

Embodied Carbon Public Sector Policy Options

The public sector is increasingly addressing climate pollution, including the emissions in the built environment related to the production of building materials. These “embodied carbon” emissions may occur outside of a jurisdiction’s boundaries but are more within government control and influence than many other activities that occur within their boundaries. Governments can affect the design and material usages of the built environment through several mechanisms:

1. **Procurement policies** for its own facilities and infrastructure. These policies are more directly within a public agency’s control, though they result in a smaller carbon reduction than addressing private buildings.
2. **Policies on private sector development** within their jurisdiction. Policies on private sector development has a bigger impact but requires working with more stakeholders.
3. **City planning** to improve utilizations of materials in the built environment at the community-scale, creating more housing, jobs, and quality of life with less building and infrastructure material inputs.

For each mechanism, there is a range of policy options. Analogous to policies that have evolved for energy usage and efficiency, policies can offer one or both of two paths to compliance: Performance and prescriptive.

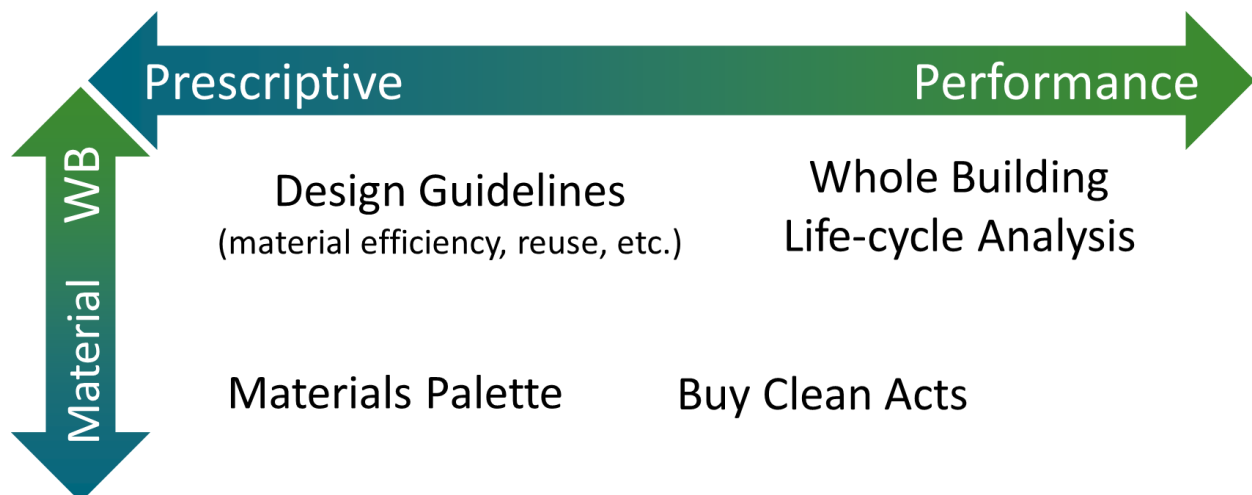
A performance requirement may set a threshold for embodied carbon impacts per square foot (or other denominator) or set a threshold for each material type. Performance-based policies allow for greater flexibility for compliance, but require a higher level of industry training and sophistication.

Prescriptive requirements may specify product *attributes* that typically result in lower embodied carbon. Prescriptive requirements are more rigid, but may be more immediately implementable.

What is Embodied Carbon?

The term “embodied carbon” refers to the greenhouse gas emissions resulting from all phases of an object’s lifecycle, including the extraction, production, and transportation of materials. In the built environment, this includes all of the supply chain emissions from building material production and the construction process. Some of the biggest impact materials are concrete, steel, and insulation.

In new construction that is designed to be highly energy efficient, embodied carbon can represent almost half of the total lifecycle emissions combining embodied and operation (energy) carbon. Furthermore, these emissions occur *in year one*, prior to occupancy, and cannot be mitigated afterward. Considering the urgency of reducing emissions immediately, the time value of embodied carbon may be considered greater than lifetime operational carbon.



Examples of embodied carbon policies and tools – from performance to prescriptive, and at whole building or material-specific levels.

Embodied Carbon Policy Examples and Tools

Whole Building Life-cycle Analysis (WBLCA) calculates total emissions related to a building's construction and operations. It provides the most flexibility to developers and designers to find ways to reduce embodied carbon and looks holistically across material types and design and trade-offs with operational carbon. However, it requires sophisticated analysis and access to data that may be difficult to obtain. In 2017, the City of Vancouver introduced a policy for project applying for rezoning permits to calculate WB LCA. They only require reporting, and do not set a maximum threshold. There are voluntary credits in systems like LEED and California's CALGreen codes that do require demonstrating a reduction against a baseline.

California's Buy Clean Act requires projects to collect and report Environmental Product Declarations for Global Warming Potential and require product suppliers of certain material categories to not exceed maximum GWP values for that category. The GWP threshold will be set at the industry average after collection and analysis of a wide database of EPDs.

Design Guidelines can encourage whole building strategies that reduce the need for new materials by reusing existing building structures or salvaged materials from other sites. Whole building embodied carbon can also be reduced by designing around lower-embodied carbon material types and renewable, carbon-sequestering materials. Designing for future reuse of the building or components (e.g. design for disassembly and material banking) also supports lower-carbon construction in the future.

Architecture 2030's Materials Palette identifies attributes that typically result in lower embodied carbon options within a given material category. If a project is already designed and committed to using a material, for example concrete, the palette offers specifications that result in lower embodied carbon concrete than standard practice. The Materials Palette focuses on key high-impact materials and also presents carbon-sequestering alternatives.

Carbon Smart Building Day Embodied Carbon Policy Panelists

The policies and tools above were presented at Carbon Smart Building Day in San Francisco in Sept 2018.



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For more in-depth descriptions of these and other embodied carbon policies, visit:

The Embodied Carbon Network's Policy Work Group's 2018 webinar recording: [embodiedcarbonnetwork.org/resources/Zizzo, Ryan et al. Embodied Carbon in Buildings and Infrastructure: International Policy Review publications.zizzostrategy.com/wp-content/uploads/2017/09/2017.09.21.Forestry-Innovation-Investment-Ltd.Embodied-Carbon-in-Construction.pdf](https://embodiedcarbonnetwork.org/resources/Zizzo_Ryan_et_al_Embodied_Carbon_in_Buildings_and_Infrastructure_International_Policy_Review_publications.zizzostrategy.com/wp-content/uploads/2017/09/2017.09.21.Forestry-Innovation-Investment-Ltd.Embodied-Carbon-in-Construction.pdf)



The Embodied Carbon Policy session at Carbon Smart Building Day was moderated by StopWaste's Legislative Affairs Manager Anu Natarajan. StopWaste is a public agency in Alameda County, CA working to reduce the waste stream through materials efficiency.