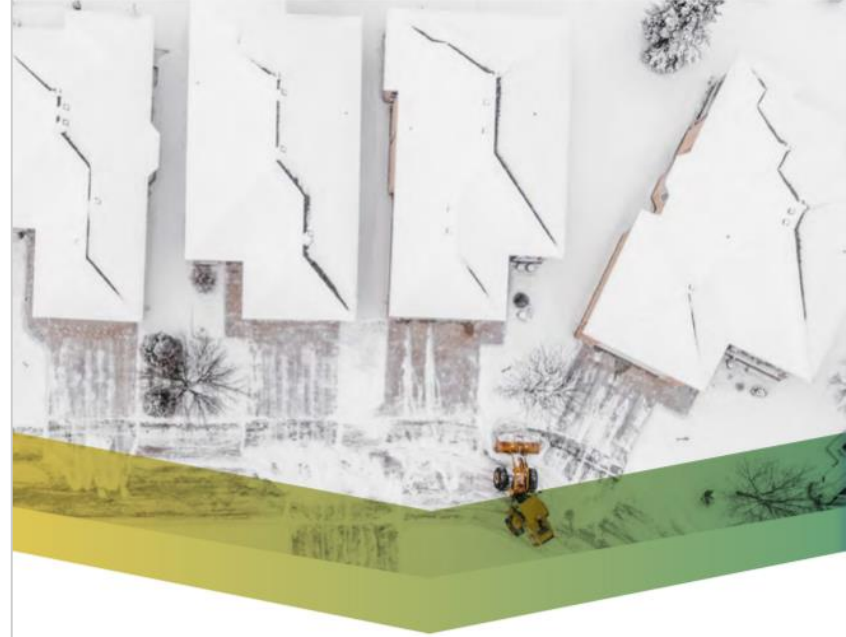


Achieving real net-zero emission homes & the importance of material carbon emissions

Chris Magwood,
Builders for Climate Action
CAP Webinar, October 13, 2021



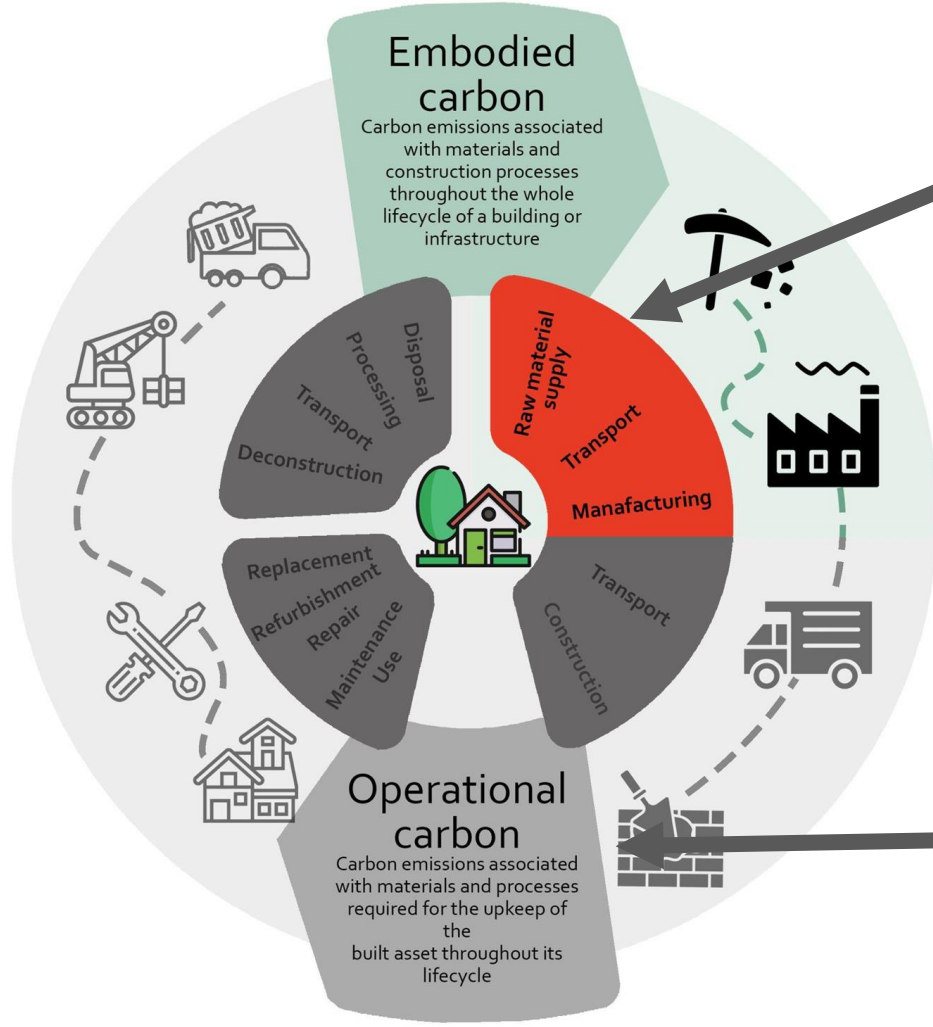
Achieving Real Net-Zero Emission Homes:

Embodied carbon scenario analysis of the upper tiers of
performance in the 2020 Canadian National Building Code



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Embodied carbon

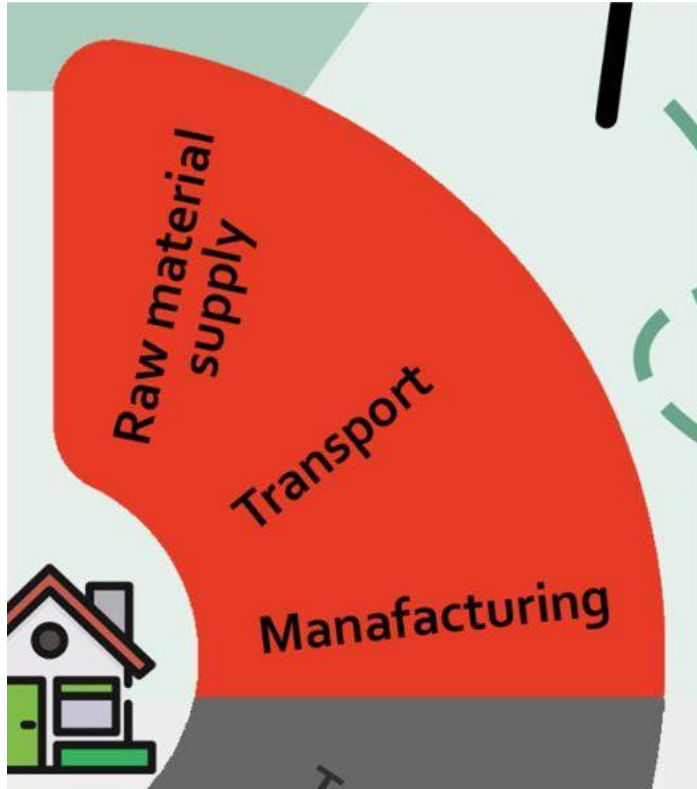
Carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure

Our work is examining the impacts found here

Operational carbon

Carbon emissions associated with materials and processes required for the upkeep of the built asset throughout its lifecycle

All of our collective focus has been here



70-85% of material life cycle impacts happen at the “product phase”

- In life cycle assessment, these are phases A1-A3
- Often called “cradle-to-gate”

Environmental Product Declarations (EPDs)

Provide ISO-standard reporting for building materials, according to Product Category Rules (PCRs)



Global Warming Potential refers to long-term changes in global weather patterns – including temperature and precipitation – that are caused by increased concentrations of greenhouse gases in the atmosphere.

Material Carbon Emissions Estimator (MCE²)



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CanmetENERGY

LEEP

LOCAL ENERGY EFFICIENCY PARTNERSHIPS

April 2021

Material Carbon Emissions Estimator (MCE²)

Project Carbon Content

Step 1 Import project data from HOT2000 (If no HOT2000 file, skip to Step 2)

Press Here to import HOT2000 Data

Energy Consumption

Elec. kWh/yr	N. Gas m ³ /yr	
9389	3259	
Propane L/yr	Oil L/yr	Wood kg/yr
0	0	0

To override energy GHG intensities, use the Energy GHG tab.

Step 2 Confirm or enter project information

Address:		Province:	Ontario
City:	CAMBRIDGE	Postal code:	N3C3Y9
Building Type:	Single Detached	Evaluation date:	2018-11-19
Storeys:	Two storeys	File ID:	A100000000
Year Built:	1986		
Heated Floor Area (above grade, m ²):	167.5		
Heated Floor Area (below grade, m ²):	66.0		
Heating Degree Days:	3900		

Operational Emissions

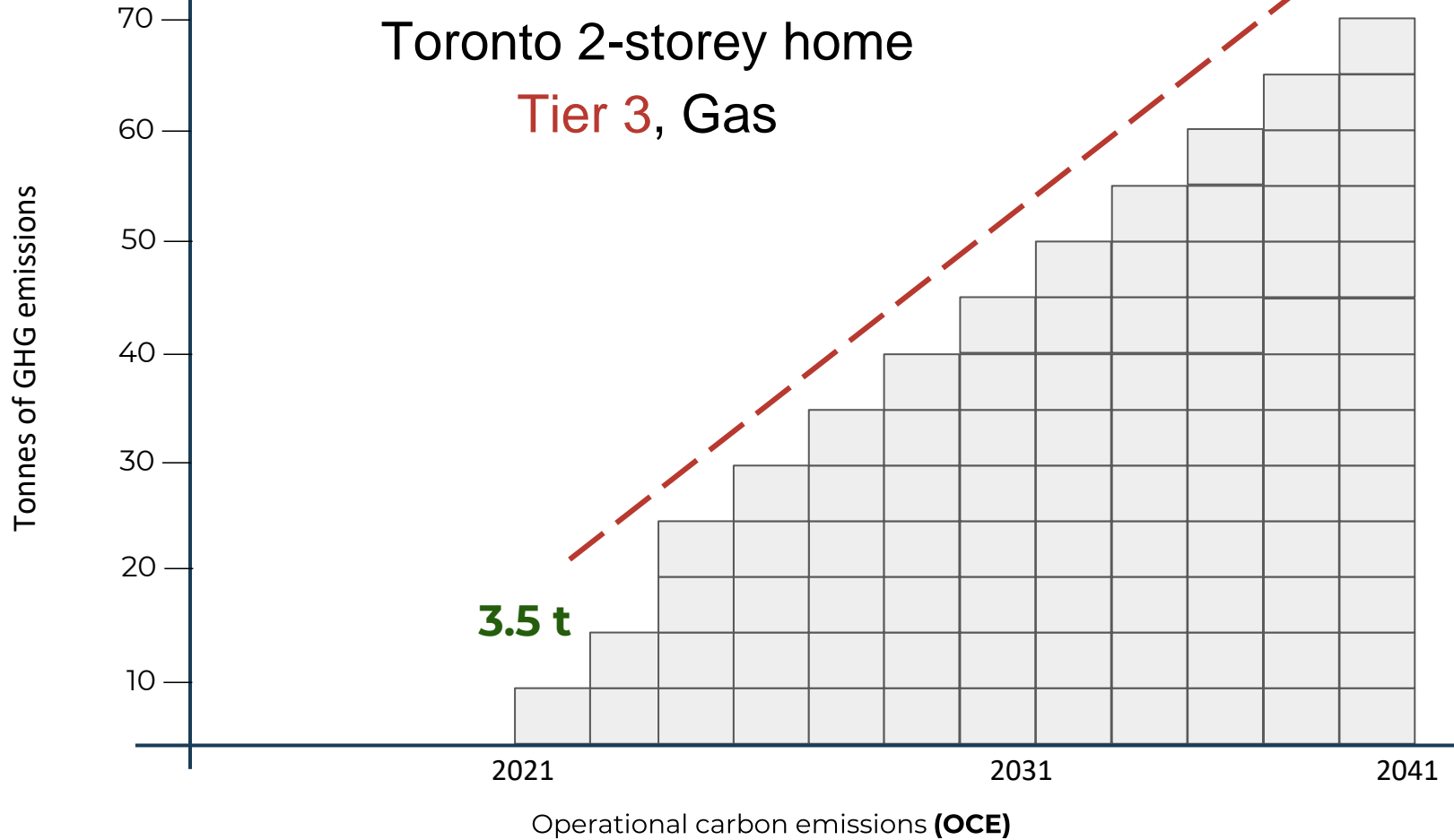
tonnes CO ₂ e / yr	t CO ₂ e / 30 yrs
6.51	195.3

Material Emissions

tonnes CO ₂ e	kg CO ₂ e / m ²
0.00	0.0

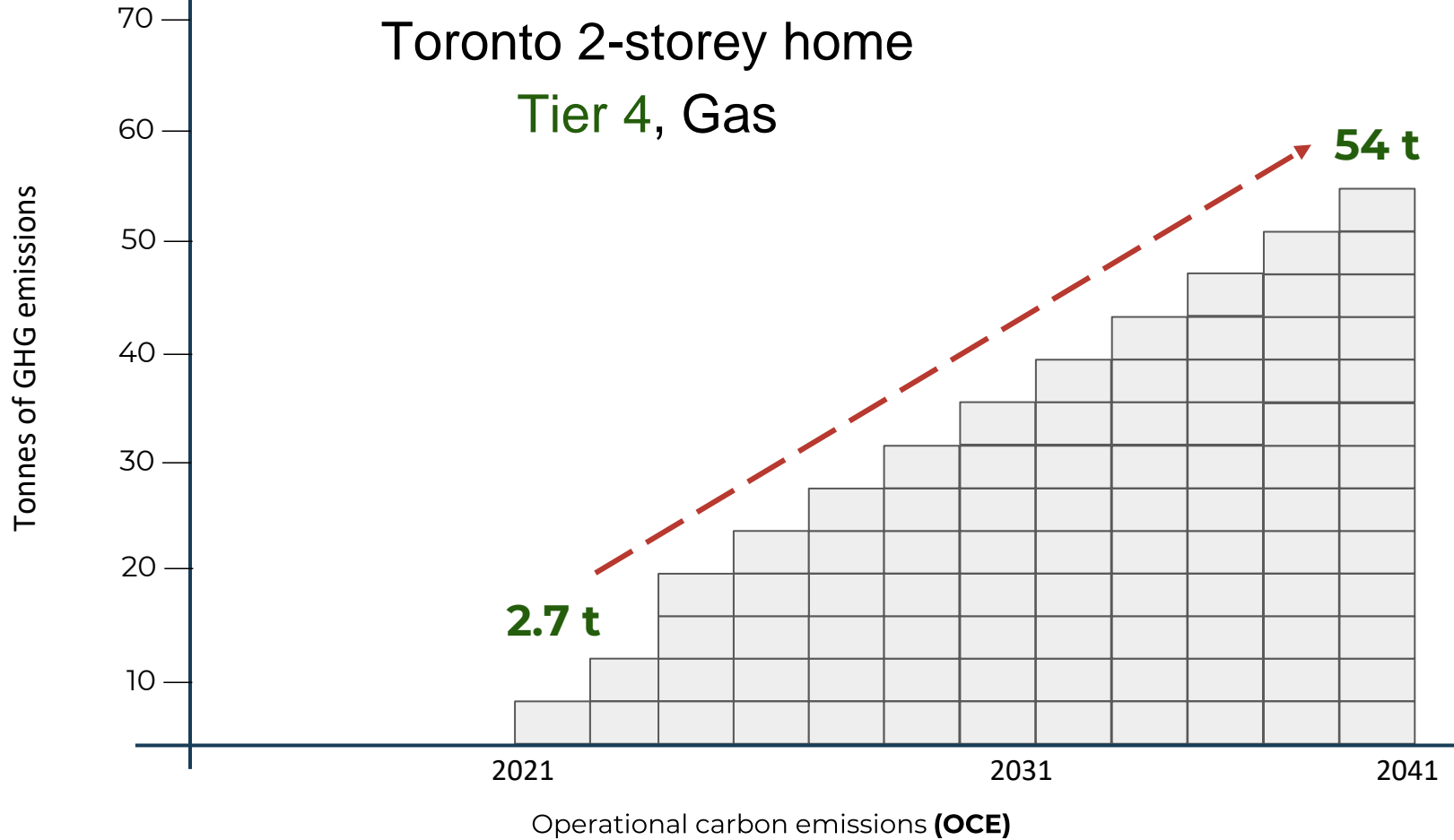
Operational Emissions from Toronto 2-storey home

Tier 3, Gas



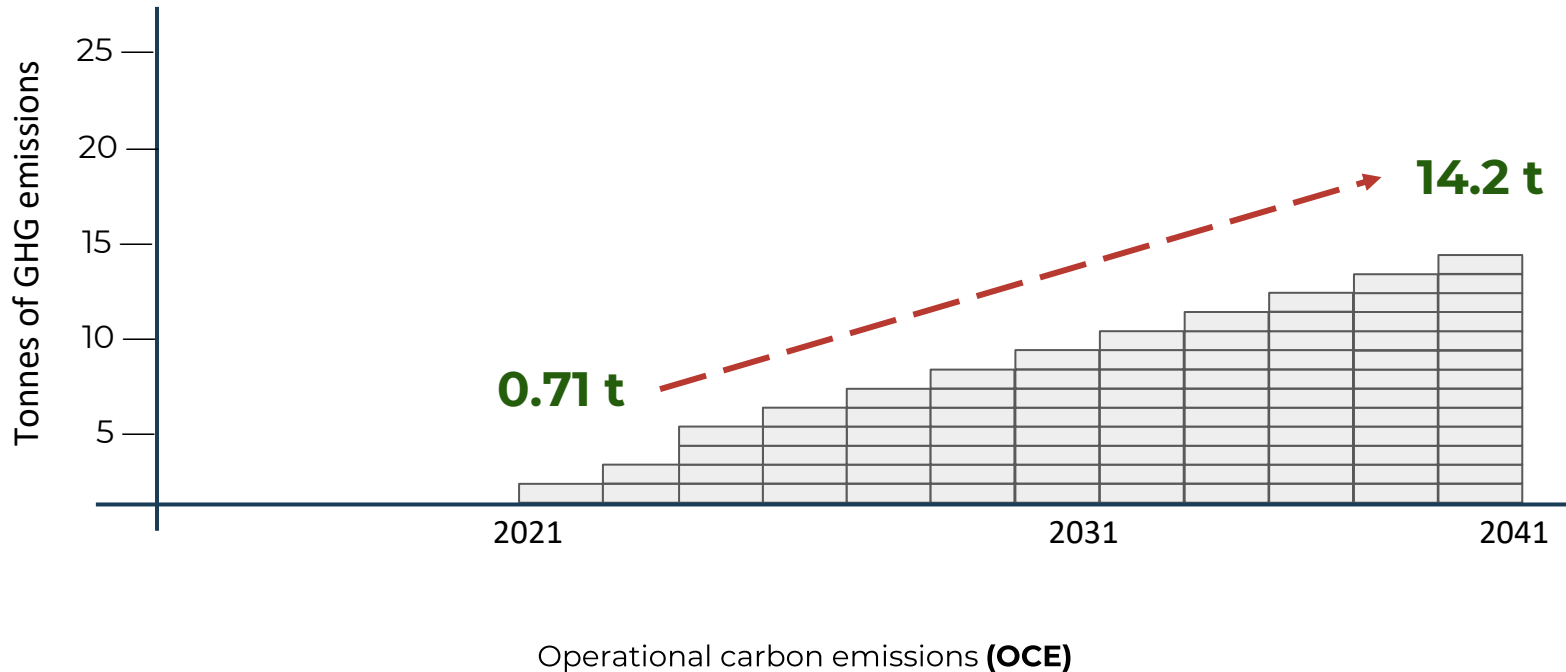
Operational Emissions from Toronto 2-storey home

Tier 4, Gas

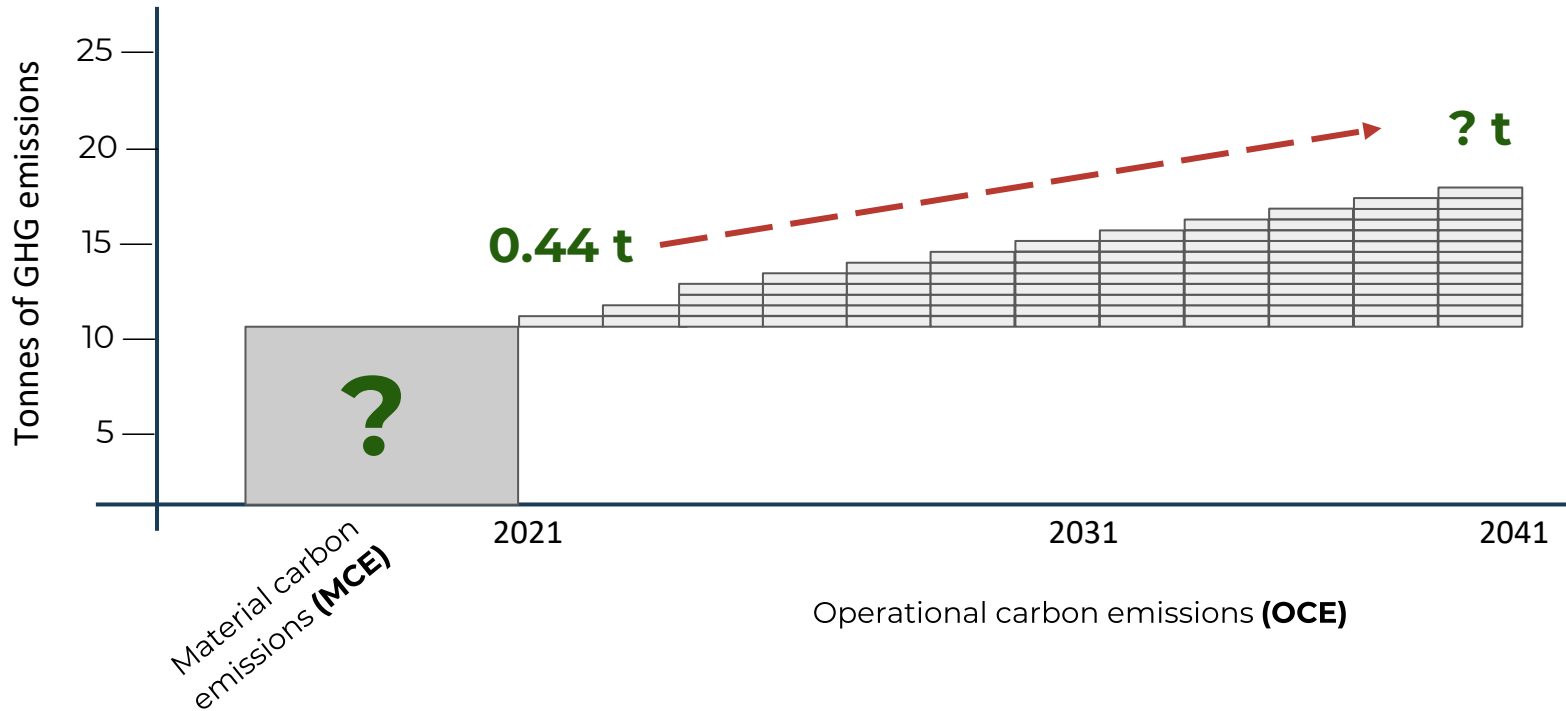


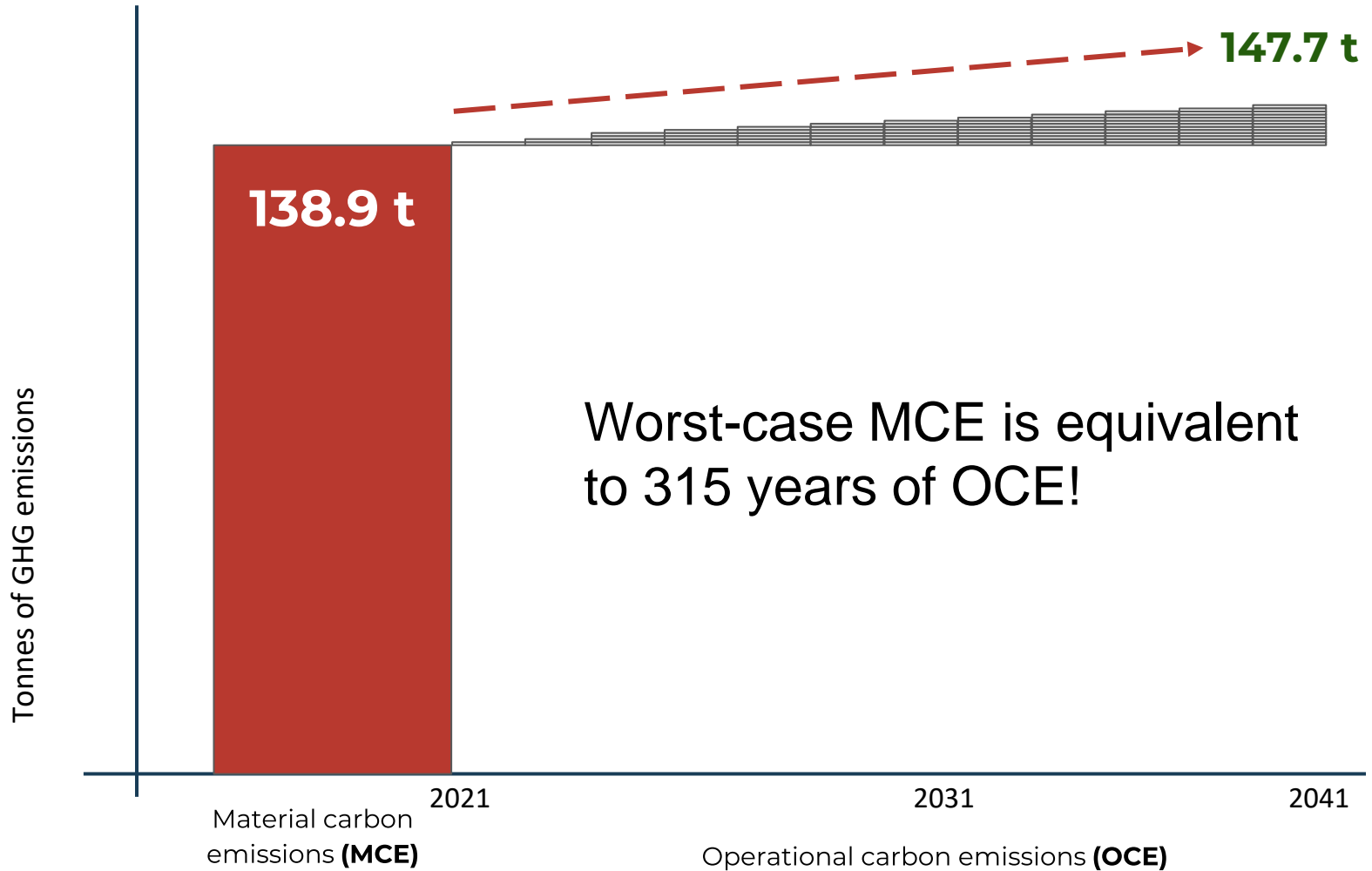
Operational Emissions from Toronto 2-storey home

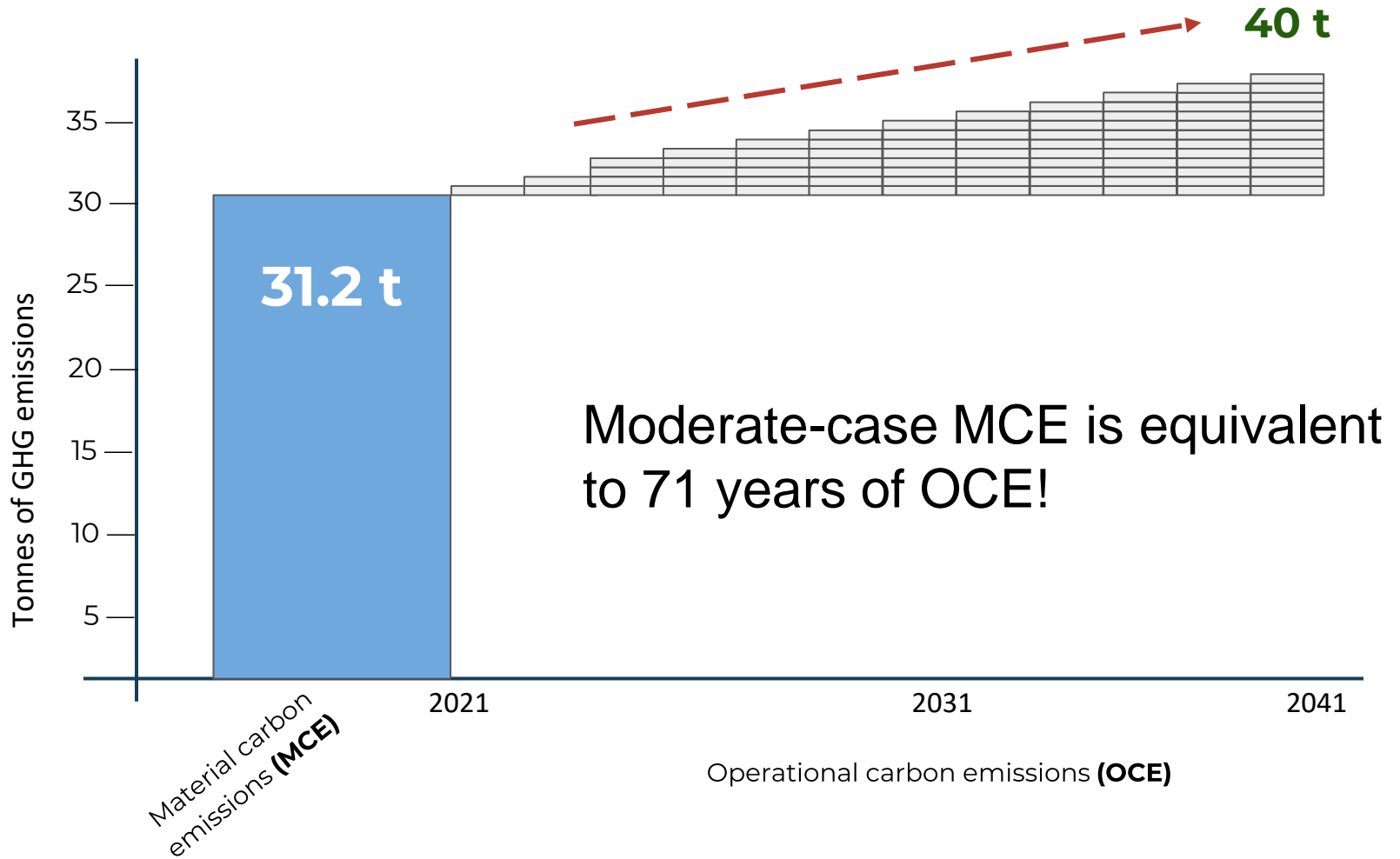
Tier 3, All-Electric (air source heat pump)



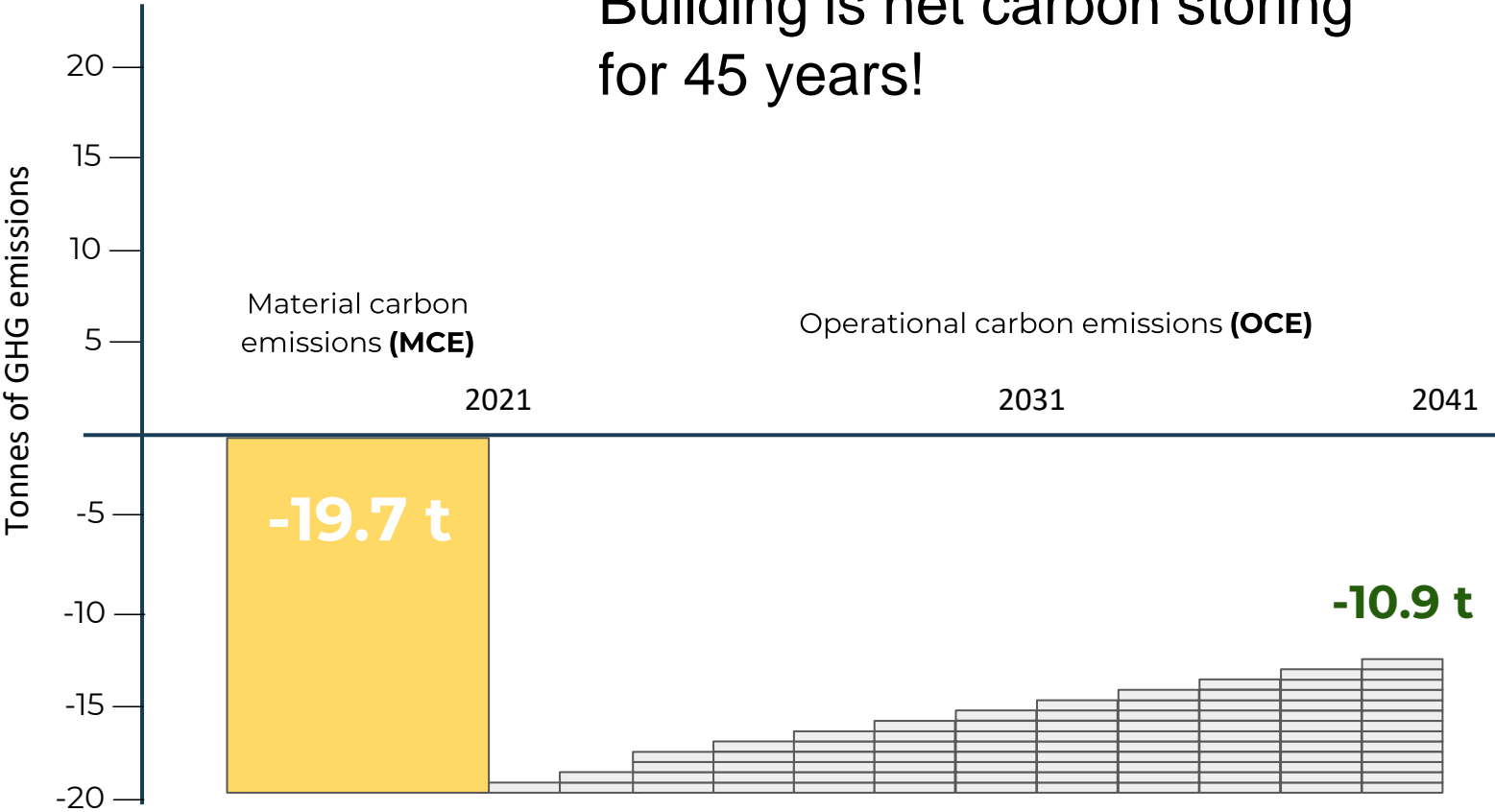
Combined MCE & OCE from Toronto 2-storey home Tier 5, All-Electric (air source heat pump)



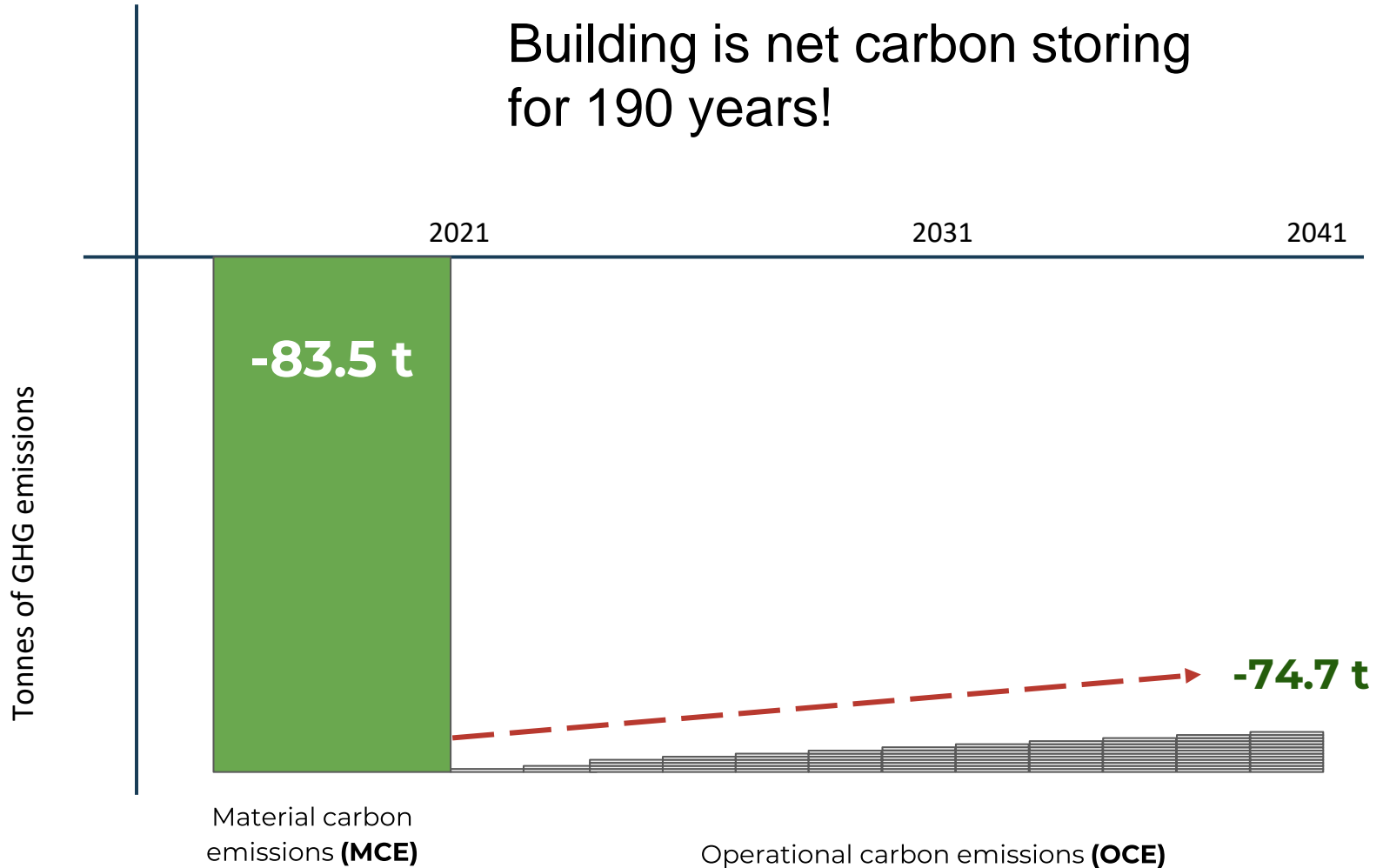




Building is net carbon storing for 45 years!



Building is net carbon storing for 190 years!



EMBARC study



PASSIVE
BUILDINGS
CANADA



Case studies of 100 GTHA homes
First large-scale benchmark of as-built homes

**NRCan results for
Toronto 2-storey**

138.9 t

31.2 t

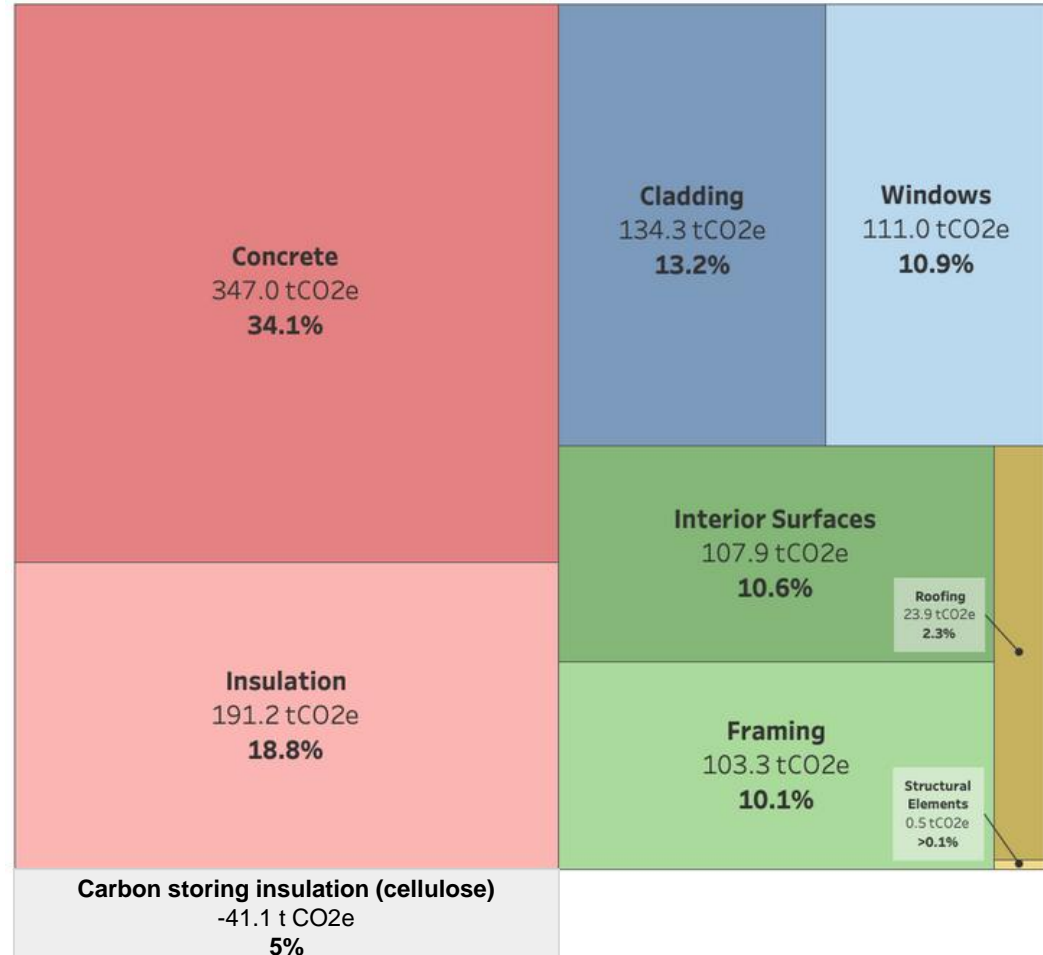
-19.7 t

**EMBARC results for
Toronto 2-storey**

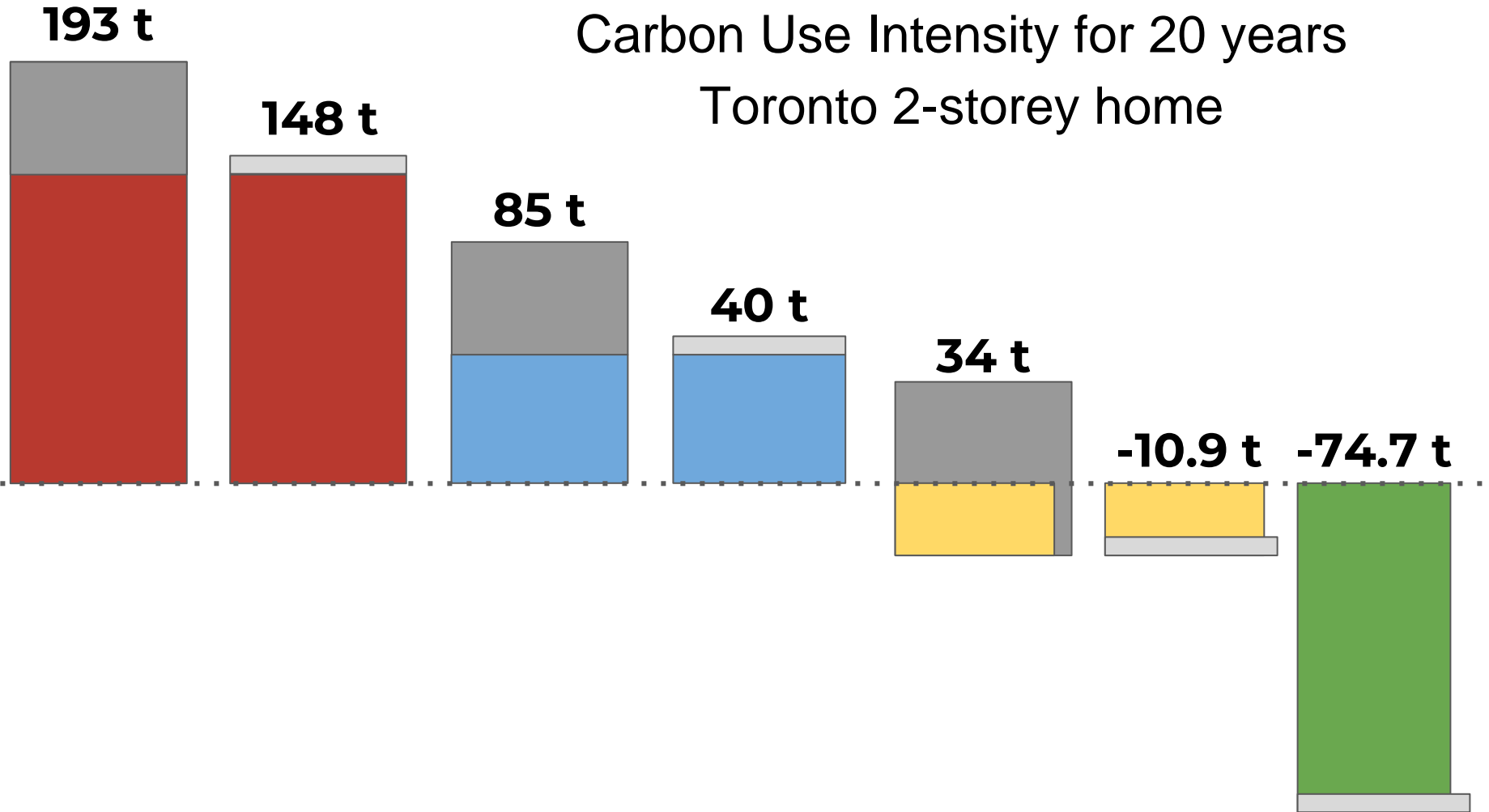
88 t worst

50 t best

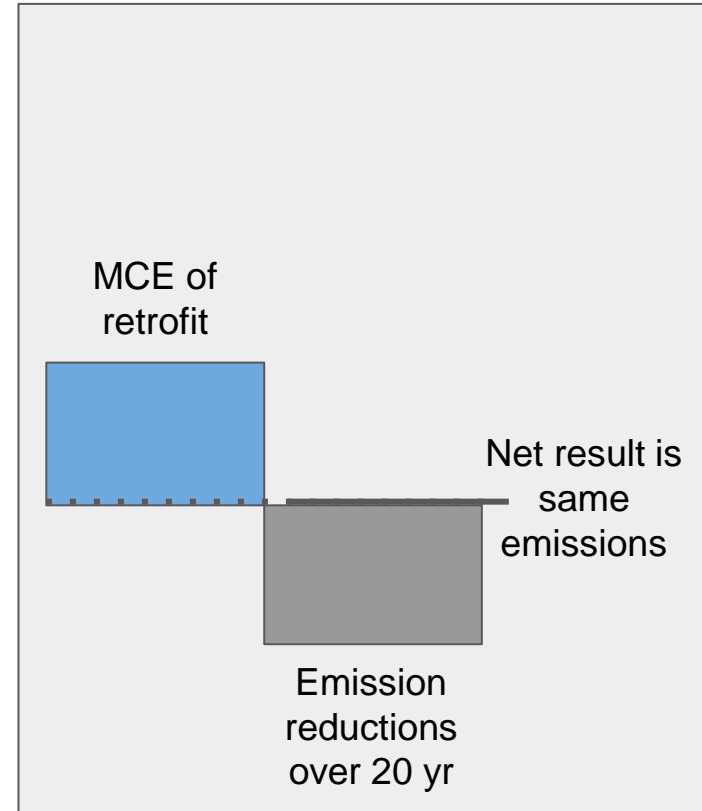
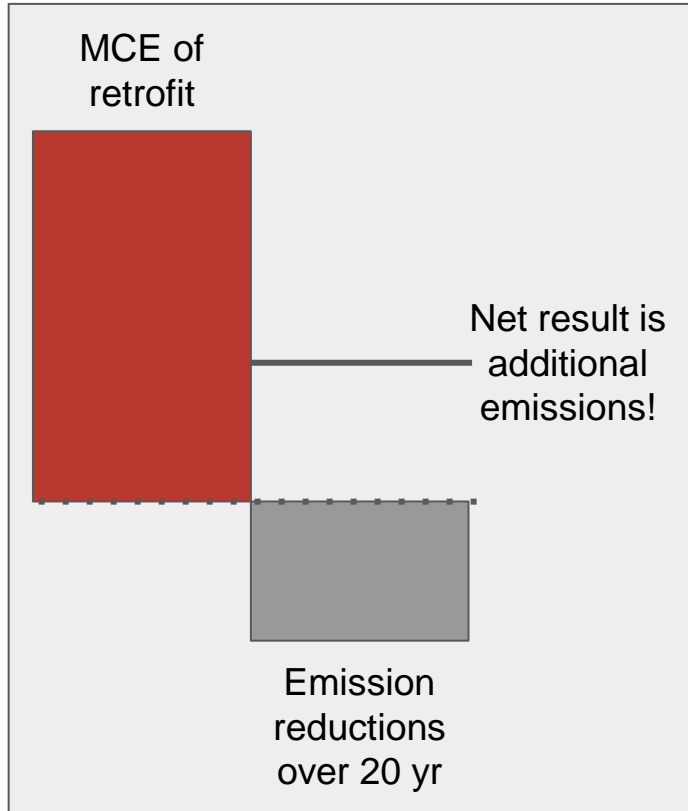
Breakdown of MCE by material category, Cities of Nelson and Castlegar study



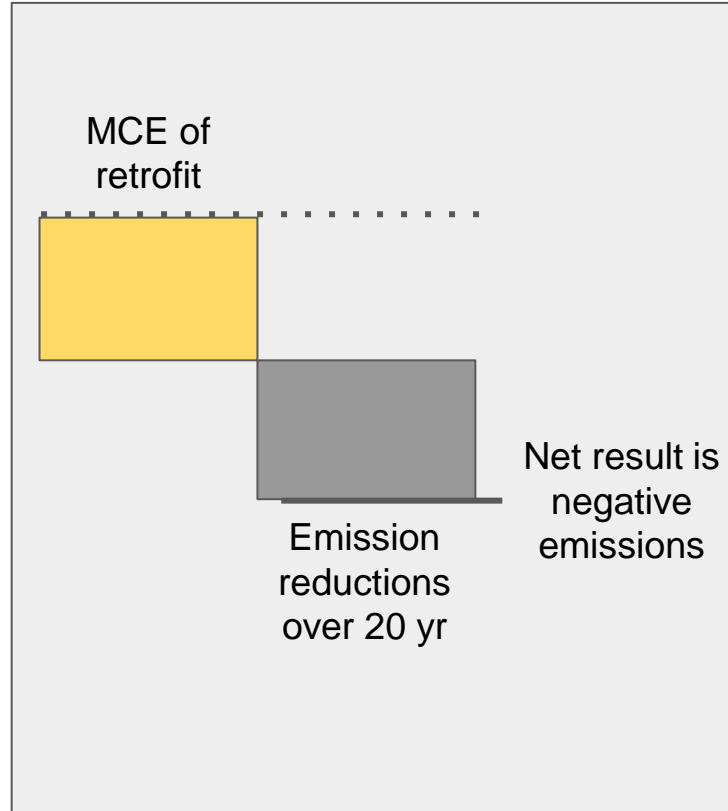
Carbon Use Intensity for 20 years Toronto 2-storey home

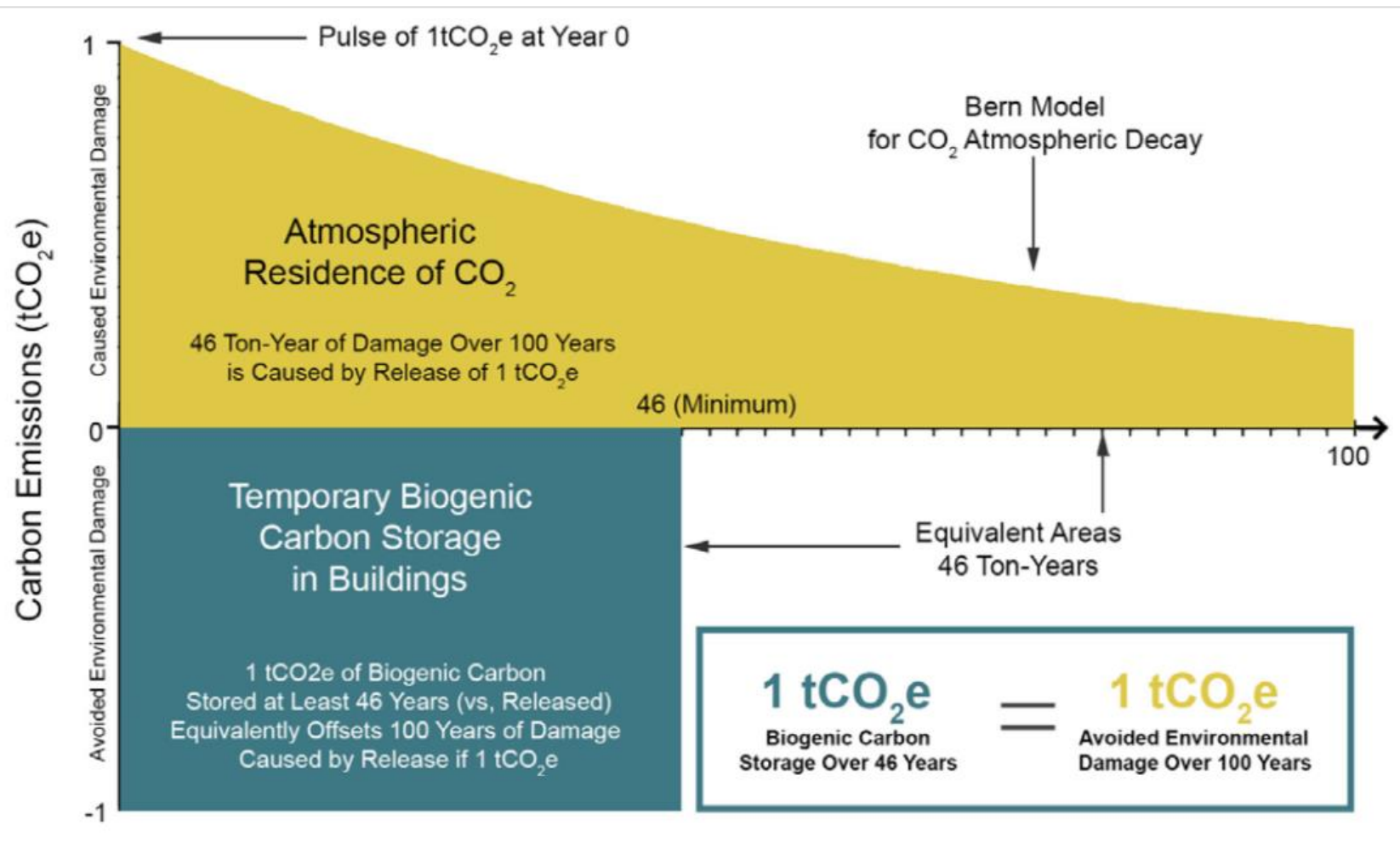


Carbon Use Intensity needs to be considered for retrofit programs as well...



Carbon Use Intensity needs to be considered for retrofit programs as well...





Ton-year accounting can accommodate length of residency in building

& is being used to develop carbon removal certificates in the market

Biogenic Carbon Stored	Duration of Storage	Equivalent Offset of Present-day Emissions
100 tons	1 year x 2.17%	2.17 tons
100 tons	20 years x 2.17%	43.4 tons
100 tons	46 years x 2.17%	100 tons
100 tons	80 years x 2.17%	174 tons



aureus
earth

Imagine if Buildings Could Heal the Climate
by Storing Carbon for Generations

How much does this cost?

Cost and MCE Comparison of Exterior Cladding Options

Cladding	Material	kgCO ₂ e for 10 m ²	Cost for 10 m ²
	Wood - SPF (unfinished)	12	\$489.52
	Wood - WRC (unfinished)	17	\$525.81
	Synthetic stucco	35	\$77.50
	Vinyl - avg of all products	54	\$370.50
	Lime stucco	96	\$12.34
	Steel panel - corrugated & painted	150	\$133.01
	Fiber-cement - avg of all products	170	\$616.42
	Brick	472	\$753.48

“The results show no direct correlation between cost and MCE of materials.”

Stacked benefits

Improved occupant health and safety

Low carbon options do not contain “red list” chemicals or chemicals of concern

Reduced waste

Low carbon options do not contain “red list” chemicals or chemicals of concern

Local material sources

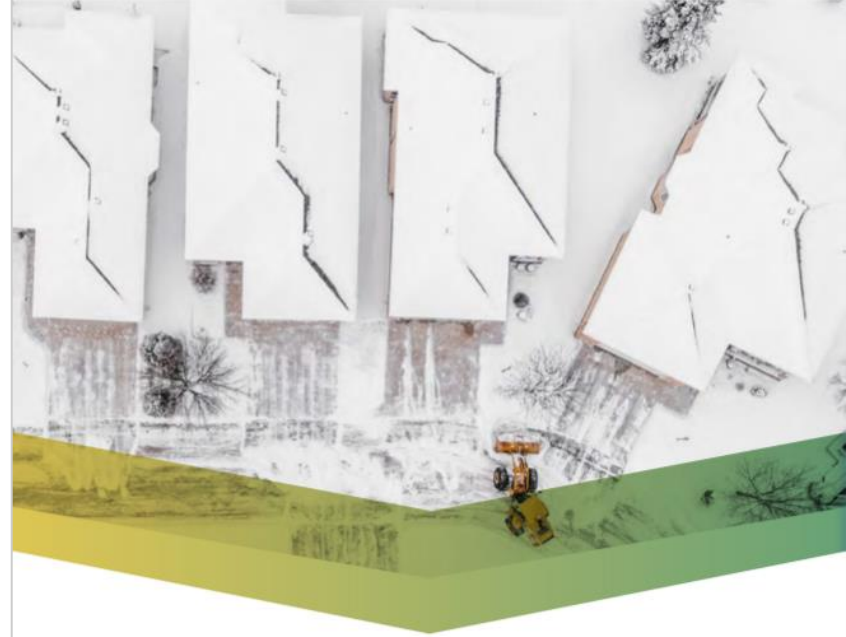
Fibers from recycling, agricultural & forestry residues

Local manufacturing

New regional manufacturing

Questions

www.buildersforclimateaction.org



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