Build Back Better—*Literally*

According to the International Energy Agency (IEA), building sector CO_2 emissions were at the highest level ever recorded in 2019.[1] In Canada, one-quarter of all GHG emissions come from buildings, and that figure doesn't include embodied carbon emissions.[2]

"Embodied carbon emissions account for up to 75% of a building's total emissions over its lifespan."[3]

What is Embodied Carbon?

Bringing Embodied Carbon Upfront

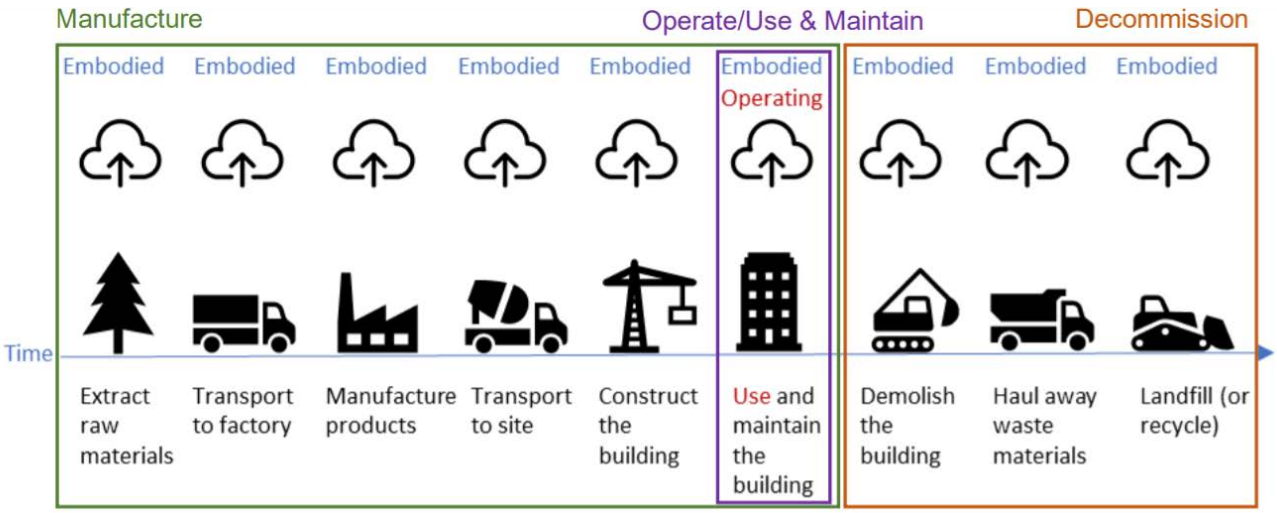
Embodied carbon, in the context of buildings, refers to emissions associated with the materials extracted for construction, transportation, manufacturing, on-site construction, as well as decommissioning (including demolition, recycling, and landfill).

Operational emissions refer to building energy consumption.

Unfortunately, only operational emissions (energy consumed for heating, cooling, ventilation, and plug loads) are factored in across Nova Scotia and most of Canada.

As illustrated below, operational emissions are just one phase in a building's life cycle; non-operational phases release significant GHG emissions, as well.

"The embodied carbon emissions of building products and construction represent a significant portion of global emissions: concrete, iron, and steel alone produce ~9% of annual global GHG emissions; embodied carbon emissions from the building sector produce ***11% of annual global GHG emissions.***"[4]



Source: Embodied Carbon in Construction[5]

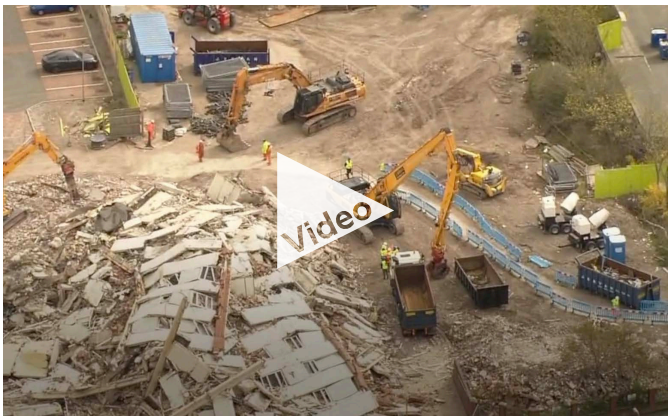
Here are the facts:

- Cement and steel are two of the biggest sources of material-related emissions in construction. A ton of cement or steel represents about a ton of GHG emissions.[6]
- If the cement industry were a country, it would be the third-largest global emitter of CO_2, after China and the US.[7]
- If we continue with business as usual, embodied carbon emissions from new construction will be almost on par with operational carbon emissions over the next 30 years.[8]
- Embodied carbon emissions are irreversible once a building or home is built. [9]
- Canada must eliminate embodied carbon emissions by 2040 in order to meet federal and international climate targets.[10]

Restore and Renovate First

The best way to reduce any new embodied carbon emissions is to reuse existing homes and buildings rather than demolish them and start over again. Unfortunately, many buildings are written off much earlier than necessary to make way for something shiny and new.

Recently, the Royal Institute of British Architects came out strongly against demolishing older buildings, saying that they should be refurbished to reduce embodied carbon emissions, instead.[11]



Source: RIBA Architects say building demolitions cause of carbon emissions video

The Halifax Regional Council is still moving ahead with approvals for two proposed development projects. If permitted, they would result in the demolition of mixed-use, small-scale, and (in some cases) historic buildings in the Carlton Street block (bounded by Spring Garden Rd, Robie St, College St, and Carlton St).[12] [13] The buildings would be replaced by four highrises (with 29-30 stories each).[14] [15]

"The greenest building is the one that is already built."[16]

When a community, such as Halifax, is full of demolitions and new construction projects, it is not a sign of sustainable prosperity or economic growth; rather, it is an indication that there is still a lack of understanding of (or disregard for) the impact of embodied carbon on climate change.
It's imperative to thoroughly consider all refurbishment options and set regulations that limit embodied carbon emissions in the building sector.

How Else Can We Reduce Embodied Carbon?

Building smart (using low-carbon materials), building efficiently (using fewer resources and wasting less), building circular (designing for reusing and recycling), and building durable (designing for longevity) are all measures that can decrease embodied carbon emissions from the buildings and construction sector.

This will require:

- ensuring accurate and transparent accounting of embodied carbon emissions in the sector
- legislating reductions in embodied carbon emissions, backed by new building regulations, monitoring, and enforcement
- mandating a whole life-cycle carbon assessment for new construction projects and requiring that projects meet specified carbon targets in order to obtain a building permit

What is a whole life-cycle carbon assessment?

It's a way to measure the environmental footprint of a building or project over its complete lifespan, from the sourcing and transportation of building materials, to its end-of-life decommissioning. Using scientifically validated CO_2 ratings for raw materials, builders can estimate the carbon footprint of a new building and consider its impact on the air, water, soil, global warming, and more. It helps to see the potential environmental benefits of using local and robust materials that last longer and can be recycled. These life-cycle carbon assessments, and the data used to inform them, should be transparent and readily accessible to the public.[17]

Source: UBC Embodied Carbon Pilot

Here's What Climate Leaders Are Doing

As of January 1, 2022, all new buildings (that have three stories or less) in Vancouver will be required to have electric heating and hot water appliances. They must also meet higher standards for insulation and windows to improve energy efficiency.[18] It's part of the city's 2020–2025 Climate Emergency Action Plan, in which Vancouver has committed to reducing embodied carbon emissions from new building and construction projects by 40 percent (compared to 2007 levels) by 2030.[19]

The Netherlands requires a whole life-cycle carbon assessment for new buildings over 100m^2 and places strict limits on their environmental footprint, reflected as a measurement of the building's "Environmental Performance." The life-cycle analysis of the materials and products used in the building process assesses 11 environmental indicators, including impact on global warming, ozone depletion, and human toxicity. The values of the materials and products are standardized in a national environmental database.[20]

Reducing Operational Carbon: Zero-Carbon Buildings

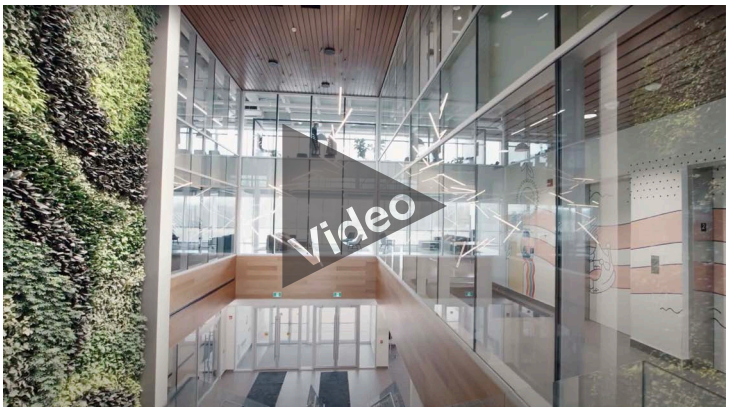
The World Green Building Council defines a net-zero carbon building as "a highly energy efficient building that is fully powered from on-site and/or off-site renewable energy sources and offsets."[21] In such a building, "the amount of carbon dioxide emissions released on an annual basis is zero or negative."[22]

While this may sound like a thing of the future, the technology is already being used in buildings and homes in Canada.

The Canada Green Building Council provides guidance on how to build and retrofit buildings to achieve net-zero carbon emissions; it also provides Zero-Carbon Building Design and Performance certifications for those that do.[23] The completed building projects are truly inspiring.

The money saved on energy costs will "more than offset the upfront capital costs" to achieve net-zero building standards.[24] Net-zero buildings—whether achieved through deep retrofits or new construction—can be designed to produce more green energy than they require. They can then provide surplus energy back to the local communities to help support the clean energy transition.

Evolv1: the first Zero Carbon Building – Design Certification[25]



Humber College Building NX: first retrofit Zero Carbon Building – Design Standard certification[26]

Canada's Climate Retrofit Mission, a new report by Efficiency Canada and Carleton University, sets out the pathways for achieving net-zero retrofits. It also presents an ambitious mission: mass climate retrofits to get all building stock to net-zero carbon by 2035:

> By 2035, we will have retrofitted all of Canada's existing building stock to eliminate the direct use of fossil fuels and made our buildings zero-carbon ready, via a high level of energy efficiency and use of a decarbonized energy supply. Building retrofits will also contribute to the decarbonization of transportation and industry by redirecting existing clean energy resources away from energy waste.[27]

Building stock includes not only residential and commercial buildings but also schools and universities, factories, warehouses, libraries, government buildings, and more.

This mission is not just about reducing carbon emissions; it's also about doing it in a way that helps mitigate the local impacts of climate change and address energy poverty:

> Our buildings will be better prepared for extreme weather events brought on by climate change and become more comfortable, healthy, and productive places to be. In the process, Canada will have eliminated energy poverty and created high-quality housing conditions for Indigenous Peoples.[28]

Today, there are turnkey and streamlined options for deep energy retrofits, which can be done more quickly and efficiently—and with less disruption—than conventional ones. The ReCover Initiative is helping introduce an energy-efficient, prefabricated, modular approach to Canada's deep energy retrofits, based on the success of EnergieSprong in the Netherlands.[29] The Dutch refer to it as a "net-zero energy makeover," and it can be done in a week.[30]

ReCover is working to prioritize deep energy retrofits for people experiencing energy poverty. In Nova Scotia, 37 percent of the population experiences energy poverty.[31]

We have the technology and know-how to "build back better" in a way that benefits society as well as the environment. It's time to use it.

Source: Energiesprong explained[32]

A Note about "Zero-Carbon Ready"

Nova Scotia has some catching up to get to 100 percent renewable energy. We cannot afford to further delay net-zero retrofits or plans for new net-zero buildings; going forward, regulations must ensure that all commercial and residential projects are "net-zero ready." This means that they need to be ready for the installation of solar PV panels, solar thermal panels, solar air heating systems, and backup battery storage (or tied into a community's clean renewable energy source).[33]

We can't kick net-zero building standards down the road anymore. We need to start this process now.

Preparing for Sea-Level Rise

Source: Floodmap.net

In addition to eliminating embodied carbon and operational GHG emissions in the building sector, Nova Scotia must quickly put measures in place to prevent new builds close to the coastline. Increasing sea-level rise, coastal erosion, and severe weather events—bringing storm surges, hurricane-force winds, and flooding—are already causing millions of dollars in property damage. Not only is this devastating for those directly impacted, but it also leaves a heavy carbon footprint when it comes to repairing, demolishing, or rebuilding homes, buildings, and infrastructure.

To view the projected sea-level rise in different communities, go to Climate Central and navigate the map of Nova Scotia (see Climate Central: Coastal Risk Screening Tool Tutorial).[34] Estimates of sea-level rise in Nova Scotia range from 1 metre to 2.5 metres by the end of the century. Storm surges and flooding will impact coastal properties beyond the sea-level rise.

> "If you look at the history of climate change modelling and prediction over the past 15 years, usually it turns out worse than the models predicted."[35]

It's already becoming increasingly difficult to get flood-protection insurance for coastal properties, leaving the province in a vulnerable position when disasters strike and municipalities, homeowners, and building property owners look to the province for disaster relief funding.

Despite the risks to coastal properties, the provincial government announced in April 2019 that it was committing $70 million towards the cost of building a new Art Gallery of Nova Scotia on the Halifax waterfront (the federal government is contributing $30 million); construction is slated to begin this fall.

The announcement came just days after the passage of the 2019 Coastal Protection Act, which purports to:

> protect the Province's coast for future generations by preventing development and activity in locations adjacent to the coast that (a) damage the environment by interfering with the natural dynamic and shifting nature of the coast; or (b) put residences and buildings at risk of damage or destruction from sea-level rise, coastal flooding, storm surges and coastal erosion.[36]

As local Halifax residents know, the waterfront has already experienced major storm surges and flooding, which have resulted in significant and costly damages.[37] [38] Sea-level rise models suggest that parts of the waterfront could be underwater in a matter of decades. Developers building along the Halifax and Dartmouth waterfronts seem to feel there's still a good business case so long as they are able to make sufficient profit. But when we consider the projected lifetime of the buildings (40-100 years), it's clear that such trade-offs are detrimental to the environment and efforts to reduce the province's GHG emissions.[39]

It's unlikely that the new art gallery, the recently completed Queen's Marque development, and other new building developments on the waterfront would pass rigorous whole life-cycle carbon assessments, given the likelihood that these buildings may end up partially submerged by 2100.

The provincial government must show some real leadership on coastal protection—leadership that can be measured in actions rather than just words. The government can start by cancelling provincial funding for the new Nova Scotia Art Gallery until it has found a location that is less vulnerable to the impacts of climate change.

Although the Coastal Protection Act was passed in April 2019, the Nova Scotia government is *still* "developing the regulations to define exactly how this legislation will work."[40]

The climate crisis requires that the government act with a much greater sense of urgency.

Endnotes *(To return to the page you were reading, simply click on the endnote number again)*

1 2020 Global Status Report for Buildings and Construction, p. 4, United Nations Environment Programme, 2020

2 Embodied Carbon in Construction, p. 1, Zizzo Strategy, December 2017

3 The Carbon Footprint of Construction: Briefing Note, p. 1, Architects Climate Action Network, February, 2021

4 Embodied Carbon in Construction, p. 2, Zizzo Strategy, December 2017

5 New Buildings: Embodied Carbon, Architecture 2030

6 The Urgency of Embodied Carbon and What You Can Do about It, Building Green

7 Concrete: the most destructive material on Earth, The Guardian, February 25, 2019

8 New Buildings: Embodied Carbon, Architecture 2030

9 The Carbon Challenge, Carbon Leadership Forum, College of Built Environments, University of Washington

10 New Buildings: Embodied Carbon, Architecture 2030

11 RIBA Architects say building demolitions cause of carbon emissions, BBC, July 8, 2021

12 Case 20761, Amendment, ZZap Consulting Inc., Halifax.ca, Updated July 6, 2021

13 Case 20218, Amendment, Dexel Developments Ltd., Halifax.ca, Updated June 16, 2020

14 Dexel Developments Ltd., Site Plan/Setback Plan, Halifax.ca, Updated June, 2021

15 ZZap Consulting Inc., Building Drawings, Halifax.ca, Updated July, 2020

16 The Greenest Building Is One That Is Already Built, The Journal of the National Trust for Historic Preservation 21, no. 4, Elefante, C., 2007

17 Embodied Carbon in Construction, p. 4, Zizzo Strategy, Embodied Carbon in Construction Policy Primer for Ontario, December 2017

18 Vancouver votes down plan to delay climate action, Vancouver News, June 10, 2021

19 How we build and renovate | Climate Emergency Action Plan, City of Vancouver

20 The Carbon Footprint of Construction, p. 30, Architects Climate Action Network, February 2021

21 The Net Zero Carbon Buildings Commitment, Advancing Net Zero, World Green Building Council

22 The Net Zero Carbon Buildings Commitment, Advancing Net Zero, World Green Building Council

23 Canada's Zero Carbon Building Standard Celebrates First 10 Certifications, Canada Green Building Council

24 The First Zero Carbon Building- Design Certification, Canada Green Building Council- CaGBC, Youtube

25 The First Zero Carbon Building- Design Certification, Canada Green Building Council- CaGBC, Youtube

26 Humber College Building NX: First Retrofit Zero Carbon Building- Design Standard Certification, Canada Green Building Council- CaGBC, Youtube

27 Canada's Climate Retrofit Mission, Efficiency Canada & Carleton University, June 2021

28 Canada's Climate Retrofit Mission, Efficiency Canada & Carleton University, June 2021

29 The ReCover Initiative, ReCover

30 Energiesprong explained, Energiesprong Foundation

31 Nova Scotia re-emerging as leader in energy efficiency, Saltwire, November 19, 2020

32 Energiesprong explained, Energiesprong Foundation

33 A 'Net Zero' home: What does it really mean?, Real Estate News Exchange, December 29, 2017

34 Coastal Risk Screening Tool Tutorial, Climate Central, YouTube, June 18, 2020

35 Rising seas and climate change: Everything you need to know, The Globe and Mail, May 14, 2020

36 Bill 106 - Coastal Protection Act - Royal Assent, Nova Scotia Legislature, April 12, 2019

37 Maritime Coastal Flood Risk Map - NS, Nova Scotia Community College, Applied Geomatics Research Group

38 Coastal Risk Screening Tool, Climate Central

39 With increasing sea level rise, does it make sense to build a new Art Gallery of Nova Scotia on the waterfront? Halifax Examiner, May 7, 2019

40 Coastal Protection Act, Government of Nova Scotia, April 2019