EPD Basics: A Manufacturer's Guide to How and Why to Develop an Environmental Product Declaration

Have you been asked about your construction product's environmental impact or embodied carbon? An environmental product declaration is the industry-standard way to disclose those impacts—and developing one may be easier and more beneficial than you might think. This guide explains what an EPD is, why you as a manufacturer would want to develop one, and how to do so.

An EPD discloses a product's key impacts on the environment (including the greenhouse gas emissions resulting from its manufacturing) and informs building product selection by designers and owners. Construction material manufacturers are seeing a growing trend of requests for EPDs from their customers. This trend is driven by increased customer awareness of the impacts of embodied carbon associated with manufacturing construction materials and products, leading to the development of procurement incentives, preferences, laws, requirements, and policies in both the public and private sectors aimed at reducing embodied carbon.

Why Develop an EPD?

- Respond to customer demand and meet growing public and private sector requirements.

1. Gain a competitive advantage by differentiating your product.
2. Understand the environmental impacts of your products and identify opportunities to reduce those impacts to improve sustainability and competitiveness—often while saving money.

The EPD Development Journey

Whether you need to meet bid requirements for high-value construction projects, comply with "buy clean" policies, or enhance customer trust, the EPD development process is the same. This document will guide you through the process so you can reap the market benefits of having an EPD.

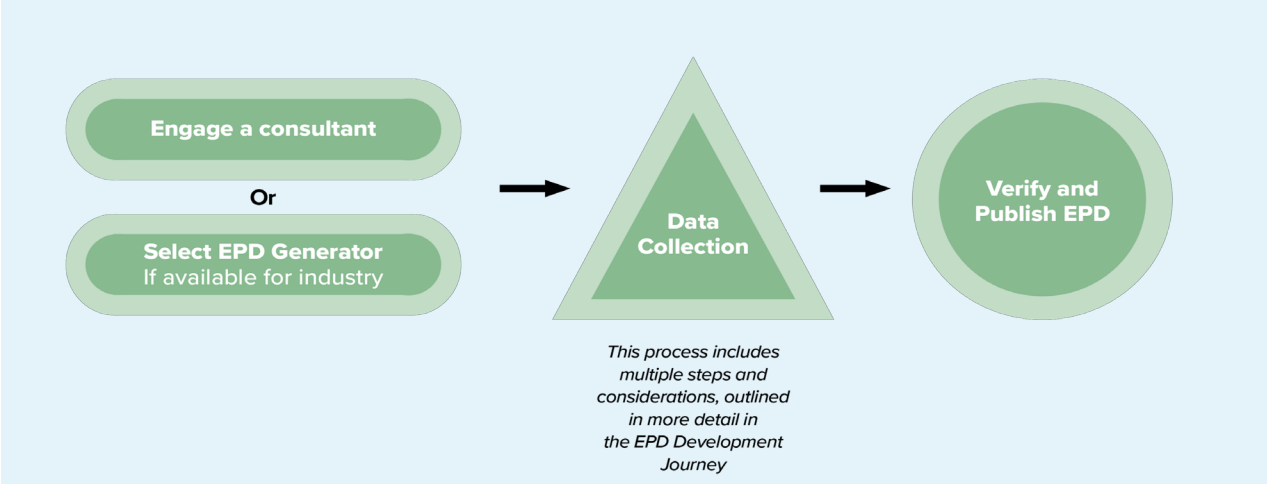

Figure 1: Manufacturer EPD Process Development. Visit the U.S. Environmental Protection Agency's embodied carbon website for more information.

Terms Used in This Guide

- **Background data:** Data contained within the process(es) supporting the foreground system. Background data constitutes the "background system" in a product system.
- **Cradle-to-gate EPD:** A type of EPD that includes data from the production stage of a product's life cycle, which covers the following: upstream extraction and processing of raw materials (information module A1), transport of raw materials to the factory (A2) and manufacturing (A3).
- **Cradle-to-grave EPD:** A type of EPD that includes data from the following life cycle stages: the production stage (information modules A1 to A3) and all the information modules from the construction stage (A4 to A5), use stage (B1 to B7 and end-of-life stage (C1 to C4).
- **Declared unit:** Quantity of a construction material used as a reference unit in an EPD based on an LCA for the expression of environmental information needed in information modules.
- **Embodied carbon:** Synonymous with embodied greenhouse gas emissions. Refers to collective greenhouse gas emissions associated with upstream—extraction, production, transport and manufacturing—stages of a product's life. (Inflation Reduction Act Section 60112 also directs EPA to consider the use and disposal stages of materials and products, where relevant).
- **Environmental product declaration (EPD):** An environmental claim providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information. An EPD also includes additional product and company information.
- **Foreground data:** Data contained within the process(es) a manufacturer is modeling for its product system. Foreground data constitutes the "foreground system" in a product system.
- **Functional unit:** The unit of comparison that assures that the products being compared provide an equivalent level of function or service.
- **Global Warming Potential (GWP):** The term "GWP" is used in EPDs, PCRs and buy clean policies for construction products as an impact category to report on embodied GHG emissions (per ISO 21930:2017, Section 7.3, Table 5). In the ISO context, "GWP" is conveyed in CO_2e/unit of product/material to denote the product-level GHG emission intensities. We note this usage is inconsistent with how "GWP" is defined by the Intergovernmental Panel on Climate Change (IPCC) and in other GHG accounting efforts, including national reporting by Parties to the Paris Agreement. Per IPCC, GWP is an index measuring the radiative forcing following an emission of a unit mass of a given substance, accumulated over a chosen time horizon, relative to that of the reference substance, carbon dioxide (CO_2). For more information on the definition and use of the term "GWP," (Global Warming Potential), please visit https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.
- **Life cycle assessment (LCA):** The compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle.
- **Primary data:** Data determined by direct measurement, estimation or calculation based on specific original source measurements for the system under investigation.
- **Product category rules (PCRs):** A set of specific rules, requirements and guidelines for developing EPDs for one or more product categories.
- **Program operator (PO):** The body or bodies that conduct an EPD program. A program operator can be a company or group of companies, industrial sector or trade association, public authority or agency, or independent scientific body or other organization. Program operators are typically the organizations that develop PCRs.

- **Secondary data:** Data indirectly determined through measurement, estimation or calculation and not based on specific original source measurements. This can include data that is originally developed using primary data sources but is further aggregated to represent average processes or products.

What Is an EPD?

An EPD is a document that discloses a product's environmental impacts, such as greenhouse gas emissions associated with the production of the product.[1] The purpose of an EPD is to enable standardized comparisons between products fulfilling the same function without revealing confidential business information or trade secrets about those products. An EPD must receive third-party verification so users can have confidence in its information. To better understand the environmental impacts of building and construction projects, public agencies, as well as large companies, and projects pursuing green building certification through systems like the U.S. Green Building Council's LEED rating system, are increasingly requiring EPDs for construction materials and products that they purchase.

EPDs are created using product category rules, which are developed by consensus-run committees of stakeholders and industry experts. A PCR provides guidance on how EPDs within a product category need to be developed. An equally important part of the process of creating an EPD is the life cycle assessment, which is the basis for the environmental impact information disclosed by the EPD. For more information, refer to "The EPD Development Journey" below.

What Are the Benefits of Making EPDs for Products?

1. Respond to customer demand and meet public and private sector requirements.

- The Inflation Reduction Act of 2022 provided the U.S. General Services Administration and the Federal Highway Administration[2] with significant funding ($2.15 billion and $2 billion, respectively) to purchase materials and products with substantially lower embodied carbon. This enabled those agencies to develop programs to prioritize and procure low embodied carbon construction materials and products rather than relying on a conventional low-bid procurement framework. GSA requires contractors to submit EPDs for construction products and materials they purchase to help quantify the embodied carbon associated with federal construction projects. FHWA provides grants to federal, state and local agencies to purchase low embodied carbon transportation materials through programs that require contractors to provide EPDs. EPDs are also required for participation in EPA's Label Program for Low Embodied Carbon Construction Materials.
- Federal and state agencies have adopted buy clean policies and initiatives to reduce the embodied carbon of construction materials and products purchased for government projects. Other initiatives related to embodied carbon include deconstruction and reuse policies, zoning and incentive programs, and climate action plans. Many buy clean policies and other embodied

[1] EPDs are also required to report other environmental impacts including acidification, eutrophication, ozone depletion and smog formation.

[2] FHWA is granting and distributing these funds to state-level departments of transportation and other agencies through its Low-Carbon Transportation Materials Grants Program to fund low-carbon material procurement programs throughout the United States.

carbon programs require suppliers to provide EPDs for participation. See the Carbon Leadership Forum's policy map, which tracks embodied carbon policies and programs, for more information.

- Increasingly, private companies are requiring manufacturers to provide EPDs for construction products and materials used for structure, building enclosure, interior finishes, mechanical, electric and plumbing components, and/or exterior hardscape. This requirement increases transparency in environmental impact reporting and helps companies track and reduce the embodied carbon of construction projects.
- Many voluntary green building and certification programs, such as the U.S. Green Building Council's LEED rating system, have encouraged the use of EPDs for years. Manufacturers that have supported green building certification programs are now viewed as market leaders due to their early development of EPDs.
- National building codes such as International Code Council's (ICC's) International Green Construction Code (IgCC) include language on the submission of EPDs. The IgCC sets a minimum requirement for green construction, applicable to new and existing building activities, that has been adopted by several federal agencies (including GSA and the U.S. Department of Defense) and many states including Arizona, Colorado, Florida, Idaho, Maryland, Rhode Island, Oregon and the District of Columbia.

2. Gain market advantage by differentiating your product.

- Designers and contractors seek to purchase products from manufacturers that are transparent about their environmental impacts. Publishing an EPD differentiates manufacturers from their competition and illustrates a commitment to product transparency, sustainability and environmental performance.
- A published EPD signals to the market that a manufacturer is a leader and is agile in meeting new market demands. Transparency and disclosure build trust with potential purchasers.
- In federal projects, where bidders must provide EPDs, an EPD may illustrate that a product exceeds the minimum environmental requirements.
- Upstream suppliers that are not directly subject to low embodied carbon procurement policies can create value for end-product manufacturers by developing EPDs that provide supply-chain-specific data and show reduced environmental impacts relative to industry averages or competitors.
- Many private and public companies, along with public agencies, report their annual GHG emissions through publication of a GHG inventory report. Typically, these reports include Scope 1 and Scope 2 emissions, and market leaders are increasingly reporting Scope 3 emissions. By providing customers with an EPD, you are giving them an easy way to report on their Scope 3 emissions that stem from your products—something that your competitors may not be able to d

3. Understand the environmental impacts of your products and identify opportunities to reduce those impacts to improve sustainability and competitiveness — often while saving money.

- Conducting an LCA gives manufacturers an understanding of the environmental impacts of a product and the manufacturing process. This insight can help identify areas where higher-intensity manufacturing processes or product ingredients can be reduced.
- Once environmental impacts are quantified in a consistent framework, manufacturers can compare their impacts to equivalent products on the market by reviewing industry benchmarks, industry-average EPDs and competitors' EPDs.
- Manufacturers can then make informed decisions and take actions to reduce their products' environmental impacts by working with their supply chains and improving the manufacturing process. These actions can also reduce operational costs.

EPD Relationship to GHG Accounting

GHG reporting under the GHG Protocol designates three scopes of emissions that relate to GHG reporting in EPDs:

- **Scope 1 emissions:** The direct emissions from the organization that owns or controls the emitting source. Examples include emissions from a fleet of vehicles a manufacturer owns and emissions directly from on-site boilers. In an EPD, this category is associated with the direct emissions from the manufacturer producing the product the EPD represents.
- **Scope 2 emissions:** The indirect emissions from the generation of purchased or acquired electricity, steam, heat or cooling consumed by the reporting entity. In an EPD, this category is associated with the generation of electricity, steam, heat or cooling used by the manufacturer directly producing the product the EPD represents.
- **Scope 3 emissions:** These are indirect emissions that occur due to an organization's activities, but are not under direct ownership or control by the organization. The GHG Protocol defines 15 categories of Scope 3 emissions, which cover both upstream and downstream processes. Example Scope 3 categories include purchased goods and services and capital goods. When you provide your EPD to a customer, you are helping them improve the supply chain specificity of their Scope 3 emissions.

See https://www.epa.gov/climateleadership/scopes-1-2-and-3-emissions-inventorying-and-guidance for more information on GHG emissions accounting.

Next Steps

1. Get started now.

- Educate and prepare your team: EPD development can take two to 12 months.
- Start collecting the information needed for the life cycle assessment, including 12 months of manufacturing data.

2. Use tools and resources.

- EPA offers resources to support manufacturers in developing EPDs.
- A variety of industry associations and other entities are receiving EPA grant funding to develop tools and resources to support manufacturers in creating EPDs. Many of these offerings will be available beginning in 2025.
- Learn more about EPA's Label Program for Low Embodied Carbon Construction Materials and related initiatives.
- Additional resources from EPA's federal government partners and other organizations are also available to reduce the cost and streamline the process of creating EPDs.

3. Explore LCA practitioner and EPD generator software options.

- Reach out to organizations that help manufacturers create EPDs, like EPD program operators and LCA practitioners. Talk with LCA practitioners to see who can meet your product's EPD needs and to compare timelines and costs. In some industries, EPD software tools can streamline the process and reduce the cost of EPD development.

The EPD Development Journey

A third-party verified EPD is the public-facing end result of a process that includes data gathering, LCA, adhering to PCRs and global EPD standards, and independent verification. Product manufacturers can create EPDs, but it is most common that an LCA practitioner or consultant with specialized knowledge and training is engaged to create the LCA and corresponding EPD.

The timeline for EPD development typically spans two to 12 months, depending on available data and the technical experience of the person conducting the assessment. This timeline can be shorter in industries where EPD software tools are available.

Let's understand what steps need to be taken to efficiently create an EPD.

1. Identify the relevant PCR for your product
2. Create an LCA
    a. Collect data
    b. Consider leveraging an EPD generator tool
3. Compile the EPD
4. Verify and publish the EPD
        a. Engage a program operator
        b. Respond to program operator feedback
        c. Publish the EPD

1. Identify the relevant PCR for your product. Once you've identified the product or material that you'd like to develop an EPD for, select the valid PCR that covers your product. The PCR will provide guidance on how the LCA should be conducted and the information needed to develop an EPD. Details of each PCR can vary, and LCA practitioners, industry associations, program operators and others can help you navigate the process of choosing the appropriate PCR. Contact your industry's trade association or consult the ACLCA's PCR search tool linked above for tips on identifying the correct PCR.

If there isn't yet a stand-alone PCR for your building product or material, you can use ISO 21930, *Sustainability in Buildings and Civil Engineering Works—Core Rules for Environmental Product Declarations of Construction Products and Services,* as the core PCR. This standard outlines the minimum rules that *all* EPDs for construction products should follow, and it is sometimes used as the core PCR for building products. However, it's important to note that some procurement policies specify the allowable PCRs and do not permit the use of ISO 21930 as a core PCR.

PCRs are developed by consensus-run committees of stakeholders and industry experts, assembled by a program operator. A PCR provides guidance on how EPDs within a product category need to be developed. It prescribes system boundaries, the declared or functional unit to be used, how to define each life cycle stage of a product, and which impact categories need to be assessed. See Figure 2 for the various system boundaries and life cycle stages of a product. For example, one existing PCR for asphalt mixtures defines the system boundary as the cradle-to-gate life cycle stages and allows two declared units: one metric ton of product and one short ton of product. Reporting consistent units allows users and customers to compare one product to another if the products are using the same PCR. Note that some PCRs have additional comparability requirements that must be followed.

Your LCA practitioner, trade association or program operator can help determine if you are using an appropriate PCR by answering the following questions:

- Will the PCR expire before your EPD is published?
- Did a trusted program operator publish the PCR? Does the program operator have appropriate experience doing this type of work?
- Is the product category clearly defined, or could any product use it?
- Were several manufacturers from the industry and other relevant parties such as purchasers and the design community involved during development?
- Did an independent panel of at least three members review it before publication?
- Do purchasers and specifiers currently reference it?
- Does it align with EPA's PCR Criteria?

If you need more help determining the appropriateness of a PCR for your product, you can contact EPA for technical assistance.

If a PCR has not been developed for your product, check out the EPA EPD Assistance Grant project summaries—many of them include development of new PCRs. Additionally, you can contact EPA directly to request technical support related to PCR development. Another helpful resource is EPA's PCR Criteria, which outlines requirements for PCRs that would like to be eligible for use as part of EPA's Low Embodied Carbon Label Program.

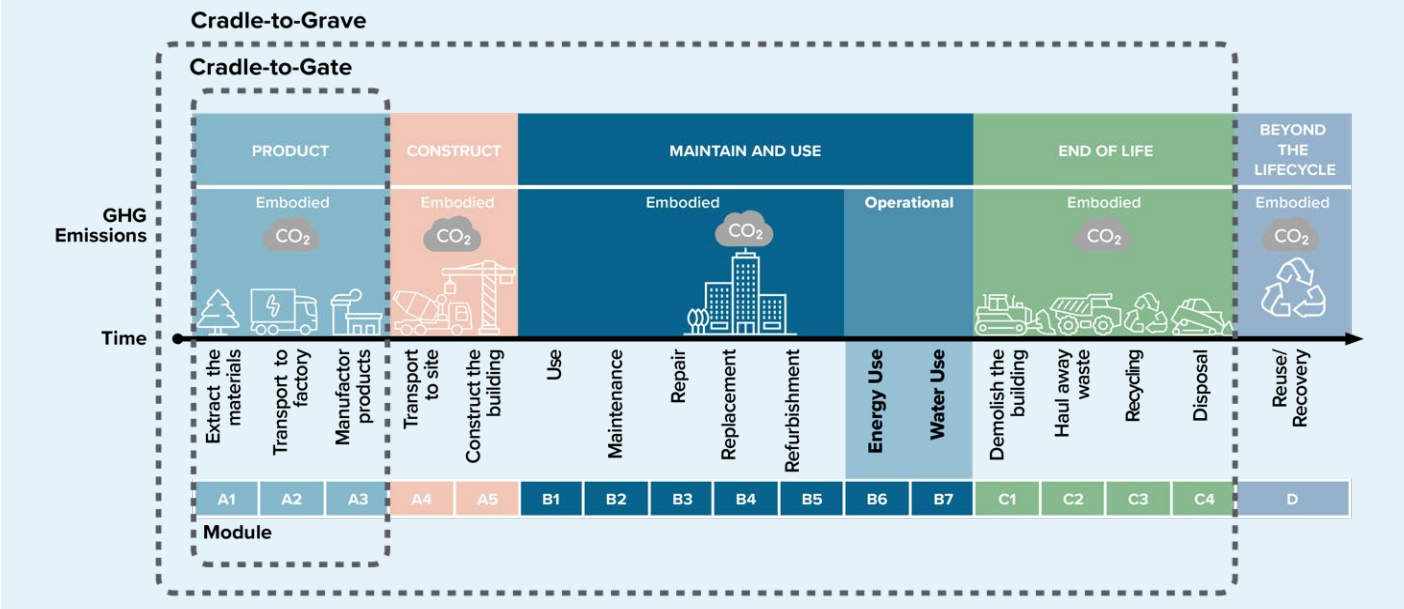

Figure 2: Life Cycle Stages and Corresponding Information Modules for Construction Materials and Products

2. Create an LCA. Now that the right PCR has been chosen, what's next? An LCA needs to be undertaken, and that process starts with data collection. The LCA practitioner or EPD generator software will inform you of the specific data needed. Since that data is often particular to your manufacturing process and embedded in internal systems, you'll need to work with different teams across the company (such as accounting, operations and procurement) to collect it. The PCR will outline what data should be collected and what life cycle stages (such as cradle-to-gate or cradle-to-grave) need to be reported in the LCA and EPD. See Figure 2 for the life cycle stages.

Data needed for the LCA is pulled from many sources within a company—e.g., utility bills from accounting, manufacturing material data from operations from each plant, supplier quantity and transport information from procurement. This is not a direct external financial cost, but a staff member needs dedicated time to collect such data. Data collection might span one to six months due to time needed to find, collect and review the data, which is often an iterative process. This process can be significantly shorter for industries with automated EPD development software tools and established data collection protocols.

The LCA practitioner may request the following information from you as the manufacturer to conduct the LCA:

- Raw materials (A1)
  - Bill of materials and quantities
  - EPDs for the raw materials used (if available)
- Transportation of raw materials to production facility (A2)
  - Mode of transportation
  - Distance from the upstream manufacturer
- Manufacturing (A3)
  - Facility location
  - Total production from the facility
  - Total units of the product made over a 12-month period
  - Energy use—electricity, natural gas, etc.
  - Water consumption
  - Waste generated
  - Direct air emissions and water discharges
- Distribution (if needed per PCR) (A4)
  - Shipping method
  - Shipping destination
- Installation (if needed per PCR) (A5)
  - Equipment use during installation
  - Additional products used during installation
  - Disposal of packaging and excess product waste
- Use (if needed per PCR) (B1 to B7)
  - Examples of products in use
  - Energy consumption during typical product use
  - Electricity mix based on sales
  - Reference service life
  - Maintenance, rehabilitation and replacement cycles
- End of Life (if needed per PCR) (C1 to C4)
  - Typical disposition at end-of-life (landfill, recycling, incineration, etc.)
  - Recycling and waste processing data

In most cases, 12 months of data will be collected from two essential sources: the manufacturing facility and the supply chain. In the best-case scenario, you as the manufacturer will have all the manufacturing facility data for manufacturing, distribution, use and product disposal or end-of-life. Your suppliers will provide detailed supply-chain information about the raw materials and transportation of those raw materials to the production facility. As much of this information as possible should be manufacturer-specific foreground data. However, if foreground data is unavailable and as allowed by the PCR, the LCA practitioner can fill in some gaps with generalized background data (data outside the manufacturer's direct control).

LCA software is then used to create the LCA. While many policies aimed at addressing embodied carbon of construction materials primarily look for a product's embodied carbon, the LCA results also report other environmental impact categories, such as ozone depletion, acidification and eutrophication, as well as resource consumption data such as energy and water use. This information is valuable feedback for understanding the full breadth of your product's environmental impacts.

3. Compile the EPD. With the LCA complete, the hardest work is behind you, since the EPD is created using information from the LCA.

The cost of compiling an EPD depends on a variety of factors, such as whether the bulk of the work is conducted in-house, whether an industry-related EPD generator tool is available, the complexity of the manufacturing process, the availability of background data for product ingredients, and how much support you need to collect data and conduct an LCA. If you engage a consultant to support you in this process, find one who has worked in your industry and/or has a history of successful LCA work to ensure quality.

If your industry has created a software tool that generates EPDs, it may make developing an EPD faster and more cost-efficient. EPD generator tools can streamline LCA development and often have pre-determined data input templates. This can reduce EPD development time to weeks instead of months. Some industries, such as ready-mix concrete, asphalt mixtures and aggregates, have such tools; others plan to develop them soon.

4. Verify and publish the EPD. Finally, you need to contract with a program operator for EPD third-party verification. EPDs must be third-party verified through a reputable program operator that operates their program according to ISO 14025. There are several reputable program operators working in North America (many of which can be found in directories like the ACLCA PCR Directory). An LCA practitioner or consultant will be able to provide guidance on how to engage a program operator.

The program operator sends the draft EPD to an independent reviewer to verify its conformity with the PCR. The reviewer then submits any relevant feedback to ensure the EPD meets the PCR requirements. Once finalized, the EPD is typically released through the program operator's EPD database and/or the manufacturer's website. Verification usually takes one to two months.

EPDs are typically valid for five years. At the four-year mark, manufacturers should start the EPD generation process again. In the meantime, you can use LCA results to evaluate how to improve your product and manufacturing process to reduce embodied carbon, as well as other environmental impacts. You may need to revise your EPD before the expiration date if there is a significant change to

your manufacturing process, product formulation or other factors that affect EPD results. Check with an LCA consultant or program operator for further guidance.

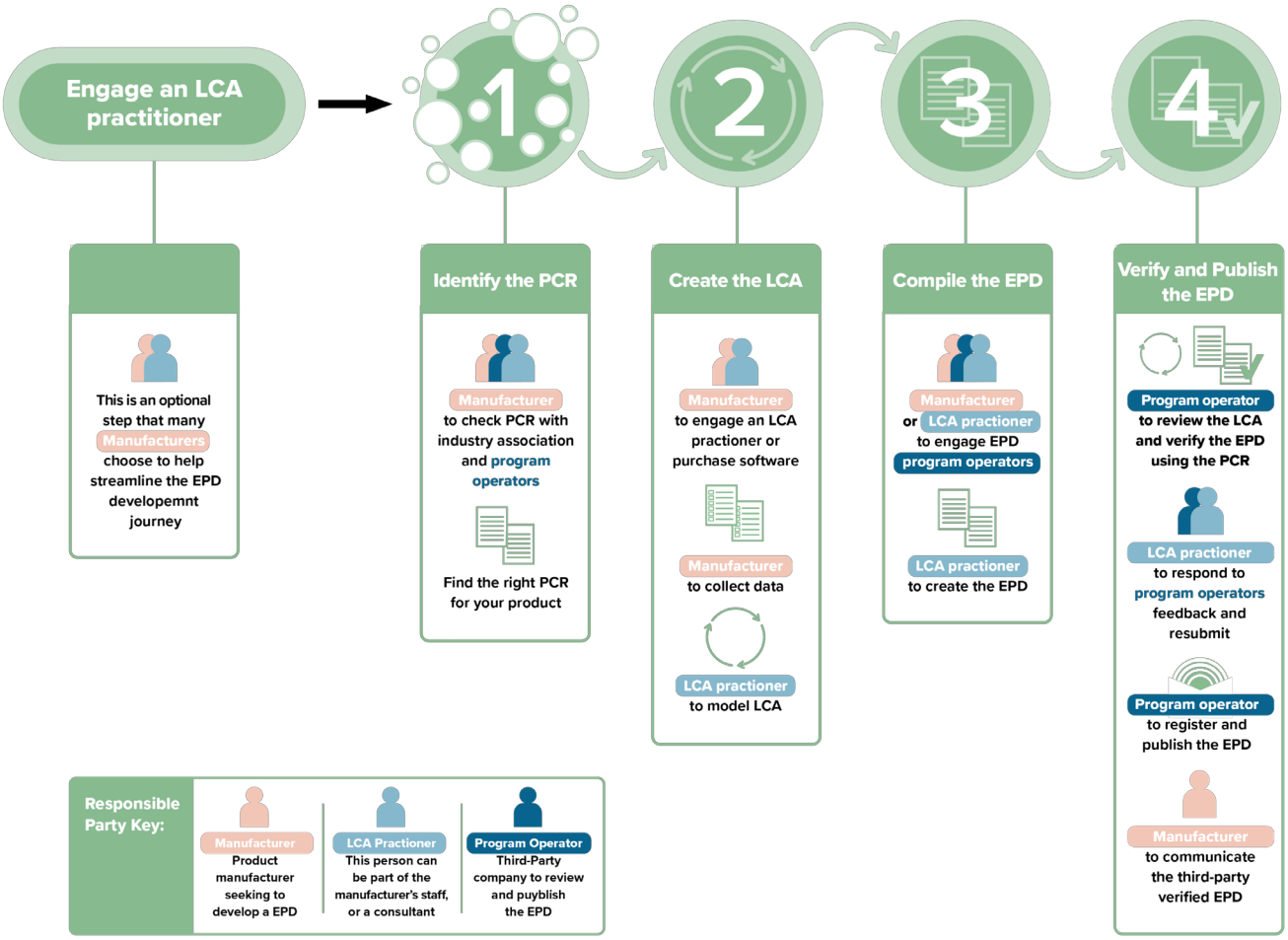

Figure 3: Key steps to develop an EPD and the responsible parties involved. These steps can be streamlined for industries with automated EPD generator software tools.

By disclosing your product's environmental impacts, you are differentiating your product in the market and growing your customer base to serve emerging public and private sector requirements.

To start your own EPD development journey, contact your industry association, an LCA practitioner, a program operator or EPA's EPD advisory services and become part of this growing movement toward sustainability

Additional Resources

- Office of the Federal Chief Sustainability Officer's Federal Buy Clean Initiative: https://www.sustainability.gov/buyclean/
- Carbon Leadership Forum's embodied carbon policy tracking map: https://batchgeo.com/map/0a7f165939da9d291b183cfc7c326726
- EPA tools, resources and funding opportunities related to embodied carbon: https://www.epa.gov/greenerproducts/tools-resources-and-funding-opportunities
- Manufacturer information (from EPA) on greener products: https://www.epa.gov/greenerproducts/manufacturer-information-greener-products
- EPA's Label Program for Low Embodied Carbon Construction Materials: https://www.epa.gov/greenerproducts/label-program-low-embodied-carbon-construction-materials
- ACLCA's PCR search tool: https://aclca.org/pcr-search/
- ENERGY STAR resources on industrial energy management: https://www.energystar.gov/industrial_plants