EPD 101 Embodied Carbon Accounting for Materials

Industrial policies that target the reduction of emissions from construction products, like "Buy Clean" policies, need data to track and set limits for the emissions of different products.

Environmental product declarations (EPDs) are standardized, third-party-verified documents that report the environmental impacts of a product based on a product *life cycle assessment (LCA)*. EPDs are the best available mechanism for requiring product embodied carbon reporting and transparency. This document provides an overview of EPDs in the context of policy.

EPDs are the right tool for product embodied carbon reporting in policies

Strategies for reducing the embodied carbon of a product can vary by material and facility. Asking the manufacturer to disclose the footprint of their product via an EPD is a first step to understanding whether or not a product is low carbon.

EPDs are like a mileage rating on a car: they summarize key data to help purchasers compare similar products. Instead of mileage per gallon, EPDs provide the environmental impact per unit of product. They are often also described as nutrition labels for building materials. EPDs can only be used to compare products within the same product category that have the same function.

Many EPDs exist across North America, but some areas have more available than others. To find EPDs, visit Building Transparency's EC3 database or visit the page of a *program operator*.

EPDs start with a product life cycle assessment

A product LCA is a method for quantifying the environmental impacts of a product over its life cycle. EPDs disclose the results of product LCAs. LCAs can also be done for buildings (read more on Building LCA here) or infrastructure projects (read more here).

Greenhouse gas emissions, including carbon dioxide, are added up over the product's life cycle and reported as *global warming potential (GWP).* EPDs also include other environmental impacts, such as acidification, eutrophication, ozone depletion, and smog formation.

Environmental impacts across a product's life cycle are broken into four main stages: Product stage (A1-A3), Construction stage (A4-A5), Use (B), and End-of-life (C), as described in Figure 1. At a minimum, cradle-to-gate emissions (A1-A3) are included in an EPD, which makes them well-suited to capture the benefits of manufacturing and supply chain decarbonization strategies.
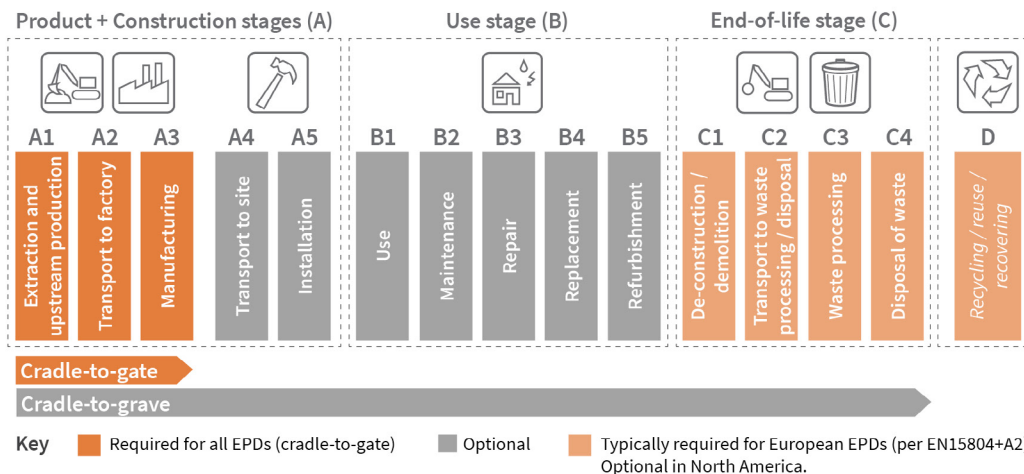
KEY TERMS

Embodied carbon

GHG emissions are generated by the manufacturing, transportation, installation, maintenance, and disposal of construction materials used in buildings, roads, and other infrastructure.

Life cycle assessment (LCA)

A systematic set of procedures for compiling and evaluating the inputs and outputs of materials and energy, and the associated environmental impacts directly attributable to a product or process throughout its life cycle.

Global warming potential (GWP)

The potential climate change impact of a product or process as measured by an LCA. GWP is reported in units of carbon dioxide equivalent (CO2e) and is the agreed-upon metric for tracking embodied carbon.

Figure 1. Life cycle stages typically included in North American EPDs. Module names are in accordance with ISO 21930. Product category rules (PCRs) dictate which life cycle stages are required, excluded, or optional.

Standards and accounting rules for EPDs

EPDs are third-party verified and based on international standards and agreed-upon rules for how each type of product calculates its footprint. The International Organization for Standardization (ISO) provides the global LCA standards followed in North America.

Each EPD must meet requirements from a family of standards:

- A North American **product category rule (PCR)**
- **ISO 21930** provides core requirements for EPDs of construction products and services and forms the basis for PCRs as the 'core PCR'. In Europe, EN 15804+A2 plays this role instead.
- **ISO 14025** defines Type III environmental claims and provides the framework for EPD creation.
- **ISO 14040** and **ISO 14044** are foundational standards that describe the principles and framework for LCA and lay out basic requirements for all types of LCAs.

ISO standards and PCRs are developed through an open stakeholder development process, where a technical committee comprising experts from industry, academia, NGOs, and government uses a consensus-based approach to create the scope and content of the standard. PCRs are typically updated every 3-5 years, and ISO standards are updated based on industry needs (there is no set interval).

The development of a product category rule is led by a **program operator**. Examples in North America include NSF International, UL Environment, and Smart EPD.

A PCR can include critical requirements for ensuring data quality and comparability, such as:

- Which life cycle stages and impact categories must be included?
- Which background data can be used?
- Which facilities need to contribute primary data?

Figure 2. Process and stakeholders for PCR development (adapted from ISO 14025:2006).

Types of EPDs

The most common type of EPDs are those created by a single manufacturer (often called a "**product EPD**" or "product-specific EPD," though this term is used differently in different cases), which report impacts for a narrow range of one manufacturer's products.

Product EPDs can be further classified into "**facility-specific EPDs**" (those that report impacts based on data from a single facility) vs. "manufacturer-average EPDs" (those that report impacts based on averaged data from a manufacturer's multiple facilities).

EPDs may be additionally classified based on the extent of specific data they use from upstream suppliers (i.e., "supply-chain-specific data"). The ACLCA's forthcoming addendum on EPD types and data specificity aims to provide definitions and clarity around these terms.

In contrast, **industry-average EPDs** report the impacts of a type of product based on data aggregated from a sample of manufacturers, often published via a manufacturing trade association. These EPDs cannot be used for complying with a policy, because they do not disclose the impacts of an individual manufacturer. However, the data is useful for understanding the industry average, such as in the context of setting policy requirements at the industry average.

How is an EPD created?

The standards and data all come together during the EPD creation process. EPDs are created by manufacturers. The creation process can be led internally if qualified staff are available, outsourced to an external LCA consultant, and/or supported through the use of EPD generator tools that aim to streamline and simplify this process.

These are the general steps manufacturers must take to create an EPD[1,2]:

- **Step 1 – Manufacturer Data Collection:** Manufacturers must collect data on the quantity and type of materials, energy, and processes used to create the product. Which data is required to be collected varies by the product and what is required by the product category rule (PCR).

- **Step 2 – Product LCA:** Complete an LCA of the product in compliance with the PCR, ISO 14025, and ISO 21930 (as described on the previous page). Where data from the manufacturer is not available or is not required by the PCR, generic or average data sources can be used.

- **Step 3 – Background report:** The background report is a non-public report that accompanies the public EPD and provides further details about the LCA methodology, assumptions, approach, and standards compliance to support the third-party verification review process. This report may include proprietary information, which is why the EPD summarizes the results of the full LCA but does not include the full background report.

- **Step 4 – 3rd party verification:** Every EPD needs to be reviewed by an independent third-party verifier before it can be published. Verifiers are typically experienced LCA professionals approved by the program operator. The verifier checks that the LCA background report adheres to international LCA standards and PCRs.

- **Step 5 – Publication:** Once the EPD has been verified, the manufacturer can submit the EPD document for publication to the program operator, who will process, register, and publish the EPD. Additionally, the EPD can be submitted to a database like EC3.

After publication, EPDs are typically valid for five years from the date of issue. All EPDs state the date of issue and period of validity.

Opportunities to improve data quality and alignment

EPDs use data from a combination of facility data specific to the manufacturer (like facility fuel use, water consumed, or waste generated) and generic or average data sources (like emissions factors for fuel). EPDs will continue to improve over time as the data quality requirements set in standards (and data collection tools) improve, and more robust public data is made available.

Updating PCRs – the rules for how to make EPDs – is the quickest lever for strengthening EPDs as a policy mechanism. As PCRs are updated, they can integrate data quality best practices, create more clarity and transparency around requirements, and increase consistency within and across different product categories. It is important to weigh data specificity requirements against the added time and administrative burden on manufacturers.
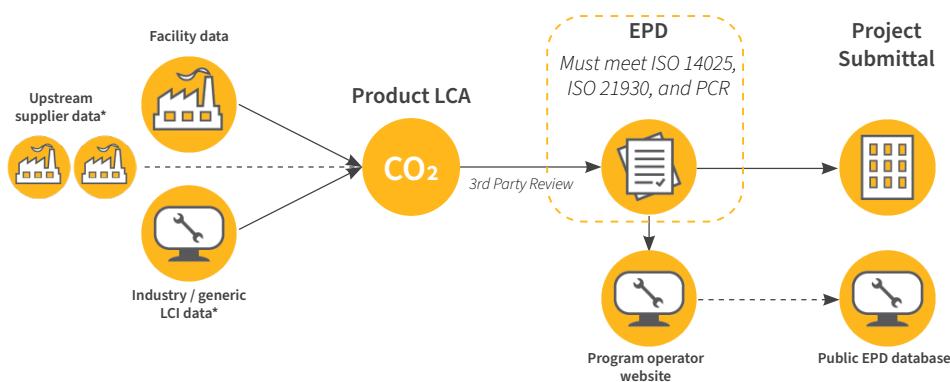
Figure 3.   Flow of data to create an EPD. (*) indicates areas where specificity and other minimum data requirements are set by the Product Category Rule. Dashed lines indicate that something is optional. Policies can also add requirements.

Beyond Environmental Impacts: Additional Reporting in EPDs

In addition to environmental impact data, EPDs may also include the location of manufacturing facilities as well as supplementary information about the products or manufacturers that are also of interest to agencies in achieving environmental or social goals.

For example, Washington state requested that manufacturers provide information on working conditions for the facility represented in the EPD and chain of custody data related to the forestry sourcing for engineered wood as part of the Buy Clean Buy Fair pilot study. Buy Clean Buy Fair Minnesota will also include an assessment of employee working conditions at the product's production facilities as part of the pilot study included in the bill.

Guidance on Policy Requirements for EPDs

EPDs are standardized, third-party-verified documents that report the environmental impacts of a product based on a product life cycle assessment. EPDs are the best available tool for requiring reporting of embodied carbon in policies.

EPD checklist: Minimum requirements
☑ Conforms to international standards (ISO 14025 and ISO 21930) and the applicable product category rule (PCR)
☑ Has a **validity date** that is not expired
☑ Is **product-specific**

EPD checklist: Best practices
☑ Is **facility-specific**
☑ Reports the **% of supply chain-specific data** used in the LCA
☑ Reports **a data uncertainty range**

Policies that do require embodied carbon disclosure should require valid, product-specific (or facility-specific) EPDs that meet the requirements of ISO 14025, ISO 21930, and the applicable PCR.

Requiring best practice reporting — in addition to the minimum requirements — can help guide future alignment and improvements to standards that guide EPD development.

When possible, government agencies are encouraged to participate in PCRs where they can represent the needs of end-users of EPDs. PCR committees are hosted by the program operator, so applications to join a committee are typically found on their websites.

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Embodied Carbon Policy Factsheet

Read more: carbonleadershipforum.org/clf-policy-toolkit