

Enhancing the value of life cycle assessment



Introduction

Creating value is an ongoing pursuit of organizations regardless of competitive or macro-economic conditions. While many organizations have traditionally focused on the processes within their own four walls — labor costs, manufacturing, logistics and the like — they may be able to create even greater value by looking at resource use in their product life cycle across the entire value chain. This can be a data-intensive process, but one that can provide both internal and external stakeholders a solid understanding of a product’s environmental impacts across the entire chain, from product development, sourcing, and manufacturing through distribution, marketing, use, and disposal. Resource use and its associated wastes — such as inefficient consumption of energy, water, or raw materials — represent real costs to suppliers that trickle down the value chain. There are daunting challenges with unlocking the value that is “trapped” upstream in the supply chain with suppliers, potentially many tiers back. Using a process called Life Cycle Assessment (LCA), internal and external stakeholders working together can use this compelling toolset to identify the areas of an end-to-end product life cycle that represent the biggest potential opportunities for additional value creation, including cost reduction and improved brand identity.

This paper will outline how LCA can be used to assess the end-to-end environmental impacts of a business decision on overall value creation. Companies should spend ample time up front collaborating with cross-functional stakeholders to define their objectives, then leverage the appropriate LCA toolset to produce actionable results. In order to realize the full potential benefits, companies should be willing to collaborate with suppliers to innovate

solutions that address the identified impacts. This paper will look at several value-creating business objectives, and show how the LCA methodology can help companies achieve these goals.

LCA: A basic definition

LCA is a methodology that is designed to help businesses measure and quantify the end-to-end environmental and economic impacts of a product, process, or service. By rigorously examining each step in the life cycle, LCA takes into account how raw materials were extracted; the consumption of the resources involved in planning or designing the product; materials and energy used during manufacturing, packaging, and distribution; impacts from using the product; and waste and pollution created throughout the process and at end-of-life (see Figure 1).

LCA differs slightly from “footprinting.” Although the two terms are sometimes used interchangeably, footprinting is a subset of LCA that only takes into account a single metric (for example, the carbon or water impact of a product), whereas LCA involves analyzing a host of complex environmental metrics such as ozone depletion potential and eutrophication to understand the relative tradeoffs involved in a particular activity. Life cycle cost analysis can be overlaid on this to integrate economic considerations into the study.

The International Standards Organization (ISO) created ISO 14040 and 14044 standards for conducting LCA studies. Such studies involve four steps: establishing the goal and scope of the study; taking a life cycle inventory; conducting a life cycle impact assessment; and interpreting the results to make a business decision.

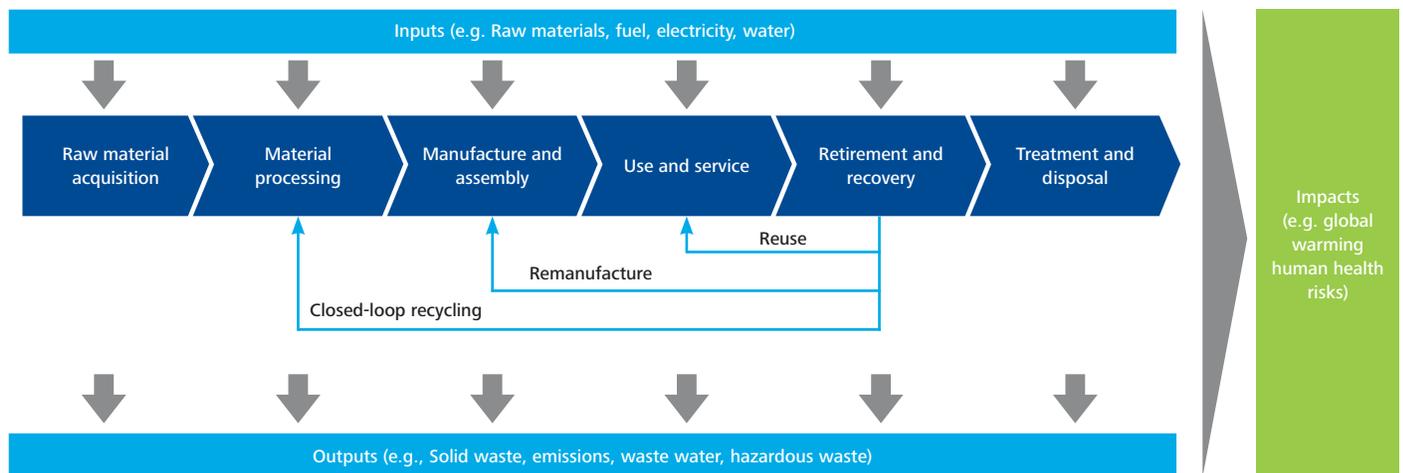


Figure 1: The Product Life Cycle (Adapted from ISO 14040:2006, *Environmental Management - Life Cycle Assessment - Principles and Framework*)

Completing an LCA helps businesses make difficult strategic and tactical sustainability decisions that take into account tradeoffs among a broad range of factors that might otherwise be deemed irreconcilable. Given the complexity of LCA, such an initiative can be quite time-consuming and therefore costly. This has deterred many businesses. However, an LCA study can also be customized and streamlined to be a less expensive and rigorous endeavor. In some cases, you can omit the more arduous number gathering and crunching in favor of qualitative assessment of key factors.

Common sustainability objectives

The first step for any life cycle study is to establish the sustainability goal(s): What decision are you looking to support with the results of the study? Below we identify seven of the most common objectives, and explain how LCA applies to each scenario.

1. Identify cost savings. A common goal of many sustainability projects is to reduce costs. You may hope to do this by reducing your consumption of costly resources, or by recycling/reusing materials that would previously have been considered waste when manufacturing your product.

LCA provides a data-driven approach to identifying potential operational efficiencies through reducing energy use, material use, water consumption, waste generation, and emissions. By quantifying environmental impacts through measuring the amounts of water, materials, and energy consumed and the carbon and waste generated at each stage of producing a product or delivering a service, companies can see where those impacts are greatest. Environmental impacts have associated financial costs — whether it's a higher energy or water bill, or increasing business risk because of future expected regulation or price volatility. By reducing the impacts, you can also reap cost savings.

For example, a global media and entertainment company asked Deloitte to assess the carbon footprint of DVD and Blu-ray disc manufacturing, particularly the environmental impact of packaging improvements. A life cycle greenhouse gas emissions study (carbon footprint) comparing 9 different packaging options was performed. Through this analysis, Deloitte found opportunities to reduce the amount of plastic in the DVD case and save millions in operating costs annually. Changes in packaging and transport resulted in a 13% reduction in raw material consumption, a 20% drop in transportation emissions, and a \$40M cost avoidance opportunity.

2. Enhance brand value for competitive differentiation.

In many industries and markets, there's a distinct caché if your brand is perceived as environmentally and/or socially beneficial. Many businesses are embracing sustainability initiatives so they have a good story to tell. For example, a food manufacturer that produces plant-based milks performed an LCA to compare the environmental impact of its products to those made from conventional dairy milk. It then used the results to boost an existing marketing platform that had been proclaiming the benefits of a plant- over animal-based diet (see sidebar). Today, the company's brand revolves around the fact that its products are competitive from both an individual health and overall environmental sustainability perspective. In many cases, a business is able to leverage sustainability decisions made primarily for other reasons — cost or regulatory compliance, for example — into positive publicity. For example, some leading beverage companies have begun using recycled PET rather than crude oil to manufacture plastic bottles, primarily because the high price of crude oil has driven up packaging costs. Although making this substitution primarily saves money, it also makes for great public relations.

A large food producer was promoting a marketing platform suggesting plant-based milk beverages are not only healthier, but also environmentally preferable to animal-based ones (dairy). In order to understand and make external claims about the environmental impacts of its products, Deloitte assisted the company in conducting the necessary LCA to enable a public product comparison of various plant-based beverages in its product portfolio with an animal-based beverage. Working with the company's suppliers and brokers all the way back to the farm, Deloitte collected primary data, developed a broad model considering relevant environmental impacts, and worked with an external review panel to determine a publically defensible LCA study. The LCA revealed an overall general environmental advantage of its plant-based beverages and identified key potential leverage points used to refine its sustainability message to consumers. The study also identified key potential improvement areas in the value chain of each product, such as packaging, that can be used to drive future focus projects and sourcing decisions that reduce food system emissions.

3. Improve design decisions. LCA is also useful when making design decisions that affect sustainability. By evaluating various possible materials and processes for manufacturing and delivering a new product at the design stage, companies can use environmental, social, and economic criteria to reduce the life cycle impact. This helps answer eternal dilemmas such as “which is better — paper or plastic?”

Newell Rubbermaid carried out an LCA of their plastic water bottles and compared the environmental impacts to steel and aluminum bottles. The main environmental impacts were caused by the washing of the bottles throughout the life cycle. Steel and aluminum bottles are hand washed and the plastic bottle can be washed in the dishwasher. A dishwasher is much more energy-efficient (in terms of heating the water) and uses much less water than hand-washing, so the plastic water bottle showed significant environmental benefits when compared to the metal bottles. Newell Rubbermaid is using these LCA results in designing other products (e.g. food containers, cookware etc.) to be dishwasher safe.

4. Make better procurement decisions. By engaging multiple suppliers on joint cost and impact reduction efforts, and by encouraging innovation among suppliers, businesses can make procurement decisions that significantly boost their sustainability efforts. LCA can lead the way here. A large big-box retailer, for example, asks suppliers to assess the environmental footprints of their products and challenges them to continuously improve those footprints. Not incidentally, improving these footprints usually results in lower costs. Although touted as a sustainability initiative, procuring products from supply chain partners that are proactively and continuously reducing their water or carbon impacts can translate into lower costs for the retailer—who can pass them on to consumers and retain its reputation as a low-price leader.

LCA can also be applied to a related procurement goal: Evaluating which supplier out of a large pool of potential partners might be best positioned to contribute to your sustainability objectives. Likewise, you can use LCA to choose the most appropriate product from a supplier’s portfolio. For example, your paper bag supplier might offer a range of options based on the percentage of recycled material you prefer.

5. Meet communications needs. Your shareholders may be asking questions about the environmental impacts of your products, such as how they contribute to climate change. Or you may decide to produce reports for local communities in which you operate manufacturing plants. You can use LCA to create a platform for communicating positive environmental attributes about products to buyers and consumers. For example, Deloitte assisted a major biotech company in conducting a water footprint to show local stakeholders at one of its facilities that its water usage was sustainable. The company considered the capacity of the local watershed and the plant’s contribution to economic development. The facility’s water consumption was not only sustainable for the watershed, but was in fact 99% below its allocation when normalized for the plant’s contribution to Gross Domestic Product.

Additionally, many businesses have started making sustainability commitments to stakeholders. For example, you may have a goal to reduce energy consumption by 20% by 2020. An LCA can help you meet that goal by calculating the initial baseline, identifying “hotspots” where energy consumption is greatest, and developing specific actions that are designed to contribute towards achievement of the goal.

LCA can also be used to create product labeling that communicates your sustainability achievements to retailers and consumers. An environmental product declaration (EPD), based on ISO 14025, illustrates the life cycle environmental performance of a product or service. EPDs have to meet and comply with specific and required methodological prerequisites. The results can be used to add up LCA-based information in the supply chain and to compare different EPDs. To achieve this goal, common and harmonized calculation rules have to be established to facilitate use of similar procedures across EPDs. These are defined in Product Category Rules, or PCRs. The PCR defines the criteria for assigning a product to a specific category, which parameters are set out to prepare the EPDs, the data quality requirements, the collection and calculation rules, and what kind of information is suitable to convey to the primary audience of the EPD. If there is no PCR available for a product, it is possible to create a new PCR based on LCA. However, this is a lengthy and resource intensive process with several public consultations and verification phases.

6. Achieve compliance. Companies can expect to come under increasing pressure from regulatory mandates at local, national, and international levels. Europe, in particular, is pressing ahead with product labeling requirements. Businesses that do not meet those labeling mandates cannot sell their products in Germany already, and France and Japan are moving toward similar initiatives. Such requirements represent a barrier to entry for businesses that have not performed detailed analyses of their environmental impacts. An LCA can directly address this, especially compliance related to directives such as the EU's 2005/32/EC directive on ecodesign for energy-using products, which establishes principles, conditions, and criteria for setting environmental requirements for energy-using appliances before they can be put on the market.

7. Create better policies. Organizations — government agencies as well as businesses — frequently want to consider the impacts of the policies they set. The European Union, for example, has a significant body of evidence-based environmental and sustainability policies, most of which are based on LCA. Likewise, businesses can use LCA to decide where to locate new storefronts or factories to reduce impact. The Environmental Protection Agency is using LCA to better understand the impact of different biofuels to set policies in the United States.¹ And the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model uses LCA to help researchers and analysts evaluate various vehicle and fuel combinations to determine the environmental impact of various modes of transportation. Leadership in Energy and Environmental Design (LEED) building standards also encourage the use of LCA.

LCA can also be used to make *internal* policy decisions. Many businesses want to establish footprint reduction goals. LCA can help them set realistic objectives within specific timeframes that they can then communicate to internal and external stakeholders.

Rightsize your sustainability analyses

Depending on your particular sustainability goals, you might not need to do a full-blown LCA, which can be time-consuming and costly. Sometimes, an LCA can be streamlined by bringing together stakeholders and forging a consensus using qualitative rather than quantitative evidence.

For example, a leading pharmaceutical company had for decades been stamping a logo on its products using red ink — a process that generated a lot of toxic waste. The company thought it could reduce the environmental impact by engraving the pills. Instead of performing a broad, quantitative LCA, the company brought together representatives from each stage in the product life cycle — from design to manufacturing, to marketing and distribution — to discuss the various environmental, economic, and social impacts of making the change. This team was able to quickly estimate impacts without having to go through exhaustive data collection and analysis phases. It discovered that the new engraving method was indeed environmentally preferable, as it reduced toxic waste without significant increases in other impact areas.

In some cases, however, full LCAs following a standard protocol may be necessary. For example, if your goal is to produce a carbon label so you can sell your product in Germany, you need to collect primary data, perform the analysis, and get the results verified and certified. If you are advertising the superior sustainability of your products versus a competitor's, you will need to perform a very rigorous LCA to get the numbers right. Likewise, if you are involved in legal action, a full LCA will be an imperative. But a surprising number of sustainability goals can be achieved with a streamlined LCA, including cost reduction and procurement decisions.

Other types of LCA include high-level quantitative or streamlined ISO-based studies. These types of studies do not require the standardized rigor of the full ISO process but can be used to determine focus areas for sustainability strategy development, determine cost/benefit areas for process or design improvements, detect environmental risks along the supply chain, and understand trade-offs from material extraction to ultimate disposal. High-level "desktop" studies typically use readily available data from industry sources and are conducted using simple, spreadsheet-based models. Streamlined LCAs generally use company-specific or "primary" data in combination with public data and provide companies with actionable results based on actual activities and services. For both types of studies, the underlying models used to calculate impacts can be designed as decision tools used to inform product design decisions, for example, or to monitor and manage impacts due to processing changes over time.

¹ Life Cycle Assessment, Environmental Protection Agency, <http://www.epa.gov/nrmrl/std/lca/lca.html>.

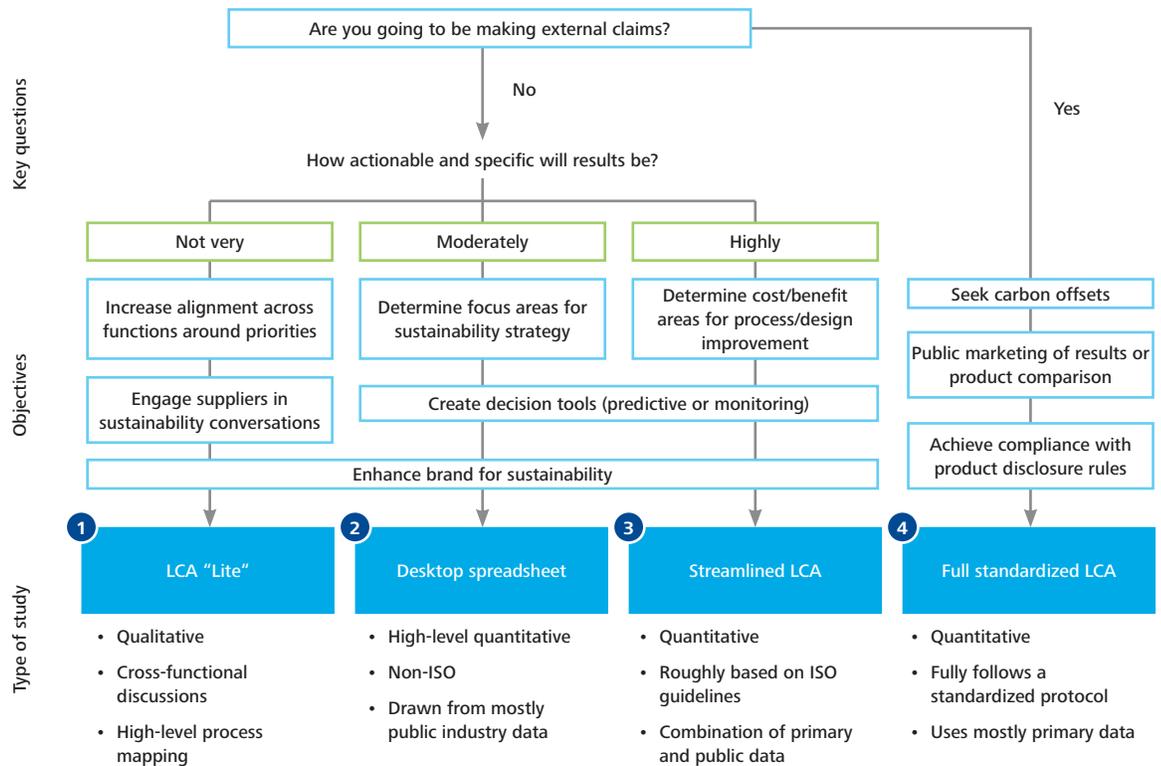


Figure 2: LCA scoping decision tree

LCA leading practices for increasing benefits

Because of the complexity and level of expertise required to perform a successful LCA, companies might consider consulting a third party specialist for guidance or to take on the entire initiative. LCA specialists are likely to go through the following steps.

Determine what level of LCA is appropriate. By following the LCA scoping decision tree (Figure 2), LCA specialists can define key objectives and relevant stakeholders; uncover issues, assess data availability, and determine how results will be used; analyze and prioritize material issues; and align LCA objectives with your broader sustainability and business objectives.

Create a strategic road map. Perform a comparison of the different LCA tools you can use — including water and carbon footprinting — with regards to how well each one aligns with your stated objective(s). Then, keeping in mind any other sustainability initiatives currently underway within your organization, create a sequenced list of actions you can take.

Engage internal stakeholders. Early on in the process, involve internal leaders in the functional areas for which information will be needed (e.g. Facilities) and who will benefit from the results of the study (e.g. Design, Marketing, etc.). Communicating the intended results and collaborating on the goals of the LCA can generate buy-in and produce more meaningful, actionable results. Once the study is finished, the leadership of “champions” from affected functions is essential to carrying out the recommended solutions.

Engage external stakeholders, particularly suppliers.

Reach out to suppliers at all tiers from which you will need to collect primary data to notify them of your intent to conduct an LCA and prepare them for upcoming data requests. This can help to reduce the time necessary to collect information, which suppliers may not have readily available in the format you need. Work closely with suppliers throughout the study to build a collaborative relationship that can help you partner together to create and implement solutions that may affect the way suppliers do business. In many cases, the majority of impacts lie upstream, and an effective way to improve the life cycle impact is by innovating new designs, material switches, or processes changes several steps before your direct control.

Use LCA to drive business investments and decisions.

This is where companies derive the value from LCA: By making tactical and strategic business decisions that improve the bottom line or enhance brand value. By following up on these decisions, performing regular benchmarks, and routinely assessing the success or failure of them, you can begin to get measurable benefits from your sustainability initiatives. By analyzing the results, you can determine which factors drive the most impact, and learn about more opportunities for making sustainability investments in sourcing or procurement, supply chain logistics and distribution systems, operations, or marketing messages.

Review LCA findings and communicate.

As mentioned earlier, some LCA results can be achieved and communicated rather informally. However, others require a more rigorous review and approval process. For example, according to ISO 14040 and 14044 standards, if you want to make comparative environmental product declarations, your findings should go through a critical review process by recognized specialists. Once you have adequately reviewed the LCA results, you should consider the many ways you might want to leverage them in corporate communications. Such communications can include press releases, third-party carbon labels, and corporate sustainability reports.

LCA is aligned with emerging international standards. That includes ISO standards, of course, but also the World Resources Institute/World Business Council on Sustainable Development Product Greenhouse Gas (GHG) Standard, the most widely used international accounting tool for understanding, quantifying, and managing GHG emissions.

Conclusion

LCA is fast becoming an increasingly effective way for businesses from all industries to prioritize and assess opportunities to create added value across a product life cycle. Despite the rigor involved and potential value created, LCA can be a relatively simple and inexpensive process. A “right-sized” LCA, one that matches objectives to expected outcomes and involves internal and external stakeholders throughout the process, can help deliver additional value creation, including cost reduction and improved brand identity.

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