



Targeting Net-Zero Embodied Carbon

This document provides an overview of three types of embodied carbon reduction targets, and also examples of corporate and other voluntary commitments to reduce embodied carbon. More information about opportunities for addressing embodied carbon with policy can be found in the [Carbon Leadership Forum’s Owner Toolkit](#).

Target-setting is key to success and momentum

Investor, developer, building owner, and tenant policies are essential to reducing embodied carbon by spurring action before a project begins when the largest range of solutions are available. As a project progresses, the range of options is reduced. Setting net-zero embodied carbon targets early in a project (preferably before it begins) is therefore key to maximizing reductions and minimizing costs.

When it comes to targeting net-zero embodied carbon, there are three relevant types of targets:

1. Company or organization-wide targets;
2. Project-level targets; and
3. Material-level (procurement) targets.

Organization-wide targets are most effective at accelerating action through aligning teams across an organization that may otherwise be siloed, such as sustainability, real estate, and procurement. Project and procurement targets support broader goals and ensure that reductions opportunities are followed through the value chain and communicated as a priority across the large number of stakeholders across a typical project.

Public sustainability commitments can also help maintain momentum on climate action within a company while signaling demand for low carbon solutions, inspiring a “race to the top” among organizations competing to be the first to net-zero.

Embodied carbon and scope 3 emissions

Embodied carbon refers to the greenhouse gas emissions associated with the manufacturing, transportation, use, and disposal of building materials used in construction.

The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard splits GHG emissions into three scopes:

- **Scope 1** emissions are from a company’s operations that are under a facility’s direct control, e.g., on-site fuel combustion;
- **Scope 2** emissions are from usage of electricity, steam, heat and/or cooling purchased from third parties; and
- **Scope 3** emissions are upstream and downstream value chain emissions, including upstream supply chain emissions from purchased products, transport emissions, and business travel and downstream emissions from transport of products, usage of sold products and product disposal.

Upfront or “cradle-to-gate” embodied carbon refers to embodied carbon impacts up to the point of purchasing, and are therefore accounted as scope 3 emissions (see Figure 1). The primary categories of scope 3 emissions associated with embodied carbon are (1) purchased goods and services and (2) capital goods, or assets that are used to produce goods or services.

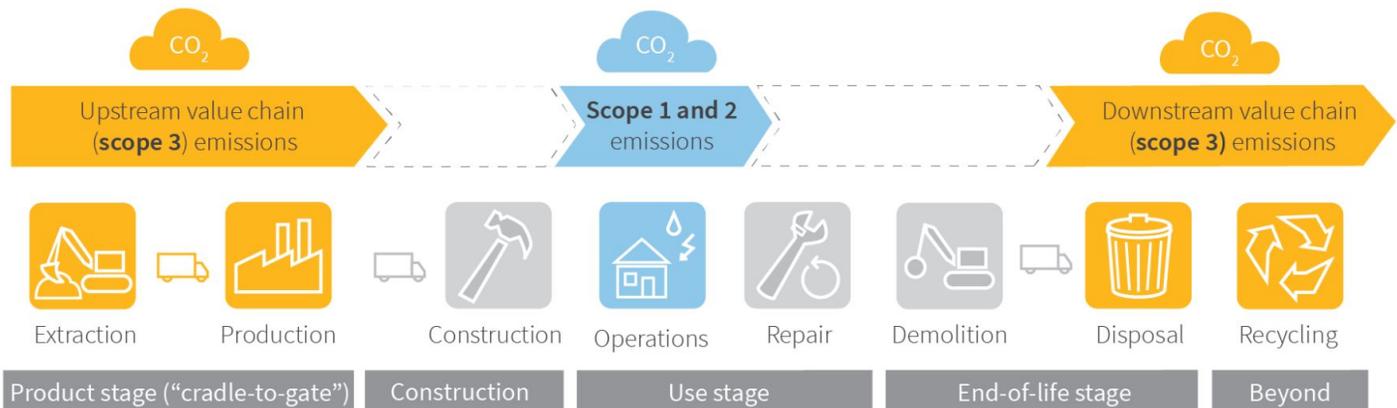


Figure 1. Building product life cycle stages included in scope 1, 2, and 3 greenhouse gas accounting, as described by the [Greenhouse Gas Protocol Corporate Value Chain \(Scope 3\) Reporting Standard](#). Cradle-to-gate emissions (including extraction, transportation, and production) as well as end-of-life waste disposal and recycling emissions are included in scope 3 emissions. Other life cycle stages, such as construction and demolition, are not clearly attributable to a category.

The following sections provide an outline of the tools and accounting methodologies that are helpful for setting company, project, and material-level targets.

Company/organization-wide targets

GHG accounting and target-setting is an integral part of corporate sustainability and reporting. The [GHG Protocol Corporate Accounting and Reporting Standard](#) is used by companies, cities, universities, and other entities to report GHG emissions. Standards like the [Global Reporting Initiative](#) (GRI) and the [Sustainability Accounting Standards Board](#) (SASB) help define what companies must report in their annual sustainability report and how GHG emissions are accounted. Corporate accountability initiatives encourage companies to take additional actions such as setting meaningful targets (see the [Science Based Targets Initiative](#) (SBTi)) or procuring 100% renewable energy (see [RE100](#)).

Until recently, GHG accountability initiatives have focused on emissions from direct or indirect energy use, also known as scope 1 and 2 emissions. However, increasing public pressure to do more holistic GHG accounting has resulted in a growing number of companies expanding their scope of GHG accounting and public sustainability commitments to include value chain (scope 3) emissions. According to SBTi, “Setting value chain targets (scope 3 targets) is now standard practice; 94% of companies with science-based targets include scope 3 emissions” ([source](#)).

While scope 3 emissions targets are becoming increasingly popular, setting targets explicitly focused on embodied carbon or through green building certifications that require embodied carbon reductions, such as the Zero Carbon Certification, provide additional pathways for targeting net-zero. Table 1 highlights examples of building owner commitments that address embodied carbon.

Project-level targets

Project-level embodied carbon targets should be set before a project begins and communicated in owner’s project requirements. There are two primary approaches to setting project-level targets:

1. A **carbon intensity limit** sets a maximum carbon footprint per area value for a building. For example, the [Zero Carbon Certification](#) requires that “[t]he total embodied carbon emissions of the project must not exceed 500 kg-CO₂e/m².”
2. **Percent reduction goals** from a baseline value can be set for the entire project or on a per area basis. For example, the LEED v4 credit “[Building life-cycle impact reduction](#)” awards points to teams that “conduct a life-cycle assessment of the project’s structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building.”

Table 1. Examples of building owner commitments that include embodied carbon reductions. Many companies have chosen to develop Science Based Targets related to scope 3 emissions that cover building materials, while others have made commitments specifically related to embodied carbon in the context of green building policies.

Owner	Goal
Amazon	Amazon co-founded The Climate Pledge, which is a commitment to net-zero carbon across their business by 2040 (including scopes 1, 2, and 3).
Autodesk	Autodesk aims to achieve climate-neutral GHG emissions for scopes 1, 2, and 3 beginning in FY21 using an internal price on carbon. Their target is to achieve an 85% reduction by 2050.
Facebook	Facebook is committed to reaching net-zero GHG emissions for their value chain (scope 3) by 2030.
Hewlett Packard	Hewlett Packard is committed to becoming carbon-neutral by 2050, covering scope 1, 2, and 3 emissions. Their 2025 climate targets include a 15% reduction in manufacturing-related GHG emissions in their supply chain from 2016 levels.
Kilroy Realty	Kilroy aims to reduce the embodied carbon of construction materials in development projects 30% like-for-like by year-end 2040 and 50% by year-end 2050 from a 2019 baseline. They are also aiming to reduce their scope 3 emissions by 72% by 2050.
Lendlease	Lendlease aims to achieve net zero carbon by 2025 for scope 1 and 2 and absolute zero carbon by 2040 from all scopes and activities without the use of offsets.
LinkedIn	LinkedIn aims to reduce their scope 3 emissions by more than half and remove more carbon than they emit by 2030.
Mastercard	Mastercard is working to reduce total scope 1 and 2 emissions by 38% and scope 3 emissions by 20% by 2025 from a 2016 baseline.
Microsoft	Microsoft aims to drive its operations and supply chain to be carbon-negative by 2030.
Salesforce	By 2025, Salesforce will work with their suppliers to set their own emissions reduction targets, targeting 50% of Salesforce's supplier emissions. After 2020, all major, new Salesforce office interiors will align with LEED Platinum v4 and pursue Net Zero Carbon certification.
University of Michigan	The University of Michigan will establish, by 2025, carbon neutrality goal dates for scope 3 emissions categories that are set for no later than 2040.
Walmart	Walmart is working with suppliers through their Project Gigaton to avoid a gigaton of GHG emissions from the global value chain by 2030.

The embodied carbon of a project can be calculated by using whole building life cycle assessment (WBLCA) tools, such as [Tally](#), [OneClickLCA](#), and others. WBLCA analysis should be included in the scope of work for the project, to be led by the architect, engineer, and/or sustainability consultant. *Learn more about WBLCA in the Carbon Leadership Forum's [Practice Guide](#).*

Analyzing data from past projects is ideal for providing meaningful carbon intensity limits or reduction goals. As of April 2021, there is no publicly available database of building life cycle assessments to provide embodied carbon benchmarks at the building scale. The [Embodied Carbon Benchmark Study](#) compiled over 1000 buildings to establish consensus on the order of magnitude of typical building embodied carbon. Additional research is needed to provide benchmark numbers similar those available for operational energy.

Material-level targets

Procurement targets should be set during the design process and included in specifications. Similar to project-level targets, two approaches can be used:

1. A **material carbon intensity** limit sets a maximum carbon footprint per unit of material, such as a cubic yard of concrete. For example, the [State of California](#) requires that rebar purchased for State projects must be below the global warming potential limit of 1.06 metric tons CO₂e per metric ton of rebar.
2. **Percent reduction goals** from a baseline value can be set in total or per functional unit of material. For example, the LEED BD+C New Construction pilot credit "[Procurement of Low Carbon Construction Materials](#)" awards teams 1 point for reductions of 0-30% and 2 points for reductions above 30% from the Carbon Leadership Forum's Material Baselines values.

Product embodied carbon should be tracked via product-specific environmental product declarations, rather than whole building life cycle assessment tools. Learn more in [Procurement Policies to Reduce Embodied Carbon](#).

Voluntary Embodied Carbon Commitments

While many building owners may choose to develop embodied carbon targets as part of broader initiatives like Science Based Targets or their corporate green building policies, the 2030 Challenge for Embodied Carbon and the Clean Construction Declaration are two examples of commitments that include targets specific to embodied carbon in construction.



The [2030 Challenge for Embodied Carbon](#) from Architecture 2030 asks the global architecture and building community to adopt the following commitment:

The embodied carbon emissions from all buildings, infrastructure, and associated materials shall immediately meet a maximum global warming potential (GWP) of **40% below the industry average today**. The GWP reduction shall be increased to:

- 45% or better in 2025
- 65% or better in 2030
- Zero GWP by 2040.



Signatories to the [Clean Construction Declaration](#) from C40 Cities pledge to "bring together and inspire stakeholders to take action, and enact policies and regulations where we have the powers to:

- Reduce embodied emissions by at least 50% for all new buildings and major retrofits by 2030, striving for at least 30% by 2025
- Reduce embodied emissions by at least 50% of all infrastructure projects by 2030, striving for at least 30% by 2025
- Procure and, when possible, use only zero emission construction machinery from 2025 and require zero emission construction sites city-wide by 2030."

- The Carbon Leadership Forum is accelerating the transformation of the building sector to radically reduce the embodied carbon in building materials and construction through collective action.
- We pioneer research, create resources, foster cross-collaboration, and incubate member-led initiatives to bring embodied carbon emissions of buildings down to zero.

