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„Entwicklung von Strategien und Nachhaltigkeitsstandards zur Zertifizierung von Biomasse für den internationalen Handel“
(Kurztitel: F+E Bio-global)

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The iLUC Factor: A Simplified Approach to Assess GHG Implications of Indirect Land Use Change from Bioenergy

Summary of the presentation given at the IEA Bioenergy ExCo Workshop "The Impact of Indirect Land Use Changes (ILUC)" May 12, 2009 in Rotterdam by Uwe R. Fritsche, Oeko-Institut (u.fritsche@oeko.de; www.oeko.de/service/bio)

What is iLUC, and how to identify?

The term indirect land use change (iLUC) refers to the **potential** effects which may be caused by cultivating biomass (for bioenergy, biofuels, or biomaterials) on land which previously was used for the production of, e.g. feed, food or fiber. The previous use is displaced by the new biomass cultivation. As one can reasonably assume that the demand for feed, food or fiber formerly produced remains, the displaced production would "move" to somewhere else where areas may have high carbon stocks (e.g. forests) which are reduced if used for cultivating the displaced production, thus causing CO_2 emissions. These **potential** CO_2 emissions are indirectly caused by the biomass cultivation which displaced the former use[1]. The CO_2 balance of indirect LUC corresponds to that of direct LUC, but the question is which areas are concerned. Since displacement may not only take place within a country, but also outside due to global trade, iLUC effects can only be allocated to biomass cultivation through models.

Therefore, it is **impossible to "monitor" indirect effects** – one can detect LUC occurring in a given area or even globally, but – as this LUC can have many causes - it is not possible to relate this occurrence to one specific driver.

An Issue of Perspective

Displacement is a problem of truncated system boundaries, i.e. an issue of **scope:** today's accounting of GHG balances of biofuels is done with partial analysis (only biofuels, no explicit modeling of agro + forestry sectors, or other land uses), which results in all LUC occurring outside of the scope being "indirect". Hence, iLUC is a construct, and **all** incremental land uses imply indirect effects unless the scope is widened to all drivers, and all land uses.

The iLUC factor approach

As a deterministic and simplified approach to quantify potential release of CO_2 from LUC caused by displacement, the iLUC factor was developed by Oeko-Institut in 2007. As displacement "works" along trade flows, shares of displaced land were derived from land used for key agro exports using 2005 yields from FAO data.

To derive average impacts; explicit assumptions which dLUC is likely and where (e.g. grassland to maize in EU and US) was used, and IPPC-based dLUC emission factors coupled with regional land use shares for each agro commodity. From that, the average CO_2 emissions per hectare of displaced land is derived and discounted over 20 years, which gives 20 t CO_2/ha/yr as the **theoretical** global average iLUC factor if all land used for biofuels would induce displacement risk.

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[1] Note that besides CO_2, indirect land use change might negatively affect biodiversity if displaced production moves into biodiversity-rich areas.

The real risk lower is lower, though, as set-aside or abandoned land may be used, and intensification of production (higher yields) reduces iLUC.

Further Work on iLUC

Current work on the iLUC factor concerns an update of the 2005 data to a 2010 estimate, and refining the LUC characteristics of displacement using historic data for agricultural land expansion (1980-2000) derived by Holly Gibbs (Standford University).

Furthermore, the concept of "**iLUC risk mapping**" will be worked out more to identify countries/regions under thread of iLUC. For this, CGE model results (e.g. GTAP) will be coupled with spatially explicit suitability and carbon maps, and infrastructure data. This will be based on country studies carried out in Brazil, China, India, and South Africa[2].

In parallel, research will be carried out together with UNEP and FAO in the context of GBEP to include developing countries views[3], and to derive policy options to reduce iLUC risks through **sourcing priorities** favoring low-iLUC biomass feedstocks, and developing project-based offsets.

In addition, the formation of an **"investor alliance"** for sustainable supply, bundling investment in degraded land and respective infrastructure "overhead" will be supported based on country study results.

Conclusions

Indirect LUC is an artifact of restricted systems boundaries, and all incremental land use – disregarding if the biomass cultivation is used for electricity, heat, transport, biomaterials, food, feed, or fiber, or if other land used displaces previous production.

Modeling iLUC is possible to some degree, and simplified approaches such as the iLUC factor allow identifying the order of magnitude of potential effects.

Mapping of degraded land is a base to incentivize its use to produce low-iLUC risk biomass, but at higher costs – thus, incentives are needed, and biodiversity and social safeguards for developing degraded land.

In the long term, iLUC could be reduced to zero if the global conventions could fully cover all land use and biomass markets: In principle, the UN Conventions on Climate Change and on Biodiversity as well as their protocols could be developed further so that potentially negative consequences of indirect land use changes on climate protection and biodiversity would be **generally avoided if** the scope of CO_2 emission caps would also include carbon from any land use change, and all biodiversity-relevant areas were protected.

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2 First results will be presented at the 2nd Joint International Workshop on Bioenergy, Biodiversity Mapping and Degraded Lands to be held July 7-8, 2009 at UNEP in Paris

3 See for details: Summary of the GBEP Workshop on Indirect Land Use Change: Status of and Perspectives on Science-Based Policies; held May 15, 2009 in New York http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/2009_events/Workshop_ILUC_NY_15May_2009/GBEP_iLUC_workshop_-_Summary.pdf