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How to consistently make your product, technology or system more environmentally-sustainable?

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Human activities are currently unsustainable, causing many damages to ecosystems, human health and natural resources. In this setting, the development of new products and technologies has been increasingly required to relate to sustainability and ensure that such development goes hand-in-hand with low environmental impacts, low-carbon emissions, low environmental footprints or more sustainability as a whole. To enable a scientifically-sound and consistent documentation of such sustainable development, quantitative assessments of all environmental impacts are needed. Life cycle assessment (LCA) is recognized as the most holistic tool to address that need. LCA has two main strengths: (1) the ability to quantify all relevant environmental impacts – not just climate change, but also metal depletion, water use, toxicity exerted by pollutants on ecosystems and human health, etc.; and (2) making the assessment of the product/technology in a life cycle perspective, from the extraction of raw materials through production and use/operation of the product up to its final disposal. Fully embracing these 2 features enables to minimize the risk of burden-shifting, e.g. if impacts on climate change are being reduced while increasing other relevant environmental impacts or if impacts are shifted from the use stage of a product to the manufacturing stage as a result of a change in the product composition. Here, we provide a glimpse at how LCA can help for eco-design purposes, moving towards the use of low-impact materials, identifying environmental hotspots (parts of the life cycle with largest environmental impacts), making prospective simulations through scenario analyses, comparing and selecting most environmentally-friendly product/technology alternatives, reporting on the environmental performances of the system. We rely on state-of-the-art science in the food sector, the aquaculture sector and the energy sector to showcase and illustrate the potential of LCA to undertake the environmental sustainability challenge and support product/technology/system development.
