**LIFE CYCLE ASSESSMENT AND**

**CARBON FOOTPRINT**

* **case WOOD**

**Teachers handbook**

**with theory and assignments**

**1 credit**

**CC - Nina Kokkonen, Häme University of applied sciences**

**Teacher's Guide:**

**Learning material and assignments for teaching LCA for wood products**

***What does life cycle assessment mean?***

***Why is life cycle thinking important?***

***To which purposes can we use life cycle assessment in the field of sustainability?***

**CC:** Nina Kokkonen, Häme University of Applied Sciences

**Objective:** To understand the basic concepts of LCA and what is meant by carbon footprint in the case of wood products.

**Facilities and accessories and duration:** The study material is suitable for reading independently and to be used at lectures / in classrooms. The assignments are intended for studies at universities of applied sciences, are suitable for the field of bioeconomy and can be completed orally or by writing. Tasks require an internet connection. The scope of the task is 1 credit, 27 working hours.

**Progress in the assignment**: The teacher prepares an introductory lecture (use LCA ppt as background) in classroom or online to familiarize students with life cycle assessment and the assignments. Students study independently the presented background material and do the assignments in the classroom or online.

**BASIC IDEA**

Life cycle assessment can be helpful when identifying opportunities to improve the environmental performance of products at different stages of their life cycle, emissions to air, water and soil. In life cycle assessment, decisions are made primarily on the basis of natural sciences.

* providing information for decision-making to industry, government or organizations (e.g. for strategic planning, prioritization, product or process design or development);
* selecting relevant environmental performance indicators and their measurement methods, and
* marketing (e.g. implementing an eco-labelling scheme, making environmental claims or preparing an environmental product label).
* Life cycle assessment addresses the environmental aspects of a product and its potential environmental impacts (e.g. use of natural resources and effects of emissions on the environment) throughout its life cycle from raw material production to production, use, decommissioning, recycling and waste disposal (cradle to grave).

Life cycle assessment reports to be used in publicly available comparative claims are subject to specific requirements.

A life cycle assessment report has four stages:

* The stage of defining the objectives and scope.
* Inventory Analysis Phase. The Inventory Analysis Phase (LCI Phase) is the second phase of a life cycle assessment. It is an inventory of the input and output data of the system under study. It includes the collection of information necessary for a defined survey.
* Impact Assessment Phase. The Impact Assessment Phase (LCIA) is the third phase of a life cycle assessment. The purpose of the impact assessment is to provide additional information to help evaluate the results of the inventory analysis of the product system in order to better understand its environmental significance.
* Interpretation phase. The interpretation of the results is the last step in the life cycle assessment procedure. At this stage, the results of an inventory analysis (LCI), an impact assessment (LCIA), or both, are combined and addressed as a basis for conclusions, recommendations, and decision-making, as defined in the objectives and scope.

Life cycle assessment is one of many environmental management techniques (e.g. risk management, environmental performance assessment, environmental auditing, and environmental impact assessment) and may not be best suited to all cases. Life cycle assessment does not usually address the economic or social aspects of a product, but the life cycle approach and methodologies described in this International Standard can also be applied to these aspects.

An iterative procedure is used both in the interpretation phase and in the other phases of the life cycle assessment.

The use of the results of the life cycle assessment for benchmarking raises particular concerns and requires the use of critical appraisal, as such use is likely to affect stakeholders outside the life cycle assessment. However, the conduct of a critical appraisal should in no way be used as a procedure for accepting any benchmark based on a life cycle assessment report.

**Carbon footprint**

The carbon footprint is a way of describing the total amount of greenhouse gas emissions over the life cycle of a product. The carbon footprint calculation is an excellent tool for determining at what stage in the product life cycle the largest emissions occur and how they could be reduced.

Trees sequester carbon dioxide (CO2) as they grow and release O2. Carbon is bound in the trunk and after production is thus bound in the wood product.

There are two different indicators of the carbon footprint of wood products:

* **Biogenic carbon footprint** - how much carbon is bound in a wood product
* **Fossil carbon footprint** - the amount of emissions over the life cycle of a product

**WHY SHOULD THE CARBON FOOTPRINT BE CALCULATED?**

The carbon footprint is a good measure of climate emissions. The more companies report on the carbon footprint of their own products and services, the easier it will be to make climate-friendly purchasing decisions!

Those companies that have calculated their emissions and report them openly deserve to be highlighted. Such pioneering companies also serve as good examples for others.

**Materials:**

Power point presentation:

Life cycle assessment (LCA) - (include some videos)

Videos:

Life Cycle Assessment

<https://www.youtube.com/watch?v=cYOC8_jJcII>

TED-ed – Plastic bottles example

<https://www.youtube.com/watch?v=_6xlNyWPpB8>

TED-ed - The life cycle of a t-shirt

<https://www.youtube.com/watch?v=BiSYoeqb_VY>

Reading materials - Case Wood:

Carbon footprint and environmental impacts of print products from cradle to grave

<https://www.vttresearch.com/sites/default/files/pdf/tiedotteet/2010/T2560.pdf>

Act for the climate - USE WOOD

<https://www.metsateollisuus.fi/uploads/2017/03/30035833/485.pdf>

**Assignments:**

1. Find out what kind of emission factors wood-based products have, using the following source: <https://www.openco2.net/fi/>. Try to solve question: Is it better to use paper cups for coffee instead of ceramic cups?
	* Discuss your findings in a group
	* Compare your findings to this press release: <https://www.huhtamaki.com/en/media/media/press-release/2019/life-cycle-study-shows-a-paper-cup-has-the-lowest-carbon-footprint---and-recycling-makes-it-even-smaller/>
2. Prepare a SWOT analysis (in a group) for the **use of wood in paper cups**
	* See instructions for SWOT here: https://www.liveplan.com/blog/what-is-a-swot-analysis-and-how-to-do-it-right-with-examples/
	* Present the results to the other groups
3. Find out: (this is recommended to be done as a homework before assignment 4.)
	1. what does functional unit mean in LCA?
	2. what do system boundaries mean?
4. Group work (time spent for this 1 - 2 hours in a classroom or couple of days online):

Your task is to complete a life cycle assessment for two different drinking items: for a 2 dl cup made from carton and for a 5 dl plastic bottle. Your goal is to find out how replacing plastic bottles with carton cups in a sports event effect the carbon footprint of the event. How will you set the functional unit? And what do you need to take into account when you form the system boundaries?

* + Results are compared and discussed in combinations of two (2) groups.
	+ This assignment can be given to students
1. Find examples of how wood affects the carbon footprint of buildings as a building material instead of concrete. Share your findings with your group.
	* This can be done online in a discussion forum.