ENVIRONMENTAL PRODUCT DECLARATIONS

What Is An Environmental Product Declaration (EPD)?

- An EPD is a transparent, verified report used to communicate the environmental impacts of a specific material (e.g., asphalt binder, portland cement) or product (e.g., asphalt mix, concrete mix).
- EPDs express the results of a life-cycle assessment (LCA) for a specific material or product. They show the environmental performance through the material production stage in terms of environmental and resource use.
- EPDs are developed with industry stakeholders and LCA experts and subjected to a critical review process following the industry standards described in the Product Category Rule (PCR) document. PCRs and EPDs are not required by law or federal regulations.
- EPDs that follow different PCRs cannot be compared.

How Are EPDs Used?

- **Green Procurement**. An EPD encourages the demand for (and supply of) those products that promote the more sustainable use of finite resources and that create less stress on the environment.
- **Environmental Stewardship**. An EPD is a statement that the manufacturer is paying attention to the environmental aspects of sustainability.
- **Effective Communication**. An EPD provides verified and transparent life-cycle environmental impact data for materials or products that can be used in pavement LCAs.
- **Progress Measurement**. Periodic updating of EPDs can show the progress made by a manufacturer or an industry. Agencies can use this information to track progress by their suppliers in meeting agency goals.

How Are Agencies Using EPDs?

- The California Department of Transportation and the Oregon Department of Environmental Quality are taking steps toward requiring EPDs for pavement and other transportation infrastructure materials for use in reporting, benchmarking, and LCA for design and asset management, but not yet as part of procurement. California requires that EPDs for steel used by State agencies be considered in procurement.
- The Minnesota Department of Transportation (DOT) recently undertook an effort to educate stakeholders and decision makers on the purpose and application of EPDs.
- Louisiana State University developed a concrete EPD and cost database that can be used in conjunction with a decision-making tool to help the State DOT benchmark its current concrete pavement designs and practices.

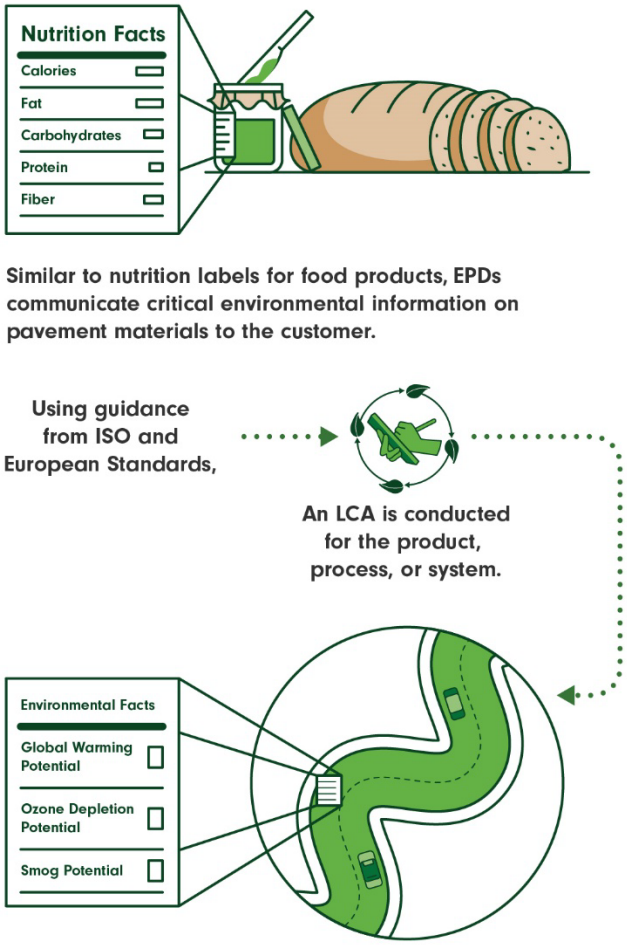

Figure 1. EPD Concepts.

What Agency Resources Are Recommended To Use EPDs?

- Agencies should develop sufficient expertise in LCA and EPDs or collaborate with other State agencies (such as various environmental departments) to ensure the content and production of EPDs is aligned with overarching agency goals, especially if the agency is considering the use of EPDs in green procurement.

How Can Agency Use EPDs Today?

- Establish a database with EPDs relevant to pavements.
- Encourage the development and use of EPDs by providing incentives to industries or manufacturers.
- Compile EPDs to track and communicate the progress being made toward the agency's sustainability goals.
- Use EPDs as inputs to the agency's use of LCA in pavement design, asset management, and in the development of specifications and policies.
- Conduct a pilot program to introduce the industry to EPDs and their applications.
- Participate as a stakeholder for creating PCRs (review or committee member) to ensure EPDs are produced in line with the public interests.
- Consider EPDs for materials procurement once harmonization efforts have created a sufficiently level playing field for competition.

How Are EPDs Developed?

- EPDs are published by a program operator, which can be a company or a group of companies, an industrial sector or trade association, public authorities or agencies, or an independent scientific body or other organization.
- EPDs are developed using standards defined in the PCR document, which is developed in conjunction with industry stakeholders and LCA experts.
- After review, EPDs are published and can be included in listing and database submittals to agencies.
- EPDs should be updated periodically, typically every 3 to 5 years (or more frequently if significant changes have occurred in the declared environmental performance).

The steps involved in the development of EPDs are outlined in figure 2.

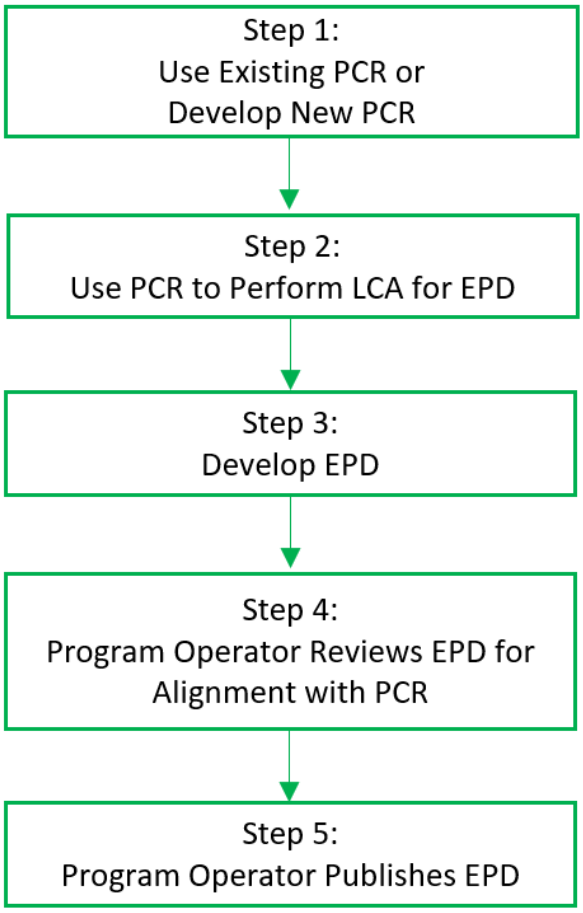

Figure 2. Steps in the development of EPDs.

What Data Are Considered?

- Most EPDs cover the "cradle-to-gate" stages of the life cycle, meaning that they include flow data up to the point the product leaves the control of the producer, but can also include other stages of the life cycle when a specific application is defined.
- EPDs can be produced using two types of data:
  - Plant-Specific EPD. Uses manufacturer's data on the production of the material or product, such as annual consumption of materials, electricity, natural gas, transportation fuels, reported emissions, waste generated, etc.
  - Industry-average EPDs. Uses data from participating manufacturers and sometimes multiple plants from different manufacturers.

Data from the literature are used for processes that are not owned or controlled by the specific facility.

What Is The Current State Of Practice For EPDs For Pavement Materials?

- Limited collaboration between program operators has resulted in some PCRs that are not consistent across areas. Harmonization efforts can improve consistency.
- The FHWA is working on documenting best practices for developing PCRs for EPDs of pavement materials.

What Are Best Practices For EPD Implementation?

A three-stage implementation plan based on the results of an FHWA-supported workshop on EPDs is summarized below:

Stage 1: Reporting (1 to 2 Years)

- Develop policies and reporting practices as a move toward standardization of EPDs.
- Use pilot projects for requesting EPDs to refine the specification for the EPDs and for using EPDs, including development of tools that use EPDs as inputs.

Stage 2: Standardization of PCRs (3 to 5 Years)

- Work with other agencies and industries to push for harmonization of PCRs and work to fill gaps in public databases.
- Implement rewards for plant-specific EPDs versus industry averages.
- Continue to improve the use of EPDs in pavement design and asset management.

Stage 3: Procurement (> 3 Years)

- Consider using EPDs along with costs in selecting materials to meet given performance requirements once sufficient progress has been made toward accounting for materials performance and improving the quality of EPDs.
- Consider EPDs for constructed pavement systems, or for longer-term maintenance and rehabilitation of a highway network as follows:
  - EPDs of materials (design-build).
  - EPDs of pavements to site (design-build).
  - EPDs of full life-cycle (design-build-maintain).

Where Can I Find EPDs?

Material	Source
Blended Cement	Portland Cement Association / ASTM Slag Cement Association
Portland Cement	Portland Cement Association / ASTM
Steel	Concrete Reinforcing Steel Institute
Hot Mix Asphalt	National Asphalt Pavement Association
Concrete	National Ready Mixed Concrete Association
Aggregates	ASTM

An example EPD for a concrete mixture design is shown in figure 3 and illustrates the type of environmental impact data that can be reported.

ENVIRONMENTAL IMPACTS

Declared Product:
Mix 3EAE75Z1 • Queens Lane (wet) Plant
3 IN LN 0.40 W/C 1" EF70 3-5 SL
Compressive strength: 5000 psi at 28 days

Declared Unit: 1 m^3 of concrete

Global Warming Potential (kg CO_2-eq)	229
Ozone Depletion Potential (kg CFC-11-eq)	7.5E-06
Acidification Potential (kg SO_2-eq)	1.69
Eutrophication Potential (kg N-eq)	0.30
Photochemical Smog Creation Potential (kg O_3-eq)	38.4
Total Primary Energy Consumption (MJ)	2,266
Nonrenewable (MJ)	2,195
Renewable (MJ)	70.8
Total Concrete Water Consumption (M^3)	2.28
Batching Water (m^3)	0.16
Washing Water (m^3)	0.02
Nonrenewable Material Resource Consumption (kg)	2,134
Renewable Material Resource Consumption (kg)	1.50
Hazardous Waste Production (kg)	0.01
Nonhazardous Waste Production (kg)	2.1

Product Components: crushed aggregate (ASTM C33), natural aggregate (ASTM C33), slag cement (ASTM C989), Portland cement (ASTM C150), fly ash (ASTM C618), batch water (ASTM C1602), admixture (ASTM C494)

Figure 3. Example EPD for a Concrete Mix Design.

Where Can I Get More Information?

- FHWA Sustainable Pavements Reference Document
- FHWA Pavement LCA Framework
- FHWA Tech Brief on Pavement LCA
- FHWA Tech Brief on Life-Cycle Thinking
- FHWA Tech Brief on EPDs

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https://www.fhwa.dot.gov/pavement/sustainability/

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