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: Exploration by inverse Generative Social Science

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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.

Agent-based modelling (ABM) of innovation diffusion has shown to be insightful for these dynamics and to assess strategies to address these questions, making it a promising approach. Typically, ABMs are designed with fixed components to investigate behaviour. Recently, an approach inverse to this has been developed: instead of exploration of the model goal by fixed model elements, inverse generative social science (iGSS) explores numerous model candidates leading to a fixed goal.

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.

Up to now, this followed the classical modelling approach. However, the chair has become interested in investigating the system with an iGSS approach. With the modular process model of IRPact, the technical basis for investigating model behaviour through iGSS is constructed.

Goal

The goal of this thesis is to explore the paradigm of iGSS in the context of residential RPV adoption within the model framework IRPact. The thesis aims to develop a methodology to apply the ideas of iGSS in the established model context, to design or adopt meta-heuristics for exploration and to analyse the structure of the generated models based on simulations.

Little previous work exists at the chair and the thesis and the process itself will be predominantly exploratory. The ABM team of IRPact will support you in conceptual and technical areas during your research and few explicit expectations exist at this time.

Your profile

Due to the model-centricity 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.