Marianne Zeyringer: Temporal and Spatial Explicit Modelling of Renewable Energy Systems - Modelling variable renewable energy systems to address climate change mitigation and universal electricity access

The decarbonisation of the power sector is key for reaching the Paris agreement goal of limiting global mean surface temperature rise to well below 2°C. Further, providing universal electricity access is an important precursor for reaching the UN Sustainable Development Goals. However, reaching similar levels of demand as in highly developed countries without deploying low carbon energy sources would pose substantial global-scale climate risks. The large scale deployment of renewable energy sources can address those two major global challenges: (1) climate change mitigation and (2) universal electricity access.

Long term energy system models are often used to answer questions on how to transition to future low carbon energy systems but are usually highly spatially and temporally aggregated. However, the location of variable renewable energy sources (e.g. wind and solar energy) determines the total output and timing of electricity production. Further, social and environmental acceptance and effects as well as technical limitations are location dependent. For electrification planning the cost-effective electrification solution depends on the location specific resources supply, demand and infrastructure. As a result, when modelling variable renewable energy systems spatial and temporal averaging can lead to (i)technically, (ii)environmentally and (iii)socially -costly, -unfeasible or -unaffordable solutions.
There is a need to develop new methods which can account for the spatial heterogeneity of supply, demand, as well as social and environmental factors. In my presentation I firstly suggest spatially explicit methods for the design of low carbon energy systems which are robust to the diversity of weather, climate resilient, affordable and publicly supported and do not impact other interrelated environmental issues. Secondly, I give interesting insights relevant for energy modellers and policy makers from spatially explicit studies for the integration of renewable energy sources to mitigate climate change and facilitate universal electricity access.