LINKING THE LABEL COMMUNITY

LIFE CYCLE ASSESSMENT FOR THE SELF-ADHESIVE LABEL

GUIDANCE DOCUMENT

LINKING THE LABEL COMMUNITY

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WHY IS LIFE CYCLE ASSESSMENT USEFUL?

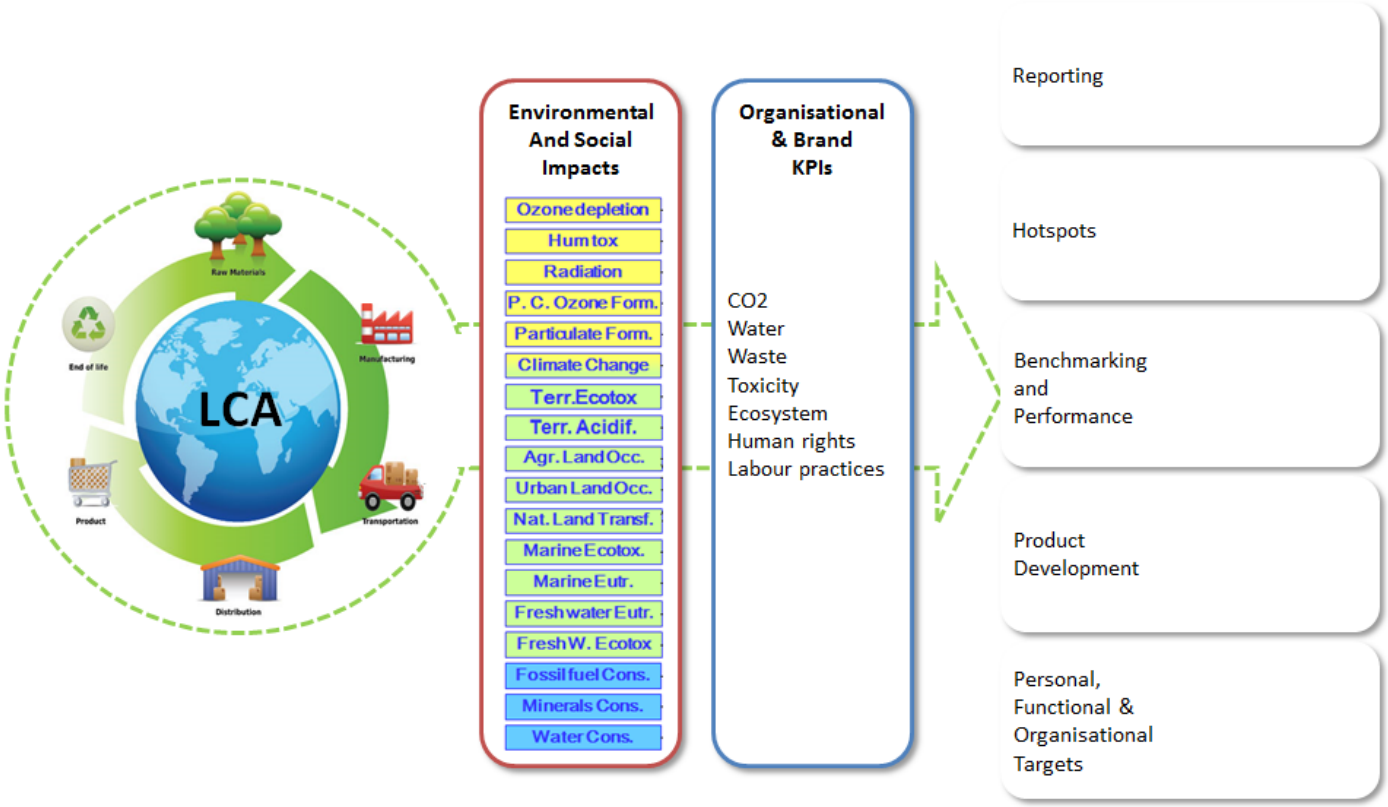
Labels play a critical role in the communication and marketing of products. The growing concern for the environment, combined with the visibility of labels, has led to an increasing number of requests from clients and stakeholders for insight into the environmental burdens of labels. Parallel to this trend, a growing number of players in the fast-moving consumer goods sector are integrating sustainability into their core business. A first step in this process is often to gain insight into the environmental performance of their suppliers. As a result companies in the labelling sector are asked more often about their environmental performance and have discovered good environmental practices are a way to distinguish themselves from the competition.

LCA is a widely recognized and scientifically sound method of measuring environmental impacts. LCA takes into account the complete life cycle of a product, from the production of raw materials to the final disposal of the product, thereby ensuring that potential impacts are not transferred from one life cycle stage to another. It makes companies aware of impacts caused by upstream and/or downstream activities. Many companies use Life Cycle Assessment (LCA) to measure their environmental performance and to set sustainability key performance indicators on organizational and brand level.

LCA measures up to 20 potential impact indicators depending on the method, including greenhouse gases (GHG/carbon footprint),, water and land use. The benefit of taking multiple impacts into account is that possible trade-offs are transparent, thereby avoiding the shifting of burdens. By looking only at one impact, there is the risk of excellent performance on one impact category, for example for GHG emissions, and poor performance on another impact category, for example water use. An overview of the most common impact categories used in LCA and their definitions can be found in the glossary.

The basis of LCA is described in ISO 14040 and 14044 which specify requirements and provide guidelines for life cycle assessment. In addition to the LCA approach described in ISO 14040 and ISO 14044, which include

How can you use LCA



multiple environmental impacts, single impact LCA approaches have been developed, including carbon footprinting and water footprinting. These approaches also take a life cycle perspective but focus on only one impact category.

NEED FOR A HARMONIZED APPROACH

At the moment, the various actors in the labelling sector are taking different life cycle assessment (LCA) approaches to measure their environmental performance or are orientating themselves on the usefulness of LCA for their company. TLMI and FINAT have recognized the potential risk of multiple requests to suppliers and of conflicting messages to customers when different approaches are used.

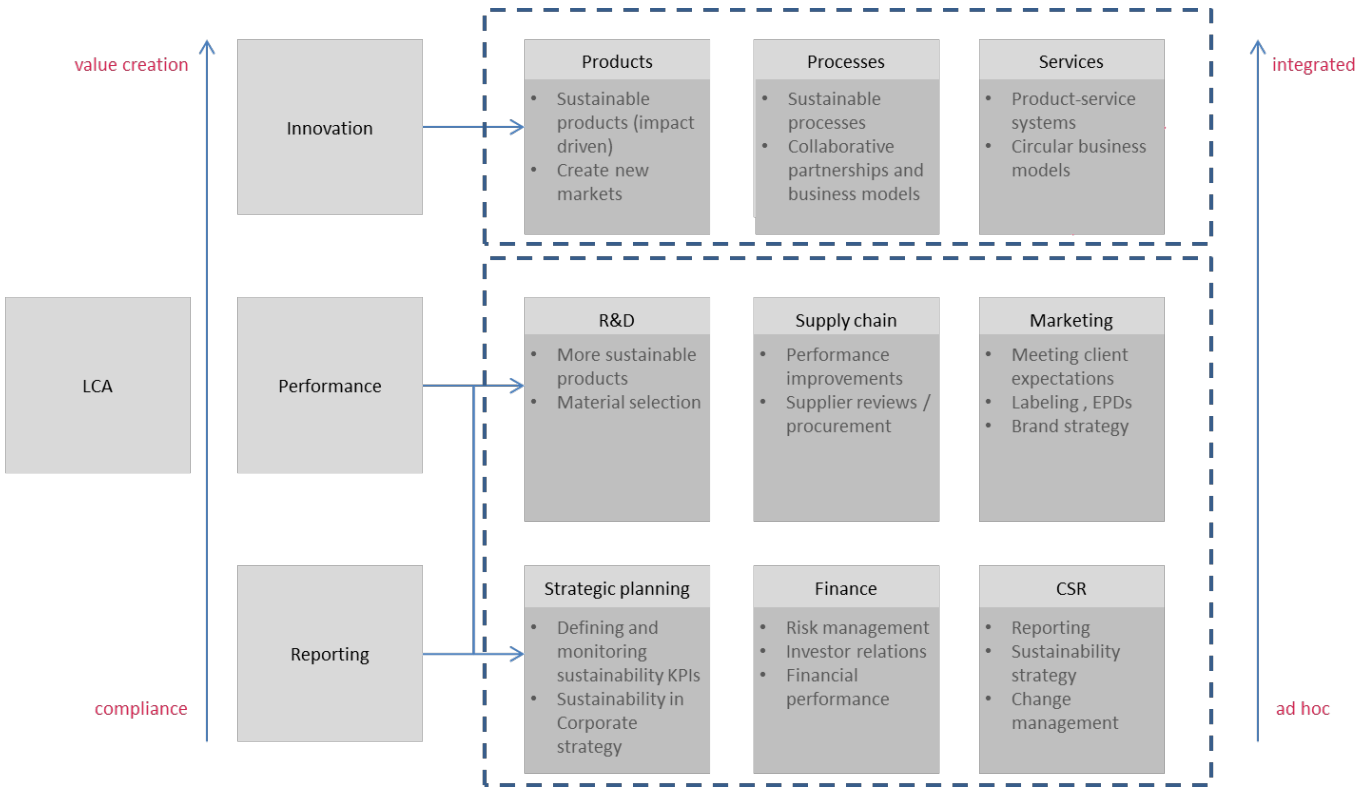
In order to ensure one harmonized approach for conducting LCA studies of self-adhesive label products, TLMI and FINAT have developed a pre-competitive harmonized sector LCA approach: Harmonized Life cycle assessment approach for the self-adhesive label industry. Such a harmonization is very important as it will likely:

- Avoid multiple data requests from various customers.
- Avoid a situation in which members of FINAT and TLMI are sending conflicting messages to customers and other stakeholders by setting fixed guidelines in advance that all should follow. These guidelines have been formulated in the.
- Make LCA accessible for the small and medium enterprises (SMEs) in the labelling sector. These guidelines are the first step towards this goal but the lack of accessible common Life Cycle Inventory (LCI) database and LCA software can still be constraining factors for Small Medium Enterprises to take up LCA.
- Give a common understanding among members of FINAT and TLMI on what the environmental hotspots and improvement opportunities are in label industry value chain.
- Create a level playing field for members of FINAT and TLMI supplying the same customer.
- Help identify data collection needs by focusing on the most relevant hotspots.
- Ensure that relevant drivers are properly covered and assessed for each individual product life cycle.

HOW CAN YOU USE LCA IN YOUR ORGANIZATION?

LCA gives an overview of the environmental impact of products and services. More specifically it offers:

- The overall environmental impact of a product and potential trade-offs,
- Insight in contribution of the life cycle stages to the overall environmental impact Identify improvement opportunities by identifying environmental hotspots in the life cycle of a product.



Besides the more obvious use of LCA results for reporting and risk mitigation, LCA insights can also be used to increase innovation and operational performance. To create shared value with LCA (by increasing the innovative and operational performance of your organization) it is important to embed life cycle approaches in your business process. This is usually related to the corporate CSR strategy: is it aimed compliance and reducing risk or is the goal to create shared value? The more it is aimed at value creation the more LCA is usually integrated in the business.

Below are some practical examples of how business value can be created with LCA:

- **Translation to organizational and business KPIs**
  LCA makes environmental impacts measurable and identifies environmental hotspots. These insights can then be used to set organizational and business Key Performance Indicators (KPIs). For example, if a printer converter has the ambition to reduce its GHG emissions, the LCA will help to identify electricity as the main contributor to the GHG emissions and define the reduction that can come from using green electricity. With these insights smart and feasible KPIs can be set.

- **Product development**
  LCA gives insight into the environmental impact of a product, these insights can be used to develop more sustainable products. For example a label manufacturer sets the target that each new product developed has a lower or similar environmental impact than its predecessor. LCA can be used to measure the potential reduction in impact when using different materials or production techniques.

- **Marketing**
  LCA can be used to create environmental performance overviews of different products. For example a printer-converter can use this information for business-to-business communication. He can communicate environmental performance, along with regular product specifications, information as a way to distinguish himself from the competition.

THE STEPS OF AN LCA

In ISO 14040 LCA is described as having four standardized steps:

- Goal and Scope Definition - What are we trying to learn?
- Life Cycle Inventory (LCI) - What's embedded in the products life cycle?
- Life Cycle Impact Assessment (LCIA) - What effects does it cause?
- Data Interpretation - What does it all mean?

When conducting an LCA you are advised to follow these four steps. In the following paragraphs we will describe what each of these steps entails.

GOAL AND SCOPE DEFINITION

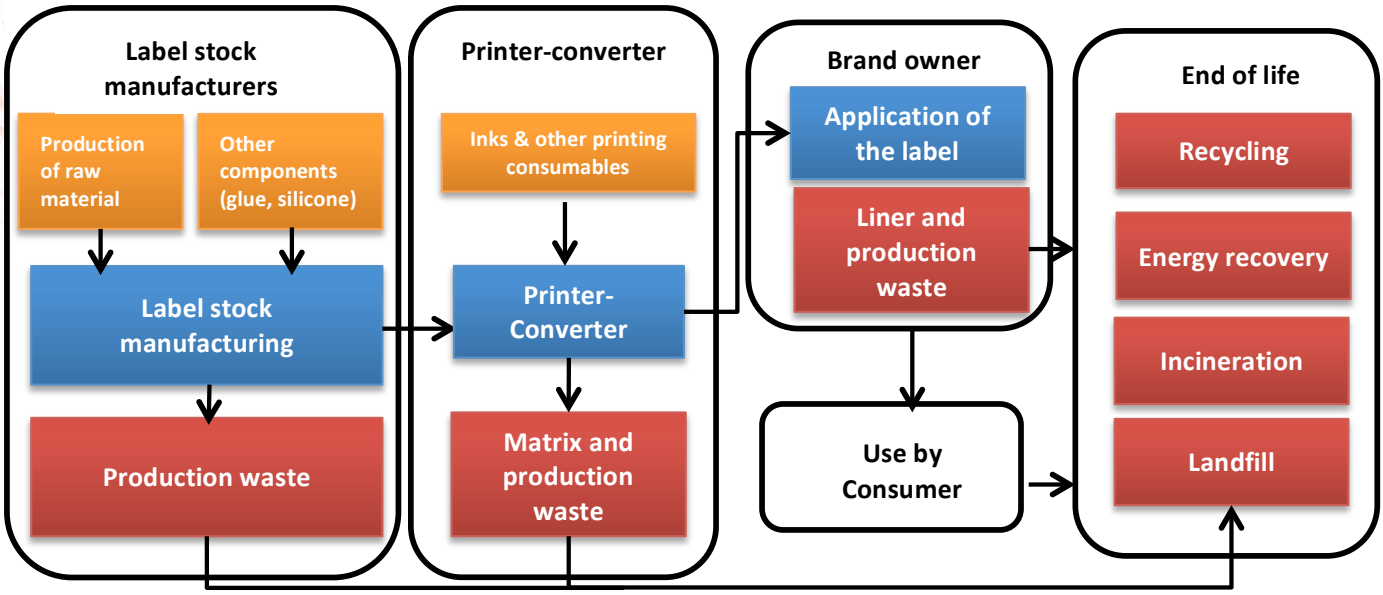
The goal and scope sets out the context of the study and explains the reason for conducting the study and to whom the results will be communicated. This is a key step and the ISO 14040 standard requires that the goal and scope of an LCA be clearly defined and consistent with the intended application. The goal and scope document therefore includes technical choices such as:

- A precise definition of the product, its life cycle and the function it fulfils.
- A definition of the functional unit (i.e. the comparison basis). Defining a functional unit can be quite difficult since it is not always obvious what function a product fulfils. Yet, defining a functional unit is especially important in product comparisons. In many cases, one cannot simply compare product A and B, as they may have different performance characteristics. In many cases, one cannot simply compare product A and B, as they may have different performance characteristics. For example label A might be more effective to apply, thereby needing less input (because there are less faulty applications) or the cutting of label A could be more effective thereby generating less matrix waste.
- A description of the system boundaries and the way co-production will be dealt with. This defines which life cycle stages are taken in to account and when during the production process more than one product is being produced the environmental impacts of the production process need to be divided over these so-called co-products. This can for example be the case when during the production of the label heat is generated. The heat is co-product when it is used as input for another production process.
- The requirements regarding the quality of the data used and the subsequent interpretation of the results.

LIFE CYCLE INVENTORY

The next phase focuses on creating an inventory of all the flows to and from nature. The aim is to get an overview of emissions released into the environment and resources consumed along the whole life cycle of a product. These are then added up to produce an inventory list of substances.

The first step to create the inventory is to draw a flow diagram of the product. Below you find an example flow diagram of a label.



From this flow diagram you can extract the data which needs to be collected. It is useful to distinguish between two types of data:

1. Primary data, which refers to specific data you need to acquire for modeling your system. Primary data are the data you have direct access to. For example, for a label material manufacturer the paper needed to produce your label, or for a printer-converter the amount of energy needed for printing your label. This data is often collected via questionnaires.
2. Secondary data, which are data for the production of generic materials, energy, transport, and waste management. Examples include the operation of a truck or the production of electricity. This data you can find in commercial Life Cycle (LCI) databases and in literature.

LIFE CYCLE IMPACT ASSESSMENT (LCIA)

There are several methods available to translate the inventory list into an impact such as climate change or human toxicity. It is important to select a method that covers the relevant impact categories for your product, to allow for possible trade-offs. For example, for paper labels we know that land use is an important impact category to take into account and for plastic labels fossil depletion should be covered in the selected method.

There are four steps common to all Impact Assessment methods., The first two are considered mandatory, while the last two are optional.

1.1 Classification: All substances are sorted into environmental themes according to the effect they have on the environment. A cause-effect pathway shows the causal relationship between the environmental intervention (for instance, the emission of a certain chemical) and its potential effects. For example greenhouse gas emissions cause radiative forcing which changes the amount of sunlight absorbed by the earth and the energy radiated back. This contributes to climate change and ultimately has an effect on humans and ecosystems due to the impacts it has on for example, flooding, wild fires, and net primary production.

2. Characterisation: All substances are multiplied by a factor which reflects their relative contribution to the environmental impact, quantifying how much impact a product or service has in an impact category. Characterized results can be shown on two levels: midpoint or endpoint. Midpoint categories are the individual environmental themes, which are combined into the following 3 endpoint categories (the areas of protection):
   - Human Health: represents the life years both

lost and disabled
- Ecosystems: represents the loss of species during a certain time in a certain area
- Resources: represents the increased cost of a commodity due to an extraction or yield of the resource.

3. Normalisation(optional): The quantified impact is compared to a reference value, for example the average environmental impact of a European citizen in one year.
4. Weighting (optional): Impact categories are assigned an importance value that are used to generate a single score. Weighting is the most controversial and most difficult step in life cycle impact assessment, but it is used quite extensively for internal decision-making.

DATA INTERPRETATION

The last of the four steps in LCA is interpretation. The results of an LCA can be offer numerous insights. See the graph below of example LCA results.

From these results environmental hotspots and improvement opportunities can be derived. In this example, the environmental hotspots are the raw materials of the label (43%), the transport (17%), and the manufacturing of the label (18%). In this case reduction of the environmental impact will be most effective when focused on these areas.

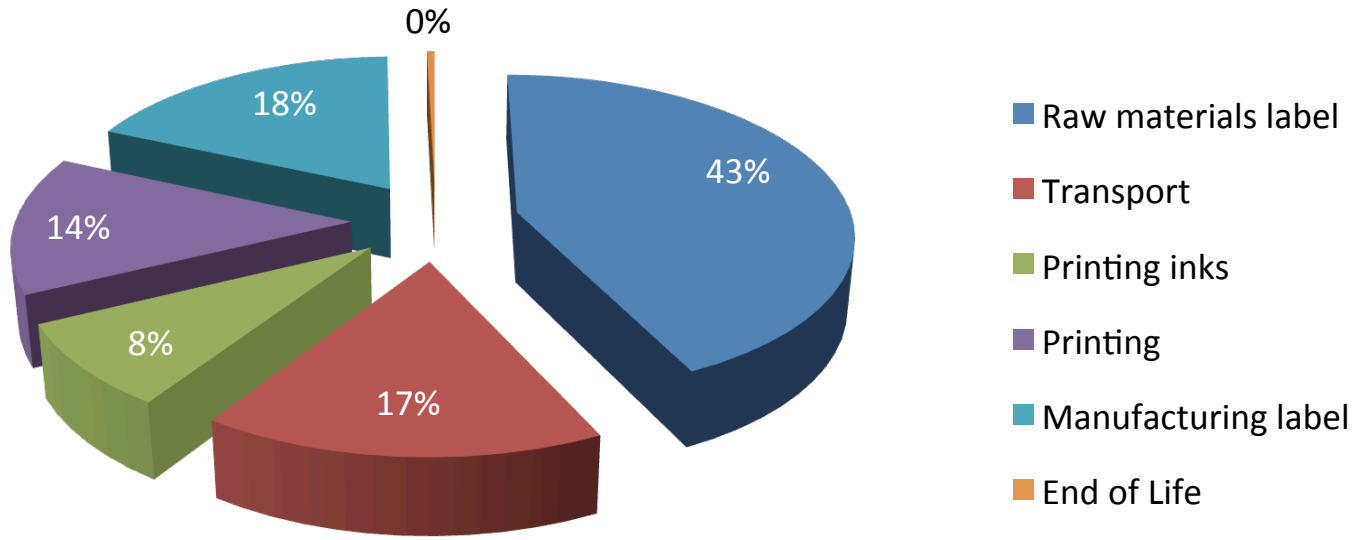
To ensure that the results are robust the following checks are recommended:

- Uncertainty analysis, to check the robustness of the data used e.g. variation in the data, correctness (representativeness) of the model, and incompleteness of the model.
- Sensitivity analysis evaluates the influence the most important choices have on the results. The principle is simple: change the assumption/inputs and recalculate the LCA. With this type of analysis, you will get a better understanding of how different assumptions affect the results. For example, if we were to change the percentage of matrix waste recycled how would this influence the results?

FINAL WORD

LCA is a robust methodology to measure the environmental impact of products. An integrated LA approach can create value for companies by guiding the optimization of operations, reducing costs (energy, packaging, etc.) and encouraging the development of greener products without transferring the potential impacts from one life cycle stage to another or from one environmental impact to another.

The pre-competitive harmonized sector LCA approach will facilitate the adoption of LCA within the labelling sector and as well as the communication of the results. This will create a level playing field and ensure that LCA results are comparable. This document will also provide guidance for those who are starting to LCA within their companies.



*ReCiPe Endpoint H/A, single score/EU normalization

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