Developing an empirically based agent-based model to support local transitions

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Abstract

Sustainable technologies (e.g., hydrogen) have great potential to contribute to achieving sustainability goals. Nevertheless, sustainable technologies are often not readily adopted. Many transitions are currently being explored with agent-based models, allowing stakeholders to explore different scenarios to advance local transformations. However, in most cases, agent-based models, mainly built by engineers, still assume the rational actor. Actual decision-making behaviour is, however, hardly rational, lowering model reliability. A theory-based framework describing technology adoption behaviour is needed to represent local systems and actor behaviour in agent-based models accurately. Integrating psychological factors regarding adopting sustainable technologies in agent-based models helps address the complexity of the interrelated technical and social phenomena and the heterogeneous social actors. In the presented research, we, based on the results of a quantitative literature review and an initial study, build a theoretical framework that includes influential psychological factors of technology adoption and distinguishes between individuals, households and organisations. With this distinction, we explore whether similar or different factors are relevant for the various stakeholders. Through our research, we seek to advance the application of behavioural insights in energy system modelling and provide a better understanding of agent-based model potentials, which allow the exploration of outcomes of different scenarios and thereby contribute to successful decision-making and intervention design. We discuss implications for transition research and reflect on hurdles and solutions regarding the integration of psychological insights into an agent-based model.