

Introduction to Life Cycle Assessment



G.EN.ESI Education Centre

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Introduction

Life Cycle Assessment (LCA) is the evaluation tool that translates life cycle thinking into a quantitative assessment of the environmental impact of a specific product. It provides a holistic perspective encompassing product life cycle and environmental issues which arise during the product's life.

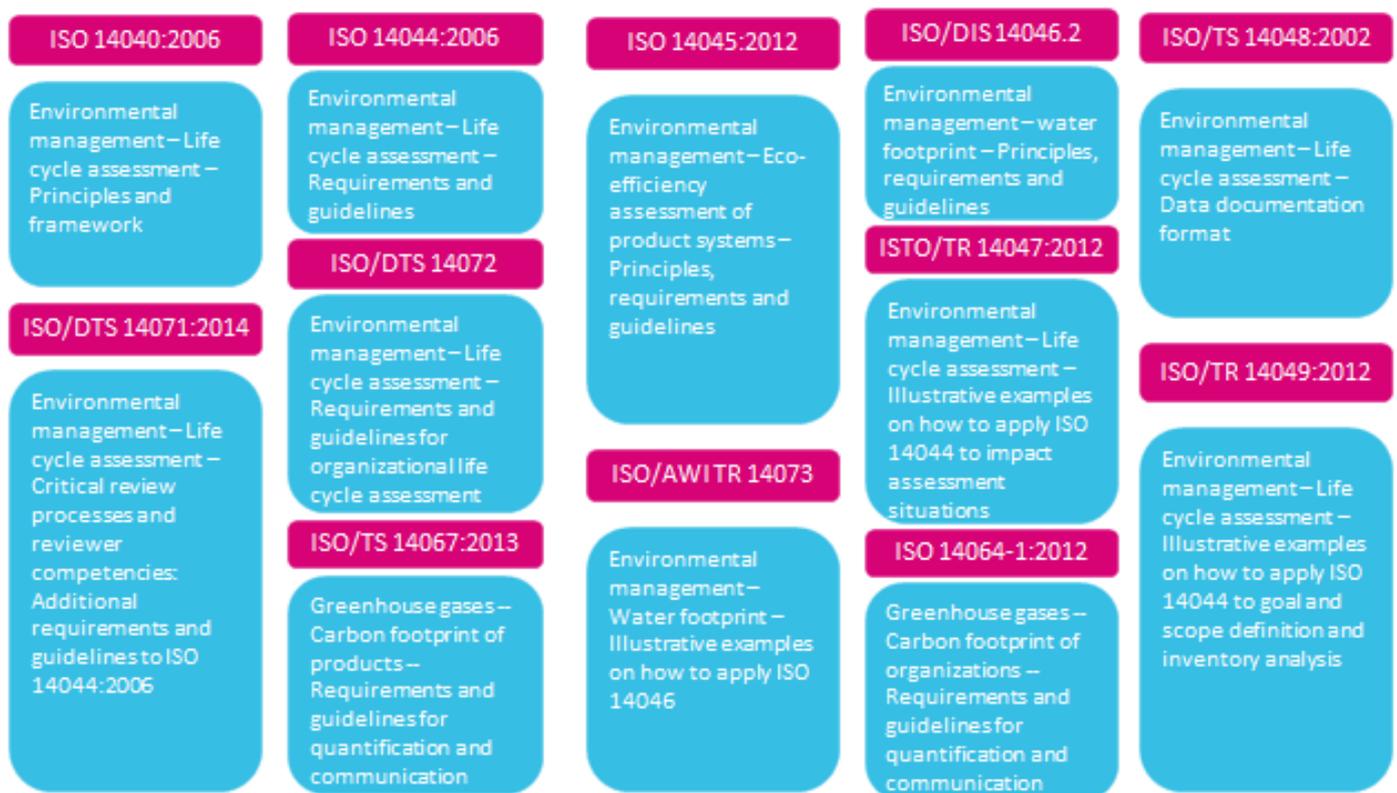
LCA has a primary role as decision-support tool. LCA is already used by many companies in industry, as an **internal** tool to detect inefficiencies, improve product design and plan improvement interventions, and **externally** to improve the competitiveness of the company's products and to communicate environmental performance to all stakeholders.

Definition

LCA is a structured and standardised method that quantifies the consumption of resources and other inputs, the amount of emissions and other outputs, and the related environmental and health impacts that are associated with any product or process [1]. LCA takes into account the whole product life cycle, in other words it evaluates the product's impact "from cradle to grave". The main advantage of LCA is that it tries not to "shift burdens" from one lifecycle phase to another, avoiding resolving one environmental problem through the creation of others.

International standards for LCA have been available since the late 90's and have encouraged the acceptance and dissemination of the LCA methodology on a large scale. Standards have become clearer, and now include the recent development of footprints, such as the Water and Carbon footprint.

The figure below shows the international standards regarding Life Cycle Assessment (ISO 14040/70 series) and standards regarding the Carbon Footprint for products and organizations (ISO 14070 series).



Normative framework for LCA and life cycle-based methods



Advantages

Several advantages arise from the implementation of LCA, such as:

- Reduction of costs. Cost saving is a major driver for companies, and an optimisation of the resources in every life cycle phase leads to reduced costs in the whole life cycle;
- Improved reputation. Governments, national institutions and international institutions are challenging companies to be "eco-friendly", by decreasing resource usage, energy consumption and production of waste;
- Provision of reliable data in order to direct the user towards lower environmental impact and more efficient activity;
- It is the only standardised method for the assessment of environmental impact of a product/service, covering a broad spectrum of indicators.
- With the recent communication on "Single Market for Green Products" [2], the European Commission recommends the use of the method whenever it is required to quantify and communicate the environmental impact of products/services.

Developments in LCA

The LCA methodology is continuously evolving towards a more accurate model, a wider set of indicators including socio-economic aspects, and a wider scope, in order to better support the definition and implementation of environmental policies. In addition, LCA principles are used within the carbon footprint, water footprint and eco-efficiency evaluation.

The European Commission (EC) recognises LCA as "the best framework for assessing the potential environmental impacts of product" [3]. The new initiative of the EC on product environmental footprint (PEF) goes a step further in LCA implementation by making it the tool for the future "green tag" for products. PEF aims to give an environmental score to every product in order to support consumers in decreasing the environmental impact of their product selection choices.

Communicating the environmental footprint

The results of LCA can be communicated in different ways and at different levels of detail depending on the specific context, and the following issues should be considered:

- Defining what question is being addressed and why;
- Identifying the stakeholders involved and affected by the decision, such as institutions, producers, enterprises in the supply chain, consumers and NGOs;
- Identification of the target audience of the study (i.e. to whom the results are intended to be communicated), which strongly affects the way in which results can be communicated;
- The level of detail of the assessment. Simplification has led to new approaches and some spin-off standards such as Single-issue LCAs, for example carbon footprint (ISO 14067) or water footprint (ISO 14046);
- Defining the method of communication. According to the communication principles stated in the ISO 14020 standards series, environmental labels should be accurate, relevant and not misleading. They should enable international trade and be based on scientific methodology. In addition the process of developing environmental labels and declarations should include an open, participatory consultation with interested parties.

Eco-label, carbon footprint and water footprint have been developed to target the general public, so they should be easy to understand and respond to. LCA results may also be communicated to industry, where detailed reports, environmental data or structured output, such as the Environmental Product Declaration (EPD) may be more appropriate due to the increased level of LCA knowledge.

Conclusion

The Life cycle assessment methodology offers a highly structured framework to address environmental issues for products and services. It is likely that LCA will continue to evolve in varied directions in the next decade in order to support the decision-making of different stakeholders concerned with life cycle sustainability management.



Further reading

There is a great deal of information available on Life Cycle Assessment and its implementation. Rather than reproducing it, we would recommend that you follow the links below for further information:

- <http://www.setac.org/>
The Society of Environmental Toxicology and Chemistry (SETAC), which is a not-for-profit organisation, composed of institutions, individual members, businesses and governments. SETAC was conceived as the first forum for interdisciplinary communication amongst environmental scientists. At present, thanks to its multidisciplinary approach, it is broader in concept and application than many other societies;
- <http://ec.europa.eu/dgs/jrc/>
The Joint Research Centre which provide scientific advice and technical know-how to support a wide range of European Union policies. The JRC addresses key societal challenges whilst stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners;
- <http://www.unep.org/publications/default.asp>
The United Nation Environment Programme. This web platform has been created to share research content and knowledge about climate change, environmental performance, resource efficiency, chemical and other waste and much more;
- <http://www.epa.gov/>
The United States environmental protection agency whose mission is to protect human health and the environment through the development and enforcement of regulations, teaching people about the environment and helping companies to understand requirements.

References

[1] ISO 14040:2006 Environmental Management – Life cycle assessment – Principle and framework

[2] European commission website <http://ec.europa.eu/environment/eussd/smgp/>

[3] Integrated Product Policy - Building on Environmental Life-Cycle Thinking /* COM/2003/0302 final */ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52003DC0302>

