GUIDING URBAN FORESTRY POLICY INTO THE NEXT DECADE

CIP Elevation 2.0 Conference

07/07/2022

Presented by: Kaitlin Webber, Melissa Le Geyt, Theresa O'Neill, Vignesh Murugesan

School of Planning

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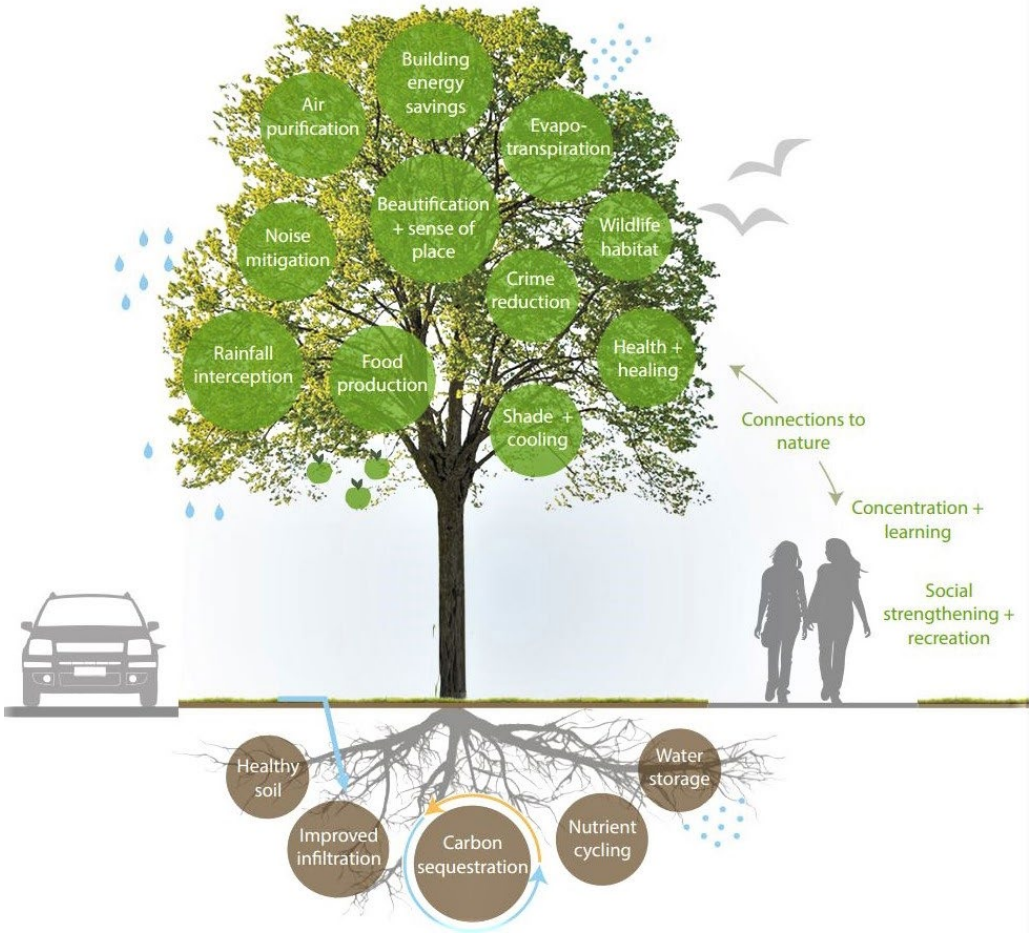
Image: Tree Canada

URBAN FORESTRY IN CANADA



- Trees provide numerous benefits for the ecosystem and communities
- National average of tree canopy coverage decreased from 27.6% (1990) to 26.1% (2012)
- Urban Forest: The sum of all woody and associated vegetation in and around dense human settlements
- A significant percentage of urban trees are located on private properties

Image: City of Vancouver

CASE STUDY OVERVIEW

2019: Report to City of St. Catharines

- Alternatives to private tree cutting by-law

2020: Practice Guide

- Recommendations for private tree management

Image: Clean Air ON

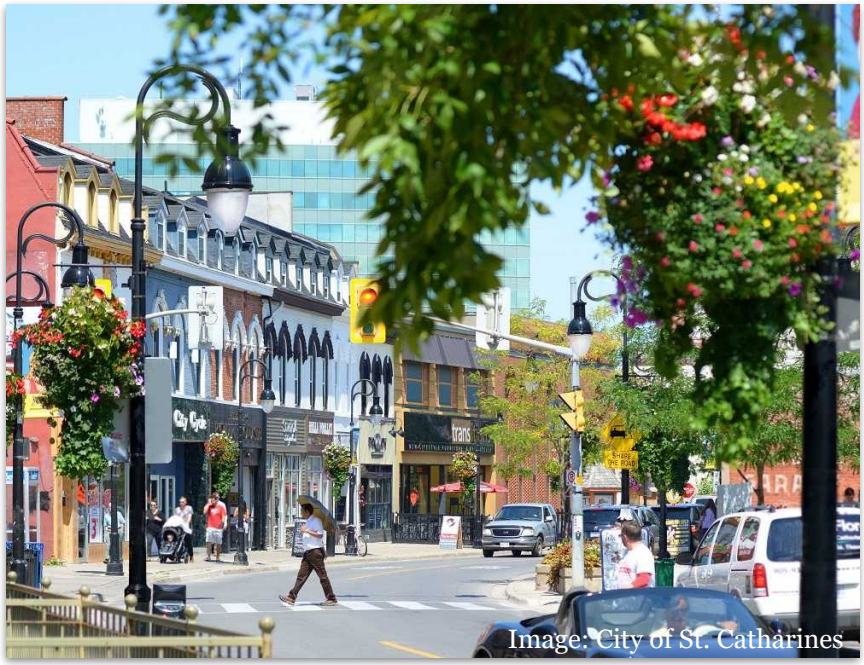


Image: City of St. Catharines

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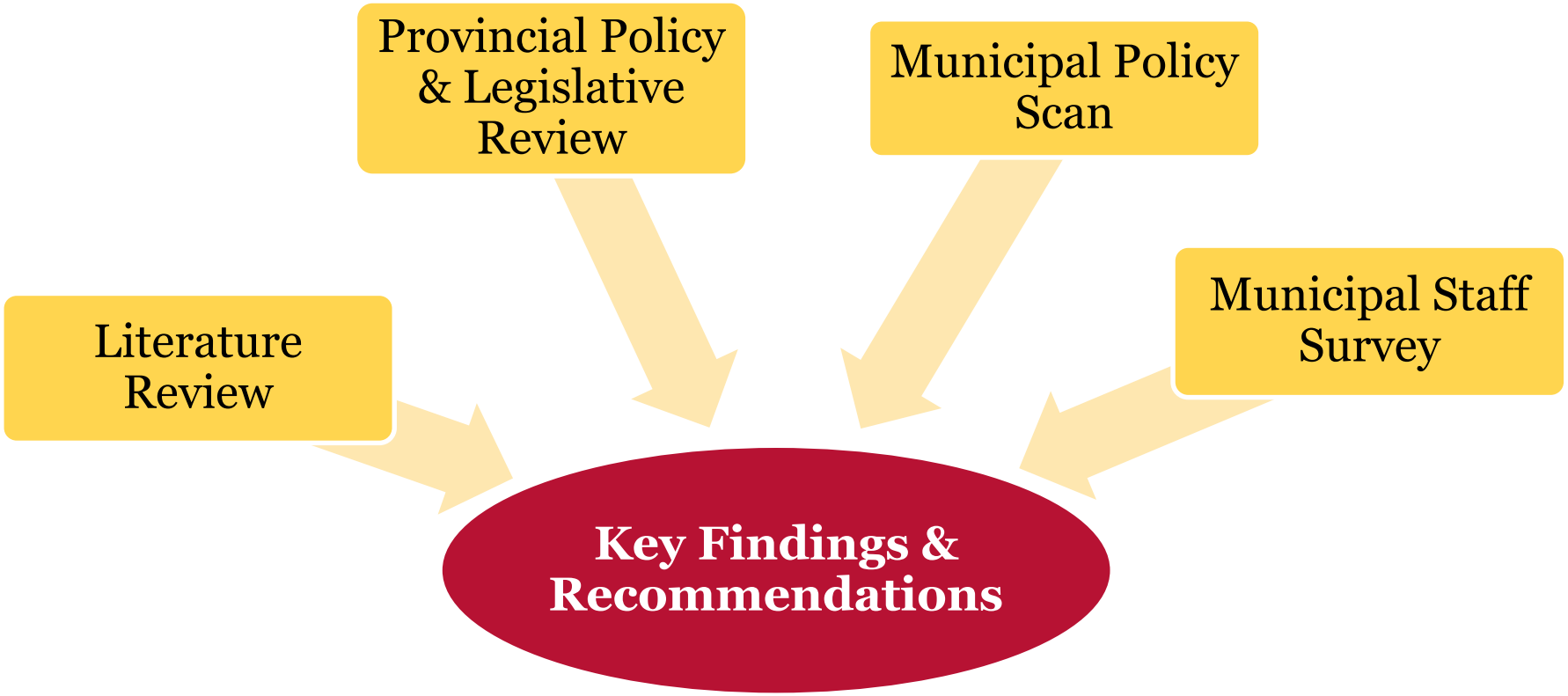
RESEARCH PROCESS



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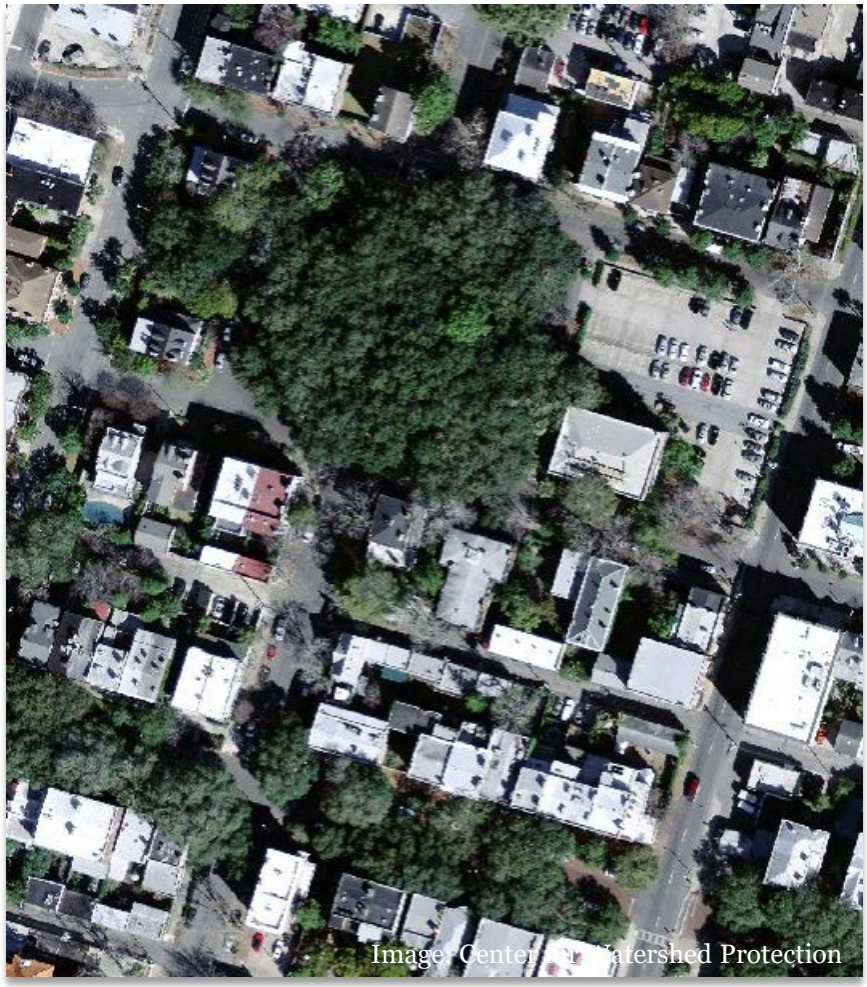
RECOMMENDATION THEMES

- Enforcement Tools
- Planning Policies
- Programs & Events



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RECOMMENDATIONS

1. Include planting target ratios

Oshawa, Landscaping Design Policies (1988), 6.0 Plant Material:
"6.4 The use of indigenous plant material is encouraged. It is suggested that at least 50 percent of all proposed tree and shrub plantings on a site be of indigenous material."

2. Leverage perimeter trees

Ajax, Employment Areas Urban Design Guidelines (2006), 4.3 Landscaping:
"Preserve all existing perimeter trees with minimal changes to the area beneath the drip line. Locate underground services and utilities so as not to encroach within the drip line of trees to be preserved, to minimize disruption to the root system"

RECOMMENDATIONS

3. Update canopy cover strategy

- Identify and follow current best practices for canopy monitoring and tracking progress.
- Support efforts to establish canopy cover targets

4. Formalize climate resilience considerations

Ajax, Official Plan (2016), 2.1.4 Tree Canopy:
"b) To maintain, protect, and enhance the existing tree canopy, the Town shall: Encourage the planting of native or non-native non-invasive tree species and vegetation that are resilient to climate change and provide high levels of carbon sequestration, subject to the Town's approval, particularly through new development and on municipally-owned land."

RECOMMENDATIONS

5. Increase tree-related programs

- Private-public partnerships can support year-round programs and fundraising

6. Create resident-focused education programs

- Develop a culture of conservation

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RECOMMENDATIONS

7. Amend Official Plans and Design Guidelines to include tree policies

Guelph Official Plan, 4.1.6.1 Urban Forest Policies:
"Healthy non-invasive trees within the urban forest shall be encouraged to be retained and integrated into proposed development. Where these trees cannot be retained, they will be subject to the Vegetation Compensation Plan."

8. Strengthen development application process

- e.g. Thunder Bay - collect money that would be allocated to tree planting requirements and plant themselves


Image: City of Guelph

RECOMMENDATIONS

9. Ensure a consistent municipal "tree vision"

SmartGuelph Principles:

f) Pastoral and Protective

"...a city that preserves and enhances its significant natural features, rivers, parks and open spaces and makes the planting and preservation of trees a priority..."

Image: TULI

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RECOMMENDATIONS

10. Designate trees as heritage features

City of Windsor Official Plan

1.26 Sandwich Heritage Conservation District

"The objective of the Sandwich Heritage Conservation District is to preserve the buildings and streetscape. Owners of property will require a heritage permit for the following changes to their property:

(s) Removal of trees with a minimum trunk diameter of 10 centimetres."

Image: City of Vancouver Heritage Tree ID # HT11

RECOMMENDATIONS

11. Develop and implement a private tree by-law

- Considered a critical tool for protecting trees on private lands
- Variations in applicability and permitting processes

12. Increase by-law coverage

- Regulate maintenance of trees through amendments to/use of existing by-laws (e.g. Property Standards)

Town of Ajax

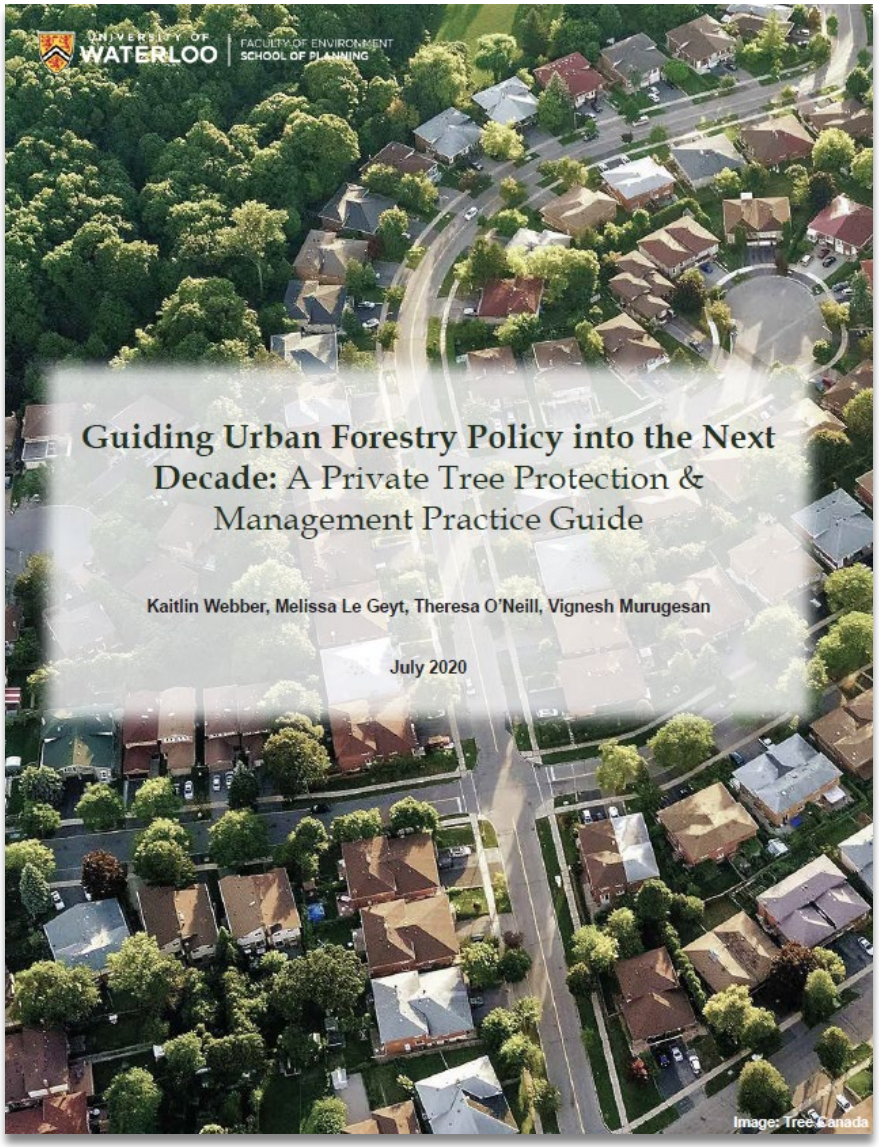
Tree Protection By-Law 137-2006

4.2 The provisions of this by-law shall apply to:

a) Any land in the area described in Schedule "A" to this by-law;
b) Any land or part of land in an area designated as Environmental Protection, Open Space, Town-Wide Park, Community Park, or Neighbourhood Park pursuant to Schedule "A" of the Town's Official Plan; and
c) Any land or part of land in an area zoned as Private Open Space pursuant to the Town's Zoning By-laws.

Practice Guide

https://uwaterloo.ca/planning/news/grad-students-develop-tree-protection-guide-private-land



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Elevate 2.0

WHY EMBODIED CARBON MATTERS TO PLANNERS

JULY 7th 2022

3:30-4:45 PT

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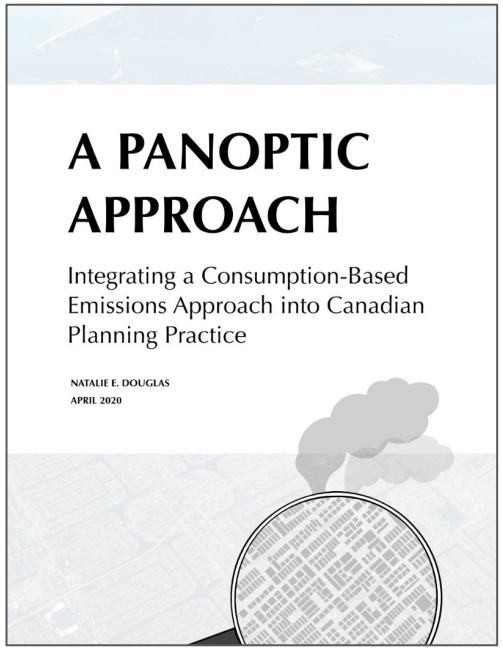

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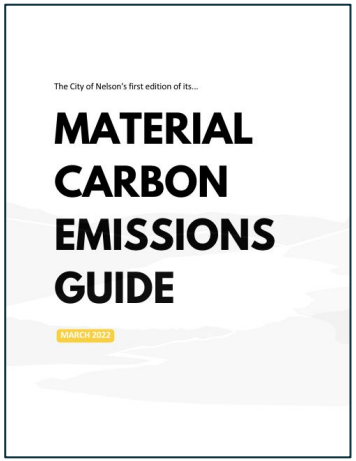

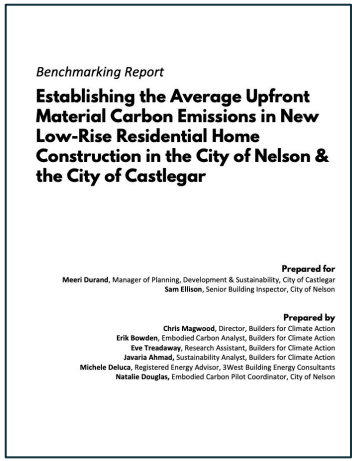

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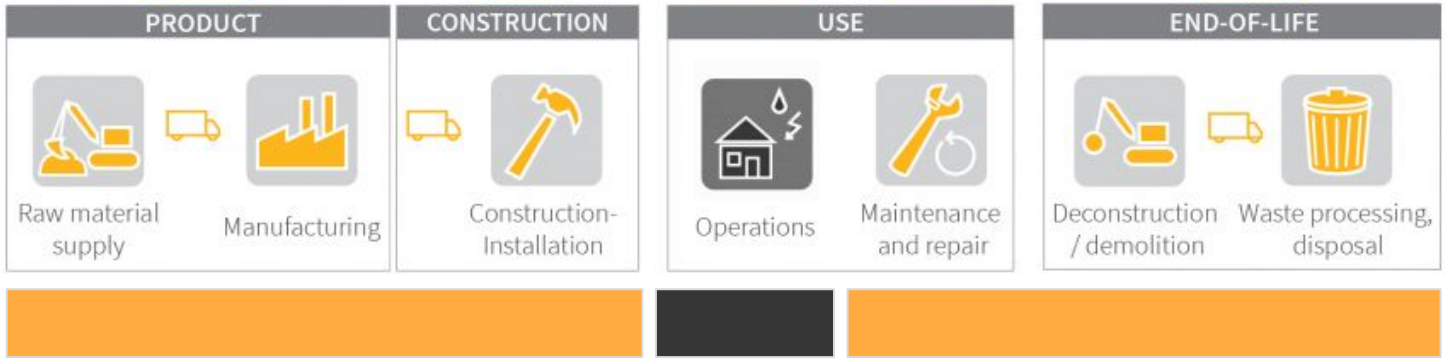
Presentation Outline

1. **What** are embodied carbon emissions?
2. **How** can planners help?
3. **Who** can we copy?



Embodied Carbon Emissions **Operational Carbon Emissions**

Traditionally, we have accounted for emissions associated with local **production** (also including greenhouse gas emissions from exported goods and services).

In the context of building materials, this would means the following emissions would be considered...

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This has become problematic since many wealthy cities and countries have moved significant amounts of material production to other countries and thus, no longer account for these emissions.

Considering emissions associated with the imports of goods and services allows us to more fully understand our **consumption-based emissions** and more effectively reduce global greenhouse gas emissions.

65-85% of today's emissions

Focusing only on production-based emissions can misplace responsibility impact that which hinders our ability to reach our global emission reduction targets.

Now, is the time to target **consumption**.

Addressing embodied carbon emissions in buildings can help us do this.

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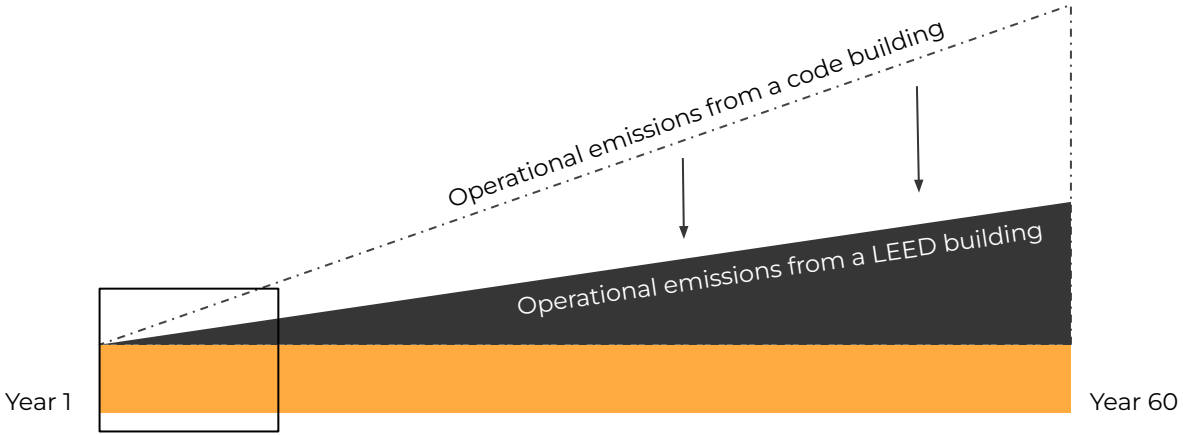
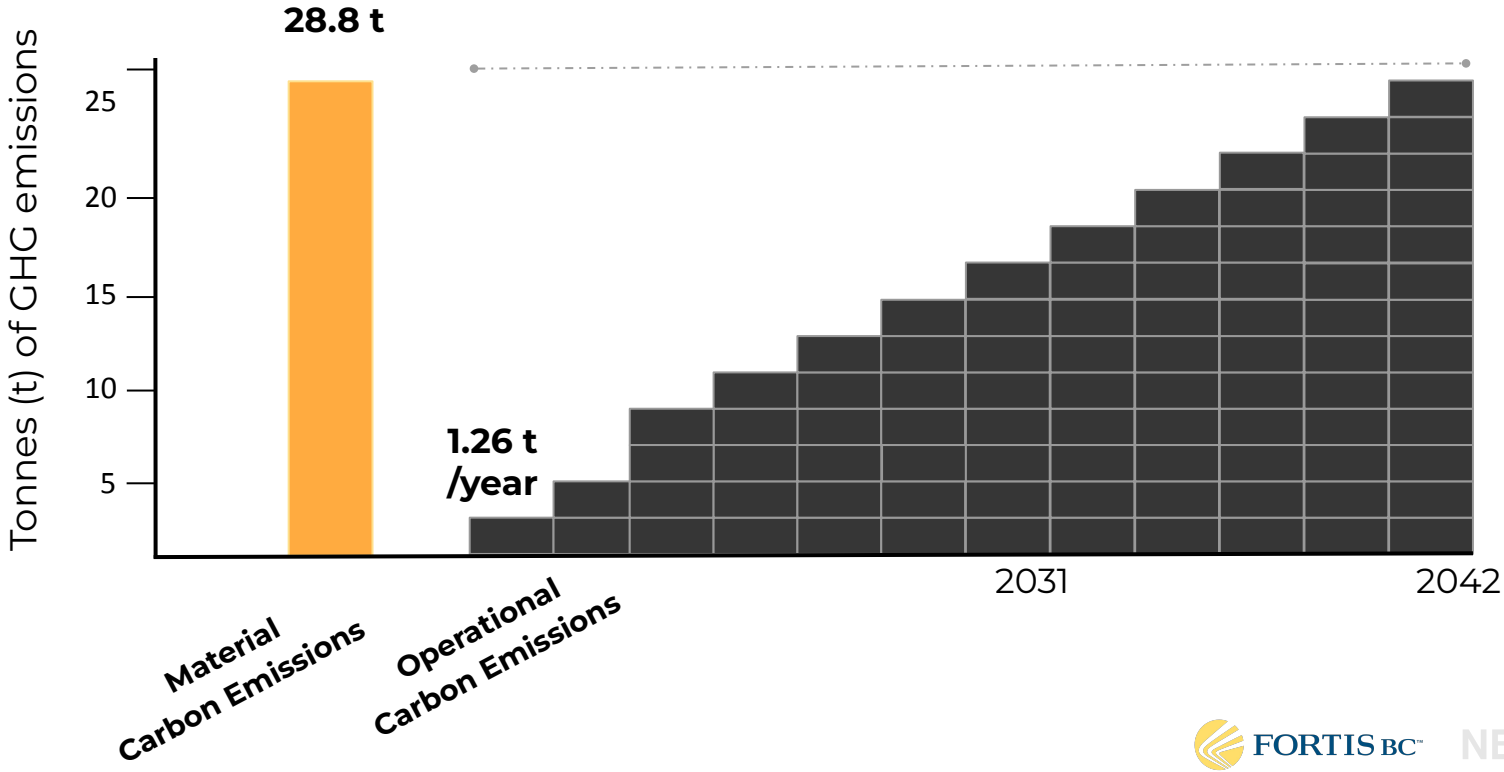


After 60 years, embodied carbon represents a total of ~40% of emissions of a LEED certified building (*based on data from an Ontario government building*).

At 12 years, the embodied carbon represents ~75% of total emissions.

If we want to reduce emissions quickly, focusing on embodied carbon may be particularly effective.

It will take **23 years** before Nelson and Castlegar's operational emissions average matches its average material carbon emissions.



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So, how does this relate to planners?

1.

DIRECT ACTIONS

Zoning, land use policies, and design guidelines can have significant material implications.

2.

SUPPORTING ACTIONS

Planners contribute heavily to establishing overarching municipal priorities and convening necessary players.

1.

EMBODIED CARBON TARGETS

PARKING POLICIES

SPACE SUFFICIENCY

BUILDING FORM CONSIDERATIONS

REDUCE BUILDING UNDERGROUND

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CNC

architecture 2030

EMBODIED CARBON TARGETS

Require the **disclosure** of embodied carbon emissions associated with projects within certain zones and/or incentivize embodied carbon reductions

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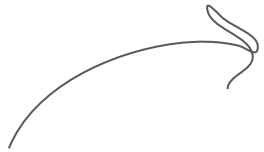
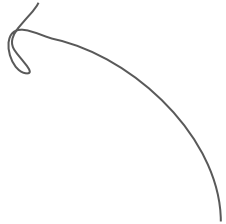
BUILDING FORM CONSIDERATIONS



Consider the emissions impact of **step-backs** and weigh this against other impacts (e.g., street comfort, affordability, etc.)

Include **basement floor area** in floor area calculation and reduce underground **parking** wherever possible



REDUCE BUILDING UNDERGROUND

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CNC

architecture 2030

E.g.,

City of Vancouver

- Since **2017**, all Part 3 buildings applying for rezoning must calculate and disclose embodied carbon.
- Since **2020**, they've had a target of reducing embodied carbon emissions by 40% by 2030 (compared to 2018 numbers)
- In **2023**, they're introduce embodied carbon reporting requirements to the building by-law for all new Part 3 buildings, and limit the amount of embodied carbon as compared to a baseline.
- In **2025**, they'll require embodied carbon reductions of 10% for all Part 3 and 20% for all Part 9 plus some prioritization of sustainable sourcing, disclosure of chemical ingredients, and 75% construction waste diversion and design for disassembly

Climate Emergency Action Plan

CITY OF VANCOUVER

E.g.,

City of Toronto

- On May 1st 2022, Version 4 of the Toronto Green Standard came into effect
  - **Low-Rise (>4 units)**: Tier 2 will require a embodied carbon emissions assessment (A1-A3), demonstrate an emissions intensity of less than 250 kg CO2e/m2, and low carbon sustainable alternatives identified
  - **Mid to High Rise Residential and Non-Residential**: Tier 2 would require a embodied carbon emissions assessment (A1-A5) and low carbon sustainable material alternatives identified. Tier 3 would require a whole building life cycle assessment and demonstrate a min. 20% embodied carbon reduction compared with a baseline building. If you reach higher tiers you get your development fees back.
  - **City Buildings**: same as mid to high rise category.

TORONTO

2.

PUBLICIZE AND ELEVATE CASE STUDIES

PROCUREMENT POLICIES

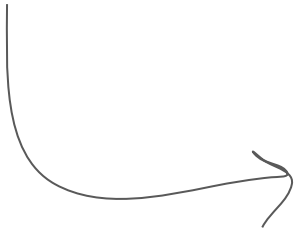
EMBODIED CARBON LIMITS

LIFECYCLE ASSESSMENTS IN TRANSPORTATION PROJECTS

Planners play an outsized role in overall policy guidance.

Armed with an understanding of some basics, planners can influence procurement, infrastructure, and waste-related policies in ways that reduce material carbon emissions.

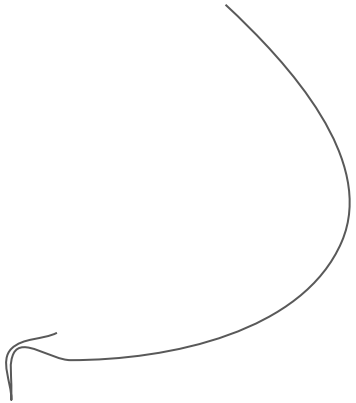
PUBLICIZE AND ELEVATE CASE STUDIES



Especially those that offer clear design guidance on how to support the use of lower-carbon **structural** systems and materials (e.g., design to use less steel and concrete) and lower-carbon **envelope** systems (e.g., use lower embodied carbon insulation)

PROCUREMENT POLICIES

Consider embodied carbon emissions and/or require **lifecycle assessments** as part of the procurement process. Prioritize procurement of **salvaged, reused, or recycle materials** in certain new city projects.



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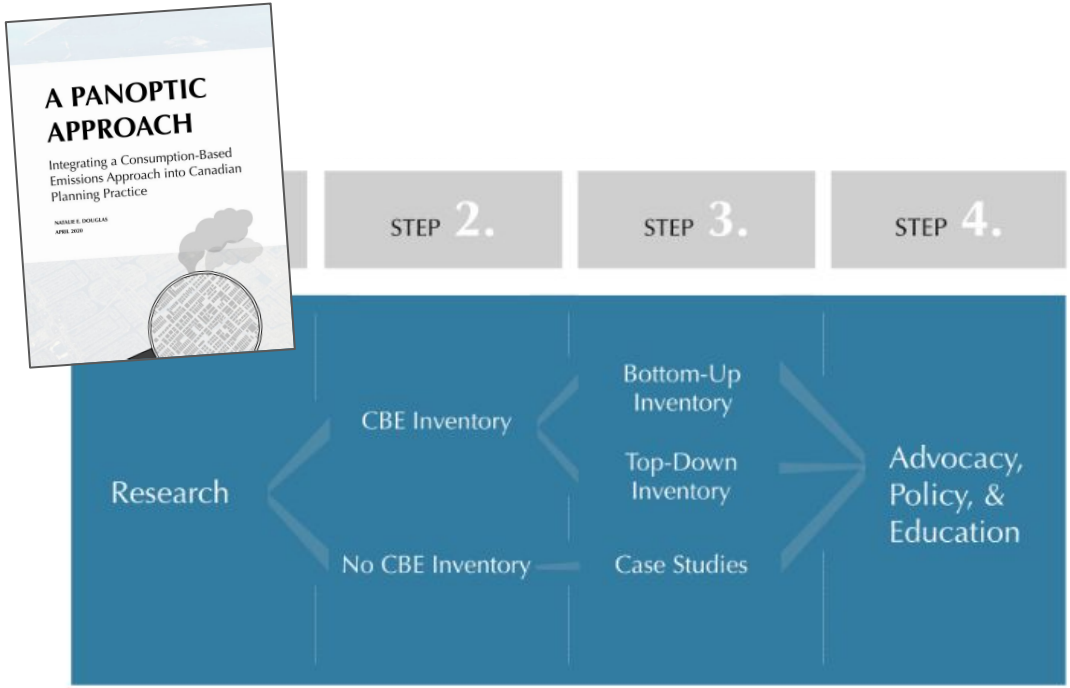

Core to this research was the realization that we couldn't wait for perfect data and that education was a crucial first step

Climate change demands that we copy each other.

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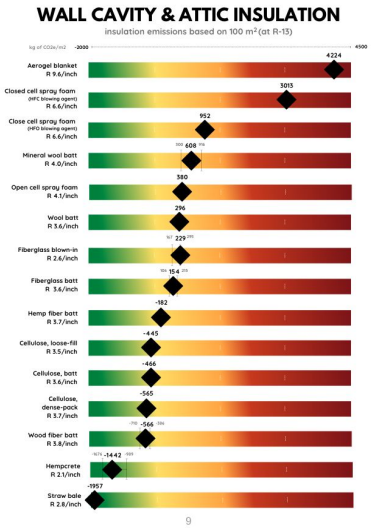
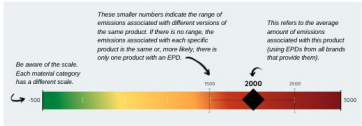


This guide provides a comparison of the greenhouse gas emissions that come from a *cradle-to-gate* (A1-A3) analysis of different categories of building materials. In this context, *cradle* refers to resource extraction and *gate* refers to the factory gate (i.e., before the product is transported to the consumer). In other words, this guide tells you which materials have less emission intensive raw material acquisition and manufacturing processes and therefore a smaller carbon footprint. This information is presented in a manner similar to the fuel efficiency ratings you find for automobiles. It is intended to help you compare building material options based on their material carbon emissions (sometimes called *embodied carbon* or *embodied emissions*).

The results in this guide are shown for a specific amount of material, noted below each section title (e.g., concrete emissions for 1 m^3 at 25 mPa strength) and are based on source data obtained from Environmental Product Declarations (EPDs). EPDs are internationally recognized standardized reports on product impacts. Most green building certifications processes require Type III EPDS, which means that the EPD has been reviewed by a third party. It should be noted that the specific product you are choosing may not be included in this guide since not every manufacturer has created an EPD. That being said, most products within the same material types have similar manufacturing processes and thus, tend to rank similarly according to their material carbon emissions.



The product types (e.g., brick) in each material category (e.g., cladding) are listed in this guide from highest emissions to lowest emissions. If you want to reduce the material carbon emissions of your home, select products that are further down on the list. It is important to recognize that we are recommending that the material carbon emissions discussed in this guide be considered in conjunction with energy efficiency considerations and other priorities (e.g., fire smart and other disaster resilience and climate adaptation strategies).

The majority of the data in this document is generalizable and can be applied to communities across the country. Although it can't provide granular guidance, it's a great tool to spread the word.

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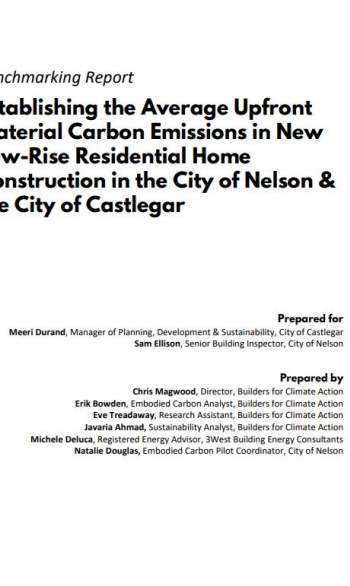

Benchmarking Report

Establishing the Average Upfront Material Carbon Emissions in New Low-Rise Residential Home Construction in the City of Nelson & the City of Castlegar

Prepared for
Meeri Durand, Manager of Planning, Development & Sustainability, City of Castlegar
Sam Ellison, Senior Building Inspector, City of Nelson

Prepared by
Chris Magwood, Director, Builders for Climate Action
Erik Bowden, Embodied Carbon Analyst, Builders for Climate Action
Eve Treadaway, Research Assistant, Builders for Climate Action
Javaria Ahmad, Sustainability Analyst, Builders for Climate Action
Michele Deluca, Registered Energy Advisor, 3West Building Energy Consultants
Natalie Douglas, Embodied Carbon Pilot Coordinator, City of Nelson

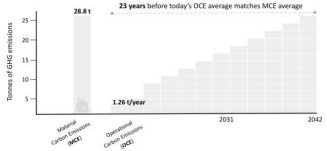

Figure 3. *This graph illustrates the importance of addressing material carbon emissions, showing that it will take 23 years before the cumulative operational carbon emissions equal the amount of material carbon emissions associated with the house by the time it is first built.*

For the 11 most emissive intensive homes in the study, it will take between 90-100 years for OCE to equal MCE. As the BC Step Code is already addressing operational emissions in line with climate targets, this study shows that these efforts must be combined with actions aimed at reducing MCE in order to address the full emissions spectrum from the home building sector. In a region with a relatively low carbon grid, reductions in MCE could be much more significant than those achieved from OCE, although the most successful strategies combine both metrics. Without addressing MCE, all the work done to reduce OCE may be entirely negated by the overall results of an efficient home made with products with high MCEs.

Material Carbon Intensity by *Density* Function (MCIx[1]): While the researchers employed MCI as a simple metric to account for size differences between homes, there was a concern that such a simple metric may not reflect the complex issues faced by municipal staff (e.g., planners) when attempting to regulate material carbon emissions. As regulators in British Columbia are learning that Step Code levels are not necessarily reflective of GHG emissions from homes, the research team was concerned that the MCI metric may potentially penalize smaller homes with higher occupant density and reward larger homes with lower occupant density. This is because smaller homes tend to have a lower surface area to floor area ratio, meaning that they require more materials per square foot of living space but still have a much lower overall MCE. A metric was created that would fairly balance MCE with building size and number of bedrooms, using the formula: (# bedrooms/house volume in m³) * (1000/MCE). This metric would enable planners to incentivize homes with low MCE while factoring both building size and the number of occupants served by the carbon footprint of the building thus, encouraging density (i.e., another low carbon tactic aimed at addressing the largest emission contributor in most Canadian municipalities). The results generated using this metric are shown in Figure 4. These bar charts show that the Material Carbon Intensity by Function metric generally gives higher (better) scores to smaller homes with low cumulative material carbon emissions and that some homes with higher bed counts were still able to score decently well. Overall, it shows that this metric generally supports the overall use of less materials and higher density housing.

[1] We use F1 to indicate the specific inputs (i.e., bedroom count, interior volume etc.) that were selected to capture density. If further research wanted to use different inputs, F2 etc. could be used.

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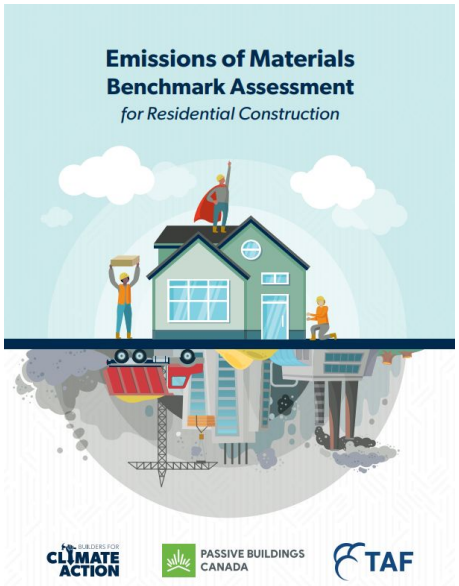

Putting Material Carbon Emissions into Context

Canada, and the entire world, is faced with a rapidly declining "carbon budget" within which we must function to stave off the worst effects of climate change. The United Nations has declared the climate emergency "code red for humanity."[1] The Pan-Canadian Framework on Clean Growth and Climate Change (PCF, 2016) identified the building sector as one of the major contributors to GHG (greenhouse gas) emissions in Canada.[2] To this end, improvements in energy efficiency have been integrated into the National Building Code of Canada and the Ontario Building Code as well as municipal incentives and voluntary green building standards in order to reduce emissions from new homes.

The very short amount of time available to meet Canada's emission reduction targets of 40-45 percent below 2005 levels by 2030[3] requires us to consider all of the emission impacts from the housing sector and focus effort on those sources of emissions that have the greatest immediate impact on our remaining carbon budget. In recent years, increased attention has been drawn to the emissions arising from building materials, often referred to as "embodied carbon," (this report uses the more specific term "material carbon emissions"(MCE) to describe the cradle-to-gate phases of life cycle assessment [4]). Early research[5,6], in this field indicated that over the next two crucial decades these emissions are likely to substantially outweigh the operational emissions attributed to newly constructed homes.

Remaining Global Emissions Budget

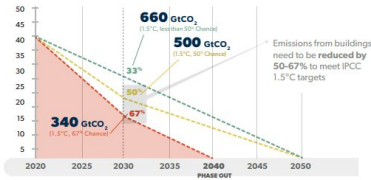

Figure 1: Emission reduction pathways to meet IPCC 1.5C targets Adapted from Architecture 2030.

These reports include material substitutions, methodological, and industry recommendations for taking action to reduce material carbon emissions.

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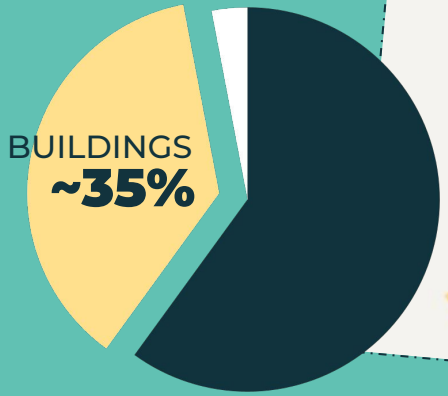
Nelson Next:



Aspiration Two

Infrastructure and buildings in Nelson are zero carbon, and resilient.

Kick-start and support a rapid transition to zero-emission and disaster-resilient homes, buildings, and communities, and lower-impact development and construction. Reducing building emissions is a top priority for achieving Nelson's climate goals and targets.

Co-Benefits

Sustainable Behaviour | Improved Resource Efficiency | Public Health

Strategies

1. New buildings are net zero ready, have low embodied carbon, and are resilient against a changing climate.
2. Existing buildings are retrofitted to achieve deep energy savings, reduced emissions, and climate resilience.
3. Our building sector and academic institutions are leaders in green building research, innovation, and construction.
4. Financial barriers to energy efficient and resilient buildings will be reduced through a range of support mechanisms (i.e. grants, targeted programs, specialized support services, etc.).

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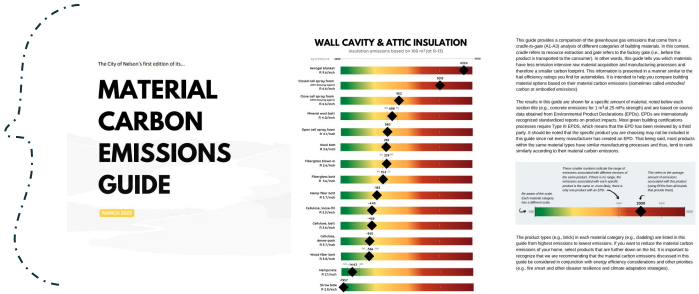
To reduce Material Carbon Emissions, we need to...

Support Residents

Regional Energy Efficiency Program



To reduce Material Carbon Emissions, we need to...

Work with the Building Community

To reduce Material Carbon Emissions, we need to...

Lead by Example

New Langford low carbon concrete policy comes into force in 2022

West Shore city aims to offset high greenhouse gas emissions from cement manufacturing

JANE SKRYPNEK / Nov. 19, 2021 2:00 p.m. / LOCAL NEWS / NEWS

The City of Langford is introducing a new construction policy that will require the majority of future developers, including the city, to use low carbon concrete.

The policy, coming into effect June 1, 2022, will apply to all concrete supplied to city-owned or solicited projects, and private projects requiring more than 50 cubic metres.

The University of San Francisco

USF Scholarship: a digital repository @ Gleeson Library | Geschke Center

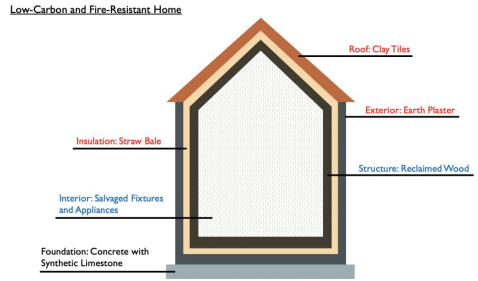


Figure 8. The Low-Carbon and Fire-Resistant Home

Low-carbon materials, including naturally derived materials, can be used to create a more fire-resistant home. Materials in red text are naturally derived and materials in blue text are salvaged. (Source: Author)

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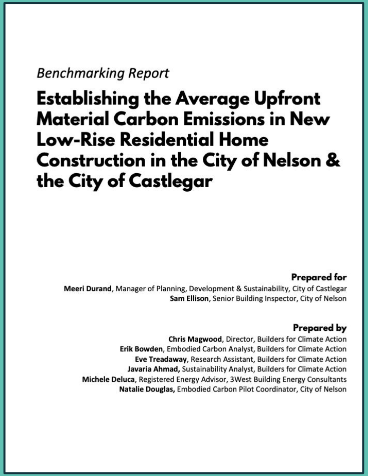
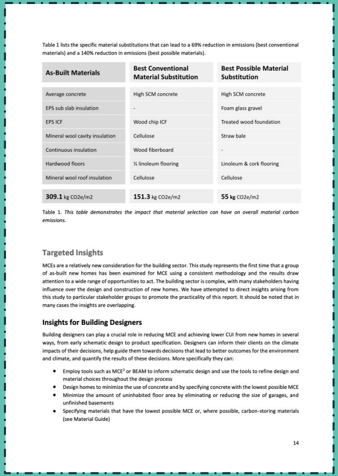
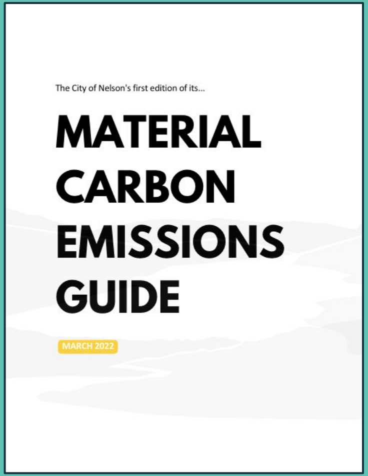
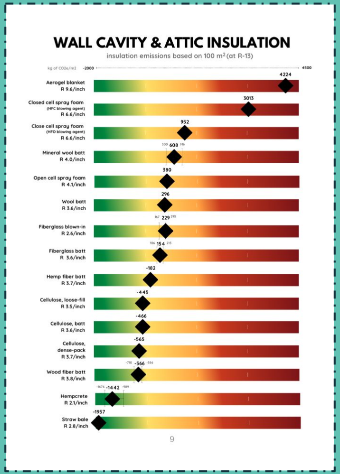
THANK YOU

Also, just a reminder that these are **FREELY AVAILABLE** on the City of Nelson's Website









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