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An Integrated Modelling Approach for Analyzing the Land-Use Effects of German Bioenergy Policies

Rüdiger Schaldach

Center for Environmental Systems Research (CESR), University of Kassel, schaldach@usf.uni-kassel.de

Daniela Thrän

Deutsches Biomasseforschungszentrum (DBFZ)

Verena Wolf

Johann Heinrich von Thünen-Institut (TI)

Jan Schüngel

Center for Environmental Systems Research (CESR), University of Kassel

Markus Millinger

Helmholtz Zentrum für Umweltforschung GmbH (UFZ),

See next page for additional authors

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Presenter/Author Information

Rüdiger Schaldach, Daniela Thrän, Verena Wolf, Jan Schüngel, Markus Millinger, Klaus Hennenberg, and Martin Banse

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**Rüdiger Schaldach^a, Daniela Thrän^b, Verena Wolf^c, Jan Schüngel^a, Markus Millinger^d,
Klaus Hennenberg^e, Martin Banse^c**

^aCenter for Environmental Systems Research (CESR), University of Kassel,

^bDeutsches Biomasseforschungszentrum (DBFZ), Leipzig,

^cJohann Heinrich von Thünen-Institut (TI), Braunschweig,

^dHelmholtz Zentrum für Umweltforschung GmbH (UFZ), Leipzig, ^eÖko-Institut e.V., Darmstadt.
Presenting author: schaldach@usf.uni-kassel.de

Abstract: The use of energy carriers derived from biomass is an essential element of the German strategy for transforming its energy system towards renewable energy sources. In order to assess the sustainability of the related biomass production it is important to analyze the environmental impacts of land-use change both domestically and in biomass exporting regions. For this purpose the MILESTONE modelling framework has been developed. It integrates a national bioenergy model (BENSIM) with a global economic model (MAGNET) and a global land-use model (LandSHIFT). The presentation concentrates on the linkage between MAGNET and LandSHIFT which represent the global land-use system within the framework. First, the harmonization of the models and the implemented coupling mechanism are explained. Second, we give an overview of the involved model and data uncertainties, and show results from a sensitivity analysis regarding the effect of changes in GDP in the economic model on global land-use change. In the third part of the presentation we show results from a global scenario analysis using the coupled models. Here we demonstrate how different national strategies for bioenergy use in combination with national and international policies for ecosystem protection affect global land-use patterns and how the coupled model can help to identify and quantify risks for biodiversity and soil quality loss in exporting regions that are linked to biomass consumption in Germany.

Keywords: Global land-use modelling; model coupling; bioenergy policies; environmental impacts.