

Assessing the EU's targets for the LULUCF carbon sinks for 2026–2030: Impacts on the global forest sector and GHG emissions

Maarit Kallio Norwegian University of Life Sciences

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If the EU's LULUCF sink targets were met, what were the consequences to

- the forest sector: production "leakage"?
- CO₂ kept away from atmosphere?
- \rightarrow costs to the EU countries?





LULUCF = Land Use, Land Use Change, and Forestry.

Structure of the presentation

- Objectives & Background
- Method: Scenario analysis
- Results
- Summary



The EU's LULUCF (Land Use, Land Use Change and Forestry) regulation

• draws land use, including forests, into climate change mitigation.

2021–2025: Reference levels for forest carbon sinks.

 If sink below reference level → an emission that must be offset with additional measures or by purchasing units from the other member states



The EU's LULUCF regulation 2026-2030



2026–2030: A target for the entire LULUCF sector

-Sink of 310 Mt CO₂ by 2030 at EU level (current plan) -Allocated to member states based on land use shares

-The main source for sinks: forests.

Research method: Scenario analysis

We compared

• Base -scenario:

global forest sector development without LULUCF targets



• LULUCF –scenario:

EU countries + Norway achieve their LULUCF carbon sink targets for 2026–2030 and keep them.

Forest sector development projected with a global forest sector model, FORMEQ.



FORMEQ: a global forest sector model

Based on economic theory:

Consumers and producers in 117 world regions maximize their welfare/profits in **competitive markets** \rightarrow the model finds **equilibrium prices and quantities** (consumption, production, trade) for all products and regions.

Detailed model:

- -8 wood categories (coniferous & non-coniferous: sawlogs, pulpwood, other industrial, fuelwood) + by-products (chips,dust)
- -5 pulp types (3 chemical pulps, textile fibers, fluff),
- -8 paper and paperboard products
- -8 mechanical wood industry products
- -4 types of recycled paper

Scenario assumptions

Market-driven development



LULUCF

Base



EU **sink goal achieved** by constraining roundwood harvests in the EU & Norway, 2026–2035.

Assumptions made to model forest sink goals

- LULUCF sectors other than managed forests cut their emissions by 10%
- Relation between forest carbon sink and harvests coarsely established based on recent data
- The UK is not participating
- Plans for tightening of goals after 2030 ignored!

Results: Impacts on the forest sector if the EU LULUCF sink goals are met



Sink target requires a rapid reduction in the EU harvests to the levels not seen after the financial crisis of 2008-2009.



LULUCF



If EU+N decrease their roundwood harvests, other world countries increase theirs to satisfy the demand for forest products.

	Deline in EU+N	Increase elsewhere	World, net
2035	-126.9 Mm ³	+81.9 Mm ³	-45 Mm ³
2030-2035	-113.2 Mm ³	+73.7 Mm ³	-39.6 Mm ³
average			



Achieving the LULUCF target triggers a significant harvest increase outside of EU+N

The %-shares of the 82 Mm³ harvest increase outside of EU+N in 2035



Change in forest industry production LULUCF - Base, 2035



Projected change in production due to LULUCF, 2035. LULUCF - Base, Mill. m³



Sågade trävaror och plywood

Results: What if the EU LULUCF policy goals were achieved? Impacts on global emission balance





The climate benefits from harvested wood products (HWP) weaken due to three reasons.

• HWPs store less carbon (their carbon sink decreases)

- When other materials replace wood, emissions may increase
 - in the production phase
 - -at the end-of-life of products



Forest product consumption decreases globally from the Base levels in LULUCF.



Solidwood products Other wood products Chemical pulps

Decline in the use of HWPs (LULUCF vs. Base) could come with an **emission increase of 26 Mt CO₂/year** in 2030-2035.



Increase in global forest sinks (LULUCF - Base) could be of magnitude 48 Mt CO₂/year in 2030-2035



Assumptions: Wood biomass includes 0.225 tC/m³. Total biomass is 1.3 x harvest in m³ (over bark). 1 t C = 3.66 t CO₂.

Net emission reduction by meeting the sink target: **22 Mt CO₂/yr globally** on average during 2030-2035



-60

Cutting harvest by **113 Mm³/year** in EU+N in 2030-2035 reduces global GHG emissions by **22 Mt CO₂/year**.



Coarse evaluation of the policy costs



Cost of tonne of CO₂ avoided around 1000 €/tCO₂

EU harvests decline 113 Mm ³ /yr	→	Global emissions decline 22 Mt CO2 /yr		
Valued at price of wood only (just part of the cost)				
122 €/m ³ x 113 Mm ³ / 22 Mt CO ₂	\rightarrow	627 € / t CO ₂		
137 €/m ³ x 113 Mm ³ / 22 Mt CO ₂	\rightarrow	704 € / t CO ₂		
Factoring in multiplicative economic effects of 1.55* – 1.85*				
1.55 x 122 €/m ³ x 113 Mm ³ /22 Mt CO ₂	>	971 € / t CO ₂		
1.85 x 137 €/m ³ x 113 Mm ³ /22 Mt CO ₂	\rightarrow	1302 € / t CO ₂		

Average export (122 €/m³) and import (137 €/m³) unit prices for roundwood in 2022-23, FAOSTAT. *Based on meta-analysis 62 contries. FAO 2022. <u>doi.org/10.4060/cc2387en</u>

Simple uncertainty analysis

What if our projection of baseline markets development or emission calculations were «100% wrong»?

- The cost of CO₂ removed from the atmosphere through forest sink goal is still about 500 €/t CO₂ or more.
- Way higher than costs of many other climate change mitigation means, many of which are considered "too expensive" today.



Uncertainty analysis

We landed to the same cost level (ca. 1000 €/t CO₂ or more) also in alternative scenarios explored:

- Baseline where EU+N harvests are not allowed to increase current levels (2022) vs. case with LULUCF reductions
- Baseline where EU+N development is affected by implementation of the European Biodiversity Strategy 2030 vs. LULUCF-restrictions in addition.



Summary

with some additional points raised out from our study



If the LULUCF sink target was achieved in EU

- Wood prices increase globally, but forest owners' income declines in the EU.
- Forest industry production decreases most in the EU's sawmill industries.
- Increased harvest pressure increases the risk of weakening biodiversity in the Rest of the World regions
 - -with higher species richness,
 - -weaker protection coverage, and
 - –less regulated use of forests
 - than in the EU+N.

If the EU LULUCF sink target was achieved

- a massive harvest "leakage" from the EU to Rest of the World with a leakage ratio at 2/3.
- a huge income transfer from the EU to RoW, with an almost negligible climate benefit considering the costs.
 - During 2030-35, on average:

-EU: -113 Mm³/year
-Rest of the World: +74 Mm3/year
-Atmosphere: -22 Mt CO₂/year

BUT: achieving the target is practically a mission impossible because *countries lack means for controlling private harvests, growth of trees and weather.* → **countries end up paying for non-obeyance.**

Thank you!



The results presented were obtained with: Elias Garvik, NMBU (LULUCF and emission data)



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Literature

On EU's LULUCF sink targets and forest sector

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On EU's Biodiversity Strategy 2030

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Manuscripts from the project behind this presentation are submitted to peer-reviewed journals and are under review:

- Kallio AMI & Rannestad MM. 2025. Potential impacts of the EU's biodiversity strategy on the EU and global forest sector and biodiversity. Submitted. Under review. *
- Garvik E & Kallio AMI. 2025. EU policy on forest carbon sinks revisited. Submitted. Under review. *

* Available by request: <u>maarit.kallio@nmbu.no</u> The published articles above are open-access.

Assumptions behind the changes in emissions due to decreased use of wood products

Decrease in carbon sink of HWPs

• Stocks calculated using the IPCC Tier 2 method and basic assumptions for the consumption of wood products in countries from 1961 to 2035. (FAOSTAT + model simulation)

Replacing HWPs by other materials, production stage

- Additional emissions per unit of replaced HWP: paperboard 1.99 tCO₂/t, wood-based textile fibers 3.47 tCO₂/t; sawnwood and plywood 0.82 tCO₂/m³; boards 0.49 tCO₂/m³.
- 95% of the reduced HWP consumption is replaced by other materials.

Less wood waste - possibly more non-renewable waste , end-of-life stage

- 85% of waste wood could have been incinerated in the EU, 70% elsewhere. The amount arriving for combustion is calculated from the decay of countries' HWP stock.
- Replaced emissions according to country-specific emission factors, which decrease in some countries (also USA) following national emission targets. China & India: heavy use of coal is still in 2035.

Scenario assumptions with EUBDS

Market-driven development Base Increase in protected areas **EUBDS** LULUCF-BD EU Sink goal achieved by constraining roundwood harvests in the EU & Norway, 2026–2035. Assumptions behind the forest sink goals LULUCF sectors other than managed forests cut their emissions by 10% Relation between forest carbon sink and harvests coarsely established based on recent data Plans for tightening of goals after 2030 ignored! LULUCF+BD Assumptions on the EU biodiversity strategy 2030 Countries increase their protected land area shares during 2026-2030 until 30% is non-strictly and 10% of is under strictly protected.

LULUCF requires harvest reductions. The EUBDS

has much less effect on harvests.



