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Policy Options to Reduce Embodied Carbon in New Multi-Unit Residential Buildings

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for

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Disclaimer

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This project was conducted under the mentorship of the City of Victoria staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of the City of Victoria or the University of British Columbia.

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Cover Photo by Author (2023)

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Executive Summary

Addressing embodied carbon—the total greenhouse gas emissions generated throughout a building's lifecycle—is crucial for reducing the environmental impact of buildings. Traditionally, policy efforts have focused on reducing operational carbon emissions through initiatives like the BC Step Codes and retrofit grants. However, a comprehensive strategy targeting both embodied and operational carbon is essential for creating truly sustainable structures. With Victoria's population projected to grow by 47,100 by 2050, necessitating 22,500 new rental units and 5,900 family units, there is a significant opportunity to integrate embodied carbon reduction into the city's development plans.

Multi-use residential buildings (MURBs), particularly mid-rise buildings, offer lower embodied carbon per household and bedroom compared to high-rise structures, which require more materials like concrete and steel.

The City of Victoria aims to reduce greenhouse gas emissions by 80% from 2007 levels by 2050, making sustainable construction practices vital. By prioritizing the development of MURBs and implementing strong embodied carbon policies, Victoria can meet its housing needs while minimizing the environmental impact and contributing to global climate change mitigation efforts.

This report provides a policy framework for reducing embodied carbon in new MURBs within the City of Victoria. The recommendations are aligned with the City's sustainability goals, emphasizing policies that promote efficient design and construction practices, innovative urban planning, and sustainable material use. The recommendations are summarized as follows:

1. Adopt embodied carbon reporting requirements for new developments
2. Adapt off-street parking policies to reduce concrete use
3. Prioritize carbon-efficient built typologies in the official community plan
4. Incentivize embodied carbon reductions with development charges and permitting fee reductions
5. Show leadership by implementing a corporate low-carbon purchasing policy
6. Act to increase home relocation, construction waste diversion and material reuse

The report underscores the importance of adopting an embodied carbon lens across all stages of development, from planning to construction and waste management. By integrating these recommendations, the City of Victoria can advance its sustainability objectives, reduce the carbon footprint of its built environment, and set a benchmark for other municipalities.

Navigating this report

Part I of the report serves as an abbreviated introduction and a summary of policy recommendations to address embodied carbon in Multi-Unit Residential Buildings (MURB) development in Victoria. Part I provides the essential details of the report.

Part II of the report provides a detailed research summary and best practice analysis for an in-depth look at the justifications for the recommendations in Part I.

PART I: Introduction and Policy Recommendations

1.0 Introduction

1.1 Objective of Report

This report aims to outline immediate and long-term policy options for the City to reduce embodied carbon emissions from new Multi-Unit Residential Buildings (MURB) based on existing policies and literature on embodied carbon adapted to the context of Victoria.
It will cover areas such as below-grade parking, low-carbon concrete, enhanced design, end-of-life considerations, and construction site practices. These strategies could cut new building embodied carbon by half compared to current standard practices.

1.2 Background

1.2.1 Addressing Embodied Carbon of Buildings

Embodied carbon refers to the total greenhouse gas emissions produced over a building's entire lifecycle, from the manufacturing and transportation of materials to installation, maintenance, and eventual disposal. While policymakers have traditionally focused on reducing operational carbon emissions—through measures like the BC Step Codes and retrofit grants—it's crucial also to address embodied carbon to reduce the environmental impact of buildings. A holistic approach that targets both embodied and operational carbon is essential for creating truly sustainable and environmentally friendly structures.[1]

[1] FII, 2017. Embodied Carbon in Construction and Infrastructure: International Policy Review

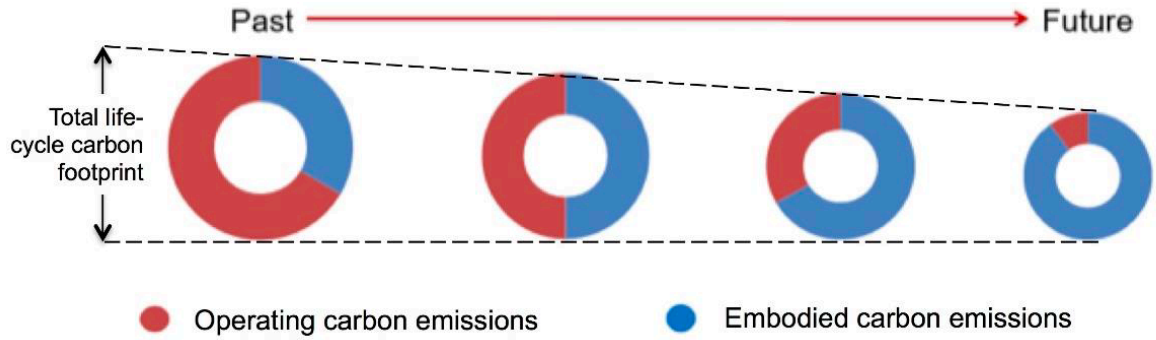


Figure 1 Projected trend in life-cycle carbon in buildings in terms of scope and allocation (Source: Athena Sustainable Materials Institute).[1]

1.2.2 Projected Housing Development in Victoria

By 2050, Victoria is expected to welcome 47,100 new residents, which will require the construction of 22,500 new rental units and 5,900 new family units. This surge in housing demand provides a pivotal opportunity to address embodied carbon.[2]

Victoria's housing crisis emphasizes the urgent need for innovative housing solutions. High rents, limited availability, and affordability issues are pressing challenges the city must address. The region's latest Housing Need Report has highlighted these issues, leading to significant policy changes to promote the development of more housing units.[3]

Recent provincial legislation has extended local governments' authority to enforce location-specific infrastructure and services essential for sustainable development. Amendments to inclusionary zoning, density bonuses, transportation demand measures, development cost charges, and amenity cost charges empower local governments to compel the integration of affordable housing and community amenities in new developments.[4]

By focusing on MURBs, which combine living, working, and recreational spaces, Victoria can maximize the efficiency of new developments, reduce transportation emissions, and create vibrant, sustainable communities.

1.2.3 Sustainability of MURBs

The City of Victoria has set a target to reduce greenhouse gas emissions by 80% from 2007 levels by 2050. This ambitious goal necessitates a shift towards sustainable construction practices. Multifamily, commercial, institutional, and industrial buildings currently account for 64% of operational emissions, highlighting the critical role of these sectors in achieving the city's

[2] Victoria, 2024. 2050 Emerging Policy Framework for OCP Update
[3] CRD, 2020. Greater Victoria Point-In-Time Homeless Count And Needs Survey.
[4] BC, 2024. New zoning, amenities, tenant protections support people, create livable communities.

climate targets. The city's Official Community Plan[5] and Climate Leadership Plan[6] emphasize the importance of low-carbon, high-performance buildings.

MURBs generally exhibit lower embodied carbon emissions per household than single-family dwellings largely due to the efficient utilization of space. Single-family homes also often allocate a disproportionate amount of space to parking, resulting in elevated embodied carbon intensity. In contrast, the consolidated design and shared walls in MURBs reduce the overall material and energy use per unit, thereby reducing embodied carbon emissions. [7]

Mid-rise MURBs have lower embodied carbon per bedroom than high-rise buildings. High-rise structures require deeper foundations and increased concrete and steel usage, resulting in higher carbon emissions. When considering density, human-scale buildings, usually up to 6 stories tall (often 80-100 ft), allow for constantly densely packed blocks instead of "spikes" of low and high density. [8] [9] [10]

Focusing on MURBs development in Victoria is a strategic and necessary approach to accomplishing the city's growth projections while minimizing the impact of global climate change. This impact can be further reduced by developing a strong embodied carbon policy that ensures new MURB developments are designed and built in a way to minimize embodied carbon emissions.

1.3 Methodology

To develop well-informed recommendations for advancing sustainable building practices and addressing embodied carbon emissions, a comprehensive methodology was employed, which included several key steps:

1. **Literature Review and Expert Consultation**: A technical literature review was conducted, focusing on LCA studies and other research related to embodied carbon emissions in buildings. This review was supplemented by discussions with LCA experts from industry and academia, who provided insights into the various factors directly or indirectly influencing embodied carbon emissions.
2. **Policy Scan of North American Jurisdictions**: A policy scan was carried out to review the embodied carbon policies of other jurisdictions across North America. This step aimed to identify best practices, innovative approaches, and lessons learned from other regions, which could be adapted to the context of the City of Victoria. Additionally, policies related to the indirect factors identified in the literature review were examined to understand their impact on embodied carbon.

[5] Victoria, 2012. Official Community Plan
[6] Victoria, 2018. Climate Leadership Plan
[7] Rankin et al, 2024. Embodied GHG of missing middle
[8] Perkins&Will, 2020. Embodied Carbon in the Built Environment—A Primer.
[9] RMI, 2021. Reducing Embodied Carbon in Buildings.
[10] Community Energy Association, 2022. A Local Government Guide: Policies, Programs, and Incentives to reduce Embodied Emissions in the Built Environment.

3. **Analysis of the City of Victoria's Existing Policies:** The existing policies of the City of Victoria were analyzed to identify regulations and laws that directly or indirectly affect embodied carbon emissions. This analysis included a detailed examination of current policies and bylaws to understand their implications on sustainability and to pinpoint areas that could benefit from an embodied carbon perspective.
4. **Synthesis and Contextual Adaptation:** The insights gained from the literature review, expert consultations, and policy scans were synthesized to create a holistic understanding of embodied carbon issues. Discussions were then held with city officials to situate these insights within the specific context of Victoria, refining the findings to align with the local legal and regulatory framework.
5. **Cross-Departmental Engagement and Policy Refinement**: Cross-departmental discussions were facilitated to ensure that the embodied carbon lens framework was cognizant of various facets of community planning and development. These discussions helped to identify changes needed in existing policies and gaps that might be overlooked, ensuring a comprehensive approach to reducing embodied carbon across all relevant sectors.

2.0 Policy Considerations for Victoria

The report recommends the following policy considerations provided below as a clear summary and checklist. Further details, explanations, and justification are provided in Part II of this report.

2.1 Adopt Embodied Carbon Reporting Requirements for New Developments

The City should require new developments proposals to provide information and estimates of the associated embodied carbon emissions. Instituting Embodied Carbon Reporting Requirements has two primary objectives: to collect data that will inform future policy development and to support and encourage projects to reduce embodied carbon in alignment with the City's emission targets.

2.1.1 Require an Embodied Carbon Estimate at Development Permit

Data collected at the Development Permit application may be less precise than later in the permitting process. Still, it is a crucial stage because it allows for early project evaluation against embodied carbon benchmarks, and designs can still be modified in response. The City of Victoria can evaluate and influence embodied carbon in development proposals by gathering estimates of embodied carbon at the Development Permit stage.

- To require this information, the city should update the *City-wide Development Approval Information Area (Sections 19.10 to 19.13 of OCP)* for Concrete Multi-Use Residential Buildings (Part 3

Buildings with majority residential) to submit 'Embodied Carbon Estimate.'

- The Embodied Carbon Estimate shall have two sections:
  - Low-Carbon Concrete
  - Life Cycle Assessment (LCA)
- The city should establish benchmarks for carbon emissions from concrete received as a Low-Carbon Concrete section while gathering local LCA data.

Once sufficient local data is available, the City should set LCA benchmarks instead of low-carbon concrete benchmarks. Additionally, the City should re-evaluate exemptions and financial incentives at both the Development Permit and Building Permit stages.

2.1.2 Require an updated Embodied Carbon Report at Building Permit

The Building Permit stage is the most suitable stage for collecting accurate data on embodied carbon emissions because design decisions and material quantities have been finalized. This stage allows a more precise understanding of the local contextual embodied carbon emissions associated with projects.

- The City should update its *Building and Plumbing Permit Bylaw* to include an 'Embodied Carbon Report' like the 'Embodied Carbon Estimate' sought at the Development Permit for Concrete Multi-Use Residential Buildings (Part 3 Buildings with majority residential) (i.e. an exemption for Wood-Frame MURBS).

This process ensures compliance, reduces discrepancies, and allows for policy adjustments if significant changes occur between the development and building permit stages. To provide further clarity for developers, the City may define an acceptable range of discrepancy between the two stages.

2.1.3 Project Exemptions and Financial Support

Certain MURB projects and building design choices, such as eliminating underground parking, can result in 10-15% lower emissions than an average concrete MURB. These designs can be incentivized in projects by offering exemptions from embodied carbon reporting requirements at the Development Permit stage, thereby reducing costs and approval times.

The City should consider an exemption to embodied carbon estimates at development permit application for Concrete MURB projects undertaking:

- Affordable Housing Projects, OR
- A project without any below-grade levels, OR
- Home Relocation of Existing Single-Family Dwellings

However, the city should still collect data from these projects at the Building Permit stage to shape its carbon baselines and benchmarks. For

projects with built-in emissions reductions, the city should provide financial support for completing an LCA, even if the projects do not necessarily require it for their emissions reduction goals. This is important because the city needs the data for future policy development.

This Report recommends conducting an independent, city-funded LCA or providing financial aid to conduct an LCA at the Building Permit Stage for Concrete MURB projects for the above-mentioned project types.

2.2 Adapt Off-Street Parking Policies to Reduce Concrete Use

Embodied carbon in new developments can be reduced by reducing the parking provided by the development, particularly underground parking, which requires significant concrete use. The City should consider the following:

1. Amend 'Section 1.2 Required Vehicle and Bicycle Parking Spaces' of Schedule C to waive general parking minimum requirements (excluding accessible parking, bicycle parking, and EV infrastructure) for MURBs, especially for inclusionary housing units that will require amendments.
2. Explore updating of Zoning Requirements, such as FSR, Height Limits, and Front yard Parking Limits, that necessitate below-ground parking

2.3 Prioritize carbon-efficient built typologies in the Official Community Plan Update

The City should ensure that the update to the Official Community Plan includes the following:

1. Prioritize MURBs and promote wood-frame construction for mid-rise residential buildings to achieve significant construction cost savings and reduce embodied carbon emissions.
2. Seek Input regarding Embodied Carbon due to Form and Character to improve the City's General Urban Design Guidelines, Downtown Core Area Plan Design Guidelines, Old Town Design Guidelines and other Heritage Conservation Area Design Guidelines
3. Consider Zones or Development Areas based on geotechnical factors
    a. Identify unstable or soft soil areas to avoid construction requiring significant carbon-intensive stabilization; repurpose these areas for less intensive construction.
    b. Consider specific foundation requirements based on geolocation to minimize unnecessary material use; seek information from developers that carbon emissions were considered while choosing foundation type.

2.4 Incentivize Embodied Carbon Reductions through Development Charges and Permitting Fee Reductions

Development charges can be adapted as follows to encourage design decisions that result in reduced embodied carbon:

1. Restructure DCC/ACC policies to promote building typologies with lower embodied carbon (i.e. wood-frame MURBs). This can align with the intent of DCC/ACCs as low embodied carbon typologies generally have a lower per capita cost impact on municipal services.
2. Encourage new buildings to plan for end-of-life material reuse and recycling by provided relaxations in building permit fees in exchange for a deconstruction plan following a guideline such as ISO 28800.
3. Provide rebates on permit fees for projects using locally sourced materials and sustainably sourced BC lumber, engineered wood products, and mass timber.

2.5 Implement a Corporate Low Carbon Purchasing Policy

The City can lead by example by instituting a strict and clearly defined purchasing policy that selects low-carbon materials and reduces embodied carbon through the following actions:

1. Establish emission intensity limits for concrete and other high carbon intensity materials for City projects
2. Include requirements for recycled content in procurement policies and contracts to create more demand for recycled materials such as salvaged timber.
3. Implement artificial discount rates and shadow pricing to ensure carbon emissions are evaluated alongside cost, schedule, and other criteria in bid selection.

2.6 Increase Construction Waste Diversion and Material Reuse

The City can reduce embodied carbon by supporting waste diversion and material reuse in construction through the following actions:

1. Investigate establishing waste diversion thresholds ranging from 50% to 75% for construction projects to reduce landfill waste and promote recycling.
2. Implement local bylaws that make home relocation more straightforward and financially attractive than demolition or deconstruction.
3. Advocate to the Province for establishing a standard grade for the quality of reclaimed wood to facilitate its use in construction.
4. Recommend that the CRD adjust landfill tipping fees to disincentivize landfilling and encourage recycling.

PART II: Detailed Analysis of Policy Best Practices

3.0 Embodied Carbon Reporting

3.1 Whole Building Life Cycle Assessments

The Life Cycle Assessment (LCA) is the internationally accepted science of measuring a product's potential environmental impacts on air, land, and water throughout its entire life cycle, from resource extraction to its end-of-life disposition. In the building sector, LCA is a crucial tool for calculating the environmental impacts due to the manufacturing and transportation of construction materials, the construction process, activities related to building occupancy and maintenance, demolition, and final waste disposal. Resources are consumed, and emissions are produced during every phase of the life cycle. [11]

Integrating LCA requirements offers a powerful approach to minimizing embodied carbon in construction projects. Significant reductions can be achieved by implementing LCA reporting and setting limits on emissions over a building's lifespan. These reduction requirements drive all project stakeholders to collaborate in designing more resource-efficient buildings. It is crucial to have suitable projects and baselines tailored to the local context to realize these reductions effectively. Meeting LCA requirements at different project scales is becoming increasingly feasible and essential. Appendix 1 lists details of jurisdictions, such as *Canada, the Province of British Columbia, the University of BC, the City of Vancouver, the City of Toronto, the City of Denver, and the District of North Vancouver,* that have implemented LCA Reporting. [12]

LCA requirements are applied to *Part 3 Buildings* in the City of Vancouver. These buildings typically include structures with an area of 600 square meters or more and more than three stories. This approach highlights the growing feasibility in the region for LCA requirements on larger scales to ensure sustainable and environmentally responsible construction practices.[13]

The Royal Institution of Chartered Surveyors (one of the first professional institutions to provide detailed guidelines on LCA) recommended that LCA calculations should be carried out for all projects. However, for small projects with a Gross Floor Area of less than 1000 square meters or less than ten dwellings, the requirements are focused on cradle-to-gate emissions i.e. the environmental impact from the start of material extraction (cradle) to the factory gate before it's transported to site. [14]

Studies have identified LCA as a critical policy directive to promote resource-efficient design and construction. For example, the Carbon Leadership Forum has highlighted the high embodied carbon of suspended slabs, emphasizing the

[11] FII, 2017. Embodied Carbon in Construction and Infrastructure: International Policy Review
[12] Doran K.A., 2021. Why We Need Embodied Carbon Benchmarks and Targets in Building Standards and Policies. Canadian Architect.
[13] Vancouver, 2023. Embodied Carbon in Vancouver Building Bylaw
[14] RICS, 2024. Whole life carbon assessment for the built environment.

need to move away from carbon-intensive structural designs. Collecting raw data output is crucial for policymakers to accurately baseline and analyze carbon emissions rather than relying on aggregated figures. Modelling software can generate these detailed raw numbers, providing a more precise understanding of the project's carbon footprint. For example, Vancouver offers a specific template for this purpose. If Building Information Modeling (BIM) standards are adhered to, they should include material labelling requirements to ensure consistency and accuracy. [15]

Several methods can be employed to measure and contextualize a project's carbon intensity effectively. One effective approach is comparing the concrete volume (in cubic meters) to the gross floor area (in square meters), which often shows a strong correlation and helps identify areas for improvement. Another valuable metric is floor plate efficiency, which measures emissions relative to the gross floor area, providing insights into the overall efficiency of the design. Additionally, evaluating project emissions in relation to the number of bedrooms can help ensure that the design is both equitable and efficient, addressing fair comparability among projects while minimizing environmental impact. [16] [17]

3.2 Require an Embodied Carbon Estimate at Development Permit

LCA should be undertaken sequentially during a project's early design, technical design, construction, and post-completion phases to integrate the decision-making framework. The LCA process can start as early as the concept design phase. Conducting an LCA at the concept design phase is recommended to establish a carbon impact baseline and identify potential opportunities for carbon reduction while still having a significant capacity to influence decisions. As the project progresses, carbon reduction opportunities will decrease, have a reduced impact, and be potentially more expensive to implement.[18]

Requiring LCA at the Building Permit stage is often too late to make impactful design changes. The City of Vancouver's rezoning policy mandates a less-detailed LCA at the rezoning stage and a detailed LCA at the Building Permit stage. In Toronto, LCA requirements are also implemented at the rezoning stage.

Several vital factors significantly influence embodied carbon in building design. The building's typology, including its height and form, directly impacts carbon intensity, as well as foundation requirements, column sizing and spacing, building shape, and slab depth. Elements such as window-to-wall ratios, balcony designs, and landscape features like permeable surfaces and vegetated areas also affect embodied carbon. Optimizing space to eliminate redundancy plays a significant role. Additionally, facade materials are crucial—materials like aluminum and precast concrete have high carbon

[15] Carbon Leadership Forum, 2024. Embodied Carbon Policy Toolkit
[16] Vancouver, 2023. Embodied Carbon in Vancouver Building Bylaw
[17] Rankin et al, 2024. Embodied GHG of missing middle
[18] RICS, 2024. Whole life carbon assessment for the built environment.

footprints, while wood and bio-based materials offer lower carbon intensity and benefits like biogenic sequestration.[19]

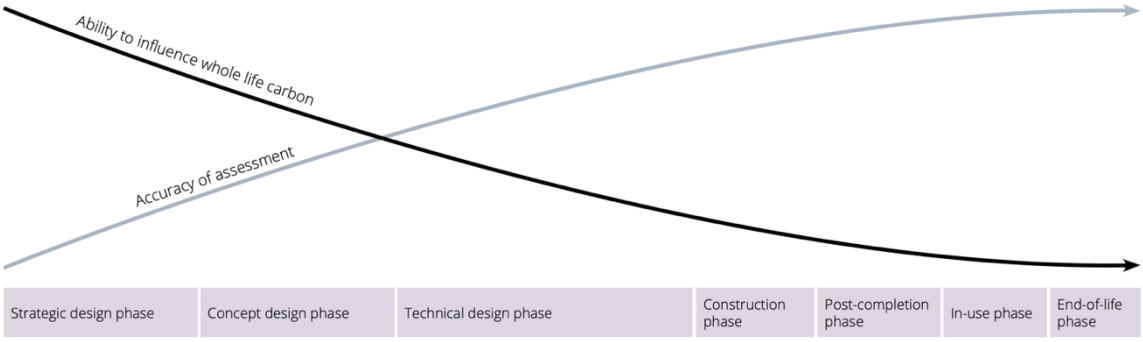


Figure 2 As the project progresses, the ability to influence whole-life carbon decreases but accuracy of data increases. (Source: RICS) [15]

3.2.1 Excluding Wood-frame constructions

Wood-frame construction provides a reduction of more than 70% in Embodied Carbon Emissions compared to poured-in-place concrete for the mid-rise residential archetype. It also resulted in over 15% savings in construction costs compared to a concrete structure. Therefore, wood-frame construction could be excluded from LCA requirements as these buildings will already be lower in embodied carbon.[20]

3.3 LCA Benchmarks

Benchmarks are specific targets that a project aims to meet or surpass. For instance, Vancouver has set a benchmark for 2025, which includes achieving a 10% reduction in embodied carbon from the established baseline (i.e. current construction practices and materials as a reference point).

Studies by the City of Vancouver have shown the potential to reduce embodied carbon by 22% to 47%. This reduction can be achieved through several vital contributions, such as reducing underground parking (10%), using low-carbon concrete (7%), and improving structural design and material selections (7%). [21]

Various jurisdictions have limited the amount of emissions allowed for construction projects to encourage sustainable building practices and minimize the environmental impact of construction materials. In Canada, federal buildings are required to reduce embodied carbon by 30%. The University of British Columbia mandates a 20% reduction. At the same time, Vancouver requires buildings to have whole-building embodied carbon impacts no more than double that of a functionally equivalent baseline or within an absolute limit of 400 CO_2e/m^2. In Toronto, Low-Rise Projects aiming for incentives

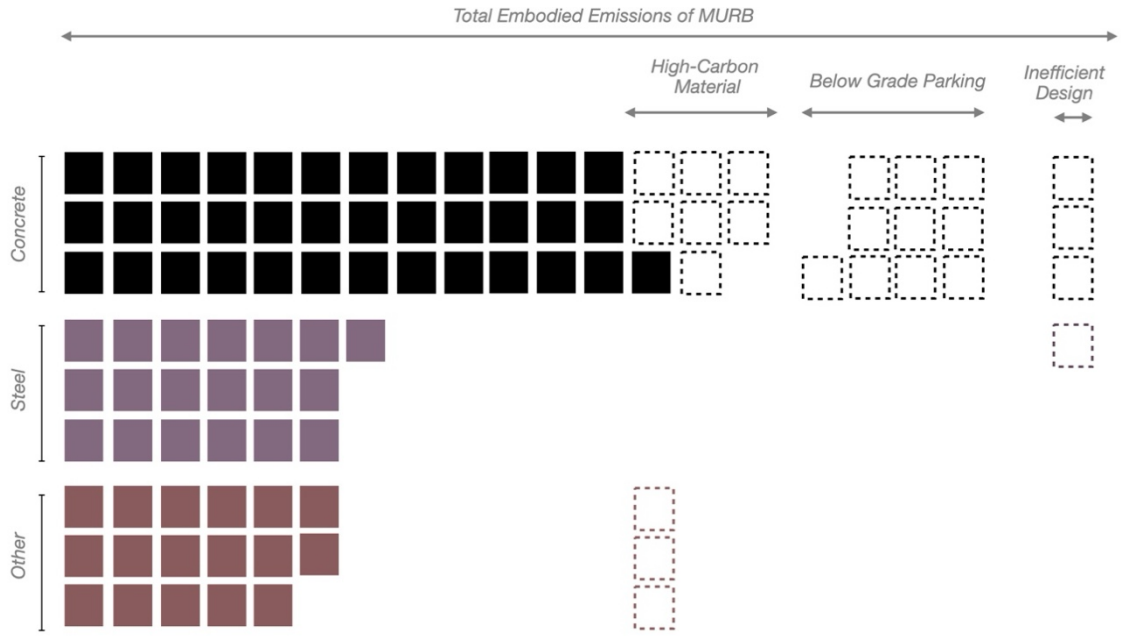
[19] Half Climate Design, 2024. Urban Design Guidelines Embodied Carbon Study.
[20] Vancouver, 2023. 1210 Seymour Street LCA Case Study
[21] Vancouver, 2023. 1210 Seymour Street LCA Case Study

must keep their emissions below 350 kg CO2e/m². Oregon provides incentives based on certification levels, with the top tier requiring a 30% reduction. Denver offers options to reduce environmental impacts by 10% or achieve a 5% reduction in three out of several impact categories. Under various Rating Systems, such as zero-carbon certification, a 20% reduction is mandatory.

Since conducting an LCA involves some costs, many leading jurisdictions provide incentives to offset these costs, which are linked to the reductions achieved, typically setting reduction requirements at 10%. Higher incentives often require a reduction of up to 30%. [22]

H1. Baseline Analysis

By analyzing baselines, jurisdictions can identify key areas where significant reductions could be made. Mid-rise residential have from 38 up to 349 kgCO2eq per sqm and an average of 12,700 kgCO2eq per bedroom. For mid-rise MURBs, the total life cycle embodied emissions distribution is approximately 60% from concrete, 20% from steel, and 20% from other materials. Most emissions (75%) occur during the manufacturing stage. [23] [24] [25] [26]



The figure above (Author) synthesizes findings from four cited sources, illustrating a rough estimate of the emission levels associated with various materials. The dotted cubes emphasize the embodied emissions linked to high-carbon materials, below-grade parking, and inefficient design. Addressing and potentially eliminating these elements could significantly reduce overall embodied emissions. The report delves into specific strategies for mitigating these factors in the following sections, which can be implemented through policy without necessitating a full LCA analysis.

[22] Appendix 1
[23] Vancouver, 2023. Embodied Carbon Reduction Study - City of Vancouver.
[24] Vancouver, 2023. 1210 Seymour Street LCA Case Study
[25] Rankin et al, 2024. Embodied GHG of missing middle
[26] Gauch et al, 2023. What really matters in multi-storey building design? A simultaneous sensitivity study of embodied carbon, construction cost, and operational energy.

3.4 Encouraging Low-Carbon Concrete

Concrete is typically the most significant contributor to a building's Embodied Carbon. Cement is the primary contributor to the Global Warming Potential of concrete and can account for as much as 90% of the overall embodied carbon impact while only accounting for approximately 10% of its weight. [27] [28] [29]

The construction industry has been actively seeking alternatives to these high-intensity materials. Innovations such as lower-carbon concrete, which incorporates industrial byproducts like fly ash and slag, have been developed to reduce concrete's carbon footprint. [30]

In British Columbia, efforts to reduce the carbon intensity of construction materials are evident. Local concrete companies have successfully lowered their emissions below the national average, providing a competitive edge in the market for sustainable building materials. These companies have adopted practices such as using alternative fuels and incorporating supplementary cementitious materials to reduce emissions. [31] [32]

3.4.1 Emissions reporting and benchmark setting for concrete

Many jurisdictions have established policies to understand the impact of concrete and other materials within their jurisdictions through either an LCA or material-based reporting.[33]

Through these policies, jurisdictions require the submission of Environmental Production Declarations (EPD) for new construction projects. By establishing reporting on EPDs and quantities of materials, cities can encourage the use of low-carbon alternatives and track their progress over time, enabling a more effective policy to tackle embodied emissions. [34]

Our discussions with stakeholders reiterated the frequent use of EPDs either to comply with existing green building standards or international market demand. The cost implication to manufacturers to provide EPDs is minimal as most concrete manufacturers already have EPDs available for their products.

The analysis of different jurisdictions, such as Langford, New York, and Denver, has revealed common policies aimed at reducing embodied carbon in construction using EPDs. Many of these policies particularly target concrete and have been put into effect within the

[27] CLF British Columbia, 2023. Pragmatic Approach to Lowering Embodied Carbon.
[28] Vancouver, 2023. 1210 Seymour Street LCA Case Study
[29] Vancouver, 2023. Embodied Carbon Reduction Study - City of Vancouver.
[30] Prasad, 2024. High-Performance Construction Materials. StructuralGuide.com
[31] Evers A., 2022. Stanford Embodied Carbon Outlook. Stanford University.
[32] ConcreteBC Website
[33] Appendix 1
[34] CNCA, 2021. City Policy Framework For Dramatically Reducing Embodied Carbon (R2-Example Language at Pg 65)

past two years. They share several key characteristics - most have set a minimum limit of 50 cubic meters for concrete volume and have established thresholds for projects that must adhere to the disclosure requirements. Municipalities use square footage as a determining factor, while provincial or federal policies use project cost as a threshold. Jurisdictions such as Langford have also implemented benchmarks or limits that require specific materials to meet identified emissions limits.

H2. Langford's Low-Carbon Policy: Implementation, Requirements, and Emission Reduction Targets [35]

The City of Langford implemented its Low-Carbon Policy in June 2023. The policy was developed through industry engagement and has successfully kept concrete's carbon emissions in their region for new construction lower than the provincial average. The City Staff found EPD requirements don't add any extra direct costs.

Langford requires EPD reporting for ready-mix concrete for all projects subject to rezoning and enforces emission limits in a stepped and phased manner. Phase 1 currently requires a 7% reduction from the Industry-Wide EPD (through ConcreteBC). There is a mechanism to review the requirements annually that can update the reduction and enforce Phase 2 - project-type LCA reporting, while the limits are 'To be Decided" as of now.
The policy also includes a penalty if there is a difference between the rezoning application and the as-built emissions. The policy is restricted to concrete elements that form the structure.

3.4.2 Environmental Product Declarations (EPDs)

EPDs are critical tools in the construction industry. EPDs are like nutritional labels for building materials. Just as food labels tell us what's in our food and how it affects our health, EPDs show the environmental impact of materials like concrete and wood. They provide clear information on pollution and energy use, helping us choose better materials for our planet. They offer a transparent and standardized assessment of the environmental impact of building materials.

EPDs are recognized and standardized worldwide through ISO 14025, ensuring high-quality and consistent metrics. These are generally referred to as Type-III EPDs. This is crucial because building materials often come from different countries. With a common standard, builders and suppliers can understand and trust the environmental impact information, no matter where the materials are from. Third-party EPDs are verified by independent entities and usually last five years; The

[35] Lanford, 2023. Low-Carbon Concrete Policy.

third-party assessment gives confidence that the information is reliable and meets international guidelines.

Most critically Type III EPDs require the disclosure of cradle-to-gate emissions which encompass approximately 50% of the material's total embodied carbon. [36] [37]

Within the Type III EPDs are Industry-wide/Generic EPDs (IW-EPD) or the more substantial, product-specific EPDs. Product-specific EPDs represent a particular product from a specific manufacturer. They can also be more precise by having plant-specific or supply-chain-specific data, enabling a much more accurate understanding of the emissions associated with the product.

Carbon Leadership Forum has published concise, nuanced guidance on EPDs that offers practical policy-making advice. [38]

3.5 Project Incentives: Exemptions and Financial Support

Best practices in design and construction can be incentivized through financial support or with exemptions from requirements or reporting. The following should be considered with regard to incentives.

3.5.1 Underground Parking Has Higher Embodied Carbon

Below-grade construction is undoubtedly the most carbon-intensive element of the building. Underground Parking for mid-rise buildings accounts for about 20% of the total carbon emissions and 20% of the project's total construction cost. [39] [40] [41]

Substructures drive emissions in all forms, and limiting basements and interior parking could reduce embodied carbon emissions by 26.6%–40.5%. Most LCA Policies and Rating Systems (Appendix 1) require a reduction of 10% to 20%. Projects constructed without underground levels will cross the current benchmark thresholds without conducting an LCA. Our discussions with industry and experts repeatedly underlined this as the most critical change in city planning bylaws - underground parking has significantly high embodied carbon effects due to extensive excavation and concrete usage. Inefficient layouts exacerbate this issue, as parking grids often misalign with residential floor plans. [42]

[36] McKinsey&Company, 2020. Data to the rescue: Embodied carbon in buildings and the urgency of now.
[37] US DoE, 2024. Embodied Carbon Reduction in New Construction: Reference Guide.
[38] Carbon Leadership Forum, 2024. EPD 101: Embodied Carbon Accounting for Materials.
[39] Vancouver, 2023. Elimination of Minimum Parking Requirements – Phase 2. Council Report.
[40] Rebello T.A., 2022. Estimating The Carbon Contribution Of The Construction And Operation Of Parking Spaces In The City Of Vancouver.
[41] Half Climate Design, 2023. Comparative Carbon Emissions of Mid-Rise Buildings.
[42] Rankin et al, 2024. Embodied GHG of missing middle

3.5.2 Home Relocation for Reducing Embodied Carbon

When the demolition or deconstruction of an existing structure is necessary to accommodate the construction of a new asset within the designated site boundary or as an extension to an existing asset, the environmental impacts associated with that demolition or deconstruction must be accounted for in the new project's Life Cycle Assessment to align with City requirements, these impacts can be offset within the LCA. For a more detailed discussion on Home Relocation, refer to Section 8.2. [43]

3.5.3 Affordable Projects for Reducing Embodied Carbon

Affordable housing projects have been found to have reduced embodied carbon levels when compared to a baseline. A study supported by the City of Vancouver revealed that, apart from condominium projects, non-market, affordable, and rental projects were specifically designed to the city's minimum parking requirements resulting in lower overall embodied carbon (see following section).[44] [45]

4.0 Parking Policy Changes to Reduce Concrete Use

4.1 Waive General Parking Minimum Requirements

Embodied Carbon reductions are often directly associated with less concrete used in the project, specifically for underground parking. This also has a considerable effect on making projects financially viable. By removing minimum project requirements, the City of Victoria can aim to allow market demand to determine parking stall needs while reducing embodied carbon in the process. [46]

The experiences of other cities that have eliminated parking minimums demonstrate the feasibility and benefits of these policies. The City of Vancouver dropped all its parking requirements in May 2024, following several cities in North America. Edmonton eliminated city-wide parking minimums in 2020, and Toronto followed in 2021. In the US, dozens of cities have eliminated minimum parking requirements in part or all their jurisdictions, including New York City, Portland, Buffalo, Anchorage, Austin, and Minneapolis-St. Paul. Like Bills 44 and 47 of BC, the states of California and Oregon prohibit minimum parking requirements near rapid transit anywhere in the state. Auburn's example shows that reducing parking minimums can significantly lower development costs and encourage business growth, supporting the broader goals of Victoria's policy directions. [47]

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[43] RICS, 2024. Whole life carbon assessment for the built environment.
[44] Thumm A.J. & Perl A., 2020. Puzzling over parking: Assessing the transitional parking requirement in Vancouver, British Columbia.
[45] Anderson et al., 2022. Embodied Energy Consumption in the Residential Sector: A Case Study of Affordable Housing.
[46] Vancouver, 2023. Elimination of Minimum Parking Requirements – Phase 2. Council Report.
[47] Spivak J., 2022. A Business Case for Dropping Parking Minimums. American Planning Association.

The City of Victoria's Sustainable Mobility Strategy was adopted in 2019. It confirms the values, policy positions, and critical initiatives surrounding mobility. It promotes multimodal transportation, reduces car ownership, and makes it accessible. Under this strategy, we already see a reduction in parking being built in projects offset by Transportation Demand Measures.[48]

The Missing Middle Regulations (Schedule P of Zoning Regulation Bylaw) adopted by the City of Victoria have reduced parking requirements for housing types under this policy if transport management measures are provided. These measures include Carshare membership and statutory right-of-way car spaces, amongst others. They also eliminate requirements for affordable rental units and secondary suites within the policy use type.[49]

Additionally, Parking requirement calculations are detailed and add a significant amount of time in reviewing a development application. Eliminating the need to calculate and validate whether these complex requirements are being met is expected to simplify and accelerate the development application and review process.[50]

4.2 Explore updating of Zoning Requirements that necessitate below-ground parking

The Victoria 2050 Policy directions for the Official Community Plan emphasize enabling and supporting ‘car-light living’ by situating homes, employment areas, and daily necessities within walkable and bikeable distances from transit routes and stops. Where parking is provided, it is intended to be electrified, shared, accommodate diverse mobility devices, and be as compact as possible. [51]

The existing requirements for Floor Space Ratio (FSR), height, density, and front yard parking currently necessitate underground parking stalls. To address this, reviewing these requirements or exploring innovative approaches to neighbourhood-level parking planning would be beneficial. One potential solution could be a design that features storefronts on the front side of properties with on-grade parking at the rear. The aim could be to create neighborhood parking plans that optimize the use of existing infrastructure, reducing the need for constructing new parking facilities.

[48] Victoria, 2019. Sustainable Mobility Strategy.
[49] Victoria, 2023. Schedule P- Missing Middle Regulations. Zoning Regulation Bylaw
[50] Vancouver, 2024. Updates to the Parking By-Law in Response to Provincial Bills 44 and 47, and On- Street Parking Management. Council Report.
[51] Victoria, 2024. 2050 Emerging Policy Framework for OCP Update

5.0 Prioritizing carbon-efficient built typologies

5.1 Prioritize MURBs and promote wood-frame construction for mid-rise residential buildings to achieve significant construction cost savings and reduce embodied carbon emissions.

See Section 3.2

5.2 Seek Input regarding Embodied Carbon on Design Guidelines

Incorporating an embodied carbon lens into the Official Community Plan and planning policies is crucial for fostering sustainable urban development. The upcoming OCP update should prioritize efficient built typologies that minimize carbon footprints. It is essential to avoid penalizing buildings with low embodied emissions to align planning policies with embodied carbon goals. This can include reviewing Form and Character Guidelines to reduce embodied emissions.[52]

5.3 Update Factors considered in Zones and Development Areas

There is opportunity to reassess the City's current land zoning practices to integrate geotechnical, environmental and climate considerations.

5.3.1 Geotechnical Factors

Identifying and avoiding construction on unstable or soft soil areas requiring costly and carbon-intensive stabilization can reduce embodied carbon. These areas could be repurposed for less intensive construction, ensuring optimal land use in the Land Use Plans. [53]

5.3.2 Carbon and Climate-based Factors

One potential approach is adding carbon-based factors in zoning alongside traditional criteria such as density, height, site coverage, and setbacks. This strategic shift can significantly contribute to the city's environmental objectives. Furthermore, a transition from conventional density transfer and variance to carbon intensity transfer could be pursued. While the parameters of height, site coverage, and setbacks have historically served as visual indicators for regulating development, there is merit in exploring the integration of carbon-related metrics in this process.

[52] Half Climate Design, 2024. Urban Design Guidelines Embodied Carbon Study.
[53] Community Energy Association, 2022. A Local Government Guide: Policies, Programs, and Incentives to reduce Embodied Emissions in the Built Environment.

6.0 Incentivizing with Development Charges and Permitting Fee Reductions

6.1 Update Development and Amenity Cost Charges

The City of Victoria can promote more carbon-efficient urban development by updating its Development Cost Charges (DCC) Bylaw. Higher-density developments generally have a lower per capita resource demand and cost compared to single-family dwellings. For example, the cost of running public transit and maintaining parks is higher per capita in single-family neighbourhoods due to lower utilization rates. This report highlights the varying embodied carbon impacts of different housing typologies. By restructuring DCC/ACC policies to distribute municipal costs based on the per capita impact of development types, the city can reduce development charges for projects with lower embodied carbon potential. A tiered approach is recommended, with higher costs assigned to single-family dwellings and decreasing charges for low-rise, mid-rise, and high-rise buildings. The City of Burnaby has recently adopted similar changes, with charges for single-family dwellings nearly three times those in Victoria's current structure. [54]

6.2 Encourage the design of new buildings for easy deconstruction to facilitate future material reuse and recycling.

Victoria's 2050 policy directions for the Official Community Plan (OCP) emphasize sustainable redevelopment practices, including mandatory deconstruction at the end-of-life stage of buildings to maximize material reuse and recycling. Key elements of this policy include promoting design for deconstruction in new buildings and facilitating home relocation. [55]

Mandatory compliance measures require waste management plans as part of building permits or rezoning applications to embed sustainability from the early planning stages. This approach is complemented by voluntary compliance options with incentives, like programs in cities like Denver and Toronto, which encourage sustainable practices while offering developers some flexibility. These dual approaches help ensure that a wide range of projects achieve significant waste diversion.

As more structures reach their end-of-life stages, future waste management will face challenges that must be addressed through effective policy and planning to mitigate embodied carbon. All buildings should include a deconstruction plan as part of the building permit process, adhering to guidelines like ISO 28800 Design for Disassembly & Adaptability and CSA Z782-06. Utilizing as-built models, BIM, or detailed construction drawings supports compliance and sustainability.

[54] Burnaby, 2023. Development Funding Program.
[55] Victoria, 2024. 2050 Emerging Policy Framework for OCP Update

Supporting design for disassembly and maintenance is crucial. By requiring demolition plans at the permit stage, which are included in construction drawings, the City can ensure that buildings are designed for disassembly, facilitate maintenance and end-of-life retrofitting, and significantly reduce waste and embodied carbon.

6.3 Provide rebates on permit fees for projects using locally sourced materials and sustainably sourced BC lumber, engineered wood products, and mass timber

The Victoria 2050 policy directions for the Official Community Plan emphasize the use of locally sourced renewable materials in new buildings and retrofits, including sustainably sourced BC lumber, engineered wood products, and mass timber. By prioritizing local materials, the City can support the local economy while significantly reducing the carbon footprint associated with transporting materials over long distances. This approach aligns with the goal of achieving net-zero transportation emissions from the manufacturing gate to the construction site. [56]

To further enhance sustainability, the policy can establish a tiered sourcing strategy. This approach prioritizes sourcing materials within British Columbia first, encourages sourcing from within Canada if local options are unavailable, expands the range to North America for materials not readily available in Canada, and considers international sources only when materials cannot be sourced from within North America. This ensures that sustainability and carbon footprint considerations are central to the material selection process, promoting a more sustainable supply chain. Appendix 3 details other jurisdictions that have codified such requirements.

To incentivize sustainable sourcing practices, a rebate on building permit fees could be offered, similar to the incentives provided for affordable housing projects. These financial incentives encourage developers to choose locally sourced materials, contributing to the city's sustainability goals. By aligning local sourcing with financial incentives, Victoria can promote sustainable building practices that support the local economy, reduce emissions, and contribute to the city's long-term sustainability objectives.

[56] Victoria, 2024. 2050 Emerging Policy Framework for OCP Update

7.0 Corporate Low Carbon Purchasing Policy

The City can lead by example by instituting a strict and clearly defined purchasing policy that selects low-carbon materials and reduces embodied carbon.

7.1 Establish emission intensity limits for concrete and other high carbon intensity materials for City projects

The City of Victoria can improve sustainability by including carbon considerations in its procurement and construction policies. The Federal Treasury Board Secretariat has developed a Concrete Procurement Policy. These benchmarks provide valuable guidance for setting local standards. Victoria can ensure its procurement and construction policies align with national best practices by aligning with these federal benchmarks. This alignment will help the city achieve its sustainability goals and set a precedent for other municipalities. Through thoughtful procurement and construction policies, Victoria can significantly reduce the carbon footprint of its building projects while fostering a more sustainable construction industry. [57]

7.2 Include requirements for recycled content in procurement policies and contracts to create more demand for recycled materials such as salvaged timber

Developing policies to promote and support the use of salvaged timber in interiors can significantly contribute to waste reduction and embodied carbon mitigation Addressing market demand for recycled materials in procurement policies is essential. Encouraging the City's Procurement Policies to include requirements for recycled content in procurement policies and contracts can create more demand for recycled materials.[58]

7.3 Implement artificial discount rates and shadow pricing to ensure carbon emissions are evaluated alongside cost, schedule, and other criteria in bid selection.

The City can implement an artificial discount rate and shadow pricing (i.e. a hypothetical cost to carbon emissions) to ensure that carbon emissions are considered along with cost, schedule, and other criteria when choosing bids for construction materials. This approach allows for a more thorough assessment of bids, encouraging using materials and practices that contribute to lower embodied carbon. It can also provide performance incentives to contractors who complete low-embodied-carbon projects or suppliers who offer materials below a specified carbon threshold. These strategies require

[57] Canada, 2022. Standard on Embodied Carbon in Construction.
[58] Victoria, 2021. Construction Material Salvage and Recycling Market Assessment.

early discussions between the City, design team, and contractor to align objectives and expectations. [59]

8.0 Increasing Construction Waste Diversion and Material Reuse

8.1 Investigate establishing waste diversion thresholds ranging from 50% to 75% for construction projects

Deconstruction (rather than demolition) allows for the recovery and reuse of materials, which can be repurposed for other construction projects or sold. Many cities have waste management bylaws, with waste diversion thresholds typically ranging from 50% to 75%. These thresholds help reduce landfill waste and promote recycling and reuse. Victoria's existing Demolition Bylaw focuses on salvaging wood; however, as Concrete MURB become more frequent, Construction and Demolition Waste that is not wood will increase significantly.[60]

Appendix 2 delineates such policies. Richmond mandates a 70% diversion rate, Austin requires 50%, and Toronto stipulates 75%. These targets encourage the construction industry to adopt more sustainable waste management practices. Some regions set even higher targets; Greater London aims for a 95% diversion rate, showing the potential for near-zero waste through careful planning and execution. Implementing deconstruction bylaws and promoting deconstruction over demolition can significantly reduce landfill waste and extend the landfill's life.

8.2 Implement local bylaws that make home relocation more straightforward and financially attractive than demolition or deconstruction

When single-family dwellings are situated on sites designated for redevelopment into MURBs, deconstructing or relocating the existing structures can reduce embodied carbon and waste.

Many areas in British Columbia are experiencing high development pressure. The current high land values and limited housing stock mean thousands of existing single-family detached homes are being demolished and redeveloped into MURBs. Local governments can support home relocation and repurposing as an alternative to demolition, reducing the need for new construction and avoiding additional embodied carbon. By implementing local bylaws that make home relocation more straightforward and financially attractive than demolition, municipalities can encourage the preservation of

[59] Lewis, M., Palmeri, J., and Simonen, K. (2022). Implementing Buy Clean: Guidance on Implementing Low-Carbon Construction Material Policies and Limits on Public Projects. Carbon Leadership Forum, University of Washington. Seattle, WA.
[60] Victoria, 2023. Demolition Waste and Deconstruction Bylaw.

existing structures, thereby conserving the materials, energy, and carbon already invested in these homes. [61]

A practical first step to enable home relocation is creating public-facing information about homes slated for demolition at the Building Permit application stage. This transparency allows house relocation and materials salvaging companies to contact homeowners for potential moving or salvaging opportunities. The Town of Sidney provides an exemplary model of this approach. Sidney has seen a significant increase in house-moving inquiries by offering a low house-moving permit fee of $250 compared to the $2,500 to $5,000 cost of a demolition permit. Nickel Bros House Moving, a company in the region, estimates that moving homes can divert 300-400 tonnes of building materials from landfills annually, substantially reducing embodied carbon emissions. [62]

The City of Richmond has also implemented a progressive House Moving and Salvage Program to promote sustainable practices. Richmond's Building Approvals Department facilitates the process by providing clear guidelines and support for homeowners interested in moving or salvaging their houses. Homeowners can list their properties on the city's website, allowing house moving and materials salvaging companies to contact them for potential relocation or salvage. The program offers a cost-effective and environmentally friendly alternative to demolition, helping to reduce waste and preserve valuable building materials. By ensuring that home relocation is less costly and more straightforward than demolition, Richmond encourages the reuse of existing homes, thus contributing to significant reductions in embodied carbon and fostering a more sustainable community. [63]

The City can further support the retrofitting and relocation of on-site single-family dwellings to the greatest extent possible by designating specific sites for retrofitting. This will ensure that existing structures are repurposed effectively rather than demolished, thereby reducing embodied carbon.

8.3 Advocate to the Province for establishing a standard grade for the quality of reclaimed wood to facilitate its use in construction.

Oregon and Washington encourage the use of salvaged or reclaimed wood in structures by establishing a standard grade for the quality of reclaimed wood. Advocating for the Establishment of a standard grade for the quality of reclaimed wood in *BC Building Code* will facilitate its use in construction, improve circularity, reduce Embodied Carbon, and improve local sourcing levels.

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[61] Community Energy Association, 2022. A Local Government Guide: Policies, Programs, and Incentives to reduce Embodied Emissions in the Built Environment.
[62] BC,2015. R&D Case Study 2: Waste Reduction, Voluntary Mechanism
[63] Richmond, 2024. Demolition, Moving or Salvage Program.

8.4 Recommend that the CRD adjust landfill tipping fees to disincentivize landfilling and encourage recycling.

A report funded by the City of Victoria recommended adjusting landfill tipping fees with the Capital Regional District to disincentivize landfilling is recommended. As market forces and Construction technologies change, these fees become less effective. Therefore, a regular mechanism to analyze the intricate balance between the forces, seek feedback and revise the fees based on the cost of inaction should be looked at. [64]

9.0 Conclusion

Reducing embodied carbon in construction is critical to meeting broader climate goals and fostering sustainable urban development. This report has outlined policy strategies for the City of Victoria to advance low carbon building practices, with a focus on multi-unit residential buildings. By adopting performance-based guidelines, prioritizing adaptive reuse, and considering site-specific factors, the City can significantly reduce its built environment's carbon footprint while supporting housing affordability.

The recommendations presented—ranging from reevaluating Gross Floor Area definitions and parking requirements to integrating geotechnical and ecological considerations in zoning—aim to shift current practices towards more environmentally conscious and sustainable outcomes. Looking forward, it is essential to continue refining these guidelines, ensuring they are adaptable to the evolving landscape of environmental challenges and urban development. Through collaborative efforts and forward-thinking policies, the City of Victoria can achieve significant reductions in embodied carbon, contributing to a more sustainable and resilient future for all.

[64] Victoria, 2021. Construction Material Salvage and Recycling Market Assessment.

Appendices

Appendix 1 LCA Requirements – Existing Policy Scan

Jurisdiction	Policy	Applicable to	Benchmarks	Compliance or Incentive
City of Vancouver	Vancouver Embodied Carbon VBBL	Part 3	Below 400 kgCO2eq/sqm in LCA	Compliance
District of North Vancouver	Climate Ready Rezoning Policy	Part 3	Reporting of LCA	Compliance
University of British Columbia	UBC Whole Building Life Cycle Assessment Guidelines v1.1	All	20% Reduction in LCA	Compliance
City of Toronto	Toronto Green Standard Tier 2	All	Equal to or less than 350 kgCO2eq/sqm in LCA	Voluntary, Refund of Development Charge
City of Denver	Denver Green Code 2022	All	10% Reduction in LCA	Elective for Code Compliance
Greater London Area	London Plan 2021	Projects referred to the Mayor	Reporting of LCA	Compliance
New York City	Executive Order 23	Public Buildings	LEED v4	Compliance
State of Oregon	SB4A Framework	Various Categories	Various, at least 20% Reduction in LCA	Voluntary Framework for Municipalities
Province of British Columbia	Low Carbon Building Materials and LEED v4	Public Buildings	LEED v4	Compliance
Canada	Greening Government Strategy Canada	Federal Buildings above $5 Million	30% Reduction in LCA, effective from 2025	Compliance
City of Langford	Low Carbon Concrete Policy	All projects subject to rezoning	Only for Concrete EPD	Compliance
City of Portland	Notice of New Requirements for Concrete	Public Projects	Only for Concrete EPD	Compliance
State of New York	Executive Order 22	Public Projects	Only for EPDs	Compliance
State of Colorado	Buy Clean Colorado Act	Public Projects	Only for EPDs	Compliance

Appendix 2 Waste Diversions Scan – Existing Policy Scan

Jurisdiction	Policy	Applicable to	Benchmarks	Compliance or Incentive
City of Richmond	Demolition Waste and Recyclable Materials Bylaw No.9516	All	70% Diversion	Compliance
University of British Columbia		For Non-LEED Projects	75% otherwise as per LEED v4	Compliance
City of Toronto	Toronto Green Standard Tier 2	All	75% Diversion	Voluntary, Refund of Development Charge
City of Austin	Construction and Demolition Recycling Ordinance	All	50% Diversion	Compliance
City of Denver	Denver Green Code 2022	All	50% Diversion	Elective for Code Compliance
Greater London Area	London Plan 2021	Projects referred to the Mayor	95% Diversion	Compliance
State of California	Calgreen Code	Various Categories	Various, at least 65% Diversion	Compliance

Appendix 3 Local Sourcing Scan– Existing Policy Scan

Jurisdiction	Policy	Applicable to	Benchmarks	Compliance or Incentive
City of Vancouver	Vancouver Community Benefit Agreement Policy	Projects over 45000 sqm	Atleast 10% material should locally sourced	Compliance
City of Toronto	Toronto Green Standard Tier 2	All	25% Material (by cost) meet at least 2 criteria for responsible extraction	Voluntary, Refund of Development Charge
City of Denver	Denver Green Code 2022	All	Atleast 10% to be sourced from within 600 miles	Elective for Code Compliance