QUANTIFYING WASTE PREVENTION WITH LCA TO MOTIVATE HOLISTIC RESOURCE MANAGEMENT

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With the Waste Framework Directive, waste prevention was promoted first priority for all EU member states in 2008 because it is superior to preparing for re-use, recycling and other waste management options in terms of resource efficiency. However, the actual implementation of waste prevention activities has so far been hesitant and the focus on end-of-pipe waste management instead of a holistic resource management prevails. Reasons include the limited measurability of waste prevention effects and the consequential lack of awareness, motivation and incentives. Our research aims to quantify waste prevention and its environmental impacts using Life Cycle Assessments and, thereby, to induce the efficient implementation of waste prevention concepts into municipalities’ strategies.

Within a two-year-project, we developed a framework to support municipalities in establishing holistic resource management. The framework comprises three phases to set up waste prevention concepts and includes a detailed guideline as well as a methodology for the evaluation of potentials and measures. Since the impacts of waste prevention can only be identified with a holistic approach, LCAs were used to calculate the potentials for quantitative as well as qualitative waste prevention. The analyzed measures were selected based on an empirical study covering 111 municipalities and include 5 waste streams and several areas of responsibility. To better motivate communities to take action and to implement waste prevention concepts, tangible impact categories and their midpoint-values were used. The impact categories for this study emerge directly from the European Waste Framework Directive and cover Waste Generation (Waste), Global Warming Potential (GWP), Water Scarcity (WSI), Mineral Resource Depletion (MRD) and Human Toxicity (H.-Toxicity).

The applicability of the proposed framework was evaluated using 5 real-world case studies (3 case studies concerning digitalization and electronical workstations, 1 case study concerning the supply of drinking water, 1 case study concerning lighting systems). Results prove that waste prevention offers high potential to reduce environmental impacts. For instance, the supply of drinking water with an Aquatower instead of PET or glass bottles amounts to a quantitative waste prevention of up to 96%. Greenhouse gas emissions in this case are highest using one-way PET bottles and can be reduced by more than 60%. The use of different impact categories enables decision makers to choose waste prevention measures according to individual preferences. For instance, the Aquatower is the best choice if waste prevention and GWP reduction is emphasized, while Glass bottles are superior when it comes to minimal metal resource depletion.

![Figure 1 - LCA results for supply of drinking water](image)

The proposed approach for the quantification of waste prevention potentials not only ensures higher motivation and awareness of decision-makers and staff members, it also supports the communication of achieved sustainability effects to stakeholders. Additionally, the use of different environmental impact categories allows communities to select the appropriate option to operationalize their overall ecological values.