

Rapport GrasGoed

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Environmental Life Cycle Costing as an addition to LCA studies



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Report

Environmental Life Cycle Costing as an addition to LCA studies

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1 Introduction

1.1 Reason for this study

The Interreg project GrasGoed has investigated the possibilities to re-use grass from nature reserves. Environmental Life cycle costing (LCC) is a method to calculate the environmental costs of a certain product or service. This method has similarities to life cycle analysis (LCA), but is far less common and developed. Within GrasGoed we looked into the possibilities of this method.

1.2 Goal

The goal was to find out the status of this method and see how we can apply the methodology to for example the LCA's we did within GrasGoed. This document describes our findings.

2 Findings

2.1 Why Life Cycle Costing

The result of an LCA is a list of environmental impacts of a product. This does provide insight in the individual impacts, but it is difficult to put those values into context and quite often to draw conclusions on the overall environmental friendliness of a product. Normalization and weighting do partly solve this problem, but the obtained numbers are still difficult to interpret for the general public. Besides weighting can be a subjective step with a huge influence on the final result and conclusion.

LCC does put a price on environmental impacts. It gives for example a price to a kg of CO₂-eq or kg SO₂-eq. If all impacts have a price and are therefore given in euros, they can be added up and the product has a price representing its total environmental burden. The environmental burden is given in euros, which is a unit that is easier to understand for the general public than the LCA results.

Another reason to use LCC could be to add information to a cost benefit analysis (CBA). The environmental costs which result from a certain investment can be included as costs within the CBA which enhances a more informed decision.

2.2 Environmental pricing

Although this sounds as an objective method, the prices are not natural science and therefore not set. They are sensitive to methods used and assumptions made in their determination; furthermore they may change in time and location.

Environmental prices represent the value of the loss of welfare due to one additional unit of pollution (eg. 1 kg CO₂). Since there is no market for environmental quality, there are also no market prices. Environmental prices are therefore derived from studies on human preferences for avoiding environmental impacts. They represent what people are willing to pay for environmental quality.

The Environmental Prices Handbook of CE Delft (2018) provides a list of environmental prices that can be used for the applications described above. The prices they report are at pollutant, midpoint and endpoint level¹.

¹ Although midpoints and endpoints are derived from the ReCiPe methodology, they are not exactly the same due to the methodology to obtain the prices.

2.3 Application of LCC

The values presented by CE Delft cannot simply be used as addition to the LCA's done in for example GrasGoed. The values represent the average Dutch situation. The effect of a pollutant depends however on the current environmental quality and the location and circumstances under which it is emitted.

As an example; the damage (and therefore the price) of air pollutants emitted in a densely populated area is higher than if emitted in areas with no people or ecosystems sensitive to the particular pollutant.

The report states that damage costs can vary because of local circumstances and the nature of the emissions. The prices are for example less representative and mostly underestimating the costs for transport emissions. Reason for this is that here the pollutants are emitted in a particular way.

2.4 GrasGoed cases

There are two reasons not to apply the environmental costs from the Environmental Prices Handbook to the cases in GrasGoed.

1. Environmental prices are a tool to weight the environmental impacts of an LCA. The purpose of the LCA's performed within GrasGoed was mainly marketing, in which the "grass" product was compared to its conventional alternative. The ISO standard for LCA does not support weighting for comparative LCA's.
2. The given environmental prices are not representative for all processes in the LCA models. Many processes take place outside the Netherlands. Besides part of the emissions originate from transport.

3 How to proceed with LCC?

The methodology for LCC is not fully developed yet and is subject to research for environmental economists. Findings from the study so far are:

- To apply environmental prices only if they are representative for the study at hand in location and nature of emissions.
- Only for general decision support and not for specific cases in which average numbers are less applicable.

The second finding can be combined with the insight that LCA as well as LCC might be interesting to support decisions in the field of upscaling certain innovations or even subsidizing certain innovations (Thomassen, 2017).

Further reading

CE Delft, 2018. Environmental Prices, Handbook 2017, Methods and numbers for valuation of environmental impacts. Publication code: 18.7N54.057

Thomassen G, Van Dael M, Lemmens B, Van Passen S, 2017. A review of the sustainability of algal-based biorefineries: Towards an integrated assessment framework. Renewable and Sustainable Energy Reviews, Vol 68-2 P. 876-887.