## **Scaling up carbon dioxide removals** Recommendations for navigating opportunities and risks in the EU

Prof. Ottmar Edenhofer, Chair of the European Scientific Advisory Board on Climate Change

Public webinar 25 February 2025



#### 1. The Advisory Board

- 2. The need for a rapid and sustainable scale up of carbon dioxide removals
- 3. Recommendations for the EU climate policy framework





## **The Advisory Board**

shall serve as a point of reference for the Union on scientific knowledge relating to climate change by virtue of its independence and scientific and technical expertise.

European Climate Law (EU) 2021/1119

## The Advisory Board is composed of scientific experts, appointed in a personal capacity



Ottmar Edenhofer (Chair)





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**Constantinos Cartalis** 

National and Kapodistrian University of Athens



Elena Lopez-Gunn

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Jean-François Soussana

French National Research Institute for Agriculture, Food...

## The Advisory Board provided advice on energy systems, the EU 2040 climate target and policy gaps





Towards a climate-neutral and climate-resilient EU energy infrastructure

Advice on scenario guidelines for trans-European networks for energy

16 November 2022



7 February 2023

Aligning policy responses to rising energy prices with the long-term climate neutrality objective

> Europear Advisory Climate C



Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050

15 June 2023



**Towards EU climate neutrality** Progress, policy gaps and opportunities

Assessment Report 2024

18 January 2024

European Scientif Advisory Board or Climate Change

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## Europe is facing increasingly severe climate impacts

Devastating wildfires in Rhodes, Greece, on 27 July 2023 Severe flooding in Angleur, Belgium, on 16 July 2021

European Scientific Advisory Board on Climate Change

## 2024 was the warmest year on record... the 1.5°C long-term warming limit is at risk







#### Surface air temperature anomalies in 2024 vs 1991–2020 Data source: ERA5. Credit: C3S/ECMWF.

## Net-zero and net-negative emissions are needed to keep long-term warming below 1.5°C





Source: Advisory Board based on IPCC C1 global pathways (median, 25<sup>th</sup>-75<sup>th</sup> percentile range, 2000-2100)

# EU scenarios show the need for a rapid scale up of removals to reach net zero and net negative





Scenarios compliant with 90% to 95% net GHG reduction in 2040, Source: Advisory Board

## Managing the greenhouse gas budget requires reducing emissions...





## ... increasing removals ...





Storage

## ... and managing reversals







Note: Only anthropogenic activities are shown.

## Fossil-CCS is not a removal, but an emission reduction







# EU policies should fulfil 7 functions to ensure a sustainable deployment of removals



#### **Opportunities and risks**

- Climate effects
- Environmental effects
- Economic effects
- Implementation challenges

#### **Key required governance functions**

- 1. Managing the greenhouse gas budget
- 2. Maintaining fiscal sustainability and enhancing distributional fairness
- 3. Ensuring the quality of removals
- 4. Reversing the decline of the land sink in a changing climate
- 5. Accelerating innovation and raising public awareness
- 6. Securing the CO<sub>2</sub> infrastructure's availability and resilience
- 7. Enhancing institutional governance

#### Policy gap analysis

Recommendations for an EU removal policy architecture

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## **Foundations**





Set separate legally-binding targets for:

- gross emission reductions
- permanent removals
- temporary removals



## EU targets lack differentiation and medium/long-term



Storage



**Net-Zero Industry Act** CCS injection capacity of 50 MtCO<sub>2</sub> in 2030 (not specifically for removals)

#### Note: Only anthropogenic activities are shown

### Set separate targets





EU climate targets and example of compliant pathway, Source: Advisory Board

#### Ensure the quality of removals

- Develop robust monitoring, reporting and verification
- Ensure a transparent contribution of removals towards policy objectives



## Ensure the quality of removals





## Acceleration





#### *Reverse the decline of the land sink*

Integrate land-related policies into a coherent framework where sectoral measures enhance EU land sinks and foster climate adaptation



## Reverse the decline of the land sink

and mainstream





#### Accelerate innovation

- Strengthen regulatory signals
- Expand funding across the entire innovation cycle
- Prioritise CCS for permanent removals
- Enhance public awareness on removals



## **Accelerate innovation**





### Secure sufficient CO<sub>2</sub> infrastructure

- Increase coordination
- Boost investment
- Enhance strategic planning
- Ensuring equitable access, a just transition and climate resilience



## Secure sufficient CO<sub>2</sub> infrastructure





## **Carbon markets**





### A mix of price-based and quantity-based instruments can incentivise removals



**Quantity instruments** 



#### *Price permanent removals*

Consider a progressive integration of permanent removals into the EU ETS, under strict conditions to:

- prevent mitigation deterrence
- address environmental risks
- support distributional fairness
- enhance dynamic cost-effectiveness





#### *Price temporary removals*

Introduce new instruments to price emissions and reward removals in the LULUCF sector, and to ensure coherence with the broader climate policy framework



## **Price temporary removals**





## Net negative





*Recognise an extended emitter responsibility* Require today's emitters to contribute to the removal of the greenhouse gases they emit





## **Recognise an extended emitter responsibility**



## Strengthen governance





#### *Strengthen governance*

- Expand climate governance and institutional capacities
- EU diplomacy and policies should support this effort by reducing carbon leakage and enhancing global climate ambition



## Strengthen governance



Reinforce the integration of removals and commitment to net negative with the **Governance Regulation and European Climate Law** 



Build capacity within existing
public bodies and consider creating new ones as needed





Conclusion

The Advisory Board calls for a rapid and sustainable scale-up of carbon dioxide removals in the EU



# Scaling up removals rapidly while managing associated opportunities and risks



- Separate targets for gross emissions, permanent and temporary removals, supported by robust monitoring
- Increased public support to urgently reverse the decline of the land sink, accelerate innovation and infrastructure deployment
- Gradual integration of permanent removals in the EU ETS and new pricing instruments to reward removals in the land sector
- Creating new instruments to operationalise the extended emitter responsibility and achieve net-negative emissions



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