Life Cycle Assessment (LCA)

A tool for holistic environmental profiling

Life Cycle Assessment , or LCA in short, is a methodology that has its basis in environmental and life sciences. It has the ability to assess the environmental performance in terms of impacts categories such as global warming based on inventories of energy and mass flows. It is applied world wide to profile products, services and scenarios.

Services

Using LCA we provide various services ranging from:

- Carbon footprint calculators
- Environmental product declarations
- Policy and transition scenario studies
- Prioritizing green purchasing and investments
- Benchmark technologies and products
- Design for the environment
- Identification of major drivers
- And more…

Key advantages

- Multi criteria analysis, known trade-offs in life cycle impacts
- life cycle thinking, including upstream, operations and downstream, direct and indirect impacts, known trade-offs in life cycle phases

LCA methodology

The fundamentals of the LCA methodology are laid down in the ISO 14040-series. According to ISO 14044 an LCA follows four steps;

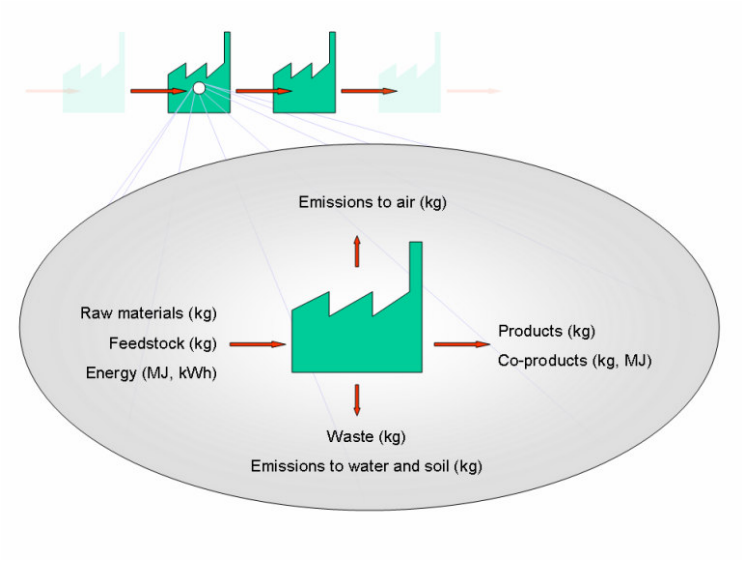
1. Goal and Scope
2. Inventory
3. Impact Assessment
4. Interpretation

1. Goal and Scope

The goal and scope is where the question is defined that needs to be answered. It includes the system boundaries of what is modeled and what not. It includes a definition of the functional unit. A functional unit is the unit to which all results are expressed. It usually consists of functional requirement over time. An example could be feeding 100,000 cattle in Texas, or providing a workspace for 1000 people for 20 years, or an office building performing for 75 years in Austin. The system boundaries express all the materials and processes that are included in the model that need to be in place to fulfill the functional unit. All together they present the life cycle. This can be demonstrated by looking at a product: it is produced, used and treated after use.

2. Inventory

Knowing what question to answer and what processes to include data have to inventoried. Since LCA is based on material and energy flows every step in the life cycle has to be defined in the following terms:



Using database the material and energy flows are traced back to impacts that are exchanged with nature. These are extracted raw materials, emissions to air, water and soil and final waste. The result is a list of environmental impacts. This is called the Life Cycle Inventory, or LCI.

3. Impact Assessment

The LCI data can be transformed to environmental impacts indicators. Examples are global warming, ozone layer depletion, summersmog and more. The process of transformation is called Life Cycle Impact Assessment, LCIA, and result in an environmental profile.

An example of a comparison of transportation with a barge of truck transporting an equal weight over an equal distance is presented below.

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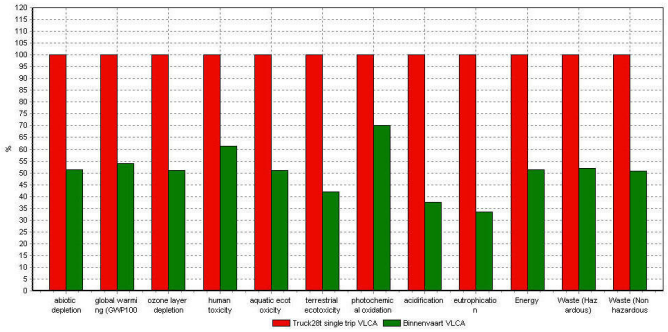


An example of the LCIA procedure can be shown by adding emissions of methane and carbon dioxide to be expressed in CO_2-equivalents based on their relative global warming potential

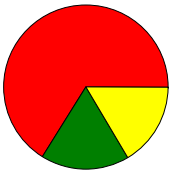
From carbon dioxide and methane to global warming
1 kg carbon dioxide = 1 kg CO_2-equivalents
1 kg methane = 24 kg CO_2-equivalents

Total = 25 kg of GWP-equivalents

The conclusion from this example is that you can better utilize methane by combustion than to release it to the atmosphere.

4. Interpretation

During the interpretion results are:



- Major drivers
- Normalization to the total impact in a geographincal area
- Sensitivity analysis for major assumptions, the use of different LCIA methodologies and other parameters that have an expected range

The power of the LCA approach is that every major driver can be traced back to the life cycle phase, the process and even the one very impact that is causing it. This knowledge leads to possibilities for improvement options. In comparisons it will tell us which product or scenario is best.

Software

There are different suppliers of LCA software. We have access to the most widely used software tool SimaPro®.

Databases

LCA uses mostly primary data for the processes under interest and secondary data for the processes that relate to energy, transportation and waste treatment.
The most eleborate databases are available in Europe, the U.S. is cathing up. We have licensed access to the most renowned database such as EcoInvent and FAL and incorporated those in our services, tailoring the to the needs and requirements for question to be answered. Our databases include information for more than 6000 processes and materials.

Environmental impact categories

Different end results can be obtainted depending on the goal and scope, but a general list of widely accepted environmental impact categories can be summarized as:

- global warming
- depletion of non-renewables
- depletion of the ozone layer
- acidification
- eutrophication
- summersmog
- aquatic ecotoxicity
- terrrestrial ecotoxicity
- human toxicity
- energy
- non-hazardous waste
- hazardous waste
- water

Other impact categories can be added for project purposes.

Our experience

We have an extensive experience gathered over a period of more than a decade in applying LCA to over 300 materials and scenario studies. We have built sector specific tools and databases. We assist producers in innovation and product improvements. We train people and organizations in life cycle thinking.

Your contact

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