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# Different markets, different business model environmental performance?

Analysing a novel recycling service for a single-use paper-based product with business model LCA (BM-LCA)

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## Extended abstract

### Introduction

In the transition away from the unsustainable production-consumption system of today, companies' business models must evolve (Lüdeke-Freund, Gold and Bocken, 2018). Circular business models are commonly proposed as more sustainable alternatives to the classical linear business models (Böckin et al., 2020), and as means for transitioning to a circular economy (Lüdeke-Freund, Gold and Bocken, 2018). Goffetti et al. (2022) note that while there is considerable trust in the potential of these business models to contribute to sustainability transitions, their actual environmental performance is rarely assessed. Böckin et al. (2022) found that although many LCA-studies claim to assess the environmental performance of business models, they merely assess their products. In response to the lack of systematic methods to assess the environmental performance of business models, Böckin et al. (2022) formulated the business model LCA (BM-LCA) methodology.

The BM-LCA method is designed to quantify and compare the environmental impacts of business models themselves (Böckin et al., 2022). Thus, the method allows for critical evaluation of business models, and offers possibilities to guide businesses towards decoupling. Previous BM-LCA studies have compared circular or servitized business models with linear business models and explored the potential to use the method for business model innovation (Baumann, 2023; Goffetti et al., 2022). Goffetti et al. (2022) contend that BM-LCA appears as a promising tool for measuring business models' environmental impact and for business model innovation, but highlight the need for

further studies, applying the method to new scenarios and investigating other potential areas of use.

### **Aim**

This (ongoing) case study applies BM-LCA to assess whether a novel recycling service for a single-use paper-based product, launched by a multinational hygiene products company, could contribute to decouple its business models around the product, on different markets. The study is a means for exploring how the level of decoupling of business models may vary across markets, and the potential of BM-LCA for analysing this dependency.

### **Business model LCA (BM-LCA)**

BM-LCA can be viewed as an extension of the well-established LCA methodology for assessing the environmental impacts of products (Böckin et al., 2022). The functional unit in conventional LCA is a quantified physical property representing the function provided to the user of a product (or service). The environmental impacts of a product are scaled with respect to the functional unit, offering the possibility to compare different options which provide the same function in terms of environmental performance.

However, the function a product provides a user is fundamentally different from the function a business model provides a company. Böckin et al. (2022) describe that a business model can be defined as a way in which a company makes money. The primary function of a business model, from a company's perspective, is arguably to generate profit. To compare business models in terms of environmental performance, the basis of comparison should reflect its economic performance.

One factor to a business model's economic performance is the function provided to the customer, which conventional LCA accounts for (Reim, Parida and Örtqvist, 2015; Böckin et al., 2022). This is nevertheless not the only factor; the economic performance of a business model depends on a combination of factors, including said function, pricing and production and distribution patterns (Reim, Parida and Örtqvist, 2015). Assessing the environmental impact of a business model with respect to the function provided to a customer is thus insufficient (Böckin et al., 2022). Regardless how low environmental impact a product has, the business model through which it is provided is not guaranteed to have low impact in total if it entails mass production and consumption.

By coupling monetary flows to material and energy flows and also taking economic performance as unit of comparison (i.e., functional unit), BM-LCA enables the assessment of environmental impact of business models as such (Böckin et al., 2022). This quantifies the total environmental impact associated with a certain level of economic performance, which is a measure of the business model's level of decoupling. Thus, BM-LCA extends the LCA methodology to the study of business models by scaling the environmental impacts of products, as determined through conventional LCA, with respect to business models' economic performance.

As of June 2023, the BM-LCA method had been applied in two completed studies and three additional studies were under way (Baumann, 2023). The study from Goffetti et al. (2022) presents a comprehensive application of the method and focuses on its potential role for business model innovation. Goffetti et al. (2022) exemplify how sensitivity analysis of BM-LCA results, with respect to various parameters, can be conducted to analyse the influence these parameters have on business models' environmental performance.

### **The case study**

In the company's novel recycling service, the single-use paper-based product is disposed of separately and later collected and transported back to the company's production site. Through a series of processes, the disposed products are recirculated into the production of new products of the same kind, and other single-use paper-based products. The given product is normally disposed of as general waste, in that sense linear business models around the product are common practice. The company has examined the environmental performance of the recycling service through LCA, which shows it contributes to lower impact per product. However, this does not necessarily imply it contributes to decoupling, as the service also entails altered monetary flows.

While the recycling service is not a fully developed business model, a circular business model scenario in which the recycling service is scaled up is constructed, as to apply BM-LCA and compare this scenario with the company's current linear business models around the product. The BM-LCA:s of these business model scenarios employ real data on the monetary flows in the company's business models and on the flows of material and energy in the product systems.

The market dependency of the scenarios' environmental performance is analysed by setting these on the Swedish and German markets respectively, markets in which the company operates and offers the recycling service. This market analysis is conducted through varying technical and economical parameters as to reflect differences in the company's own processes and the background system (i.e., energy and waste management systems) on the two markets. Further sensitivity analysis with respect to said types of parameters is carried out to analyse what factors influence the business model scenarios' level of decoupling, and what this implies for their environmental performance on other markets.

### **Synthesis and potential contributions**

The study presents another application of the recently developed BM-LCA methodology. A novel recycling service for a single-use paper-based product is evaluated with regards to its potential to decouple the manufacturing company's business models around the product. As such, the study responds to the calls from Böckin et al. (2022) and Goffetti et

al. (2022) for applications of the method on different types of business models, in different industries.

The study seeks to further add to the nascent field of research around BM-LCA by conducting a market analysis of the business model scenarios' environmental performance, by means of sensitivity analysis of BM-LCA results. This approach was proposed by Böckin et al. (2022) and has to our knowledge not yet been undertaken in any BM-LCA study. A literature search on the topic of market dependency of business models' environmental impacts suggests this issue composes a knowledge gap, which the case study may contribute to explore.

## Keywords

Life cycle assessment, Business model, Circular business model, Case study, Market analysis

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