
Environmental sustainability of energy systems: Relevance of life cycle assessment and case of electricity generation

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Abstract

Damages to ecosystems, human health and natural resources caused by anthropogenic activities are increasingly recognised by industries and authorities. To address these issues, tools allowing for assessing and managing these damages have thus gained more and more importance over the past decades. In that setting, life cycle assessment (LCA), which is a decision-support tool aiming at quantifying relevant environmental impacts in a comprehensive manner, has started to play an important role. Recommended by the European Commission (EC) in a number of domains, e.g. solid waste management (EU Directive 2008/98/EC), it can assist decision- and policy-makers to move societies towards more sustainability. After giving a brief overview of the challenges that societies face when addressing environmental sustainability, LCA will be introduced and its strengths will be reflected on the case of electricity generation in Europe, where the political awareness of the global challenges posed by climate change and resource depletion has guided several countries to gradually move from a dominant use of fossil fuels towards more utilisation of renewables. Taking examples of assessments at single technology level as well as at whole grid mix level, risks of suboptimisation, e.g. policies targeting reduction of a specific impact while inadvertently increasing others, will be evidenced. This will demonstrate the need to include holistic quantitative sustainability assessments in policy-making at large and in particular within the energy sector to ensure environmentally-sound energy transition.

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