Biofuels Life Cycle Assessment in EU legislation

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Biofuels in EU legislation: the TARGET

Directive 2009/28/EC (RES-D)

- 10% target for RES in transport

Directive 2009/30/EC (FQD)

- 10% GHG reduction by fuel suppliers (6% through alternative fuels)
- Regulations on BF blends for Gasoline and diesel (e.g. E10 and B7)
### ENVIRONMENTAL GOALS

The two Directives include a set of sustainability criteria and monitoring requirements for biofuels

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG Impact</td>
<td>- Minimum 35% GHG Emissions saving (50% from 2017, 60% from 2018)</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>- Not be made from raw materials obtained from biodiverse areas (including primary forests)</td>
</tr>
</tbody>
</table>
| Land use                          | - Not be made from land with high carbon stock (i.e. wetlands, forested areas…)  
|                                   | - Not be grown on peatlands                                                 |
| Good agricultural conditions      | - Requirement for good agricultural and environmental conditions (as defined in Annex III to Council Regulation 1782/2003) and social sustainability |
Sustainability scheme is included in the Directives

- Sustainability criteria must be met in order to count towards target or obtain incentives
- Non-discriminatory – WTO compatible: Applies to both EU production and imports
- Incentives for 2nd generation biofuels

Practical implementation of the scheme:

- Responsibility of Member States, but “Guideline on practical implementation of the sustainability scheme“ by EC
- Commission can conclude bilateral/ multilateral agreements, accredit voluntary national/ multinational/ international schemes
- Monitoring and reporting requirements by the Commission
LCA METHODOLOGY

GHG emissions saving calculated by:

1. Actual values → Methodology in Annex V of RE Directive

Total emissions from the use of the fuel:

\[ E_B = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr} - e_{ee}, \]

**GHG SAVING** = \( \frac{(E_F - E_B)}{E_F} \) \hspace{1cm} (min 35%)

Where \( E_F \) = emissions from the fuel comparator

Main uncertainties:

- indirect land use change effects are not included
- allocation of emissions between fuel and co-product
- \( \text{N}_2\text{O} \) emissions
2. Default values from JEC – WTW input database

“Well-to-wheels analysis of future automotive fuels and powertrains in the European context”

Results and report on-line:

3. Combination of 1 + 2 → Disaggregated default values in Annex V
### Biofuel Production Pathways

<table>
<thead>
<tr>
<th>Biofuel Production Pathway</th>
<th>Typical GHG Emission Saving</th>
<th>Default GHG Emission Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar beet ethanol</td>
<td>61%</td>
<td>52%</td>
</tr>
<tr>
<td>Wheat ethanol (process fuel not specified)</td>
<td>32%</td>
<td>16%</td>
</tr>
<tr>
<td>Wheat ethanol (lignite as process fuel in CHP plant)</td>
<td>32%</td>
<td>16%</td>
</tr>
<tr>
<td>Wheat ethanol (straw as process fuel in CHP plant)</td>
<td>69%</td>
<td>69%</td>
</tr>
<tr>
<td>Sugar cane ethanol</td>
<td>71%</td>
<td>71%</td>
</tr>
<tr>
<td>Rape seed biodiesel</td>
<td>45%</td>
<td>38%</td>
</tr>
<tr>
<td>Palm oil biodiesel (process not specified)</td>
<td>36%</td>
<td>19%</td>
</tr>
<tr>
<td>Palm oil biodiesel (process with methane capture at oil mill)</td>
<td>62%</td>
<td>56%</td>
</tr>
<tr>
<td>Waste wood ethanol</td>
<td>80%</td>
<td>74%</td>
</tr>
</tbody>
</table>

= Typical + 40% increase on the estimated processing emissions
RESULTS DEPEND ON THE PROCESS AND BY-PRODUCT USE:

Figures do not include land use change emissions
ACCOUNTING OF CO-PRODUCTS

- **a. Substitution approach:** discount GHG emissions of the substituted product from the total “fuel + co-product” emissions
  
  For policy analysis (JEC – WTW study)

  The calculation for the GHG saved *in the transport fuel sector* should not depend on the use of the by-products…….

- **b. Allocation approach:** emissions divided between fuel and co-product in proportion according to:
  - mass
  - energy content (excluding residues) → **RE Directive**
  - Economic value

  • Allow Estimation *in the transport sector* (All options)
  • no undesired incentives (the use of co-products is irrelevant) (All options)
  • Doesn’t change in time (like price) (1 and 2)
  • Gives values more close to those calculated with “substitution” (2)
CONCLUSIONS

• Sustainability *sine qua non* condition for biofuels promotion in the EU
  
  ➢ No negative environmental and social impacts
  ➢ No negative impacts on food availability

• Life Cycle Analysis methodology is defined, but economic operators need additional tools to calculate GHG emission savings

• Main uncertainties in the correct evaluation of GHG savings are due to marginal emissions from ILUC, N2O emissions and allocation of emissions to co-products.

• Coordination with non-EU regulations is fundamental.