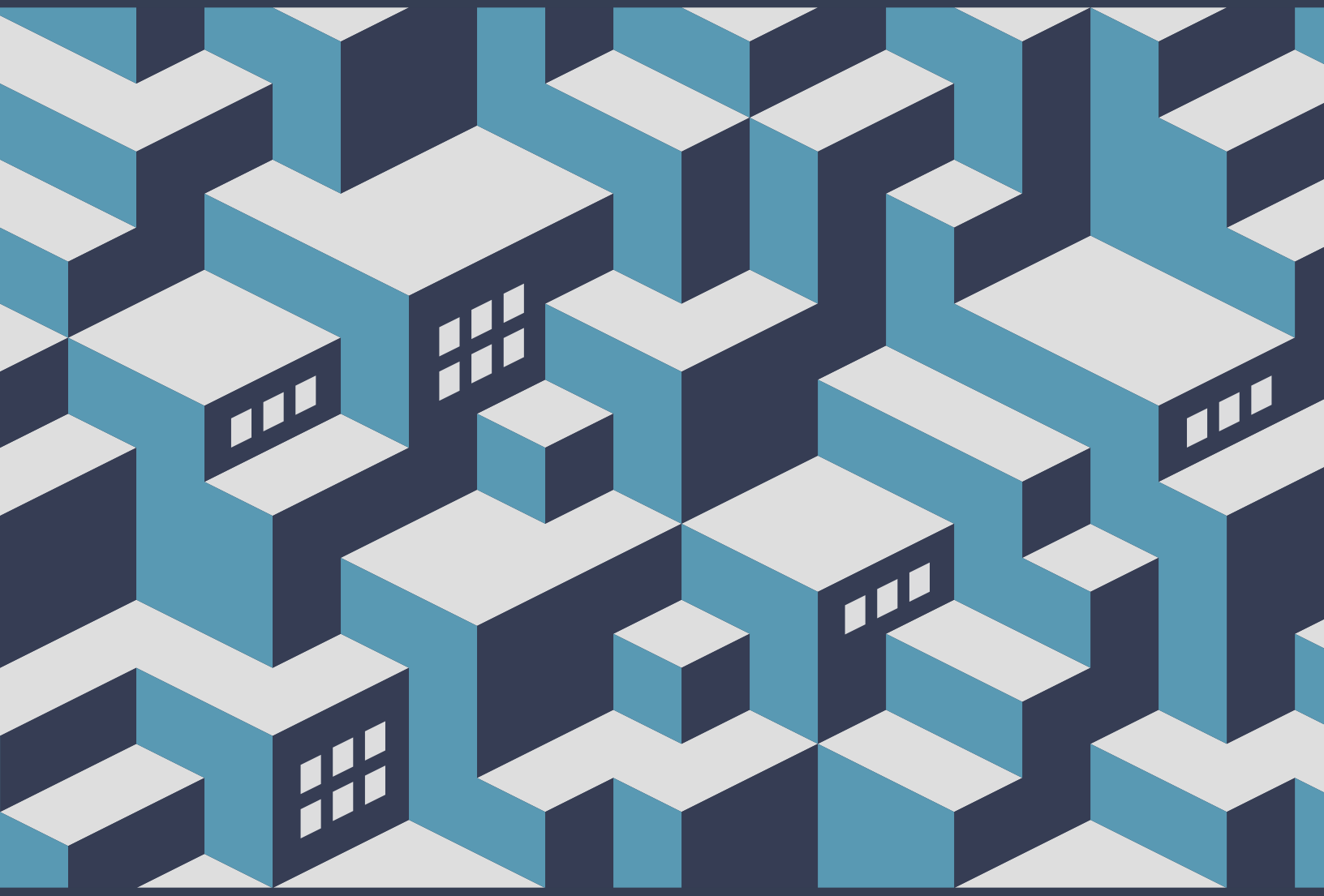
Building Transparency



The Manufacturer's Guide To Embodied Carbon

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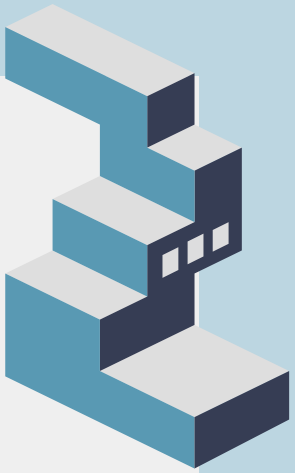

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What is Embodied Carbon?

Most larger companies, including manufacturers, will be familiar with requirements to report out direct greenhouse gas (GHG) emissions (Scope 1 and 2) in Corporate Social Responsibility Reports or through reporting tools like CDP or EcoVadis. But not everyone is aware that this reporting typically represents only a tiny percentage of a company's true impact on global warming.

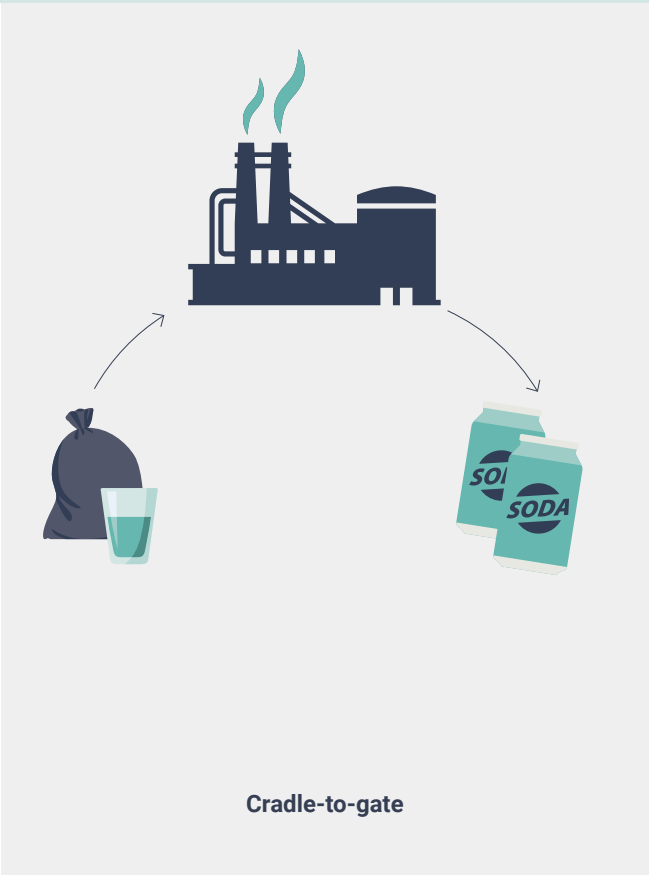
The next generation of reporting requirements emerging for building product manufacturers includes both direct emissions and the total "embodied carbon" emissions associated with each of your product types. Depending on the carbon intensity of your manufacturing processes, your supply chain emissions may be 10-15 times higher than your direct or operational emissions. Standard accounting for your company's Scope 1 and 2 GHG emissions does not include supply chain emissions; it is included as part of Scope 3 emissions (see more in Defining Emissions Types).

One way to calculate supply chain emissions is using embodied carbon reporting, which requires using Life Cycle Assessment (LCA), a scientific modeling method used to estimate the full environmental impacts of a product's life cycle. For many years, LCA was used by companies as an internal tool to guide product design and material selection. LCA data can now be verified by a third party and published externally in the form of standardized Environmental Product Declarations (EPDs). EPDs can be published for each distinctive product platform a manufacturer produces.

Looking Closer at Embodied Carbon

In the language of lifecycle assesment (LCA) data, the carbon emissions for which a product is responsible are known as cradle-to-grave Global Warming Potential (GWP), which represents all of the GHG emissions required to produce a product from raw materials extraction ("cradle" where material inputs are "born") through end-of-life ("grave"). The total GWP associated with the product's life cycle (expressed in the number of kilograms of emissions required to produce each unit of your product, or kg CO2e/unit) will increasingly be part of the calculus specifiers and procurement teams use to determine whether to use your product or a competitor's.

If your product is responsible for 20 kg/unit and your competitor can provide similar performance for only 10 kg/unit, you will increasingly be at a disadvantage in today's marketplace.



Cradle-to-gate

Of increasing interest is the specific part of the life cycle known as cradle-to-gate, which includes the life cycle stages of raw material extraction through manufacturing (signifying the "gate" of a loading dock where a product waits to be shipped to a job site). This upfront carbon can't be reduced over time, which means it is the most urgent opportunity for the building industry to help solve the global climate crisis. It is also the piece most directly owned by the manufacturer, providing more control compared to other stages.

As awareness grows that this specific, measurable part of the life cycle needs to be included as part of decision-making criteria, requests for this data will increase. We anticipate that the industry will increasingly use it alongside product performance data that has long been considered for materials like insulation and glass that impact a building's energy use and operational carbon emissions. Due to this focus, "embodied carbon" is often used as shorthand for cradle-to-gate embodied carbon.

Cradle-to-grave

Defining Emissions Types

GHG emissions are the main cause of global warming. To help businesses understand where their emissions are coming from, the Greenhouse Gas Protocol broke down emissions into the following three categories:

Scope 1

Direct Emissions: These are emissions directly in a company's control, including on-site burning of fuel for energy or heat, the creation of waste and fueling company vehicles and equipment.

Scope 2

Indirect Emissions from Purchased Energy: These emissions are generated from electricity, natural gas, HVAC, refrigeration, and other energy generated off-site for your consumption.

Scope 3

Indirect Emissions from Product Lifecycle: These are, according to GHG Protocol, "all indirect emissions (not included in Scope 2) that occur in the value chain of a reporting company, including both upstream and downstream emissions." This covers everything from the emissions produced for purchased parts and materials to emissions generated by a customer's use of a product or service.

Building Emissions

Similarly, building-related emissions can be broken down into categories to help determine the largest opportunities to drive decarbonization strategies:

Embodied carbon is defined as the GHG emissions generated by the manufacturing, transportation, installation, maintenance, and disposal of construction materials used in buildings. This total life-cycle is also called cradle-to-grave in Life Cycle Analysis (LCA).

Upfront embodied carbon (also known as upfront carbon) refers to the GHG emissions released before a building or infrastructure starts being used, which are largely from manufacturing and supply chain impacts.

Operational carbon refers to the use phase of a product or building.

It is good practice when using these terms to be clear about which part of a product or building's life cycle is being referenced.

Upfront Embodied Carbon
Manufacture, transport, and installation of construction materials

Operational Carbon
Building energy consumption

Why Does Embodied Carbon Matter to Manufacturers?

Important building product market influencers, including the American Institute of Architects (AIA), United States Green Building Council (USGBC), the US Federal Government, and state policymakers, have all identified the upfront embodied carbon of building products as a critical missing piece and near-term opportunity in their efforts to address climate change.

All this means that "Do you have EPDs?" is likely the first way you will see embodied carbon show up as a customer request. Here's more:

Industry Support

The AIA Architecture & Design Materials Pledge, signed by over 100 architecture firms and many general contractors and consultants, commits firms to "support climate health by preferring products that reduce carbon emissions and ultimately sequester more carbon than emitted."

AIA's Materials Pledge and USGBC's LEED v4.1 recommend starting low-carbon procurement by asking all manufacturers for product-specific EPDs for their products. Then, prioritize the highest-impact building materials when evaluating embodied carbon of a building. To do so, you need to be aware of whether your product falls into one of the key priority categories and what the recommended carbon impact caps are for each product type. The materials included in the LEED Pilot Credit for Procurement of Low Carbon Construction Materials are a good starting point.

Policy Efforts

The Inflation Reduction Act (IRA), passed in July of 2022, focuses on decarbonizing buildings by requiring low-carbon procurement for public infrastructure projects, including buildings.

The Act includes $250 million in funding to support the development and standardization of EPDs by providing grants and technical assistance to manufacturers to invest in transparency.

To start evaluating materials with a large impact in line with policy efforts, you can consult the State of California's first-of-its-kind Buy Clean legislation, which sets limits on embodied carbon of structural steel, rebar, flat glass, and mineral wool insulation. Since Buy Clean California passed in 2017 and as of 2023, six states have passed bills requiring low-carbon government procurement programs with other states introducing similar legislation.

ownersCAN

Another key initiative to be aware of is the Owners Carbon Action Network (ownersCAN), a group of building owners and lessees committed to substantial reductions in embodied carbon in all of their facilities and properties. ownersCAN, whose founding members include the General Services Administration (GSA), Microsoft, Salesforce, Meta, Kilroy, Skanska, and Hudson Pacific Properties, has published an Embodied Carbon Action Plan to guide their projects and educate their design and manufacturing partners on the need for embodied carbon action.

Companies like the ownersCAN members increasingly see the embodied carbon impact of their buildings as an important part of their mandatory ESG (Environment, Social, Governance) reporting to their investors. Many have already set and are tracking progress against goals for reducing the embodied carbon of building products they purchase. At the same time, the tools to make embodied carbon reductions a standard part of every design and construction project, such as Building Transparency's tallyLCA and Embodied Carbon in Construction Calculator (EC3), improve every day, driven by demand and investment by large design firms, design software companies and Bill Gates' Breakthrough Energy fund.

Manufacturers who do not have EPDs and cannot report progress in reducing their embodied carbon emissions may find that they struggle to participate in projects with these end-use customers and the AEC firms they partner with.

How Do Customers Expect Manufacturers To Act On Embodied Carbon?

Where to Start: Assessment and Reporting

Life Cycle Assessment

Companies have used LCA as an internal decision-making tool for many decades, but since the inclusion of Environmental Product Declarations (EPDs) in LEED v4 in 2013, publishing LCA data for products publicly has become the new normal in the building industry. Many larger companies now have LCA professionals on staff, but others outsource this work to consultants. Either way, an independent consultant will have to be paid to verify the final LCA to ensure that your LCA meets marketplace standards for LCA reporting. Verification is not as important if the LCA is only being used internally to make strategic decisions on reducing environmental impacts across your products' value chain.

Environmental Product Declarations

Suppose you wish to receive credit for your LCA work from customers and green standards in the marketplace, like LEED. In that case, you must have your LCA verified and work with an EPD Program Operator to create a standardized report on your life cycle assessment for each product type, known as an Environmental Product Declaration (EPD). The steps of this process, from LCA through EPD, are guided by several International Standards Organization (ISO) standards and rules that standardize reporting for each product type, called Product Category Rules (PCRs). The first step in converting your LCA into an EPD will be finding out whether there are existing Product Category Rules standardizing reporting requirements for your product types. If there is no PCR for your product type, you will need to work with an EPD program operator to create these rules.

Increasingly, decision-makers pull data from your products' EPDs into databases and programs that help them select lower embodied carbon products (remembering that in LCA language, carbon emissions are known as GWP, or Global Warming Potential). If you don't publish EPDs for your products, they may not be considered for selection on building projects measuring embodied carbon.

The Next Steps: Using LCA data

Know Your Hot Spots and Begin to Optimize

The green marketplace will expect leading manufacturers to show that they are taking action on their published LCA data results to reduce their impacts. The last section of an EPD always contains an interpretation of the data that notes which component materials and life cycle stages generate most of the product's negative environmental impacts. More sophisticated customers may even ask manufacturers what they have done to address the known carbon hot spots in their product category (see Architecture 2030's Carbon Smart Materials Palette for examples of how hot spots are being used in product selection).

Recent versions of the LEED green building standard allow manufacturers' products to contribute to an additional point in the Materials & Resources category (see EPD Option 2: Embodied Carbon/LCA Optimization) if they can demonstrate that their LCA impacts, especially embodied carbon (GWP), have decreased over time or even that the manufacturer has a signed Action Plan to reduce them in the near future.

Advanced: Public Commitment to Climate Leadership

For many years, large companies, including manufacturers, have been asked by customers to report on their GHGs using CDP and other reporting tools. As more and more companies require GHG reporting from their suppliers, industry leaders have moved beyond reporting. Companies that want to stand out from the crowd on climate now set Science Based Targets (SBTs), which invariably commit them to substantial near-term absolute reductions in GHGs emitted by their business. Most relevant to the topic of embodied carbon, receiving approval of an SBT by the Science Based Targets initiative (SBTi), requires companies to commit to reducing not only their Scope 1 & 2 but also their Scope 3 emissions (see more about emissions types in What Is Embodied Carbon?).

materialsCAN's commitment to Science Based Targets

As of March 2022, all materialsCAN member organizations from the global building industry have committed to set or already set a Science Based Target, or a GHG reduction target that will help keep global temperatures from rising above 1.5 degrees Celsius compared to pre-industrial levels. Science Based Targets include reductions in Scope 3 emissions, identifying the necessary reduction of embodied carbon of the materials they produce as manufacturers. Having all materialsCAN members commit to targets that are science-based should inspire others in the building industry to consider their own impacts, raise their ambition, and set a target that aligns with 1.5 degrees.

How to Reduce Embodied Carbon Emissions of Products

Getting Started: Who Do You Need On Board?

When considering reducing your products' embodied carbon, many people and departments in your organization will need to understand the basics of LCA. An effective way to get smart on LCA is the Certified Life Cycle Executive certification, developed by American Center for Life Cycle Assessment (ACLCA), which provides the fundamentals needed to interpret and communicate LCA results. For those looking for a more rigorous training course, ACLCA also offers a Life Cycle Assessment Certified Professional certification.

Some leading companies make LCA modeling a stage gate in the new product development process to ensure that product changes are not unintentionally increasing emissions or other impacts. R&D is another popular place to include an LCA expert to help calculate new materials' and process improvements' potential to decrease embodied carbon. Because so many emissions occur upstream from your facilities, you will also need support from your procurement team in setting expectations for emissions reductions with raw material and component suppliers.

Case Study: TK Elevator

As complicated mechanical and electrical systems, new elevator products are not quickly developed. TK Elevator developed the first EPDs for an elevator company from its existing portfolio of products in 2017. The EPD documentation and certification were done solely by the sustainability group. As a result of that learning, the company knew integrating product design with sustainability, supply chain and engineering was critical to success in lowering embodied carbon. For that reason, in its latest product development round, the sustainability team was considered an integral member of the design and development engineering. TK Elevator uses LCA practices and gives embodied carbon estimates and comparisons for every significant decision, whether related to material or supplier selection. The company has set a 15% embodied carbon reduction target in its latest product design.

Waste Reduction and Energy Efficiency: The Low Hanging Fruit

LCA provides the greatest value to a manufacturer when used to identify strategic opportunities to reduce the environmental impact of their operations and supply chain. These reductions can result in near-term cost reductions where waste is identified and eliminated in their own or a supplier's facilities. Raw material purchasing and energy use drive cost in manufacturing but typically also directly correlate with environmental impacts that show up in an LCA. For this reason, the lowest hanging fruit for reducing embodied carbon of products tends to be projects that reduce material and energy waste. These efficiency projects usually offer excellent short-term return on investment.

Dematerialization: Less is More

"Dematerialization" as a strategy reminds us that the lowest cost, lowest footprint raw material choice is simply to redesign the product to require less raw material per unit of production. Magnify the impact of this strategy by finding ways to reduce your use of the highest-impact raw materials in your product. This requires identifying the raw material hot spots in your supply chain where per-unit embodied carbon is the highest. These often turn out to be your most expensive material inputs as well, so overall savings can be substantial on dematerialization projects.

The Basics of Renewable Energy

Switching the energy used to run your manufacturing operations from fossil-fuel-based to renewable energy will always reduce your product's embodied carbon emissions. However, it will not necessarily be a considerable reduction.

Since electricity use typically has a lower footprint than gas or other thermal energy, it is seldom a hot spot for embodied carbon. However, processes driven by electric arc furnaces or similar will be exceptions to this rule. The more carbon intensive the fuel source for your baseline grid electricity (e.g., grids dominated by coal-fired power plants), the larger your potential reduction will be. Asking your utility about available renewable energy purchasing options in your area should be your first step.

Options will vary widely by region, but there is another option if your utility cannot provide cleaner energy. Renewable Energy Credits (RECs) are a financial instrument that allows companies to purchase credit for renewable electricity (including solar and wind power) generated elsewhere on your regional power grid. Make sure you are aware of the Product Category Rules for your product type regarding the inclusion of RECs in LCA modeling. For instance, companies whose REC purchases are not equivalent to 100% of their electricity use may not be able to count the purchase of RECs toward reducing the embodied carbon of their products.

See Taking The Next Steps for more renewable energy procurement strategies, including on-site renewables and Power Purchase Agreements.

Taking The Next Steps: Innovation to Address Hot Spots

Supplier Engagement and Hot Spots: The Carbon "Elephant in the Room" May Not Be in Your Own Facility

Many products made in very efficient factories still have very high embodied carbon. Why is that? This is because the hot spot for the product's carbon footprint is typically further upstream in the product's supply chain. This is often the case for products where the final manufacturing is an assembly process rather than an energy-intensive material transformation.

For example, mining, refining, and smelting aluminum ore to make aluminum consumes far more energy and emits far more carbon into the atmosphere than stamping the finished metal into a window frame. Products made with very simple, unrefined raw materials (e.g., sand that is melted to make glass) may have their hot spot further downstream or even in the factory where final assembly occurs. Complex products made from different raw materials may have multiple upstream hot spots to address (see Case Studies below for ways building product manufacturers addressed different hot spots).

All the basic strategies in the previous section will help you reduce your embodied carbon emissions. Still, these strategies will be even more impactful if implemented in your product's supply chain hot spots. If one of your key raw material or component suppliers has a carbon-intensive manufacturing process, there is an opportunity to work with your procurement team to look for ways to help them reduce their GHG emissions. Ideally, your suppliers can provide you with LCA data on the inputs they provide to you. This will improve data quality in your own product's LCA model and provide a baseline from which to track improvement over time as part of vendor negotiations. Sometimes improving the data suppliers provide will reflect well in your product's EPD, allowing you to start to account for reduction or success just through the data collection process.

Today, many digital platforms, like Manufacture 2030, can help your suppliers learn footprint-reduction strategies and even share successful approaches with other manufacturing companies.

Case Study: TK Elevator #2

TK Elevator published its first EPD in 2017 and its first LCA in 2010. As a sustainability-driven organization, the company focused on its operations, particularly its manufacturing. The manufacturer has a 12-acre facility in Tennessee where it makes all the elevators sold in North America. But when it did the LCA, TK Elevator learned that only 10% of its impact comes from manufacturing. Nearly 40% of its carbon emissions for product was from the supply chain, and the remaining 40% of the carbon footprint is operational carbon from the product's energy while in use. Learning this information changed the manufacturer's product strategy. It switched to engaging its supply chain and solely focused on energy in its product engineering. TK Elevator continues to innovate in its facility, but it is now more heavily invested in partnering with its supply chain and lowering its products' use phase energy requirements.

Designing Away Your Hot Spots: Exploring New Product Designs and Formulations

What if your suppliers of high footprint inputs are either unable or unwilling to take on reducing their emissions? What if doing so would increase your raw material costs too much? This is where educating your Product Designers and R&D team on LCA can pay dividends.

Your teams can explore whether your product can be re-designed or re-formulated to deliver performance with less of the highest-footprint inputs. This could take shape as a prioritized approach to dematerialization or a focus on using bio-based or recycled material to replace all or part of your hot spot input. Substituting recycled plastic or metal for their virgin counterparts is a classic example of this strategy, but it requires vetting LCA data, material performance, process compatibility, and supplier quality controls to avoid undesirable trade-offs. Ultimately, dramatic reductions in embodied carbon will require some manufacturing technology to be re-designed to accommodate new materials and for new raw materials for supply chains to be scaled up to make them cost competitive (see Advanced Strategies section for more).

Beyond RECs: Next Steps for Renewable Energy

When most people think of renewable energy use in manufacturing, they think of siting photovoltaic (PV) panels or even wind turbines at a factory. Generating a substantial amount of renewable electricity may require more space than you have available at your facility. While payback has dramatically improved for PV installations in particular, economics can still be disadvantageous in some areas. Off-site Power Purchase Agreements (PPAs), where a manufacturer agrees to help purchase all or a portion of the output of a renewable electricity development project on their grid, can address some of these issues but usually requires a long-term purchase agreement. PPAs (and now virtual or vPPAs) are becoming increasingly common and offer favorable economics in many areas. PPAs can help a manufacturer invest in renewables where it will have the highest impact.

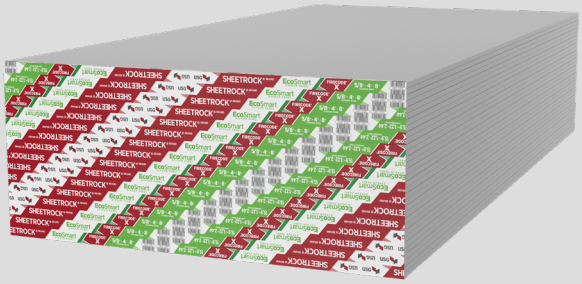
But what if most of your GHG emissions from your facility do not come from electricity use and instead come from thermal energy? Thermal energy traditionally comes from burning fossil fuels like natural gas. Insulation and efficiency technologies like Combined Heat and Power may help decrease fossil energy needs. Still, a growing number of financial instruments address the need for renewable thermal energy. Some landfills and other facilities that produce non-fossil methane now sell bio-gas certificates that mirror RECs for electricity and put renewable methane onto the gas grid in the name of the entity that owns the certificates. In regions where renewable gas is unavailable, switching gas-powered manufacturing processes to technologies that use electricity-based heat may be an easier path to 100% renewable energy.

It's worth nothing that while moving away from thermal energy is a huge opportunity for decarbonization, it is a decision that comes with large costs. If you're consdering the switch, we recommend finding grant opportunities, like those included in the IRA, to help.

As ever, if your embodied carbon hot spots are upstream of your manufacturing process, it may be that your time is best spent helping key suppliers convert their facilities to renewable energy.

Case Study: US Gypsum (USG)

Even mature products, such as Type X gypsum board, can be redesigned using fewer raw materials. In gypsum board production, lower board weight can mean less water is required to disperse the materials during production while also making it easier and safer to install on-site. This lower amount of water equates to lower energy requirements to evaporate this water and thus, a lower embodied carbon value.



Advanced Strategies: How to Make Progress Toward Carbon Negative Products

Given the growing threat of climate destabilization, leading manufacturers have begun to figure out how to make products in ways that remove heat-trapping gases from the atmosphere. Since LCA traditionally measures Global Warming Potential of products, the carbon emissions that end up in the atmosphere are reported as a positive number. But if carbon is actually removed from the atmosphere in a given life cycle stage, that would be counted as a "negative emission" and subtracted from the other GHG emissions a product's life cycle. Thus if an LCA shows that the removals outweigh the emissions for the portion of the life cycle defined, e.g.: cradle-to-gate, that product would be net "carbon negative."

If enough manufacturers made and managed their products in ways that stored atmospheric carbon in their products for the long term, we could become heroes of the climate crisis. But how do we get our products on this path to making them part of the solution to global warming?

The first step is essential because some stages of the product life cycle (e.g., transportation) will inevitably emit carbon into the atmosphere. But if we can reduce these carbon emissions to a bare minimum, there is a chance that the carbon stored in other portions of the supply chain can exceed them.

Carbon-storing materials currently come in two forms: bio-based or technology-based carbon capture. Bio-based materials still must be subjected to rigorous LCA to ensure they are truly carbon negative. Nevertheless, they represent the most significant near-term opportunity to store carbon in products since we have yet to economically scale up technologies for carbon capture. Bio-based waste streams that would otherwise be burned (releasing all the carbon they stored back into the atmosphere) or left to decompose (potentially releasing methane – a very potent greenhouse gas) are a near-term opportunity if they can be converted into manufacturing inputs.

Finally, if manufacturers truly aspire to store carbon in meaningful amounts, there must be capital investment in the supply chain and manufacturing technologies to make as many products as possible carbon negative.

Here are three steps to moving your products toward carbon negativity without the use of carbon offsets:

01.

Dramatically reduce the embodied carbon emissions from your supply chain and production.

02.

Identify where and how carbon-storing materials can be used in your products and scale up a supply chain for these materials.

03.

Invest in the manufacturing technology required to make your products with these carbon-storing materials.

Case Study: Kingspan

In December of 2022, Kingspan Insulated Panels North America announced new EPDs that provide the most detailed cradle-to-grave information to architects and building design professionals. The EPDs go a step deeper than most by providing more granular data about each specific manufacturing site, supplier-specific information associated with each site and product-specific thickness. The third-party certified EPDs result from 12 months of manufacturing data collected at plants in Modesto, California; DeLand, Florida; Caledon, Ontario; and Langley, British Columbia. All four plants manufacture QuadCore. For the commonly used 3" IMP thickness, the GWP figure for the product produced in Caledon is 2.59 KgCO2/ft2 representing a 35% reduction from the previous EPD level of 3.98 KgCO2/ft2.

This was achieved through a number of optimization steps. All Kingspan sites are powered by some percentage of direct renewable energy (both electricity and renewable natural gas), 60% of the electricity demand in Modesto is from on-site PV. A cornerstone of Kingspan's Zero Carbon manufacturing goal by 2030 is energy efficiency. The company has maintained a very low energy demand increase even as production volumes continue to rise significantly each year. One of the largest factors in this 35% reduction was supplier-specific data reflecting the sourcing of EAF steel vs. BAF steel.

Case Study: Interface

In 2020, global flooring manufacturer Interface introduced the first carbon negative commercial carpet tile, when measured cradle-to-gate. In addition to using carbon-storing materials in the backing, Interface spent decades reducing the embodied carbon emissions from its manufacturing process and supply chain, including dematerializing layers of the product, addressing the biggest hotspot (transitioning to 100% recycled nylon in carpet fiber), purchasing RECs and bio-gas credits for all factory energy use, and helping suppliers reduce the footprint of key components. Another key investment was in new tufting and backing line equipment that drives efficiency as well as provides ability to run new types of materials, including carbon-storing biobased inputs.

Communicating Progress

As building product manufacturers begin to invest in and make progress toward carbon reduction goals across their operations and specific to their product line, it's critical that they effectively communicate these efforts. This makes it easier for potential partners and customers to understand their progress and inform decision-making regarding product procurement and specification. Here are a few considerations for teams to keep in mind to avoid greenwashing:

Carbon Neutral Claims
Keep claims using offsets distinct from reductions in embodied carbon. Always clearly state the scope of the carbon neutral claim and verify the validity of the offsets used and the LCA calculation of the quantity of offsets that must be purchased to equal the carbon footprint. When offsetting, the gold standard is to offset emissions from the product's entire life cycle (e.g., cradle-to-grave), including any emissions from use and maintenance during a product's average expected lifespan. Ideally, products offered as carbon neutral internalize the price of offsets purchased (no additional cost to the customer) to create an incentive for the manufacturer to reduce the product's life cycle emissions; lower footprint products will cost less since fewer offsets must be purchased to make the product carbon neutral. The US Federal Trade Commission's Green Guides are scheduled to issue revised guidance on the use of "carbon neutral" and other green marketing claims in 2023.

Note: while a product whose EPD verifies a cradle-to-gate GWP of zero could also be called "carbon neutral without offsets," nearly all carbon neutral claims currently require purchasing offsets.

Renewable Energy
Be sure to distinguish renewable electricity from thermal energy (heat/direct combustion of fuels). The term renewable energy and any percentages reported should include both types of energy and clearly state the scope of the claim (e.g., manufacturing energy use). Renewable electricity in the form of Renewable Energy Credits or similar financial instruments for thermal energy (e.g., bio-gas certificates from a digester or landfill) must follow specific rules to be included as legitimate embodied carbon reduction strategies in LCA calculations.

Your Products Are Not Done
Communicate sustainability as an ongoing (and exciting) journey of innovation, not a seal of approval or destination you have already reached. As one building products company's CEO put it, "the companies that are for real [in sustainability] are the ones who talk about what is still to be done, not what they've already done." Make sure to share your challenges too; this can be a way to attract new innovation partners.

Use EPDs
Leverage EPDs to communicate carbon-related data for products and materials accurately. The use of EPDs to compare and select building materials will continue to grow over the coming years as support continues to grow from policymakers and A&D industry changemakers. These documents are a clear and transparent way of communicating progress-to-date and areas of focus for further improvements.

materialsCAN Partners all have 3rd Party Verified, publicly available EPDs and already set or committed to set a Science Based Target:

SAINT-GOBAIN · USG · SKANSKA · ASSA ABLOY Opening Solutions · Armstrong WORLD INDUSTRIES Inspiring Great Spaces · TKE · Gensler · Interface · Kingspan · Heidelberg Materials · materialsCAN Carbon Action Network · SUPERIOR ESSEX

Resources

The following resources provide additional insights and next steps into the strategies discussed in this guide. For any additional questions please visit buildingtransparency.org/programs/materialscan.

Additional Resources

Background:

- Overview of Embodied Carbon Opportunity
- What is Life Cycle Assessment (LCA)?
- How to create an EPD
- How to buy and use carbon offsets
- USGBC Credits for EPDs, Optimization for Low Carbon
- Greenhouse Gas Protocol FAQs

Toolkits for Stakeholders

- Embodied Carbon Toolkit for Architects
- Embodied Carbon Toolkit for Building Owners
- Climate Toolkit for Interior Design
- Embodied Carbon Policy Toolkit
- RMI: Roadmap to Reaching Zero Embodied Carbon

Tools for Materials Selection

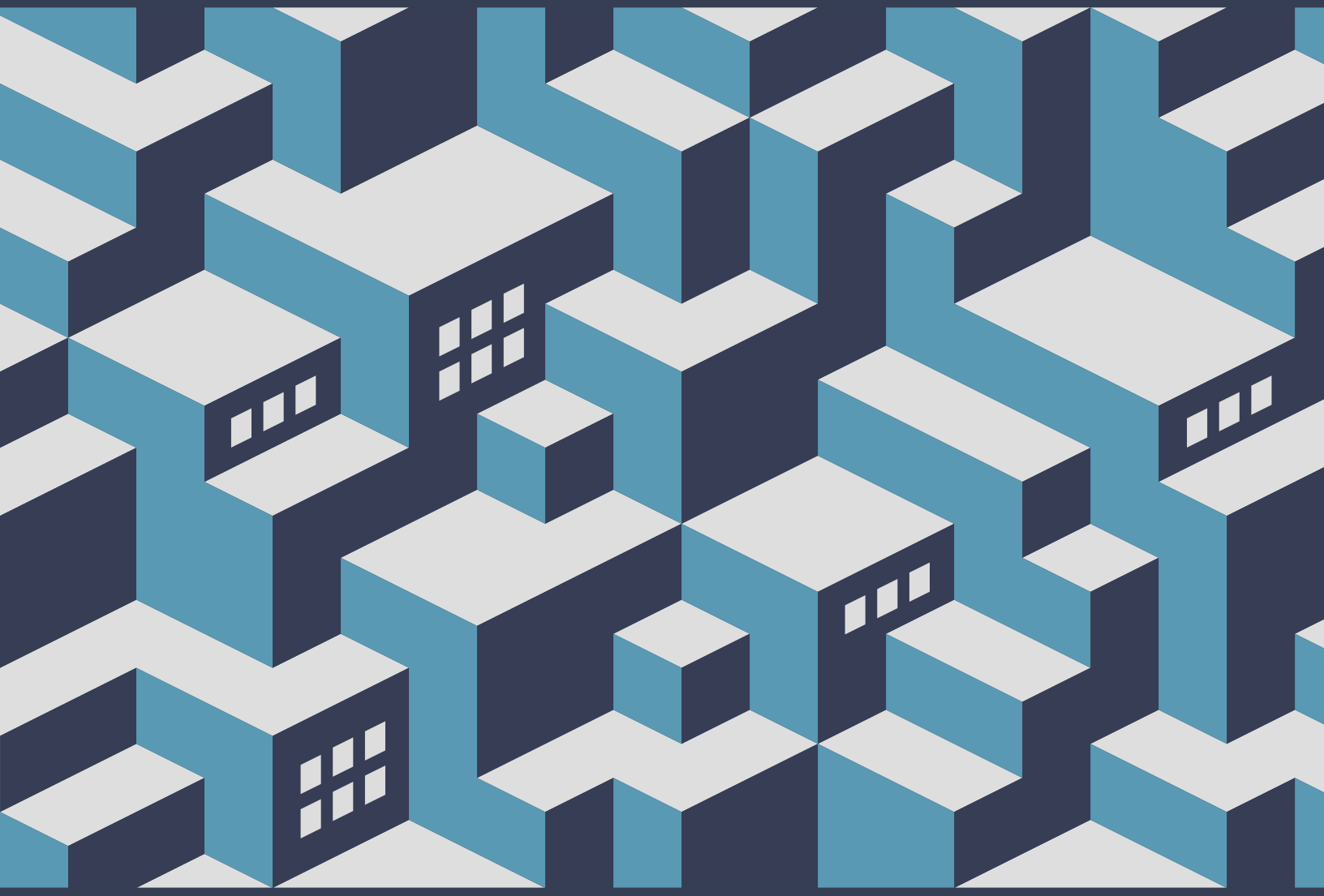
- EC3 Tool
- Manufacture 2030
- Carbon Smart Materials Palette

Reports on Trends

- US Federal Buy Clean program for Manufacturing
- Bringing Embodied Carbon Upfront Report
- RMI: Reducing Embodied Carbon in Buildings

Leadership

- National Strategy for US Leadership in Advanced Manufacturing



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