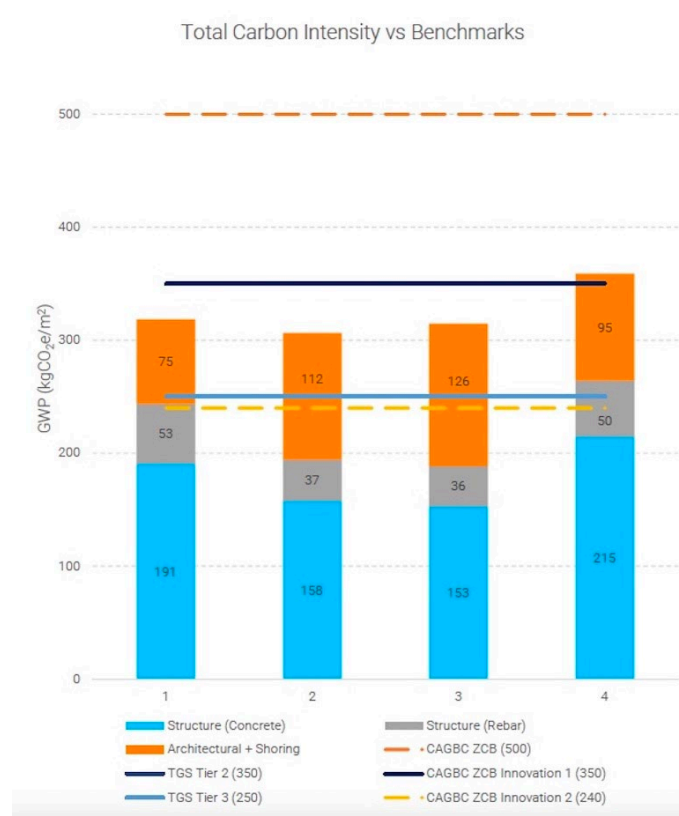


Embodied Carbon in Toronto's Urban Development

October 2, 2023

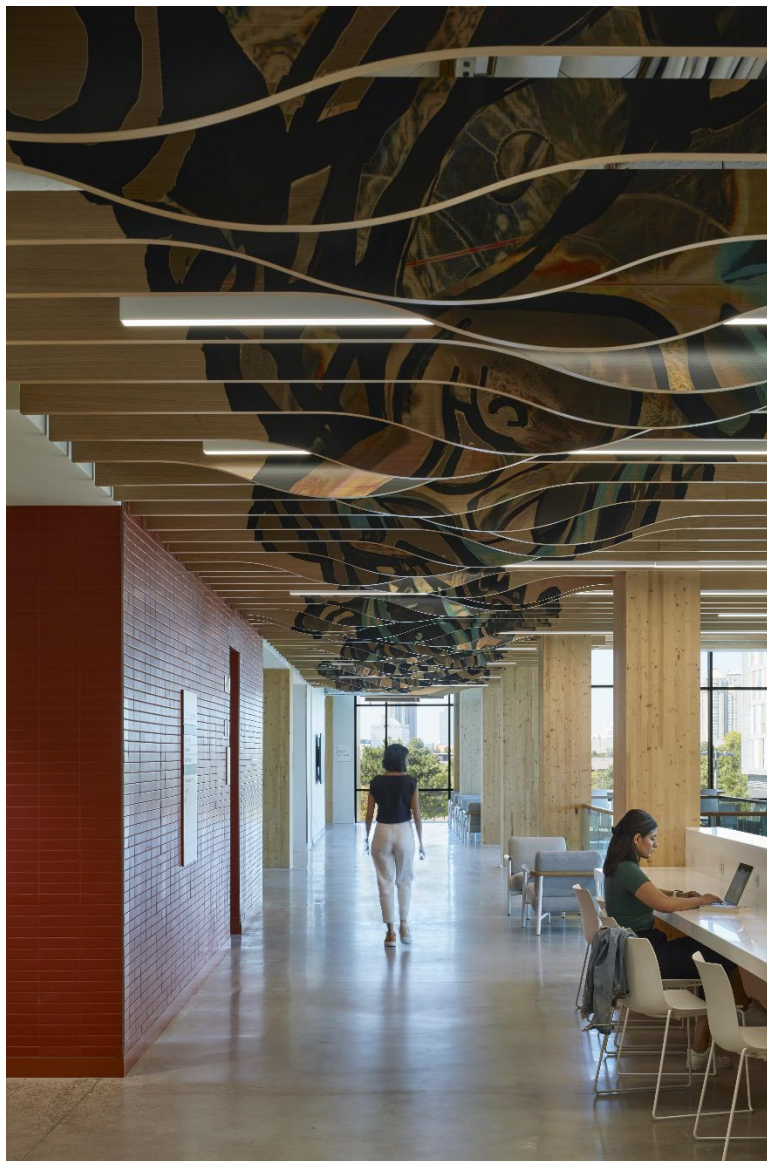
In Toronto's rapidly developing cityscape, where new buildings continuously rise, a silent yet significant environmental concern looms: the carbon emissions from these burgeoning developments. This issue has profound implications for the future of sustainable urban development. While operational carbon – such as the emissions from burning fossil fuels to heat and cool a building – often grabs headlines, [a recent study](#) by [RJC Engineers](#) and [BDP Quadrangle](#) delves deeper into the less-discussed topic of embodied carbon in residential structures, especially the carbon emitted during the construction phase of buildings. While operational carbon is becoming more manageable due to advancements in energy efficiency, the embodied carbon – often overlooked – is emerging as a significant contributor to the city's overall carbon footprint.



A chart of total carbon intensity vs benchmarks, image courtesy of RJC Engineers

[Dominic Mattman](#), an engineer at RJC and a lead author of the study, shed light on the findings in a recent interview with UrbanToronto. "Embodied carbon has become a much bigger focus in the past few years, especially as buildings become more energy-efficient [operationally]," Mattman told us.

The study analyzed [four anonymized active residential projects](#) in Toronto, finding that 60 to 77% of a building's total embodied carbon originates from the reinforced concrete used in construction. Measured against the [Toronto Green Standard](#), three of the four studied projects met the TGS Tier 2 targets, with the fourth marginally exceeding them. None of the projects, however, achieved the more stringent TGS Tier 3 targets which the City is now looking for from new construction, indicating a need for a 20-30% reduction from the baseline to meet these ambitious goals. Mattman applauds the City's proactive approach to embodied carbon through TGS Tier 3, saying "It is great to see Toronto taking decisive steps to address this issue."



The frame and ceiling architectural feature at Centennial's Progress Campus, one of RJC's projects, image courtesy of DIALOG

The construction of a building reflects the efforts of a team of architects, engineers, and other professionals working in harmony. "One of the biggest takeaways is that we need to collaborate earlier-on in projects. We need to work together to make design decisions that will work for the project overall," Mattman stressed. This collaborative spirit is essential to ensure that design decisions are made with aesthetics and sustainability in mind; structural engineers, according to Mattman, have a pivotal role to play as they significantly influence the embodied carbon required in building projects.

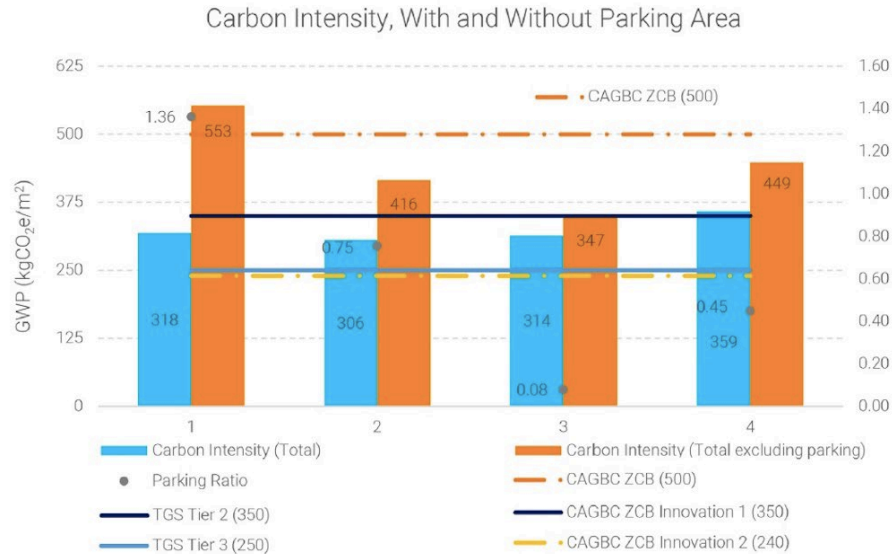


Figure 2: Carbon intensity of including and excluding parking from the building area

Carbon intensity with and without parking area, image courtesy of RJC Engineers

The study offers recommendations for other stakeholders in the industry. Policymakers are advised to implement embodied and operational carbon targets, review minimum requirements for developments, shorten the approval process duration, and rethink financial incentives for developments.

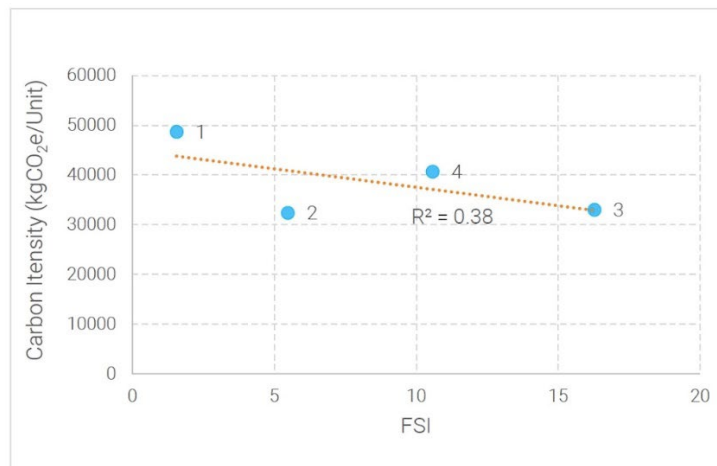


Figure 4: Carbon Intensity per Unit against FSI

Carbon intensity per unit against FSI, image courtesy of RJC Engineers

The study suggests that developers should prioritize reusing existing buildings, design beyond code minimums for longer building lifespans, utilize lower carbon products, and engage in integrated design approaches with construction and design teams to minimize embodied carbon.

Designers, on the other hand, can influence environmental goals by understanding different structural systems, quantifying and understanding the sources of embodied carbon in buildings, advocating for responsible building practices, and employing adaptive reuse of buildings when feasible.

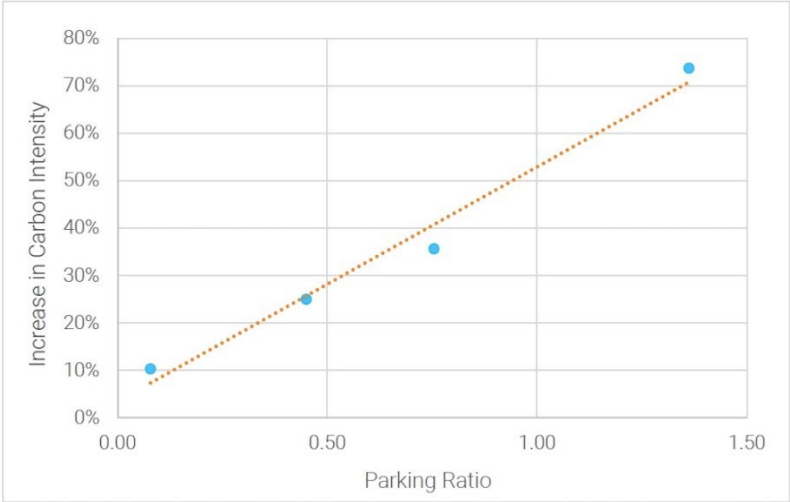


Figure 3: Carbon Intensity Increase by Parking Ratio

Mattman's message is clear: "The time is now." With the clock ticking and urban development in Toronto proceeding at an unprecedented pace, it is imperative for professionals, policymakers, and the public alike to join forces in addressing this critical issue, paving the way for a sustainable and environmentally responsible future for the city and the planet.

UrbanToronto will continue to follow progress on this issue, but in the meantime, you can join in on the conversation by leaving a comment in the space provided on this page.

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