Pathways to Net-Zero Embodied Carbon in Buildings: Barriers and Solutions to Effective Policies and Actions

CHALLENGE-TO-IMPLEMENTATION WORKSHOP REPORT

THE UNIVERSITY OF BRITISH COLUMBIA
Sustainability Hub

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AUTHORSHIPS

This report was prepared by the University of British Columbia (UBC) Sustainability Hub as part of the “Pathways to Net-Zero Embodied Carbon in Buildings" project, which seeks to build local and regional collaborations and partnerships to identify immediate barriers and challenges to implementing embodied carbon policies and actions. The report describes the outcomes of the Pathways project's Challenge-to-implementation Workshop conducted on July 18, 2024.

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The cover photo of the Exterior of the Evolve passive house at Wesbrook Village is courtesy of Paul Joseph / UBC Brand & Marketing.

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DISCLAIMER

The opinions, recommendations, and any errors in this report are those of the authors and do not necessarily reflect the views of the participating municipalities or the University of British Columbia. Input from municipal staff does not necessarily represent the official position of their respective organizations.

LAND ACKNOWLEDGEMENT

The Sustainability Hub office is located at the UBC Point Grey campus, situated on the traditional, ancestral, and unceded territory of the xʷməθkʷəy̓əm (Musqueam). As part of the larger UBC community, we are guests and settlers on the traditional, ancestral, and unceded territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh (Squamish), Seĺílwitulh (TsleilWaututh), and Syilx (Okanagan) Nations.

In our pursuit of sustainability, climate action and climate justice, we understand that protecting human rights is indelibly woven into environmental protection and sustainability.

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EXECUTIVE SUMMARY

The UBC's "Pathways to Net-zero Embodied Carbon in Buildings" is a two-year project led by the UBC Sustainability Hub. The project aims to build local and regional collaborations and partnerships to identify immediate barriers and challenges to implementing embodied carbon policies and actions and to develop solutions to advance along the pathway to Canada's net-zero carbon emissions targets between 2030 and 2050. The project, funded through the Climate Action and Awareness Fund, part of the Government of Canada's Environmental Damages Fund, supports the Net-Zero Advisory Body's (NZAB) mandate to advise the federal Minister of Environment and Climate Change in achieving the 2050 net-zero GHG emissions goal. One of the project activities is workshops conducted with representatives from local, provincial, and federal government agencies, industry, and academia.

The Challenge-to-implementation Workshop was a standalone session to explore the challenges of implementing embodied carbon reduction policies in municipalities across British Colombia. The workshop was run and facilitated virtually via Zoom on July 18, 2024, by the UBC Sustainability Hub.

The key objectives of the workshop were as follows:

- Review Policies: Gather the latest information on BC municipal policies for measuring, reporting, and reducing embodied carbon in construction, including current and upcoming requirements.
- Identify Challenges and Successes: Understand municipalities' difficulties and successes in implementing embodied carbon reduction policies, as well as lessons learned.
- Explore Solutions: Discuss solutions to key challenges, identify support and resources needed by local government staff, and develop strategies for effective implementation in other municipalities across BC.

Prior to the workshop, the Pathway project team collected information from participants to understand the current status of embodied carbon policy across these jurisdictions. The workshop itself facilitated discussions on two overarching areas:

1. Identification of Municipal Procedures and Protocols for Successful Implementation: In the first activity, participants shared their experiences with procedures and protocols within their municipalities for successfully delivering embodied carbon policies. The responses were thematized into five categories: leadership, staff capacity and training, assessment, communication, and feedback mechanisms.
2. Identification of Current Implementation Challenges and Potential Solutions: In the second activity, participants discussed the challenges and barriers to implementing their current or future embodied carbon policies. They classified these challenges and discussed solutions.

The first discussion mainly centered on leadership and communication categories and participants shared strategies for increasing projects' LCA reporting, using low-carbon materials, and engaging the public, suppliers, and designers on the concepts of embodied carbon emissions and associated reductions. In the assessment category, cities highlighted useful tools and resources for implementing new policies. There was less emphasis on hiring, staff training, and feedback mechanisms. External resources were found to be very helpful to support the municipalities with staffing shortages. For feedback mechanisms, events of various kinds with the public and feedback from the council were discussed.

In the second discussion, workshop participants listed policy implementation challenges and grouped them into thematized categories, and discussed each category. Participating municipalities had taken different approaches and were at different stages of policy implementation, therefore, the challenges were quite varied. Key issues identified included:

1) Limitations of staff capacity and training.

2) Lack of leadership or support from provincial and federal governments.

3) Lack of a low-carbon product supply chain in Canada.

4) Barriers and limitations of industry buy-in.

Participants briefly discussed solutions, noting the importance of raising public awareness about embodied carbon, involving the industry early in policy development, coordinating among municipalities in the absence of higher-level leadership, and sharing resources and staff.

The insights and recommendations collected from this workshop enhanced the Pathway project team's understanding of current municipal challenges in maturing policies related to embodied carbon. This information will serve as foundational knowledge for future knowledge mobilization, policy recommendations, and discussions, as well as additional investigations into the identified challenges. The Pathway project will hold further workshops with municipalities and industry professionals to explore these ideas.

TABLE OF CONTENTS

GLOSSARY OF TERMS

Consumption Based Emissions Inventory (CBEI): a calculation of all of the greenhouse gas emissions associated with producing, transporting, using, and disposing of products and services consumed by a particular community or entity in a given time period (Urban Sustainability Directors Network, 2024).

Embodied Carbon Emissions: Total emissions associated with materials and products in a built asset throughout a part or all building life cycle stages. These emissions exclude operational and water use.

Environmental Product Declarations (EPD): Third-party-verified documents report the environmental impacts of a product. They often represent impacts associated with raw materials extraction, products manufacturing, and transportation and distribution (NRC, 2022).

Life Cycle Assessment (LCA): A systematic set of procedures for compiling and examining the inputs and outputs of materials and energy, and the associated environmental impacts directly attributable to a product, including buildings and their materials, throughout its life cycle (NRC, 2022).

Life Cycle inventory (LCI): A phase of LCA including the data collection and quantification of inputs and outputs associated with a product or process throughout its life cycle (NRC, 2022). Such inputs and outputs include energy, raw materials, other physical inputs, and emissions to air, land, and water (RMI, 2023).

Materials Carbon Accounting: Embodied carbon emissions from materials production and construction phases.

Operational Carbon: Emissions associated with energy used to operate buildings.

Part 3 Buildings: In the British Columbia Building Code, buildings classified as residential, office/service, retail), or medium- and high-hazard industrial major occupancies that exceed 600 square metres in building area or exceed three storeys in building height (BC Building Code 2018, 2022).

Part 9 Buildings: In the British Columbia Building Code, buildings less than 3 storeys in height, with a building footprint not exceeding 600 square metres (BC Building Code 2018, 2022).

Whole Building Life Cycle Assessment (WBLCA): LCA applied to a whole building.

ABBREVIATIONS

BCBC | British Colombia Building Code

BP | Building Permit

C&CP | Campus and Community Planning

CEA | Community Energy Association

DP | Development Permit

ECCC | Environment and Climate Change Canada

EPD | Environmental Product Declaration

GHG | Greenhouse Gas

GWP | Global Warming Potential

LCA | Life Cycle Assessment

LCI | Life Cycle Inventory

NRC | National Research Council Canada

NRCan | Natural Resources Canada

UBC | University of British Columbia

WBLCA | Whole Building Life Cycle Assessment

UBC | University of British Columbia

WBLCA | Whole building life cycle assessment

ZCSC | Zero Carbon Step Code

ZEIC | Zero Emissions Innovation Centre

BACKGROUND

In Canada, buildings rank as the third-largest contributor to the country's total greenhouse gas (GHG) emissions, accounting for 12% of national emissions, following the transportation and oil and gas sectors (ECCC, 2022). However, this total only encompasses operational emissions, and is expected to rise to 18% if embodied carbon emissions are included (NZAB, 2023). Embodied carbon emissions refer to the GHG emissions produced from the energy used for raw material extraction, manufacturing, transportation, installation, maintenance, and disposal of building materials.

The majority of a building's embodied carbon emissions are generated during the production of its materials and components, including raw material extraction and transportation throughout the supply chain, and during the building's construction. Unlike operational carbon emissions, which can be reduced through post-construction efficiency updates, there is very limited opportunity to decrease embodied carbon emissions once the building is constructed.

Until recently, most policies and standards have focused on reducing buildings' operational emissions. However, as buildings become more and more energy-efficient, embodied carbon emissions associated with the manufacture and use of materials are gradually becoming a more significant proportion of total building-related emissions. Between 2022 and 2050, embodied carbon could represent over 90% of a new Canadian building's total emissions (CAGBC, 2021). Embodied carbon in buildings, therefore, needs immediate actions to avoid undermining GHG emissions reductions from energy efficiency.

Unlike a number of European countries, Canada lacks national-level regulations and standards to assess carbon emissions of buildings and construction products. Instead, local municipal governments are at the forefront of these efforts, developing policies that address regional variations in building types and construction practices. However, these local policies often face challenges in implementation due to limited resources, technical expertise, guidance, and coordination from higher levels of government, etc.

INTRODUCTION

The UBC's "Pathways to Net-zero Embodied Carbon in Buildings" is a two-year project led by UBC Sustainability Hub to address challenges and pilot innovative solutions to reduce embodied carbon emissions from buildings. Fostering local and regional collaborations and partnerships, the project aims to identify immediate barriers and challenges to implementing embodied carbon policies and actions. Furthermore, it aims to develop solutions such as policy changes, education and training, tools and resources, and governance to advance towards Canada's 2030 and 2050 carbon emissions reduction targets.

Key Objectives:

1. Identify barriers and challenges to the implementation of local and regional policies and regulations to reduce embodied carbon emissions from building materials.
2. Identify and develop potential solutions to urgent challenges through collaborative and applied research projects, building on the collective expertise and experience of government, Industry, and academia.
3. Create pathways or models to pilot and test proof-of-concept policy solutions and analyze their effectiveness, as well as related benefits, constraints, and trade-offs.
4. Create educational and skills development materials and activities around policies and regulatory barriers and solutions, to increase capacity and inform and motivate change in government and Industry.

Strategic Workshops:

In order to meet the project objectives, one of the key activities was to run collaborative workshops and exchange sessions with regional experts and policymakers to understand the issues and barriers to establishing effective embodied carbon reduction policies and practices and explore potential solutions. The first series of strategic workshops, "Challenge-to-Solutions Workshops", were held in the fall of 2023 and focused on the identification of key challenges with significant impact in the field (Challenge-to-Solution Workshop, 2024). An important outcome from the first series was recognizing that while developing embodied carbon policy is important, successful implementation, particularly at the municipality level, is the critical next step. In the summer of 2024, the Pathways project team organized a second workshop, "Challenge-to-implementation Workshop", with BC municipalities to discuss challenges in the implementation phase.

MUNICIPAL CHALLENGE-TO-IMPLEMENTATION WORKSHOP:

The Challenge-to-Implementation Workshop was conducted virtually via Zoom on July 18, 2024 and led by the UBC Sustainability Hub. It aimed to:

- Collect and review current updates on BC municipal policies for measuring, reporting, and reducing embodied carbon in construction, along with their current and planned requirements.
- Understand the difficulties and successes that cities are encountering as they implement policies to reduce embodied carbon in construction, including the successes and lessons learned.
- Explore potential solutions to key challenges, identify the support and resources available to and needed by local government staff, and strategies for more effective implementation across British Columbia.

Prior to the workshop, the Pathway project team created and distributed a collection information template to municipalities with active embodied carbon policy to conduct background research on the current status of embodied carbon policies developed across BC (Appendix II). A total of seven jurisdictions were invited to the workshop, and three municipalities—City of Vancouver, District of North Vancouver, and City of Port Moody, as well as UBC Campus and Community Planning (C&CP)—responded to the template. Participants were provided with a two-page backgrounder before the workshop (Appendix III). Additionally, the Pathways project team discussed the workshop topics via individual phone calls with representatives from New Westminster, Nelson, and UBC C&CP who could not attend the workshop. The responses from these conversations, along with the collected information from the templates, are integrated into the workshop discussion summary.

The workshop followed a structured agenda:

1) Introduction: Introduction of Pathways project team and workshop participants followed by the overview of the Pathways project, workshop objectives, and agenda
2) Municipal Policy Overview: Overview of embodied carbon-related policy and efforts across municipalities participating in the workshop, collected from the templates.
3) Activity 1: A group discussion with a whiteboard activity where participants were asked to share their current or expected procedures and protocols within their organization for implementing embodied carbon policies within their municipalities.
4) Activity 2: A second group discussion with a whiteboard activity where participants discussed and categorized the challenges, they faced in implementing embodied carbon policies within their municipalities.
5) Wrap-up Discussion: A wrap-up discussion sought potential solutions and strategies from the participants to address the challenges discussed.

The Workshop had a total of 9 participants, including 7 municipal representatives from the City of Vancouver, the City of Nelson, UBC C&CP, the City of Victoria, the District of Squamish, District of North Vancouver, and City of Port Moody, and two staff from the BC Zero Emissions Innovation Centre managing programs connected to embodied carbon emissions reductions. Throughout activities, group discussions, and wrap-up session, workshop participants shared their individual experiences within their municipalities and the challenges they faced, informed by their professional experiences, and briefly brainstormed the possible strategies and solutions to address the key challenges and barriers they have for policy implementation at the local government level.

MUNICIPAL POLICY OVERVIEW

Municipal policies targeting the reduction of embodied carbon emissions in buildings are still very new in Canada and BC. Within the workshop participants, four municipalities have embodied carbon policies in place, and three municipalities are still developing policies and trying to proactively address implementation issues.

All the policies follow the British Columbia Building Code (BCBC) to explicitly address two categories of buildings, simple buildings and complex buildings (as defined within the Building Code, based on size and use). These are commonly referred to as:

- Part 3 Buildings: buildings taller than three storeys or with a footprint greater than 600 square metres, used for residential, commercial, institutional, assembly or industrial purposes.
- Part 9 Buildings: buildings three storeys and under, with a footprint smaller than 600 square metres, used for residential, commercial or low-hazard industrial purposes.

Cities with Active Embodied Carbon Policies

The following four cities already have in place policies for embodied carbon reporting. The Pathways project team sent out templates to these cities to collect information about the implementation of these policies. The responses were collected and then presented at the workshop by the Pathways project staff.

City of Port Moody

In the City of Port Moody, developers must submit a Sustainability Report Card (SRC), which is a checklist of activities completed on a point system, required for rezoning, heritage revitalization agreement, heritage alteration permit, and some development permit applications. The embodied carbon section includes the reuse of buildings, whether onsite or relocated. It also includes voluntary life cycle assessment reporting, but because of the cost, it is rarely included in applications. Instead, many choose to use wood frames and low-carbon concrete and to source materials locally. Builders in Port Moody have shown little opposition to embodied carbon regulation during builder consultations.

City of Vancouver

In the City of Vancouver, the leadership team placed an embodied carbon emissions target in the Climate Emergency Action Plan. The Vancouver Building Bylaws (VBBL) currently requires all Part 3 buildings to submit an Embodied Carbon Design Report, which requires a project to define a baseline or follow an absolute carbon intensity value. Whole building life cycle assessments (WBLCAs) must also be included with the building permit submissions.

For Part 9 buildings, the NearZero Stream 2 offers financial compensation for low-rise homes, and incentives allow additional height and density in mass timber rezoning applications. The mandatory compliance measures in the Vancouver Building Bylaws will be amended in 2025.

District of North Vancouver

In the District of North Vancouver, the Climate Ready Rezoning Policy requires a Climate Ready Design Strategy to be submitted at the time of detailed rezoning application for new Part 3 buildings. This includes preliminary calculations for embodied emissions (WBLCA), a description of specific measures that will be explored during design to reduce embodied emissions, and other sustainability measures. Applicants are required to submit an updated WBLCA at the building permit application stage with updated calculations and identifying strategies that were implemented to reduce embodied emissions. During the building permit application stage, building plan reviewers receive an updated emissions report that includes refrigerant emissions.

The District's Climate Ready Municipal Buildings Policy is a separate policy that requires new district-owned buildings to meet either the Canada Green Building Council (CAGBC) Zero Carbon Building Design Standard or the Passive House Standard. The CAGBC Standard requires measurement and minimization of embodied emissions through design strategies and material choices.

UBC Campus and Community Planning

At the University of British Columbia, UBC's Green Building Action Plan has the goal of a 10% reduction of embodied emissions from a UBC-defined baseline in institutional buildings. With its target set to increase to 40% for Part 9 buildings and 50% for Part 3 buildings by 2030, UBC is leading the province with its reduction goals.

For Part 9 buildings, the Residential Environmental Assessment Program (REAP) mandates embodied carbon reporting on the Vancouver campus. All projects on both campuses must comply with the UBC Whole Building LCA Guidelines and score three out of five points in the Building Life-Cycle Impact Reduction credit under the LEED Gold certification. Residential buildings require one design workshop, and institutional buildings require three workshops, one of which must include an embodied carbon analyst in the design process.

Cities that are developing Embodied Carbon Policies

The following three cities are in the process of creating and implementing new policies and pilot projects regarding embodied carbon. Their participation in the workshop discussions was based on their future plans and expected implementation strategies.

City of Nelson

In the City of Nelson, staff are working on a proposal to require LCA reporting for development permit applications for Part 3 buildings. This would mean that all Part 3 buildings will need to have a) A1-A3 basic LCAs completed for development permit approval; and b) a full LCA completed prior to approval of occupancy. City staff are working to ensure that these new requirements will include support for both the added administrative work to review and approve these LCA submissions, as well as for the local vendor community to effectively meet the LCA requirements..

City of Victoria

In the City of Victoria, officials are planning to highlight the importance of embodied carbon emissions reductions in the upcoming updates to the Official Community Plan (OCP) and Climate Leadership Plan. City staff are examining the feasibility and impact of several possible policy opportunities including a) an embodied emissions lens in its corporate purchasing policy, b) developing information for Part 9 builders regarding low-carbon materials, c) requesting LCAs for certain buildings during permitting, and d) providing grants for embodied carbon assessments of Part 9 buildings using the Material Carbon Emissions Estimator (MCE2) tool.

District of Squamish

In the District of Squamish, the leadership has included embodied carbon emissions requirements in the Community Climate Action Plan through waste management strategies. However, Squamish and Whistler worked with the Community Energy Association (CEA) to produce the Embodied Emissions Guide for developers in 2022. Squamish currently does not have a plan for WBLCA reporting. Squamish is currently focusing on operational emissions and has an interest to develop embodied carbon policies in the future.

WORKSHOP GROUP DISCUSSION SUMMARY

ACTIVITY 1: SUCCESSFUL IMPLEMENTATION

The first group activity was conducted on a whiteboard via the Zoom platform. Participants were asked about the policies and procedures within their municipalities to successfully deliver embodied carbon reporting and achieve reduction targets.

Participants were then asked to categorize their responses into six categories: leadership, staff hiring and training, assessment, communication, feedback mechanisms, and others. They first wrote bullet point responses on a Zoom platform Whiteboard for ten minutes and then engaged in a group discussion about the topic. Table 1 compiles the notes from each municipality. Following the table, the summary of discussion and information collected from the templates are provided for each municipality.

Table 1: A summary table detailing the current policies, strategies, and protocols that the participants have taken to deliver embodied carbon reporting and reduction target goals. The answers were categorized by leadership, hiring/staff training, assessment, communication, and feedback mechanisms.

Guiding Question: How do you successfully implement policies and procedures to deliver embodied carbon reporting and reduction goals? If implementation has not yet begun in your city, how do you anticipate doing so?	
Leadership	
City of Port Moody	Our Council is very keen on using the Sustainability Report Card (SRC) to get the community benefits they want to receive from a development.
City of Vancouver	Embodied Carbon target was incorporated into the Climate Emergency Action Plan. Embodied Carbon Strategy specifies the actions to meet the target. Embodied Carbon Guidelines that are now adopted by the National Research Council (NRC) as the National WbLCA Practitioners Guide, which is key in alignment nationally and setting up successful benchmark and reduction targets.
City of Victoria	▪ Highlighting Embodied carbon reduction as a priority in upcoming high-level planning documents: Official Community Plan and Climate Leadership Plan ▪ Investigating adding an embodied carbon lens to the Corporate Procurement Policy
District of Squamish	Incorporating embodied carbon into our climate action plan to provide direction and give a mandate. Our Official Community Plan (OCP) update will dovetail with our Community Climate Action Plan (CCAP)
UBC Campus and Community Planning	▪ Getting support and approval from the Council and executive team as well as piloting measures that go beyond minimum building code can help demonstrate leadership. ▪ Connecting to leadership through overall Climate Action and providing updates and reminders on importance at all opportunities. Include low-carbon archetypes in planning

Staff Capacity, Communication and Training	
City of Nelson	Not sure there will be City support to hire staff for bringing LCA requirements into development permit applications in Nelson. There may only be a few of these a year as we are a small municipality. However, there are concerns amongst staff that this will mean an increase in workload for existing staff and in an area that they are unfamiliar with. It will be important to find an effective way to reduce the work required for implementing these changes.
City of Port Moody	We have two staff members familiar with embodied carbon and LCA to assess the Sustainability Report Card.
City of Vancouver	Currently, we have one full time staff and we're planning to hire another full-time staff in the Sustainability Group. There's about 0.5 FTE support from other Sustainability Group staff for embodied carbon reviews.
District of North Vancouver	Our initial roll-out involved webinars with industry experts, staff guides, and applicant guides, but additional and regular training is critical to support new and changing staff.
District of Squamish	Very unlikely to get new staff in a smaller community. We must integrate the work into existing staff's work plans.
UBC Campus and Community Planning	Creating a work plan for specific existing staff to manage the development of policy and the review of submittals. Include DP for staff related to embodied carbon.
Zero Emissions Innovation Centre	Additional support is almost always required. If training existing staff is the option (this is usually the realistic solution based on available grants), outside guidance and support may be needed to integrate into existing workplaces and workflows.

Assessment	
City of Port Moody	Currently exploring baseline and mandatory sections to fill out in the Sustainability Report Card. Our embodied emissions section could be one of these mandatory areas.
City of Vancouver	Planning to develop a reporting and compliance platform to reduce efforts on submission and compliance assessment.
City of Victoria	▪ Examining the use of the development approval information area to request LCAs for certain TBD building types ▪ Investigating the opportunity to offer grants for Part 9 embodied carbon assessments (MCE2 tool)
District of North Vancouver	Our initial roll-out involved webinars with industry experts, staff guides, and applicant guides, but additional and regular training is critical to support new and changing staff.
District of Squamish	Very unlikely to get new staff in a smaller community. We must integrate the work into existing staff's work plans.
UBC Campus and Community Planning	Creating a work plan for specific existing staff to manage the development of policy and the review of submittals. Include DP for staff related to embodied carbon.
Zero Emissions Innovation Centre	Additional support is almost always required. If training existing staff is the option (this is usually the realistic solution based on available grants), outside guidance and support may be needed to integrate into existing workplaces and workflows.

Communication	
City of Nelson	It would be interesting to find an effective way to connect various municipalities that are implementing LCA requirements through land use policy (Vancouver, North Vancouver, Nelson, etc.) to collaborate on this work, especially during the initial implementation phase. Likely the challenges faced will be similar.
City of Vancouver	• Working with Carbon Leadership Forum BC for external capacity building and communication. • Reaching out to the industry for input as changes are proposed.
City of Victoria	Consider creating simple supporting information for builders of Part 9 buildings to guide them in choosing lower carbon materials.
District of Squamish	This has been identified as a major ongoing task for the community, industry, etc.
District of North Vancouver	Using clear presentation slides to communicate embodied emissions, and creating staff and applicant guides with FAQs, definitions and examples.
Zero Emissions Innovation Centre	Educating the council, key builders and developers so the terms become familiar, and targeting energy advisors to help continue this conversation (especially for Part 9 buildings projects)

Feedback Mechanism	
City of Vancouver	• Organizing workshops and events leading to Vancouver Building Bylaw (VBBL) 2025 updates. • Direct contact to Embodied Carbon Planner is provided to project applicants.
Zero Emissions Innovation Centre	Telling stories and elevating projects that show cost-neutral low-carbon projects or realistic low-carbon solutions to support embodied carbon works while continuing to prioritize comfort.
Others	
City of Nelson	With a small vendor community, it will be important to find ways to support local vendors and developers in meeting these new requirements for LCAs in development permits.
District of North Vancouver	Starting with reporting as the first step is a relatively low-barrier move for the industry, followed by encouraging higher performance where possible

In the whiteboard activity, participants wrote about policy updates from their municipalities and successful strategies within six categories. Following is a summary of the discussion that followed, organized by categories.

Leadership

A participant from Vancouver wrote about how the Climate Emergency Action Plan included the Embodied Carbon Strategy to meet the Embodied Carbon Target. The associated Embodied Carbon Guidelines have now been adopted by the National Research Council (NRC) as the National WBLCA Practitioners Guide, which is important for national alignment and setting a target and benchmark.

A UBC participant wrote about how the Council showed support for pilot measures that went beyond building code. A participant from Port Moody said that the city is considering mandating certain sections of their Sustainability Report Card and that this mandating could include the embodied carbon section. Participants from Victoria and Squamish both wrote about how their respective cities are planning to highlight embodied carbon in upcoming policies and plans.

A participant from Victoria spoke about how the city is leaning towards mid-rise six-story housing to be the key building type for future growth, and this will hopefully enable wood frame construction over concrete. He further added that Victoria sees the City of Langford's Low Carbon Concrete Policy as a successful model. Langford's policy mandates that all buildings over 50 cubic metres must use low-carbon concrete. He admires the policy because it targets specific materials and is not as burdensome as LCAs.

He added that while rezoning requirements have traditionally been a common method for gathering emissions data or mandating sustainability features, new mechanisms might be needed for embodied carbon reporting as the City moves towards more consistent zoning, which will result in fewer rezoning processes.

A participant from UBC added that UBC does not rezone individual sites, so UBC C&CP is updating the campus plan to use standard archetype buildings found on campus and encourage the use of materials like mass timber. In a separate conversation, another UBC staffer attributed successful leadership to the level of detail within the building code and how clear it is written. Participants from both North Vancouver and UBC C&CP spoke about using the City of Vancouver's reporting requirements and standardized templates as a model because of its clear and detailed language.

A participant from Nelson gave an update about their next official community plan, in which they are exploring the idea of having one development permit area for the whole city that will cover all Part 3 buildings. This would mean that all Part 3 buildings will need to complete a) a basic LCA (including only stages A1-A3 life cycle stages, i.e., raw material extraction (A1), transportation to manufacturer (A2), and manufacturing (A3), for the development permit and b) a full LCA for the occupancy permit.

Staff Hiring and Training

The activity notes indicate that many cities have a hard time hiring more staff. This is especially true of smaller cities,

The moderator then posed the question, "What have you noticed about getting the public to actually understand the messaging around embodied carbon".

A participant from Squamish said that conversations with the public are often too broad and end up becoming about operational carbon, because that is what people are familiar with. He said there is a language issue around embodied carbon, because the public has not had enough exposure to the terminology needed to have informed discussions on the policies. Participants cited Nelson as an example to follow for public engagement, because the general public in Nelson has been taught sufficient language to participate in policy feedback mechanisms in a useful way.

A participant from ZEIC noticed that residents struggle to participate in conversations with more technical details, such as LCAs and other reporting methods. Several participants said approaching the conversation from a materials perspective made the most sense when doing initial public education, because this strategy is easier to understand in a non-technical way. A participant from Victoria spoke about how, in open houses with the public, he noticed that people seemed to support using "natural materials", such as wood. A participant from UBC also spoke about how people in the community wanted wood construction, so the public messaging from UBC C&CP is linking wood heavily with embodied carbon reductions. She spoke about pushing this conversation further to encourage the use of climate-friendly wood.

Feedback Mechanisms

The activity notes and discussion for feedback mechanisms were limited. A participant from the City of Vancouver wrote about how the city has been holding workshops and events for the public in preparation of the 2025 updates to the Vancouver Building Bylaws. Project applicants have also been given direct contact with the city's Embodied Carbon Planner. A participant from Victoria spoke about the use of public engagement events such as open houses, which was mentioned above in the communication section. A participant from UBC spoke about how UBC C&CP provides the university council with updates and reminders, giving the council members a chance to comment.

Another participant from UBC said that their developers have asked for more coordination between requirements from jurisdictions across BC. He added that currently UBC and the City of Vancouver are now collaborating on UBC's future policy changes.

Conclusion

Discussion in this activity focused on the topics within the Leadership and Communication categories. Participants discussed strategies that municipality leadership can take to a) receive more LCAs for building projects and b) enable the greater use of low-carbon materials. They also spoke of the importance of strategies for public engagement to communicate the concept of embodied carbon to the general public, suppliers, and designers. Regarding Assessment, many cities wrote about tools they are considering using for new policy implementation.

There was less said regarding the topics within Staff Hiring and Training and Feedback Mechanisms. External resources were found to be very helpful to help with staffing shortages. For Feedback Mechanisms, events of various kinds with the public were discussed, as well as feedback from councils.

ACTIVITY 2: CHALLENGES AND SOLUTIONS TO IMPLEMENTATION

The second group activity was conducted as another Zoom whiteboard session and asked participants about the challenges linked to implementing embodied carbon emissions reduction policies within their municipalities and the strategies or solutions municipalities have developed to address these challenges. This activity aimed to uncover common challenges and understand the various obstacles municipalities encountered. First, the participants wrote down the challenges they faced without specific themes. Once this was done, they reviewed the challenges and categorized them into themes.

Table 2 compiles the challenges suggested by participants in response to the first question of activity 2. Due to time constraints, the discussion on the second question, i.e., strategies and solutions, was brief; however, the challenges identified offer valuable insights for future exploration and resolution.

Table 2: A table detailing challenges that were faced by the municipalities when implementing embodied carbon policies. They were categorized by themes including Staffing Issues, Industry Capacity, Lack of Upper Tier Government Leadership, Lack of Regulatory Mechanisms, Balancing Priorities, Perception of Risks and Costs, Supply Chain Issues, and a Holistic Approach to Life Cycle Carbon.

Guiding Question: What challenges have you encountered in implementing embodied carbon policies within your municipality? What strategies or solutions have you developed to address these challenges?	
Staff Capacity, Communication, and Training	
City of Nelson	The planning department will ultimately house the land use policies that require LCAs for development permits. In small municipalities, these departments are already overloaded. There needs to be care taken to bring in such requirements in an efficient and simple flow such that there will not be pushback/resistance. The benefits need to be clearly explained, and there needs to be support offered for the developers/initial vendors navigating these requests until capacity/understanding is built.
City of Port Moody	We only have one person assessing the Sustainability Report Card. If they leave, someone else would need to be completely re-trained.
City of Vancouver	Staff capacity as additional requirements are added to the review process.
District of North Vancouver	• Staff confusion as to the rationale for embodied carbon reporting without performance targets. • Limited capacity to provide recurring staff training. • Limited staff capacity to review program implementation.
District of Squamish	Limited capacity to provide recurring staff training.
UBC Campus & Community Planning	Limited staff capacity to review program implementation.
Industry Capacity and Adaptation	
City of Nelson	It would be interesting to find an effective way to connect various municipalities that are implementing LCA requirements through land use policy (Vancouver, North Vancouver, Nelson, etc.) to collaborate on this work, especially during the initial implementation phase. Likely the challenges faced will be similar.
City of Vancouver	• Developers' concerns regarding the capacity of structural engineers and the supply chain, along with the challenge of overwhelming the industry with additional requirements. • Lack of a governing body to accredit WBLCA professionals and acceptable tools
Zero Emissions Innovation Centre	A lot of change is happening in the building sphere, which has traditionally been, and perhaps still is, quite risk-adverse. Keeping up with everything is overwhelming, especially in an industry with a poor history of mental health supports.

Provincial and Federal Government Leadership	
City of Nelson	What support is there for early adopters of LCA requirements in development permit processes? If we are paving the way or providing early investigative efforts into this area, how can higher-level organizations support our efforts?
City of Vancouver	• Developers' concerns regarding whether regulating embodied carbon falls under the city's responsibility rather than that of the provincial and federal governments. • Supporting the supply and innovation in low-carbon materials
City of Victoria	Need for provincial leadership.
District of North Vancouver	• There is no standardized building design for low embodied emissions. • Lack of regulations to reduce GHG emissions associated with the manufacturing of concrete and steel. • Lack of standardized reporting templates, and can cause confusion for the development industry. • Embodied emissions are not addressed in provincial and national codes.
District of Squamish	Embodied carbon emissions reporting is not part of the Squamish inventory!
Zero Emissions Innovation Centre	Lack of financial support and coordination support from the provincial and federal governments in Canada.

Regulatory Mechanisms and Accountability	
City of Port Moody	The added costs of building homes are a big concern for our Council. They needed a lot of persuasion just to implement the Zero Carbon Step Code, so any data showing minimal additional costs associated with lowering embodied carbon is always helpful in getting policies adopted.
City of Vancouver	Ensuring that the as-built matched the proposed design in the building permit and identifying accountability.
City of Victoria	Lack of regulatory authority for most municipalities.
District of North Vancouver	• Uncertain legal authority for municipalities to require embodied carbon emissions reductions and performance. • Part 9 buildings may have relatively limited resources compared to Part 3 design teams.

Balancing Priorities in Emission Reduction	
City of Port Moody	Putting other priorities first - Now we have received approval for the Zero Carbon Step Code to be implemented in Port Moody, we will now move our focus more towards embodied emissions projects.
City of Victoria	The City encountered pushback on adding more requirements to housing projects when building housing is a key political priority. To address this, we need to educate to gain buy-in and take action simultaneously.
District of North Vancouver	Competing priorities - should limited resources be focused on reducing the bulk of building emissions (e.g., fuel-switching in existing buildings) to meet upcoming GHG reduction targets, rather than on policies that may influence potential emissions from materials used in new constructions?

Perceived Risks and Costs	
City of Nelson	Beyond concerns about the cost of LCA requirements, there seems to be the time, delays and disruptions that these requirements could bring to the development permit process.
City of Victoria	Status quo can slow change within the building industry.
UBC Campus & Community Planning	• The cost or perceived cost due to a "new" requirement is the biggest challenge. • Multiple policies for projects in addition to regulations and complaints from developers.
Zero Emissions Innovation Centre	Things often look worse before they look better (i.e., not even currently included in our inventories), which is not great for morale.

Supply Chain for Low-Carbon Products and Reused Materials	
City of Victoria	• Need for new materials. • Need the development of retrofits and demolition systems to safely reuse materials.
UBC Campus & Community Planning	• Lack of ways to deal with BC's amazing wood products in a truly climate-friendly way. • Lack of a robust supply chain for low-carbon products such as concrete.

Holistic Approaches to Life Cycle Assessment	
City of Vancouver	▪ We are lacking holistic approaches to LCA. We need to: ▪ Collecting data and encouraging reductions from salvage and reuse, as well as designing for deconstruction. ▪ Collecting data and encouraging reductions in construction site emissions. ▪ Developing standards for the reuse of salvaged elements (wood, steel, etc.). ▪ There are growing concerns regarding the exclusion of forestry impacts in wood product Environmental Product Declarations and alignment on assessing and reporting biogenic carbon.
UBC Campus & Community Planning	The quality of LCA studies varies (a representative from the City of Vancouver noted in response, "This concern can be reduced by adopting the new national guidelines").

Throughout the whiteboard activity, participants engaged in a discussion to elaborate on some of the common key challenges. The highlights from the discussion are summarized below, organized by themes.

Perceived Risks and Costs

Based on the activity notes, the implementation of embodied carbon initiatives is significantly affected by perceived risks and costs faced by developers and project teams. In addition to cost premiums, there are concerns about the additional time due to delays and disruptions caused by LCA requirements. Participants noted that the building industry generally prefers to maintain the status quo, which presents a challenge for those trying to implement new policies. The workshop moderator highlighted that the common beliefs regarding increased costs and risks associated with new policies or materials are not always accurate. She referenced mass timber as an example, where initial concerns about higher costs and risks were proven exaggerated over time. She then posed the question to participants: "Do you feel that the perception of cost is specifically tied to actual cost increases, or is there a lack of understanding from the industry about what is being asked of them, along with a general fear of the risks?"

A participant from the UBC C&CP confirmed that developers generally believe that implementing new policies will increase costs. She added that subcontractors may raise their fees for work that is outside their usual expertise or experience. This situation is similar to the initial difficulties encountered when adopting mass timber and LEED certification, where concerns about increased costs were prevalent. She clarified that the perceived costs associated with new policies are not necessarily the same as any actual additional costs that could come from using low-carbon concrete or other new materials.

A participant from Zero Emissions Innovation Centre added that "sustainable" building is often regarded as an added benefit, or "value add," rather than a standard expectation. Because of this perception, sustainable materials are often priced higher, as companies market them as premium products to attract buyers. She suggested that if the industry shifts its perspective and stops viewing these sustainable materials solely as "value adds," their prices could decrease as more people start buying them.

Perceived Risks and Costs

The activity notes reveal that while new guidelines and requirements are being introduced to reduce embodied carbon emissions, the industry's capacity to adapt to these changes is strained. There are significant concerns about support, accreditation, capacity, and the mental well-being of industry professionals.

A participant from Zero Emissions Innovation Centre explained that developers in Vancouver are not enthusiastic about embodied carbon regulations for two main reasons.

First, the initial implementation will incur costs, though these may level out with subsequent projects. Second, the lack of leadership from higher levels of government creates uncertainty, making it difficult to plan and ultimately costing the building community more money.

A participant from the City of Vancouver emphasized the importance of clear and consistent communication and signalling for the industry to plan effectively when regulations are introduced. For example, structural engineers, who are already managing new seismic requirements, will be further overwhelmed by new embodied carbon regulations. Therefore, she stressed that there's a need for clear communication and signalling to help them navigate these challenges.

A participant from UBC C&CP highlighted that an effective communication strategy is to provide case studies relevant to the types of buildings in each municipality, particularly local and Canadian examples, as they offer valuable reference points for developers and stakeholders.

Provincial and Federal Government Leadership

The activity notes indicate several challenges municipalities face in implementing embodied carbon initiatives, largely due to insufficient support and coordination from provincial or national levels of government. Participants noted the need for more support for early adopters of LCA requirements in development permit processes, lack of financial and coordination support at the provincial or national level, and concerns about whether the responsibility for regulating embodied carbon should fall under local or higher-level governments. At the moment, embodied emissions targets or requirements are not included in provincial or national codes, and they are often not included in municipal inventories. Additionally, a lack of provincial-level leadership for low embodied emissions buildings, minimal regulations to reduce GHG emissions from manufacturing, and inconsistent emissions data and reporting make it more challenging for the industry.

In the discussions, participants expressed concerns regarding the role of municipalities in regulating embodied carbon and the potential challenges that arise from this responsibility. A participant from the City of Vancouver highlighted a key point of resistance: uncertainty about whether it is appropriate for municipalities to take on this regulatory role. Additionally, questions were raised about the capacity of the supply chain to accommodate these changes.

Participants highlighted the Federal Greening Government Strategy, noting that while it contains a section on embodied carbon emissions, it does not explicitly include it in the building code, which could lead to delays in implementation. Another participant pointed out that the federal government will eventually focus on procurement, which could increase the use of LCAs and potentially lower their costs through federal contracts although this shift may not occur as soon as desired.

Regulatory Mechanisms and Accountability

To facilitate embodied carbon regulations and gain support from city councils, participants shared that they have to present data that demonstrates minimal financial impact and need to ensure that actual construction aligns with the designs outlined in building permits. They noted that existing policies often exclude certain building types, leaving some applicants without adequate support. However, there are limited options available to address these gaps, as many municipalities face challenges due to a lack of regulatory authority to enforce carbon reduction measures, which complicates their ability to effectively implement and uphold these regulations.

A participant from the District of North Vancouver pointed out that the lack of regulatory power can be a significant barrier. While municipalities can use rezoning policies to encourage reporting and emissions reductions, many are likely hesitant to establish more stringent requirements due to legal uncertainties and the lack of supportive legal opinions. Another participant highlighted her experience discussing the feasibility of municipal regulations on embodied carbon emissions with a legal firm and the various legal challenges that complicated the path forward. Participants also noted that it is uncertain whether gaining the power to enforce regulations would lead to actual emissions reductions in their cities or simply add to procedural complications.

A participant from the City of Vancouver proposed the need for an integrated regulatory ecosystem that aligns resources effectively to avoid duplication.

Such an ecosystem should include a standardized reporting and compliance system, consistent language for the requirements, and educational resources for both government staff and the building industry. Additionally, she highlighted the importance of investing in better data, developing low-impact products, and building a robust industry for assessing and reusing buildings. She suggested creating a roadmap that outlines the roles and resources, available and needed for collective efforts. She referenced the Urban Design Guidelines Embodied Carbon Study,

by Ha/f Climate Design for the Atmospheric Fund, as an example of work led by another municipality that others can learn from. The study looks at the City of Toronto's Urban Design Guidelines and provide an illustrative summary of how contemporary Urban Design Guidelines impact emissions and costs, in order to inform ongoing and future amendments to the city's typological building guidelines.

Supply Chain for Low-Carbon Products and Reused Materials

In the activity notes, participants emphasized the need for new low-carbon materials and the development of systems for retrofitting and demolishing structures to safely reuse materials. Some highlighted that there is a lack of effective methods for utilizing the BC's abundant wood products in a climate-friendly manner, as well as an insufficient supply chain for low-carbon products like concrete.

A participant shared a recent study from the University of Toronto, How to Build More with Less, that showed if Canada were to build enough housing to make it affordable again without changing current construction practices, the country would exceed its climate commitments by 437% (Irving, 2024). The report highlighted the urgent need for new low-carbon materials, as well as materials use efficiency, increased deconstruction, and reuse of existing materials to reduce carbon emissions from the building sector. Another participant confirmed and added that according to the University of Toronto's research, the best way to reduce construction emissions in the next decade is to make technically simple building design changes (e.g., building less underground, building smaller homes, reducing circulation space, avoiding transfer slabs) and to build more multi-unit neighbourhoods.

Staff Capacity, Communication and Training

The activity notes highlight challenges related to staff capacity, communication, and training in municipalities implementing LCA requirements for development permits. Smaller municipalities struggle with overloaded planning departments and need to introduce new requirements efficiently to avoid resistance. Staff capacity issues are evident, with limited personnel available for assessments and training, leading to potential gaps if key staff leave.

The absence of performance criteria also creates confusion for staff regarding the implementation of reporting requirements for applicants. Overall, municipalities propose the need for ongoing training and resources to effectively support staff in managing increased regulatory demands.

Participants discussed various strategies to enhance collaboration and resource sharing among municipalities as solutions to limited staff capacity. A participant from the City of Victoria suggested developing playbooks that municipalities can adapt to their local contexts, helping to avoid duplication of efforts. A participant from the City of Vancouver proposed the idea of shared staff across municipalities, that could potentially be funded by provincial or federal support, to foster the development of regional embodied carbon resources.

Participants agreed on the importance of understanding educational materials and regulatory systems to increase the efficiency of municipal work. However, a participant from the BC Zero Emissions Innovation Centre raised a concern about the lack of funding conversations at a recent National Embodied Carbon Summit hosted by the Canada Green Building Council, which mainly focused on provincial and national leadership rather than local government positions. She noted the procedural challenges in accessing federal funds, with a need for clearer communication on the requirements of funding allocation. A participant from the UBC C&CP recommended municipalities engage with BC Hydro Community Energy Managers and build cross-municipal collaborations on embodied carbon. However, questions were raised about whether organizations like BC Hydro which support operational energy efficiency and emissions reductions, would also support embodied carbon initiatives.

A participant from the District of North Vancouver pointed out that the province is working on standardizing building designs for common typologies, which provides potential opportunities to integrate embodied carbon considerations. Some participants expressed a desire to connect with the province's selected architect to explore these avenues further. The idea of creating a builder's guide targeting specific materials was suggested as a way to package resources effectively, even if the initial provincial focus did not include embodied carbon.

HIGHLIGHT OF KEY CHALLENGES

Although the participants represented municipalities taking different approaches and at different stages of policy implementation, there was consensus in the workshop discussions on the challenges in reducing embodied carbon emissions from buildings in their cities.

Challenges in Staffing

Participants agreed that many municipalities struggle with insufficient staff or funding to hire and train staff to develop and implement embodied carbon policies, particularly when it comes to technical requirements related to LCA and embodied carbon reporting.

This challenge is more obvious in small municipalities, where staff have to balance new embodied carbon requirements with other development priorities. Even larger cities with dedicated staff often require additional technical support or capacity to assist industry. Participants suggested options to increase funding and foster staff and resource-sharing among multiple municipalities or utilizing province-wide organizations, like BC Zero Emissions Innovation Centre, as an intermediary and resource for knowledge sharing.

Challenges in Provincial and Federal Leadership

One of the biggest challenges highlighted by participants is the lack of provincial and federal leadership. While many municipalities are developing approaches to reduce embodied carbon emissions in their buildings, there is uncertainty about the scope of staff responsibility and their legal authority to enforce reductions. Since embodied carbon emissions are not currently addressed in provincial and national building codes there is no cohesive regulatory ecosystem, leading to variations among municipal approaches and hindering local government's ability to effectively collaborate or coordinate on emission reduction targets.

Acknowledging that progress in provincial and federal policies can take a long time, participants proposed some immediate workarounds. One suggestion was uniting municipalities to build an integrated policy or regulatory ecosystem that aligns resources effectively to avoid duplication while continuing to demand leadership from provincial and federal governments.

This ecosystem could include approaches such as low-carbon building designs, standardized data and reporting requirements, building and supply chain performance targets, and manufacturing regulations for critical building materials like concrete and steel. Local government staff could also collaborate on a collective roadmap that outlines the roles and resources needed by individual municipalities and opportunities for collective efforts, while clearly articulating demands to regional authorities.

Challenges in Low-carbon Supply Chains

Participants agreed that one of the most critical prerequisites for ensuring the reduction of embodied carbon emissions is the availability of low-carbon building materials and products. However, there is a significant shortage of these materials, making it difficult to meet local development needs (e.g., housing demand) without relying on existing, more carbon-intensive options. Additionally, there is no system in place for retrofitting and safely reusing materials from old buildings, which further contributes to the problem. There is a greater need for legislation and requirements concerning materials efficiency and design changes that have a significant impact on emissions reduction.

Some participants said that, when national and provincial regulatory requirements came into place, the market for low-carbon materials would expand, lowering prices and increasing manufacturers and suppliers. However, there is limited ability for municipal governments to influence manufacturing supply chains directly.

Challenges in Industry Engagement

Participants noted that municipalities experience pushback from the industry for additional development requirements, generally due to: 1) the actual costs or perceived costs of new policies and regulations, 2) limited capacity in terms of knowledge, skills, and experience to adapt to these policies, and 3) a lack of government support to navigate the changes. There are additional challenges in smaller municipalities, where developers and builders are more likely to be from other regions, unfamiliar with local policy, or only have experience with the most common of local building types.

Participants agreed that developers and builders are expressing a desire for alignment and consistency in development policy, building codes and regulations throughout the province, not a city-by-city approach. They reiterated the importance of local collaboration and the need for action by provincial and national governments.

While participants noted the need for a better low-carbon supply chain to reduce cost, they also suggested municipalities can respond to and help address concerns around new emission policies with clear, consistent messaging that speaks to different building industry sectors based on their individual needs and priorities. Additionally, they emphasized the importance of providing incentives and training for government staff and industry stakeholders, as well as communication and education for industry and the general public to facilitate the adoption of embodied carbon policies and regulations.

KEY SOLUTIONS AND NEXT STEPS

Along with the common challenges, participants proposed key methods of success in embodied carbon policy implementation. These methods, if further explored, could be solutions to many challenges listed above.

#1 Educating the Public

Firstly, participants stressed the importance of educating both the building industry and the general public about embodied carbon emissions. They found that approaching the conversations from the perspective of low-carbon materials, especially wood and low-carbon concrete, was engaging and easy to understand. They also suggested using specific examples of building projects from within the community to illustrate the concept of embodied carbon and strategies for reducing emissions. Getting everyone–government staff, building industry and the community–familiar with key terminology associated with embodied carbon emissions accounting is also essential to having quality discussions with the public before new policies are enacted. The messaging must be specified to the audience, whether it is to developers, builders, suppliers, or local building owners.

#2 Involving Industry Early

Secondly, participants also stressed the need for the building industry to be involved in the early stages of policy development and planning. Holding workshops and events for industry well before policy implementation will enable a municipality to a) get feedback on how the policy implementation plan should be adjusted for success and b) give adequate time for industry professionals to adjust their business practices so as to minimize costs and risks. Having a clear point of contact in the city for local industry is also a good method for more consistent communication.

#3 Coordinating Among Municipalities

Thirdly, participants spoke about how, in the absence of provincial guidelines, the building industry wants more consistency among municipalities on emissions reduction policies. Municipalities could coordinate on aspects such as standardized reporting, compliance pathways, language for requirements, educational resources for staff and industry, and the collection of relevant case studies and example projects that can serve as guides. Participants also suggested municipalities with established policies could create playbooks for other municipalities to follow and encourage the provincial government to align with and build off of local progress and successes when they develop new embodied carbon building codes.

#4 Sharing Resources and Staff

Finally, participants had many ideas to share resources across many municipalities, so as to maximize efficiency and avoid duplicating work. They suggested a model similar to or coordinated with the BC Hydro Community Energy Managers, which are local government positions supported by BC Hydro to coordinate efforts on energy efficiency and operational emissions reductions. Participants suggested that BC Hydro or other provincial-scale organizations or programs such as Clean BC, Zero Emission Innovations Centre, Builders for Climate Action, and the Community Energy Association could potentially sponsor or facilitate the sharing of staff and resources among local municipalities to accelerate local efforts to reduce embodied carbon emissions in construction.

Next Steps

Further investigation and brainstorming are required to implement these ideas to solve the challenges highlighted earlier in this report. The Pathways project will hold a second workshop with representatives from local governments in September, in collaboration with the Zero Emissions Innovation Centre's Carbon Leadership Forum and Zero Emission Building exchange. This second workshop will engage members of the Embodied Emissions Peer Network, a local government staff network focused on knowledge and resource sharing related to embodied carbon. The workshop aims to create a collective roadmap outlining municipal roles, required resources, and collaboration opportunities, with a focus on addressing regional demands for implementing embodied carbon policies.

The learning from these workshops, as well as other municipal-focused engagements, will be collected and synthesized into policy, strategy and resource recommendations for reducing embodied carbon emissions in buildings by the Pathways project team and shared with local, provincial and national governments. These recommendations are intended to inform policy changes, education and training, tools and resources, and governance to advance towards Canada's 2030 and 2050 carbon emissions reduction targets.

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APPENDICES

Appendix I: Attendees Information.

NAME	ROLE/ PROFESSIONAL TITLE	ORGANIZATION
Natalie Douglas	Program Manager	Zero Emissions Building Exchange / Zero Emissions Innovation Centre
Stephanie Dalo	Program Manager	Carbon Leadership Forum BC / Zero Emissions Innovation Centre
Penny Martyn	Policymaker	UBC Campus &Community Planning
Ralph Well*	Community Energy Manager	UBC Campus &Community Planning
Alex Leffelaar	Policymaker - Engineer	City of Nelson
Alex Thumm*	Policymaker - Planner	City of Nelson
Ian Picketts	Policymaker-Planner	District of Squamish
Adam Wright	Policymaker-Sustainability Planner	District of North Vancouver
Zahra Teshnizi	Senior Planner	City of Vancouver
Chris Moore	Policymaker - Engineer	City of Victoria
Laura Sampliner*	Policymaker- Climate Action Manager	City of New Westminster
Christopher Brown	Policymaker-Energy and Sustainability Coordinator	City of Port Moody

APPENDIX II BACKGROUND INFORMATION COLLECTION TEMPLATE

THE UNIVERSITY OF BRITISH COLUMBIA
Sustainability Hub

This project was undertaken with the financial support of the Government of Canada.
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Canada

Workshop on Municipal Challenges to Implementation: Background Information Collection Template

Name:
Position:
Municipality:

Workshop Objective:

Developing effective policies is only the start of the process; once in place local government must then implement them. This Workshop on "Municipal Challenges to Implementation" invites participants to share difficulties that their cities are facing as they roll out policies relevant to reducing embodied carbon in construction, as well as successes and lessons learned. Discussion will include potential solutions to these challenges, support and resources for local governments, and strategies for more effective implementation across British Columbia.

Workshop Background:

B.C. municipalities are taking diverse approaches to reducing embodied carbon in buildings, and have different types of policies in place. In order to set the stage for a useful discussion, we are collecting brief descriptions of each cities' current policy or policies in measuring, reporting, and reducing embodied carbon in construction, as well as their current and upcoming requirements. These descriptions will be shared as part of the workshop background and presented at the beginning of the workshop.

Information Collection:

To help us understand what your city is doing, please review our summary from the city of **[Insert City Name]**'s embodied carbon policy below, correct any inaccuracies, and answer the seven questions following the policy description:

- Name of the document(s):

1. Which department, program, or group is responsible for overseeing this policy?
2. What is the process for review, approval, and analysis of submissions?
3. How much time is typically needed for this process?
4. Are there any guidelines and/or training provided for staff to review submissions and build general capacity?
5. Are there any incentives provided to encourage compliance with these policies?
6. What resources (e.g., expert groups) are available to support compliance?
7. Is there anything else we should know or ask about your municipality's approach to reducing embodied carbon in construction?

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Canada

Pathways to Net Zero Embodied Carbon in Buildings: Barriers and Solutions to Effective Policies and Actions

About the project:

The goal of the project is to identify barriers and challenges to implementing embodied carbon policies and actions, and to explore immediate solutions in collaboration with academic researchers, local and regional policymakers, and building practitioners. The solutions can take a variety of forms but will all aim to advance policy and practical strategies along the pathway to Canada's net-zero carbon emissions targets by 2050.

This project was undertaken with the financial support of the Government of Canada.

Key project objectives:

- Identify barriers and challenges to the implementation of local and regional policies and regulations to reduce embodied carbon emissions from building materials,
- Identify and develop potential solutions to urgent challenges through collaborative and applied research projects, building on the collective expertise and experience of government, industry, and academia,
- Create pathways or models to pilot and test proof-of-concept policy solutions and analyze their effectiveness, as well as related benefits, constraints, and trade-offs,
- Create educational and skills development materials and activities around policies and regulatory barriers and solutions, to increase capacity and inform and motivate change in government and industry.

Key Project Activities:

- Activity 1: Collect information on the current state of embodied carbon emission policies and actions, with a specific focus on British Columbia, and document preliminary understanding of barriers and challenges,
- Activity 2: Conduct a series of facilitated workshops with representatives from government, industry and academia to confirm the barriers and challenges, develop ideas for solutions to these barriers and challenges, and identify a shortlist of immediate challenges and potential solutions to pursue through collaborative projects,
- Activity 3: Develop and support a small number of pilot projects exploring solutions with collaborations between academic researchers and government and/or industry professionals,
- Activity 4: Conduct knowledge mobilization to document learning and develop educational materials to help advance government and industry knowledge and skills.

Key Terminologies:

Embodied Carbon:
The greenhouse gas emissions associated with materials and construction processes such as resource extraction, manufacturing, installation, use and end-of-life processes of the building's materials.

Life Cycle Assessment (LCA)
A set of procedures for compiling and examining the inputs and outputs of materials and energy, and the associated environmental impacts directly attributable to a building/ product throughout its life cycle.

. Whole Building Life Cycle Assessment (WBLCA)
A type of LCA, that covers all life-cycle stages of a building and measurements impact across multiple major environmental indicators (not just carbon emissions).

Terminologies reference: Driving Action on Embodied Carbon in Buildings, RMI 2023

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Workshop on Municipal Challenges to Implementation

About the workshop:

Developing effective policies is only part of the process; once in place, local government must then implement them. This workshop invites participants to share the difficulties and successes that their cities are facing as they roll out policies relevant to reducing embodied carbon in construction, as well as the successes and lessons learned. The discussion will also include potential solutions to the challenges, the support and resources available to and needed by local government staff, and strategies for more effective implementation across British Columbia.

Municipal Policies

B.C. municipalities are taking different approaches to reducing embodied carbon in buildings:

Port Moody:
Developers must submit a Sustainability Report Card, which is a checklist of activities completed on a point system. Reuse of buildings (on-site or relocated) is a key pillar of the checklist. LCA reporting is optional and voluntary. The Sustainability staff in the Planning Department have focused more on operational carbon, and they have undertaken some in-house initiatives to further educate the staff on embodied carbon.

City of Vancouver:
Vancouver Building Bylaws have had embodied carbon requirements since last year. All part 3 buildings are required to submit an Embodied Carbon Design Report as part of building permit submission. This report requires a project to either a) define a project baseline or b) follow an absolute carbon intensity per the City of Vancouver Embodied Carbon Guidelines. Submissions undergo review and approval by the Green and Resilient Buildings team, with unofficial internal review guidelines in place. The Senior Planner of Embodied Carbon also looks over submissions to make future policy recommendations. Mandatory compliance will see proposed amendments for stricter reductions in 2025.

University of British Colombia:
UBC has the Green Building Action Plan, which implemented policies for embodied carbon reduction, with a 10% reduction goal in institutional buildings (Vancouver and Okanagan Campuses) from a defined baseline. The Residential Environmental Assessment Program (REAP) mandates embodied carbon reporting as a precondition for neighborhood multi-unit residential buildings at the Vancouver Campus. Projects must adhere to UBC whole building LCA guidelines and submit their reports with their building permit applications. The UBC Sustainability and Engineering team reviews and approves all building permit applications (including LCA reports) for UBC buildings. while, submissions for Okanagan buildings are reviewed by the City of Kelowna.

Questions for Workshop Discussion:

- **Successful Implementation**
  How do you successfully implement policies and procedures to deliver embodied carbon reporting and reduction goals? If implementation has not yet begun in your city, how do you anticipate doing so?
- **Challenges and Solutions on Implementation:**
  What challenges have you encountered in implementing embodied carbon policies within your municipality? What strategies or solutions have you developed to address these challenges?
- **Challenges and Considerations for Next Phase**
  Based on your experience, what considerations and practices do municipalities need to successfully develop and implement long-term embodied carbon policies? What resources and support would be helpful to you and other local governments?

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