

Open Source Lifecycle Inventory

A collaborative approach to creating business, environmental and social value

Introduction

Businesses are beginning to better understand and manage their environmental and social impacts. While some companies are taking steps in this area due to pressure from NGOs or to mitigate the risk of a tarnished reputation, smart companies are recognizing that building sustainability into their business can create short and long term business value and are seizing the opportunity.

While these efforts initially focused on a company's direct environmental and social impacts, it quickly became clear that a significant amount of a company's true impacts come from the cumulative impacts of the supply chains of the products or services they sell, and in some cases also the use and/or disposal of the product. This has led to a need for standard tools and approaches for measuring the social and environmental impacts of products and their lifecycles. Lifecycle Assessment (LCA) provides this common framework. However, the time and resources needed to produce an LCA for even one product have limited the adoption and impact of these methods. Open Source Life Cycle Inventories (LCI) provide an approach for accelerating the adoption and creation of LCAs across the global consumer goods economy.

What is Life Cycle Assessment and Life Cycle Inventory?

Lifecycle Assessment (LCA) is an approach used to quantify the environmental and social impacts of a product by measuring the inputs, such as raw materials and energy, and outputs, such as water and greenhouse gases, associated with the entire supply chain of a product. The life cycle of a given product is made up of thousands of linked processes (called 'unit processes') that are each required in support of the production and use of the product, and all have their own inputs and outputs that impact our environment. The LCA results in a rich set of data, a laundry list of impacts at the unit process level that can be loaded into a database. This resulting database is the life cycle inventory (LCI) and provides a detailed description of all of the impacts associated with each process in a products life. Because of the complexity of product life cycles, LCAs are very data intensive and can be costly and time consuming. Data must be available and used to describe each of the thousands of unit processes within a supply chain, and for each of the unit processes supporting the use phase and end-of-life phase.

The Traditional Approach to LCA

Traditional Private Sector LCA/LCI

The traditional approach to conducting a lifecycle analyses involves hiring a consulting firm with specialized knowledge and skills to conduct a focused study on a given product. The consultants leverage in-house proprietary databases, methods and assumptions to conduct a lifecycle assessment for the client, often collecting primary data to support their study. This primary data is loaded into their proprietary database and used to improve the results of that study and future studies conducted by that consulting firm. The unit process level data is kept completely private. The overall totals are sometimes loaded into a separate database and sold to LCA practitioners at prices ranging from \$10,000 - \$40,000.

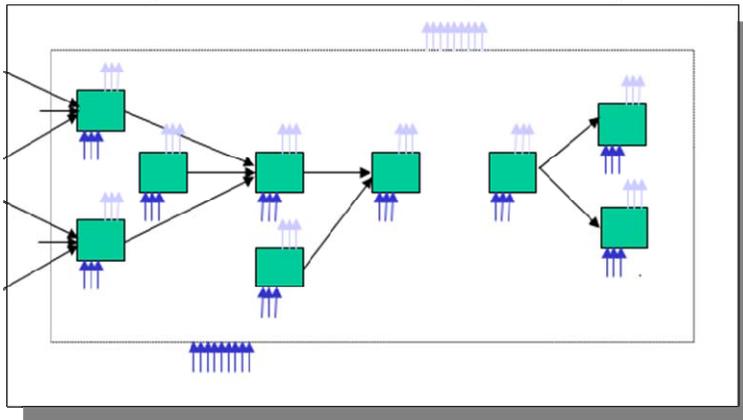


Figure 1: In a traditional LCA, consultants assess a product lifecycle using proprietary methods, data and assumptions, keeping everything but the end result private.

Following this approach, a firm pays for a study to be conducted, sees the overall results, and the consulting firm keeps the unit process data to leverage in future studies for their future clients. The lack of transparency of assumptions, methods and processes makes comparability of the results impossible, and the inability for future LCAs to leverage the resulting unit process data keeps the industry as a whole from leveraging past work to achieve economies of scale. This hinders our ability to reduce the time and resource burden of LCA over time.

Traditional Public LCI

Recognizing that many unit processes are common among the supply chains and life cycles of a wide range of products, companies and even industries, governments began funding national LCI databases to try to build a common foundation from which to develop LCAs. These databases were aimed at addressing the need to reduce redundant work (two consulting firms charging two different clients to study the same unit process, for example producing corn) and increase consistency across LCAs. Some of these databases, like the USLCI database at the National Renewable Energy Lab, were shared with practitioners for free and relied on federal funding for population of data and system administration and support. Others, like the Ecoinvent database in Switzerland, offer access to consistent, transparent unit process data and charge users a fee that is used entirely for the development and support of the database. The development of these national databases represents a significant step in the direction of providing transparent unit process level data to LCA practitioners around the world.

Open Source LCA/LCI

Public LCI databases allow many LCAs to be built at least partially on a set of consistent foundational unit process data. However, progress is much slower than needed. After more than 5 years and more than \$1 million invested, the US LCI database contains data for fewer than 400 unit processes. The complexity of product supply chains, together with the sheer number of new and existing products produced around the world, have kept LCA based product assessment from achieving its full potential to improve business value and environmental or social performance. A improved approach to LCI data development is needed if consumers and businesses are going to be able to incorporate environmental and social impacts into buying decisions based on consistent, reliable and transparent information. The cost and complexity of product LCAs must be significantly reduced in order to accelerate the adoption of these practices across the global economy.

A fresh approach provides a path to dramatic reduction in the cost of LCI data development.. Open source LCA/LCI looks at the chain of unit processes not as a single system that must be studied in depth by a given consulting firm at a given time, but rather as a series of modular units that can be studied by the

owners of the unit processes and combined, reused and aggregated to produce consistent, quality and transparent LCI data while keeping proprietary company specific information private. Each individual owner can provide information on their unit process into an on-line system, building the specificity of the unit process data up over time. For unit processes where detailed data is not yet available, industry average data or best available modeling are used to estimate the impacts of these unit processes. A product level lifecycle assessment for the entire chain can then be completed and improved upon over time. Focus can be on those unit processes that are unique in a given lifecycle and are of significant importance, while industry average data can be kept for unit processes where industry averages suffice.

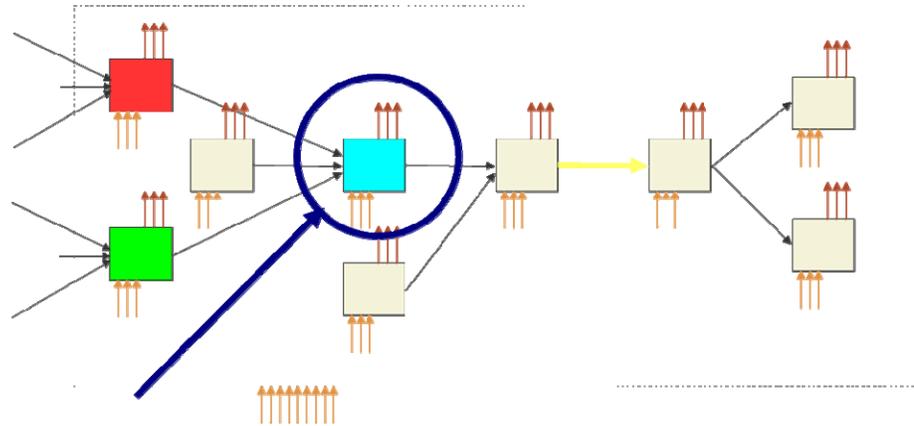
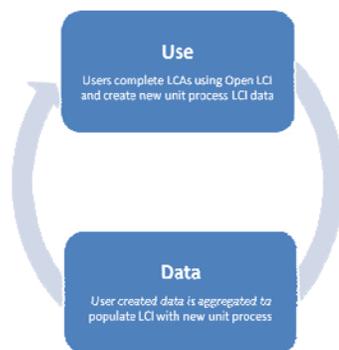


Figure 2: In an open source LCA, companies assess their own gate-to-gate impacts and combine these results with best available public information about the rest of the lifecycle for their total product LCA, making the results of their study available to be aggregated with other firms, creating industry averages that can be made public for future studies.

As the unit process specific data is gathered for a given unit process from a number of firms, the data can be averaged by a third party and loaded into the national LCI databases to provide consistent, continuously growing and improving average unit process data for future studies to be used by all. Building this on principles of consistency and transparency based on



established standards and protocols would ensure comparability across products as well as comparability to industry averages that are developed and refined over time. The LCI becomes a living database with consistent, transparent industry average unit process data that is evolving as technology improves and studies are completed. Leveraging the results of each study without divulging company specific trade secrets reduces the cost and improves the quality of information as time goes on. The use of public LCI data in product LCAs, the results of which eventually feed back to grow and improve public databases, creates a continuous feedback loop that sets the stage for exponential growth in the adoption and quality of LCAs at the product level. This accelerated growth and adoption will provide companies with information about hot-spots within their product's lifecycle and provide a basis for innovation.

The true impact of that innovation can be quickly and cost effectively reincorporated into the product lifecycle without the need for a new exhaustive LCA. The comparability that is achieved through consistency, openness and transparency will allow companies to view the impact of innovations and changes relative to industry norms.

Conclusion

Companies can use LCA as a tool for understanding and improving the social and environmental performance of their products. In order to overcome the cost and time burdens associated with these studies so that broad adoption can occur, a new approach is needed that fosters the collaborative creation of LCI data that can be leveraged by all who want to add value to the process. Open source LCA/LCI provides a framework for accelerating the adoption of these methods.