

## Challenges when evaluating Product/Service-Systems through Life Cycle Assessment - DTU Orbit (08/11/2017)

### Challenges when evaluating Product/Service-Systems through Life Cycle Assessment

Life Cycle Assessment (LCA) is a state-of-the-art method for conducting environmental assessments of systems, whether these consist of goods or services, or a combination of the two. However, current LCA guidelines focus on assessing tangible products and lack specific attention to more complex systems, such as Product/Service-Systems (PSS), which also consist of intangible elements. PSS imply a shift in business paradigm from selling specific products to delivering a function, through a mix of products and services, thereby incentivising resource efficiency as well as user satisfaction. Despite their potential to reduce environmental impacts, PSS are not by default more environmentally benign compared to conventional systems, and quantifications of their environmental performance are called for. This paper contributes by showing that specific challenges need to be addressed when using LCA to evaluate the environmental performance of PSS. We identify a set of PSS characteristics that can challenge an LCA study. Three relevant scopes are distinguished, where LCA may be applied: (1) evaluating options within the PSS itself; (2) comparing a PSS with an alternative; and (3) modelling the actual contextual changes caused by the PSS. We derive three pronounced challenges when conducting LCA within the three scopes: (i) identifying and defining the reference system; (ii) defining the functional unit; and (iii) setting system boundaries. We elaborate on how these challenges are discussed in current literature. Recommended future work includes developing adapted guidelines and further empirical case studies that quantify the environmental changes and impacts caused by introducing PSS.

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