Position paper on future EU Climate regulation architecture

EU climate regulation architecture has greatly improved with Fit For 55-package – notably with the establishment of a new emissions trading system for sectors not covered by the pre-existing trading scheme.

Yet, a number of important challenges remain, if the EU is to attain a net-0 target for 2050 in a cost-efficient way, as GHG emissions of important sectors and activities still have inadequate regulatory set-ups with few if any reduction incentives both on the EU level and nationally. The main problems and risks are:

Agriculture has no common EU climate regulations, even though:

- GHG emissions in the sector have remained almost stable since 2010 – with the sector is responsible for almost 500 Mt of CO2e - or around 14 percent of EU GHG emissions. These numbers include emissions from peat soils cultivated in agriculture and energy use for machinery and heating. On a global scale agriculture is responsible for around a quarter of GHG emissions including LUC, and the EU is a net-importer of both agricultural products and inputs like soy.
- The sector produces standard commodities characterized by intense price competition. Handling the sector by national mitigation policies – as now presumed by the Effort Sharing Regulation and the LULUCF Regulation for peat soils – creates significant risks of intra-EU carbon leakage, as single Member States are not allowed to establish trade barriers towards other Member States to limit leakage. Different national reduction targets in the Effort Sharing Regulation and mitigation potentials in the LULUCF sector will lead to very different marginal mitigation costs for agriculture across EU countries.
- Development of new mitigation technologies in agriculture and alternative foods with low climate footprints has been sluggish due to the lack of effective EU regulation and hence market pull. It will remain so with the present fragmentation of climate regulation into 27 different, national mitigation schemes.
- A recent analysis from the European Environment Agency indicates that agricultural emissions are projected to decrease by only 1.5% from 2020 to 2040 based on current national policies and measures.[i]

The Commission proposal to form an EU Land-sector for agriculture and LULUCF after 2030 was not supported by Member States. Still, it would retain different national reduction targets and fragmentation of the mitigation effort.

Wood-based energy is not carbon neutral, and the significant climate impact of EU wood-energy use has been left without effective EU regulation.

- Combustion of wood creates significant CO2-pulses – increasing the CO2 content of the atmosphere for several decades or even centuries until new trees have absorbed

similar amounts of CO2 or the initial CO2-pulses have been balanced by avoided emissions from natural decomposition of combusted wood waste.

- The climate impact of EU wood energy use of more than 400 mio. m^3 in 2017[ii] may be estimated at around 175 Mio. t CO2 – or 5 % of total EU emissions (based on an emission factor of 42 kg CO2/GJ calculated for Danish waste-wood to energy[iii]). The consumption of wood-energy seems to have increased by around 150 % since 1990[iv], and some Commission scenarios foresee significant growth towards 2050[v].
- The magnitude of the specific climate impact of wood-energy remains much disputed[vi], but almost all scientific assessments recognize a climate impact above zero for all but tiny fractions of waste-wood.
- IPPC rules dictate that the climate impacts of wood energy be recorded in LULUCF-accounts, while reported as zero-emission at the point of combustion.
- The complicated reporting set-up has been translated into an unfortunate and ineffective compliance and incentive regime:
    - Energy companies combust large amounts of wood with ensuing CO2 emissions reported as zero-emission.
    - Member States pick up the bill in terms of lower carbon stocks and net-removals in their LULUCF accounts.
    - Forest LULUCF accounts cannot provide specific numbers on the impacts of wood-energy consumption on forest carbon stocks, why this remains invisible and poorly understood in Member States.
    - Consequently, no Member States seem to have transferred any reduction obligations on either forest owners selling wood for energy nor on wood energy consumers. Hence, the climate impact of wood energy has no effective regulation in the EU at all.
    - On top, a number of Member States subsidize the use of biomass for energy in order to replace fossil fuels.
- Most of the debate on the climate impact of wood-energy has centered on whether wood-based energy is better or worse for the climate than fossil fuels – which were deemed to have lower costs. Yet, with an EU target of net-zero GHG emissions in 2050 the relevant counterfactual is no longer fossil fuels but renewables like wind and solar with negligible climate impacts. On top, in recent years renewables have become cheaper than fossil fuels.
- Increasing use of waste wood for energy is potentially a key explanatory factor behind the decline in EU LULUCF net-removals in forest since 2013: Forest growing stock per Ha reportedly kept increasing at more or less historic trends in the same period.[vii] [viii] Hence, the overall declining trend in EU forest net-removals seem to stem from no or low growth in deadwood in forests – consistent with more waste wood being used for energy.[ix] Less deadwood in forests is also an important factor in deteriorating bio-diversity of EU forests.
- Even the new and tighter LULUCF Regulation and sustainability criteria in the Renewables Directive can never ensure pricing of the climate impact of woody-biomass on par with GHG emissions covered by the ETS1 and ETS2.

Negative emissions will be crucial to ensure a net-zero society, and it is crucial to get EU targets and incentives right.

Some early indications of EU policies indicate risks of getting incentives for negative emissions wrong – in particular as regards real additionality and permanence of negative emissions based on biogenic carbon.

Preparatory work on the Carbon Removal Certification scheme indicates that:

- Certification of bioenergy carbon capture and storage, BECCS, potentially neglects foregone carbon sequestration in biomass used to create negative emissions. Secondly, it may also ignore the significant extra energy consumption to drive the capture process and foregone electrification of fossil energy use in other sectors.
- Certificates may be issued for non-permanent carbon stores in agricultural soils and forests.

Potential certification of extra forest increment carries a systemic risk: Global forest growth is enhanced by CO2-fertilization, higher temperatures and NOx deposition – creating the so-called Land Sink[x]. No efforts have so far been taken in EU LULUCF-reporting to estimate the size of climate induced forest increment – even as the JRC has identified this problem[xi] and UNEP has introduced a harmonization for this factor in the recent Gap Report[xii]. The Kyoto Protocol established national maximum limits on LULUCF-credits from forests for the period 2008-12 citing the risk of issuing credits based on climate induced forest growth.[xiii] This has been forgotten in recent EU climate legislation.

With the present policy indications this natural response to climate change and its forcers risk being used to offset hard-to-abate emissions.

- The Commission 2021 proposal for a joint Land-sector for agriculture and LULUCF after 2030 would allow agricultural emissions being offset by net-removals in forests.

Market introduction of non-fossil chemicals and raw materials for plastics suffers from a lack of carbon pricing of fossil raw materials.

- A major share of fossil-based plastic and chemicals eventually end up being incinerated or oxidated into CO2 in other ways. EU climate regulations do cover fossil CO2 emissions from waste incineration. But regulating these emissions at the very final phase of the plastic life cycle provides no incentives to use low carbon raw materials.

Solutions

Below a number of potential solutions to the problems raised above are sketched out. Extending emissions trading to as many emissions as technically and economically feasible is the main recommendation.

Agriculture

The agricultural sector should preferably be included into the two ETS-systems – with non-CO2 emissions and emissions from peat soils covered by ETS1 and energy for agricultural machinery and heating by ETS2, which at present is only an option (A major part of Category 1.A.4.c in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). A second-best option would place agricultural energy use for machinery and heating in the ETS2, while creating a separate emissions trading scheme for remaining emissions from agriculture.

- Common EU pricing of agricultural emissions on par with other sectors will be key to incentivize mitigation and technology development and to inform consumers of the relative climate impacts of different foods. This will also help promote low-carbon diets and new low-carbon food products.
- Regulating agricultural emissions within a common EU emissions trading scheme will hinder intra EU carbon leakage in the sector. Joint EU-carbon border adjustment schemes could be established to counter carbon leakage towards third countries.
- The largest reduction potentials in traditional agriculture are by far to be found in primary production on farms. Consequently, incentive schemes should be tailored to individual farms.
- An upstream emissions trading scheme for industries processing primary agricultural products will not be able to establish properly working reduction incentives for individual farms, where the main reduction potentials are.
- Almost all drained peat soils are cultivated in the agricultural sector and should be treated along with other emissions from the sector. Rewetting of peat soils represents a large and relatively cheap reduction potential.[xiv]

The main challenge raised for inclusion of agriculture into the ETS 1 is provision of accurate emission records, which may be independently verified – all within reasonable transaction costs.

- Denmark and New Zealand have announced they will introduce carbon taxation of agriculture based on detailed carbon accounts for individual farms.
- IT-based standard accounting schemes with pre-filling of data from public databases on nutrients, animal numbers, type and size of slurry systems a.o. can greatly diminish administrative complexity for individual farms[xv].
- Yet, carbon accounts for individual farms may still be complex – not least for small farms in Member States with less developed databases of farm data. A hybrid scheme with low administrative complexity and costs should be made optional for such small farms, even if such schemes would offer less access to report mitigation efforts and reduce economic burdens.

- The Commission should urgently start preparations for carbon accounting on individual farms across the EU.
- Present EU support for farmers in the Common Agricultural Policy (CAP) should be changed accordingly to help farmers and Member States establish carbon accounts for individual farms. Secondly, CAP payments may help farmers adapt their production to new markets patterns and/or support re-training for jobs in other sectors.
- Preparations for the inclusion of agriculture into the ETS will probably take time, but some measures may be introduced early. The next revision of the CAP should make payments for peat soils conditional on rewetting.

Agricultural non-CO2 and energy emissions are now covered by the Effort Sharing Regulation. Emissions from peat soils are covered by the LULUCF Regulation. The proposed inclusion of these emissions into the ETS 1 and ETS 2 will integrate those emissions under common ETS reduction obligations. This could trigger amendments to the present regulatory set-up:

- Agriculture should no longer be covered by the Effort Sharing regulation. The widely different national reduction targets under this regulation would hinder equitable treatment of agricultural production across the EU operating in commodity markets with intense price competition. But the Burden Sharing Regulation also places higher economic burdens on high-income Member States. Low-income Member States should be compensated for resultant redistribution of reduction burdens with a higher share of auctioning revenues from the enlarged ETS-systems.
- It need not be necessary to adapt the scope of the LULUCF Regulation. Inclusion of peat soils emissions in the ETS barely affects commodity markets. Furthermore, the regulation has no differentiation of reduction efforts and economic burdens between Member States. In contrast, inclusion of peat soils into the ETS 1 will only help Member States to achieve their national reduction obligations under the LULUCF regulation – much the same way the establishment of ETS 2 for heating and transport now help Member States achieve their national reduction targets under the Effort Sharing Regulation.

Joint EU climate regulation of agriculture will also help Member States tackle outstanding environmental problems with nitrogen and phosphor leakage into waterways or ammonia emissions.

Climate impacts of bio-energy - wood energy in particular

The climate impact of bioenergy must be included into both ETS1 for large users and the ETS2 for small consumers. Overall ETS-caps must be changed accordingly. The climate impact from wood-energy is deemed significant, whereas plants with short rotation, e.g. straw and miscanthus, have lower but still noteworthy impacts. Consequently, inclusion of wood-energy impacts into the two ETS-systems should be given priority.

- Inclusion into the ETS must be based on emission factors – emissions per unit of energy produced. Emission factors must take into account natural decay in case the biomass had not been combusted and/or future growth on harvested forest land in case of

stem-wood being combusted. Consequently, the calculated emission factors will be lower than the instant emissions from combustion of bioenergy.

- The Commission must prioritize the development of standard emission factors for the main fractions of woody biomass used for energy in the EU – taking a pragmatic approach in spite of the scientific uncertainties involved.
    - The emissions factors should reflect the temporal lag between combustion emissions and avoided emissions from natural decay and/or CO2-removals in new trees, as short term GHG increases may lead to climate tipping points being surpassed. Tackling these time lags seem to be one of the main complications for analysts trying to quantify the climate impact of wood-energy.
    - Discounting relevant CO2-streams should be considered as a pragmatic method to develop emissions factors[xvi].
    - A conservative approach could potentially be used for a start: Most of the studies trying to quantify wood-energy climate impacts in terms of emission factors and cited in footnote V indicate impacts for waste wood of more than 20 kg CO2/GJ, with some studies citing factors above 100 kg CO2/GJ.
- Reporting on compliance with sustainability criteria in the Renewable Energy Directive provide solid data on wood used for energy for the development on common emission factors.
- As a starting point allowances for wood energy use in the two ETS schemes should be auctioned, as the main consumers in heat and electricity production face minimal risks of carbon leakage. However, some industries facing competition from third countries - like pulp and paper plus sawmills with high legacy use of wood energy - may be allocated a limited amounts of free allowances until these sectors may be covered by Carbon Border Adjustment Measures.
- In principle, the LULUCF reporting system could remain unchanged in order to ensure proper registration of carbon stocks and fluxes in both agricultural soils and forests. This would be similar to the ETS 1, where Member States now register emissions without having reduction obligations for these emissions.
- Subsidies for wood-energy use should be phased out.

Inclusion of emissions from woody biomass into the ETS will integrate those emissions under the common ETS emission budgets and provide clear reduction incentives in terms of the ETS allowance price. Yet, this will not incentivize extra removals in forests. In consequence, the national reduction obligations in the LULUCF Regulation starting in 2026 should be maintained and possibly made more ambitious as integration into the ETS will help Member States achieve their obligations.

Integration into the ETS will provide real and cost-efficient pricing incentives to the polluters responsible for bio-energy climate impacts for the first time in the EU. The relative low number of operators using large amounts of wood-energy are often covered by one of the two ETS-schemes already, which ensure low administrative complexity and costs. Large retailers of wood pellets and firewood are already covered by sustainability reporting in some Member States, and they could easily be included in the ETS administrative framework.

In contrast, the newly amended LULUCF Regulation will hardly be able to translate into equally effective mitigation incentives for emissions from wood-energy: The LULUCF Regulation implies wood-use should be regulated from the supply side. Yet regulating wood-use would require regulating and monitoring the operations of several thousand forest owners and -plots, which would be very costly at the least. Secondly, 27 separate national obligation schemes would never bring about comparable pricing signals on the climate impacts of wood energy. Finally, regulation of wood-supply recorded in LULUCF accounts may be ineffective, as significant amounts of wood may be used for energy without being reported in these accounts.[xvii] [xviii]

Transfer to the robust incentive and compliance scheme in the ETS will supplement the Sustainability Criteria in the Renewable Energy Directive for bioenergy. In addition, including the climate impact of bioenergy into EU emissions budgets via the ETS framework will also ensure that woody biomass used for renewable energy will not increase climate impacts from EU renewables consumption.

Getting incentives for negative emissions right – in particular for biogenic carbon storage

The Commission is considering ways to incentivize negative emissions beyond voluntary trading based on the Carbon Removal Certification scheme[xix]. The recent revision of the ETS directive indicated that negative emissions may be used to offset remaining, hard-to-abate emissions covered by the ETS. But a cautious approach should be applied:

In general, alongside targets for EU emission reductions, a separate target for negative emissions should be considered. Emission reductions are fundamentally different from negative emissions in scope and timing.

Carbon dioxide remains partly in the atmosphere for more than 1000 years. Hence, carbon removals can only counteract the warming effects of emissions and reverse the trend of ever-increasing greenhouse gas (GHG) concentration in the atmosphere, if they keep the CO2 out of the atmosphere for the same period.

For this reason alone, temporary and reversible storage in forests and agricultural soils should not become tradable, negative emissions in the two ETS-systems. Secondly, these temporary carbon stores will be difficult and costly to monitor. Thirdly, it would be difficult to ensure replacements when/if the temporary carbon stores are depleted. And fourthly, part of forest growth is probably induced by CO2 fertilization, higher temperatures and nitrogen fertilization caused by deposition of NOx.

Consequently, carbon removals should only be recognized in the ETS schemes, if CO2 is removed from the atmosphere and permanently stored for more than a thousand years.

But even permanent storage is not sufficient: On top, foregone carbon sequestration in biomass used to create negative emissions must be factored in when determining the real net-effect of the process.

Significant challenges may arise for BECCS based on wood-energy:

- BECCS removes no CO2 directly from the atmosphere. It merely moves carbon stored in biomass into a geological storage with a loss of 10 percent or more during the capture process. The only climate benefit will be the avoided natural decomposition into CO2, if the biomass was left for natural decay. Hence, BECCS based on slowly decaying waste wood may take up to 30 years to deliver net-additional CO2-storage. [xx] In contrast, BECCS based on fast decaying straw only take a few years or less to deliver net-additional-storage. And BECCS on waste incineration takes even shorter time to deliver net-additional carbon storage, as the counterfactual here is incineration or landfilling with high methane emissions.

The effects of biochar are equally dependent on the counterfactual carbon sequestration of the biomass used in the process and process conversion losses.

In conclusion, the best regulatory set-up will be separate targets for: 1) emission reductions, 2) nature based and temporary carbon removals and 3) a target for permanent storage from industrial removals. In addition, the future framework should ensure that EU incentives for technical carbon removals based on biogenic carbon properly reflect the loss of carbon stored in the biomass used for the process and conversion losses. Discounting future CO2-streams from biomass carbon stores should be considered as the standard method to calculate real net-effects of such processes.

Extra forest growth induced by climate change and its drivers or other pollution.

The Commission should undertake a thorough study of potential extra forest increment induced by climate change and its drivers in EU forests. If the study confirms significant extra forest growth the Commission should propose a new target for a minimum net-removals in EU forests. Being natures defense against climate change the minimum net-removals should not be used to offset any other EU-emissions.

Fossil raw materials for chemicals and plastic should be included into the ETS1

Inclusion of fossil raw materials in the ETS 1 should also change the overall ETS cap. Up-front pricing of ensuing CO2 emissions from incineration or other forms of oxidation of plastics and chemicals should be considered in order to provide a level playing field for non-fossil alternatives. If introduced the carbon pricing of the fossil content of waste incineration may be phased out in order to avoid double taxation.

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[ii] Avitabile V. et al.; JRC 2023: *Biomass production, supply, uses and flows in the European Union*

[iii] Danish Climate Council 2022: *Kommentering af Global Afrapportering 2022;* Kommentering af Global Afrapportering 2022 | Klimarådet (klimaraadet.dk)

[iv] Eurostat nrg_cb_rw (Numbers for Primary solid biofuels of which wood is the dominant fraction, as specific numbers for wood were unavailable)
[v] EU Commission 2018; *A clean planet for all: In depth analysis in support of the Commission Communication COM (2018)773*
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[vii] FAO 2020*: Global Forest Resource Assessment,* Soimakallio S. et al. GCB Bioenergy, 2022: *Closing an open balance: The impact of increased tree harvest on forest carbon*.

[viii] Avitabile et al. op. cit.
[ix] Danish Forest Owners Assosciation; https://www.danskskovforening.dk/nyhed/nye-tal-for-doedt-ved-i-de-danske-skove-tilgaengelige/ https://www.danskskovforening.dk/nyhed/nye-tal-for-doedt-ved-i-de-danske-skove-tilgaengelige/
[x] IPPC 2018: *Climate Change and Land,* Global Carbon Budget 2021, IPPC 6th Assessment Report 2021; The Physical Science Basis
[xi] Grassi G. et al. 2022 op.cit.
[xii] UNEP 2022: *The Closing Window*; section 2.2. and annex A
[xiii] Marrakech Accords; Decision 16/CMP.1
[xiv] Danish Climate Council 2023: *Landbrugets omstilling ved en drivhusgasafgift.* Landbrugets omstilling ved en drivhusgasafgift.pdf (klimaraadet.dk)
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[xvi] Danish Climate Council 2022 op.cit.
[xvii] Camia A et al. JRC 2021: *The use of woody biomass for energy in the EU*, pg. 40ff
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[xix] Oeko Institute 2023: *Making Carbon Removals a Real Climate Solution*
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