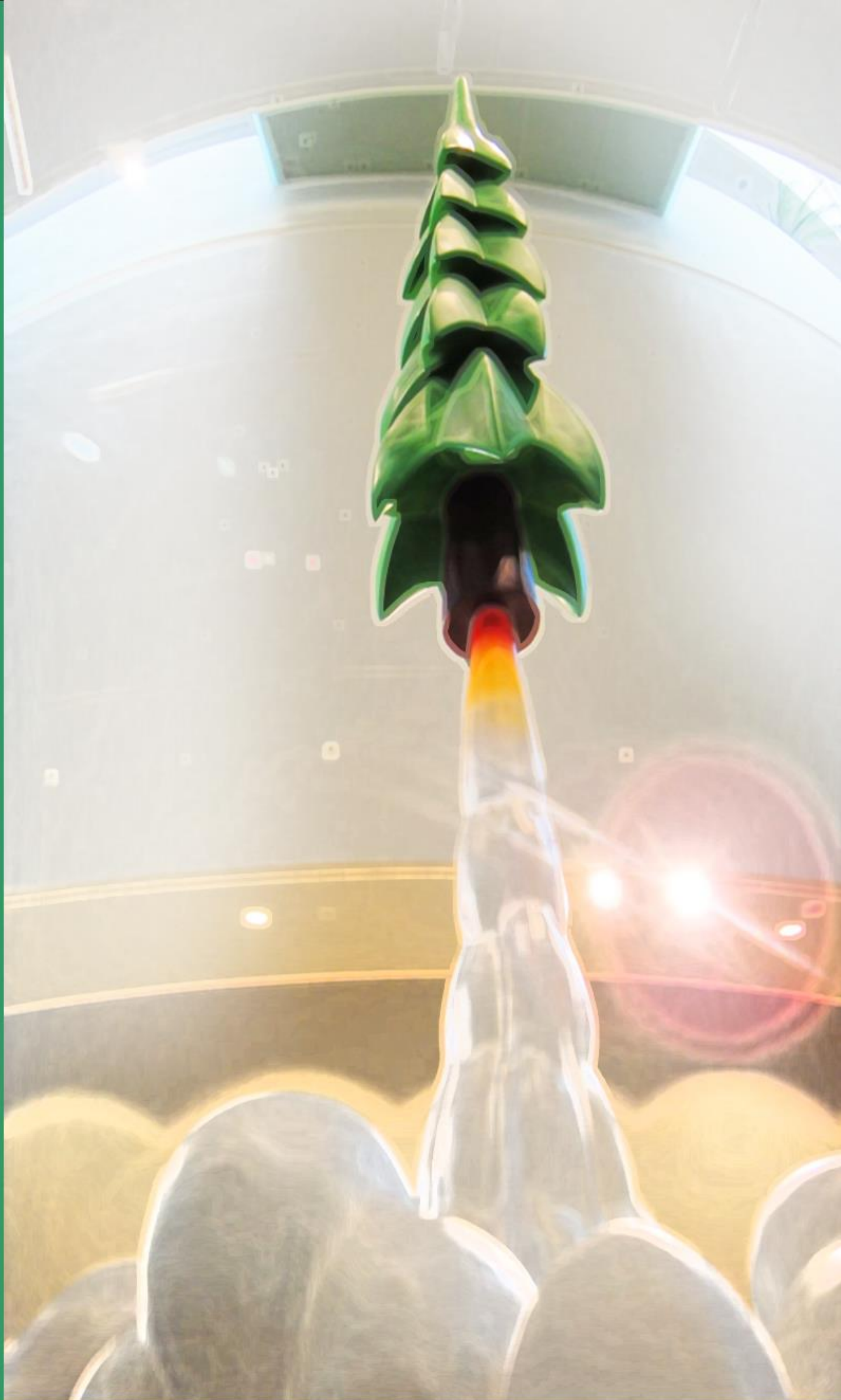

Future Perspectives of International Bioenergy Trade

IEA Bioenergy

Task 40: Sustainable International Bioenergy Trade

Coordinating author

Lukas Kranzl
Energy Economics Group
Vienna University of Technology
www.eeg.tuwien.ac.at

Main authors

Julian Matzenberger, Lukas Kranzl
Energy Economics Group
Vienna University of Technology
www.eeg.tuwien.ac.at

Martin Junginger, Vassilis Daioglou
Copernicus Institute
www.uu.nl/geo/copernicus

Eric Tromborg
Norwegian University of Life Sciences

Kimon Keramidas
Enerdata

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Future perspectives of international bioenergy trade

Summary

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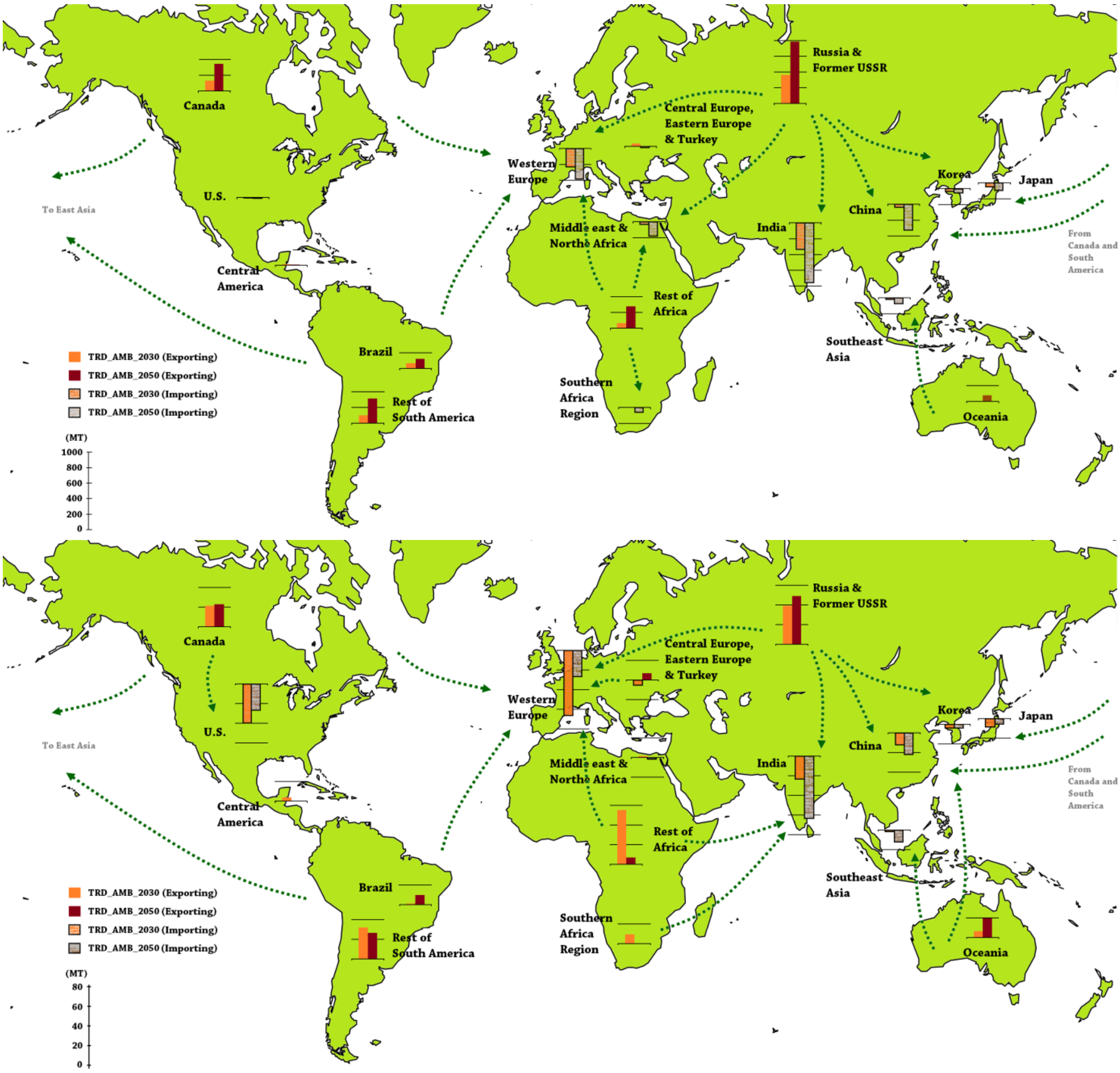
According to IEA World Energy Outlook 2012, primary demand for bioenergy will strongly increase up to the year 2035, the demand for biofuels and biomass for electricity is expected to tripple. Moreover, the patterns of bioenergy use are expected to change substantially. Power generation and production of biofuels for transportation will constitute a larger share of biomass use compared to the currently dominating traditional biomass. These changes will have an impact on the regional balance of demand and supply of bioenergy leading to a change in trade patterns as well. IEA foresee that international trade of solid biomass for power generation and biofuels for transport increases about six fold up to 2035 (IEA 2012, p211).
Many studies have been undertaken to assess the biomass potential to contribute to future energy supply. A limited number of studies is dealing with the gap between regional bioenergy demand, supply and bioenergy trade. Conclusions from these studies vary significantly. We have indentified 28 models which contain an analysis of bioenergy trade. Three models have been selected for a detailed comparison of scenarios and their impact on global bioenergy trade: GFPM, TIMER and POLES. In order to make results from these models comparable an common biomass fractions have been aggregated and 20 world regions have been defined, that allow for a grouping of individual model regions on a sufficient resolution. In ambitious scenarios, 14-26% and 14-30% of global bioenergy demand is traded between regions in 2030 and 2050, respectively. In more detail, the model scenarios show a huge range of potential bioenergy trade: for solid biomass, in ambitious scenarios bioenergy trade ranges from 700Mt to more than 2,500 Mt in 2030 and from 800 Mt to almost 4,200 Mt in 2050. For liquid biomass, the ambitious scenarios show a bioenergy trade in the range of 65 Mt to more than 360 Mt in 2030 and from 40 Mt to 520 Mt in 2050. For comparison, trade volumes of liquid fuels (ethanol and biodiesel) did not exceed 5 Mt in 2011. Net woody biomass trade in 2010 amounted to roughly 18 Mt (mainly wood pellets fuel wood and wood waste). Thus, the model results show a huge increase of bioenergy trade in the coming decades in most of the scenarios (in particular in the more ambitious bioenergy scenarios).

Across the scenarios, the total use of biofuels and thus also the total volume of biofuels traded depends on how competitive it is vis-à-vis other energy carriers. Thus, in cases where fossil fuels become very expensive early on (low emission stabilisation targets or high carbon prices), consumptions as well as trade of biofuels increases. Those model scenarios with an ambitious increase of bioenergy demand imply a huge increase in bioenergy trade, an increase by a factor of 70 betwen 2010 and 2030 for liquid biofuels, and by a factor of 80 for solid biomass. It has to be taken into account that these results refer to trade between world regions. International trade within these regions (e.g. within Europe) would have to be added to these values. Such an increase would result in quantities of internationally traded biomass commodities which would be higher than the current total global bioenergy demand (i.e. larger than 50 EJ). Considering the currently very small share of internationally traded bioenergy, this would result in huge challenges and tremendous changes in terms of production, pretreatment of biomass and development of logistic chains. While both liquid and solid international biomass trade has grown exponentially between 2000 and 2010, it is rather doubtful that this speed can be maintained and reach the levels of trade anticpated by the models. As an illustration, worldwide coal trade amounted to 1142 Mt in 2011 (world coal, 2013), i.e. roughly the size that solid biomass would need to grow to within 20 years in the optimictsic bioenergy use scenarios. However, coal infrastructures have been developed for over 200 years, coal does not require any pretreatment before transport, and logistics typically originate from large point sources (mines).



Regional bioenergy trade balances in the median of *ambitious* model scenarios 2030 and 2050. Top: solid biomass, bottom: liquid biomass. (Unit: Mt)

The insight into future scenarios and perspectives of bioenergy trade revealed that substantial challenges for the future development of global and international bioenergy trade may be expected in the coming decades if a low carbon energy system is to be developed. The theoretical and technical biomass potentials in many models are often quite optimistic, and sustainable biomass potentials are only included to a limited extent, as these are often hard to quantify and are also not the main aim of the models. It remains to be seen how global, stringent mandatory sustainaibility requirements (e.g. on water use, biodiversity, forest carbon accounting and iLUC) would limit the production, trade and use of feedstocks in the first place, but also how practical certification of biomass would affect bioenergy trade.

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