



#### Institute of System Sciences, Innovation & Sustainability Research Kislinger, M.<sup>a</sup> / Füllsack, M.<sup>a</sup> / Posch, A.<sup>a</sup> / Fleiß, E.<sup>a</sup> / Seebauer, S.<sup>c</sup> Mautz, R.<sup>b</sup> / Brudermann, T.<sup>a</sup> / Reinsberger, K.<sup>a</sup> / Hatzl, S.<sup>a</sup> / Gartler, M.<sup>a</sup>

<sup>a</sup>Institut für Systemwissenschaften, Innovations- und Nachhaltigkeitsforschung (ISIS), Universität Graz; <sup>b</sup>Soziologisches Forschungsinstitut Göttingen (SOFI); <sup>c</sup>Wegener Center für Klima und Globalen Wandel, Universität Graz

# **RESHAPE – Reshaping Institutions and Processes in the Transition towards Renewable Energy: Lessons from Bottom-Up Initiatives**

### Problem

The project RESHAPE investigates **bottom-up initiatives** (BUIs) in the field of **photovoltaics** that emerged in recent years. The analysis includes the process of initiating and implementing a BUI to the participants' individual motives. In addition, an **agent based model** is developed exploring different adoption diffusion scenarios.

# **Research Questions**

- 1) Who are the most important **public** and/or **private actors** for BUIs?
- 2) Which **processes** guide the emergence of BUIs from the idea generation to the successful implementation?

As is the case in Austria, various forms of bottom-up initiatives in the field of photovoltaics are taking root, extending over all provinces. The range includes classical initiatives on the level of communities and associations, but also local and regional energy suppliers have taken the initiative and provide opportunities for their customers to invest and participate in renewable energy production.

- 3) What are important **social**, **psychological**, and **economic determinants** and **motivations** for the participation and non-participation in different types of bottom-up initiatives?
- 4) What are possible **development scenarios** for the diffusion and adoption of (selected) promising BUIs for renewable energy production?
- 5) What can be learned from **past and ongoing BUIs** for reshaping institutions and processes in the transition towards renewable energy?

# Methodology

The project methodology is twofold, consisting of an empirical phase and a dynamical system model phase. The **empirical phase** covers (a) an explorative analysis of institutional settings, where structures, processes and conditions of different bottom-up initiatives as well as actors' constellations are investigated, using semi-structured interviews, and (b) a quantitative empirical analysis of actors' behaviour using a standardised quantitative survey in the three case study areas.

The **dynamical system model** is constructed pinpointing the salient influence factors on the diffusion and adoption process within bottom-up initiatives, allowing for a better understanding of the process and thereby providing development scenarios for the selected BUIs. The model building process comprises two main stages: a conceptual system model and an empirical system model.

## Case Study Areas



Based on the information gathered from the explorative empirical step, three cases have been selected:



HELIOS Sonnenstrom GmbH (Upper Austria)
MEA SOLAR GmbH (Upper Austria)
Generative fiture risk Duration of (Durational states)

3. Sonnenkraftwerk Burgenland (Burgenland)

#### Results

The results presented here show the **agent-based conceptual system model**, with two examples (see figures 1 and 2). The model focuses on the effect of **social influence**. Agents interact with each other in respect to the similarity of their traits and, as a result, change attitude towards adopting the technology. Interaction takes place within the social network of contacts represented by the edges that connect the nodes of the network. We divided the agents into three groups: (a) the inclined, who tend towards an adoption, (b) the opposed, who object to becoming an adopter and (c) the undecided, who tend neither direction.

The process of adoption and diffusion within the social networks proceeds as follows: an initial small population is either opposed or inclined to adoption, whereas the majority is undecided. Through a number of iterations, an agent then interacts with other agents and changes through interaction, eventually becoming either inclined or opposed. Figure 1: Scale-free network with a powerlaw distribution



The opposed actors in both firgures are coloured red, the inclined green and the undecided black. The triangular-shaped agents indicate initial opposed/inclined agents.







*Figure 2: Random network with an* 

average degree

