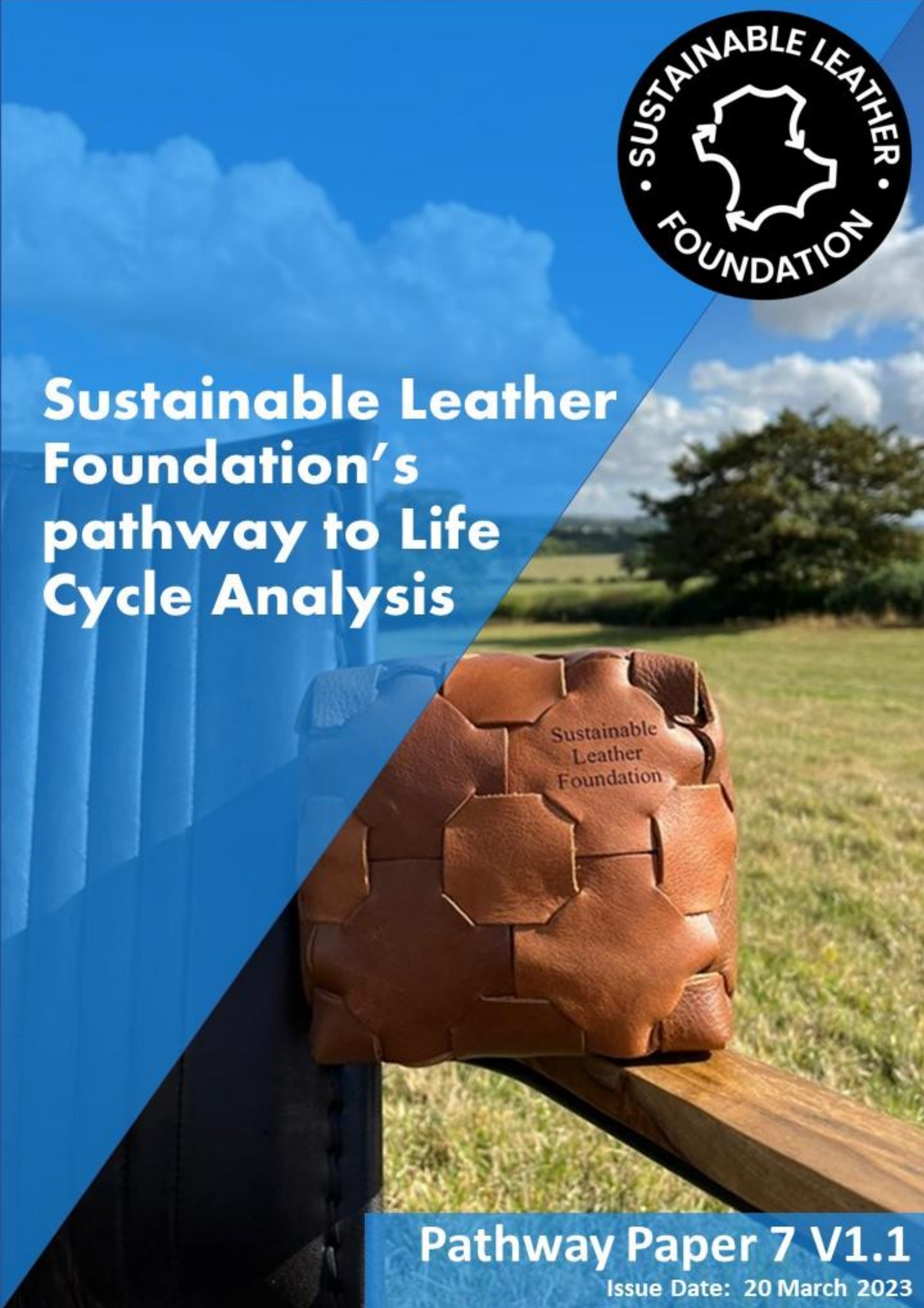
# Sustainable Leather Foundation's pathway to Life Cycle Analysis




## Pathway Paper 7 V1.1

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# Sustainable Leather Foundation's Pathway to LCA: A Beginner's Guide to Life Cycle Analyses

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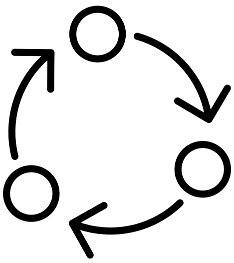

## Introduction

Life Cycle Analyses (LCAs) are an integral part of understanding and evaluating your environmental, social, and governance (ESG) performance. They are a measurement tool that evaluates the inputs, outputs, and potential environmental impacts of a product system throughout its life cycle[1]. An LCA creates a model of any process being studied – this model will never include all the impacts, but a good LCA includes most. Life cycle analyses are also commonly referred to as life cycle assessments and environmental footprints. Each of these terms mean nearly the same thing; but at their core, they each represent a methodology in which all the environmental impacts of a product can be measured.

When using the term environmental impacts, it references all the environmental factors that are potentially affected by the product and associated processes throughout its entire life cycle. This means that impact categories such as carbon footprint, acidification potential, eutrophication (to name a few[2]) are all evaluated across the product from its creation to its end-of-use.

It is important to note that carbon footprint (greenhouse gases) measurements are only one of the many environmental impact categories that are measured in a life cycle analysis. While it is a prominent measurement, it is not the only factor considered.

Life cycle is also a relative term. The scope of each LCA conducted is highly bound by the methodology and framework in which the LCA is conducted. Key terms such as system boundaries, allocation methods, and functional unit outline the specifics of how each LCA is conducted. For example, the system boundaries dictate which parts of a product's life cycle is measured. Thus, if a tannery that produces wet blue bovine hides wanted to conduct an LCA for their facility, they would complete a partial LCA with the system boundaries set from raw hide through to wet blue. This would allow the facility to reduce the LCA to the scope that fits their facility and calculates environmental impacts according to their portion of the process.

LCAs, while incredibly detailed, provide excellent feedback as to the "hot spot" areas of environmental improvement needed across a series of processes. LCAs in and of themselves are an excellent tool that can be developed over time and expanded upon to further its impact year on year. Identification of these critical environmental impact areas can not only support operational improvements but can identify waste streams (supporting lean and quality

[1] ISO14001:2006 Environmental Management – Life Cycle Assessment – Principles and Framework

[2] Reference SLF's glossary located in the Technical Library for definitions of environmental aspects, such as eutrophication, acidification, etc.

management) to reduce overall costs, resources, and time. LCAs used in tandem with other operational tools not only provide tangible hard benefits, but also showcase proactive engagement in ESG, a critically important topic to brands and consumers alike.

With the influx in global customers demanding an understanding of LCAs and ESG, SLF aims to provide a simple how-to-guide for those interested in starting and those encouraging engagement across their supply chain. LCAs can be complex, but with a few simple steps, many organisations across the leather industry can get started without high-cost impacts.

## Components of a Life Cycle Analysis

There are six major components to understand prior to initiating an LCA:

1. Scope of Environmental Footprint / LCA
2. Functional Unit
3. System Boundary
4. Allocation
5. Life Cycle Inventory
6. Life Cycle Impact Assessment

It is critical to research each of these components prior to collection of data or hiring of a third party. While there are many more variables to consider when evaluating an LCA, understanding these six will provide a solid baseline for beginners.

The scope of the LCA must be evaluated first and foremost as this defines the extent to which an organisation wishes to measure and conduct the analysis. Outlining the scope of specified processes of a selected system with associated attributes (functional unit, system boundary, allocation, impact categories, etc) provides a baseline for which the organisation can feasibly measure.

The functional unit is the unit of measure, or the quantified performance of a product system for use as reference[3]. For example, a tannery could measure the environmental impact per every 1 $m^2$ of leather or a product manufacturer could measure per every pair of shoes produced. The functional unit is critical to define as this is the singular metric that must exist across all processes to standardize the measurement across the LCA.

System boundaries set the criteria for which processes are part of the LCA being conducted[4]. The easiest place to start with LCAs is to measure the processes that occur within one facility. For example, a product manufacturer may initially set the boundaries from incoming finished hide to a completed pair of shoes – only measuring those processes that their organisation leads. However, as the product manufacturer grows, they may be inclined to work with their supply chain and extend the boundaries of their LCA to start from the raw hide source.

Allocation is the measurement method applied in which the input and output flows of a product system or series of processes are calculated with reference to the LCA being conducted[5]. In the leather industry, allocation is easiest to understand with reference to the raw hide sourcing. As an example, a tannery which produces leather from raw hide through to finished product is interested in conducting an LCA from birth of the animal through to finished hide. Their functional unit would be 1 $m^2$ of leather, and all the data would be collected in their operations (energy use, water use, etc.). This tannery would then coordinate with their supply chain to collect data on all processes associated with the birth, raising, and slaughter of the animal. Since the animal is slaughtered for the main purposes of the meat, the upstream processes (from birth to raw hide) only make up a percentage of the environmental impact applied to the leather. Thus, the allocation method is utilized to apply a percentage of the upstream/farming impact (most commonly in leather by weight or economic value) to the leather produced by the tannery conducting the LCA.

Allocation is a very complex subject, but it is one that should be reviewed by the team and understood before initiating an LCA. There are standards that exist which outline a preferred allocation methodology (e.g.,

[3,4,5] ISO14001:2006 Environmental Management – Life Cycle Assessment – Principles and Framework

EU's Leather PEF-CR), there is still much debate surrounding the preferred method. One way to simplify the LCA for your first start is to limit the system boundaries to your facility. This will largely minimise and/or eliminate the initial need for allocation.

Life Cycle Inventory (LCI) is the phase of the LCA that involves compiling all the inputs and outputs for a particular life cycle[6]. As mentioned in the earlier example, a tannery interested in conducting an LCA for their facility would be required to collect all the data on their specified processes to evaluate the amount of energy, water, waste, effluent, etc. produced per functional unit. This process of collecting the data is called the LCI and is one of the most important aspects of conducting an LCA. The quality of an LCA is solely based upon the quality of the data collected, and thus the LCI becomes a critical component for those just starting out.

The Life Cycle Impact Assessment (LCIA) is also critical as this is the phase of the LCA that focuses on the analysis of the data collected[7]. An LCIA evaluates all the potential environmental impacts' magnitude and significance against each of the processes measured. Therefore, if a tannery collects all of its energy data for its retanning processes, the LCIA looks at the type and amount of energy use per the function unit and calculates the extent of associated environmental impacts (e.g., how much carbon dioxide, acidification, etc. is generated).

The above is a brief introduction to the main components of an LCA. Globally, universities now have entire degrees and specialisations dedicated to the development and implementation of LCAs. However, do not let this expansive topic scare your team away from getting started. By understanding the basics and selecting an individual on your team to research and understand the LCA ISO standards, your team can get started simply and effectively.

## Where to Start

As mentioned in the previous section, the best place to start is to learn the basics of an LCA and dedicate an individual in your organisation to study the existing ISO standards for LCA (ISO14040 and 14044). While a passion for sustainability always helps, your quality and environmental health and safety professionals will be very familiar with these types of guidance tools and can act as excellent leaders for this type of research.

While research is kicked off on a deeper level, the management team can decide which product to focus the initial LCA upon. It is recommended that a simple, high-running product is selected for the first LCA. Once the product is identified, operational team leaders can begin by collecting the facility data associated with that product. Even if the scope, system boundaries, etc, are not finalised, the facility data (for energy, water, air emissions, waste, chemical, effluent, etc) can be collected and organised in parallel. It is a solid place to start.

Once the system boundaries are selected, the operational team can begin to collect and/or create the associated process flows for this product. These process flows will be critical in outlining all the appropriate inflows, outflows, and intermediary flows associated with the product. The collection of data along with the process flows is the basis for your LCI. It is likely your quality team has many of these flows already created. Don't start from scratch, always search for what currently exists and adjust as needed.

With all this information collected, the team can begin to draft a proposal outlining the critical components of the LCA. To move forward with calculation and analysis, it is recommended that either a third-party auditor/assessor is utilised, or an internal employee obtains the proper training to conduct the LCA.

LCA calculation involves many variables and equations, thus there is current software available to alleviate this complexity. However, many of these software programs are built for cross-industry applications and are not suited specifically for the leather industry.

[6,7] ISO14001:2006 Environmental Management – Life Cycle Assessment – Principles and Framework

To move forward with calculation and analysis to provide accurate initial results, SLF suggests:

1. Identify an internal employee who can attend a SimaPro training (or similar software) to insert data and evaluate the calculations necessary within the software (an employee with an engineering or scientific background is best suited for this role).
   a. PROS: Your team gains in-house knowledge of LCAs and owns the calculations behind the environmental impact of your product. Lower cost overall.
   b. CONS: Requires more time and a dedicated expert internally to build and understand equations. Cost of training and software licenses will likely increase over time. May still require external auditor to certify accuracy of LCA conducted.
2. Coordinate with a third-party auditor/assessor who may be able to run the calculations for you.
   a. PROS: Faster turnaround time by a certified third-party. Minimal internal resources required beyond collection of data and project management. Allows your team to focus on operational output and business targets (helpful if small team).
   b. CONS: Higher cost overall. Calculations and methodology may be owned by third-party auditor/assessor. Potential loss of internal knowledge of methodology (unless organisation duly invests in internal expert).

SLF currently does not conduct LCA training, calculation, or certification, however included below is a list of available resources for your teams to explore as you begin your LCA journey. This list is certainly not exhaustive, and we will continue to update this list as we identify reputable resources globally.

SLF is here to support you on your sustainability journey and will continue to produce additional guides to further your access to cost-effective, trustworthy sources.

## Available Resources

ISO Standards:

- ISO14040:2006
- ISO14044:2006

LCA Software:

- SimaPro
- Sphera / GaBi
- Free Available "Open Source", e.g., OpenLCA options are available, but largely untested and loosely correlated to accredited standards

LCA & Sustainability Support:

- Global Universities provide Basic Professional LCA Online / Flexible Training Courses – examples below:
  - Massachusetts Institute of Technology (MIT)
  - University College London (UCL)
  - Shanghai Jiao Tong University
- Third-party auditors/assessors supporting Leather-Specific LCAs and Training:
  - **Organisation:** SATRA/Authenticae
    **Type of Service:** Full & partial life cycle inventory, LCIA, all environmental footprints (including carbon), LCA sensitivity analysis and replacement advice, assistance with marketing and claims, and LCA review services
    **Region of Service:** Global
    **Website:** https://www.satra.com/footwear/sustainability.php
    **Contact:**
    Nicola-Pichel-Juan (nicola.pichel-juan@satra.com)
    Karl Flowers (karl@authenticae.co.uk)

- **Organisation:** SGS Global Softline Office
  **Type of Service:** Full LCA and Carbon Footprint
  **Region of Services:** China, Hong Kong, can be delivered in other regions based on requirement
  **Website:** https://www.sgsgroup.com.hk/en/sustainability/sustainability-reporting/life-cycle-assessment
  **Contact:**
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  SGS Hong Kong – Lily Pang (lily.pang@sgs.com)
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