Guidelines for evaluating the environmental performance of Product/Service-Systems through life cycle assessment

Product/Service-Systems (PSS) such as integrated solutions, performance-based contracts or sharing systems are often proposed as means to enable improved environmental sustainability. However, PSS are not necessarily environmentally benign compared to conventional systems. Quantitative environmental performance evaluations of PSS are hence needed. Life cycle assessment (LCA) is a commonly used method for environmental performance evaluation. However, applying LCA in the context of PSS requires specific considerations, which are not sufficiently addressed by current LCA guidelines. In this article, we propose a set of guidelines consisting of six steps, which elaborates the LCA process with respect to the specific consideration for PSS assessment. The guidelines were developed based on identified challenges for the application of LCA on PSS, a review of existing LCAs on PSS case studies, expert consultations, case study applications, and structured user feedback. The use of the guidelines is demonstrated on three exemplifying cases, covering three different scopes for PSS evaluation. By applying the guidelines, the risk of biased results, predictable rebound effects and significant cut-off errors should be reduced. Future work includes evaluating the guidelines through full-scale case applications and further development of dynamic and prospective modelling approaches for assessing systemic consequences and rebound effects.

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