

Embodied Emissions Reduction Opportunities in New York

January 2025

Executive Summary

According to the EPA, the US industrial sector is linked to nearly a third of annual U.S. greenhouse gas (GHG) emissions, and the manufacturing of construction materials and products accounts for 15% of annual global GHG emissions.¹ As tracked by the UN, current emissions reduction efforts amount to only 2.6% by 2030 compared to the 43% that scientists say is necessary by 2030.² Manufacturing impacts also have a negative effect on human health and environmental justice for fence-line communities near polluting facilities and supply chains.

New York State and New York City recently issued executive orders (EO 22 and EO 23, respectively) that recognize the importance of embodied carbon emissions in building materials. NYS's requirements generally focus on material transparency and reporting as first steps to help the industry become familiar with the issues; however, they do not yet mandate reductions. In PlaNYC (2023), the City commits to reduce the carbon footprint of the construction industry by 50% by 2033, including tactics related to low-carbon materials and equipment by way of the C40 Clean Construction Accelerator. Moving forward, New York could look to CALGreen, the California green building code, as a model for regulating embodied carbon flexibly across large private-sector new construction projects.

American Institute of Architects New York (AIANY) and the New York City Hub of the Carbon Leadership Forum (CLF NYC) have compiled the following recommendations for how New York City and State can strengthen existing efforts by expanding limits on embodied carbon for specific materials and requiring project life cycle assessments. While EO 22 and EO 23 take meaningful action to address embodied carbon, current efforts are not enough to reach NY's goals at the state and city level. We have prepared this memo to showcase opportunities to reward buildings that focus on creative design solutions, use less new material, support low carbon products, and value durability and de-constructability. These recommendations build off well-established policies implemented in states and municipalities across the country. An aligned memo similar to this document is planned to be shared on circular economy at a later date.

Policy Opportunities

Material Reporting and Thresholds

1. **Expand reporting using Type III Environmental Product Declarations (EPDs) that comply with maximum Global Warming Potential (GWP) Limits to the private sector, and add materials covered for the public sector.** Adopt the GWP limits for concrete, asphalt, flat glass, and steel that are included in NYS's Buy Clean Policy and EO 22, and make them applicable to all nonresidential and large multifamily construction. Expanding limits on concrete to the private sector in just NYC alone has the potential to reduce about 3 million mtCO_{2e} between now and 2050.³ GWP limits can be reduced over time to drive cleaner procurement, and building area thresholds can be reduced to cover more projects. In the public and private sectors, add reporting

¹ *Sustainable Marketplace: Greener Products and Services - Embodied Carbon*. United States Environmental Protection Agency (EPA). <https://www.epa.gov/greenerproducts/what-embodied-carbon>

² McGrath, M. *World way off target in tackling climate change - UN*. BBC. <https://www.bbc.com/news/articles/ce8yytle2eq2o>

³ Benke, B., Lewis, M., Carlisle, S., Huang, M., and Simonen, K. (2022). *Developing an Embodied Carbon Policy Reduction Calculator*. Carbon Leadership Forum, University of Washington. Seattle, WA.

and limits for metal studs, glass, wood, insulation, ceiling tile, gypsum board, and flooring, which would cover an additional ~30% of the embodied emissions of a building. The Carbon Leadership Forum’s most recent Materials Baselines Report provides regional and national industry-average values that can be used for setting GWP limits.⁴

2. **Create incentives to help small manufacturers connect to EPA grant programs and facilitate EPD creation.** Incentives are an important tool to help producers offset costs and take critical steps to research and develop lower carbon materials. This is an important tool for ensuring that smaller producers are not overly burdened by requirements to develop EPDs. An incentive program like New Jersey’s [Low Embodied Carbon Concrete Leadership Act](#) (LECCLA), or [MassSave’s EPD grant program](#) would be useful to support smaller producers to develop plant-specific EPDs.

Project Reporting and Performance Requirements

3. **Mandate project LCAs.** For buildings and infrastructure over a defined square footage or construction cost, require projects to conduct a project LCA in alignment with New York’s EO 22 and EO 23 project LCA guidance. Adding this requirement will ensure the industry is prepared and adequately trained to do LCAs, which are critical to exploring project-wide design solutions to reduce embodied carbon. If tracked and collected, this reporting can contribute to a regional database of project LCAs that can become the basis for setting NY-specific project level embodied carbon targets.
4. **Require reductions in whole building embodied emissions.** Expand NYS’ upcoming EO 22 project LCA guidance to require reductions at the building level through reductions from a baseline or comparison to a Building Carbon Budget.⁵ Explore exemptions for building reuse, similar to the CALGreen provisional approach to embodied carbon.⁶
5. **Expedite permitting process for projects submitting LCAs as part of a broader green incentive program.** For those who choose to submit a project LCA, creating an expedited permitting process, similar to Seattle’s Priority Green Expedited Program or expanding the scope of existing processes like NYC’s Green Fast Track for Housing, could provide a key incentive for early adoption of best practices and encourage more uptake from developers.
6. **Provide support for design and construction firms to learn and adopt tools to predict embodied carbon and whole life carbon performance.** Existing NYSERDA programs that provide financial and technical support, such as the Building Excellence Early Design Support Program, are excellent models for how state support can accelerate industry adoption.⁷ These resources serve as a complement to existing knowledge in the marketplace. Programs such as these are critical long-term investments that enable more design practitioners to be trained and conduct these analyses without overburdening firms.

Commitments

⁴ Waldman, B., Hyatt, A., Carlisle, S., Palmeri, J., and Simonen, K. (2023). 2023 Carbon Leadership Forum North American Material Baselines (version 2). Carbon Leadership Forum, University of Washington. Seattle, WA. August 2023. <https://carbonleadershipforum.org/clf-material-baselines-2023/>

⁵ Carbon Leadership Forum (2023). 5 – Building-Scale Embodied Carbon Performance Requirements. <https://carbonleadershipforum.org/building-ec-performance-reqs/>

⁶ 2022 California Green Building Standards Code, title 24, Part 11 with July 2024 Supplement. [Chapter 5 Nonresidential Mandatory Measures.](#)

⁷ NYSERDA. Buildings of Excellence Early Design Support Program. <https://carbonleadershipforum.org/building-ec-performance-reqs/>

7. **Explicitly include quantitative and time-bound embodied emissions targets in state and city climate goals.** PlaNYC includes embodied carbon action and aims for a 50% reduction for new buildings, infrastructure, and major retrofits. PlaNYC also calls for implementing performance-based standards by 2025, but does not define a baseline or set a date for full achievement of the 50% goal. While EO 22 and EO 23 take meaningful action to address embodied carbon, we suggest the city and state go further to set quantifiable reduction targets that apply to all new construction and align with global efforts to address the climate crisis.

New York Policy Precedents

New York State and New York City entities have varied and diverse precedents for incorporating embodied carbon policy, the key examples are summarized below:

- [New York State Executive Order 22](#), issued in September 2022, outlines the state's commitment to environmental quality, public health, economic prosperity, and social well-being; it applies to all State entities and is applicable to projects over \$1 million. Executive Order 22 states that entities shall seek to reduce embodied carbon in all new construction projects or significant renovations. The first phase of the Embodied Carbon Guidance, developed in response to the executive order, was issued in June 2023, and is focused on EPD disclosure in response to the executive order.
- [New York City Executive Order 23](#), also issued in September 2022, is meant to order the City of New York to lead the market development and uptake low embodied carbon and clean construction strategies. The guidance orders city agencies to make their best efforts to incorporate low carbon concrete specifications; to submit environmental product declarations for concrete and steel; to include low emission vehicles and equipment; and to endeavor to achieve credits related to Life Cycle Assessment for capital projects seeking green building standards. The order referred to the development of future guidance to agencies ([LCA Guidance](#)), and capital project agencies were required to submit action plans by October 2023.
- [New York State Senate Bill S542A](#), the New York State Low Embodied Carbon Concrete Leadership Act, passed in 2021 amends state finance law to require the Office of General Services in New York State to establish procurement guidelines for low embodied carbon concrete. The language emphasizes the role of the contractor and subcontractors involved in low carbon concrete procurement and delivering against OGS's minimum standards.
- The [GreenNY Specification](#) provided by New York State's Office of General Services (OGS) is meant to support OGS's role in the [New York State Senate Bill S542A](#). The standard provides numerous technical definitions, sets standards and certification programs, and describes specification requirements including EPD requirements, cement limits, SCMs, and take-back programs.
- The Port Authority of New York and New Jersey's [Clean Construction Program](#) has led by example in the region since 2020 by requiring EPD submission and low carbon limits on concrete and is now expanding to asphalt, steel, aluminum, and wood.
- [C40 Clean Construction Commitment](#), issued in 2022, commits to a range of actions that are related and complementary to embodied carbon. These include prioritizing reuse of existing building stock, leading by example with municipal procurement, procuring zero emissions construction equipment, piloting net zero emission construction, and facilitating the growth of local manufacturing and circular economy.

- The [Climate Leadership and Community Protect Act](#), signed into state law in 2019, sets legally binding targets to reduce GHG emissions to at least 85% below 1990 levels by 2050 and transition New York to systems powered by clean energy.
- [Local Law 97 of 2019](#) is a city law that sets carbon emission caps on buildings over 25,000 square feet starting in 2024, with the goal of net zero emissions by 2050. The law applies to approximately 50,000 buildings, which is about 60% of NYC’s building area and 50% of NYC’s building emissions, and includes large penalties for buildings exceeding the carbon cap.

What is Embodied Carbon?

Embodied carbon refers to the greenhouse gas (GHG) emissions generated by the manufacturing, transportation, installation, maintenance, and disposal of construction materials used in buildings, roads, and other infrastructure. Currently, materials used in the construction of buildings represent about 7% of total global GHG emissions. Raw materials use is predicted to double by 2060 – with steel, concrete, and cement already major contributors to GHG emissions.

Emissions released now are more critical than emissions released later because (1) emissions will accumulate in the atmosphere, and (2) there is limited time remaining before the tipping point of the climate crisis. This means that in the near term, reducing embodied carbon is as important as – or more important than – reducing operational carbon. The urgency of reducing emissions that will happen in the short term between now and 2030 or 2050 is sometimes referred to as “the time value of carbon.”

Embodied carbon is inherently connected to climate justice and public health. Its impact can be seen locally and globally in frontline communities – those that experience the impacts from climate change “first and worst.” Increasing transparency of reporting for embodied carbon can illuminate environmental hot spots and reducing embodied carbon can have co-benefits by simultaneously reducing other environmental harms.

There is no one size fits all strategy for reducing the embodied carbon of buildings. Strategies for reducing the embodied carbon of buildings generally fall into four broad categories:

1. Build less, reuse more: extend the life of existing buildings via adaptive reuse and material reuse.
2. Build lighter and smarter: use less of a given material (or floor area) to do the same work.
3. Material and assembly substitution: replace intensive materials and assemblies with alternatives.
4. Procure low carbon products: compare different products and select the lower carbon option.

In order to quantify embodied carbon, practitioners use a method called life cycle assessment (LCA) to track the GHG emissions produced over the full life cycle of a product, building, or piece of infrastructure. LCA provides an estimate of GHG emissions over the build’s entire life cycle, reported as global warming potential (GWP), as well as other environmental and human health impacts, such as acidification, eutrophication, and smog formation. Life cycle stages (product, construction, use, end-of-life) and modules (A1, A2, etc.) subcategorize the life cycle stages that are important for capturing the emissions of a product or building over its life cycle.

LCAs can be done at multiple scales. The most common scales are:

- Product-level LCAs that focus on quantifying the extraction and manufacturing impacts of a specific product and are reported in the form of an environmental product declaration (EPD). EPDs are standardized, third-party-verified documents that report the environmental impacts of a

product based on a product LCA. EPDs are the best available mechanisms for requiring product embodied carbon reporting and transparency and helping project teams compare functionally equivalent products for procurement.

- Building-level LCAs that focus on quantifying the impacts of the materials and processes used to construct a building. A whole building LCA (WBLCA) is a cradle-to-grave (A-C) assessment that evaluates the environmental impacts of a building or portion of a building across its life.

For additional information, see [Carbon Leadership Forum's Policy Toolkit](#).

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