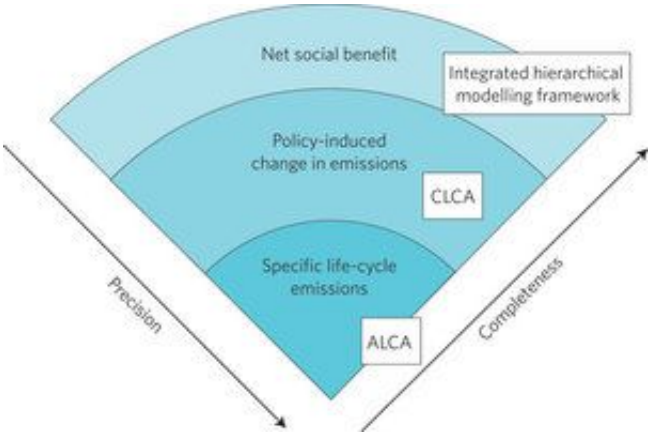
Climate risks of bioenergy underestimated

March 9 2012



Precision and completeness of bioenergy evaluation.

Energy from biomass presents underappreciated risks, new research published in Nature Climate Change shows.

"A precautionary approach is needed," says Ottmar Edenhofer, chief economist of the Potsdam Institute for Climate Impact Research (PIK) and professor at the Technische Universität Berlin (TU Berlin). "Before further expanding bioenergy, science has to deliver a more comprehensive risk assessment to policy makers – dealing with the uncertainties inherent to projections of bioenergy use up to now. Novel kinds of risk management for land-use change are needed." One option would be to shift the burden-of-proof of meeting sustainability standards to the bioenergy producers.

Large-scale cultivation of bioenergy crops could lead to increased net greenhouse-gas emissions when, for instance, forests are cleared for agricultural use. At the same time, long-term scenarios suggest that replacing fossil fuels to achieve low CO2 stabilisation might require major deployment of bioenergy. The article provides a framework for reconciling these two seemingly disparate views and identifies key uncertainties underlying the debate.

"Bioenergy is a matter of heated debate," says Felix Creutzig, lead author of the article by scientists from TU Berlin, PIK, and the University of California in Berkeley. "Scientists need to be very clear about the assumptions that their analyses rest upon and the effect alternative assumptions may have on their conclusions when they aim to systematically explore the risks associated with alternative policy options. Policy makers may choose to only allow further bioenergy deployment under very restricted circumstances."

The net effect on climate of increasing production of bioenergy is highly uncertain. While current analyses are mostly good at accounting for historical emissions in the production of energy from biomass, according to the study the effects of future large-scale deployment of biofuels on agricultural and transportation fuel markets are often ignored. For instance, increased biofuels feedstock production on agricultural land might drive global food prices up. This provides significant incentives to expand agricultural area at the expense of natural carbon sinks.

In contrast, many economic climate change mitigation scenarios treat bioenergy as "carbon neutral" by assuming the implementation of policies to prevent deforestation and that technological progress will enable increased bioenergy yields per hectare. Whether these assumptions will prove correct is difficult to predict, and differing beliefs about such assumptions cause estimates of bioenergy potential to vary substantially – that is, by a factor of ten.

Comprehensive assessments of the climate benefits of bioenergy should try to explore the full range of possible outcomes and systematically integrate market effects, the researchers conclude. This also includes more systematic assessments of the climate performance of bioenergy in imperfect worlds with, for example, limited technological progress or policies. Progress in this debate will require much greater interdisciplinary collaboration and coordination among researchers across the numerous scientific communities touched by bioenergy.

"This is one key challenge for upcoming scientific assessments," Edenhofer points out. "Projections of bioenergy use partially depend on value judgements – concerning energy security, climate change mitigation, food security, and biodiversity protection." When science succeeds in communicating all underlying assumptions and uncertainties to policy-makers, says Edenhofer, "then that can be a starting point for the important discussion on where we as a society want to go and which risks we are willing to take."

The analysis has been supported by the Michael Otto Stiftung and the German Federal Ministry of Education and Research.

More information: Creutzig, F., et al. (*Nature Climate Change*, 2012): Reconciling top-down and bottom-up modelling on future bioenergy deployment. doi:10.1038/nclimate1416

Provided by Potsdam Institute for Climate Impact Research