

Validating against the future: Laws of nature at work

Petr Havlík, Hugo Valin, Michael Obersteiner

International Institute for Applied Systems Analysis, Laxenburg, Austria

Large scale economic models are regularly used for forward looking analysis and their projections are gaining importance in the context of both climate change mitigation (biofuels, REDD) and climate change adaptation. Policy makers are increasingly tempted not to not only draw on the qualitative insights about interactions in complex systems but also to use the modeled numbers directly – often in the context of legal documents. The question about validity of these projections is hence more pressing than ever. Comparing projected values with historical data provides a reality check to which modeling teams are now being asked to avail themselves. However, “the future is not what it used to be”, and hence the validation against the past should be complemented by consistency checking against the future. One of the few elements we can reasonably foresee for long term projections spanning to 2050 and beyond is the following: *the basic laws of nature will still hold*.

In this context, we discuss the role of economic assumptions and theoretical frameworks chosen to look into the future, including: econometric models, equilibrium reduced form models, and bottom-up optimization models. We emphasize in particular: (i) the importance of biophysical linkages between systems is critical for representing properly development of a certain number of indicators; (ii) the question of scale of analysis and aggregation can have high implications for the results, in particular for agriculture where production is very heterogeneously distributed and for land use; (iii) systems boundaries are structurally absent from many reduced form models, whereas they constitute a key component of many environmental issues. We look at each of these issues and explain why validation also requires structural consistency in order to ensure insightful scenarios of agriculture future. Illustrations are drawn from our work with the GLOBIOM model.

Outline

- 1) Introduction**
- 2) GLOBIOM: a robust modeling architecture for land use change modeling**
 - a. Land cover: the elementary Simulation Unit grounded on best available dataset**
 - b. Land use activities: building biophysical relationships on engineering based approaches**
 - c. Economic markets modeling and land use change optimization**
- 3) Land use change projections using GLOBIOM**
 - a. Land type projections in GLOBIOM and comparison with historical trends**
 - b. Underlying drivers contribution**
- 4) Validating land use change projections: real challenge**
 - a. The importance of biophysical linkages**
 - b. Why heterogeneity and disaggregation matters?**
 - c. Planet boundaries and non linearities?**
 - d. The role of policies**
- 5) Conclusion**