

EMBRACING CIRCULARITY: STRATEGIES FOR REDUCING EMBODIED CARBON IN BUILDING MATERIALS IN ONTARIO

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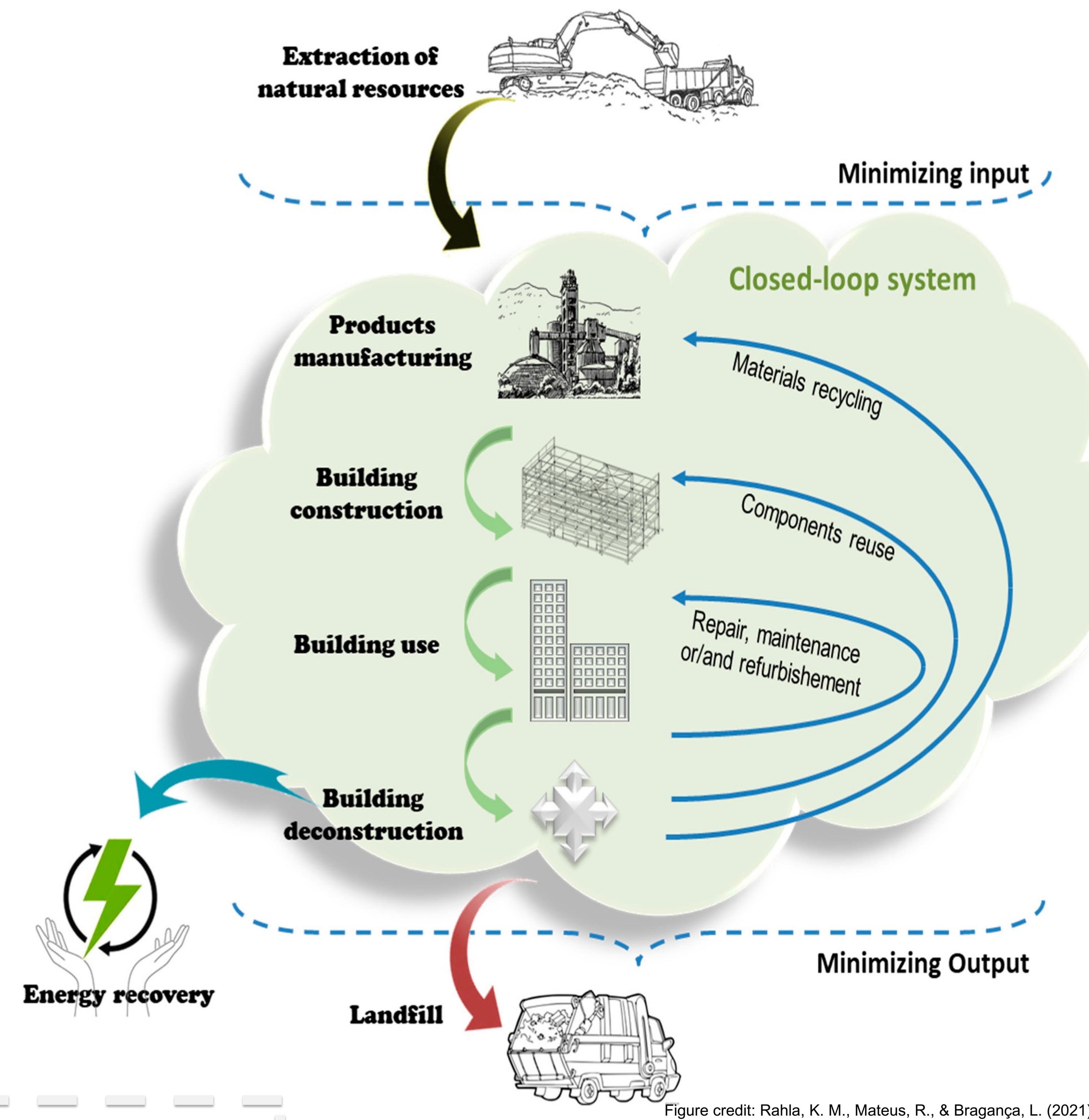
DISCUSSION

INTRODUCTION

- The Global Status Report (2022) indicates the building sector generates 37% of global GHG emissions, with a significant part from materials' lifecycle, necessitating improvements to avoid a projected doubling in 20 years.
- Canadian strategies focus on reducing construction waste and embodied carbon in government projects, emphasizing the need for material efficiency for sustainable growth.
- The study targets Ontario's challenge of balancing housing needs with carbon control, suggesting the use of international and circular economy frameworks to align with Canada's net-zero 2050 goal.

METHODOLOGY

- Literature Review:** identify prevalent CE barriers throughout building life cycle from international literature.
- Municipal Analysis:** Assess the incorporation of circularity in building materials based on official documents and waste practices from 23 municipalities in the GTA and central Ontario.
- Interviews:** Three-part interview process including unstructured discussion, structured discussion with prompts, and prioritization exercise with 7 practitioners from Ontario's construction value chain to understand barriers to CE adoption and potential solutions.



Material Flow Analysis and Municipal Collaboration

- Municipalities should work with waste management facilities to perform material flow analyses for a clear understanding of material quantities and qualities.
- This approach, illustrated by Toronto and Guelph-Wellington, helps identify leverage points and prioritize interventions, contributing significantly to establishing a circular economy baseline.

Standardized Data Protocol for Building Materials

- It's essential to standardize data collection on new building materials' embodied content to support deconstruction and material reuse.
- Encouraging Environmental Product Declarations and developing embodied carbon estimator tools can aid in reducing both embodied and operational carbon emissions.

Public-Private Partnerships for Material Exchange Networks

- Developing robust markets for secondary materials through public-private partnerships can help overcome storage constraints and modulate demand.
- Such networks could facilitate material reuse and recycling, promoting industrial symbiosis and ensuring carbon remains sequestered in materials.

Manufacturer-led Dematerialization Efforts

- Manufacturers can identify and mitigate emission-intensive areas in their supply chains, potentially gaining a competitive advantage by certifying their carbon reduction efforts.
- Research suggests significant embodied carbon reductions are possible in manufacturing processes like gypsum board production by optimizing product specifications.

Early Engagement and Material Substitution

- Early involvement of project teams is critical to set and meet targets for reducing embodied emissions through the selection of low-carbon materials.
- Industry-led studies show potential for significant reductions in embodied carbon in both large buildings and residential projects without impacting cost or timelines.
- Training for construction professionals on the benefits and application of low-carbon materials is vital for encouraging sustainable practices.

CONCLUSION

The study concludes with a call for a holistic focus on reducing both embodied and operational carbon emissions throughout a building's lifecycle.

It underscores the importance of circular economy principles, secondary markets, and deconstruction standards in achieving this goal, aiming to significantly lower buildings' total carbon emissions.

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Toronto

- Leads in addressing embodied carbon through CE concepts with a net-zero target by 2040.
- Toronto Green Standard Version 4 mandates initial evaluation of embodied carbon for certain projects.
- Collaboration with research institutions to benchmark embodied carbon assessments.



Guelph-Wellington

- Circular Opportunity Innovation Launchpad promotes CE nationally.
- Material flow analysis on CRD waste highlights primary sources and challenges in waste management.
- Systemic design analysis explores barriers to circular development and the impact of deconstruction by-laws.



WELLINGTON COUNTY



York

- The SM4RT Living Plan aimed for significant diversion of construction waste from landfills.
- Recent reports indicate a pause in C&D recycling program and lack of construction waste mention.



Durham

- Long-Term Waste Management Plan incorporates CE measures but lacks explicit plans for CRD waste.
- Pilot projects in road construction use recycled materials, and landfill mining recycles concrete and scrap metal.



Halton

- Solid Waste Management Strategy focuses on increasing recycling rates, particularly for shingles.
- By-laws introduced to forbid landfill disposal of certain C&D materials.

BARRIERS IDENTIFIED FROM INTERVIEWS with architect, structural engineer, developer, institutional asset manager, deconstruction expert, manufacturer, standard setter.

REGULATORY		ECONOMIC	
Lack of regulatory guidance	6/7	Lack of quality supplier competitions	6/7
Lack priority to operational carbon	4/7	High associated cost reduce profitability	4/7
Conflicting regulations (CE & building codes)	4/7	Lack of access to market for recyclers	4/7
SOCIOLOGICAL		TECHNOLOGICAL	
Lack of client demand	4/7	Difficult to scale up	3/7
Perception of 2 nd hand materials in sub-standard quality	4/7	Lack of warranty with reclaimed materials	3/7
Detached consumeristic society	3/7	Lack of info about existing structure	3/7

