



# Life Cycle Analysis and Environmental Product Declarations: North American Market Analysis

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With the official launch of the USGBC's LEED version 4 at Greenbuild Nation in November 2013, Life Cycle Assessments (LCAs) and Environmental Product Declarations (EPDs) are becoming hot new topics of discussion. With LEED v4, project teams will be able to achieve LEED credits for conducting a whole building LCA<sup>1</sup> and/or choosing products with a 3<sup>rd</sup> party validated EPD<sup>2</sup>. The goal behind allocating credits for these options is fostering transparency.

This white paper defines LCAs and EPDs, identifies LCA/EPD impact on building design, and discusses the current North American market uptake for:

- LCAs completed as per the ISO 14040<sup>3</sup> guidelines
- Type III EPDs completed according to the ISO 14025<sup>4</sup> guidelines

## What is LCA?

LCA is an integrated concept for managing the total life cycle of products and services towards more sustainable consumption and production patterns<sup>5</sup>.

How it works:

- Compile an inventory of relevant energy and material inputs and environmental releases.
- Evaluate the potential environmental impacts associated with identified inputs and releases.
- Interpret the results to help you make a more informed decision.

William McDonough, architect and globally recognized thought leader in sustainable development, is a proponent of the idea that our environmental degradation problems are in fact due to poor design:

“Pollution and waste are the result of human errors; they are not an inevitable part of commerce. They signal design failure in product development, operations and corporate strategy and call for dramatic changes in how leaders think and how companies make things.”

LCAs and EPDs can help manufacturers and designers analyze in full the true environmental impact of a product's manufacturing and usage, with the ultimate goal of improving product design.

<sup>1</sup> Under NC v4: MRC1: Building Life Cycle Impact Reduction, Option 4 – 3 points.

<sup>2</sup> Under NC v4: MRC2: Building Product Disclosure & Optimization: EPDs – 3 points; MRC3 under CI v4.

<sup>3</sup> The environmental footprint declared in the EPD makes it necessary to conduct an LCA analysis in accordance with the ISO 14040-standards series (ISO 14040; ISO 2006b, ISO 14044; ISO 2006c) and obtain a third-party verification of the LCA as well as the EPD.

<sup>4</sup> Type III programs (ISO 14025; ISO 2006a) are based on a specialized third party scheme using quantified product information labels and pre-set indices. An example of III Type label is the EPD; it is based on an environmental declaration that gives objective and quantified environmental information about the products in such a format that comparison between products fulfilling identical functions is enabled. It is important to highlight that there are no environmental performance requirements for a product to obtain an EPD.

<sup>5</sup> Definition provided by US Environmental Protection Agency (EPA) National Risk Management Research Laboratory's Life Cycle Assessment website [www.epa.gov/nrmrl/std/lca/lca.html](http://www.epa.gov/nrmrl/std/lca/lca.html)

For manufacturers, LCAs are a way of completely analyzing a product's environmental impact at each stage of its life cycle: extraction or harvesting, pre-processing, manufacturing, transportation, use, disassembly, re-manufacturing and/or disposal.

LCAs can be conducted on construction materials, electronics, precious metals, wastewater treatment plants, consumables such as coffee or alcoholic beverages, and software systems, to name only a few examples.

Why bother to conduct a LCA? Typical optimization opportunities uncovered by a LCA include:

- Variations in waste, fuel costs and emissions where multiple plant locations exist
- Increased production rates
- Reducing embodied energy footprint
- Plant re-location to reduce transportation costs
- Upgrade plant equipment to reduce operating costs
- Reduced greenhouse gas emissions

LCA results can be reported in multiple formats; for some industries such as carpet/flooring and furniture, the EPD format for reporting LCA information has become commonplace.

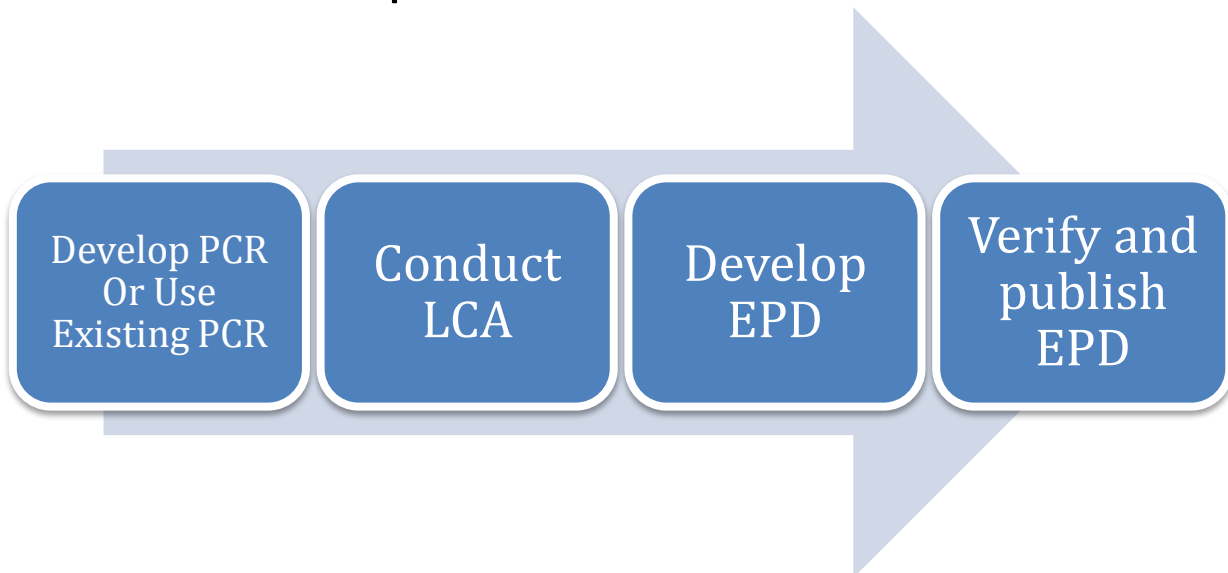
## What is an EPD?

EPDs are a type of eco-label for products and follow the reporting format outlined by the ISO 14025 standard, as well as the Product Category Rule (PCR) available for specific products. EPDs provide a standardized set of information categories for reporting LCA results; when EPDs also use the same PCR, it is possible to conduct side-by-side product comparisons.

Why bother to seek out products with EPDs? Specifying products with EPDs on a LEED v4 project can assist the project to gain points under the Materials & Resources category, but more importantly, EPDs identify resource inputs and environmental and health outputs, and can help guide informed design decisions which minimize resource waste.

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## Create an EPD in 4 Steps



## Step 1: Develop PCR or Use Existing PCR

PCRs are created by single companies, companies in partnerships with others or companies in partnerships with LCA experts in an open consultation process, and are reviewed by an independent panel prior to publishing. PCRs in North America typically comply with ISO 14025. In other markets, the following may be used:

- Product Rules, GHG Protocol Product Life Cycle Accounting and Reporting Standard
- Supplementary Requirements, PAS 2050
- Product Footprint Category Rules, European Commission Product Carbon Footprint Standard (Draft)
- Product Category Rules, BP X30 (France), SMRS (Sustainability Consortium) TS 0100 (Japan), ISO 14067.

PCR development is overseen by Program Operators such as UL Environment or NSF International, which develop guidance for creating PCRs and EPDs. If a PCR<sup>6</sup> exists for your product type, it will be published by a Program Operator. Program Operators exist internationally; for a full list of North American Program Operators, see below. To find out more about PCRs, visit [www.pcrguidance.org](http://www.pcrguidance.org), an open initiative created to develop global guidance for PCRs and EPDs, as well as any of the Program Operator websites listed below.

ISO 14025 Program Operators	Published PCRs	Published EPDs
UL Environment <a href="http://www.ul.com/environment">www.ul.com/environment</a>	<ul style="list-style-type: none"> <li>▪ Building Envelope Thermal Insulation</li> </ul>	<b>105 EPDs:</b> <ul style="list-style-type: none"> <li>• Building/Construction</li> <li>• Electronics</li> <li>• Insulation</li> <li>• Flooring</li> </ul>
NSF International Centre for Sustainability Standards EPD <a href="http://www.nsf.org">www.nsf.org</a>	<ul style="list-style-type: none"> <li>▪ Flooring: Carpet, Resilient, Laminate, Ceramic, and Wood (NSF 2012)</li> <li>▪ Residential Countertops</li> <li>▪ Business and Institutional Furniture Manufacturers Association (BIFMA) for Storage Products: UNCPC 3812</li> <li>▪ BIFMA Seating</li> </ul>	<b>3</b> Modular Carpet EPDs
ICC Evaluation Service, LLC <a href="http://www.icc-es.org/ep/epd-index.shtml">http://www.icc-es.org/ep/epd-index.shtml</a>	<ul style="list-style-type: none"> <li>▪ Ceiling Panels for Suspended Ceiling Systems</li> <li>▪ North American Pressure-Treated Wood</li> </ul>	<b>9</b> Ceiling Panel EPDs
CSA Group <a href="http://www.csa.ca/">http://www.csa.ca/</a>	None to date	None to date
ASTM <a href="http://www.astm.org/EPDs">http://www.astm.org/EPDs</a>	None to date	None to date
FP Innovation <a href="http://www.fpinnovations.ca">www.fpinnovations.ca</a>	<ul style="list-style-type: none"> <li>▪ North American Structural and Architectural Wood Products</li> </ul>	<b>3</b> Crosslam <b>2</b> Wood Decking and Siding
Earth Sure – Institute for Environmental Research and Education (IERE) <a href="http://iere.org/earthsure.aspx">http://iere.org/earthsure.aspx</a>	<ul style="list-style-type: none"> <li>▪ Pavement Preservation Products</li> <li>▪ Beer</li> <li>▪ Rule in Process: Windows for Buildings</li> </ul>	<b>1</b> Countertop <b>1</b> Asphalt System <b>8</b> Beer
Carbon Leadership Forum PCRs <a href="http://www.carbonleadershipforum.org/">http://www.carbonleadershipforum.org/</a>	<ul style="list-style-type: none"> <li>▪ Concrete</li> </ul>	None to date

<sup>6</sup> A Product Category Rule defines the requirements for product EPDs. Some product categories have multiple PCRs, although this is rare, and some product categories have no PCRs.

## Step 2: Conduct LCA

Conducting a LCA requires significant access to information on the product's composition, extraction and manufacturing locations, core upstream and downstream processes and use of resources. It is essential to have high quality data in order to generate a good quality LCA.

Many North American companies offer custom LCA services and tools to assist manufacturers in conducting LCA on their products, including:

- The Athena Institute's<sup>7</sup> free EcoCalculator with pre-defined assembly and envelope configurations for commercial and residential building assemblies.
- Quantis<sup>8</sup> Suite 2.0 that allows the user to analyze, evaluate and manage product environmental impacts.
- US Environmental Protection Agency (EPA)'s Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI) Version 2.0.
- Institute of Environmental Sciences (CML)<sup>9</sup>'s November 2010 Impact Assessment Tool (CML 2001).

Alternatively, a company can build in-house EPD capacity by enrolling an employee in a professional LCA program such as the Interuniversity Research Centre for the Life Cycle of Products, Processes and Services and Sustainability Learning Centre<sup>10</sup>.

## Steps 3 & 4: Develop, Verify and Publish EPDs

Once the LCA is complete, the EPD can then be developed, verified and published with one of the Program Operators listed in Step 1. The EPD, once verified, will be published on the Program Operator's website along with a 2 page Transparency Brief, similar to a nutritional label, which briefly summarizes key results.

## Reading EPDs

There are a few tips to reading and understanding EPDs:

- Ensure the products you are comparing are using the same PCR.
- Ensure the EPD has been certified by a third party, such as a Program Operator.
- Ensure the certification period is up to date.
- Start with an EPD's Transparency Brief, a 2 page summary of key EPD results.
- Compare Lifecycle Impact Categories, with an emphasis on your environmental objectives for this particular product. For instance, if you'd like to focus on water impacts, choose the product with the smallest acidification and eutrophication potentials.

<sup>7</sup> The Athena Institute's work includes development of LCA data for construction materials and systems, LCA-based software tools, and LCA advocacy. [www.athenamsi.org](http://www.athenamsi.org)

<sup>8</sup> With a team of dedicated analysts and with expertise ranging from [life cycle assessment](http://life_cycle_assessment) studies to consulting and business software, Quantis helps today's and tomorrow's sustainability leaders walk the talk. [www.quantis-intl.com](http://www.quantis-intl.com)

<sup>9</sup> An institute of the [Faculty of Science](http://Faculty_of_Science) of Leiden University.

<sup>10</sup> This program includes completion of 1 product LCA, approximate cost is \$22,000.

## Manufacturer Benefits

- Optimize processes and save energy and transportation costs.
- Understand all product inputs and outputs.
- Compare environmental impacts across product lines.
- Generate values for corporate social responsibility reporting, including GHG emissions and energy consumption.
- Provide clear value to your stakeholders.
- Align with LEED v4 transparency requirements for EPDs and Health Product Declarations (HPDs); often requested for health care facilities and schools.
- Demonstrate leadership in your industry.

## Designer Benefits

- Faster comparison of products across multiple technical and environmental attributes.
- Choose products for secondary characteristics such as manufacturing process, carbon emissions footprint, health impacts, durability.
- Product attributes are presented in a standard format, using standard language.
- Immediate evaluation for alignment with LEED v4 requirements.



## EPD Transparency Brief

COMPANY NAME	<b>Interface</b>
PRODUCT TYPE	<b>CARPET TILE: GLASBACRE® TYPE 6,6 NYLON</b>
PRODUCT NAME	<b>MODULAR CARPET TILE WITH GLASBACRE® BACKING &amp; SOLUTION DYED TYPE 6,6 NYLON</b>
PRODUCT DEFINITION	Modular carpet with recycled solution dyed Nylon 6,6 (polyamide 6,6) yarn face cloth (yarn weight: 712g/sq m) combined with GlasBac®Re backing. The products are manufactured by Interface in Picton, NSW Australia
PRODUCT CATEGORY RULE (PCR)	<b>PCR – Floorcoverings</b> Harmonised Rules for Textile, Laminate and Resilient Floor Coverings
CERTIFICATION PERIOD	<b>12/12/2011 - 12/12/2016</b>
DECLARATION NUMBER	<b>110919.11CA29311.114.1</b>



- Keep in mind that Lifecycle Impact Categories are often based on 1 year of use.

- Wood Products: The American and Canadian Wood Councils have co-released several EPDs on softwood lumber, composite wood and glu-lam.

### Finding EPDs in North America

There are a number of ways to find EPDs for North American products:

- Directly from manufacturers, suppliers and distributors.
- Program Operator websites, as detailed above under *Create An EPD in 4 Steps*.
- Green product databases.

EPDs are gaining popularity in the following sectors:

- Carpet & Flooring: Industry leaders such as Interface, who developed the first EPDs for this market sector, as well as Mannington, Shaw Industries, Mohawk Group, J+J Flooring Group and Tandus Flooring have all published EPDs for select products.
- Furniture: Steelcase, Herman Miller, Knoll Inc., RH Environment, Teknion, and Arper have all published EPDs for select products.
- Ceiling Tiles: Armstrong, CertainTeed, and SAS International have all published EPDs for suspended ceiling systems.

Transparency is the ultimate goal of LCAs, EPDs and HPDs. As the industry moves towards transparent reporting formats, collecting and analyzing product information is crucial for making better product decisions, and improving design.



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Contact Light House for more information about LCA comparison consulting services to help you make informed decisions about your building materials.