UNIVERSITÄT LEIPZIG

Wirtschaftswissenschaftliche Fakultät
Institut für Infrastruktur und Ressourcenmanagement
Professur für Energiemanagement und Nachhaltigkeit
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Call for theses:
Modelling the Diffusion of Rooftop PV Systems: Calibration & Validation of Agent-based Model(s)

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Motivation

In 2020, the primary energy consumption of private households amounted to 27.4%, showing the importance of household-level decarbonization for successful energy infrastructure transformation. Arguably, technological innovation and their adoption by private households can have a large impact on the environment and climate change mitigation.

While institutional change largely depends on (rational) arguments and the influence of ‘green’ behavior on an institutions’ image, the behavior of private consumers is a complex amalgamation of opinion dynamics, societal and peer pressure, perceptions, preferences, advertisement and a large range of cognitive factors.

Understanding the behavior and decisions of consumers is not only important for successful product launch planning, but also for actors in the public sphere promoting climate change mitigation. Agent-based modelling (ABM) of innovation diffusion has shown to give insight in these dynamics and to assess strategies to address these questions. However, models need to be validated and calibrated, which is particularly difficult for stochastical models.

Background

To investigate the diffusion of rooftop photovoltaic (RPV) systems in municipal context, the chair of Energy Management & Sustainability developed the modular agent-based innovation diffusion framework IRPact, which is suitable to quickly generate different process models for the study of the diffusion of sustainable energy innovations. Within this framework, the RPV adoption model PVact was developed and tentatively validated.

Due to its stochastic nature, calibration turned out difficult, though, resulting in the development of a validation scheme (PVactVal) and a thesis in mathematical economics. Still, much need for research remains

Goal

The goal of this thesis is to build on existing work on the validation of PVact and to develop or improve relevant validation schemes. After a review of different approaches, the thesis develops one (or several) validation approaches and evaluates them based on a case study.

The goal of the thesis is to indicate options for validating stochastical ABMs in sustainable product diffusion and to exemplify their application within the IRPact framework. Optionally, different scenarios are modelled and evaluated based on the developed scheme.

Your profile

Due to the formality of the subject matter, you should have a strong background in mathematics, CS, physics, engineering or comparable fields. Additionally, you should be interested in transdisciplinary questions. You should be willing to have both a view for the system as a whole and identifying its constituents, as well as their interconnections. In addition to a keen eye for numbers and formulas, you should have an integral view of the social and environmental aspect of a system. Writing the thesis in English is strongly preferred; however, it is possible to write the thesis in German as well.

It is strongly advised that you would’ve attended the course ‘Modeling in Resources Management’ or have comparable background in agent-based modelling or practical modelling experience. While developing a model is not part of the thesis, creative and analytical work on an extensive model is.