Integrating Social Sustainability: Social Life Cycle Assessment and its application to green hydrogen

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In the context of the transition towards sustainability, green hydrogen and related technologies are seen as being important in helping to reduce our carbon emissions globally. The United Nations defines sustainability in terms of three main areas: the environment, the economy and society. Nevertheless, the academic community has yet to conduct a comprehensive investigation into the social implications of this energy transition. With regard to the social dimension, Social Life Cycle Assessment (SLCA) represents an emerging methodology for the assessment of potential social impacts along product supply chains from a life-cycle perspective. In 2020, the United Nations Environment Programme (UNEP) updated the SLCA guidelines. SLCA can be used to evaluate multiple social aspects of a product's life cycle and their potential positive and negative impacts across the different life cycle stages or stakeholder groups. The framework offers a systematic approach that integrates quantitative and qualitative data, providing insights into social and socio-economic aspects that can inform decision-making, human rights due diligence, and sustainable design. SLCA can be employed to identify social hotspots in the supply chain of a product, examine options for the social improvement of the supply chain, or compare the social performance of product systems. Green hydrogen has received considerable policy, economic, and technical attention, particularly with regard to environmental life cycle assessment (LCA), life cycle costing (LCC), and cost-benefit analysis. However, the social sustainability implications of a significant deployment of green hydrogen in the context of the sustainability transition remain underdeveloped. In particular, in consideration of SLCA-based approaches to the production of green hydrogen and related technologies such as electrolysers and fuel cells, the amount of research is limited. In light of the considerations presented, an overview will be provided of current research into the social life cycle assessment (SLCA) of green hydrogen, with a particular emphasis on the main case studies that have been analysed thus far. The main findings from the literature in this field will also be discussed, together with an analysis of the strengths and limitations inherent in this research area.