

4 CONCLUSION

In this study, four prototype embodied carbon policy calculators were developed and tested on three different C40 pilot cities including New York City, Portland, and Austin. The intent of the study was to prove the concept and functionality of developing calculators for estimating embodied carbon at the scale of a city and assessing whether this type of data would be useful for developing and communicating embodied carbon policies.

The prototype calculators proved effective for estimating order-of-magnitude embodied carbon impacts of the different policies and were able to generate meaningful outputs that, with additional future research and development, could help inform real-world policy decision-making. For instance, preliminary results from the prototype calculators indicated that requiring reductions in building embodied carbon intensity was the most impactful for making city-scale reductions, followed by incentivizing adaptive reuse. However, multiple significant data and functionality gaps were identified as being critical for future development before the calculators could be applied in a real-world policy setting.

Throughout the study, the authors and contributors sought feedback from the pilot cities on the efficacy and applicability of the selected policy types and calculators. Each city overwhelmingly found the building embodied carbon intensity, limiting carbon content of concrete, and increasing adaptive reuse to be the most helpful and useful policy calculators for communicating the importance of embodied carbon and advancing policy development in their city. Additionally, the city feedback reinforced the need for future research development of the calculators. High priorities for future work include:

- Developing regionally and typologically specific building embodied carbon intensity values;
- Expanding the physical and temporal scope of the calculators to include infrastructure, parking, and cradle-to-grave impacts;
- Including stepped policy limits to evaluate the impact of incremental phasing over time and the cumulative impact of two or more policies combined; and
- Adding additional policy types that could target material reuse, procurement, or other types of planning and zoning strategies.

City policymakers need to have measurable, reliable, and actionable metrics to support their decision-making on embodied carbon policies. These future research priorities, and others listed in [Appendix B](#), will help refine and expand the calculators in order to provide those metrics and help cities across the globe address the urgent need to decarbonize the built environment.