Status of science and policy regarding ILUC

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Tokyo International Forum, November 15, 2011
ILUC and Bioenergy

- Overview of status of ILUC science and scientific discussion around the world

- ILUC-relevant policy measures being implemented or discussed

- Relevance of the ILUC discussion to policymakers and scientists in countries just starting to work on GHG LCA of bioenergy
Accumulated anthropogenic C emissions to the atmosphere since 1850. Cement and gas flaring is 1-2% of total accumulated emissions. Source: Carbon Dioxide Information Analysis Center (CDIAC) of US DOE
GHG from direct LUC

\[
e_l \left[ \frac{g\text{CO}_2}{MJ} \right] = e_l \left[ \frac{gC}{ha} \right] - e_l \left[ \frac{gC}{ha} \right] \cdot 3,664
\]

\[
P_{\text{final product}} \left[ \frac{MJ}{ha \cdot yr} \right] \cdot 20[yr]
\]

C stock prior to LUC

C stock after LUC

C to CO₂

yield of biofuel product

distribution of dLUC over 20 years
Direct and Indirect Effects

Indirect Effects (Displacement)

- Food & feed crops
- Protected & other high-nature value areas
- Loss of biodiversity
- Energy crops/plantations
- "unused" land (marginal, degraded)
- Forests, pasture, peat- and wetlands
- Deforestation, carbon release
Indirect LUC

- **All** incremental use of fertile land imply indirect effects if system boundaries of analysis < total land use of all sectors

- real world: only **direct** LUC

- indirect LUC of bioenergy = direct LUC of agriculture/forestry

- **Distinguish between** analytical (science) vs. regulatory (policy)
ILUC: Four Questions…

1. Market response?

2. Which LUC?

3. Carbon stocks?

4. Time/allocation?

based on presentation of Bart Dehue (Ecofys) at GBEP ILUC Workshops, May 2009 in NYC
ILUC: Market Responses...

ILUC: many studies...
ILUC Policies in EU and US

- **EU**: many studies, EC report on ILUC in Dec 2010, no recommendations; impact assessment for ILUC policy options (Jan 2012?)

- **US**:
  - Federal level: EPA regulated GHG emissions of biofuels (**RFS2**) incl. ILUC
  - California: Low Carbon Fuel Standard (**LCFS**) also incl. ILUC, ongoing work on updates (International Expert Group)
Renewable energy

Land use change

On 22 December 2010, the Commission published a report on indirect land use change related to biofuels and bioliquids.

The report acknowledges that indirect land use change can reduce greenhouse gas emissions savings associated with biofuels, but also identifies a number of uncertainties associated with the available models. The report announces that the Commission will conduct an impact assessment, thereby taking into consideration potential changes to the existing legislation. If needed, the Commission will recommend to address this issue under a precautionary approach. In addition, the Commission will continue to conduct work in this area in order to ensure that policy decisions are based on the best available science and to meet its future reporting obligations on this matter.

Related documents

- Commission adopts Report on indirect land use change
  Report from the Commission on indirect land-use change related to biofuels and bioliquids [COM(2010)6811, 22/12/2010]

- Press room
  Biofuels: Commission adopts Report on indirect land use change [IP/10/1772, 22/12/2010]

- Studies
  Land use change studies and reports

- Public consultation
  Indirect land use change and biofuels (closed since October 2010)

Renewable Fuel Standard (RFS)

EPA is responsible for developing and implementing regulations to ensure that transportation fuel sold in the United States contains a minimum volume of renewable fuel. The Renewable Fuel Standard (RFS) program regulations were developed in collaboration with refiners, renewable fuel producers, and many other stakeholders.

The RFS program was created under the Energy Policy Act (EPAct) of 2005, and established the first renewable fuel volume mandate in the United States. As required under EPAct, the original RFS program (RFS1) required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012.

Under the Energy Independence and Security Act (EISA) of 2007, the RFS program was expanded in several key ways:

- EISA expanded the RFS program to include diesel, in addition to gasoline;
- EISA increased the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to 36 billion gallons by 2022;
- EISA established new categories of renewable fuel, and set separate volume requirements for each one;
- EISA required EPA to apply lifecycle greenhouse gas performance threshold standards to ensure that each category of renewable fuel emits fewer greenhouse gases than the petroleum fuel it replaces.

RFS2 lays the foundation for achieving significant reductions of greenhouse gas emissions from the use of renewable fuels, for reducing imported petroleum, and encouraging the development and expansion of our nation’s renewable fuels sector.

To learn more, click on the tabs above.

For more information, please contact the EPA Fuels Programs Support Line at 202-343-9755 or EMITS Support at 800-385-6164.

http://www.epa.gov/otaq/fuels/renewablefuels/index.htm
ILUC in US: California

Low Carbon Fuel Standard Expert Workgroup

This page provides information regarding ARB's Low Carbon Fuel Standard Expert Workgroup (EWG).

On April 23, 2009, the California Air Resources Board (ARB/Board) approved the Low Carbon Fuel Standard (LCFS) regulation. As part of the Board Hearing, the Board approved Resolution 09-31 (Resolution). The Resolution includes a number of provisions related to ongoing work on the LCFS. One such provision relates to land use and indirect effect analysis of transportation fuels.

The Board-approved resolution reads: “BE IT FURTHER RESOLVED that the Board directs the Executive Officer to convene an expert workgroup to assist the Board in refining and improving the land use and indirect effect analysis of transportation fuels and return to the Board no later than January 1, 2011 with regulatory amendments or recommendations, if appropriate, on approaches to address issues identified. This workgroup should evaluate key factors that might impact the land use values for biofuels including agricultural yield improvements, co-product credits, land emission factors, food price elasticity, and other relevant factors. The Executive Officer shall coordinate this effort with similar efforts by the U.S. Environmental Protection Agency (U.S. EPA), European Union, and other agencies pursuing a low carbon fuel standard.”

Workgroup Information

- Subgroup Membership List (PDF)
- Expert Workgroup Guidelines (PDF)
- Expert Workgroup Member's Information (PDF)
- Requirements for Subgroup Draft Work Plans (PDF)
- LCFS Proposal for an Expert Workgroup (PDF)
- Solicitation Letter for the LCFS Expert Workgroup (PDF) and Application (PDF) (Closed)

http://www.arb.ca.gov/fuels/lcfs

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## Mitigating ILUC...

<table>
<thead>
<tr>
<th>Current Opportunities</th>
<th>Limitations to Addressing iLUC</th>
<th>Practical Challenges</th>
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<tbody>
<tr>
<td>Use underutilized land, sometimes referred to as degraded, abandoned, or marginal land.¹</td>
<td>Increasing productivity requires increased water. Within one watershed changes in hydrology could deliver water availability problems for other users and trigger land use change elsewhere as a result. On social side, the “unused” or marginal land could be in use for example as land for foraging and firewood. Displacing this activity elsewhere is an iLUC impact.</td>
<td>Developing universally applicable definitions and criteria for ‘underutilized’ land. Defining appropriate baselines and business as usual projections to determine productivity increases.</td>
</tr>
<tr>
<td>Improve productivity of biofuel feedstocks on lands where they are currently grown to increase yields through improved fertilization and irrigation techniques, crop rotations, double-cropping, etc.¹</td>
<td>As above.</td>
<td>As above for determining baselines. Determining procedures for allocating increased productivity to non-biofuel outputs (cattle and soymean) and biofuel outputs (soy oil).</td>
</tr>
<tr>
<td>Improve productivity through crop-livestock and other integrated bioenergy systems, such as integrating sugarcane or soy with cattle and biofuel crops with other crops. Biofuel crops are essentially “new” in such a system and do not reduce productivity of the existing crop.¹</td>
<td>Largely expected not to encounter limitations but in some cases could have negative impacts if the waste has existing uses.²</td>
<td>Complex supply chains create tracking and measurement problems.</td>
</tr>
<tr>
<td>Use wastes and residues as a feedstock.</td>
<td>Largely expected not to encounter limitations.</td>
<td>Defining appropriate baselines and business as usual projections to determine efficiency increases.</td>
</tr>
<tr>
<td>Increased efficiency through reducing supply chain losses.</td>
<td>Largely expected not to encounter limitations.</td>
<td>Stakeholder buy-in to offset concepts.</td>
</tr>
<tr>
<td>Increased efficiency through integrated processing systems such as co-location of ethanol production and cattle lots.</td>
<td>Largely expected not to encounter limitations.</td>
<td></td>
</tr>
<tr>
<td>Carbon offsets.</td>
<td>Biodiversity in one area less likely to be ‘swapped’ and compensated by another.</td>
<td></td>
</tr>
</tbody>
</table>

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Source: Winrock International: Biofuels and Indirect Land Use Change - White paper: Challenges and opportunities for improved assessment and monitoring; Chalmers, J. et al.; Arlington VA
Mitigating ILUC…

commissioned by:
ePURE (European Renewable Ethanol Association)
IUCN (International Union for Conservation of Nature)
Neste Oil
PANGEA (Partners for Euro-African Green Energy)
Riverstone Holdings
Shell

...argues for a market-based approach, i.e. incentivising low-ILUC biofuels through a “mitigation credit“
## no-ILUC Biomass Potentials

<table>
<thead>
<tr>
<th>Land type</th>
<th>Area</th>
<th>energy</th>
<th>reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>degraded land</td>
<td>0.4-0.6 billion ha</td>
<td>8 - 110 EJ/a</td>
<td>Hoogwijk et al. (2003)</td>
</tr>
<tr>
<td></td>
<td>2.50 billion ha (19% of land area)</td>
<td>~ 500 EJ/a</td>
<td>Metzger/Hüttmann (2009)</td>
</tr>
<tr>
<td>abandoned land</td>
<td>0.4 billion ha</td>
<td>27 EJ/a</td>
<td>Field et al. (2008)</td>
</tr>
<tr>
<td>marginal and degraded land</td>
<td>1.1 – 1.4 billion ha</td>
<td>150-200 EJ/a</td>
<td>Cai, Zhang, Wang (2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90 EJ/a</td>
<td>Wicke (2011)</td>
</tr>
<tr>
<td>water-scarce, marginal + degraded lands</td>
<td>70 EJ/a</td>
<td></td>
<td>ECN et al. (2009)</td>
</tr>
</tbody>
</table>

Global primary energy demand in 2010 ca. 550 EJ

Data above without ground truthing – country studies indicat need for correction factor (20% conservative estimates) → 5% of global energy
Identification of potential areas for biomass production in China: Discussion of a recent approach and future challenges

Wilko Schweers, Zhanguo Bai, Elliott Campbell, Klaus Hennenberg, Uwe Fritsche, Heinz-Peter Mang, Mario Lucas, Zifu Li, Andrew Scanlon, Haoran Chen, Qin Zhihao, Dianxiong Cai, Yunxiang Jin, Jun Zhang, Lili Tu, Marco Gemmer, Tong Jiang, Nannan Zhang

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i Centre for Geoinformation, Wageningen University, The Netherlands
Climate Negotiation: REDD

Financial rewards for **reduced emissions from deforestation and forest degradation**

- If financially viable, deforestation could be reduced significantly
- Could reduce GHG emissions from ILUC if implemented effectively
GHG from LUC: Dynamic View

• Future iLUC can become low:
  – Dampening ILUC through REDD (if adequately implemented and financed)
  – “free“ land through intensification (tradeoffs!)
  – LUC policies in key countries (AR, BR, ID…)

• Prioritizing low-iLUC feedstocks:
  – wastes/residues (2\textsuperscript{nd} generation)
  – un- and underused + degraded land (with biodiversity/social safeguards)

→ iLUC is no “fate”
Workstream in Indirect Effects

- International Workshop on ILUC May 15, 2009 in New York collected knowledge and thoughts on future work from GBEP partners, observers, and interested parties

- GBEP’s role is to help prepare common knowledge about and increase transparency on ILUC. Collaboration on working level with GBEP partners (esp. EU, IEA, UNEP)

- Work should not only focus on quantification of the problem but also on practical measures to minimize the risk of negative indirect effects

- Internal GBEP briefing on ILUC at Sustainability Task Force meeting in Oct. 2010 in Rome
GBEP and indirect effects

- **Inventory** of national policies on LUC, focus on developing country experiences (e.g. land use planning/zoning laws, feedstock restrictions) – draft by end of 2011

- **Briefing Paper** for GBEP on substance of ILUC and possible responses (update 2012?)

- **2nd International ILUC Workshop**, possibly b2b with GBEP WG meeting (May 2012)?
Conclusions on ILUC

• iLUC has international consequences → involve developing countries

• iLUC goes beyond biofuels → issue for all additional land uses

• Science substantiates ILUC as significant, but uncertainty in models; different political views on maturity of science for ILUC regulation

→ focus on minimizing risk and reduce ILUC rather than being “accurate”
GBEP Workshop on Indirect Land Use Change (iLUC): Status of and Perspectives on Science-Based Policies

New York, 15 May 2009
Millennium UN Plaza Hotel

Workshop Summary


Info on sustainable bioenergy

www.oeko.de/service/bio

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