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Sustainability assessment of regional bioenergy case studies: review and testing of feasible criteria and indicators under a life cycle perspective

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Abstract: Biomass is the most important source for renewable energy in Europe and there is still potential to increase its contribution. Nevertheless, the sustainable use of biomass has to be assured to avoid critical impacts on environment, society and economy. Various sustainability criteria for biomass were proposed in recent years. To test their feasibility in practice, ten pilot cases from small and medium enterprises in five different regions in Europe were investigated, ranging from forest biomass supply to various energy conversion systems and wood ash recycling. This study tested the applicability of sustainability criteria in the context of specific implementation projects of local companies, and revealed gaps between theory and practice. Time constraints and limited data availability often prevented a quantitative assessment of criteria, which is why more qualitative assessments needed to be considered, so that any relevant criteria were not overlooked. Quantitative assessments of GHG emissions of a given bioenergy chain was enabled to some extent by the use of default values from literature. However, the use of default values cannot fully replace calculations of lifecycle GHG emissions by means of LCA, which is one of the most efficient options to determine environmental bottlenecks in bioenergy systems.

Keywords: solid biomass, bioenergy, sustainability, LCA, forestry residues, landscape elements, energy crops, life cycle, assessment criteria, case study