How to integrate the high uncertainty of natural and technological sinks in the 2040 ECL

Natural and technological carbon sinks will play a critical role in achieving the EU's climate targets. However, the situation of the LULUCF sector and the uncertainty surrounding the deployment of technological sinks in EU demonstrates the profound difficulties in constructing a robust and efficient climate framework for these sectors within the required timeframe.

Over the last ten years, the LULUCF sector has lost more than a third of its net removals, from almost -350 Mt CO_2e in 2013 to around -200 Mt CO_2e in 2023 (cf. Annex 2). While some differences exist from one country to another, one of the main reasons explaining this declining trend is the degradation of European forests' carbon removal capacities under the pressure of increasing climate change impacts, which largely exceeds the short-term influence of Member States' public policies.

As indicated in a recent work from the European environmental agency (EEA), the EU is expected to reach a removal level of -233 Mt CO_2e by 2030 if all Member State's planned additional measures are swiftly implemented, far behind the EU's objective of -310 Mt CO_2e. A majority of Member States are anticipating a deficit in comparison to their respective goal, with a high level of uncertainty in our collective capacity to eventually reach the target in the long term.

Long term, according to the European Commission's impact assessment report, EU LULUCF levels could negatively deviate from the standard S1 projection by up to 111 Mt CO2e in 2040 due to climate change impacts, falling from -218 Mt CO2e to -107 Mt CO2e (cf. Annex 3)**. While this worst-case scenario remains unlikely,** as it too dependent on model uncertainty and notably because Member States are planning on implementing more policies and measures**, the possible impacts of climate change on the LULUCF sector are such that they cannot be ignored. Therefore, we believe it is important to provide a likely range of outcomes in 2040.**

Using the impact assessment report**, a trajectory** of a RCP 7.0 scenario, combined with the implementation of half of the 50 €/tCO2e measures from S2**, would amount to a LULUCF level of -200 Mt CO2e in 2040 (cf. Annex 1). Current projections by the EEA suggest the natural carbon sink could indeed reach -200 Mt CO2e in 2040 with the implementation of planned added measures[1]. Such a result would correspond to a significant but far from unlikely gap to the -316 Mt CO_2e objective**[2] used in the proposition for a 2040 European Climate Law (ECL).

Finally, **the future contribution of technological sinks to the 2040 ECL objective remain uncertain**, for both technical and economic reasons, mostly linked to industrial scalability, with estimations going **from -49 Mt CO_2e to -75 Mt CO_2e in 2040**[3].

1 EEA's Trends and Projections 2025 draft report

2 S2 scenario from the European Commission's impact assessment report

3 Scenario S2 and S3 from the European Commission's impact assessment report.

Considering the magnitude of the uncertainty surrounding the contribution of carbon sinks to the -90% target in 2040, which is evaluated at about 3% (cf. Annex 1), France considers essential the inclusion in the ECL of a de-risking feature:

- **A reinforced review clause by 2030 to reassess current and projected GHG removals from carbon sinks as well as planned policies and measures in these sectors; coupled with**
- **An emergency break, that could reduce the 2040 ECL net target by up to 3% if projected net removals prove insufficient.**

This emergency break would allow a clear and predictable contribution of gross emission reductions to the 2040 target to avoid automatically increasing the contribution of gross emissions reduction.

Annex 1: An uncertainty of 3% of the carbon sinks' contribution to the 2040 ECL target

	Scenario -		Scenario +		Variation	
	Performance in 2040 (Mt CO_2e)	Contribution to the -90% target	Performance in 2040 (Mt CO_2e)	Contribution to the -90% target	In MtCO_2e	
LULUCF sector	-200	4,3%	-316	6,8%	116	2,5%
Technological sinks	-49	1,1%	-75	1,6%	26	0,5%
Total	-249	5,3%	-391	8,4%	142	3,1%

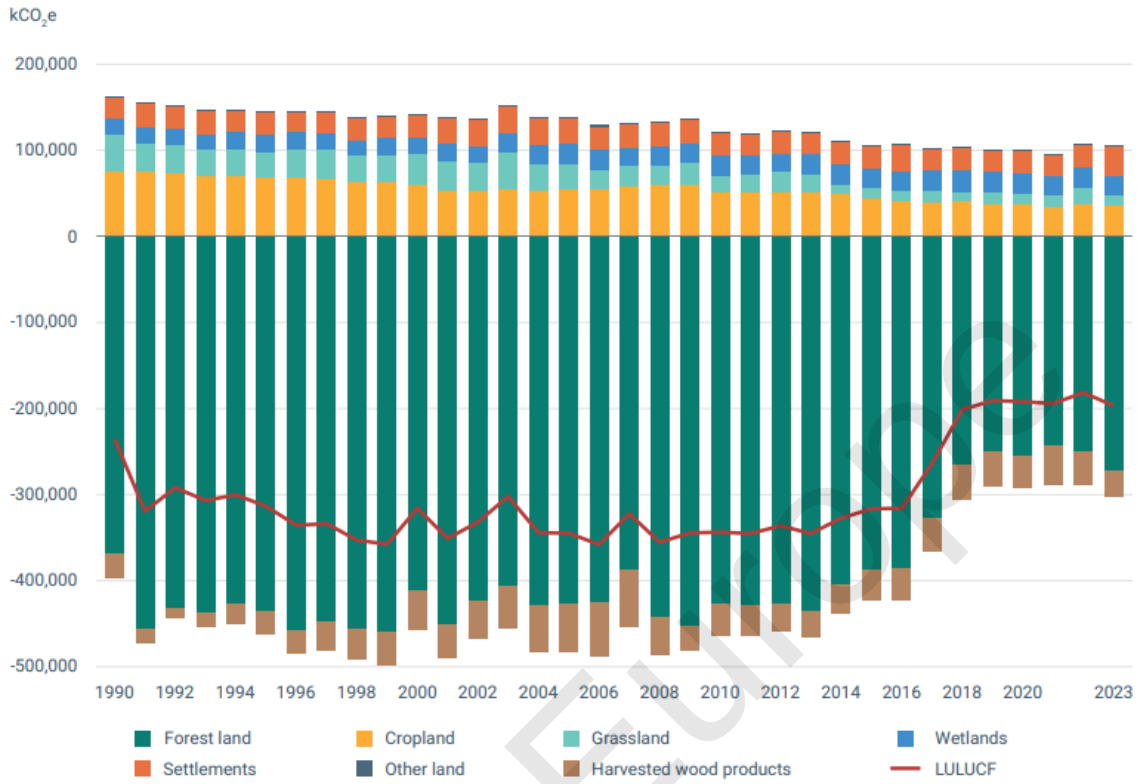
Figure 1: Contribution of the natural and technological carbon sinks to the 2040 ECL target according to two scenarios

Hypothesis:

- "Scenario –":
  - LULUCF sector: -200 Mt CO_2e in 2040, which corresponds to the S1 (RCP 7.0) scenario from the European commission's Impact assessment report (around 150 Mt CO_2e in 2040), with the deployment of 50% of the 50 €/tCO_2e policies and measures separating the S1 and S2 scenario (around 50 Mt CO_2e/tCO2e in 2040), such as peatland restoration, agroforestry policies, protection of forests from fires, afforestation, etc.
  - Technological sinks: -49 Mt CO_2e in 2040, corresponding to the S2 scenario from the European commission's Impact assessment report.
- "Scenario +":
  - LULUCF sector: -316 Mt CO_2e in 2040, corresponding to the S2 scenario from the European commission's Impact assessment report.
  - Technological sinks: -75 Mt CO_2e in 2040, corresponding to the S3 scenario from the European commission's Impact assessment report.

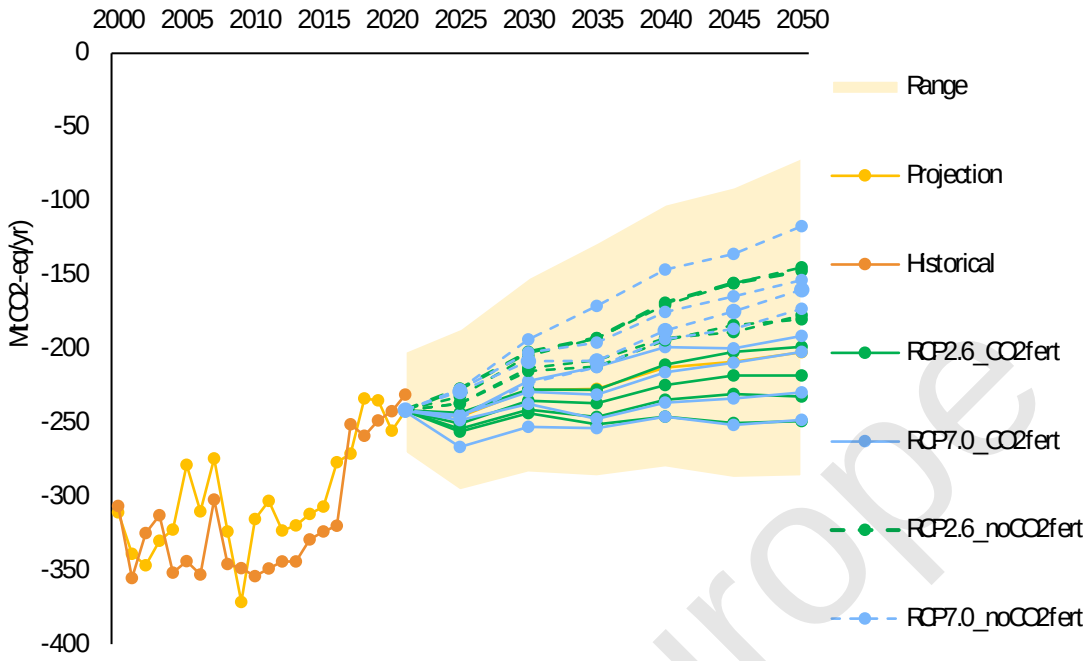
Depending on scenarios, the contribution of LULUCF and technological sinks by 2040 could vary by around 3 %, based on the current projected scenario. Given these uncertainties and the difficulty to yield short-term results on the LULUCF sector, planning for an "emergency brake" in case of significant deviation from target could provide for more certainty on the contribution of the other sectors.

Annex 2: LULUCF historic evolution



Source: Enhancing Europe's land carbon sink: status and prospects, 2025, European Environment Agency (EEA)

Annex 3: Evaluation of climate change's impacts on the LULUCF sector



Note: The graph displays a model-based projection of the development of the LULUCF net removal in absence of dedicated mitigation policies [lower level]. The historical trajectory shows the historical inventory data based on UNFCCC 2023. and the 'projection' shows the trajectory of the LULUCF net removal without considering the impact of climate change. The different 16 trajectories show RCP 2.6 vs. 7.0 (2) X different climate models (4) X CO2 fertilisation vs. no fertilisation (2). The range illustrates the uncertainty due to climate change impacts across all trajectories including uncertainty on carbon storage in soils.

Source: European Commission, Impact assessment report, part 3 (GLOBIOM, UNFCCC 2023)