UNIVERSITÄT LEIPZIG

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Call for thesis: Modelling the Diffusion of Dynamic Electricity Tariffs with IRPact

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.

The transition from a demand-driven electricity system to a supply-driven system requires not just a change in the operation of the electricity grids and markets, but also a change in the behaviour of private households. Whereas a lot of leverage is seen in concepts like demand response and demand side management, which shifts or reduces consumption in critical time, price signals are an important component in the system. A way to communicate price signals is seen in dynamic (i.e. time-varying) electricity tariffs.

While institutional change largely depends on (rational) arguments and the influence of ‘green’ behaviour on an institutions’ image, the behaviour 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 behaviour 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 of innovation diffusion has shown to give insight in these dynamics and to assess strategies to address these questions.

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Model State

In order to address this issue, the chair of Energy Management & Sustainability developed the agent-based innovation diffusion framework IRPact, aimed at easy and flexible development of models on the diffusion of sustainable products. Within this framework, a former thesis developed a conceptual model for the diffusion of dynamic energy tariffs in municipal contexts.

While the conceptual model already exists, empirical and socio-demographical data for the model context has not yet been collected. Furthermore, the model is still agnostic to the geographical context and several modelling choices are specific to the choice of the (yet unspecified) investigated case-study.

The tools developed around IRPact offer a rich array of research avenues for policy instruments, behavioural drivers, socio-demographic and geographical structures, as well as many other research questions.

Goal

On the basis of the developed conceptual model, the goal of the master thesis is to apply the conceptual model to a specific case study through conceptualizing, parameterizing, conducting and analysing concrete simulations within the model framework.

For this, modelling choices have to be made, data needs to be acquired, the model needs to be specified and technically formulated within the modelling environment. Scenarios have to be designed, run and evaluated by you and results have to be discussed and contextualized. In all steps, you will be supported both scientifically and technically.

Your profile

You should be interested in transdisciplinary questions, most preferably in an environmental field. You should be willing to have both a view for the system as a whole and identifying its constituents, as well as their interconnections. You should not be averse to numbers and formulas, but at the same time 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.