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Collaborative Modelling of the Renewable Energy Transition: The COLLAGE/APoLUS framework

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Abstract: Transition to a low-carbon economy requires a complete transformation of the energy sector. The replacement of traditional energy sources with renewables implies extensive changes to socio-ecological systems and existing structures. Simply replacing fossil fuels with renewables in a large-scale producer-controlled commercial system is unlikely to be successful. Rather, local, decentralized, publicly supported renewable energy initiatives are predicted to play a major role in this transition.

These increasingly popular projects involve new actors and dynamics and have impacts that are insufficiently understood. There is a need for new tools and approaches to support co-design of integrated regional spatial planning and land use policy. For example, local stakeholders could explore effects of different CO₂ emissions reduction options through interactive scenario planning activities. In this paper, two approaches are described; 1) The Collaborative Location and Allocation Gaming Environment (COLLAGE) and 2) the Actor, Policy and Land Use Simulator (APoLUS). Co-application of these two models conforms a participatory scenario modeling process where local actors interactively explore consequences of renewable energy implementation on land use. The approach addresses the complexity and non-linearity of these land use changes by using information from stakeholders to develop future scenarios. The process builds credibility among the stakeholder community and facilitates co-generation of knowledge.

This paper highlights the current COLLAGE/APoLUS integrated modeling framework being used in the EU FP7 COMPLEX project. Recent applications of this model to cases of renewable energy development in Spain and the Netherlands are included to highlight the advantages and disadvantages of this framework.

Keywords: *Collaborative Modelling; Renewable Energy Transition; Land Use Policy*