STUDY

ENVI Workshop Proceedings

European Parliament

# 2030 climate target plan: review of Land Use, Land Use Change and Forestry (LULUCF) Regulation

Policy Department for Economic, Scientific and Quality of Life Policies
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PE 662.929 - June 2021

EN

# 2030 climate target plan: review of Land Use, Land Use Change and Forestry (LULUCF) Regulation

**Abstract**

The proceedings summarise the expert presentations and discussions of the workshop on the extension of the Review of the Land Use, Land Use Change and Forestry Regulation. The workshop served to prepare the ENVI Committee for the upcoming legislative "Fit for 55" package of proposals, as part of the European Green Deal. The presentations focused on options for improving carbon sinks in the EU and strengthening the LULUCF Regulation.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies for the Committee on the Environment, Public Health and Food Safety (ENVI).

This document was prepared for the European Parliament's committee on Environment, Public Health and Food Safety.

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Original: EN

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Manuscript completed: June 2021
Date of publication: June 2021


This document is available on the internet at:
http://www.europarl.europa.eu/supporting-analyses


For citation purposes, the publication should be referenced as: Urrutia, C. et al., 2021, *2030 climate target: Review of Land Use, Land Use Change and Forestry (LULUCF) Regulation - ENVI Workshop Proceedings*, Publication for the committee on Environment, Public Health and Food Safety, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg.

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| | |
|---|---|
| **AFOLU** | Agriculture, forestry and other land use |
| **CAP** | Common Agricultural Policy |
| **$CH_4$** | Methane |
| **EEA** | European Environment Agency |
| **ENVI** | Environment, Public Health and Food Safety |
| **ESR** | Effort Sharing Regulation |
| **ETS** | EU Emissions Trading System |
| **EU** | European Union |
| **FRL** | Forest Reference Level |
| **GAEC** | Good Agricultural and Environmental Conditions |
| **GHG** | Greenhouse gas |
| **HWP** | Harvested wood product |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **JRC** | Joint Research Centre |
| **LULUCF** | Land use, land use change and forestry |
| **MEP** | Member of the European Parliament |
| **MtCO2eq** | Million tones $CO_2$ equivalent |
| **Mtoe** | Million tons of oil equivalent |
| **$N_2O$** | Nitrous oxide |
| **NDC** | Nationally Determined Contribution |
| **RED II** | Renewable Energy Directive |
| **SOC** | Soil organic carbon |
| **UNFCCC** | United Nations Framework Convention on Climate Change |

# EXECUTIVE SUMMARY

## Background

To achieve climate neutrality by 2050, the EU has adopted a more ambitious EU-wide, economy-wide greenhouse gas emissions reduction target of 55% by 2030 compared to 1990. Among the proposals for revisions of relevant legislative measures to deliver on the increased climate ambition is the review of the land use, land-use change and forestry (LULUCF) Regulation to increase this sector's efforts to reduce emissions and maintain and enhance carbon removals.

In the Inception Impact Assessment (European Commission 2020e), the Commission presented three options for how the LULUCF Regulation could be revised. The first option would be to strengthen the current LULUCF Regulation and enhance its ambition. The second option would be to increase the flexibility of LULUCF credits towards the Effort Sharing Regulation. The third option would be to combine agriculture and LULUCF into one separate policy pillar with its own target.

## Aim

The Policy Department for Economic, Scientific and Quality of Life Policies organised for the committee on the Environment a workshop in preparation for the upcoming discussion in the European Parliament on the review of the LULUCF Regulation. The event included four expert presentations:

- Dr. Valentin Belassen, French National Research Institute for Agriculture, Food and the Environment, focused on challenges and blind spots associated with monitoring and accounting under the current LULUCF Regulation. It also highlighted the importance of long-term strategies for achieving a balance between anthropogenic emissions by sources and removals by sinks after 2050.
- Dr. Hannes Böttcher, Division Energy and Climate, Oeko-Institut, Germany, presented actions and policies to enhance and incentivise natural sinks in forests. He emphasised the importance of protecting carbon stock, using a comprehensive $CO_2$ balance to assess the mitigation potentials of options in the forestry sector, better accounting under the LULUCF Regulation and developing complementary measures focused on forest owners.
- Dr. Ana Frelih-Larsen, Ecologic Institute, Germany, presented actions and policies to enhance and incentivise carbon sequestration capacities of soils. She stressed the importance of soil health for mitigation and climate resilience and argued for the development of actions and instruments that includes soil health. She also described options to improve the LULUCF Regulation with regards to soil carbon and noted the need to integrate soil health and carbon across policy areas.
- Mr. Robert Matthews, Forest Mensuration, Modelling and Forecasting, Forest Research, UK, addressed strengths and weaknesses of the LULUCF Regulation with regards to biomass and energy and described options for improvement.

## Main discussions

Enhanced targets at EU and Member State level under the LULUCF Regulation are required for effective enhancement of sinks and reduction of emissions in the LULUCF sector. The LULUCF sector has specific characteristics such as larger uncertainties of emissions and removals in the inventory, unknown impacts of climate change on the future sequestration potential and the potential risk of reversal of carbon stored in soils and ecosystems. The design of the future contribution of the LULUCF sector to

the EU target should take these specific features into account. The discussion focused on how accounting under the LULUCF Regulation can be strengthened and simplified. This would entail replacing accounting against projected reference levels with area-based target or a historic reference, both options would reduce complexity of accounting and could apply to all LULUCF activities and pools.

The revision of the LULUCF Regulation should be designed with a view to setting the right incentives to enhance the long-term carbon sinks required to achieve EU climate neutrality in 2050 and to increase the consistency with the long-term requirements. The discussion also highlighted the need for the development of tools to incentivise action by forest owners. One option discussed was to create new business models for forestry that pay for carbon storage and other ecosystem services. However, the challenge with this approach will be determining the right price. Setting a single price will not address the diversity of forests and of forest management practices.

The provisions under the LULUCF Regulation do not avoid potential negative impacts from enhanced bioenergy use or other land-use policies on biodiversity. Therefore, the Regulation needs to be complemented with additional instruments such as legally binding EU nature restoration targets as proposed in the EU's biodiversity strategy for 2030. A central theme of the discussion was that the EU needs to balance the trade-off between protection of carbon stocks and forest use, considering the short-term and the long-term perspective.

Significant potentials for increased carbon storage in peatlands and organic soils are untapped. Enhancing sequestration in organic soils requires additional instruments and policies beyond the revision of the LULUCF Regulation. In this regard, the need for an EU soil legal framework to protect and restore soil health was discussed. Other options include enhancing sequestration as part of Member States' national strategies under the Common Agricultural Policy.

# 1. INTRODUCTION

On Tuesday, 25 May 2021, the Policy Department for Economic, Scientific and Quality of Life Policies organised at the request of the committee on Environment, Public Health and Food Safety (ENVI) a workshop entitled '**2030 climate target plan: review of LULUCF Regulation**'. The workshop served as a preparatory measure for upcoming discussions on the legislative reform. The workshop was chaired by MEP Bas Eickhout, Vice-Chair of the ENVI committee and streamed online.

The event was structured around four experts' presentations. In the first presentation, Dr. Valentin Belassen from the French National Research Institute for Agriculture gave an overview of emissions and removals in the LULUCF sector, described current accounting rules and presented future options for accounting of emissions and removals under the LULUCF Regulation. The following two presentations focused on actions and policies to enhance and incentivise carbon sequestration capacities and their linkages to the LULUCF Regulation. Dr. Hannes Böttcher from Oeko-Institute in Germany presented his views on forests and Dr. Ana Frelih-Larsen from Ecologic Institute in Germany focused her presentation on soils. The last presentation by Mr. Robert Matthews from Forest Research UK dealt with bioenergy and biomass and related emissions in the LULUCF Regulation. The workshop proceedings are complemented by a technical background. The contents of this section are taken from the background paper prepared in advance of the workshop (Herold et al. 2021)[1].

The current European climate target to reduce total emissions by 40% compared to 1990 levels by 2030 consists of three pillars:

- the EU Emissions Trading System (ETS), which covers about 40% of the European greenhouse gas (GHG) emissions and which shall deliver a reduction of 43% compared to 2005,
- the Effort Sharing Regulation (ESR) with a share of about 60% of total GHG emissions with a reduction target of 30% compared to 1990, and
- the Land Use and Land Use Change and Forestry (LULUCF) Regulation (Regulation (EU) No 2018/841), which covers the emissions and removals from the land use, land-use change and forestry sector and sets the target to avoid net emissions from this sector.

In April 2021, the EU adopted an increased target of reducing emissions by 55% by 2030 compared to 1990 levels. This target includes emissions and removals from the LULUCF sector. In July 2021, the European Commission will present legislative proposals underpinning this more ambitious reduction target, including a proposal for a revised LULUCF Regulation.

The inclusion of LULUCF emissions and removals into the -55% EU target for 2030 aims to strengthen the role of natural sinks. This target is based on emissions or removals as reported in the greenhouse gas (GHG) inventory, without considering accounting rules under the LULUCF Regulation. To ensure a minimum emission reduction of other sectors, the contribution of the LULUCF sector to the target is capped at net sink of -225 million tons $CO_2$eq. This corresponds to the Commission's assessment of the net carbon sink resulting from the existing commitments under the LULUCF Regulation (European Commission 2020c). If the LULUCF sector contributes to the 55% reduction target within the scope of this cap in 2030, emissions of other sectors need to decrease by 53%. If the LULUCF sector achieved a net sink of -300 million tons $CO_2$eq in 2030, the net removals beyond the cap cannot be used to compensate emissions of other sectors, but are additional and would lead to a total EU GHG emission reduction of 57% compared to 1990.

[1] The full technical background can be accessed here: https://www.europarl.europa.eu/cmsdata/233827/Background_paper_LULUCF_Regulation_2030_Climate_target.pdf

In the Inception Impact Assessment (European Commission 2020e), the Commission presented three options for how the LULUCF Regulation could be revised. These are based on the options discussed and quantified in the impact assessment of the Climate Target Plan (European Commission 2020c). The three policy options are discussed in the technical background.

# 2. TECHNICAL BACKGROUND ON THE LULUCF REGULATION

## 2.1. Current and projected trends in GHG emissions and removals

The main physical pools of terrestrial ecosystems to store carbon are above ground biomass in trees and perennial vegetation, below ground biomass, litter and dead wood as well as soil organic carbon (SOC).

**Forests** store carbon in their living biomass with a long lifetime (Böttcher et al. 2021). The EU27+UK forests cover 167 million ha (European Environment Agency 2021) with a carbon stock of 9.8 billion tons of carbon in living biomass, which constitutes 36% of the total forest carbon pool in 2020 (Forest Europe 2020). The forest soil has the highest share in the EU forest carbon pool of 54% (Forest Europe 2020).

Globally, **soils** store more carbon than all the vegetation and the atmosphere combined (Friedlingstein et al. 2019). The total storage of organic carbon for the EU27+UK topsoil (0-30 cm) is estimated to be 73 billion tons of carbon. About 50% is in peatlands and under forests and 22% in agricultural soils (Camia et al. 2021; Jones et al. 2005). Mineral soils store considerably less carbon than organic soils. In Europe, organic soils store four to five times more carbon than forests (Swindles et al. 2019). Finland and Sweden report together more than half of the total area of organic soils in the EU (European Environment Agency 2021). Under cultivation, organic soils are usually drained, which causes high $CO_2$ emissions. Total $CO_2$ emissions from organic soils in the EU reached 107 million tons $CO_2$eq in 2019 which represents about 37% of total EU net removals from LULUCF (Camia et al. 2021; European Environment Agency 2021). After Indonesia, the EU is the second largest emitter of GHG emissions from drained peatlands (van Akker et al. 2016).

**Harvested wood products** (HWP) can also store carbon but cannot sequester it. Harvest of biomass leads to immediate emissions if the biomass is burnt, but to delayed emissions if the biomass is used in products. In 2019, the EU27 net storage through HWP was -40.4 million tons of $CO_2$ (European Environment Agency 2021). The amount of carbon stored in HWP depends on how much harvested wood is stored in wood products with long lifetimes.

Important marine carbon pools in Europe are coastal ecosystems such as saltmarshes and seagrass meadows which are currently not included in the GHG inventories because estimation methodologies have only recently been developed by the IPCC and are not yet mandatory under the UNFCCC. Most EU Member States may not have collected sufficient data to estimate emissions from coastal ecosystems.

Overall, the **LULUCF sector in the EU** showed a total net removal of -264 million tons $CO_2$eq for EU27 for 2019. At EU level, there are net emissions from the categories cropland, grassland, wetlands, settlements and other land, and net removals from forest land and HWP, which outweigh net emissions of the other four categories to a large extent.

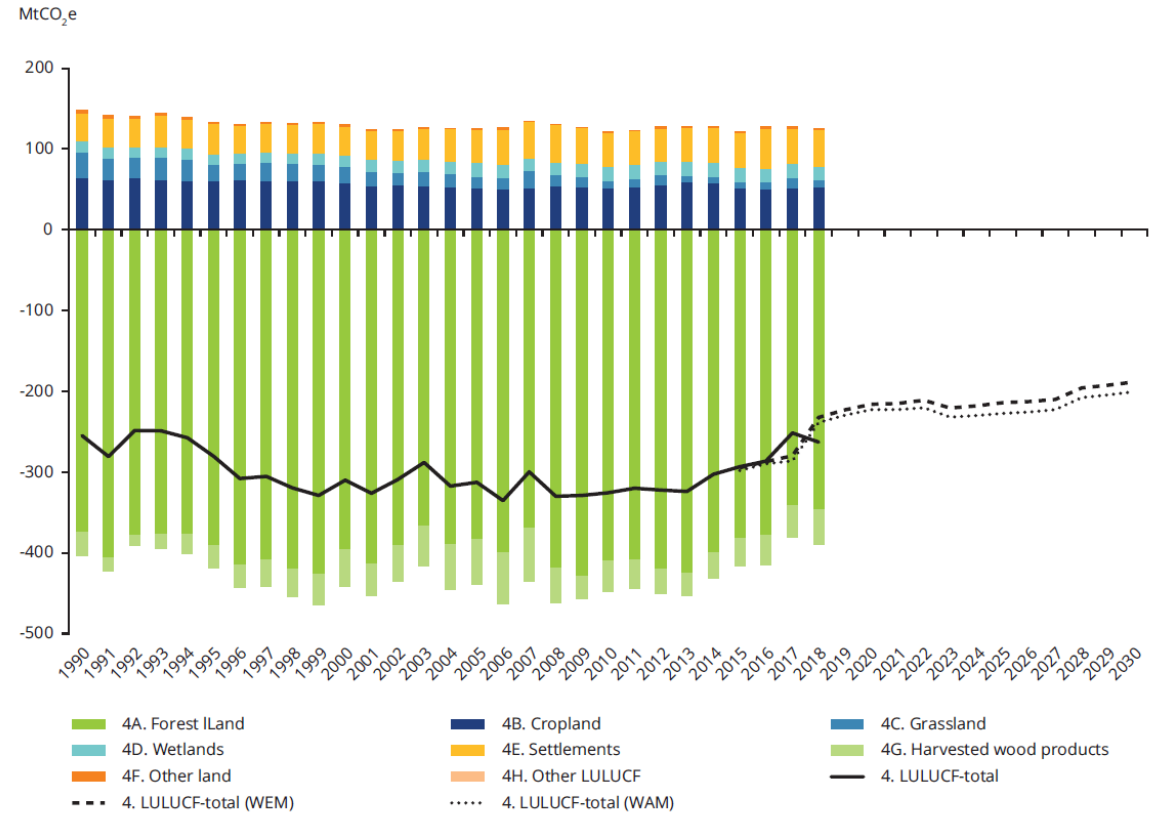
A significant **net decrease of the EU's sink can be observed in the last decade**: it fell from -316 million tons of $CO_2$eq in 2013 to -251 million tons of $CO_2$eq in 2017. This is due to ageing forests and higher harvesting rates, in addition to climate change-related pressures on forests such as droughts, storms or fires. Ceccherini et al. (2020) recently reported an increase in the forest harvest rate for Europe, which is an important driver of the decreasing carbon sink in forests.

Different projections show that **with current practices the capacity of European soils and forests to absorb $CO_2$ will further decline** to a level of -200 million tons $CO_2$eq in 2030, which represents a loss of 63 million tons $CO_2$eq. In the Commission's impact assessment for the climate target plan, a net sink

of -225 million tons $CO_2$eq is projected for 2030 if no further actions are taken. **A more ambitious policy scenario of the impact assessment** (European Commission 2020c) enhances the LULUCF sink to approximately -340 million tons $CO_2$eq by 2030. For 2050, by which time the EU aims to be climate-neutral, the entire LULUCF sector is expected to balance about -425 million tons $CO_2$eq of residual emissions from other sectors (European Commission 2018). After 2050, net GHG emissions of the EU will need to be negative to stay below the temperature target established by the Paris Agreement.

The potential future sink in the LULUCF sector is not easy to estimate. Böttcher et al. (2021) compile total **results of different studies, ranging from a net sequestration of -244 to -787 million tons $CO_2$eq per year in 2050**. A **main factor of uncertainty is the effect of climate change on forests and wetlands**. Between 2018 and 2020, European forests were affected by severe droughts, wildfires, storms and spreading bark beetle infestations (Lindner and Verkerk 2021). But it remains difficult to predict the future development because it is not known whether the extreme weather patterns of 2018-2020 present a new 'normal' climate or an exceptionally dry period or whether the future climate may even become more extreme.

Figure 1: Historical and projected LULUCF emissions and removals




**Note:** **Bars** and **solid lines** represent historical GHG emissions (available for the period 1990-2018). **Dashed lines** represent projections for the scenario with existing measures (WEM). Dotted lines represent projections for the scenario with additional measures (WAM).

Source: European Environment Agency (2020).

## 2.2. Role of Member States in relation to the EU emissions and removals from the LULUCF sector

Under the LULUCF Regulation, Member States have to ensure that accounted GHG emissions from LULUCF are balanced by at least an equivalent accounted removal of $CO_2$ in the period 2021 to 2030. This is known as the 'no debit' rule.

Information on average LULUCF emissions and removals from 2014 to 2018 in the 2020 EU GHG inventory indicates that there are **six Member States with net emissions** (Denmark, Ireland, Latvia, Malta, the Netherlands and Slovenia). **Large net sinks can be observed in Sweden** with a share of 80% of total GHG emissions, followed by **Finland** (30% of total emissions) and **Lithuania** (26% of total emissions). Forest land is the most relevant sub-category in absolute terms, resulting in a net sink for all Member States apart from Slovenia and Malta. Another important sink is the net carbon stored in HWP in most Member States. Cropland and settlements are relevant net sources of emissions in most Member States. In the settlement category emissions mainly result from deforestation for transport infrastructure and settlement areas.

## 2.3. Monitoring, reporting and accounting framework for the LULUCF sector

### 2.3.1. Monitoring

Under the Paris Agreement and in the EU, the 2006 IPCC Guidelines have been adopted as mandatory monitoring and estimation methodologies for inventories. The estimates of emissions and removals in some LULUCF categories have relatively high uncertainties: 38% for $CO_2$ emissions from cropland at EU level, 1018% for $CO_2$ emissions from grassland and 56% for $CO_2$ emissions from wetlands (European Environment Agency 2021, Table 6.41). Uncertainties are considerably higher for the changes of carbon stocks in the soil carbon pool than for the above ground biomass.

There are many ongoing discussions about the reliability of reported LULUCF data. Böttcher et al. (2020) identified potential issues of completeness, consistency and accuracy in current reporting and accounting rules and procedures for EU Member States and their implications for incentives to changed land management within the EU looking at cropland, HWP, managed forests and organic soils. Grassi et al. (2021) postulate that carbon-absorbing effects of forest land are overestimated in GHG inventories. In addition, there are ongoing discussions about the results from satellite data which suggests a huge increase in the harvested forest area after 2015 (Ceccherini et al. 2020); scientists have questioned whether this result may be influenced by improved sensitivity of satellite data (Palahí et al. 2021).

### 2.3.2. Reporting and verification

Reporting in the EU and under the UNFCCC aims at documenting the level and development of anthropogenic GHG emissions and removals over time. Anthropogenic emissions and removals in the LULUCF sector result from biological processes on land areas directly or indirectly influenced by human activities on managed lands. GHG inventories report six main categories (forest land, cropland, grassland, wetlands, settlements, other land and HWP) and are annually submitted by Member States to the European Environment Agency (EEA). These inventories are aggregated to an EU inventory. Reported data on emissions and removals are regularly recalculated for past years due to continuous improvements in methodologies and updated data.

### 2.3.3. Accounting

Accounting, in contrast to reporting, sets the reported emissions and removals into perspective to a target. The LULUCF Regulation establishes accounting rules to ensure that the LULUCF sector does not generate net emissions. It defines six accounting categories (afforested land, deforested land, managed cropland, managed grassland, managed forest land and managed wetland). HWP are accounted in the categories managed forest land and the afforested land. The Regulation introduces two accounting periods, the first from 2021 to 2025 and the second from 2026 to 2030. Accounting in the different categories follows specific rules:

- For the afforested and deforested land categories, the total emissions and removals that occur during the accounting periods are accounted – they are not compared to any reference.
- The categories cropland, grassland and wetlands are compared to the average net emissions and removals of 2005 to 2009.
- For forest land, a Forest Reference Level (FRL) is the baseline for accounting. The FRL is the counterfactual value of emissions and removals that would occur in managed forest land in the future based on the continuation of 'sustainable forest management practices' as applied in the period from 2000 to 2009. Therefore, FRLs provide incentives for improved land management because the continuation of current practices does not result in accountable removals, but only practices that further enhance removals. The FRLs for the first accounting period were determined by Member States based on common criteria and guidance, reviewed by experts, revised in the light of review recommendations and adopted as part of a delegated act (European Commission 2020a). The FRLs for the period 2026 to 2030 will be determined in 2023 with the same procedure. The LULUCF Regulation also applies a limit to the total accountable net removals from managed forests. It is set at 3.5% of the total base year emissions.

Table 1: Accounting rules under the LULUCF Regulation

| LULUCF category | Accounting Rule | Data Source |
|---|---|---|
| Afforested land | Total net emissions/removals in the accounting period (comparison against zero) | Reported emissions and removals in compliance period |
| Deforested land | Total net emissions/removals in the accounting period (comparison against zero) | Reported emissions and removals in compliance period |
| Managed forest land and HWP | Against a Forest Reference Level (FRL) | European Commission (2020a) |
| Managed cropland | Against historic reference, the average net emissions and removals of 2005-2009 | Reported emissions and removals 2005-2009 |

| LULUCF category | Accounting Rule | Data Source |
|---|---|---|
| Managed grassland | Against historic reference, the average net emissions and removals of 2005-2009 | Reported emissions and removals 2005-2009 |
| Wetlands | Voluntary until 2025, against historic reference | Reported emissions and removals 2005-2009 |
| Settlements and other | Not included as a category in EU accounting, but land conversion to and from settlements included in categories above while changes of carbon stocks in settlement areas are assumed to be negligible. | |

Source: Oeko-Institut, for further information see Böttcher et al. (2019).

Due to the application of accounting rules, accounted emissions and removals differ from the reported emissions and removals. The table below provides an example of balanced accounted emissions while reported emissions and removals in GHG inventories result in a net sink.

Table 2: Example results of accounted and reported emissions and removals (in million tons $CO_2$ equivalents)

| Land category | Accounting reference (FRL or historic reference) | Average emissions and removals | Result after accounting: +0 Mt $CO_2$eq | Total in GHG inventory: -225 Mt $CO_2$eq |
|---|---|---|---|---|
| Managed forest land and HWP | -316 | -316 | 0 | -316 |
| Managed cropland | 52 | 52 | 0 | 52 |
| Managed grassland | 15 | 15 | 0 | 15 |
| Wetlands | 17 | 17 | 0 | 17 |
| Afforested land | None | -40 | -40 | -40 |
| Deforested land | None | 40 | 40 | 40 |
| Settlements and other | None | 7 | Not included | 7 |

Source: Oeko-Institut.

The LULUCF Regulation also includes provisions on how Member States may exclude emissions from natural disturbances such as storms, fires, droughts or insect outbreaks from the accounting and how they can account for carbon temporarily stored in HWP.

### 2.3.4. Flexibilities

Member States can use the following flexibilities under the LULUCF Regulation to achieve compliance:

- In case of non-compliance with the net debit target, Member States may use Annual Emission Allocations under the ESR to compensate surplus emissions under the LULUCF Regulation.
- Member States with net removals beyond the commitments under the LULUCF Regulation can use a limited amount of net removals for compliance with the ESR. In total, this flexibility is capped at 280 million tons $CO_2$ in the period 2021-2030. The maximum amounts of net removals that Member States can take into account for compliance with the ESR are fixed in Annex III of the LULUCF Regulation. For further information on the ESR compliance cycles, see Gores et al. (2019).
- Member States can sell net removals under the LULUCF Regulation to other Member States that have net emissions from LULUCF accounting.
- Member States can bank surplus net removals from the first accounting period (2021-2025) to the subsequent accounting period.

The flexibilities between the ESR and the LULUCF sector have been criticised for opening a 'fire wall' between biogenic emissions and removals of land use activities and fossil fuel emissions from ESR activities and thereby decreasing incentives for the reduction of fossil fuel emissions (Fern 2018). However, these flexibilities can also be seen as setting additional incentives for sequestration and mitigation in all sectors and as an important safeguard against non-compliance risks.

## 2.4. The role of bioenergy

Biomass demand is often associated with potential impacts on the land use sink. According to the Impact Assessment for the climate target plan (European Commission 2020d), **the production of biomass for industrial and energy use has continuously increased in the EU in the past 30 years**. The Commission's Joint Research Centre (JRC) estimated that about half of the total wood harvested in the EU is directly or indirectly used for energy production (Cazzaniga et al. 2019). **In most scenarios of the impact assessment, the consumption of bioenergy only slightly increases up to 2030 compared to the current level** with highest demand from power generation and residential heating. Projections for 2050 assume a considerable increase of bioenergy consumption from around 150 million tons of oil equivalent (Mtoe) in 2030 to 230-250 Mtoe, half of which is assumed to come from solid biomass (European Commission 2020d).

To achieve renewable energy targets, bioenergy is very relevant, especially in the heating and cooling sector. In 2018, biomass has a share of 81% in final energy consumption from renewables in this sector. Toleikyte and Carlsson (2021) analysed the planned development in the heating sector as reported in National Energy and Climate Plans submitted by Member States in 2020. The use of biomass will slightly increase and will remain the dominant technology in this sector in the EU27 until 2030. Biofuels will continue to play a role in the transport sector. There is also a high interest in the electricity sector to use biomass to replace coal and to avoid the need to buy increasingly expensive emission allowances under the EU ETS.

At the same time, there are serious concerns about the use of biomass for energy production due to the impacts in the LULUCF sector and on biodiversity. **While the emissions from bioenergy are assumed to be zero in the energy sector, the emissions from bioenergy use are counted in the LULUCF sector** in the form of harvested biomass. **Therefore, increased pressure on wood use for bioenergy will not add emissions in the energy sector but in the LULUCF sector.** Imported biomass and biofuels do not add emissions in the LULUCF sector in the EU, but they can be significant drivers of deforestation on a global level (e.g. Gao et al. 2011). In addition, increased removal of biomass residues for energy use can reduce carbon stocks in soils, dead wood or litter and can have negative impacts on biodiversity. Due to finite land areas, nutrient and water supply, biomass production is limited and there are considerable feedstock limitations for biomass. Biomass should be used in the most efficient way possible with a preference for replacing fossil-based materials and subsequent burning for energy purposes in a cascade chain (Eickhout 2012). In the construction of forest reference levels under the LULUCF Regulation, a constant ratio of wood used for energy and for materials is assumed, which does not take into account the higher priority of material use. Additional ecological safeguards need to be ensured by reinforced sustainability criteria, to be addressed by the revised Renewable Energy Directive (European Commission 2021f). In Camia et al. (2021), several pathways for forest management practices and their impacts on biodiversity and carbon emissions mitigation are compared which could contribute to discussion on sustainable use of woody biomass.

## 2.5. Policy options for the revision of the LULUCF Regulation

In the Inception Impact Assessment (European Commission 2020c), the Commission presented three options for how the LULUCF Regulation could be revised related to the "Fit for 55" package.

### 2.5.1. Option 1: Strengthen the current LULUCF Regulation and increase its ambition in line with the 2030 Climate Target Plan

**National net sequestration targets instead of no debit rule**

The commitments under Article 4 of the regulation – that each Member State shall ensure that emissions do not exceed removals in all land categories – could be strengthened to a 'net removal' target in the LULUCF sector. Such a net sequestration target should be aligned with adaptation needs and the EU biodiversity and ecosystem restoration targets (see section 2.5.4). A net sequestration target at EU level would need to be converted into specific targets for each Member State, taking into account the different status and potentials to enhance sinks in forest and soils in Member States. Böttcher et al. (2020), propose to additionally allow for country targets that go beyond an EU average target. Enhanced individual targets for each Member State would require a difficult and time-consuming political negotiation process. Strengthened targets may also need the maintenance of current flexibilities under the LULUCF Regulation such as trading of excess net removals between Member States or banking between accounting periods to ensure compliance in a sector with high uncertainties.

**Strengthening accounting rules**

Accounting rules for the forest sector could be revised to increase the incentives for Member States to enhance carbon sequestration. The accounting rules are interlinked with the LULUCF targets. Considerably, strengthened targets may not need enhanced accounting provisions whereas strengthened accounting provisions can be a way of ensuring additional efforts for weaker targets.

The current setting of Forest Reference Levels (FRLs) for the accounting of emissions and removals from forest management under the LULUCF Regulation is based on a projected baseline assuming the

continuation of current management practices. The FRLs established for the first accounting period include the possibility of assuming a declining sink in future years or an increase in wood harvesting. If the sink decreases less than the FRL, removals are generated. Rules for the FRL could be strengthened in such a way that the projected baseline at least assumes a constant sink and does not allow declining net removals or increased harvesting. Currently, there are two Member States (Denmark and Ireland) with positive emissions in their FRLs for the period 2021-2025 who would be particularly affected by such strengthening of FRL rules.

The climate target impact assessment (European Commission 2020e) discusses the more radical change of replacement of the FRL accounting for forest land with a historic reference period (2000-2009). This would partly eliminate the difference between reported and accounted emissions and would generate an increase in the sink over the FRLs of around -73 million tons $CO_2$eq per year (European Commission 2020d). This quantitative change would not directly reflect increased ambition, but only a change in the accounting approach. A historic reference period for forest land would be simpler, increase transparency and be in line with the way the -55% EU target was set. However, after lengthy deliberations, FRLs have now been established and agreed for Member States in a burdensome process for the period from 2021-2025 with the intention of limiting accounting to effects from improved management. Accounting against historic periods may lead to a situation in which some Member States may achieve considerable net removals without enhanced efforts and some Member States may be confronted with considerably higher efforts. If combined with the option of enhanced net removal targets for Member States, a change to accounting against historic reference periods may be more acceptable for Member States because national circumstances such as age class structure and sequestration potentials could be taken into account in the target setting instead of the FRLs.

The LULUCF Regulation grants Member States some flexibility to temporarily increase their harvest intensity in accordance with sustainable forest management practices that are consistent with the objective set out in the Paris Agreement, provided that total emissions in the EU do not exceed total removals in the LULUCF sector (Managed forest land flexibility – Article 13). The mechanism allows Member States to reduce their debits by individual amounts set out in an Annex to the LULUCF Regulation. The deletion of this flexibility would enhance the accounting rules under the LULUCF Regulation and Member States would need to compensate the full net debit in their countries.

For afforested land, Member States may use longer transition periods of 30 years instead of 20 years in the LULUCF Regulation before the land area is accounted as 'managed forest land' if a justification is provided based on IPCC Guidelines. This means that all net removals from the afforested areas are fully accounted for ten additional years before the land area must be accounted as forest land against the FRL, which leads to significantly lower accounted net removals. For countries with historically high afforestation rates, this option is an advantage and increases their accounted net removals in the accounting periods without additional efforts. Older afforestations contribute strongly even if more than 20 years have passed since they were established. If only the standard IPCC transition period of 20 years were allowed, the incentives for additional new afforestation would increase.

The LULUCF Regulation also applies a limit of 3.5% of total base year emissions to the total accountable net removals from managed forests. Such limits are particularly relevant to maintain a certain mitigation ambition from other categories or sectors if net removals offset emission reductions from other categories or sectors. Its application has to be considered in the context of the general future accounting approach.

Accounting of managed wetlands is voluntary in the period 2021-2025. Mandatory accounting of wetlands in the first accounting period would strengthen the LULUCF Regulation but would be difficult

to implement. Not all Member States have fully established monitoring and reporting systems for wetlands and it takes time to develop and implement them.

The exclusion of emission and removals from natural disturbances mediates the effects of storms or fires on the accounted emissions and removals. The provision helps Member States to ensure compliance with LULUCF targets despite strong climate change impacts on the sector. However, the accounted emissions no longer reflect all emissions released into the atmosphere due to their temporary exclusion. A similar function could be achieved if the effects of natural disturbances were considered in the compliance assessment of Member States based on data presented at the end of the accounting period.

### 2.5.2. Option 2: Strengthen flexibility with the Effort Sharing Regulation

The increased use of flexibilities with the ESR can lower the compliance of Member States under the ESR. The flexibilities also moderate costs of emission reductions for Member States, but safeguards are necessary so that ambition levels are maintained under both regulations.

**Flexibility to use net removals under the ESR**

Currently, the use of net removals from LULUCF sector for compliance under the ESR is capped at a maximum of 262 million tons $CO_2$ over the period 2021-2030. This represents 1.3% of total Annual Emission Allocations in the period 2021-2030 under the ESR. Depending on the review of the ESR, the total amount of Annual Emission Allocations may change and the amount would need to be recalculated based on this percentage. The maximum amounts of net removals under the LULUCF Regulation which can be used under the ESR have been determined for each Member State. Member States can only use them in the case that Effort Sharing emissions exceed the Annual Emission Allocations for a certain year but only to the level of the annual total of net emissions and removals of the country. Due to these restrictions, it can be assumed that the full amount will not be used.

The permitted flexibility for using net removals under the ESR could be increased or decreased. The current 'no-debit' target under the LULUCF Regulation is likely to leave some Member States with considerable excess net removals after accounting, reducing incentives to actively change management practices in the land-use sector (Böttcher et al. 2021). These countries could have windfall benefits under the ESR, which reduces incentives for emission reductions under the ESR. However, additional flexibilities for using surplus net removals for compliance under the ESR may increase the incentive to improve management in the LULUCF sector in some Member States.

**Flexibility to use Annual Emission Allocations for compliance with the LULUCF Regulation**

In the case of non-compliance with the net debit target under the LULUCF Regulation, Member States may use Annual Emission Allocations under the ESR to compensate surplus emissions under the LULUCF Regulation. Due to high uncertainties related to the future emissions and removals in the LULUCF sector, it is recommended that this flexibility is retained to support compliance under the LULUCF Regulation.

**Changes to flexibilities**

The impact assessment of the climate target discusses a sub-option in which Member States would have to cancel or discount a certain amount of net removals before surplus net removals can be transferred to the ESR or other Member States (European Commission 2020c). This proposed sub-option could be an instrument for accounting for the higher uncertainties in the LULUCF sector.

### 2.5.3. Option 3: Combine agriculture and LULUCF sectors into a single climate policy pillar with a separate target

The agriculture sector includes mainly $CH_4$ and $N_2O$ emissions from livestock, fertilisation, manure management, rice cultivation, burning activities and $CO_2$ emissions from liming and urea application. $CO_2$ emissions and removals from carbon stock changes in agricultural soils are reported as part of the LULUCF sector (cropland and grassland). Thus, emissions from cropland areas and grassland areas are reported in two different sectors. It has been suggested that an integration of both sectors into an AFOLU (Agriculture, Forestry and other Land Use) sector would promote more consistent use of data and bring emissions and removals from the same land area into one sector.

The emissions from agriculture mostly result from natural microbiological processes in soils and from ruminant animals. Unlike in other sectors, these emissions cannot be reduced to zero as long as the EU intends to continue food production. In a net zero emission scenario for 2050, residual emissions from agriculture production have to be offset by $CO_2$ sequestered in the LULUCF sector or by other $CO_2$ capture and storage options. From the perspective of the 2050 climate neutrality target, it seems useful to combine the sector with the potentially largest residual emissions in 2050 with the sector that includes the potential to compensate these emissions.

**New AFOLU targets necessary**

New targets for an AFOLU pillar would need to be defined for 2030 at EU and Member State level to contribute to the overall 55 % reduction target. The minimum target at EU level for 2050 would be net zero emissions from a combined AFOLU sector. However, this may not be a very ambitious target as can be shown based on the Commission's impact assessment: The ambitious LULUCF+ scenario with additional actions could enhance the LULUCF sink to approximately -340 million tons $CO_2$eq by 2030 (European Commission 2020c). The agriculture emissions in 2018 were 394 million tons $CO_2$eq. To achieve a net balance by 2030, agriculture emissions would need to be reduced by 13% to 340 million tons $CO_2$eq. In the LULUCF+ scenario, the net sink would grow to -425 million tons CO2eq in 2050, which is about the same level as 2019 emissions from agriculture. Thus, if the combined target were zero net emissions, the LULUCF sector would carry the full burden and the agriculture sector would not need to reduce emissions in this scenario. These considerations show that due to the high uncertainties of the future net removals from LULUCF and of emissions from agriculture, it may be difficult to set a combined AFOLU target which provides sufficient and balanced incentives for action for both sectors.

The differentiation of targets on the Member State level needs a national target setting approach which has to take into account national circumstances and sequestration/mitigation potentials. The political negotiation process may be even more complex than for increased LULUCF targets. Establishing a single AFOLU sector will enhance the dependency of the agriculture sector on LULUCF and vice versa, which may create a more complex situation to ensure compliance in Member States. Such national targets should provide clear incentives to drive action directly on the level of farmers and foresters. For compliance with an ambitious AFOLU target, it is essential that additional mitigation policies in the agriculture and LULUCF sectors are implemented which is not a direct function of the LULUCF Regulation.

**Accounting periods to be defined**

Technically, the GHG emissions of the agriculture sector are currently accounted on an annual basis against the 2005 base year under the ESR while the LULUCF Regulation uses the accounting periods 2021-2025 and 2026-2030 against different reference levels (as explained above). An integration of both sectors would require as a minimum a uniform accounting period – either on an annual basis or in 5-year periods as under the LULUCF Regulation.

If the accounting period were changed to a 5-year accounting period for agriculture emissions, this would lower ambition because compliance would no longer be assessed on an annual basis and it may be that cases of non-compliance are detected too late to remedy the situation. In its submission to the UNFCCC to update its Nationally Determined Contribution (NDC), the EU has indicated that it accounts GHG emissions from the agriculture sector on an annual basis. Thus, five-year accounting periods for agriculture would be inconsistent with the EU's NDC.

The opposite option of adopting annual accounting for the LULUCF sector would strengthen the compliance system. This would create the need to establish annual AFOLU targets for the EU and Member States that are similar to the annual caps in the ETS. This may be technically challenging for Member States. Currently, they report emissions and removals from the LULUCF sector on an annual basis; however, the monitoring systems in most countries are not based on annual, but on periodic measurements. Member States would either need to move to strengthened annual data collection systems or it would need to be accepted that the net emissions/removals used for annual EU compliance are different to the final data. It would also be possible to install a recalculation mechanism for EU compliance in cases in which final emissions/removals from the LULUCF sector show large deviations from the annually accounted data. Generally, this option of annual accounting for the LULUCF sector would strengthen EU climate legislation and decrease the differences in accounting compared to other sectors.

**High uncertainties**

An AFOLU sector would combine two sectors in which emissions and removals generally have higher uncertainties than other sectors and where the projected trends are also facing high uncertainties due to the impacts of climate change on forests and agriculture areas. Climate change impacts may turn existing carbon stocks into emissions at any point in time and on a large scale. A separate LULUCF target may handle these uncertainties in a better way than a combined AFOLU target.

**Comparison of emissions at Member State level**

Agriculture emissions have remained approximately constant since 2005 at EU level; limited reductions were achieved between 1990 and 2005. Since 2013, the start of the Effort Sharing Decision period, emissions have increased. For an overview of current agriculture and LULUCF emissions and removals on Member State level, see the Annex.

### 2.5.4. Other options to enhance the contribution of the LULUCF sector to the EU climate targets

Apart from the revision of the LULUCF Regulation, many other initiatives are discussed to increase carbon sequestration in the LULUCF sector and reduce emissions. Some selected options discussed in the EU are reflected in this section.

In 2021, the European Commission will propose **legally-binding EU nature restoration targets** (European Commission 2021c). These targets are part of its Biodiversity Strategy (European Commission 2020b) for 2030 and a public consultation took place at the end of 2020. Strong synergies exist between the restoration of carbon-rich ecosystems and maintaining as well as strengthening the sinks required to compensate residual emissions from other sectors in 2050 and beyond. Restoration supports **long-term sequestration of carbon in biomass and soil** and helps to reduce emissions from those pools in the short term. Nature restoration can mean, for example, increasing the area of forest land, restoring carbon stocks in standing forests, maintaining and increasing soil organic carbon in mineral soils and restoring wetlands (Böttcher et al. 2021). One of the most effective measures is to reduce GHG emissions from organic soils in arable land and wetlands (Pérez Domínguez et al. 2020).

Avoiding peat extraction could reduce about 9 million tons of $CO_2$ emissions annually (European Commission 2020c), but in 2019 13,000 ha of organic soils were still converted to peat extraction (European Environment Agency 2021). Nature restoration also contributes to biodiversity and adaptation to climate change. Clear definitions and criteria at EU level are required to promote the restoration and sustainable use of ecosystems in the EU.

As set out in the Farm to Fork strategy, the Commission is piloting **carbon farming initiatives** (European Commission 2021b). Carbon farming practices focus on management techniques that, for example, help to enhance soil organic carbon in arable land, protect organic soils or increase the carbon stock in forests. The key idea behind carbon farming is to provide results-based payments to incentivise action from farmers and foresters. Like nature restoration, this would have benefits in terms of ecosystem and biodiversity conservation. Some of the recognised challenges associated with carbon farming are that it requires robust and precise monitoring, reporting and verification, and that permanence and additionality of stored carbon need to be ensured (European Commission 2021a). Also, foresters and farmers will need to cover short-term costs, but the carbon benefit will only be achieved in the long term, given the inertia of natural systems.

Another idea is to introduce **carbon removal certification mechanisms**, whereby carbon sequestration would generate carbon units. These units could then be sold by farmers and foresters to stakeholders aiming to offset their GHG emissions. This approach is only recommended if robust procedures to ensure that removals are additional and permanent can be put in place. Offsetting fossil fuel emissions with non-additional removals from the land use sector or with removals that are easily reversed, poses a serious risk to environmental integrity, if it leads to less mitigation in other sectors, than would have occurred without offsetting (Broekhoff et al. 2019). The current estimation of emissions and removals from LULUCF in GHG inventories is not linked with a geographic identification of land areas in which carbon stock changes occur. This makes it impossible to detect double counting if carbon removal certificates were fungible with ETS, ESR or the LULUCF Regulation.

### 2.5.5. Synergies and linkages to other legislative elements, EU strategies and key policies

The LULUCF Regulation alone is not sufficient to ensure that countries enhance the contribution of the land sector to keeping the global temperature increase below 1.5°C. Additional instruments are necessary. Countries are more likely to increase their ambition level in the land-use sector if the targets are supported through incentives from a mix of policy instruments.

The **Common Agriculture Policy (CAP)** should be implemented by Member States in such a way that the CAP strategic plans incentivise the restoration and expansion of carbon sinks and implement measures to reduce $CH_4$ and $N_2O$ emissions from agriculture.

The **EU Forest Strategy** is very relevant for the future development of the LULUCF sector. It will build on the biodiversity strategy, cover the whole forest cycle, and promote services provided by forests (European Commission 2021d). It will focus on EU forest protection, restoration and sustainable management and on world forests where not already covered.

The European Commission recently adopted a new **EU Strategy on Adaptation** (European Commission 2021e). There are many potential synergies between effective net sink and biodiversity protection strategies that can also be beneficial for climate adaptation. For example, the increase of forests has positive regional climatic effects, especially in urban areas, where the cooling effect of woody vegetation cover can be used to buffer heat waves. Water run-off and erosion in croplands can be reduced by agroforestry.

The upcoming revision of the EU's **Renewable Energy Directive** is highly relevant for the LULUCF sector with regard to the incentives for biomass and biofuel use. The level of (sectoral) renewable targets will be relevant to biofuel demand (see section 2.4) and expected enhanced sustainability criteria for biomass use will be essential for a biomass policy that also ensures the protection of carbon stocks in forests.

The revision of the EU's **Directive on Energy Performance of Buildings** could increase the wood demand in the construction sector, e.g. via the enhancement of the use of wood for buildings. In addition, the directive sets rules for decreasing the heating demand of buildings which directly reduces the need for energy, reduces the denominator for the renewable share for heating and cooling and reduces the pressure on biomass use for heating purposes.

# 3. PRESENTATIONS AND DISCUSSION

## 3.1. Emissions and removals in the LULUCF sector, current accounting and future options related to the LULUCF Regulation

Speaker: Dr. Valentin Belassen, French National Research Institute for Agriculture, Food and the Environment, INRAE, France

### 3.1.1. Summary of the presentation

According to information reported to the UNFCCC, changes in forest biomass have been the key driver of emissions and removals in the land sector in the EU since 1990, followed by emissions resulting from wetland drainage. Mineral soils have been reported as steadily removing around 40 million tons $CO_2$eq per year since 1990. However, these **figures may not reflect the real emissions and removals from mineral soils**. A **significant blind** spot becomes apparent if figures for soils are updated with information from Member States. For example, unreported emissions from cropland would amount to 70 million tons $CO_2$eq per year, if numbers from soil inventories are upscaled. Whereas reported figures for cropland soils amount to a removal. Unreported removals from grassland soils would amount to -15 million tons $tCO_2$eq per year and those from forest soils to -45 million tons $CO_2$eq per year. For wetlands maps are lacking, therefore the unreported emissions from wetland drainage cannot be quantified.

The described blind spots in emissions and removals from soils are a result of current arrangements under the LULUCF Regulation (Regulation (EU) 2018/841). According to Article 5, paragraph 4 carbon pools such as soils and litter do not have to be reported if they are not a source of emissions. Therefore, if a Member State assumes that soil carbon is increasing, it is not required to report it. Estimation methodologies range from simple Tier 1 methods to country-specific Tier 2 methods and most complex Tier 3 methods. Estimation of emissions and removals using simple Tier 1 methods is allowed, when the amounts of emissions and removals are assumed to be small. For soils, such simple Tier 1 estimation approaches results in neutrality, which explains the blind spots in reported emissions from soils. Tier 2 and Tier 3 methodologies are more complex but are not necessarily more accurate. Tier 2 approaches do not capture major drivers of soil carbon changes (e.g. cover crops, agroforestry) Some Member States use complex Tier 3 models, but not all models are validated and may therefore lack accuracy.

A revised LULUCF Regulation could improve monitoring and reporting by mandating the use of higher tier methodologies for monitoring soil carbon in key categories, by requiring the monitoring of activity data (area) of key practices (e.g. agroforestry, wetland drainage, cover crops and by measurement-based Tier 3 approaches. Another option is creating incentives (e.g. CAP subsidies, access to land carbon market) that are tied to the quality of greenhouse gas (GHG) inventories to improve the quality of monitoring and reporting. The enforcement of the LULUCF Regulation could be improved by strengthening the review process of GHG inventories either at the EU level (amending Regulation (EU) 2018/1999 Art. 38) or under the UNFCCC. The reviews should check whether 'land remaining land' categories are likely key categories based on default emission factors for Europe. They should also assess whether Tier 3 models have been validated. The review reports should more clearly 'name and shame' countries with poor methodologies, e.g. through a traffic light approach.

**Accounting in the LULUCF Regulation** is done using projected forest reference levels (FRLs), which has several weaknesses. A comparison of reported emissions from forests in 2019 and the forest management reference level for the second commitment period of the Kyoto Protocol shows a large gap of more than a 100 million tons $CO_2$eq per year. Since changes in forests take a large time, there is

no way that this gap is a result of effective policies that have improved the forest sink over such a short period of time. The difference is thus very likely hot air. For post-2020 commitments, the LULUCF Regulation addressed this issue and there will be arguably less hot air. But despite this improvement, the weaknesses of the reference level approach are going to grow after 2030. The use of a projected FRL is difficult to reconcile with the 2050 climate neutrality target. The Commission estimates 450 million tons $CO_2$eq per year of residual GHG emissions in 2050, which means there will be the need for a corresponding long-term sink of - 450 million tons $CO_2$eq per year, regardless of the reference level used for accounting. Also, projections become less reliable the further away they are from the 2002-2009 reference period: In addition, the process of setting and reviewing FRLs is very resource-intensive. Lastly, the system is vulnerable to information asymmetry, since Member States will always know their national circumstances and modelling framework better than the European Commission and external reviewers. This would allow them to pick convenient parameter values in the construction of their FRLs. The key strength of reference levels was to account for the age structure of forests, but this argument will become less important after 2030.

An **alternative approach for accounting in the LULUCF sector** is setting a long-term target based on the long-term potential for carbon storage. The easiest approach to derive potentials would be based on land area. The sink requirement of the overall long-term ambition of the EU (-450 million tons $CO_2$eq per year) could be allocated to Member States based on their land area. This approach is simple and consistent with the need for long-term removals and removal potentials beyond age-related effects are logically correlated with land areas. Dr. Belassen considered the resulting level of ambition as be reasonable for most Member States (see Table 3). In his view, there would be no obvious windfall credits because only Italy, Poland and Slovakia would have a 2050 target slightly smaller than their 2018 net removals (negative values in Table 3). Member States with a high percentage increase in this approach have a small absolute net sink in 2018 despite a medium land area such as Belgium, Greece or Latvia. The disadvantage of this approach is that the potentials have not been adjusted based on finer determinants such as climate and soil conditions and current land management. The approach could, however, be a starting point for political negotiations.

**If Member States decide to continue with the reference level approach, then technical adjustments to improve their effectiveness would be required.**

Table 3: Targets based on a potential-based approach reflecting Member States' land areas

| Member State | Total LULUCF 2018 [Mt $CO_2$e] | 2050 potential-based LULUCF target [Mt $CO_2$e] | Change required betweeen 2018 and 2050 [%] |
|---|---|---|---|
| Belgium | -1,0 | -3,3 | 229% |
| Bulgaria | -8,8 | -12,1 | 43% |
| Czechia | 5,8 | -8,6 | 248% |
| Denmark | 6,6 | -4,7 | 171% |
| Germany | -26,9 | -39,0 | 45% |
| Estonia | -2,0 | -4,9 | 148% |

| Member State | Total LULUCF 2018 [Mt $CO_2e$] | 2050 potential-based LULUCF target [Mt $CO_2e$] | Change required betweeen 2018 and 2050 [%] |
|---|---|---|---|
| Ireland | 4,3 | -7,6 | 277% |
| Greece | -3,0 | -14,4 | 383% |
| Spain | -38,1 | -55,1 | 45% |
| France | -25,4 | -59,8 | 136% |
| Croatia | -5,1 | -6,1 | 21% |
| Italy | -36,3 | -32,7 | -10% |
| Cyprus | -0,4 | -0,6 | 56% |
| Latvia | 1,4 | -7,0 | 596% |
| Lithuania | -3,9 | -7,1 | 83% |
| Luxembourg | -0,2 | -0,3 | 32% |
| Hungary | -4,7 | -10,1 | 117% |
| Malta | 0,0 | 0,0 | |
| Netherlands | 4,9 | -4,1 | 183% |
| Austria | -5,2 | -9,1 | 77% |
| Poland | -36,5 | -34,0 | -7% |
| Portugal | -6,3 | -10,0 | 59% |
| Romania | -24,5 | -26,0 | 6% |
| Slovenia | 0,2 | -2,2 | 1008% |
| Slovakia | -5,7 | -5,3 | -6% |
| Finland | -10,3 | -36,8 | 258% |
| Sweden | -42,0 | -49,0 | 17% |
| Total | -262,4 | -450,0 | 72% |

Source: Author's calculation based on UNFCCC/Eurostat data.

If Member States decide to continue with the reference level approach, then technical adjustments to improve their effectiveness would be required. Improvements are required related to the consistency in trends. This can be achieved through the use of pre-existing and published models and projections, the explanation of key drivers for trends for the reference and the projection period or through a mandate for the JRC to calculate consistent forest reference levels as in 2011. A consistency assessment in tabular format could also improve FRLs. The definition of 'management intensity' as either harvest probability or harvest volume as a function of age-related characteristics (e.g. standing volume) would also be useful and a materiality provision that allows for the exclusion of de minimis pools and gases from the FRL.

Overall, it is important to align the incentives from the LULUCF Regulation with the climate neutrality target, which requires a **long-term strategy for forests in the EU**. The overarching purpose of the LULUCF Regulation is achieving a balance between anthropogenic emissions by sources and removals by sinks of GHG in the second half of this century. So far, there has been little focus on this long-term strategic dimension of the LULUCF Regulation. In practice, this requires considering the trade-offs between the sectors that use wood (energy and paper/cardboard industry) and the LULUCF sector, where carbon is stored in forests. It also means considering the trade-off between the long-term and the short-term GHG balance. So far, national forest plans show little indication of long-term strategies. The few Member States that have national strategies focus on increasing harvest, which, as literature shows, has a negative climate impact in the short term (20 to 30 years) on net removals (Agostini et al. 2013; Hudiburg et al. 2011; Valade et al. 2018; Braun et al. 2016; Lecocq et al. 2011; Roux et al. 2017; Smyth et al. 2014). A revised LULUCF Regulation could require that the national forest strategy of each Member States has to be cumulatively better than the business as usual (FRL) development.

### 3.1.2. Summary of the discussion

One MEP wanted to know the reasons for the decrease of the forest sink in the EU. Analysis conducted by Mr. Belassen and his team attributed ¾ of the decrease to increase in harvest, some of it for bioenergy. It is thus very likely that the most important driver is increased harvest, although research is still ongoing. A small contribution to the decrease of the carbon sink in the past 10 to 15 years comes from aging forests. In the short term, in this case at least in the next 30 years, increasing harvest means decreasing the sink and increasing $CO_2$ concentrations in the atmosphere, even under consideration of substitution effects.

Considering the new target setting of -55%, including land use, accounting becomes even more important. MEPs inquired whether the reference level approach would allow for sufficiently precise accounting. Another question was whether the proposed alternative accounting approach could also be used for cropland, grassland and other pools, e.g. soils. Mr. Belassen agreed that a projected reference level is not very compatible with achieving the EU's short-term or long-term target. However, he clarified that he is not arguing against using a point of reference at all. His argument is that the reference level for accounting should be determined in a simple way, as is done in other sectors which use the emission levels of 1990 or 2005 as their reference. In his view, a simple area-based number would be better suited for the LULUCF sector than a historical number, but he conceded that this is up for debate.

In Mr. Belassen's view, apportioning ambition according to land area, e.g. forest area, would mostly be fair for all Member States and thus support solidarity between Member States that have large forest sinks and those that have small forest sinks.

One participant wanted to know how the forest sink can be increased even though the trend is the opposite. Mr. Belassen highlighted the challenge of achieving the EU's climate target. He expressed

doubts whether the decrease in biomass and the corresponding declining trend in removals could be reversed. He clarified that the carbon stock in forest soils is larger than the one in biomass, but in terms of flows (emissions and removals), the larger changes come from biomass. If inventories were scaled up to reflect a more accurate picture, it would probably show that soils remove around 80 million tons CO2eq per year and biomass around 300 million tons CO2eq per year. There outlined that there is a significant mitigation potential in improving sequestration in soils and in increasing the lifetime of harvested wood products.

## 3.2. Actions and policies that enhance and incentivise carbon sequestration capacities of forests and linkages to the LULUCF Regulation

Speaker: Dr. Hannes Böttcher, Division Energy and Climate, Oeko-Institut, Germany

### 3.2.1. Summary of the presentation

The presentation focused on four key actions and policies to enhance and incentivise carbon sequestration in the EU.

**Prioritising the protection of carbon stocks, especially in forests**

Forests form large but also vulnerable carbon stocks in the EU and the world. As such, preserving carbon stored in forests and enhancing their capacity to sequester carbon is an effective mitigation option. However, natural disturbances pose significant threats to carbon stock in forests. The impacts of climate change create uncertainty for forests' carbon stocks because there may be positive effects on growth as well as increased natural disturbances. The biggest direct threat to forest carbon stocks in the EU results from forest management and related wood extraction. At the same time, there is a lack of incentives for preserving forest carbon stocks. Forest management in the face of climate change also requires considering potential trade-offs between supporting the adaptation of forests and increasing carbon stocks and fostering synergies with biodiversity conservation.

The protection of forest carbon stocks is inherently complex. For example, an older broad-leaved forest can still have a high increment in carbon sequestration, but economic reasons will justify harvesting the wood. Harvest always results in a reduction of the forest carbon stock and an eventual emission of the stored carbon into the atmosphere. Another example are spruce forests in the Central European Lowlands, which are suffering from natural disturbances from climate change. In the short term, protecting these forest carbon stocks may require increased harvest and emissions to allow for the introduction of more resilient tree species. This will temporarily reduce the forest carbon stocks but allow for long-term sink enhancement.

**Assessing mitigation potential by considering the full scope of the $CO_2$ exchange between forests, the atmosphere and wood products**

A comprehensive assessment of mitigation potential of a cubic meter of wood requires considering:

- the impact of harvest on the future carbon sink,
- what wood is used for, and
- the fossil fuel emissions resulting from harvesting, transport and processing.

Wood extraction reduces the forest carbon stock and impacts the future carbon sink. When large trees are felled and young trees are replanted, the carbon sink decreases for a certain period. This is because of the higher sequestration capacity of large trees compared to small trees. The implications of wood

extraction for the future carbon sink in the EU can be assessed with counterfactual scenarios that ask how the future sink would have developed under less intense harvest. Scenario comparison shows that the reduction of the forest sink in the EU is about 0.5 to 1.5 tons $CO_2$ per $m^3$ of extracted wood. How to compensate for losses in the forest sink needs to be part of the comprehensive assessment of the mitigation potential of wood. Only if carbon storage in harvested wood products and substitution effects compensate for the reduced sink, this can result in an overall net benefit for the atmosphere. Determining the impact on the forest sink depends on the time horizon considered (e.g. 50 years or 100 years) and requires careful consideration of the type of extracted biomass (e.g. wood residues, stem wood) and its use.

A comprehensive assessment of the mitigation potential leads to the conclusion that using stem wood for direct bioenergy use leads to overall net emissions. Extracting stem wood decreases the carbon stock, there is no storage effect since carbon is directly released and the substitution effect is limited, especially once fossil fuels are phased out.

**Tightening the accounting rules under the LULUCF Regulation to improve accountability and provide better incentives for increased action in the sector**

Accounting takes place against a FRL. The reference level projects what would happen to the forest sink under business as usual management practices. The use of a FRL allows measuring the emissions and removals that result from changes in forest management. The rationale behind this approach is to provide incentives to countries to improve their forest management. Further, the LULUCF Regulation foresees flexibilities. For example, debits from increased harvest can be compensated to a limited extend, as long as forests remain a sink.

Challenges arising from the current LULUCF Regulation for Member States, the European Commission and reviewers include the complexity and effort related to setting and reviewing FRLs. Member States use a range of approaches for setting their FRL, which reduces transparency and comparability. The review of FRLs carried out in the past two years revealed inconsistencies and data gaps in Member States. Another challenge is that flexibilities mix reductions of fossil fuel emissions, which are permanent, with biogenic removals, which are non-permanent.

Tightening the accounting rules under the LULUCF Regulation could be achieved by banning or reducing the amount of credits for a Member State if the projected baseline shows a decrease in net removals or an increased harvest. Another option is to reduce the flexibilities that allow increasing harvest and constrain flexibilities with the Effort Sharing Regulation.

**Developing instruments to incentivise the implementation of mitigation measures in forests**

Timber production is currently the only source of income from forests, while mitigation measures lack funding. This limits action by the private sector. Member States should develop targeted instruments to incentivise mitigation measures in forests. In doing so they should consider the challenges arising from scattered forest ownership, which means that instruments need to address large numbers of forest owners. Instruments also need to be effective in ensuring the permanence of carbon stored in forests. This is especially relevant if revenue for carbon storage in forests is to be generated from certificates and a carbon market mechanism. Any instrument would also require means to ensure that only additionally stored carbon is rewarded. A high risk of leakage, e.g. harvest is shifted abroad if limits on rates are imposed to increase carbon stocks, can limit the possibilities to achieve net benefits for the atmosphere.

Fostering carbon storage in forests and increasing the forest sink will benefit from reducing wood demand and from increasing the efficiency of wood use, which may permit lower harvest rates. Also,

instruments and business models for forest owners should reward ecosystem services beyond carbon and foster adaptation of forest ecosystems.

### 3.2.2. Summary of the discussion

The discussion reflected on the difficulties associated with increasing the forest sink and the protection of forest carbon stocks. It was noted that a challenge for developing business models that go beyond carbon, is that currently the only tool available is a carbon price. One question related to what kind of price would be required per hectare of forest to balance out income from wood harvest. Mr. Böttcher explained that determining one price per hectare for the EU is not feasible for several reasons. First, prices for wood vary, for example, there is highly valuable timber grown over hundreds of years and there is fast growing wood. Forest owners pursue different goals with their management choices. Second, the range of ecosystem services delivered by forests varies across regions and countries. What should be narrowed is the gap between foregone opportunity costs and income provided from protecting the forest carbon sink and ecosystem services of forests.

## 3.3. Actions and policies that enhance and incentivise carbon sequestration capacities of soils and linkages to the LULUCF Regulation

Speaker: Dr. Ana Frelih-Larsen, Ecologic Institute, Germany

### 3.3.1. Summary of the presentation

The narrative used around soil carbon is important. The currently dominant narrative in the public and policy sphere focuses on sequestration in croplands on mineral soils and market-based instruments. This narrative is mainly driven by corporate climate neutrality goals, initiatives such as the '4 per 1000' launched in 2015 and the strong interest in certification schemes to generate carbon offsets as new business models for farmers. This is problematic from a soil perspective because the additional sequestration potential on mineral soils in the EU is limited, uncertain and highly reversible. The narrow attention on soil carbon and a single type of instrument leads to a limited scope of action. A broader view is necessary to support soils' capacity to deliver on mitigation and climate resilience.

From a scientific perspective, the starting point for carbon sequestration in soils needs to be **soil health**. Healthy soils are the basis for the continued supply of ecosystem services, including carbon storage and the protection from climate change impacts, such as increasing erosion risks, flooding or droughts. Once soils are polluted and degraded, their function as a carbon sink and the delivery of other ecosystem services is compromised. Data shows that 60% to 70% of soils in the EU are unhealthy. Supporting healthy soils goes beyond the singular focus on soil carbon sequestration in croplands and market-based instruments. Instead a much broader agenda that focuses on protecting and restoring soil health as part of ecosystem restoration is required. Examples of what this means in practice are included in Table 4.

Table 4: Measures for enhancing carbon sequestration capacities in soils

| Measure | Comments and examples |
|---|---|
| Preserving current peatland stocks | • Has a significant mitigation potential<br>• Can be achieved through peatland rewetting and paludiculture |
| Improving soil carbon levels in croplands | • Can be achieved through improved crop rotation, the use of cover and deep-rooting crops, compost, manure, residue management and reduced soil disturbance<br>• Carbon stored in soils can be released (risk of reversal) and total mitigation potential is limited<br>• Measure is essential for maintaining soil fertility and reversing continued losses of stocks in mineral soils |
| Scaling up agroforestry | • High potential for above ground and below ground storage<br>• Has many adaptation benefits, e.g. maintaining productivity of the system in drought conditions |

Source: Presentation by Ana Frelih-Larsen.

It is equally important to address the ongoing **drivers of soil degradation**. Ongoing degradation processes include:

- subsoil compaction through heavy machinery,
- input of pollutants through industrial pollution / off-farm inputs,
- pesticide accumulation,
- erosion (bare soils, increasing field sizes), and
- soil sealing and land take.

These degradation processes lead to partial or complete loss of soil functions. Quantified estimates of the impact of these processes on emissions and sinks are still not available, but there are estimates for the cost of soil degradation in the EU, which currently exceed €50 billion per year. Also, loss of soil health through degradation translates into an increased need for fertilisers, which generates losses in farm economics and contributes to $N_2O$ emissions. Research in the United States shows that up to one third of fertilisers applied in maize fields are needed to compensate for long-term losses in soil fertility. Annual emissions from fertilisers in the EU are estimated at 147 million tons $CO_2$eq per year. In comparison, estimates for potential sequestration for mineral soils range from 9 to 58 million tons $CO_2$eq per year.

The climate agenda needs to address the drivers of soil degradation and at the same time avoid creating perverse effects that add to soil degradation. How this is currently not the case can be illustrated with two carbon farming practices that seem beneficial for mitigation but also risk worsening soil health and reducing the carbon sink function:

1) **Slurry application with low emission trailers**: The machinery has high wheel loads, reaching 14 tons at the rear axle when fully loaded. This weight greatly increases the risk for subsoil compaction. Subsoil compaction is irreversible, persistent and cumulative. It is estimated that

nearly 30% of soils across Europe are already affected. This results in long-term annual yield penalties of 6% or well over one billion euros.

2) **Use of off-farm organic inputs to increase soil carbon on croplands**: Many certification schemes allow some sort of inputs into croplands (e.g. biochar, municipal compost or biogas digestate). However, the practice carries high risk of pollution, e.g. from heavy metals, microplastics or hormones. The currently popular impact of biochar has an uncertain life cycle impact and introducing it in soils has potential negative impacts on soil biodiversity. Soils' biodiversity is essential for their ability to sequester and maintain carbon. Further, effective control mechanisms for managing these inputs are complex and difficult to enforce. Lastly, the practice does not deliver an additional climate benefit because carbon just gets moved around in the system instead of being removed from the atmosphere. Thus, organic inputs, whether off-farm or on-farm inputs should not be eligible management actions in crediting mechanisms.

These examples underline the importance of **policy improvement and integration**. The LULUCF Regulation can be improved in terms of monitoring, protection of current carbon stocks and soil health. This requires:

- **Improved estimation methods for $CO_2$ emissions and removals from soils**: Currently, estimates are incomplete and there are large differences in estimated carbon stock changes. Some Member States assume the same changes in carbon stocks for the entire period from 1990–2019 disregarding variability and heterogeneity. There is a lack of ground-truthing and validation of models with concrete sampling.
- **Improved standards to ensure completeness and accuracy for estimates of emissions and removals from soils**: The current estimation methods do not reflect farmers' management activities and their impact on carbon stock changes. The LULUCF Regulation should ensure comparable estimation methodologies for soils that enable tracking real progress in achieving LULUCF targets for soil carbon pools.
- **Ambitious targets to protect and enhance soil carbon stocks:** This relates especially to peatlands, but also to mineral soils and forest soils. However, current data does not provide a complete or accurate picture of the status. Under these circumstances, an alternative would be to set activity-based targets, e.g. integrate a requirement that land conversion for peat extraction should no longer be allowed (peat extraction accounts for over 9 million tons $CO_2$eq per year), targets for peatland rewetting or agroforestry coverage.
- **Safeguards to avoid negative impacts on soil health**: Such safeguards are required to achieve coherence between short-term actions and the long-term impacts on soils and their function as carbon sinks.

The Commission has made the proposal for a new AFOLU pillar under the LULUCF Regulation. This would require harmonising accounting periods. Agricultural $N_2O$ and $CH_4$ emissions are accounted annually, whereas carbon stock changes in soils are accounted in five-year periods. Monitoring data for annual soil carbon stock changes are currently not available, so annual accounting is very challenging whereas data on fertiliser and manure inputs are available on an annual basis and annual accounting as currently under agriculture is no problem.

Important areas for a **better integration of soils into other policy areas** include:

- Use the **Common Agricultural Policy** to scale up action, for example by:

  - Improving transparency and implementing ambitious climate expenditure tracking, provided a sufficient share of the funding goes to beneficial climate measures and climate relevance is well defined;
  - Incentivising rewetting of peatlands by making paludiculture fully eligible for direct payments;
  - Addressing subsoil compaction as part of the 'Good Agricultural and Environmental Conditions' (GAEC) related to soil organic matter under the Common Agricultural Policy and inclusion of compulsory training and risk assessment;
  - Significantly up-scaling of funding for crop rotation, cover crops and agroforestry; and
  - Limiting investments in heavy machinery or set safeguards so that heavy machinery does not damage soil health.
- Set explicit soil ecosystem targets within the **Ecosystem Restoration Targets**. These can be general or specific for soils in forests, croplands and grasslands.
- Scale up **capacity building regarding soil carbon management practices**. Research shows farmers perceive lack of knowledge as a key barrier for the uptake these practices. Farmers need to know costs and benefits of the practices.
- The **Certification Framework** for removals**,** which was announced by the Commission for adoption in 2023, requires a critical assessment. If soil carbon is included, then robust schemes and strict safeguards that avoid negative impacts on soil health and carbon storage are required.
- Scaling-up the mobilisation of **private finance**. Regrettably agricultural criteria were removed from the Sustainable Finance Taxonomy, so there remains a gap that needs to be addressed.

### 3.3.2. Summary of the discussion

In the discussion, MEPs acknowledged the need for a cross-sectoral approach for soil health. One MEP inquired whether, from a scientific point of view, there would be a need for a soil legal framework, comparable to that for water in the EU. Mrs. Larsen agreed that this would be a very effective approach to identify risk areas for soils, establishing targets to tackle these risks and tracking progress. She considered that for now, the EU soil strategy gives the opportunity to enshrine the importance of soil health as a resource for society and that this would be a step forward in the absence of a legal framework for soils. She noted that important targets for soils in the Farm to Fork strategy relate to organic farming, landscape features, reduced use of pesticides and antimicrobials and reduced nitrogen input. All these targets can support a transition of the system towards the use of agroecological solutions that support soil health.

Regarding the question how the improvement of soil health could be incentivised within the LULUCF Regulation, Mrs. Larsen reemphasised two opportunities for action. The first relates to improving monitoring and accounting of soil carbon and making data more transparent, especially around emissions from soils. The aim should be to monitor changes on the ground so that the effect of management is reflected in GHG inventories. The second opportunity is for the LULUCF Regulation to set explicit targets, which can be quantitative or activity-based. For example, preventing conversion to certain types of uses, targets for rewetting or agroforestry coverage. The type of targets should be chosen under consideration of the data available for tracking progress.

One MEP asked if blue carbon is addressed in the LULUCF Regulation, which is not the case.

## 3.4. Bioenergy and biomass in the LULUCF Regulation and in the EU climate legislation: current status and future options

Speaker: Robert Matthews, Head of science group Forest Mensuration, Modelling and Forecasting of Forest Research, UK

### 3.4.1. Summary of the presentation

Forestry accounting is complex because the effect of management practices on the forest carbon sink needs to be assessed separately from the effects of natural forest growth (photosynthesis, respiration), natural disturbances and climate change. In contrast, quantifying the impact of actions to reduce emissions from fossil fuels only requires a comparison of fuel consumption in a given year with consumption in previous years.

Harvesting is the main driver of the reduced forest sink and related to the age of forests, which is the result of historical actions by Member States. In the EU, forests are generally becoming more mature, partly because of historical efforts by Member States to reforest, afforest and restore degraded forest areas, with the intention that these forests will be managed as a productive resource. Those forest have now reached the age where harvesting is expected. Older trees can still sequester carbon at significant rates, but older tree populations (forest stands) slow down in terms of growth per hectare and rate of carbon sequestration.

In the **current LULUCF Regulation**, the impacts of management changes on emissions and removals in forests are quantified relative to projected emissions based on the FRL. The FRL is constructed using modelling assuming business as usual management of forests as quantified for a historical period. The net impacts (emissions) of increased biomass extraction from forests are accounted for considering forest age structure. In the case of biomass extraction, the LULUCF Regulation requires to assume "*a constant ratio between solid and energy use of forest biomass as documented in the period from 2000 to 2009*" in the model used to construct the FRL. If biomass is diverted from material use to energy use, this is reflected in accounted emissions and vice versa.

**Strengths of the LULUCF Regulation** with regards to biomass and bioenergy lay in its underlying principles and design. The LULUCF Regulation aimed to create a level playing field for forestry and other sectors, to incentivise additional mitigation activities. It also tried to avoid possibilities for gaming or hot air and as far as possible is founded on hard data and evidence that Member States must present to support the construction of their FRLs. The stringent target is an important design element of the LULUCF Regulation: accounted LULUCF emissions must not exceed removals. The European Commission made significant efforts to support the implementation of the LULUCF Regulation and for example, produced supporting guidance for the development of FRLs. Another supporting factor is the external expert review process.

The LULUCF Regulation has several **weaknesses** with regards to biomass and bioenergy. The scope of the regulation is limited to EU Member States thus it is irrelevant for imported biomass from non-EU countries. Using FRLs means that harvest rates and bioenergy supply can increase, while Member States can still account for net removals or avoiding accounted emissions. This is because in the construction of the FRL scheduled harvest due to forest aging can be considered as business as usual. The combination of FRLs with the assumed "*constant ration between solid and energy use*" can lead to an increase in bioenergy use without accounting for all emissions. In terms of implementation, the reliance on models for the construction of FRLs and its complexities is an obstacle to consistency, transparency and verifiability. There are also limitations related to data sources in Member States, e.g. forest inventories, management practices and wood production statistics. A key limitation of the

LULUCF Regulation is that it does not send direct signals to actors on the ground. The LULUCF Regulation aims at directing national strategies and schemes, interacts with the Renewable Energy Directive (RED II) and the Emissions Trading System, but only does so indirectly.

**Improvements to the LULUCF Regulation** can be done through incremental changes and simplifications. For example, the definition of current forest management practices could be changed to the recent rate of wood production or the construction of the FRL could use the recent level of consumption of biomass for bioenergy instead of the recent ratio of solid to energy use. Another option would be to change the approach of the regulation. Instead of using FRLs, the regulation could set a target for the future level of removals. Member States could also strengthen related policies and for example introduce stronger criteria for identifying and managing risks associated with forestry practices and biomass use. They could use a 'blunt' policy instrument and set restrictions on biomass feedstock types, like the use of stem wood.

In conclusion, the LULUCF Regulation has room for improvement and the challenge will lay in balancing the trade-off between protection of the forest sink and forest carbon stocks and utilisation in the short and long term.

### 3.4.2. Summary of the discussion

Several MEPs noted the importance of developing a sustainable business case for forestry in the future and of sustainable forest management. On the question of increasing forest area in the EU, Mr. Matthews considered that the LULUCF Regulation incentivises forest restoration through accounting, but it does not strongly incentivise the creation of new forest areas. Though this is a weakness of the LULUCF Regulation, the opportunities for creating new forest areas are limited in many Member States.

One MEP stated that natural forests that are not harvested also create emissions. Mr. Böttcher explained, that trees do not die from one day to another, unless they are harvested or there is a natural disturbance. Thus, in many forest types, old trees, dying trees and dead wood still contribute to increasing carbon stocks and have benefits for biodiversity and the local climate. For example, if wood is removed from a beech forest, this impacts the entire carbon sink because of the long growth period of beech trees.

MEPs recognised the difference between solid and energy use of biomass. On whether bioenergy use should be restricted, Mr. Mathews stressed he does not argue against the use of bioenergy or the use of wood in either secondary form (residues) or primary form (from forests) if regulated appropriately. But he also noted that there are serious risks associated with using forest resources for energy purposes in the short and mid-term. .

One MEP noted that harvest will continue for the next decades and asked if it would be possible to use all biomass in solid form, e.g. through cascading use. Mr. Böttcher explained that there are limits to solid use, for example caused by logistics. He considered using residues from harvest as inputs for district heating system as an efficient way of biomass use but noted that there are competing uses for wood residues. In addition, such residues are not readily available for bioenergy use. For example, instead of using residues for heating, they can be used for producing insulation material thus reducing overall energy demand. Mr. Böttcher emphasised that mitigation scenarios need to compare the impacts of alternative uses.

The discussion also focused on what would be a more sophisticated tool to direct the use of biomass resources, considering that RED II takes the blunt approach of setting a target for renewable energy that incentivises an undifferentiated increase in the use of bioenergy, e.g. primary use of wood for energy. Mr. Matthews recognised the need for simplicity and practicality in policy measures. He

considered that a first step would be to quantify the potential for bioenergy supply from EU forests and global forests, while allowing for appropriate sustainability criteria and he referred to research work on such estimates and criteria.

Questions also related to ways for defining and enforcing sustainability criteria, e.g. considering the time needed to sequester $CO_2$ in forests and how to balance carbon storage in forests with biodiversity protection. There is a need to have practical criteria that can be easily applied to manage the risks associated with the use of bioenergy and seize opportunities. Mr. Matthews and his team have developed criteria whether a particular biomass source, from a particular forest area, would have low, medium or high risk for associated greenhouse gas emissions which are included in Table 7 in the Annex.

Mr. Matthews noted that the EU cannot legislate forest policy in Member States and highlighted that this is a challenge for achieving a unified approach across the EU, especially because Member States face different challenges and opportunities. One approach would be to look at existing national forests standards and open up a dialogue on how these standards could be unified. This would promote voluntary harmonisation.

Mr. Belassen emphasised that scientific evidence shows that increased harvest for bioenergy use or any other purposes does not yield climate benefits in the foreseeable future (next 30 years). Thus, a carbon price or other climate related policies should not be used to incentivise increased harvest. However, he recognised the dilemma between using wood and protecting the forest sink. In his view, a carbon price could be used to incentivise agroforestry, which has unquestionable climate benefits. He also acknowledged that forest age plays a role in forest management but argued that this should not be a reason to increase the complexity of accounting under the LULUCF Regulation. Age also plays a role in other sectors, for example in investment decisions in power plants, but has not been given consideration in accounting in the energy sector.

# WORKSHOP PROGRAMME

Policy Department for Economic and Scientific Policies
Committee on the Environment, Public Health and Food Safety

European Parliament

## Workshop

## '2030 climate target plan: Review of Land Use, Land Use Change and Forestry (LULUCF) Regulation'

Tuesday, 25/05/2021, 13.45-15.45 pm

SPINELLI 5G2, European Parliament
(also Interactio virtual room and webstreaming)

## Programme

To achieve climate neutrality by 2050, the EU has adopted a more ambitious EU-wide, economy-wide greenhouse gas emissions reduction target of 55% by 2030 compared to 1990. Among the proposals for revisions of relevant legislative measures to deliver on the increased climate ambition is the review of the land use, land-use change and forestry (LULUCF) Regulation to increase this sector's efforts to reduce emissions and maintain and enhance carbon removals including a potential merging of the sectors agriculture and LULUCF. The workshop intends to prepare for the upcoming legislative package of proposals in June 2021.

| | |
|---|---|
| 13:45-13:50 | **Introductory remarks**<br>Chair: MEP Bas Eickhout, Vice-Chair ENVI Committee, European Parliament |
| 13:50-14:00 | **Emissions and removals in the LULUCF sector, current accounting and future options related to the LULUCF Regulation**<br>Speaker: Dr. Valentin Belassen, French National Research Institute for Agriculture, Food and the Environment, INRAE, France |
| 14:00-14:15 | **Q&A session with Members** |
| 14:15-14:25 | **Actions and policies that enhance and incentivise carbon sequestration capacities of forests and linkages to the LULUCF Regulation**<br>Speaker: Dr. Hannes Böttcher, Division Energy & Climate, Öko-Institut, Germany |
| 14:25-14:40 | **Q&A session with Members** |
| 14:40-14:50 | **Actions and policies that enhance and incentivise carbon sequestration capacities of soils and linkages to the LULUCF Regulation**<br>Speaker: Dr. Ana Frelih-Larsen, Ecologic Institut, Germany |
| 14:50-15:05 | **Q&A session with Members** |
| 15:05-15:15 | **Bioenergy and biomass in the LULUCF Regulation and in the EU climate legislation: current status and future options**<br>Speaker: Robert Matthews, Forest Mensuration, Modelling and Forecasting, Forest Research, UK |
| 15:15-15:40 | **Q&A session with Members** |
| 15:40-15:45 | **Closing remarks**<br>Chair: MEP Bas Eickhout, Vice-Chair ENVI Committee, European Parliament |

## WORKSHOP PRESENTATIONS

**Emissions and removals in the LULUCF sector, current accounting and future options related to the LULUCF Regulation**, by Dr. Valentin Belassen

https://www.europarl.europa.eu/cmsdata/234961/21-05-25%20-%20Bellassen%20-%20Emissions%20and%20removals%20in%20the%20LULUCF%20sector.pdf

**Actions and policies that enhance and incentivise carbon sequestration capacities of forests and linkages to the LULUCF Regulation**, by Dr. Hannes Böttcher

https://www.europarl.europa.eu/cmsdata/234960/Bottcher%20Forests%20EP%20ENVI%202030%20Climate%20Target%20Plan_final.pdf

**Actions and policies that enhance and incentivise carbon sequestration capacities of soils and linkages to the LULUCF Regulation**, by Dr. Ana Frelih-Larsen

https://www.europarl.europa.eu/cmsdata/234959/Frelih_Larsen_Soils_LULUCF_25052021_v1BIS.pdf

**Bioenergy and biomass in the LULUCF Regulation and in the EU climate legislation: current status and future options**, by Robert Matthews

https://www.europarl.europa.eu/cmsdata/234958/Robert%20Matthews%20Bioenergy%20and%20biomass%20in%20the%20LULUCF%20regulation%20v01.pdf

## SPEAKERS BIOGRAPHIES

https://www.europarl.europa.eu/cmsdata/233709/Biographies%20Workshop%20LULUCF%20regulation.pdf

## THE RECORDING OF THE WORKSHOP

https://multimedia.europarl.europa.eu/en/department-for-economic-scientific-and-quality-of-life-policies-workshop-2030-climate-target-review_20210525-1345-COMMITTEE-ENVI_vd

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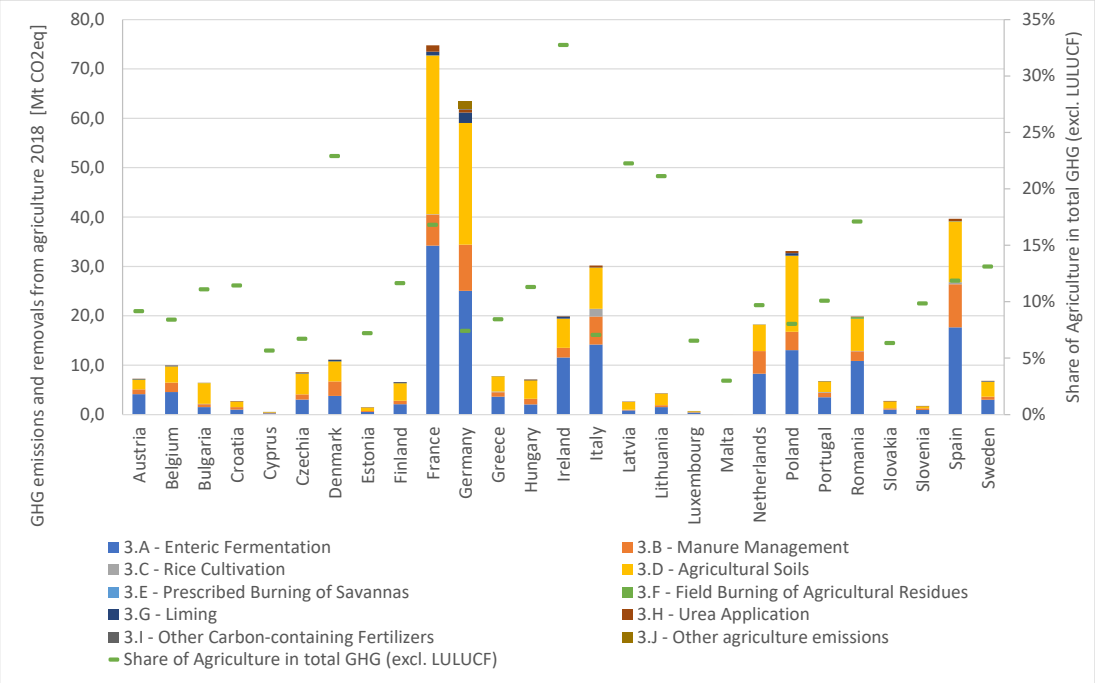
# ANNEX: DATA UNDERLYING THE BACKGROUND SECTION OR PRESENTATIONS

Table 5: Member States' average emissions and removals from LULUCF in 2014-2018

| 2014-2018 average | Land Use, Land-Use Change and Forestry | 4.A - Forest Land | 4.B - Cropland | 4.C - Grassland | 4.D - Wetlands | 4.E - Settlements | 4.F - Other Land | 4.G - Harvested Wood Products | 4.H - Other LULUCF | Share of LULUCF in total GHG (excl. LULUCF) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mt CO2 eq | | | | | | | | | |
| **EU27** | -279,3 | -369,5 | 53,1 | 9,0 | 17,4 | 44,7 | 1,8 | -37,1 | 0,4 | **-7%** |
| Austria | -4,7 | -4,3 | 0,1 | 0,4 | 0,1 | 0,5 | 0,2 | -1,5 | 0,0 | -6% |
| Belgium | -1,1 | -1,3 | 0,8 | -0,8 | 0,0 | 0,4 | 0,0 | -0,3 | 0,0 | -1% |
| Bulgaria | -8,7 | -7,4 | 0,8 | -1,9 | 0,3 | 0,7 | 0,0 | -1,3 | 0,0 | -14% |
| Croatia | -5,2 | -5,5 | 0,4 | -0,1 | 0,0 | 0,8 | 0,0 | -0,8 | 0,0 | -21% |
| Cyprus | -0,3 | -0,1 | -0,2 | -0,1 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | -4% |
| Czechia | -2,7 | -2,0 | 0,2 | -0,3 | 0,0 | 0,2 | 0,0 | -0,8 | 0,0 | -2% |
| Denmark | 4,8 | -0,5 | 3,8 | 1,4 | 0,1 | 0,2 | 0,0 | -0,1 | 0,0 | 10% |
| Estonia | -2,0 | -2,7 | 0,4 | 0,0 | 0,9 | 0,3 | 0,0 | -1,0 | 0,0 | -10% |
| Finland | -16,9 | -25,0 | 7,8 | 0,7 | 2,2 | 1,0 | 0,0 | -3,6 | 0,0 | -30% |
| France | -28,0 | -51,3 | 19,5 | -8,0 | 0,5 | 11,7 | 0,0 | -1,2 | 0,3 | -6% |
| Germany | -27,4 | -67,4 | 15,9 | 16,6 | 4,3 | 5,2 | 0,0 | -2,3 | 0,1 | -3% |
| Greece | -2,7 | -2,1 | 0,3 | -1,2 | 0,0 | 0,1 | 0,1 | 0,1 | 0,0 | -3% |
| Hungary | -5,0 | -4,9 | -0,3 | -0,1 | 0,2 | 0,2 | 0,0 | -0,1 | 0,0 | -8% |
| Ireland | 4,3 | -4,2 | -0,1 | 6,9 | 2,3 | 0,2 | 0,1 | -0,8 | 0,0 | 7% |
| Italy | -36,5 | -34,1 | 0,1 | -7,9 | 0,1 | 5,2 | 0,0 | 0,0 | 0,0 | -8% |
| Latvia | 0,9 | -2,7 | 2,4 | 1,6 | 1,5 | 0,2 | 0,0 | -2,0 | 0,0 | 8% |
| Lithuania | -5,2 | -5,9 | 1,2 | -1,0 | 0,9 | 0,7 | 0,1 | -1,1 | 0,0 | -26% |
| Luxembourg | -0,4 | -0,5 | 0,0 | 0,0 | 0,0 | 0,1 | 0,0 | 0,0 | 0,0 | -4% |
| Malta | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0% |
| Netherlands | 5,0 | -1,8 | 1,7 | 3,4 | 0,0 | 1,5 | 0,2 | 0,1 | 0,0 | 3% |
| Poland | -34,1 | -35,3 | -0,7 | 0,0 | 1,8 | 4,4 | 0,0 | -4,4 | 0,0 | -9% |
| Portugal | -3,9 | -6,7 | 0,6 | 0,1 | 0,4 | 2,6 | -0,8 | -0,1 | 0,0 | -6% |
| Romania | -22,7 | -22,4 | -1,7 | 0,4 | 1,5 | 3,8 | 1,9 | -6,1 | 0,0 | -20% |
| Slovakia | -6,3 | -4,4 | -1,1 | -0,2 | 0,0 | 0,1 | 0,1 | -0,9 | 0,0 | -15% |
| Slovenia | 0,0 | 0,5 | -0,2 | -0,4 | 0,0 | 0,2 | 0,0 | -0,1 | 0,0 | 0% |
| Spain | -38,0 | -34,6 | -2,6 | -0,2 | 0,0 | 1,3 | 0,0 | -1,9 | 0,0 | -11% |
| Sweden | -42,6 | -43,1 | 3,8 | -0,1 | 0,2 | 3,2 | 0,0 | -6,6 | 0,0 | -80% |

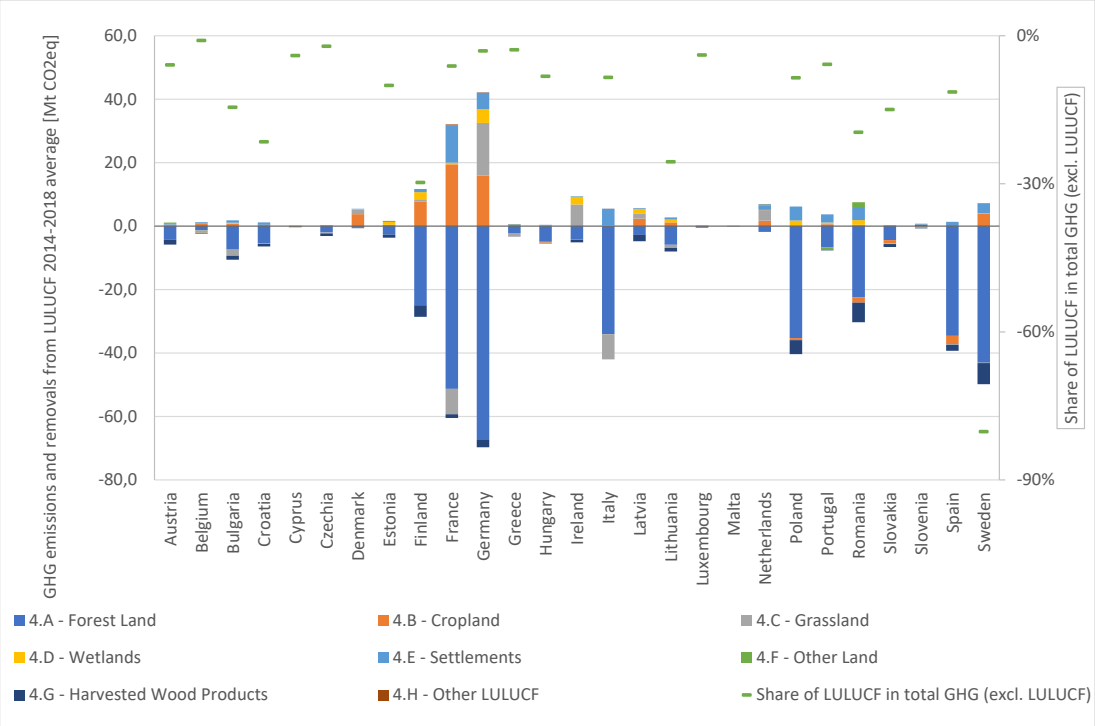
Source: European Environment Agency 2020c; own representation.

Figure 2: Agriculture emissions by EU Member States in 2018




Source: European Environment Agency 2020c; own representation.

Figure 3: LULUCF emissions by Member States 2014-2018




Source: European Environment Agency 2020c; own representation.

Table 6: Overview of contributions of LULUCF and agriculture sectors to GHG emissions in 2018

| | Share of LULUCF in total GHG (excl. LULUCF) 2014-2018 | Share of Agriculture in total GHG (excl. LULUCF) 2018 | Difference |
|---|---|---|---|
| **EU 27** | **-7%** | **10%** | **3%** |
| Austria | **-6%** | **9%** | **3%** |
| Belgium | **-1%** | **8%** | **7%** |
| Bulgaria | **-14%** | **11%** | **-3%** |
| Croatia | **-21%** | **11%** | **-10%** |
| Cyprus | **-4%** | **6%** | **2%** |
| Czechia | **-2%** | **7%** | **5%** |
| Denmark | **10%** | **23%** | **33%** |
| Estonia | **-10%** | **7%** | **-3%** |
| Finland | **-30%** | **12%** | **-18%** |
| France | **-6%** | **17%** | **11%** |
| Germany | **-3%** | **7%** | **4%** |
| Greece | **-3%** | **8%** | **6%** |
| Hungary | **-8%** | **11%** | **3%** |
| Ireland | **7%** | **33%** | **40%** |
| Italy | **-8%** | **7%** | **-1%** |
| Latvia | **8%** | **22%** | **31%** |
| Lithuania | **-26%** | **21%** | **-4%** |
| Luxembourg | **-4%** | **7%** | **3%** |
| Malta | **0%** | **3%** | **3%** |
| Netherlands | **3%** | **10%** | **12%** |
| Poland | **-9%** | **8%** | **0%** |
| Portugal | **-6%** | **10%** | **4%** |
| Romania | **-20%** | **17%** | **-2%** |
| Slovakia | **-15%** | **6%** | **-9%** |
| Slovenia | **0%** | **10%** | **10%** |
| Spain | **-11%** | **12%** | **0%** |
| Sweden | **-80%** | **13%** | **-67%** |

Table 7: Tentative criteria for forest management and wood utilization aimed at bioenergy supply with low risks of increased GHG emissions compared to fossil fuels

| Criterion | Practice |
|---|---|
| Deforestation | Disallow supplies of forest bioenergy that lead to deforestation. |
| Afforestation | Strongly favour supplies of forest bioenergy where these are explicitly associated with afforestation activities. However, avoid afforestation activities:<br>• on soils with existing high organic carbon content, and<br>• that lead to high risks of indirect land-use change. |
| Improvement of growing stock | Strongly favour supplies of forest bioenergy where these are explicitly associated with activities to conserve and enhance forest growing stock, carbon stocks and forest productivity. |
| Growth rate | Disfavour forest bioenergy production from forest areas with low growth rates. Tentatively, low growth rate is defined as 2 $m^3$ $ha^{-1}$ $yr^{-1}$ or less. Possible exemptions in some cases, e.g. disease infested forest areas. |
| Thinning and (clear)felling | If the level of supply of forest bioenergy from thinning and felling activities in forest areas is consistent with long-term historical levels, and with the principle of sustainable yield, then risks of issues with GHG emissions are low.<br>If the level of forest bioenergy from thinning and felling activities in forest areas involves increased supply compared with long-term historical levels, then favour production from thinning over production from felling, with the aims of:<br>• improving the quality of the remaining growing stock, and<br>• minimising disturbance of litter and soil carbon.<br>If, and only if, the level of forest bioenergy from thinning and felling activities in forest areas involves increased supply compared with long-term historical levels, then it is necessary to |

| Criterion | Practice |
|---|---|
| | consider the conditional criteria as well as the mandatory criteria regarding use of wood feedstocks for bioenergy. |
| Scale of forest bioenergy use: Mandatory criterion | Aim for levels of forest bioenergy use that are well within the long-term sustainable-yield capacity of the supplying forest areas.<br>When setting levels for bioenergy use, take account of the consumption of biomass for other uses (i.e. materials) and levels of biomass consumption outside the EU region. |
| Stumps including roots: Mandatory criterion | Strongly disfavour supplies of forest bioenergy from stumps including roots. |
| Post-consumer waste wood: Conditional criterion | Strongly favour supplies of forest bioenergy from postconsumer waste wood. Particularly favour such sources where the waste wood would otherwise be burnt or put in landfill without energy recovery. Also favour use of waste wood at levels that do not compete with current levels of consumption of such feedstocks for material uses (e.g. wood-based panels). |
| Industrial residues: Conditional criterion | Strongly favour supplies of forest bioenergy from industrial residues. Particularly favour such sources where the residues would otherwise be burnt as waste without energy recovery. Also favour use of industrial residues at levels that do not compete with current levels of consumption of such feedstocks for material uses (e.g. wood-based panels). |
| Forest residues: Conditional criterion | Strongly favour supplies of bioenergy from fast-decaying forest residues (i.e. apart from stumps including roots or other large residues) provided this avoids levels of extraction of forest residues that lead to high risks of degradation of site/soil quality (e.g. carbon stocks, nutrient status, water balance). |
| Salvage logging: Conditional criterion | Favour supplies of wood biomass from salvage logging where a simply calculated but robust estimate of GHG emissions meets a defined minimum threshold. |

| Criterion | Practice |
|---|---|
| Whole tree stems: Conditional criterion | Restrict supplies of forest bioenergy from whole tree stems to small/early thinnings, with the aim of improving the quality of the remaining growing stock. Favour situations in which, otherwise, there would be limited incentives to thin and improve forest stands.<br>Alternatively, favour supplies of wood biomass from small/early thinnings where a simply calculated but robust estimate of GHG emissions meets a defined minimum threshold. |
| Small roundwood: Conditional criterion | Favour supplies of forest bioenergy from small roundwood at levels that do not compete with current levels of consumption of such feedstocks for material uses.<br>Particularly favour such sources where the small roundwood would otherwise be burnt without energy recovery or sent to landfill. |
| Sawn timber, especially suitable for construction uses: Conditional criterion | Strongly disfavour supplies of forest bioenergy from wood feedstocks suitable for use for sawn timber products. |
| Co-production: Conditional criterion | Strongly favour the supply of forest bioenergy as a by-product of wood harvesting for the supply of long-lived material wood products. However, it is very important to ensure that flanking measures are in place to ensure that other feedstock criteria above are met and to encourage the disposal of material wood products at end of life with energy recovery and/or in a way that ensures low GHG emissions. |

Source: Matthews et al. 2018.

The proceedings summarise the expert presentations and discussions of the workshop on the extension of the Review of the Land Use, Land Use Change and Forestry Regulation. The workshop served to prepare the ENVI Committee for the upcoming legislative "Fit for 55" package of proposals, as part of the European Green Deal. The presentations focused on options for improving carbon sinks in the EU and strengthening the LULUCF Regulation.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies for the Committee on the Environment, Public Health and Food Safety (ENVI).

PE 662.929
IP/A/ENVI/2021-10

Print ISBN 978-92-846-8325-3 | doi:10.2861/339503 | QA-09-21-249-EN-C
PDF ISBN 978-92-846-8309-3 | doi:10.2861/009138 | QA-09-21-249-EN-N