



EMBODIED CARBON GUIDEBOOK

(Q2 2023)

This guidebook includes a list of resources for education, benchmarking, and tools for reducing Embodied Carbon in commercial development in Buckhead.

01 Embodied Carbon 101

02 Tools

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The information within the guidebook is intended to be uploaded to the Livable Buckhead website.

This document contains live links and is not intended to be distributed.

01 Embodied Carbon 101

a. Embodied Carbon ULI mTap Presentation

(Stakeholder Meeting #1 - 03.21.23 presentation and recording provided to Livable Buckhead)

Education Session with stakeholders - PowerPoint presentation (& Recording) covering general information about Embodied Carbon.

b. Carbon Leadership Forum Website

[Carbon Leadership Forum website](#)

Website includes Case studies, Education, Research Reports, Toolkits and Videos.

This [video](#) covers some examples/case studies for City Incentive programs.

c. Measuring Embodied Carbon

[Measuring Embodied Carbon - Carbon Leadership Forum](#)

Life Cycle Assessment - (LCA)

LCA is a methodology that is used to measure the environmental impacts of a building, product, or process over its full life cycle, from raw material extraction through end-of-life and disposal. LCA measures impacts through a variety of metrics, such as global warming potential, acidification potential, eutrophication potential, smog formation potential, and ozone depletion potential. Global warming potential (GWP) is the metric used to measure and track embodied carbon. GWP is quantified in kilograms of CO₂ equivalent (kg CO₂e). The “equivalent” or “e” in “kg CO₂e” means that other greenhouse gases like methane are included alongside carbon dioxide and normalized to the impact of CO₂ based on their radiative forcing potentials relative to CO₂.

Whole Building LCA (WBLCA)

WBLCA provides an assessment of the embodied carbon impact of a whole building. This includes the impact of all materials used in the project, or a subset of the project, like structure and/or envelope, throughout the life cycle of the building. Similar to energy modeling, architects, or their consultants, should perform WBLCA throughout the design process to actively inform the design of a building.

LCA Tools: Categorized by Software, Databases & Calculators

LCA Software	LCI Databases	LCA Tools
<ul style="list-style-type: none">• GaBi• SimaPro• OpenLCA• Umberto	<ul style="list-style-type: none">• GaBi• EcolInvent• US LCI / Fed LCA Commons	<ul style="list-style-type: none">• Tally• OneClick LCA• Athena Impact Estimator • EC3• Beacon• ZGF Concrete Calculator• BH BoM• Cove• ECOM• Edge



Description and Uses for these tools can be found on the Carbon Leadership Forum website:
[Tools for Measuring Embodied Carbon - Carbon Leadership Forum](#)

02 Tools

a. Calculators

Calculators are typically simple online or spreadsheet-based tools designed to allow for targeted and quick decision-making.

Building calculators help designers get a quick sense of the order of magnitude of embodied carbon. These are typically most helpful in early design stages before modeling has begun. While building calculators are useful tools, they are not typically appropriate for reporting embodied carbon to meet the requirements of standards or rating systems. Programs like LEED v4 require the use of whole building LCA tools, rather than calculators, unless a specific tool has been developed for compliance with the policy or program.

[*Building Carbon Neutral, Athena EcoCalculator*](#)

Material-specific or assembly-specific calculators help designers quickly evaluate design or sourcing decisions related to a single material or assembly, such as wood or façades.

[*Kaleidoscope, Upstream Forestry & Carbon LCA Tool*](#)

b. Design-integrated Life Cycle Analysis (LCA) tools

Design-integrated LCA tools may be integrated into software that architects already use, or they may be freestanding tools.

Whole building LCA tools. A WBLCA tool has features that allow the user to easily model the whole building at a fair level of detail (in terms of material types and material quantities) and performs the calculations to produce the LCA results.

Examples (North America): [*Tally \(a plug-in for Revit\), One Click LCA, Athena Impact Estimator*](#)

c. Assembly-specific design tools

Some tools have been developed to track and manage embodied carbon for a specific physical scope, such as structure or façade.

Examples: [*Beacon, Building and Habitats object Model \(BHoM\)*](#)

d. Product selection/procurement tools

This type of tool collects product data, such as EPDs, and facilitates comparison to help users select a product or supplier.

Example: [*Embodied Carbon in Construction Calculator \(EC3\)*](#)

e. Professional LCA software

Professional LCA software tools are primarily used by LCA experts and consultants for all types of products, not just those related to the building industry. These software tools are also commonly used to perform the LCA that an EPD is based upon and are used to create the background datasets used in most WBLCA tools.

Examples: [SimaPro](#), [OpenLCA](#), [GaBi](#)

03 Carbon Reduction Strategies

[Carbon Reduction Strategies - Carbon Leadership Forum](#)

a. Advocacy

The **ownersCAN Carbon Action Network**: The Carbon Action Network (CAN) is comprised of members of the global building industry that are ready to act on the smart prioritization of embodied carbon in building materials. ownersCAN, a sister program/counterpart to materialsCAN, is a group of developers, users, and managers of buildings that are dedicated to measuring and reducing the embodied carbon of their projects. The group has been created to raise awareness and provide education on the importance of embodied carbon in the built environment, and share strategies and lessons learned to inspire others to follow.

Purpose - ownersCAN aims to:

- Improve embodied carbon awareness amongst peers, industry, and external partnerships through best practice sharing.
- Promote use of the EC3 tool, and other embodied carbon tools that support accounting for and reducing embodied carbon emissions.
- Highlight case studies on successfully implementing embodied carbon policy and processes within building projects and realizing embodied carbon savings.
- Keep abreast of emerging policy/legislation regarding embodied carbon.
- Use collective influence as owners to advocate for industry action on embodied carbon. For example, better availability of EPDs and more transparency in embodied carbon data

[ownersCAN - building-transparency.org \(buildingtransparency.org\)](#)

[Embodied Carbon Action Plan by ownersCAN](#)

Project Phase	Sub-Phase	Chapter	Owner	Construction Manager	Sustainability Consultant	Architect	Structural Engineer	General Contractor	A1-A3 Cradle to Gate	A4 Transportation	A5 Installation	B Use	C End of Life
First Steps	Pre-Design	Setting embodied carbon benchmarks and targets	●	●	●				■	■	■	■	■
		Demonstrating market demand for low carbon materials	●	●	●	●	●		■				
Preconstruction	Concept / Schematic Design	Requiring embodied carbon accounting for projects	●	●					■	■	■	■	■
		Using embodied carbon data to inform systems level design	●	●	●	●	●		■	■	■	■	■
	Design Development	Setting a bill of materials for embodied carbon tracking	●	●	●				■	■	■	■	■
		Creating an upfront carbon estimate	●	●	●				■				
		Creating low carbon specifications	●	●	●	●	●		■			■	■
	Construction Documents	Refining the upfront carbon estimate	●	●	●				■				
Refining low carbon specifications		●	●	●	●	●		■			■	■	
Construction	Procurement	Creating low carbon bid documents	●	●	●				■	■	■	■	■
		Including embodied carbon data in bid leveling	●	●	●				■				
	Construction	Tracking realized embodied carbon of materials in construction	●	●	●				■				
		Minimizing transportation carbon emissions	●	●						■			
		Minimizing construction site carbon emissions	●	●							■		
Minimizing construction waste	●	●									■	■	
Operations	Use/Replacement	Minimizing replacement of materials	●	●	●	●						■	■
Deconstruction	End of Life/ Disposal	Promoting a circular economy	●	●	●	●	●					■	■

Other Links and Information:

[The Construction Material Pyramid](#)

<https://www.climatecentral.org/>

[Parson's Healthy Materials Guide](#)

[Embodied Carbon Video](#) with comparison of design of the same building with different materials.

[Zero Carbon - International Living Future Institute \(living-future.org\)](#)

b. Benchmarking

Benchmarking for Materials:

The CLF North American Material Baselines Report provides a snapshot of the state of Environmental Product Declarations (EPDs) for North American-produced building materials.

<https://carbonleadershipforum.org/clf-material-baselines-2023/>

Benchmarking for Projects:

2017 Embodied Carbon Benchmark Study researched the typical magnitudes and ranges of embodied carbon in buildings. The link below provides a downloadable result of the research and the Database for different building types.

<https://carbonleadershipforum.org/lca-benchmark-database/>

Carbon Leadership Forum WBLCA Benchmark Study v2:

The Carbon Leadership Forum is currently conducting a multi-year project to develop a robust and harmonized database of WBLCA benchmarks.

Version 2 of the building benchmark study is underway. Currently, it is difficult to set robust targets or benchmarks for the embodied carbon of building projects due to the lack of a robust collection of WBLCA models. This project will fill a critical gap in the AEC industry and help enable architects, engineers, policy makers, and the entire design community to work towards realistic and measurable embodied carbon reductions at the building scale. More information and details for v2 can be found here: [CLF WBLCA Benchmark Study v2 - Carbon Leadership Forum](#)