underway. As a first step, users could support these databases. • The NRC is building a Canadian LCI database for various construction materials, including cement, concrete, wood products, and insulation, with data

date and relevant / appropriate data to use, and different practitioners use different data. It was recognized that there are currently multiple databases, and that there is no central organization with leadership. Additionally, the significant overlap in products with the United States raises challenges.	collection enabled through agreements with manufacturer associations. • Public Services and Procurement Canada (PSPC) has recently commissioned Circular Innovation Council (CIC) to engage stakeholders on a searchable Green Products Database Pilot Project; one of the parameters is EPD data. • Mindful MATERIALS is working on a Sustainable Product Data Hub, trying to bring users together and work towards alignment in material data.
Need for consistent and harmonized wbLCA tools It was also acknowledged that there is a need for wbLCA tools to be more consistent and harmonized to support the collection, analysis, comparison, and sharing of data.	**Align tools with national wbLCA Framework** All wbLCA tools should enable stakeholders to accurately measure embodied carbon and effectively evaluate, compare, and reduce the impacts of different products and construction methods. The results from different tools should be comparable and be aligned with requirements from jurisdictions. wbLCA tools should therefore align with the national wbLCA Framework as it is formulated. To ensure consistency and reliability, a national governing body could potentially be established to qualify and approve wbLCA tools. This approach might help create alignment.
Need for a national wbLCA results database The absence of a comprehensive national database for wbLCA results is felt to be a significant barrier to understanding the current range of embodied carbon assessment outcomes. This hampers benchmarking, limits the ability for design teams to find inspiration and appreciate what is possible, and ultimately makes it difficult for projects to set appropriate reduction targets.	**Create a national wbLCA results database** Establishing a national wbLCA database will provide a centralized, accessible repository of verified comparable results. This will allow for benchmarking, showing the range of results possible, and allow for innovative targets to be set. There are precedents for this. Several European countries, such as Germany with ÖKOBAUDAT and Sweden with Boverket's Environmental Indicator, have national wbLCA databases. Recently Globe has started a Global Building Data Initiative as well. If sufficiently aligned, it should be possible to compare results across datasets. If a national database were created, owners and project teams would still need to be willing to share their project data either publicly or anonymously.

Lack of clear and uniform product category rules (PCRs) The lack of clear and uniform product category rules (PCRs) leads to different interpretations and approaches, presenting a significant barrier to developing comparable environmental product declarations (EPDs). Without standardized and comparable PCRs there is considerable variability in how products are assessed and reported, making it even more difficult to compare EPDs in wbLCAs. This inconsistency hampers the ability of interested parties to make informed decisions regarding material comparability, selection, and ultimately carbon reduction strategies.	**Establish clear and uniform requirements for product category rules (PCRs)** Develop and implement clearer, standardized requirements for PCRs that leave little room for interpretation and variation, across all product categories. This involves creating detailed guidelines that specify the methodologies (and potentially data sources) for calculating and reporting the environmental impacts of products. Harmonizing these requirements at the international level and across product categories will increase consistency, transparency, and comparability of EPDs, facilitating their integration into wbLCAs. Additionally, involving interested parties such as industry associations, standards organizations, and policymakers in the development process will help ensure that the PCRs are comprehensive and widely accepted.
Need for wbLCA parametric analysis tools and the data to support them Participants identified a need for wbLCA parametric analysis tools that can evaluate environmental and cost (capital/operating) implications of multiple design options. Such tools require regionally appropriate data for multiple building types.	**Develop, expand and refine wbLCA parametric analysis tools with enhanced data** Parametric embodied carbon analysis tools should be developed, expanded and refined to enable project teams to easily evaluate material and design options early in design. Reliable, standardized regional environmental and cost information should be collected to inform the tools. Pathfinder is an example of such a tool; however, it is currently limited to eight building archetypes, is based on a limited set of data points, and only serves the Metro Vancouver and Greater Toronto areas.
Over reliance on tools and profession-based silos The building industry often places excessive reliance on specific tools and software in efforts to minimize embodied carbon. Further, design often occurs in profession-based silos at the expense of broader systems thinking. These characteristics can lead to a narrow focus that overlooks the holistic, interconnected aspects of building projects across their entire life cycle.	**Adopt a systems-oriented approach including integrated design and circular economy principles** Systems thinking emphasizes understanding the entire life cycle of a building and the interactions of design elements to achieve optimal sustainability outcomes. It requires an integrated design process, whereby various professions co-create a building, designing systems to work together to optimize performance. By integrating design, redundant elements can be eliminated, and single systems can provide the function of what would take multiple systems under traditional design.

	Circular economy principles are also key to systems thinking. By focusing on adaptability, disassembly, and the reuse and recycling of materials at the front and back-ends of a building's life, we can minimize waste and further reduce embodied carbon.
Lack of standard approaches and templates for building specifications to address lower embodied carbon materials The lack of standardized approaches and templates for building specifications that prioritize materials with lower embodied carbon results in project teams spending needless effort. Additionally, the lack of clear direction in expectations for lower carbon materials makes it challenging for suppliers and manufacturers. The lack of awareness on the usefulness performance-based[7] specifications was also raised as a current gap.	**Update National Master Specification with low-carbon requirements** Create an updated National Master Specification with low-carbon requirements, along with standardized bid templates. Performance-based specification templates would also be useful, with education on when to apply them. To help with preparing these specifications, users could look to the Model Embodied Carbon Specifications released by CLF in January 2025. The model specifications address select materials/products; these could be utilized in the production of revising master specifications for Canada as well as be used to help create project-based specifications.

[7] With performance-based specifications, designers outline the outcome they want rather than prescribing specific materials. For example, instead of a prescribing the use of a specific concrete mix, a designer would instead note performance requirements such as the strength, durability, and CO_2e emission reductions targeted, allowing the contractor to supply what would be suitable taking into consideration additional factors such as the project schedule and ambient temperatures during construction.

Relevant Parties	**Federal government:** For tools and data to be nationally accepted, they should be developed, supported and/or approved by a federal government entity, such as the National Research Council Canada (NRC), Natural Resources Canada (NRCan) or Environment and Climate Change Canada (ECCC). The federal government is also critical to several other aspects such as updates to the National Master Specification (NMS). **Data providers:** Manufacturers, organizations that develop LCI data, LCAs and EPDs, those that maintain databases of such data, as well as organizations that perform wbLCAs, or that are provided such information (e.g., green building certification bodies and regulators) should all support the development and maintenance of centralized databases and tools. Collaboration with industry stakeholders will ensure that these resources meet the needs of users. **Tech companies:** Companies that develop software and analytical tools should create solutions that are tailored to the needs of the construction industry, facilitating widespread adoption. **Academic institutions:** Advance wbLCA parametric analysis by developing methodologies and providing essential data analysis. They also prepare future professionals to implement these techniques effectively. **Policy makers and project owners:** Play key roles in integrated design by requiring collaboration across disciplines, funding projects, and ensuring effective implementation. These groups also need to be willing to share their wbLCA data to help build the national datasets. **Program Operators:** EPD Program Operators can actively participate and lead national and international efforts to bring greater clarity and uniformity to PCRs.

2.3 Awareness, Training and Education

Gaps / Barriers	Solutions
Lack of awareness and understanding by industry and decision makers A general lack of awareness and understanding of embodied carbon and its impacts extends across the industry from policy makers and owners to designers, contractors and trades people. Awareness of the importance and urgency of reducing embodied carbon is a prerequisite for action.	**Pro-actively drive increased awareness and understanding amongst industry stakeholders** Each mention of embodied carbon serves to increase awareness. Individuals can pro-actively work to raise awareness within their offices, firms, and project teams. Professional associations can raise awareness amongst their members through their newsletters, events, training, research, awards, and advocacy. Industry should also work to grow awareness amongst policy makers, providing them with the knowledge and tools to incorporate embodied carbon considerations into policymaking.

Shortage of education, training and credentialing Currently, embodied carbon concepts are not widely incorporated into educational curricula nor integrated into ongoing credential maintenance, training, and resources for industry professionals. There is also limited credentialling to recognize training and knowledge in specific areas, such as wbLCA.	**Scale embodied carbon education, training and credentialing** Industry requires education and training tailored to specific aspects of embodied carbon and to different levels of knowledge and experience. In some instances, education and training must be adapted to specific professions. For professionals with knowledge of embodied carbon, training should focus on application and the latest developments. Micro-credentials allow industry to recognize knowledge and skill sets gained through education and training. This is of great service to industry and hence drives interest in embodied carbon education and training.[8] Summit participants felt it is crucial to develop and standardize credentialing programs across the country, ensuring accessibility and consistency. Coordination and collaboration are required between regions, professions and education/training delivery agents. Government financial assistance can expedite the creation of education and training and support delivery to increase participation.
Need for better information sharing / accepted central source A central repository and/or authority for sharing of important embodied carbon information is lacking. Interested parties (e.g., owners, manufacturers, design professionals, contractors, and trades person) have no single source to find vetted, updated, and trust-worthy information and resources on embodied carbon in Canada.	**Enhance industry communication and engagement strategies** Effective communication and engagement strategies are needed to disseminate information and best practices. It was proposed that a national body be identified or created to help disseminate embodied carbon news and resources, using various media to reach different audiences, and ensuring that information is accessible and easy to understand by different audiences.

[8] British Columbia Institute of Technology's (BCIT's) four-course wbLCA micro-credential program is an example of the type of credentialing program that industry requires. It is available nationally through online delivery.

Lack of public awareness regarding embodied carbon The lack of public awareness about embodied carbon is a significant concern. While the public is becoming increasingly aware of operational carbon, they remain largely unaware of the significant impacts of embodied carbon.	**Establish public awareness campaigns and tools** A building labelling program would raise awareness, help consumers identify buildings that are addressing the issue of embodied carbon, and encourage environmentally conscious choices. To facilitate public engagement and drive political willingness to act, a public awareness campaign focused on educating the population about the whole-life carbon (operational and embodied) impact and cost over the life cycle of buildings is recommended. Simple, memorable, “catchy” campaigns could capture public attention and emphasize the importance of reducing embodied carbon. Such campaigns can be funded through private and public collaboration. Compelling and positive storytelling could illustrate the benefits of reducing embodied carbon and inspire public action.

Relevant Parties	**Educational institutions:** Universities and colleges should integrate embodied carbon concepts into their curricula across a wide range of studies, providing students with the knowledge and skills needed to address embodied carbon in their future careers no matter their specialty. **Training providers:** Vocational schools, industry associations, and training organizations should develop and deliver programs that build the skills needed for low-carbon construction. **Industry employers:** Companies in the construction sector should invest in the professional development of their employees, ensuring that they have the knowledge and skills needed to implement sustainable practices. **Industry bodies:** Organizations like the CAGBC, professional associations (e.g., RAIC, Engineers Canada), and CLF Hubs (CLF BC, CLF Toronto, CLF Alberta, and CLF Ottawa) play a role in developing and delivering training, communicating developments, and raising industry as well as public awareness. **Government:** Governments can provide funding for directed professional education and targeted retraining programs.

2.4 Embodied Carbon Requirements

Gaps / Barriers	Solutions
Lack of embodied carbon requirements within national and provincial codes The absence of embodied carbon requirements in the National Model Codes is a significant gap in Canada's building regulations, which may lead to fragmentation in the policy landscape of leading jurisdictions. Embodied carbon is expected to be addressed in the 2030 code cycle; however, implementation will take time as provinces and territories adopt and put the new requirements into effect. With codes possibly silent on this critical issue for several more years, it will continue to fall on municipalities to lead the way. However, this is not an optimal solution as not all municipalities have the authority to address embodied carbon in non-municipal buildings. Additionally, as expressed within the wbLCA Framework section above, while there are examples of leadership at the municipal level, it can lead to a fragmentation in the policy landscape, making it challenging for clients who operate across jurisdictions.	**Enable earlier adoption of National Model Codes proposed changes** Introducing tiered embodied carbon performance requirements to the 2025 editions of the National Model Codes could offer a practical, phased approach to establishing embodied carbon reduction goals across Canada. This approach would be akin to the energy efficiency tiers of the National Energy Code for Buildings 2020. The lowest tier might not include any embodied carbon requirements, while the next tier could require disclosure of embodied carbon and higher tiers could establish specific embodied carbon performance thresholds for wbLCA or individual materials. The higher tiers could be voluntarily adopted or incented by leading jurisdictions. This may not be possible given the current (2025) code cycle's work plans and given the need for policy discussions, consultations and technical development. However, jurisdictions could choose to adopt proposed changes (or aspects thereof), introducing embodied carbon requirements as they are published for public review over the course of the 2030 code development cycle, i.e., prior to the publication of the 2030 Codes.
Lack of adoption of green building certifications Green building certification systems like LEED and ZCB-Design encourage reductions in embodied carbon and it would be beneficial for these certifications to be more widely adopted.	**Promote the pursuit of green building certifications** Promoting green building certifications that recognize and reward low embodied carbon material and building design can drive competition, increase subject matter expertise, and encourage wider adoption of embodied carbon reduction practices. Even if embodied carbon is adopted into the codes or driven through other government programs, certification programs encourage industry leaders to drive further reductions through new innovations and practices. As such, certification programs play a critical role in the ongoing evolution of the market.

Relevant Parties	**Canadian Board for Harmonized Construction Codes (CBHCC)**: The CBHCC, made up of representatives from provincial, territorial, and federal governments (NRC is the federal member), oversees the development of Canada's national model codes, including the National Building Code of Canada (NBC) and the National Energy Code of Canada for Buildings (NECB) which sets energy requirements for large buildings. The CBHCC will continue to recommend carbon policy for the Codes, with a focus on embodied carbon. These policy recommendations will be made available for public consultation. CBHCC National Model Code Committees are expected to begin work on embodied carbon requirements in early 2025 for the 2030 code cycle. **Governments:** Federal, provincial, and municipal governments can develop and implement policies that support embodied carbon reductions. Governments have the regulatory authority to enforce compliance, ensure alignment with others, and provide incentives for best practices. It is recommended that the policies would need to be developed and implemented in a way that's removed from politics to survive political cycles. Additionally, where municipal governments do not have the authority to enact these policies, the leadership would need to be driven by the province or alternatively at federal level. **Canadian Standards Association (CSA):** The CSA and international equivalents could lead the development of standards regarding new products or other innovations. These organizations have expertise in standard creation, and the ability to create guidelines that can be widely accepted and adopted. **Policy advocates from non-governmental organizations and industry groups:** These groups should engage in advocacy to ensure that the voices of all stakeholders are heard in the policy-making process and to ensure all political parties are aware of the importance of these actions.

2.5 Economics

Gaps / Barriers	Solutions
Lack of a costing framework for low embodied carbon options Industry lacks a standardized costing framework that allows developers, contractors, and consultants to request and find cost data for low carbon materials effectively. Summit participants felt the absence of a unified approach makes it difficult to benchmark and compare costs, leading to challenges in decision-making related to embodied carbon.	**Facilitate collection and use of costing data for low embodied carbon materials and designs** RFPs and bidding templates can be improved and standardized to streamline the process of responding to RFPs and evaluating submissions. Data from cost estimators could be used to inform shared tools that inform building design, including wbLCA tools.

Lack of financial support for EPD creation The high cost of creating EPDs is a significant barrier, particularly for small and medium-sized enterprises. Without sufficient funding, many manufacturers are unable to produce EPDs or renew EPDs after they expire, limiting the availability of crucial data needed for accurate embodied carbon assessments.	**Provide financial support to encourage the creation of EPDs** Addressing the high costs of EPDs through grants, subsidies, tax breaks and similar measures will enable more widespread EPD creation, promoting transparency and helping the industry to achieve its embodied carbon goals. Such funding support was introduced in the United States through the Inflation Reduction Act. Canada should introduce a similar program to maintain competitiveness with American manufacturing.
Short-term financial decision making The construction industry often makes budget and investment decisions based on a short-term financial evaluation that focuses on initial construction costs rather than considering the entire life cycle costs and returns. In many cases, greener solutions have slightly higher upfront costs but lead to significant cost savings over the life of the asset. Furthermore, investment decisions often ignore future risks, such as regulations, escalating energy costs, and “brown discounts” associated with inefficient, high-carbon assets. Indirect benefits, such as accelerated construction times associated with prefabrication (e.g., mass timber), are rarely valued appropriately.	**Make decisions based on longer-term financial benefits and life cycle costing** Adopting a life cycle cost perspective to decision making ensures that long-term financial benefits are recognized and valued, leading to more sustainable and cost-effective building practices. Decision making should also consider future risks and indirect benefits.
Lack of financial incentives There is a lack of financial support to encourage the adoption of lower-carbon products and construction practices. Similarly, there is generally a lack of financial penalties associated with using higher-carbon products and construction practices. These financial incentives are critical because embodied carbon reduction measures do not typically result in operating cost savings that can be used to offset any incremental capital costs in the way that operational carbon reductions often do.	**Provide financial incentives for low carbon products and buildings** More robust financial frameworks, including grants, subsidies, and tax incentives, can lower the economic barriers to reducing embodied carbon while a financial penalty for using high-carbon options could advance adoption. These incentives and penalties could be a continuum / sliding scale so better (or worse) performance results in larger financial gain (or pain). This would reward deeper reductions.

Limited supply of salvaged building materials Salvaged materials bring multiple benefits including cost savings, embodied carbon reductions, lower resource consumption, and reduced landfill waste. The deconstruction industry also supports local jobs. While salvaged materials could only ever meet part of the demand for building materials, supply could be significantly increased.	**Support the growth of the salvaged materials industry and circularity** To support building deconstruction and material reuse, the salvaged materials industry's growth can be accelerated through funding, the creation of reclaimed material sorting and storage facilities, and policies that encourage disassembly and reuse. These circular practices also bring many co-benefits including minimizing waste and virgin resource extraction while providing local jobs.

Relevant Parties	**Government:** Governments should provide financial incentives and support programs to encourage the adoption of low-carbon technologies and materials. As well, governments could use whole life cycle costing in the management of their portfolios/projects. **Financial institutions:** Banks and investment firms should develop products and services that support the financing of low-carbon projects. This includes offering favourable loan terms and investment opportunities for developers and manufacturers that develop lower carbon buildings and materials.

2.6 R&D and Commercialization

Gaps / Barriers	Solutions
Limited research and development focused on low-carbon materials and designs, and their financial impacts Research and development (R&D) focused on materials and designs that minimize embodied carbon is ongoing, but not adequate. The Summit discussions also revealed a significant gap in research on the financial impact and effective application of low-carbon materials and designs.	**Accelerate research and development** Continuous R&D focused on low embodied carbon technologies and design approaches is essential. R&D should focus on developing and assessing innovative materials and low carbon designs, as well as understanding of design/construction processes such as the application and impacts of integrated design and modular construction. Collaboration between academic institutions, industry, and government can drive meaningful progress. Additionally, research into the financial implications of low carbon materials and designs would be of benefit to the industry. Improving the industry's familiarity with the true upfront costs and life cycle (or lack thereof) of low-carbon materials is also important. Education and training, case studies, and other measures should be leveraged. To this end, the NRC has created the Low Carbon Built Environment Challenge program. Working with Canadian and international partners from academia, industry and government as well as other interested stakeholders, the program focuses on four key areas in the construction sector, one of them being low carbon materials, products and systems. Additionally, Clean Energy Canada is leading a project to assess the cost implications of lower-embodied-carbon construction of buildings. They plan to address the financial implications of switching out materials to lower-carbon alternatives and optimizing design to reduce embodied carbon. The study is due out later in 2025.
Challenges in applying research findings to real-world projects While some research into new technologies, materials, and design concepts exists, it is often not translated into practical applications at scale. There are challenges in applying research findings to real-world projects, which hampers the adoption of innovative solutions.	**Facilitate swift application of research findings** Efforts should be made to bridge the gap between research and application by swiftly translating research findings into products, tools, and guidelines that can be used in real-world projects at scale. Pilot projects and case studies can demonstrate the feasibility and benefits of new technologies to reduce embodied carbon.

Participants stressed the importance of fostering a closer relationship between research institutions and industry practitioners to ensure that new technologies and methodologies can be implemented effectively by industry.	Supporting early adopters and encouraging innovation are key to overcoming the challenges associated with reducing embodied carbon. By promoting a culture of innovation, and rewarding new, more efficient approaches, the industry can develop and adopt new technologies and methodologies that drive progress. To support this, risk mitigation strategies, such as sharing risks among stakeholders or offering incentives for early adopters, should be implemented.
Slow speed of code and standard adaptation Guidance and regulatory approval for the use of new products and design solutions is critical to their adoption. However, codes and standards are typically slow to evolve.	**Provide a streamlined process to address new materials and building designs within codes and standards** A fast-tracked process to acceptance of low carbon materials and low carbon construction solutions is needed. It would help if codes and standards could accelerate consideration of new concepts once they are through the research phase and available for application.

Relevant Parties	**Research institutions:** Universities and research organizations should lead efforts to develop and assess new technologies and methodologies for reducing embodied carbon. **Government:** Governments can fund the necessary research and pilot projects. **Industry associations:** Groups representing the building sector and sub-sectors (such as the green building sector or the concrete, steel and wood sub-sectors) can conduct or support research and disseminate results in a manner that is most useful to industry. **Industry leaders:** Leading companies in the construction sector are needed to implement pilot projects, provide data (including costing) and partner with research institutions to test and implement new solutions. **Canadian Standards Association (CSA):** The CSA and international equivalents could lead the development of standards regarding new products or other innovations. These organizations have expertise in standard creation, and the ability to create guidelines that can be widely accepted and adopted.

2.7 Availability of Verified Low Carbon Products

Gaps / Barriers	Solutions
Lack of available low carbon products It can be challenging to source low carbon materials and products. Certain products may only be produced in limited quantities, or only available from distant countries. The data to support embodied carbon claims may also be lacking.	**Provide real estate industry support for the manufacturing sector** Contractors and designers should express their desire for low carbon products to suppliers. All those on the demand side, including governments and sustainability groups, should work with suppliers and trade associations to understand and alleviate any obstacles to making low-carbon products readily available. For example, driving and supporting updates to regulations and standards, or helping to assess and drive market demand for low embodied carbon product options. **Provide financial support for modernizing and expanding manufacturing** Government can support modernizing and expanding production capacity for low-carbon products. Some production processes require particularly significant capital investments and displace production capacity that is not at end of life (e.g., low carbon steel and some forms of low carbon cement).[9] **Increase market demand for verified embodied carbon data** Contractors and designers should actively request EPDs from suppliers, sending a clear market signal of the interest in lower-carbon solutions and the need for third-party verification. **Provide financial support for EPDs** Government could provide financial assistance to support manufacturers in creating EPDs.

[9] For example, the federal government and various provincial governments have invested in innovation for steel, mass timber, and concrete. Some examples include:

- The Canadian government's Regional Economic Growth through Innovation – Steel and Aluminum Initiative supported technology demonstration and commercialization.
- The Canadian Infrastructure Bank (CIB) fund enabled a steel plant to move away from coal-fired processes.
- B.C.'s Manufacturing Jobs Fund supported the modernization of a mass timber manufacturing facility in South Okanagan.
- The CleanBC Industry Fund (CIF) supports accelerating new emissions reduction technologies, such as providing funding to a cement manufacturer to further develop its carbon utilization technology.

	Provide EPD guidance and training Manufacturers should be provided more guidance and training on the value and process of creating EPDs (e.g., CAGBC's Manufacturer EPD Kickstarter program). **Adopt circularity strategies** Deconstruction, reuse, and design for disassembly can help meet the need for low-carbon materials.
Relevant Parties	**Professionals and Contractors:** These individuals and their firms can specify low-carbon products, request EPDs, and incorporate circularity strategies. **Governments:** Governments can help meet the significant investments required for new production capacity, support manufacturers in creating life cycle inventory data and EPDs and support the elements of a circular economy (e.g., waste sorting and storage facilities). They can also support workforce capacity initiatives.

3. Continuing the Conversation

The final segment of the National Embodied Carbon Summit focused on how to continue the collaborative conversations and move forward. Participants engaged in a dynamic group discussion that helped identify ways to ensure sustained progress in reducing embodied carbon. The following summarizes those discussions.

Expand the conversation to additional stakeholder groups: There was a consensus on the need to expand the conversation to include stakeholder groups that were not present at the Summit, including the manufacturing, heritage, circularity, waste management, landscape architecture, financial, and wbLCA software sectors, amongst others.

Engage a broader audience: To realize significant market transformation the conversation must reach beyond the immediate circle of participants. This involves creating working groups for different tasks and initiatives, organizing follow-up conferences and meetings, and producing engaging events, reports, and opportunities to capture attention and inspire action. Different target audiences should also be considered for these activities.

Data sharing: To refine and adjust targets effectively, participants suggested sharing data and aligning standards; the industry can track progress, update benchmarks, share findings, and make necessary adjustments. This collaborative effort can prevent fragmented approaches and ensure consistency across different jurisdictions.

Build trust and transparency: Developing a publicly available benchmarking database was proposed to build trust and transparency within the industry. This resource would allow stakeholders to see tangible progress and understand the impact of their efforts.

Focus on practical and tangible actions: The Summit underscored the need for practical and tangible actions. Setting clear, tactical goals and identifying yearly milestones can help maintain momentum and ensure continuous progress.

Share insights with interested parties: Insights from the Summit should be shared with industry; that is the intended goal of this document.

Consider re-engaging through another summit: The Summit brought together key stakeholders with subject matter expertise and ability to drive action. There is value in re-convening such a group as part of larger, multi-faceted efforts.

Maintain partnerships and avoid silos: Existing collaborations and partnerships should be fostered and expanded; by working together we can accomplish more and avoid overlap and confusion for the market.

By continuing these conversations and implementing the suggested actions, industry can make substantial strides towards reducing embodied carbon and achieving net zero carbon and other sustainability goals. The collective effort of all stakeholders, guided by clear objectives and supported by robust data, will be essential to drive meaningful change.

CAGBC will continue to support efforts to reduce embodied carbon by convening stakeholders and otherwise supporting industry initiatives. We will continue to provide outreach, develop training, and align LEED and ZCB requirements, guidance and tools with industry norms. Efforts will be made to leverage and share data and insights gained from certified projects.

What was missed at the Summit?

Participants recognized that one day was not sufficient to address all issues, and that some voices were not represented. Missing elements included:

- Not all stakeholder groups were represented in the room: missing were landscape architects, manufacturers, financial institutions, small to mid-sized local government, and wbLCA tool developers, among others.
- There wasn't an exploration of the pros and cons of using a whole life carbon approach, in which operational and embodied carbon are considered in tandem (see Figure 1 below). A whole life carbon approach helps ensure that all carbon impacts are considered throughout a building's lifecycle, from construction to demolition, and that emissions aren't simply being shifted between life cycle phases.
- The potential of building retrofits and adaptive reuse was not sufficiently explored. Although the industry may currently view retrofits as less affordable due to unfamiliarity, they can often be a lower-cost and faster alternative to the traditional approach of rezoning, demolishing, and building new. Retrofits also conserve resources, minimize landfill waste, and support local jobs associated with on-site renovation.
- There was no discussion of how wbLCA might be expanded from structure and envelope materials to include interior elements, mechanical-electrical-plumbing (MEP) systems, and siteworks.
- New technologies, like carbon sequestration, could not be addressed in the limited time.
- Value creation opportunities could not be fleshed out.
- Science-based target tracking was not explored.
- Lastly, it was recognized that considerations of the impacts of changing political climates were not discussed, nor how to make the solutions politically resilient.

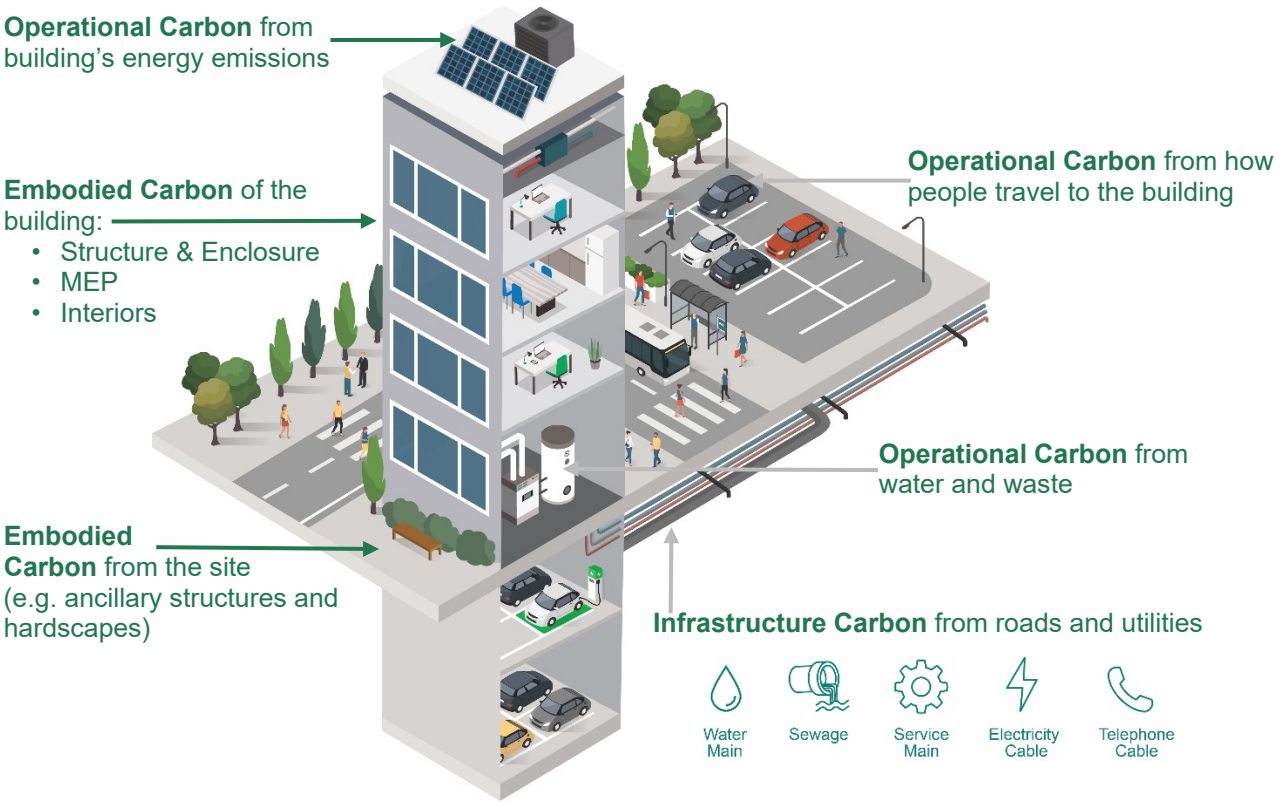

Figure 2 - Key sources of building-related carbon emissions. The Summit was only able to focus on the embodied carbon of the building itself. Participants also noted that wbLCA has been focused on structure and enclosure only to date.

Conclusion

The National Embodied Carbon Summit was a comprehensive platform for industry leaders, policymakers, researchers, and other stakeholders to collaborate on the critical issue of embodied carbon reductions in Canada's buildings. The Summit discussions and findings highlighted the urgency, and the multi-faceted approach needed to address embodied carbon effectively.

The Summit underscored the need for an approach that spans policy, education, research, and industry. Reducing embodied carbon is not just about technological advancements but also about systemic change in how the construction industry operates. A recurring theme was the need for a unified national framework aligning standards, policies, and targets. Such a framework would provide guidance and consistency across the industry, facilitating and coordinating efforts.

Participants noted the need to expand conversations on embodied carbon and to encourage public endorsement of supportive policies. They acknowledged that awareness of embodied carbon is still very limited, and we must do more now to reach those not engaged in the discussion. While the issues are complex, the climate emergency conversation must be reframed to include embodied carbon. At this early stage, participants were encouraged looking for quick wins, understanding that we might not always reach consensus, but collaboration is key to advancing embodied carbon reductions. Lastly, it was noted that while there are data quality and availability concerns, industry needs to move forward and improve on the available data over time.

There was exceptional interest and passion shown by the Summit participants, evident in social media sharing and conversations at CAGBC's Building Lasting Change conference. Summit organizers hope this optimistic momentum will carry forward in future conversations and efforts from participants and everyone championing reductions in embodied carbon.

By addressing the issues identified in this document comprehensively and collaboratively, Canada can make substantial progress in reducing embodied carbon in buildings. The insights and recommendations from the National Embodied Carbon Summit provide a clear path forward, emphasizing the importance of a unified approach, continuous education, robust research, reliable data, financial incentives, and industry capacity building. The journey towards a sustainable built environment is challenging but achievable with the collective efforts of all.

2024 National Embodied Carbon Summit Attendees – photo courtesy of Ryan Zizzo, Mantle Developments