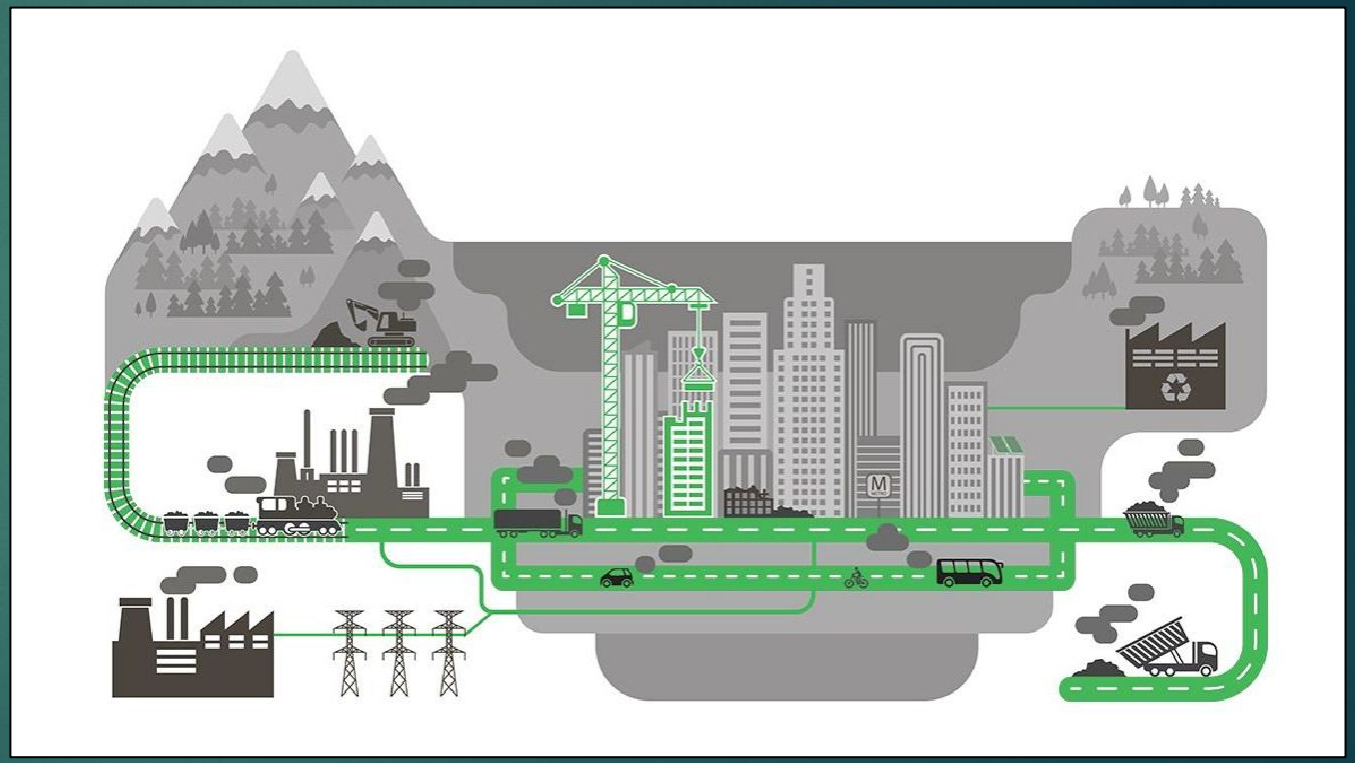
Embodied Carbon

AN OVERLOOKED TOOL IN OUR CLIMATE ACTION TOOLBOX

What is Embodied Carbon?

- The GHG emissions created through the construction and demolition stages of a building's life—the energy that is required to manufacture building materials, transport them to the construction site, and then ultimately the demolition and removal of these materials from the property

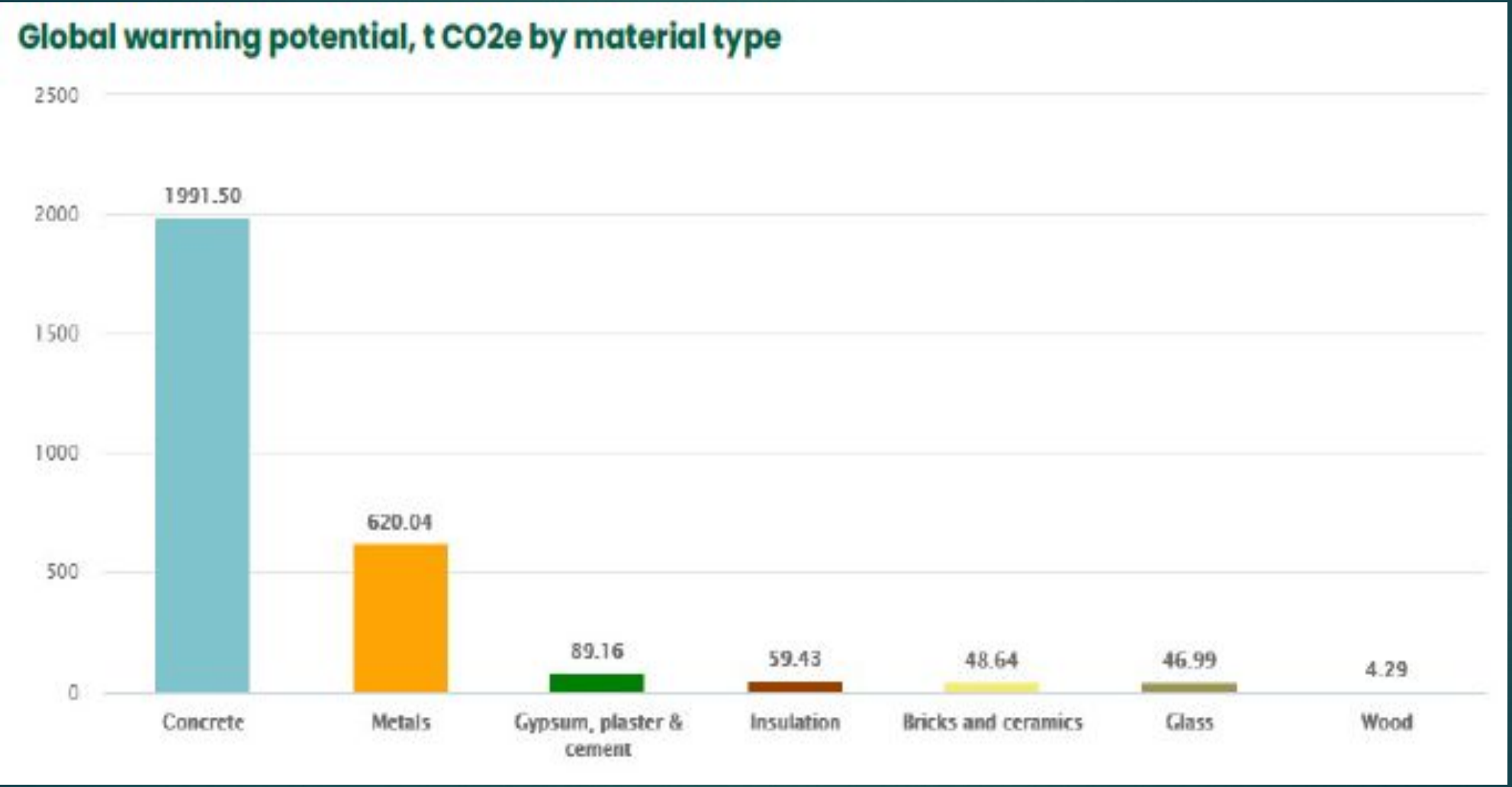


Taken from *City Policy Framework for Dramatically Reducing Embodied Carbon*

Low Embodied Carbon Construction

- Ways to decrease a building's carbon footprint:
  - Adaptively re-use existing buildings;
  - Re-use materials salvaged from deconstructed buildings;
  - Use materials that have low embodied carbon, such as wood;
  - Use less of materials that have high embodied carbon, such as concrete;
  - Use recycled materials, such as recycled aluminum;
  - Use materials that are locally sourced;
  - Use renewable energy rather than fossil fuels onsite.

Low Embodied Carbon Materials



Why Focus on Embodied Carbon?

- According to Ontario's 2018 Greenhouse Gas Progress Report, buildings represent 21% of total GHG emissions—**but this only includes operational emissions, not embodied carbon**
- Focus so far has been on reducing operation emissions
- Embodied carbon in buildings adds **a further 11% to GHG emissions**
- Embodied carbon will be responsible for half of entire carbon footprint for new construction between now and 2050
- To meet our growing population, the equivalent of one NYC needs to be built every month for the next 40 years
- **IF WE IGNORE EMBODIED CARBON, WE CANNOT REACH NET-ZERO EMISSION TARGETS**

Why Focus on Embodied Carbon?

- Aligns with Town's commitment to reducing, reusing and recycling waste;
- Aligns with Council's Environmental Stewardship Strategic Priority;
- **ALIGNS WITH THE TOWN'S 2020 CLIMATE EMERGENCY DECLARATION**

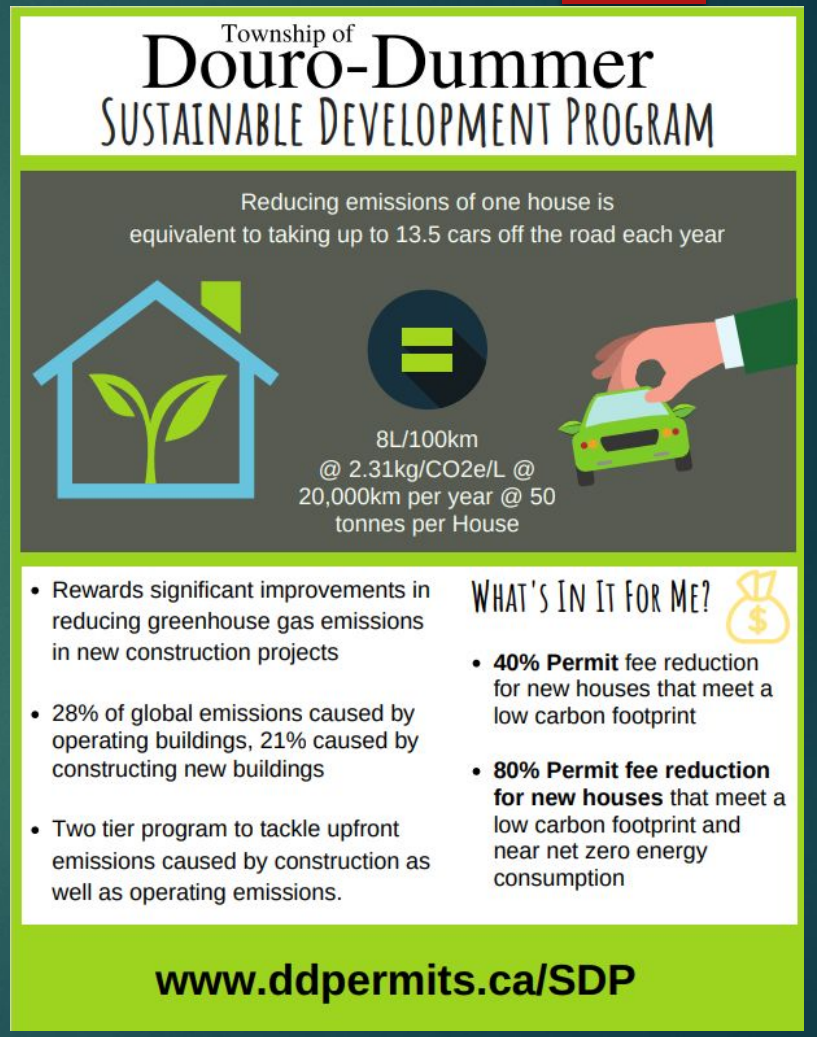
But where do our policies address embodied carbon?

- Newmarket Energy Efficiency Retrofit deals solely with decreasing operations emissions, though it does encourage use of existing buildings;
- No mention of embodied carbon in Town's *Community Energy Plan;*
- No mention of embodied carbon in York's draft *Climate Change Action Plan*

What is Being Done?

Township of Douro-Dummer

- Developed a Sustainable Development Program that specifically targets embodied carbon:
  - 40% permit fee rebate on projects that meet required greenhouse gas reduction targets; or,
  - 80% permit fee rebate on projects that achieve net-zero emissions



What is Being Done?

- In Aurora, old Howard Johnson Hotel being adaptively reused as a retirement residence
- Exterior will be retained, interior will be gutted to create a residence for independent and assisted living for seniors.

What is Being Done?

- Caledon:
  - proposing that all new Town construction projects report on the embodied carbon for all new buildings or major renovations that are bigger than 500m2.
  - Embodied carbon targets for new buildings and major renovations proposed to be mandatory by 2025.
  - A Green Development Standard is being drafted to apply to all new planning developments.

What is Being Done?

- Richmond Hill, Brampton, Markham and Vaughan:
  - Require new developments to complete a Sustainability Performance Metrics, which requires development to reach a certain score through their sustainability assessment tool.
  - Sustainability Metrics has been updated in 2021 to include metrics specifically about embodied carbon.

What is Being Done?

- Vancouver:
  - enacted Green Demolition Bylaw, which defines reuse and recycling requirements for demolition waste from pre-1940s one- and two-family homes (75%) and 90% for homes that have character status.
  - Came into effect on Sept 1 2014 (after being approved in June 2014) and was amended in 2018 to extend to pre-1950s homes.

What is Being Done?

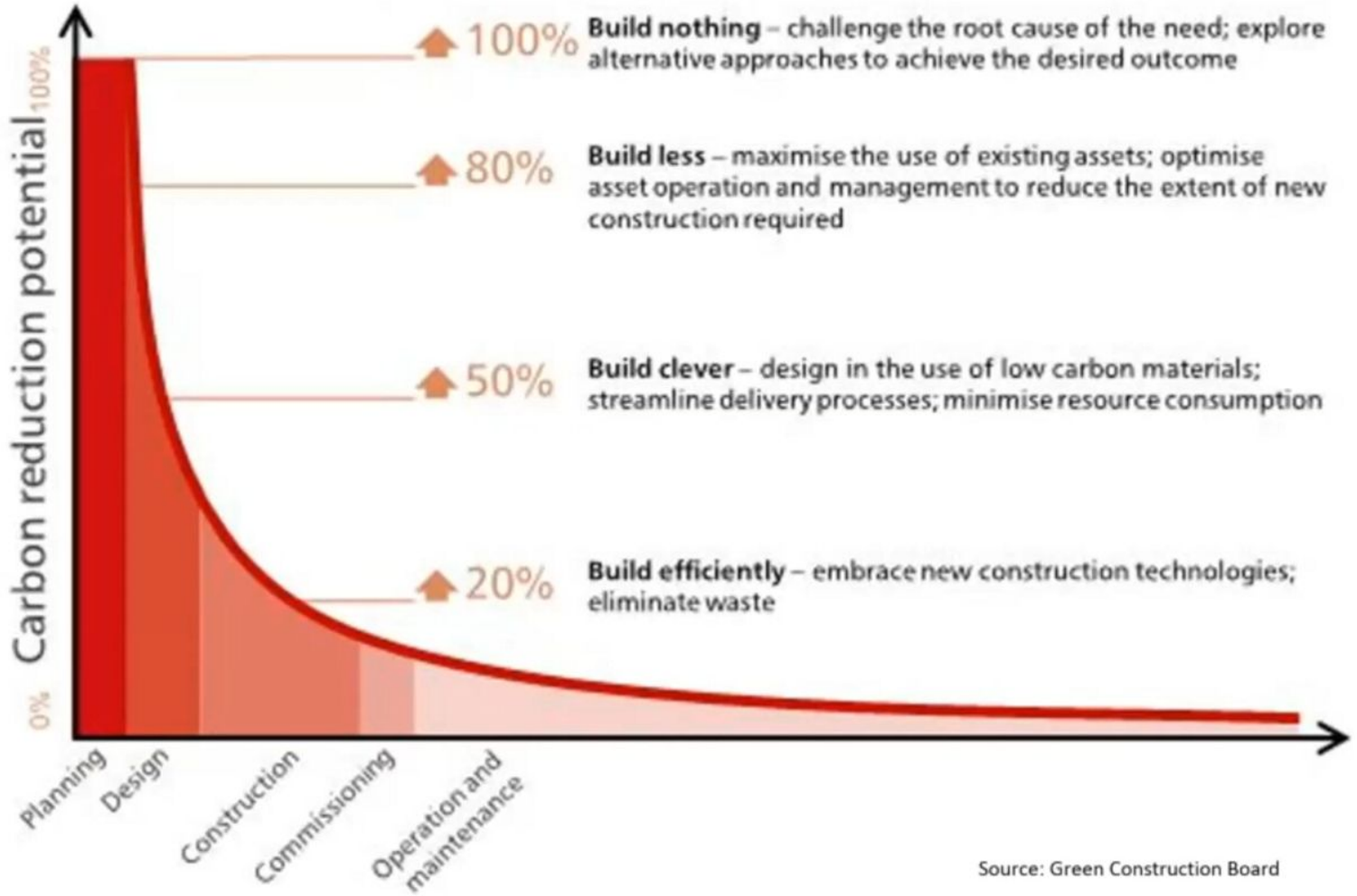
- London:
  - CityStudio teamed up City of London staff with Western graduate students to explore connection between heritage conservation and climate change action. Will result in two deliverables: policy brief for decision makers, and infographic for heritage property owners.
- Ontario:
  - Provincial government working on new building carbon calculator tool (to be launched in next few months)

What is Being Done?

- Toronto's revised Green Standard for new construction requires applicants to provide the following to confirm the City's goals are met:
  - Conduct either a Material Emissions Assessment or a Life Cycle Assessment for the building's structure and envelope for mid-rise or high-rise applications
  - Conduct a Materials Emissions Assessment for structural, enclosure, and major finishes materials for low-rise buildings
- Comes into effect May 1, 2022

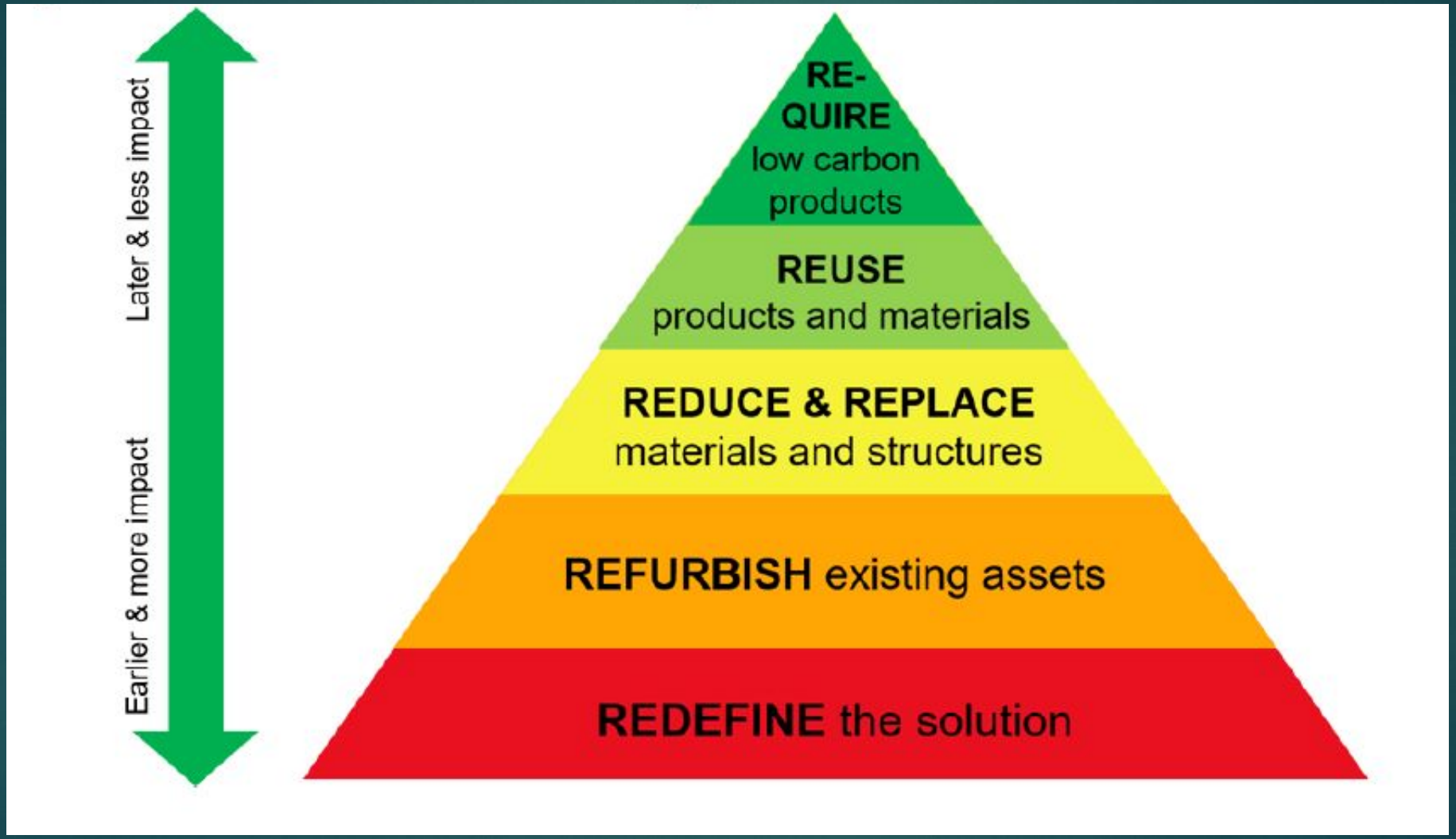
National Trust for Canada / Fiducie nationale du Canada | CAHP | ACECP

Carbon Reduction Curve – Restoration / Upgrades get us more than half way there



Taken from "Environmental Reset: Decarbonizing Heritage & Making Mainstream Impact", presentation at the *Heritage & the Global Reset: Seizing the Moment* National Trust Conference 2021

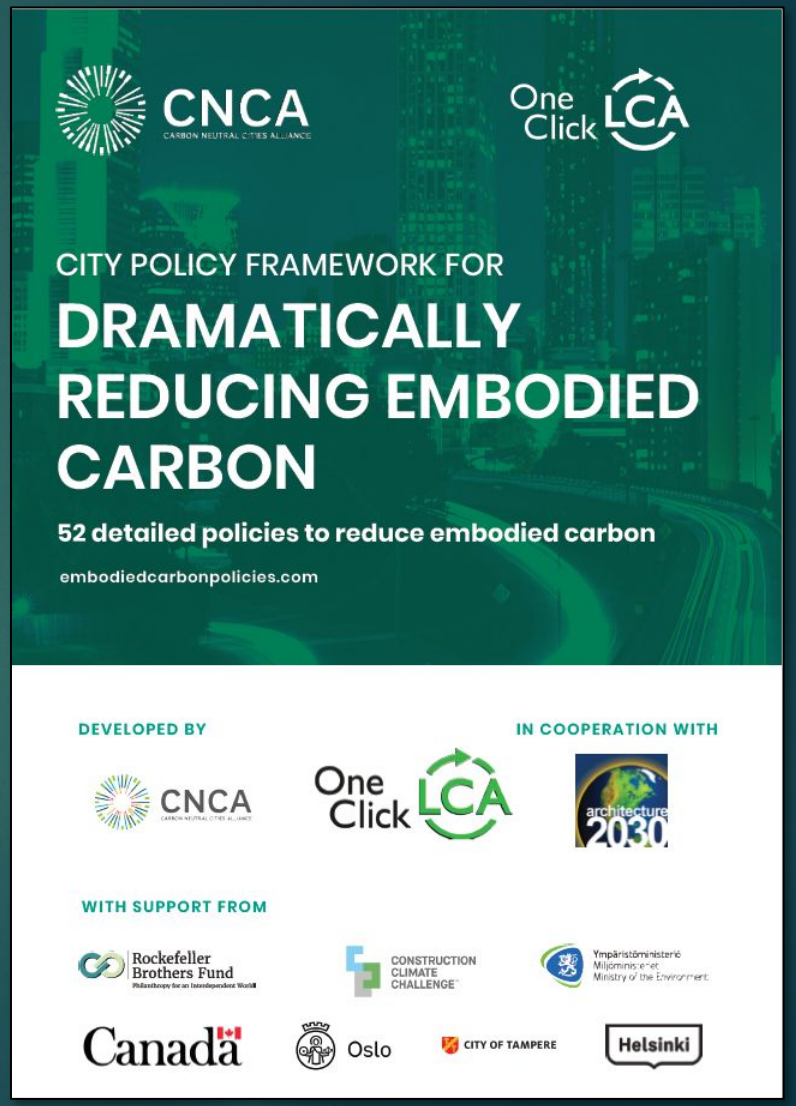
How to Reduce Embodied Carbon



Taken from *City Policy Framework for Dramatically Reducing Embodied Carbon*

What Can Newmarket Do?

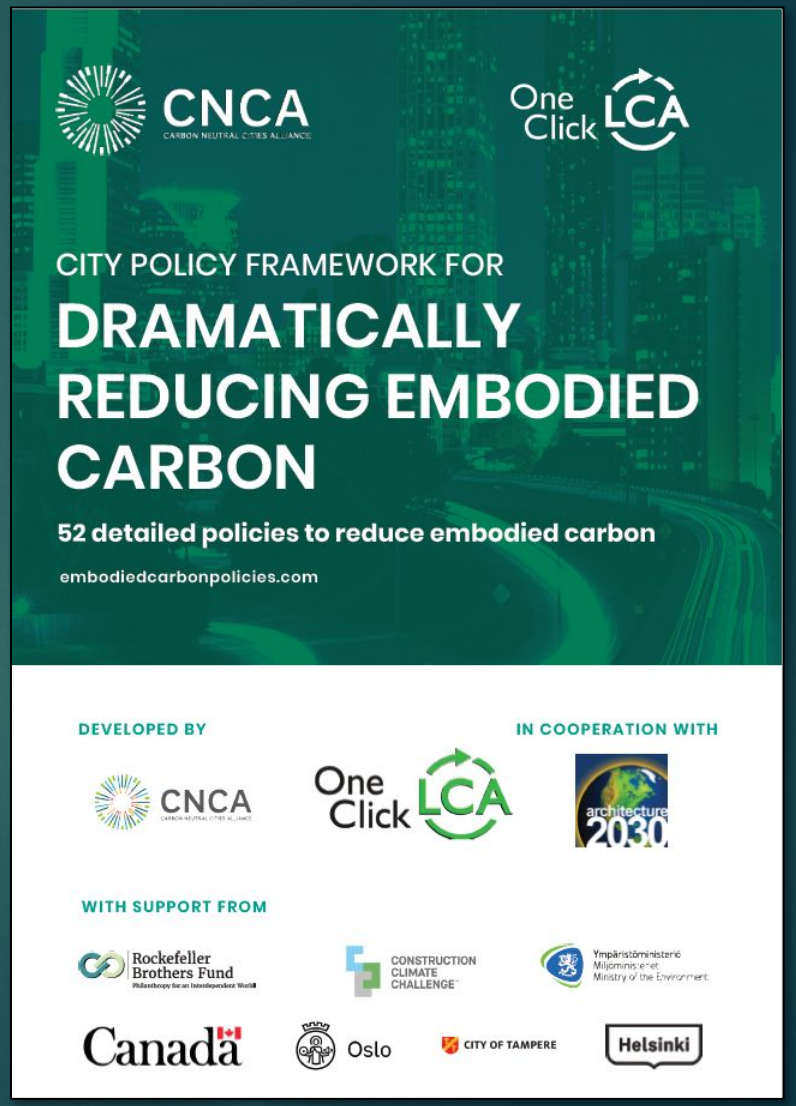
- *City Policy Framework for Dramatically Reducing Embodied Carbon* identifies 52 policies for cities to enact
- Policies for zoning/land use, building regulations/ordinances, public procurement, waste and circularity, financial, municipal buildings, and infrastructure development.
- Policies evaluated for:
  1. Carbon reduction impact;
  2. Cost efficiency;
  3. Ease of Implementation;
  4. Enforceability



www.embodiedcarbonpolicies.com

What Can Newmarket Do?

In short, **a game plan for the Town to reach net-zero development**



Which Policies Are Most Effective?

ZONING AND LAND USE POLICIES

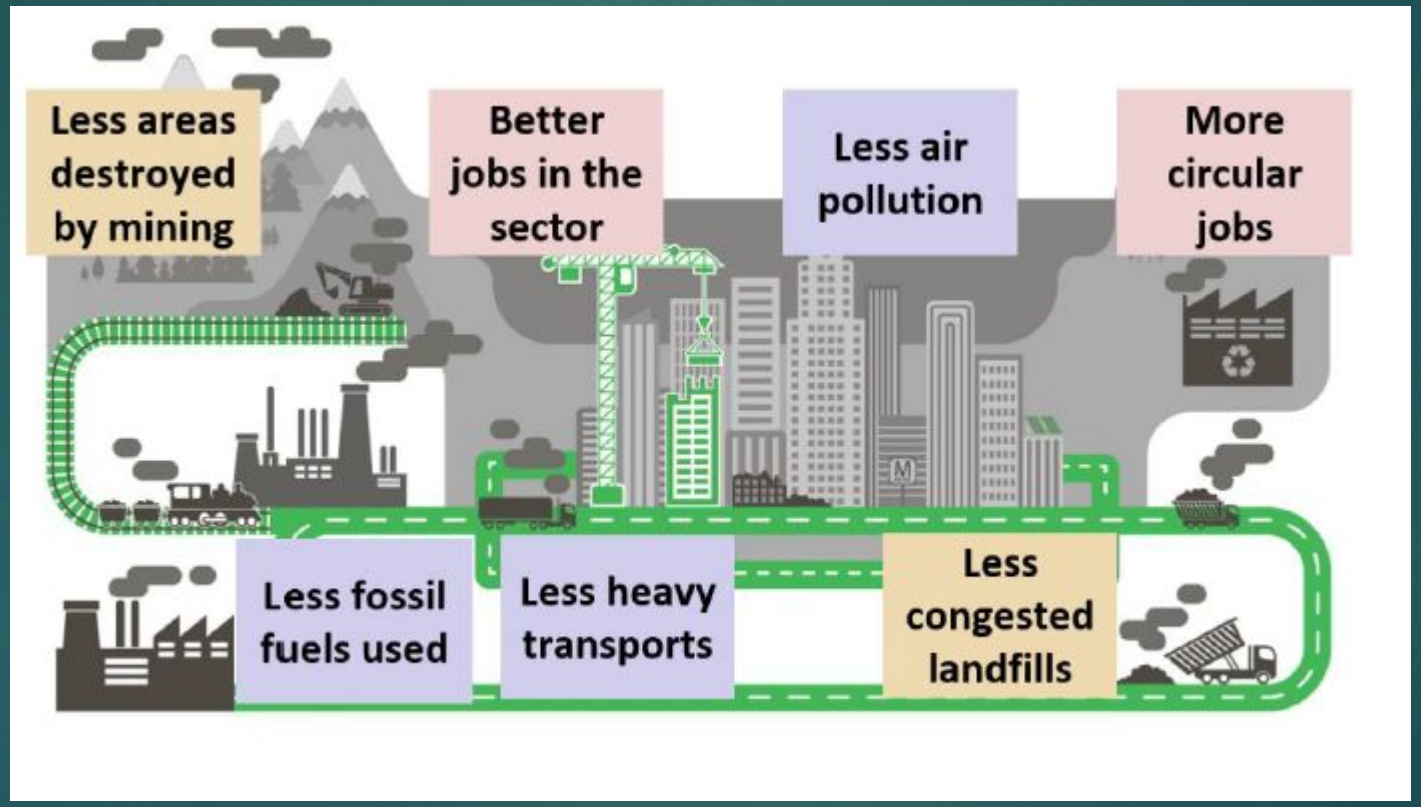
POLICY CODE	POLICY NAME	CARBON IMPACT	COST-EFFICIENCY	IMPLEMEN-TABILITY	ENFORCE-ABILITY	SUM OF SCORES	EXAMPLES PROVIDED
Z1	EMBODIED CARBON TARGETS FOR ZONING PROCESS	●●●●●	●●●●○	●●●○○	●●●●○	16	-
Z2	SET ZONING REQUIREMENTS FOR BIO-BASED MATERIALS	●●●●○	●●●○○	●●●●○	●●●●○	15	Helsinki
Z3	CARBON-SCORED LAND SALES COMPETITIONS	●●●●○	●●●○○	●●●○○	●●●●○	14	Porvoo, Tampere
Z4	PARKING REQUIREMENT OPTIMIZATION	●●●○○	●●●●●	●●●●○	●●●●●	17	London, Portland, Helsinki
Z5	APARTMENT SIZE AND SPACE EFFICIENCY GUIDELINES	●●●○○	●●●●●	●●●●○	●●●●●	17	NYC
Z6	PREFABRICATED OR MODULAR CONSTRUCTION PRIORITY	●●●○○	●●●●○	●●●○○	●●●●○	14	-
Z7	INCREASING DENSITY USING EXISTING INFRASTRUCTURE	●●○○○	●●●●○	●●●●○	●●●●○	14	-
Z8	USE LOW CARBON BUILDING TYPOLOGIES IN ZONING	●●○○○	●●●○○	●●●●○	●●●●●	14	-

Which Policies Are Most Effective?

BUILDING REGULATION AND SUPERVISION

POLICY CODE	POLICY NAME	CARBON IMPACT	COST-EFFICIENCY	IMPLEMEN-TABILITY	ENFORCE-ABILITY	SUM OF SCORES	EXAMPLES PROVIDED
R1	LIFE-CYCLE CARBON LIMITS FOR NEW BUILDINGS	●●●●●	●●●○○	●●●○○	●●●○○	14	Vincent, Douro-Dummer, London
R2	LOW CARBON CEMENT AND CONCRETE POLICY	●●●●●	●●●○○	●●○○○	●●●○○	13	Singapore, Masdar City, Portland, Dubai
R3	MATERIAL-EFFICIENT STRUCTURAL DESIGN REQUIREMENT	●●●●○	●●●●●	●●●○○	●●●○○	15	Singapore, San Francisco, Los Angeles, Seattle
R4	DENSITY BONUS FOR CARBON EFFICIENCY	●●●○○	●●●●●	●●●●○	●●●●○	16	Seattle, Washington, other US cities, Singapore
R5	ZERO CARBON CONSTRUCTION SITES	●●○○○	●●○○○	●●●●○	●●●●○	12	Trondheim, Oslo, Malmö, Göteborg, Stockholm
R6	CONSTRUCTION MATERIALS EFFICIENCY DECLARATION	●○○○○	●●●●○	●●●●○	●●●●○	13	-
R7	EXPEDITED PERMITTING FOR LOW CARBON PROJECTS	●○○○○	●●●○○	●●●●○	●●●●●	13	San Diego, Seattle
R8	PROHIBITING EXTREMELY HIGH EMITTING MATERIALS	●○○○○	●●●○○	●●●○○	●●○○○	9	North Bend, Washington, Tuttle
R9	LIFE-CYCLE CARBON CALCULATION AND REPORTING	●○○○○	●●●○○	●●●●○	●●●●○	12	London

Other Benefits to Reducing Embodied Carbon



Taken from *City Policy Framework for Dramatically Reducing Embodied Carbon*

Conclusion

- Carbon embodied in buildings is largely overlooked;
- If we don't control the amount of embodied carbon in our buildings, **WE WILL NOT MEET NET-ZERO GOALS**
- We must act now

Municipalities have the ability to enact policies to decrease carbon emissions