Open questions in GHG accounting

A. Agostini

EC – JRC – IET – CEU – Petten (NL)

Joint Research Centre

Outline

1. The GHG sustainability criteria in the RED
2. Intro to GHG calculation according to the directive
3. GHG default values
4. Open issues
5. Way forward?

GHG criteria in the RED

1. GHG criterion: Minimum 35% GHG Emissions saving (50% from 2017, 60% from 2018)
2. In annex V LCA methodology for GHG calculation and fossil fuel comparator
3. It is not aimed at accounting or reporting GHG emissions
4. It's a go/no go approach (the upstream emissions are accounted for in other sectors... diesel in transport etc)
5. The emissions from the fuel in use are set to 0

European Commission

Actual GHG calculation

$$E = e_{ec} + e_{l} + e_{p} + e_{td} + e_{u} - e_{sca} - e_{ccs} - e_{ccr} - e_{ee}$$

E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

European Commission

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EMISSIONS (+) ***SAVINGS (-)***

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EMISSIONS (+)

e_{ec} = cultivation of raw materials;

SAVINGS (-)

Actual GHG calculation

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e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

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EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

SAVINGS (-)

Actual GHG calculation

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E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

e_{td} = transport and distribution;

SAVINGS (-)

Actual GHG calculation

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EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

e_{td} = transport and distribution;

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SAVINGS (-)

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

E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

e_{td} = transport and distribution;

e_u = emissions from the fuel in use;

SAVINGS (-)

e_{sca} = soil C accumulation via improved agricultural management;

Actual GHG calculation

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

E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

EMISSIONS (+)

e_{ec} = extraction or cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

e_{td} = transport and distribution;

e_u = emissions from the fuel in use;

SAVINGS (-)

e_{sca} = soil C accumulation via improved agricultural management;

e_{ccs} = carbon capture and geological storage;

Actual GHG calculation

$$E = e_{ec} + e_{l} + e_{p} + e_{td} + e_{u} - e_{sca} - e_{ccs} - e_{ccr} - e_{ee}$$

E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_{l} = carbon stock changes caused by land-use change;

e_{p} = processing;

e_{td} = transport and distribution;

e_{u} = emissions from the fuel in use;

SAVINGS (-)

e_{sca} = soil C accumulation via improved agricultural management;

e_{ccs} = carbon capture and geological storage;

e_{ccr} = carbon capture and replacement;

Open questions

1. Is the assumption that CO2 emissions from forest bioenergy is 0 acceptable?
2. Which reference system should be used for the comparison?
3. What is the correct timeframe for the analysis?
4. Which bioenergy pathways do have GHG savings if forest carbon stock changes are accounted for?
5. How should the displacement be addressed?
6. Should a cascade use of wood approach be recommended? And how can it be implemented?
7. What is the effect of disturbances and how is it possible to reduce and factor it?

European Commission

Is the assumption that CO2 emissions from forest biomass is 0 acceptable?

Bioenergy
102 gCO2 / MJ

Fossil
Hard Coal: 96 gCO2 / MJ
Natural Gas: 56.4 g CO2 / MJ

Joint Research Centre

European Commission

Is the assumption that CO2 emissions from forest biomass is 0 acceptable?
1 year later

Bioenergy
102 gCO_2 / MJ

Fossil
Hard Coal: 96 gCO_2 / MJ
Natural Gas: 56.4 g CO_2 / MJ

Joint Research Centre

Is the assumption that CO2 emissions from forest biomass is 0 acceptable?
After many years/decades

Bioenergy
102 gCO_2 / MJ

Fossil
Hard Coal: 96 gCO_2 / MJ
Natural Gas: 56.4 g CO_2 / MJ

Which reference system should be used for the comparison?

- The choice of the emissions per functional unit to which the bioenergy emissions are compared when GHG savings, but also the payback time, are calculated, is fundamental.
- The most important choice is between the marginal reference system or the average per MJ (heat, electricity or fuel).
- In case the marginal reference is chosen, then assumptions have to be made on what technology is replaced and whether the competing technology is based on fossil or renewable sources.
- What would happen to the forest/harvested wood without bioenergy has to be accounted for in the reference system.
- If the forest is harvested in individual blocks then most of the forest is the same in both the with bioenergy and without scenarios. Only the harvested blocks are important

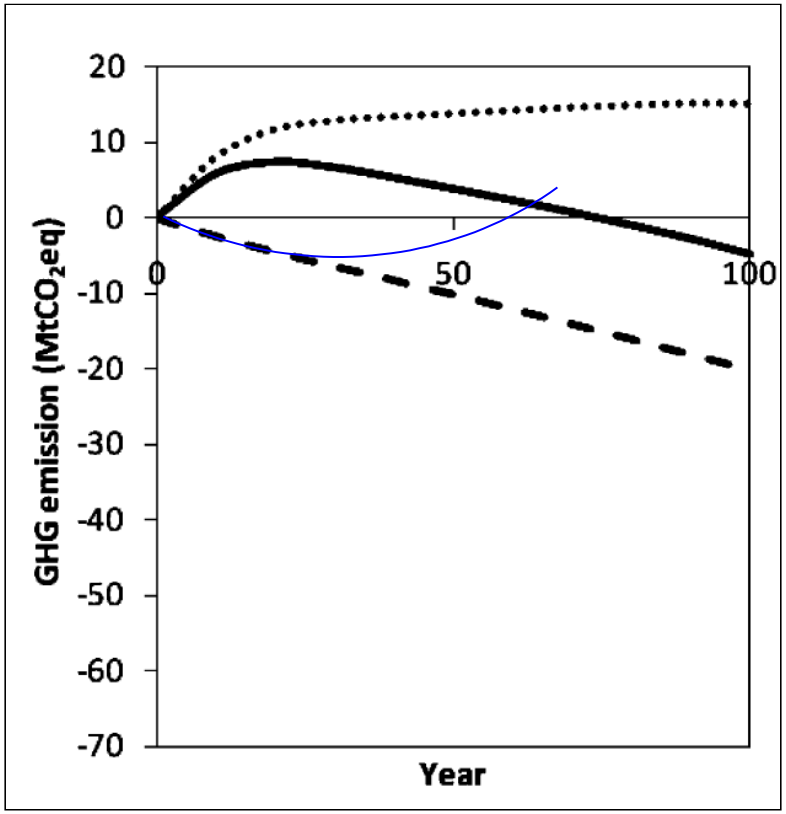
What is the correct timeframe for the analysis?

The timeframe of the comparison plays a relevant role.

If the time frame chosen is short, the current emissions from the reference systems can be considered suitable, but, in case the timeframe is long, also the changes in the reference systems have to be accounted for.

As examples, practically in all of the studies the reference system (coal or NG) is kept constant for the whole duration of the analysis, while, according to EU policies, by 2050 the EU should be decarbonized.

What is the correct timeframe for the analysis?



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Which bioenergy pathways do have GHG savings if forest carbon stock changes are accounted for?

Biomass source	Global warming mitigation efficiency					
	Short term (10 years)		Medium term (50 years)		Long term (centuries)	
	coal	Natural gas	coal	Natural gas	coal	Natural gas
Temperate roundwood	---	---	+/-	-	+	+
Boreal roundwood	---	---	-	- -	+	+
Harvest residues	+/-	+/-	+	+	++	++
New plantation on marginal agricultural land	+++	+++	+++	+++	+++	+++
Forest clear cut and substitution with plantation	-	-	++	+	+++	+++

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How should the displacement be addressed?

An increased use of biomass for bioenergy, even if from 'sustainable' sources, might indirectly cause an increase in the pressure on natural forests.

Normally all the wood is already used somehow, therefore, if used for bioenergy purposes it would have to be replaced with some other source in the system where it was taken from.

- Eucalyptus from Brasil
- Rubber tree Liberia
- Fossil fuels replace residues in industrial processes
- Increased price of wood make other materials more competitive for products diverting the wood from products to bioenergy

Should a cascade use of wood approach be recommended? And how can it be implemented?

UNECE and FAO recommend to sequester carbon in forests, then a 'cascaded' use of wood (i.e., firstly for wood-based products, secondly recovered and reused or recycled and finally used for energy)

Table 21: Carbon stocks and flows in the EFSOS scenarios, total Europe

		Unit	Reference		Maximising biomass carbon	Promoting wood energy
			2010	2030	2030	2030
Carbon stocks	Forest biomass	Tg C	11 508	13 214	14 130	13 100
	Forest soil	Tg C	14 892	15 238	15 319	14 994
Carbon flows	Change in forest biomass	Tg C/yr		85.3	131.1	79.6
	Change in forest soil	Tg C/yr		17.3	21.4	5.1
	Net change in HWP	Tg C/yr		18.2	18.2	17.6
Substitution effects	For non-renewable products	Tg C/yr	NA	NA	NA	NA
	For energy	Tg C/yr	61.6	83.0	83.0	121.7
Totals	Stock (forest only)	Tg C	26 400	28 452	29 449	28 093
	Flow (sequestration + substitution)	Tg C/yr		203.7	253.6	224.0

Source: The European Forest Sector Outlook Study II (UNECE. and FAO, 2011))

What is the effect of disturbances and how is it possible to reduce and factor it?

The way forward

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr}$$

E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

e_{td} = transport and distribution;

e_u = emissions from the fuel in use;

SAVINGS (-)

e_{sca} = soil C accumulation via improved agricultural management;

e_{ccs} = carbon capture and geological storage;

e_{ccr} = carbon capture and replacement;

The way forward

$$E = e_{ec} + e_{cs} + e_p + e_{td} - e_{ccs} - e_{ccr}$$

E = total emissions from the use of the fuel in g $CO2_{eq}$/MJ

EMISSIONS (+)

e_{ec} = cultivation of raw materials;

e_l = carbon stock changes caused by land-use change;

e_p = processing;

e_{td} = transport and distribution;

e_{ind} = indirect effects (ILUC or displacement);

Merge in emission from carbon stock changes = e_{cs}

SAVINGS (-)

e_{sca} = soil C accumulation via improved agricultural management;

e_{ccs} = carbon capture and geological storage;

e_{ccr} = carbon capture and replacement;

New factor = e_{ind}

Thank you

Alessandro.agostini@ec.europa.eu

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