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# ICAO Colloquium on Aviation and Climate Change

## 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

<b>GHG Impact</b>	<ul style="list-style-type: none"><li>❑ <i>Minimum 35% GHG Emissions saving (50% from 2017, 60% from 2018)</i></li></ul>
<b>Biodiversity</b>	<ul style="list-style-type: none"><li>❑ <i>not be made from raw materials obtained from biodiverse areas (including primary forests)</i></li></ul>
<b>Land use</b>	<ul style="list-style-type: none"><li>❑ <i>Not be made from land with high carbon stock (i.e. wetlands, forested areas...)</i></li><li>❑ <i>Not be grown on peatlands</i></li></ul>
<b>Good agricultural conditions</b>	<ul style="list-style-type: none"><li>❑ <i>Requirement for good agricultural and environmental conditions (as defined in Annex III to Council Regulation 1782/2003) and social sustainability</i></li></ul>

## 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:

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

$$GHG \text{ SAVING} = (E_F - E_B)/E_F \quad (\text{min } 35\%)$$

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
- N<sub>2</sub>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:

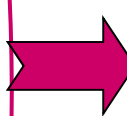
[http://re.jrc.ec.europa.eu/biof/html/documents\\_main.htm](http://re.jrc.ec.europa.eu/biof/html/documents_main.htm)

3. Combination of 1 + 2  Disaggregated default values in Annex V



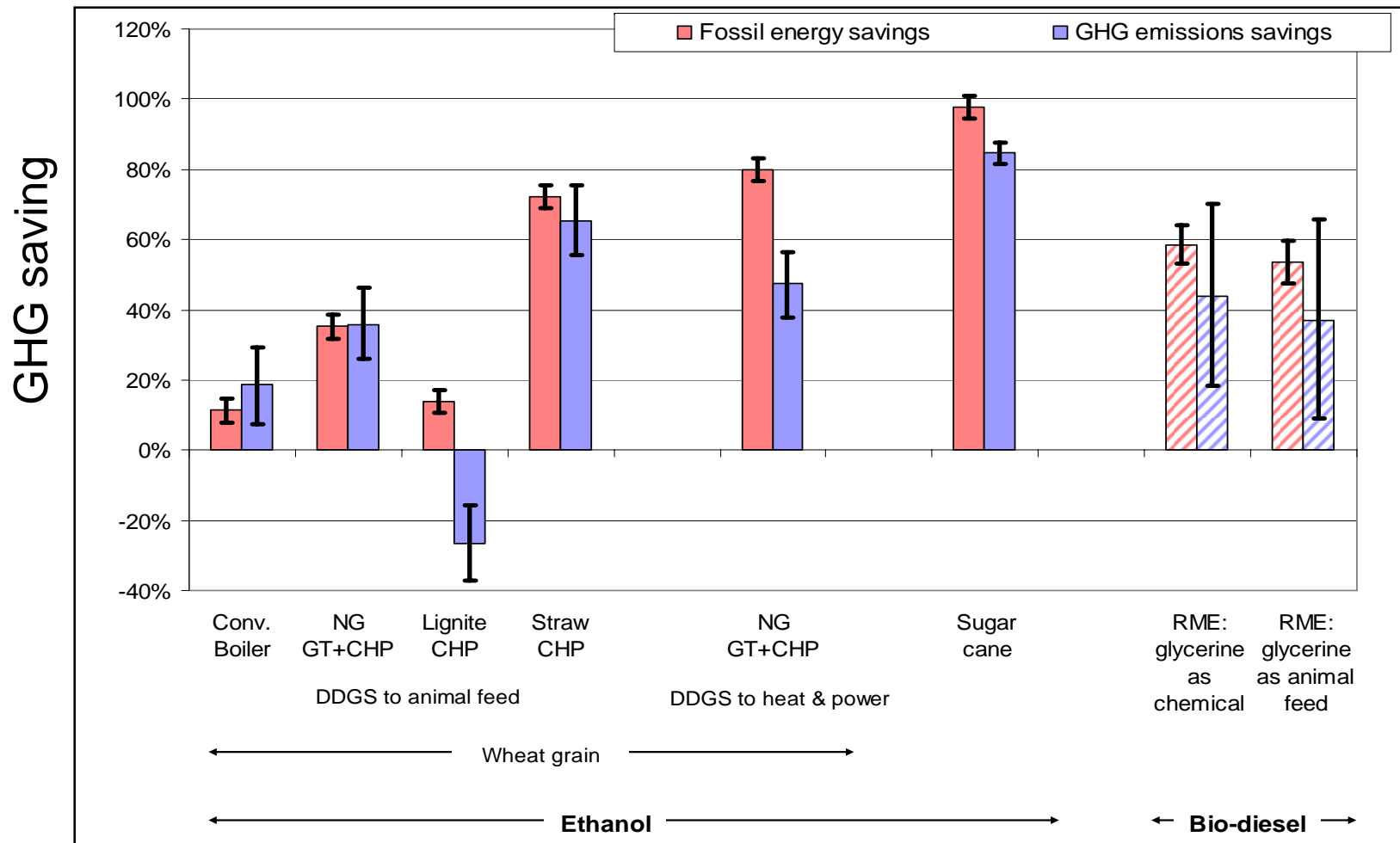


Biofuel production pathway	Typical GHG emission saving	Default GHG emission saving
sugar beet ethanol	61 %	52 %
wheat ethanol (process fuel not specified)	32 %	16 %
wheat ethanol (lignite as process fuel in CHP plant)	32 %	16 %
wheat ethanol (straw as process fuel in CHP plant)	69%	69%
sugar cane ethanol	71%	71%
rape seed biodiesel	45%	38%
palm oil biodiesel (process not specified)	36%	19%
palm oil biodiesel (process with methane capture at oil mill)	62%	56%
waste wood ethanol	80%	74%



= 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, N<sub>2</sub>O emissions and allocation of emissions to co-products.
- Coordination with non-EU regulations is fundamental.