Climate Change Advisory Council Secretariat

CB WG Meeting 8

23rd November 2023

Agenda

Time	Agenda Item
10:30	1. Opening of Meeting
10:35	2. Carbon Dioxide Removal and Negative Emissions Technologies
11:30	3. Biodiversity Considerations
12:30	4. Agriculture and Land Use Review
13:00	5. Carbon Budgets Work Plan
13:15	6. Next Steps and Agenda for next meeting
13:20	7. AOB
13:30	Meeting Close

1. Opening of Meeting

Action Number	Date Raised	Description	Owner	Due	Status
9	19/10/23	CBWG members to provide feedback and/or suggestions on the proposed topics for consideration in 2024 as outlined in the Meeting No. 7 presentation	CB WG Members	Nov 2023	*Propose to Close.* *Open invitation to CBWG members to submit suggestions on topics for consideration.*
10	19/10/23	Secretariat to share a note on the inputs required for macroeconomic analysis and a template regarding the temperature impact analysis with the core modelling teams for review and feedback	CCAC Secretariat/ CB WG Members	Nov 2023	Notes shared via email 31/10/23. *Propose to Close 1 week after this meeting.*

Agenda

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13:30	Meeting Close

5. Carbon Budgets Work Plan: Topics for Meetings

CB WG Meeting No.	Proposed Date and Time	Topic(s) for Consideration
1	Thursday 9th March 2023 10:00 – 13:00	Carbon Budgets Methodology
2	Thursday 20th April 2023 13:30 – 16:30	Carbon Budgets Methodology / Scoping of modelling work
3	Wednesday 31st May 2023 10:30 – 13:30	Vision for 2050 and Beyond/ Scoping of modelling work/
4	Thursday 29th June 2023 13:30 – 16:30	Climate Justice and 'Paris Test'/ Scoping of modelling work/ Macroeconomic Impacts of carbon budgets/
5	Thursday 27th July 2023 13:30 – 16:30	Focused discussion on methane/ Scoping of modelling work/
6	Friday 8th September 2023 13:30 – 16:30	Populations Projections/ Socioeconomic considerations
CB WG Workshop 1	Wednesday 13th September 2023 13:30 – 16:30	Input model parameters for 2030 starting points, scenario development and assumptions
7	Thursday 19th October 2023 13:30 – 16:30	2024 Projections Process (EPA, SEAI & ESRI)/ International approaches to carbon budgets
8	Thursday 23rd November 2023 10:30 – 13:30	Role of Negative Emissions/ Biodiversity Considerations/ Agriculture and Land Use Review
9	Friday 15th December 2023 13:30 – 16:30	*COP28 – Global Stocktake / 1st Iteration of Core Modelling Results Moral Considerations for Irish Carbon Budgets*

5. 2024 Meeting Schedule and Proposed Topics for Consideration

CB WG Meeting No.	Proposed Date and Time	Topic(s) for Consideration
10	Thursday 18th January 2024, 13:30 – 16:30	IEA Net Zero Roadmap 2023 Update/ Analysis of warming impact of selected core scenarios (1st iteration)/ Update on economic & macroeconomic analysis
11	Thursday 29th February 2024, 9:30 – 12:30	Quantitative approaches to carbon budgeting for Parties to the Paris Agreement (Victorian Government Report)/ Energy and Power systems modelling (Paul Deane)
12	Friday 22nd March 2024, 13:30 – 16:30	Agree inputs, parameters and assumptions for 2nd Iteration of Modelling/
13	Friday 19th April 2024, 13:30 – 16:30	
14	Thursday 23rd May 2024, 13:30 – 16:30	*2nd Iteration of Core Modelling Results/*
15	Friday 28th June 2024, 13:30 – 16:30	Analysis of warming impact of selected core scenarios (2nd iteration)/ *Macroeconomic and Economic Modelling Results (based on 1st and 2nd iteration)*
16	Thursday 25th July 2024, 13:30 – 16:30	Agree inputs, parameters and assumptions for 3rd Iteration of Modelling/
17	Thursday 29th August 2024, 13:30 – 16:30	*3rd Iteration of Core Modelling Results/*
18	Wednesday 18th September 2024, 13:30 – 16:30	*Macroeconomic and Economic Modelling Results (based on the 3rd iteration)* Analysis of warming impact of selected core scenarios (3rd iteration)

5. Other Proposed Topics for Consideration in 2024

- Follow on discussion on the Just Transition principles and considerations in the Carbon Budget Process (NESC)
- Follow on discussion on biodiversity considerations (Yvonne Buckley/ Secretariat)
- Discussion on various aspects of aviation and maritime (Secretariat)
- Greenhouse gas - air pollution interactions and synergies (Andrew Kelly)
- Economic assessment of climate change impacts and adaptation options in Ireland (ESRI)
- EU 2040 Climate Target and Greenhouse Gas Budget (ESAB)
- Follow on discussion on methane (Secretariat)

5. Carbon Budgets Workplan

Item	Description	2023									2024											
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	**Modelling / Analysis Iteration 1**																					
1.1	Agree inputs, paramaters and assumptions																					
1.2	Core pathways development and modelling																					
1.3	Paris Test Assessment																					
1.4	Additional modelling and testing of results																					
1.5	Post-hoc analysis																					
2	**Modelling / Analysis Iteration 2**																					
2.1	Agree inputs, paramaters and assumptions																					
2.2	Core pathways development and modelling																					
2.3	Paris Test Assessment																					
2.4	Additional modelling and testing of results																					
2.5	Post-hoc analysis																					
3	**Modelling / Analysis Iteration 3**																					
3.1	Agree inputs, paramaters and assumptions																					
3.2	Core pathways development and modelling																					
3.3	Paris Test Assessment																					
3.4	Additional modelling and testing of results																					
3.5	Post-hoc analysis																					

- Scenario results from UCC (TIMES), Teagasc (FAPRI) and NUIG (GOBLIN) to be presented to CBWG on 15/12/23
- A paper on Irish Carbon Budgets: Some Moral Considerations (Kian Mintz-Woo) to be presented to CBWG on 15/12/23
- Analysis of warming impact of selected core scenarios from the 1st iteration of modelling and additional testing of scenario results from SEAI (NEMF) to be presented to CBWG on 18/1/24
- Update on macroeconomic and economic analysis to be discussed at the CBWG on 18/1/24

6. Agenda for Meeting No. 9: 15th December 13:30 – 16:30

1. COP28 - Global Stocktake

- Overview of the outcome of the global stocktake
    - In the context of European Climate Law, which sets out a binding objective of climate neutrality in the European Union by 2050 in pursuit of the long-term temperature goal set out in the Paris Agreement to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels” and pursue efforts “to limit the temperature increase to 1.5°C above pre-industrial levels”.

2. Presentation of the 1st Iteration of Core Modelling Results

- Presentation and discussion of the 1st iteration of core modelling results by Teagasc (FAPRI), NUIG (GOBLIN), and UCC (TIM)

3. Irish Carbon Budgets: Some Moral Considerations

- A paper by Kian Mintz-Woo to be presented for discussion

6. Agenda for Meeting No. 10: 18th January 13:30 – 16:30

1. IEA Net Zero Roadmap 2023 Update

- Christophe McGlade (IEA) to present on the IEA's Net-Zero by 2050 report

2. Analysis of warming impact of selected core scenarios (1st iteration)

- Joe Wheatley to present an assessment of the warming Impact of indicative emissions scenarios selected from the 1st iteration of modelling and analysis

3. Additional testing of scenario results

- SEAI to present additional testing of scenario results from the 1st iteration of modelling with the NEMF

4. Update on economic & macroeconomic analysis

- The data requirements for the macroeconomic/economic analysis to be discussed in the context of the 2nd and 3rd iteration of modelling and analysis

7. AOB

- TBC

Carbon Dioxide Removal and its integration in European Union Climate Policy

Dr Oliver Geden

Head, SWP Research Cluster Climate Policy and Politics
Vice-Chair, IPCC AR7 Working Group III

CCAC CBWG Meeting 8, 23 November 2023

SWP

Stiftung Wissenschaft und Politik
German Institute for
International and Security Affairs

Definition of *Carbon Dioxide Removal*

Anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.

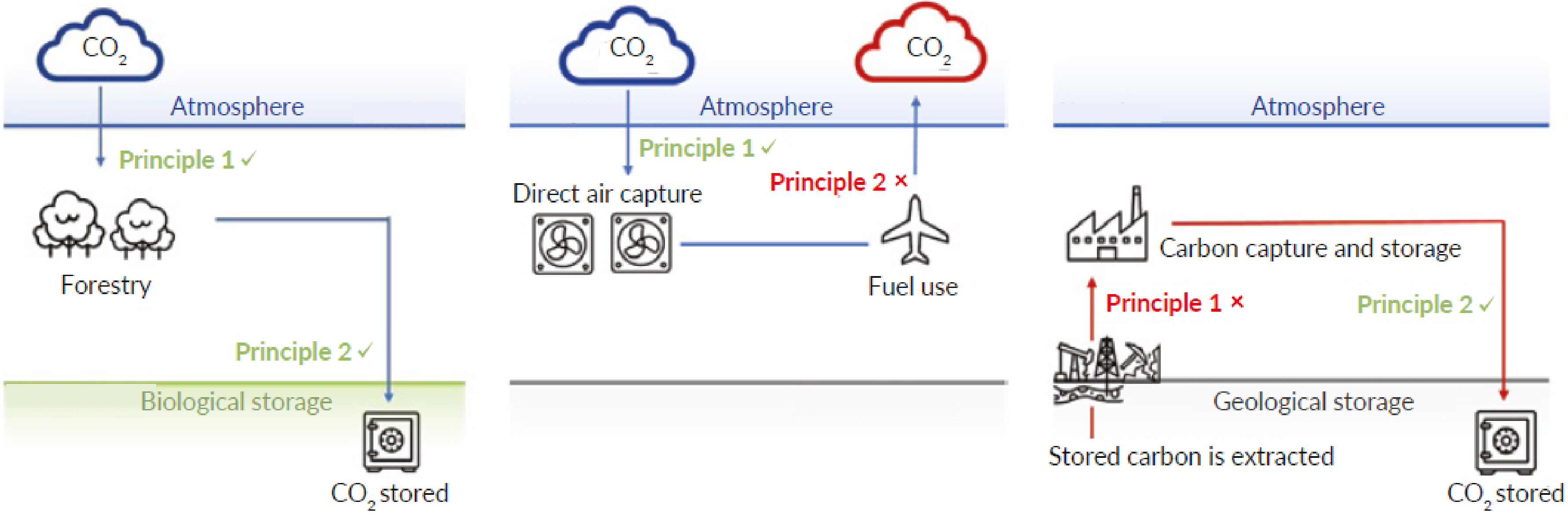
It includes existing and potential anthropogenic enhancement of biological or geochemical CO_2 sinks and direct air carbon dioxide capture and storage (DACCS), but excludes natural CO_2 uptake not directly caused by human activities.

CDR and other Carbon Management Approaches

Carbon Dioxide Removal (CDR)

Carbon Capture & Utilization (CCU)

Carbon Capture & Storage (CCS)

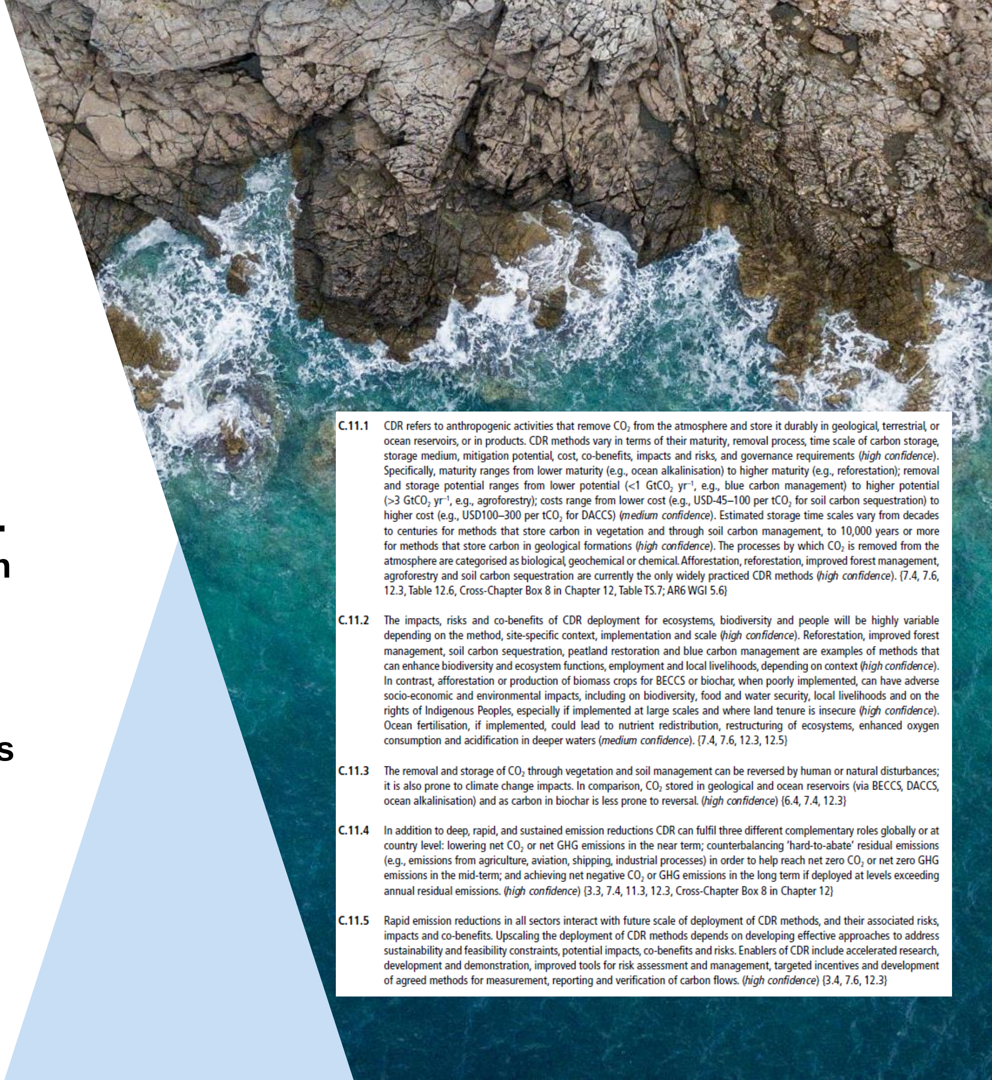


State of CDR Report & Zero Emissions Platform

WG III Summary for Policymakers

C.11 The deployment of Carbon Dioxide Removal (CDR) to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO_2 or GHG emissions are to be achieved. The scale and timing of deployment will depend on the trajectories of gross emission reductions in different sectors. Upscaling the deployment of CDR depends on developing effective approaches to address feasibility and sustainability constraints especially at large scales. (*high confidence*)

{3.4, 7.4, 12.3, Cross-Chapter Box 8 in Chapter 12}



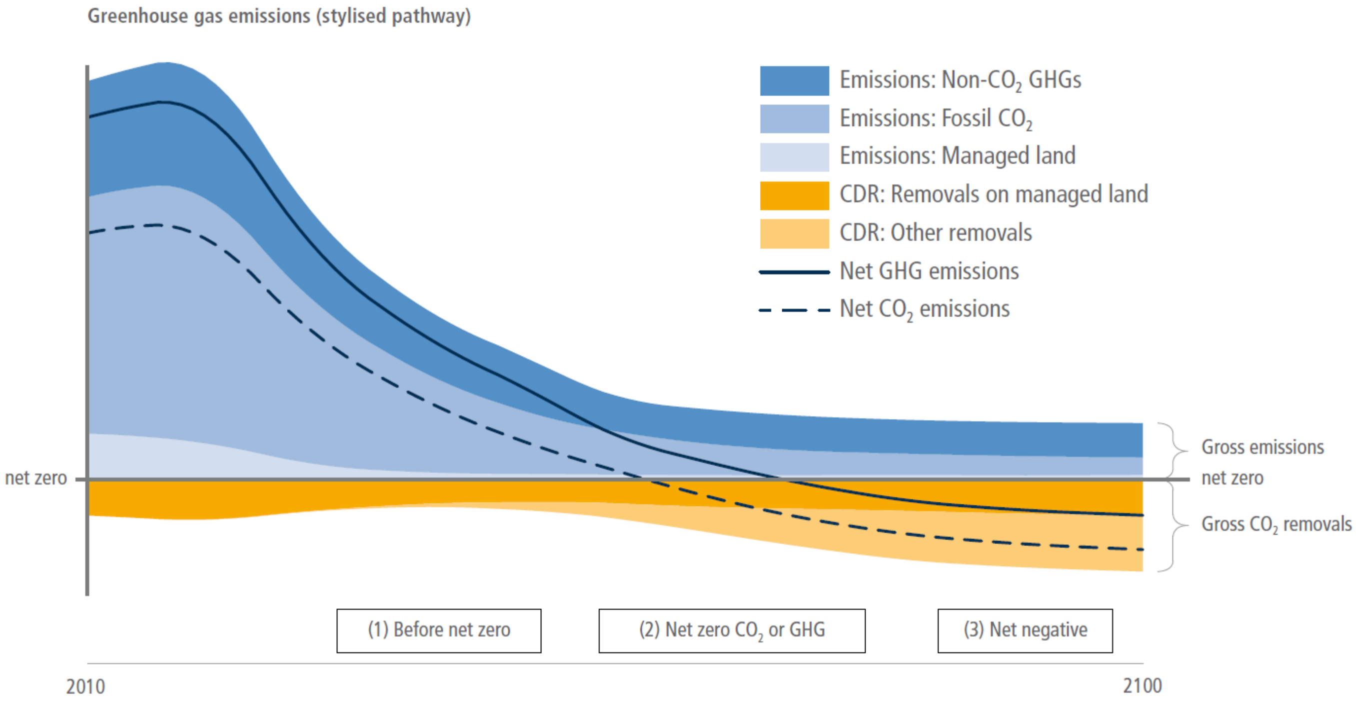
C.11.1 CDR refers to anthropogenic activities that remove CO_2 from the atmosphere and store it durably in geological, terrestrial, or ocean reservoirs, or in products. CDR methods vary in terms of their maturity, removal process, time scale of carbon storage, storage medium, mitigation potential, cost, co-benefits, impacts and risks, and governance requirements (*high confidence*). Specifically, maturity ranges from lower maturity (e.g., ocean alkalinisation) to higher maturity (e.g., reforestation); removal and storage potential ranges from lower potential (<1 $GtCO_2$ yr^{-1}, e.g., blue carbon management) to higher potential (>3 $GtCO_2$ yr^{-1}, e.g., agroforestry); costs range from lower cost (e.g., USD-45–100 per tCO_2 for soil carbon sequestration) to higher cost (e.g., USD100–300 per tCO_2 for DACCS) (*medium confidence*). Estimated storage time scales vary from decades to centuries for methods that store carbon in vegetation and through soil carbon management, to 10,000 years or more for methods that store carbon in geological formations (*high confidence*). The processes by which CO_2 is removed from the atmosphere are categorised as biological, geochemical or chemical. Afforestation, reforestation, improved forest management, agroforestry and soil carbon sequestration are currently the only widely practiced CDR methods (*high confidence*). {7.4, 7.6, 12.3, Table 12.6, Cross-Chapter Box 8 in Chapter 12, Table TS.7; AR6 WGI 5.6}

C.11.2 The impacts, risks and co-benefits of CDR deployment for ecosystems, biodiversity and people will be highly variable depending on the method, site-specific context, implementation and scale (*high confidence*). Reforestation, improved forest management, soil carbon sequestration, peatland restoration and blue carbon management are examples of methods that can enhance biodiversity and ecosystem functions, employment and local livelihoods, depending on context (*high confidence*). In contrast, afforestation or production of biomass crops for BECCS or biochar, when poorly implemented, can have adverse socio-economic and environmental impacts, including on biodiversity, food and water security, local livelihoods and on the rights of Indigenous Peoples, especially if implemented at large scales and where land tenure is insecure (*high confidence*). Ocean fertilisation, if implemented, could lead to nutrient redistribution, restructuring of ecosystems, enhanced oxygen consumption and acidification in deeper waters (*medium confidence*). {7.4, 7.6, 12.3, 12.5}

C.11.3 The removal and storage of CO_2 through vegetation and soil management can be reversed by human or natural disturbances; it is also prone to climate change impacts. In comparison, CO_2 stored in geological and ocean reservoirs (via BECCS, DACCS, ocean alkalinisation) and as carbon in biochar is less prone to reversal. (*high confidence*) {6.4, 7.4, 12.3}

C.11.4 In addition to deep, rapid, and sustained emission reductions CDR can fulfil three different complementary roles globally or at country level: lowering net CO_2 or net GHG emissions in the near term; counterbalancing 'hard-to-abate' residual emissions (e.g., emissions from agriculture, aviation, shipping, industrial processes) in order to help reach net zero CO_2 or net zero GHG emissions in the mid-term; and achieving net negative CO_2 or GHG emissions in the long term if deployed at levels exceeding annual residual emissions. (*high confidence*) {3.3, 7.4, 11.3, 12.3, Cross-Chapter Box 8 in Chapter 12}

C.11.5 Rapid emission reductions in all sectors interact with future scale of deployment of CDR methods, and their associated risks, impacts and co-benefits. Upscaling the deployment of CDR methods depends on developing effective approaches to address sustainability and feasibility constraints, potential impacts, co-benefits and risks. Enablers of CDR include accelerated research, development and demonstration, improved tools for risk assessment and management, targeted incentives and development of agreed methods for measurement, reporting and verification of carbon flows. (*high confidence*) {3.4, 7.6, 12.3}

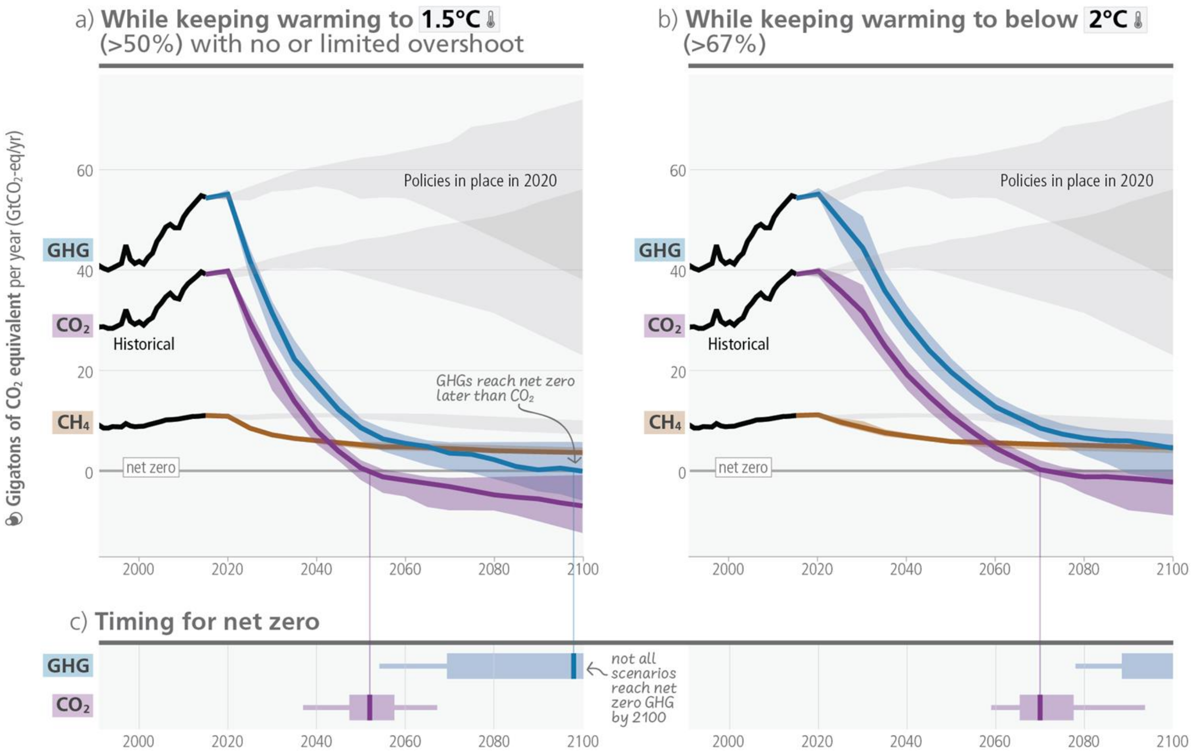


IPCC AR6 WG III, CHAPTER 12, CROSS-CHAPTER BOX 8, FIGURE 2

- Global & national pathways share basic components
- (Modelled) residual emissions mainly non-CO_2 GHGs from agriculture, but also CO_2 from industry, aviation and land-use
- *Gross/Gross* perspective more insightful than *net* only

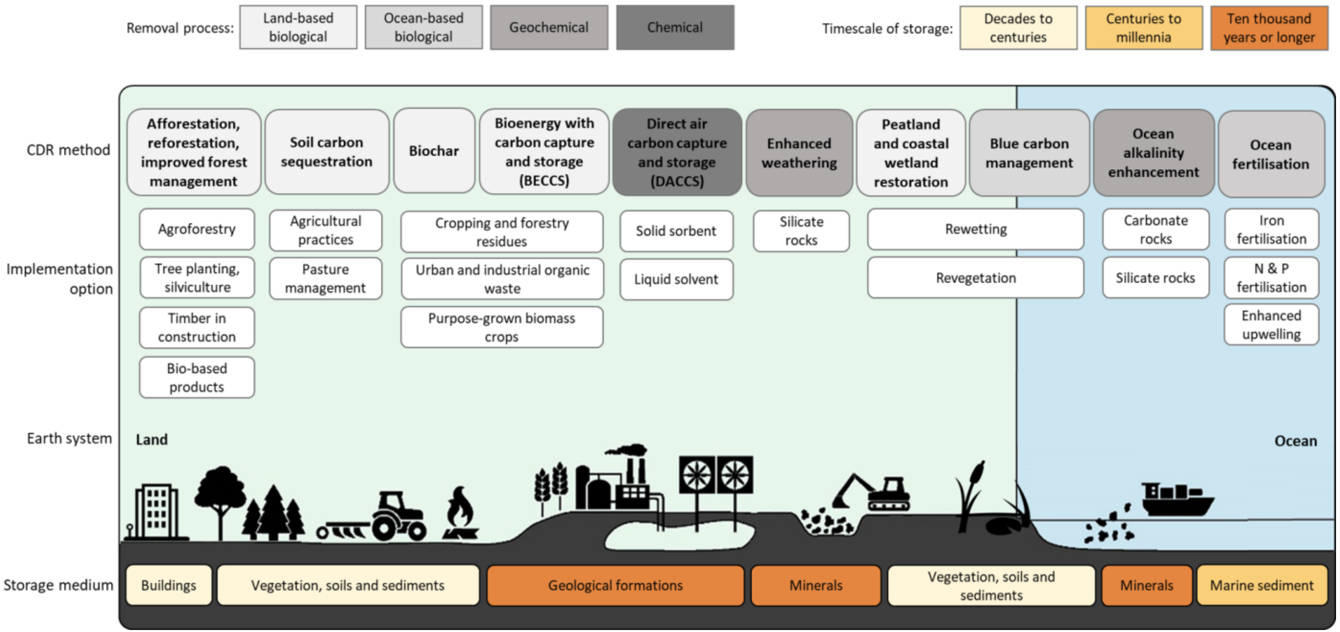
Global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot reach net zero CO_2 emissions around 2050

Total greenhouse gases (GHG) reach net zero later



- Synthesis Report focus on *overshoot*: exceedance of 1.5°C in early 2030s and possible return by 2100
- Limiting warming to 1.5°C by 2100 with limited overshoot requires net negative CO_2 emissions
- Drastically reducing *net* emissions 2019-2030 (GHG: 43%, CO_2: 48%) not enough to avoid exceeding 1.5°C temporarily but only to limit overshoot (to 0.1°C)

IPCC AR6 SYR, FIGURE 3.5

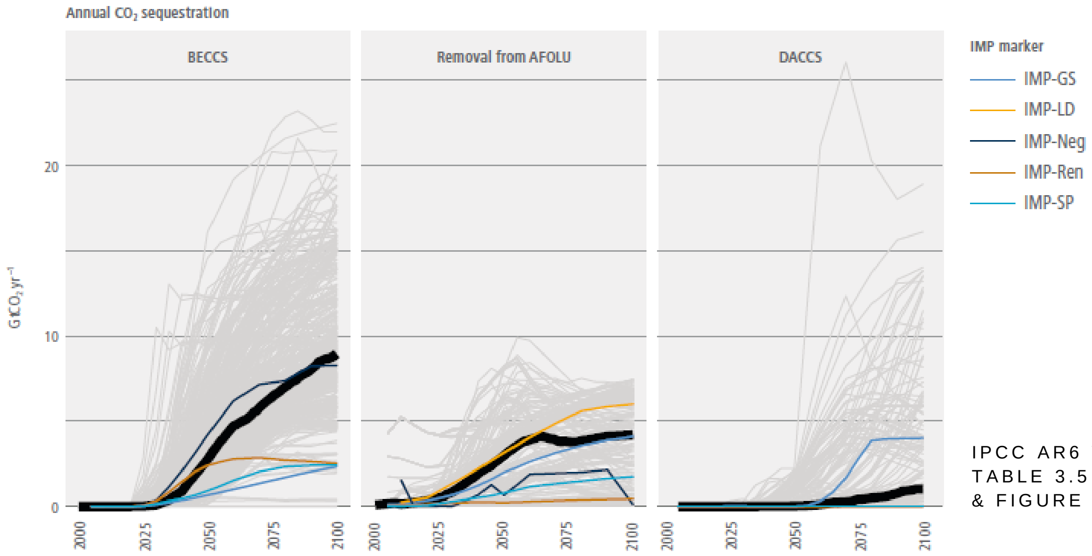


- Taxonomy of CDR methods based on AR6 WG I, highlighting *removal process & timescale of storage*
- Often several implementation options per CDR method
- CCS and CCU can be part of CDR methods, with durable storage of CO_2 from biomass or ambient air
- No dichotomy beyond land vs. ocean-based

IPCC AR6 WG III, CHAPTER 12, CROSS-CHAPTER BOX 8, FIGURE 1

CDR option	C1: Limit warming to 1.5°C (>50%) with no or limited overshoot		C2: Return warming to 1.5°C (>50%) after a high overshoot		C3: Limit warming to 2°C (>67%)	
	Quantity	Count	Quantity	Count	Quantity	Count
CO_2 removal on managed land including Afforestation/Reforestation[1]	262 (17–397)	64	330 (28–439)	82	209 (20–415)	196
BECCS	334 (32–780)	91	464 (226–842)	122	291 (174–653)	294
Enhanced weathering	0 (0–47)	2	0 (0–0)	1	0 (0–0)	1
DACCS	30 (0–308)	31	109 (0 – 539)	24	19 (0–253)	91

[1] Cumulative CDR from AFOLU cannot be quantified precisely because models use different reporting methodologies that in some cases combine gross emissions and removals, and use different baselines.

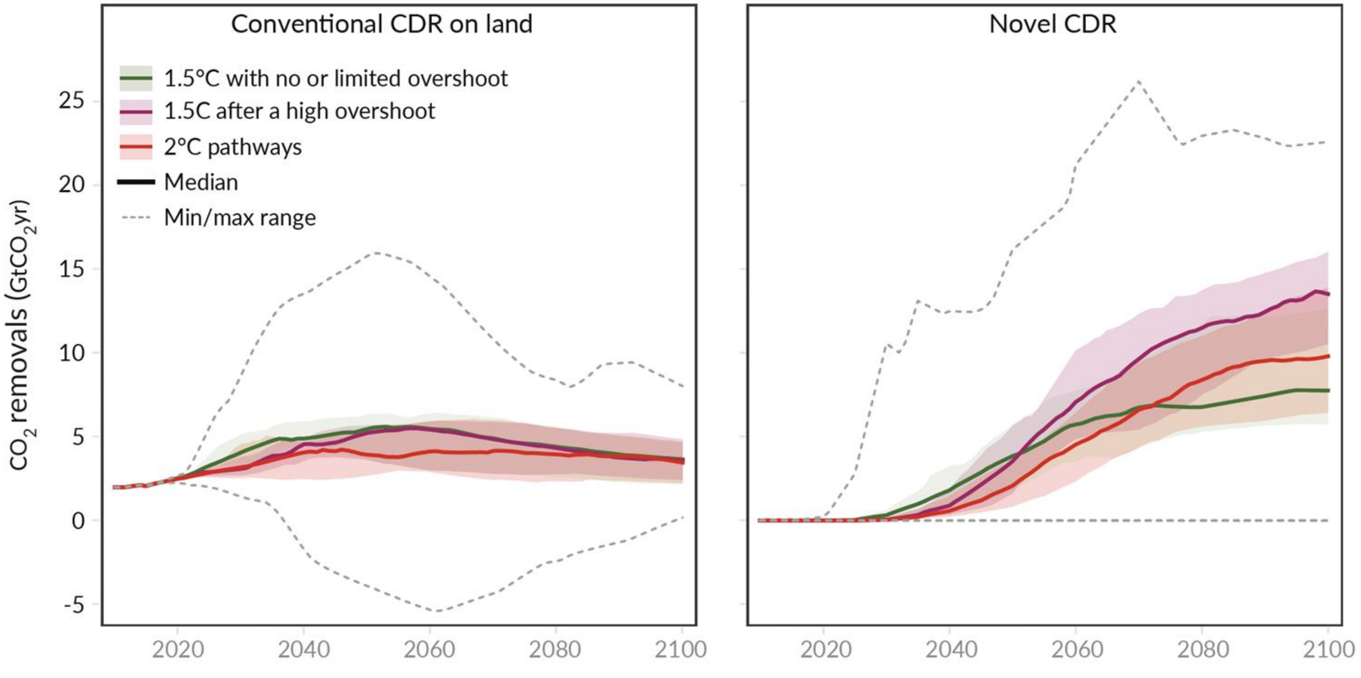


IPCC AR6 WG III
TABLE 3.5
& FIGURE 12.3

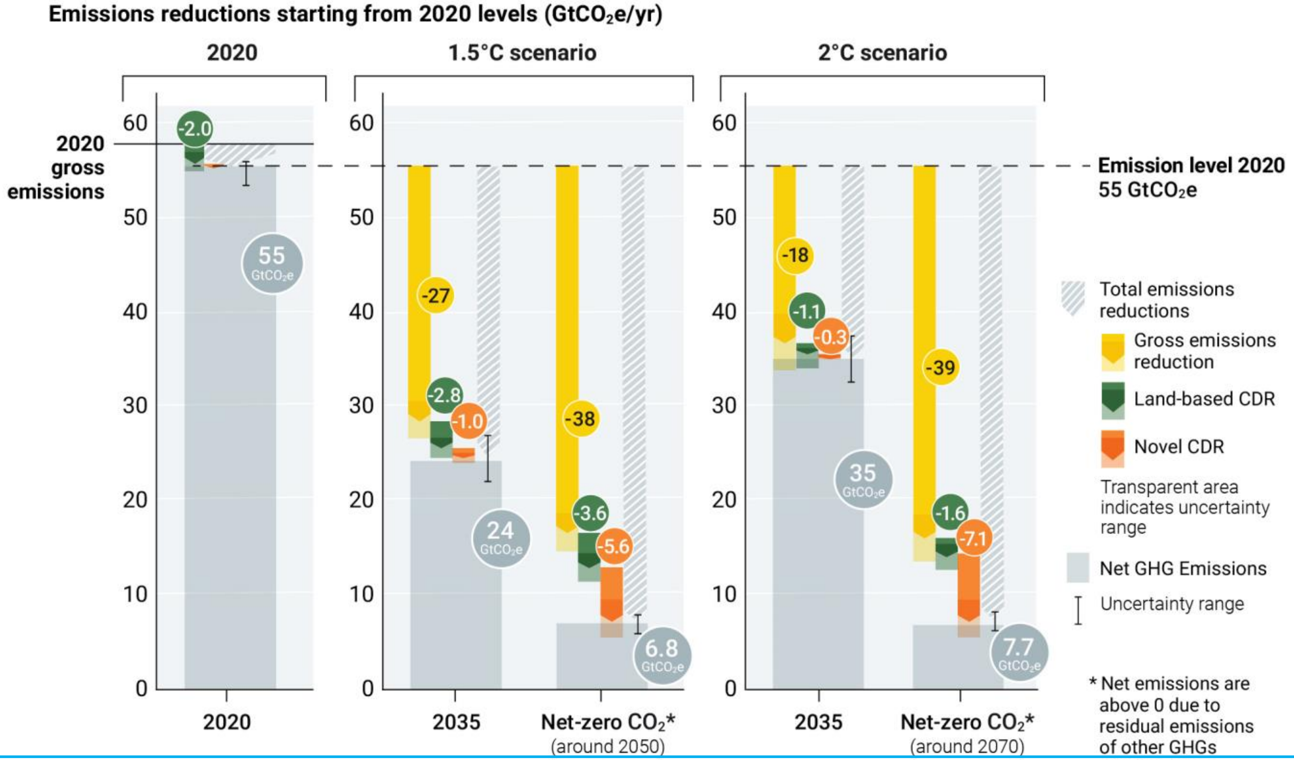
- No total CDR volumes until 2100 (mainly due to scenario database reporting standards and methodologies)
- Numbers depend on contextual factors, incl. assumptions on discount rate & residual emissions, and core mitigation strategies

Upscaling of CDR methods under different pathways

Expansion of land-based CDR but also rapid scaling up of novel CDR methods are needed.



Global net-zero CO_2 mainly via emissions reductions, with shift from conventional land-based to novel CDR



UN environment programme

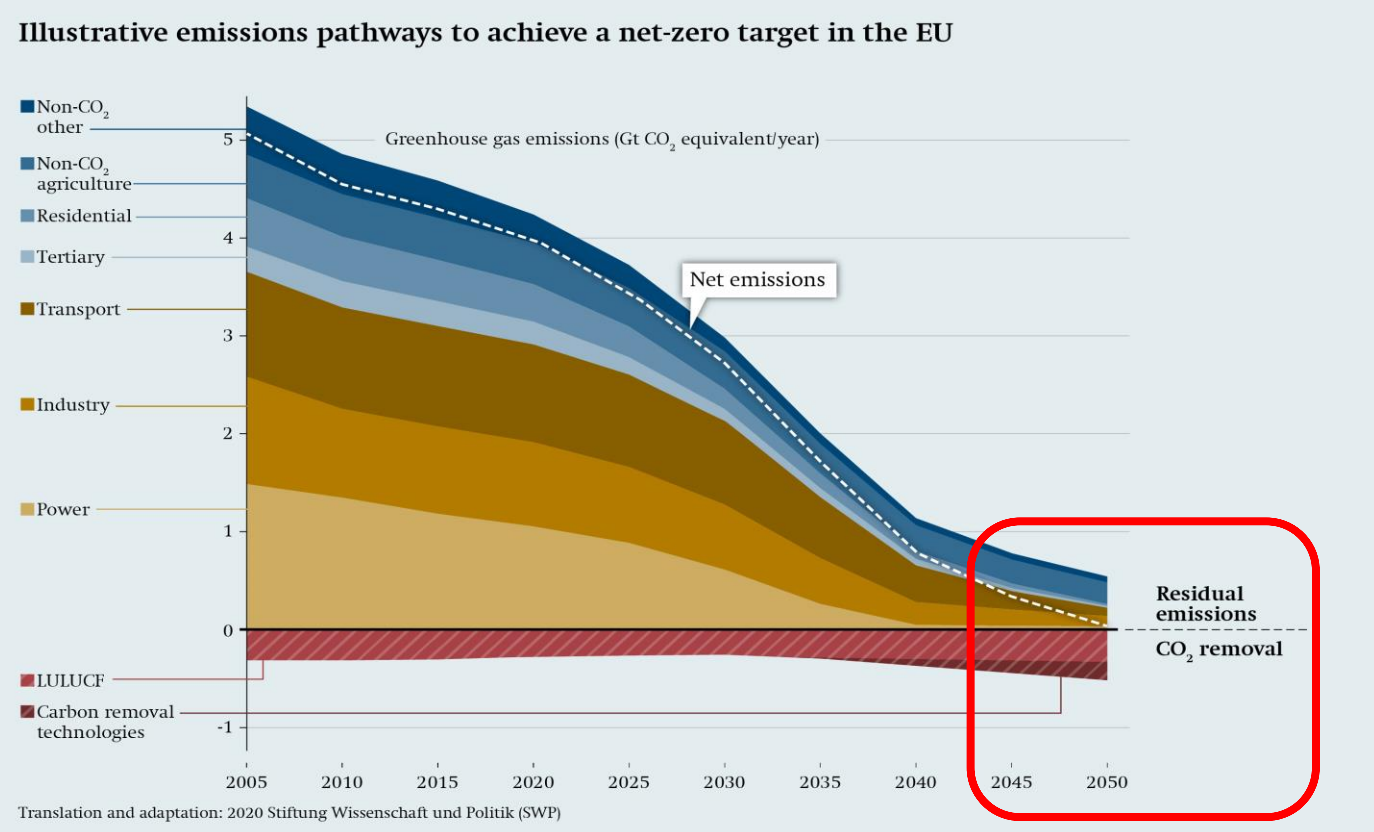
Table 12.6 | Summary of status, costs, potentials, risk and impacts, co-benefits, trade-offs and spillover effects and the role in mitigation pathways for CDR methods. Technology readiness level (TRL) is a measure of maturity of the CDR method. Scores range from 1 (basic principles defined) to 9 (proven in operational environment). Author judgement ranges (assessed by authors in the literature) are shown, with full literature ranges shown in brackets.

CDR method	Status (TRL)	Cost (USD tCO_2^{-1})	Mitigation Potential ($GtCO_2\ yr^{-1}$)	Risk and impacts	Co-benefits	Trade-offs and spillover effects	Role in modelled mitigation pathways	Section
DACCS	6	100–300 (84–386)	5–40	Increased energy and water use	Water produced (solid sorbent DAC designs only)	Potentially increased emissions from water supply and energy generation	In a few IAMs; DACCS complements other CDR methods	12.3.1.1
Enhanced weathering	3–4	50–200 (24–578)	2–4 (<1–95)	Mining impacts; air quality impacts of rock dust when spreading on soil	Enhanced plant growth, reduced erosion, enhanced soil carbon, reduced soil acidity, enhanced soil water retention	Potentially increased emissions from water supply and energy generation	In a few IAMs; EW complements other CDR methods	12.3.1.2
Ocean alkalinity enhancement	1–2	40–260	1–100	Increased seawater pH and saturation states may impact marine biota. Possible release of nutritive or toxic elements and compounds. Mining impacts	Limiting ocean acidification	Potentially increased emissions of CO_2 and dust from mining, transport and deployment operations	No data	12.3.1.3
Ocean fertilisation	1–2	50–500	1–3	Nutrient redistribution, restructuring of the ecosystem, enhanced oxygen consumption and acidification in deeper waters, potential for decadal-to-millennial-scale return to the atmosphere of nearly all the extra carbon removed, risks of unintended side effects	Increased productivity and fisheries, reduced upper ocean acidification	Subsurface ocean acidification, deoxygenation; altered meridional supply of macro-nutrients as they are utilised in the iron-fertilised region and become	No data	12.3.1.3
Blue carbon management in coastal ecosystems	2–3	Insufficient data, estimates range from ~100 to ~10,000	<1	If degraded or lost, coastal blue carbon ecosystems are likely to release most of their carbon back to the atmosphere; potential for sediment contaminants, toxicity, bioaccumulation and biomagnification in organisms; issues related to altering degradability of coastal plants; use of subtidal areas for tidal wetland carbon removal; effect of shoreline modifications on sediment redeposition and natural marsh accretion; abusive use of coastal blue carbon as means to reclaim land for purposes that degrade capacity for carbon removal	Potential and can adaptati biodivers acidificat human n terrestria feed add or materi			
BECCS	5–6	15–400	0.5–11	Competition for land and water resources, to grow biomass feedstock. Biodiversity and carbon stock loss if from unsustainable biomass harvest	Reductio optimal u health be can enha and land			

CDR method	Status (TRL)	Cost (USD tCO_2^{-1})	Mitigation Potential ($GtCO_2\ yr^{-1}$)	Risk and impacts	Co-benefits	Trade-offs and spillover effects	Role in modelled mitigation pathways	Section
Afforestation/ reforestation	8–9	0–240	0.5–10	Reversal of carbon removal through wildfire, disease, pests may occur. Reduced catchment water yield and lower groundwater level if species and biome are inappropriate	Enhanced employment and local livelihoods, improved biodiversity, improved renewable wood products provision, soil carbon and nutrient cycling. Possibly less pressure on primary forest	Inappropriate deployment at large scale can lead to competition for land with biodiversity conservation and food production	Substantial contribution in IAMs and also in bottom-up sectoral studies	7.4
Biochar	6–7	10–345	0.3–6.6	Particulate and GHG emissions from production; biodiversity and carbon stock loss from unsustainable biomass harvest	Increased crop yields and reduced non-CO_2 emissions from soil; resilience to drought	Environmental impacts associated with particulate matter; competition for biomass resource	In development – not yet in global mitigation pathways simulated by IAMs	7.4
Soil carbon sequestration in croplands and grasslands	8–9	-45–100	0.6–9.3	Risk of increased nitrous oxide emissions due to higher levels of organic nitrogen in the soil; risk of reversal of carbon sequestration	Improved soil quality, resilience and agricultural productivity	Attempts to increase carbon sequestration potential at the expense of production. Net addition per hectare is very small; hard to monitor	In development – not yet in global mitigation pathways simulated by IAMs; in bottom-up studies: with medium contribution	7.4
Peatland and coastal wetland restoration	8–9	Insufficient data	0.5–2.1	Reversal of carbon removal in drought or future disturbance. Risk of increased methane emissions	Enhanced employment and local livelihoods, increased productivity of fisheries, improved biodiversity, soil carbon and nutrient cycling	Competition for land for food production on some peatlands used for food production	Not in IAMs but some bottom-up studies with medium contribution	7.4
Agroforestry	8–9	Insufficient data	0.3–9.4	Risk that some land area lost from food production; requires high skills	Enhanced employment and local livelihoods, variety of products, improved soil quality, more resilient systems	Some trade-off with agricultural crop production, but enhanced biodiversity, and resilience of system	No data from IAMs, but in bottom-up sectoral studies. with medium contribution	7.4
Improved forest management	8–9	Insufficient data	0.1–2.1	If improved management is understood as merely intensification involving increased fertiliser use and introduced species, then it could reduce biodiversity and increase eutrophication	In case of sustainable forest management, it leads to enhanced employment and local livelihoods, enhanced biodiversity, improved productivity	If it involves increased fertiliser use and introduced species, it could reduce biodiversity and increase eutrophication and upstream GHG emissions	No data from IAMs, but in bottom-up sectoral studies with medium contribution	7.4

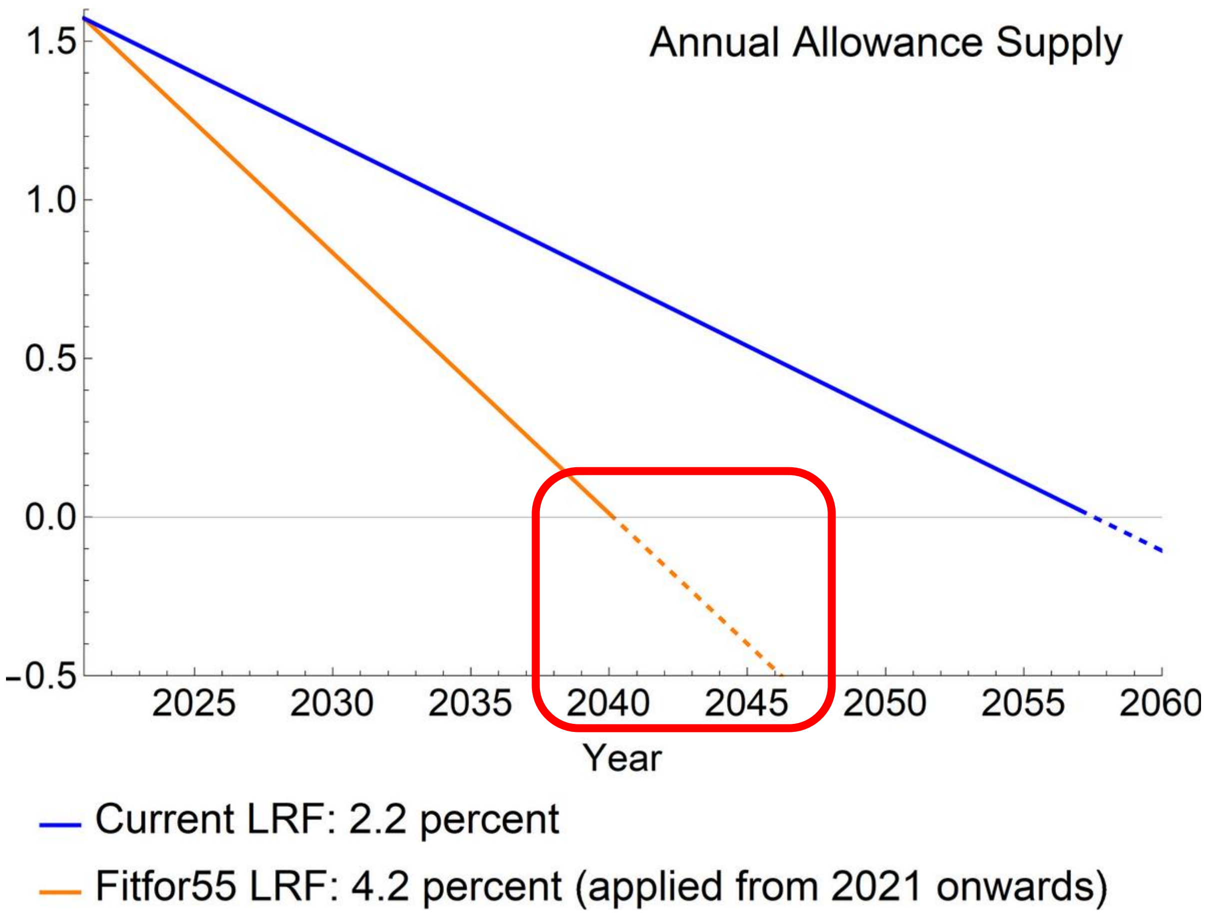
- *IPCC AR6 WG III, Chapter 12, Table 12.6*

EU Mitigation Trajectory until 2050

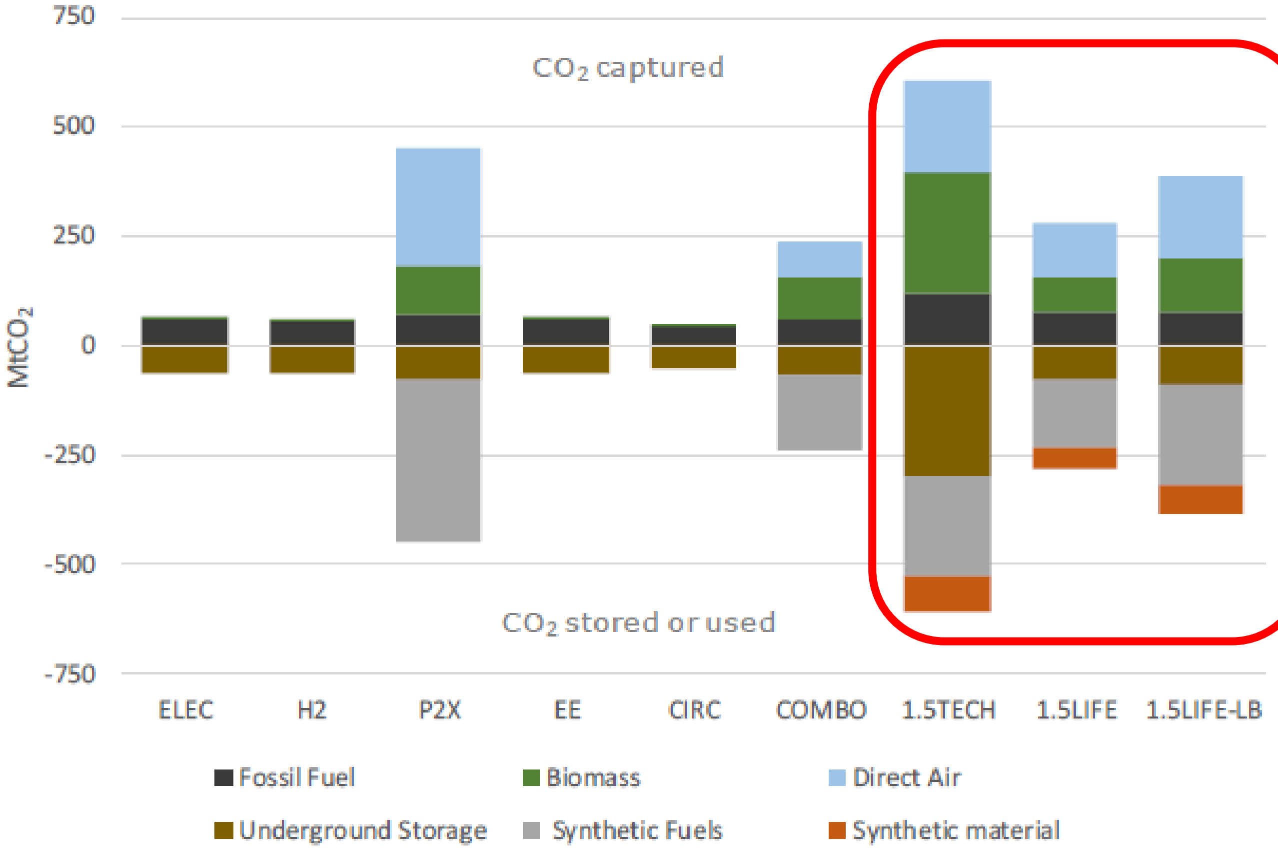


O. Geden/F. Schenuit 2020: Unconventional Mitigation (SWP Research Paper)

ETS-I trajectory creates need to integrate CDR



CO_2 Storage and Utilization in EU in 2050



In-Depth Analysis in support of COM(2018) 773 final

CDR Policy in Europe

What do we have already…

- LULUCF: Regulation (EU) 2023/839, amending Regulation (EU) 2018/841
- EU ETS Innovation Fund (e.g., *BECCS Stockholm*)
- CRCF proposal, currently under negotiation in EP & in Council, 2022/0394(COD)
- Expert group on carbon removal (methodologies)

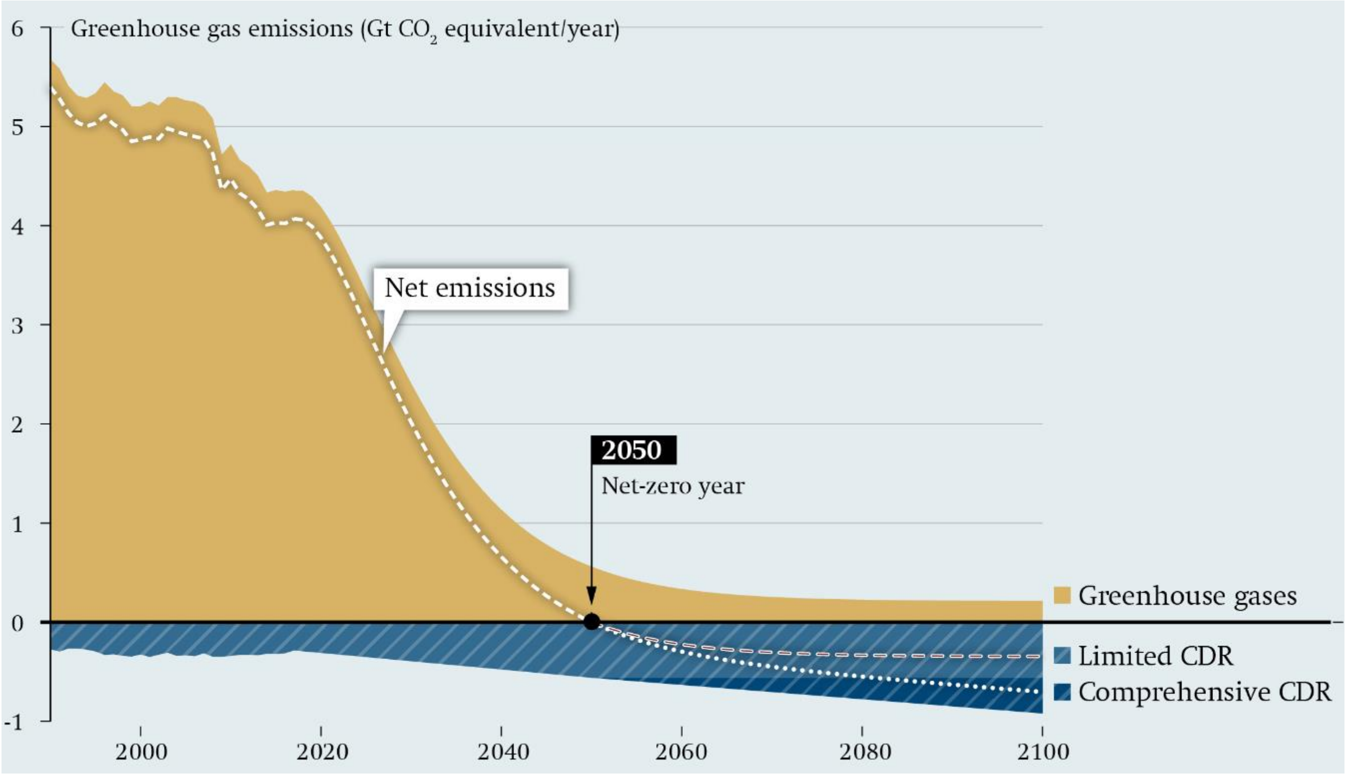
What we will see in the near future…

- Clarification role of CDR to achieve EU 2040 target (and maybe already in EU NDC for 2035), in view of the role of CDR to allow for differentiation among Member States towards 2050 (*Union-wide* net-zero GHG target)
- Clarification role of CDR in EU ETS (COM Report 2026, CDR in ETS Directive for 2031-2040]

Some developments in Member States

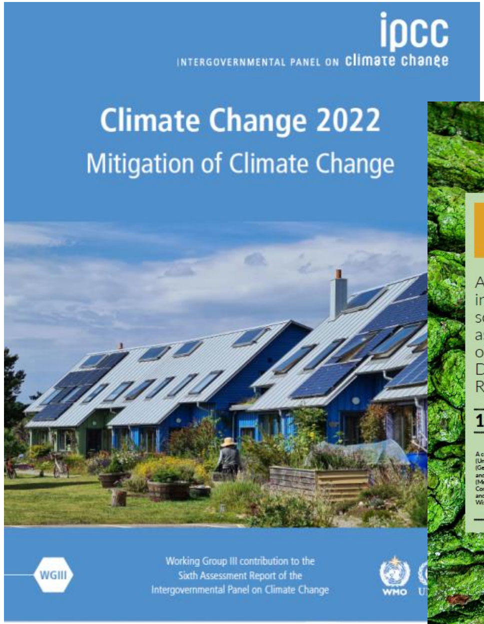
- LULUCF 2030 targets for all Member States (all net-negative, incl. NL, DEN and Ireland)
- Germany: strategy on residual emissions and CDR (incl. non-LULUCF CDR targets) in 2024
- Denmark: net-negative GHG emissions target 2050 (-110%)
- Sweden: reverse auctioning scheme for BECCS (?)

EU Post-2050: what comes after *Net Zero*?



O. Geden/F. Schenuit 2020: Unconventional Mitigation (SWP Research Paper)

Thank you!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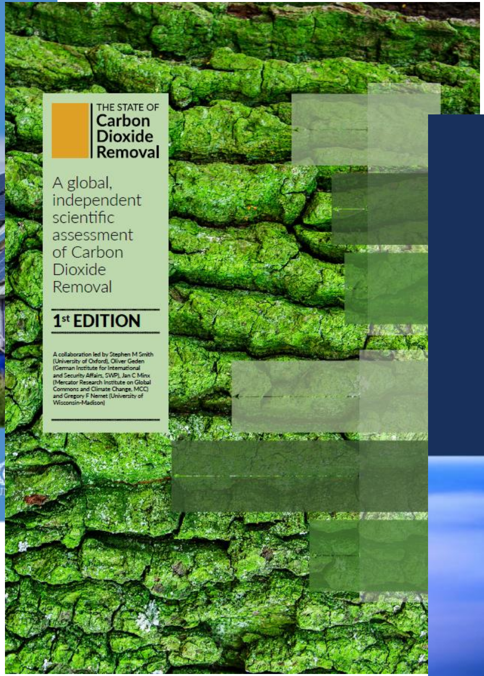
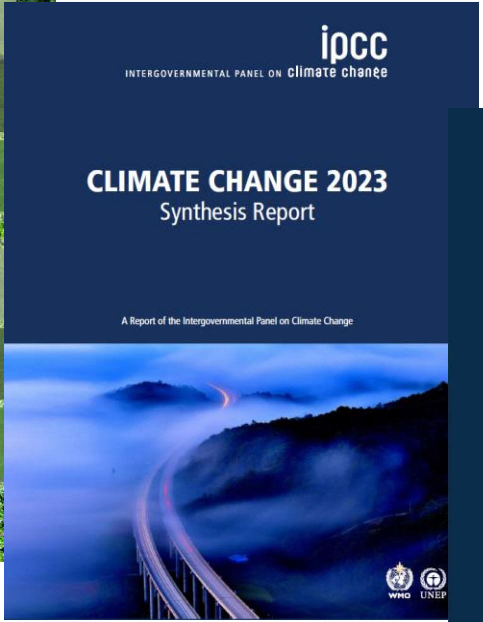
INTERGOVERNMENTAL PANEL ON climate change
Climate Change 2022
Mitigation of Climate Change
WGIII
Working Group III contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change


THE STATE OF
Carbon
Dioxide
Removal
A global, independent scientific assessment of Carbon Dioxide Removal
1st EDITION
A collaboration led by Stephen M Smith (University of Oxford), Oliver Geden (German Institute for International and Security Affairs, SWP), Jan C Minx (Mercator Research Institute on Global Commons and Climate Change, MCC) and Gregory F Nemet (University of Wisconsin-Madison)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INTERGOVERNMENTAL PANEL ON climate change
CLIMATE CHANGE 2023
Synthesis Report
A Report of the Intergovernmental Panel on Climate Change


UN environment programme
Broken Record
Temperatures hit new highs, yet world fails to cut emissions (again)
Emissions Gap Report 2023

Biodiversity considerations of carbon budgets - developments

Yvonne Buckley, Carbon Budgets Working Group

- Talk given to All Island Biodiversity & Climate Research Network (AICBRN) members meeting on biodiversity assessment of carbon budgets
- Workshop arising from AICBRN talk - AICBRN Biodiversity assessment of carbon budgets working group (ABC) met
- Updating Gorman et al. (2023) recommendations (*post hoc* assessment)
- Updating modelling briefs to incorporate biodiversity considerations (*a priori* assessment)
- Held workshop & completed report on Nature-based Solutions in Ireland
- Draft letter to CCAC

Carbon budgets to 2050

- CB1: 2021-2025 – behind targets
- CB2: 2026-2030 (51% reduction target)
- CB3: 2031-2035 – finalization
- CB4: 2036-2040 – proposal
- 2050 – climate neutral (Net Zero) target

- Electricity
- Transport
- built environment (residential, commercial, public sector)
- industry and other
- Agriculture
- land use, land use change and forestry – no sectoral emissions ceiling yet

“it is possible to implement carbon budgets while protecting and enhancing biodiversity. However, it is critical that further pressure on biodiversity from all aspects of climate mitigation measures is avoided, in particular from poor siting of renewable energy infrastructure and inappropriate land-use change such as over reliance on, or poor siting of, mono-species afforestation. Care must be taken to identify and implement measures which deliver ‘synergistic gains’ for climate mitigation, biodiversity protection and restoration and catchment resilience”

CCAC Carbon Budgets Technical Report 2021

“Potential synergies and conflicts between biodiversity and the other elements of the National Climate Objective have received limited attention and need to be further explored.”

Key indicators for Land Use Land Use Change & Forestry Sector

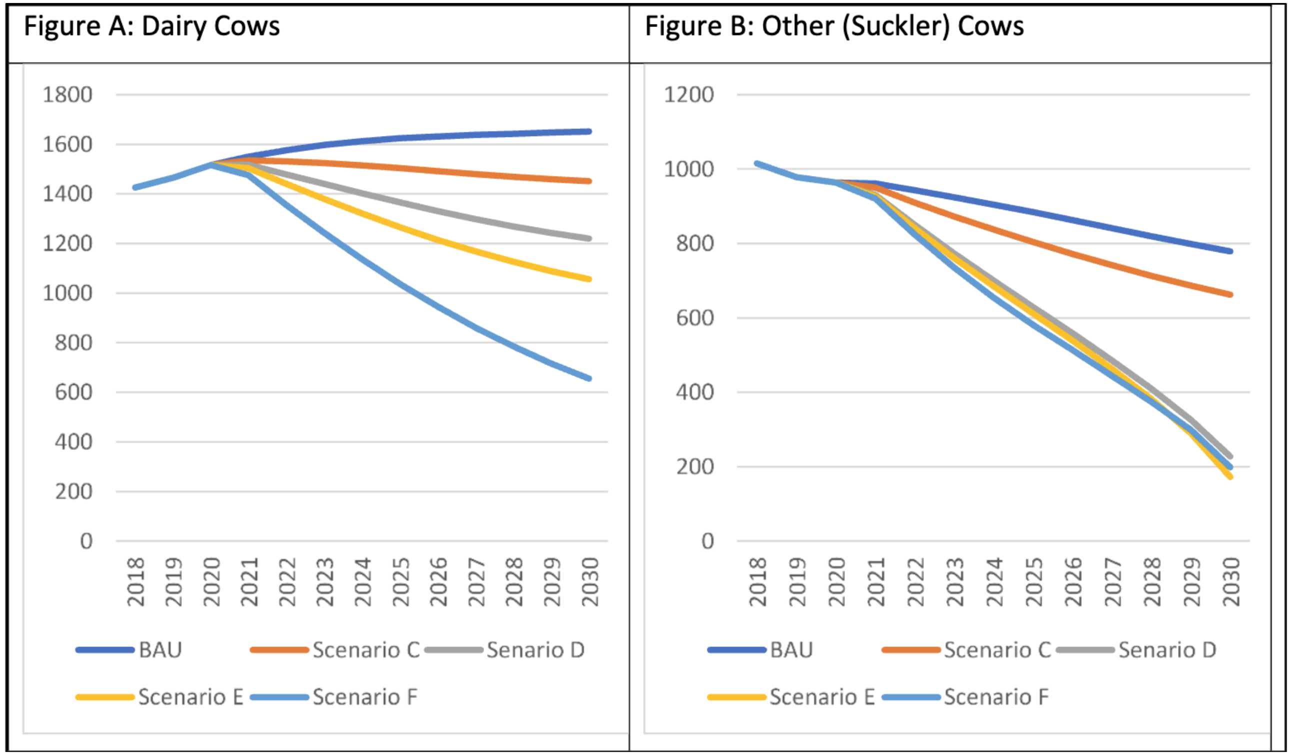
Potential additional indicators required to monitor implementation of measures		NCAP 2021 2030 target	NCAP 2023 2030 target
Management of organic soils and peatlands	Rehabilitation of degraded peatland	65,000 ha	78,000 ha
	Improved management of forest on organic soils	No target specified	No target specified
Grasslands management	Rewetting, water table management of grassland	80,000 ha	80,000 ha
	Agroforestry	No target specified	No target specified
	Hedgerows (establishment and removal)	No target specified	No target specified
	Multi-species sward	No target specified	No target specified
Tillage	Cover crop	50,000 ha	50,000 ha
	Straw incorporation	10%	55,000 ha

- How do we factor biodiversity into recommendations for carbon budgets (up to 2040)?
- What does biodiversity look like in a Net Zero world? (2050) (<1 rotation of Sitka Spruce!)
- What are the potential risks for biodiversity from the actions needed to achieve future carbon budgets?
- Can we manage those risks with further actions?
- Direct win-wins for climate & biodiversity action?
- Trade-offs?
- How do we factor in potential benefits of reduced climate change due to effective climate action?
- Land use will be critical and there will be conflict between proposed uses

Working group on effects of climate action on biodiversity?

Illustrative Scenario Area of land use change or Change in land management			
51% Goblin	2021-2025	2026-2030	Cumulative 2021-2030
Afforestation (ha)	46,500	92,500	139,000
Grassland re-wetting (ha)	43,601	69,000	112,601
Peatland rewetting (ha)	27,839	34,798	62,637

* Other options (such as improved management of mineral and organic soils under grasslands, and cropland management) which were not included in this modelling would reduce the amount of afforestation and rewetting required to achieve the assumed 51% reduction target.



Workshop arising from AICBRN talk
AICBRN Biodiversity assessment of carbon budgets working group (ABC)

Attendees: Hannah Daly, David Styles, John Finn, Amy Taggart, James Moran, Ken Byrne, Caren Jarmain, Aoife Molloy, Roisin Moriarty

1. Updating sectoral recommendations in Gorman et al (2023)
2. Letter to CCAC on what is needed for assessment of biodiversity for carbon budgets
3. Incorporation of biodiversity considerations into existing modelling approaches

ACTIONS	
Action	When
Recommendations on renewable energy developments	End of November 2023
Recommendations on afforestation	End of November 2023
Recommendations on peatland	End of November 2023
Recommendations on rewetting drained soil	End of November 2023
Recommendations on heavy soil	End of November 2023
Recommendations on livestock	End of November 2023
Letter to CCAC of recommendations for assessment of biodiversity for carbon budgets	End of November 2023

What do we need for assessing biodiversity impact of carbon budgets?

- Biodiversity/ecology expertise on CCAC
- Appropriate resourcing of biodiversity at CBWG
- Literature review of approaches taken by other jurisdictions to biodiversity assessment of carbon budgets
- Context and scale dependence of biodiversity impacts need to be considered (spatially explicit), not just general statements
- Land use change is a leading driver of biodiversity change & loss – climate action will entail major changes in land use
- Conflict over land use, ability to layer different land uses, total land area required for different actions, efficiency of land use
- Long term view important (post 2050)
- More detail in land balance models needed to account for heterogeneity and context dependence
- Coordination with land use review (phase 2), other landscape mapping projects (e.g. TerrainAI) important
- All-island basis for assessment of biodiversity impacts

Additional slides follow (not presented)

Where & what type of onshore wind?
Efficient delivery of renewable energy projects

Locating homes closer to businesses to reduce dependency on cars

Use timber in construction
Reduce food waste

District heating
Retrofit homes that use peat

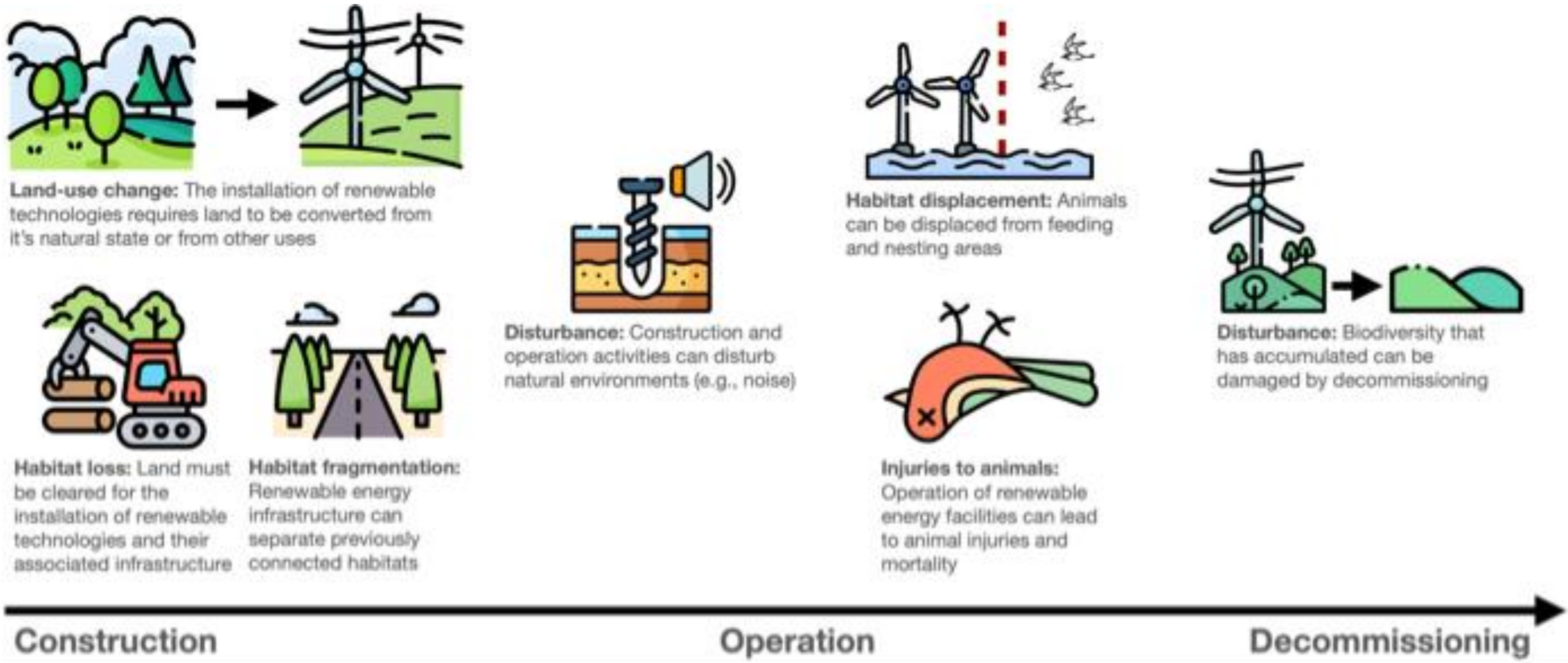
Ag & LULUCF
Income diversification
Greener forms of fertilizer (protected urea)
Feed additives to reduce methane
New forestry strategy implementation
Agroforestry

ADAPTATION
Coastal management strategy

50% of forestry products go into wood pulp, pallets etc.
Forests on poor land
Mark, Ken, James
Sensitivity mapping – policy makers reluctant to make maps
Forest maps (2010-12) coincide with HNV & nature restoration sites
HNV already has a high proportion of trees
No one wants to highlight the conflicts…
Land use dominated by different interest groups & separate gov depts, no integration of targets.
30 by 30 targets
Can broadleaf forests provide timber of good quality?

What would a biodiversity model look like?
TERRAIN-AI
Win-wins
Tabular modelling for forestry – CBM model GCBM (current spatial model).
Impact of albedo as consequence of LUC on radiative forcing
LIDAR – surrogate of land mapping – add to land cover maps
Workshop with Land Cover Map – expert judgement on land use potential capacity – where should forestry, renewable energy go in this landscape? Participatory mapping exercise? Biophysical & social components. Storylines approach?
Nitrates derogation – "tidying up places that have been newly rented"
Sensitivity analysis – nature benefits, costs, trade-offs. Constrain to marginal areas? Constrain to low nature value areas. Random?
Multifunctional agricultural activities in the past – making ppl aware of past systems

Key recommendations for Energy sector



Key recommendations for Forestry

1. Avoid afforestation of naturally open habitats (e.g. grasslands) and deep peat soils
2. Restoration of degraded natural and semi-natural woodlands to improve carbon and biodiversity states
3. Set targets for native mixtures in plantation forests
4. Avoid using planted trees as bioenergy crops
5. Avoid displacing land-use (e.g., intensifying land-use on natural and semi-natural habitats)
6. Disincentivise the use of fire to clear land
7. Promote agroforestry initiatives
8. Rehabilitate peatlands on failed plantation sites
9. Prioritise and extend LiDAR surveys of Teagasc Signpost farms to estimate carbon sequestration of hedgerows and woody habitats on farmland

Key recommendations for Peatland

1. Promote and fund the rehabilitation of decommissioned industrial peatlands
2. Further regulate all peat extraction, including turf and horticultural peat production
3. Consider how turbary rights can be altered (to carbon & biodiversity sequestration rights) or purchased to reduce small scale peat extraction.
4. Identify and map peatland areas related to turf and horticultural peat extraction (non BNM areas)

Key Livestock recommendations

1. Prevent dairy expansion
2. Use new CAP to incentivise extensification of livestock farming and provision of alternative ecosystem services
3. Reduce the amount of N applied to pastures
4. Use clover and multi-species swards to reduce need for nitrogen application

Key recommendations for heavy soils

1. Multi-species swards should not be considered as a replacement for high nature value/semi natural grasslands but can be effective in reducing fertiliser needs.
2. Assess whole of life-cycle impact on GHG due to drainage of heavy soils and subsequent intensification for livestock farming.

Carbon budgets working group

Biodiversity assessment of carbon budgets 2031-35 and 2036-2040

CLIMATE CHANGE ADVISORY COUNCIL

Key questions:

- What additional sectors should we consider for biodiversity impacts?
- Can we refine our previous recommendations?
- The devil is in the detail – biodiversity impact will depend on where and at what scale changes are implemented
- How do we assess the land and sea capacity for different proposed budgets? Will there still be room for biodiversity?
- Land/sea sparing vs. land/sea sharing for climate action?

Carbon Budgets Working Group

Agriculture and Land Use

23rd November 2023

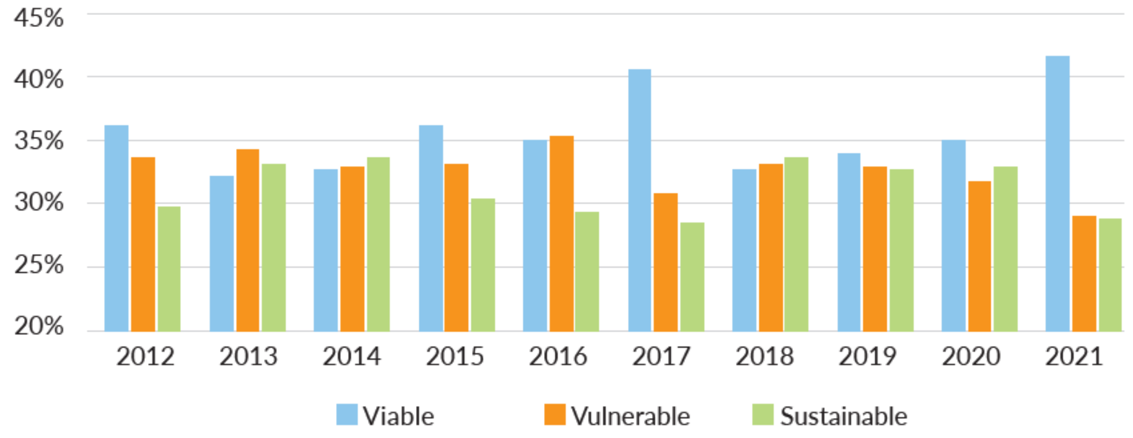
Basic Facts and Figures

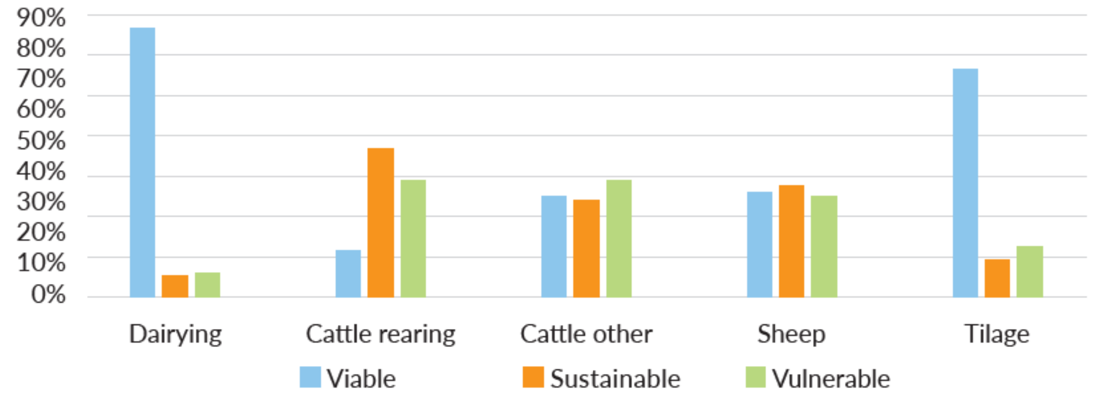
- DAFM paints a dynamic picture of the Agriculture and Land Use Sectors
- In 2021, Ireland had 135,037 farms, 808,848 hectares of forestry and nearly 1,900 fishing vessels.
- The sector employed 170,400 people, or 7.1%, of the total workforce on the island.
- Average Family Farm Income increased for the third successive year, by 26% during 2021.
- Irish farmers received close to €1.9 billion in direct and capital payments under EU and nationally funded schemes.
- The value of agri-food exports for 2021 is a record €15.4 billion, which is up 51% on 2012.
- We exported our in-demand produce to over 180 countries, with our largest export being dairy, which exceeded €5 billion for the third year in a row. Agri-food exports accounted for 9.5% of total merchandising exports from Ireland.
- Output multipliers ranging from around 2.5 for beef, 2.0 for dairy and food processing and 1.75 for seafood. This compares with an average output multiplier of 1.4 for the rest of the economy and 1.2 for foreign owned firms.
- The Food & Drink sector accounted for 38% of all exports of Irish-owned firms in 2020.

Sustainability at Farm Scale

- Farms earning less the €4k ~ 22% of all farm holders (Ag census data)
- Are ubiquitous across the country
- Not captured in the National Farm Survey analysis
- Specialist Dairy are most economically robust
- Specialist Tillage and Mixed Grazing reasonably robust
- Large majority of Specialist Beef and Sheep are not robust

Farm Type	Less than €4k	€4k - €8k	€8k - €15k	€15k-€25k	€25k-€50k	€50k-€100k	Over €100k		All economic sizes
Specialist beef production	16%	19%	23%	19%	16%	6%	1%		55%
Specialist sheep	27%	24%	22%	13%	10%	3%	0%		13%
Specialist dairying	0%	0%	0%	0%	4%	16%	80%		11%
Mixed field crops	97%	1%	0%	0%	0%	0%	1%		9%
Mixed grazing livestock	4%	8%	16%	18%	25%	18%	12%		6%
Specialist tillage	3%	5%	11%	13%	22%	22%	25%		3%
Other	40%	3%	3%	2%	3%	5%	44%		1%
Mixed crops and livestock	1%	2%	6%	13%	28%	27%	23%		1%
All farms	22%	14%	17%	14%	13%	8%	12%		

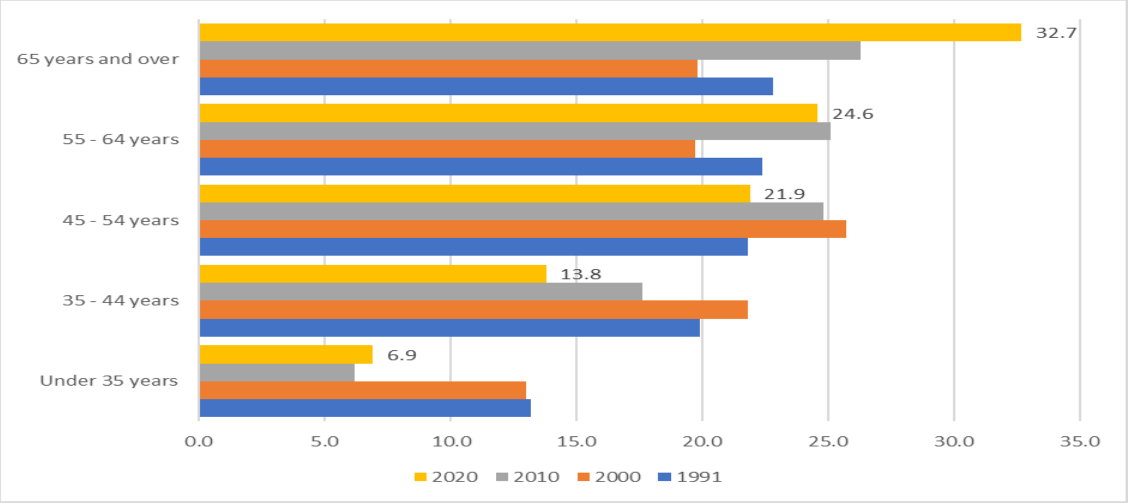


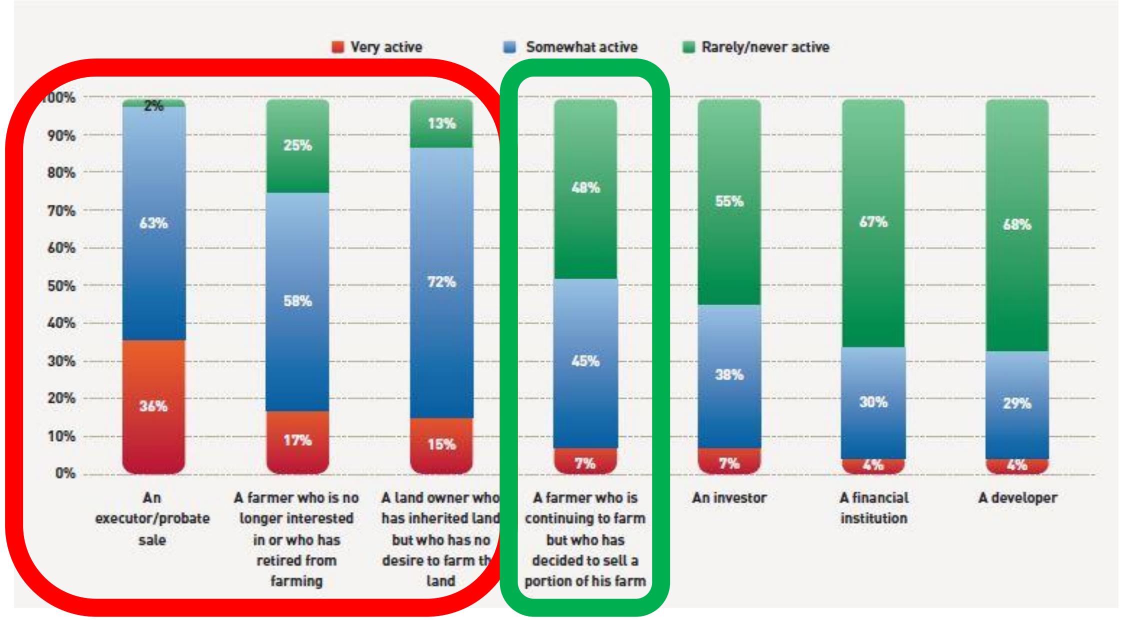


Demographics and the Family Farm

- Farm holders are getting older
- Dairy farmers are the youngest cohort
- More analysis required on family labour on farm and succession
- New Entrants required?

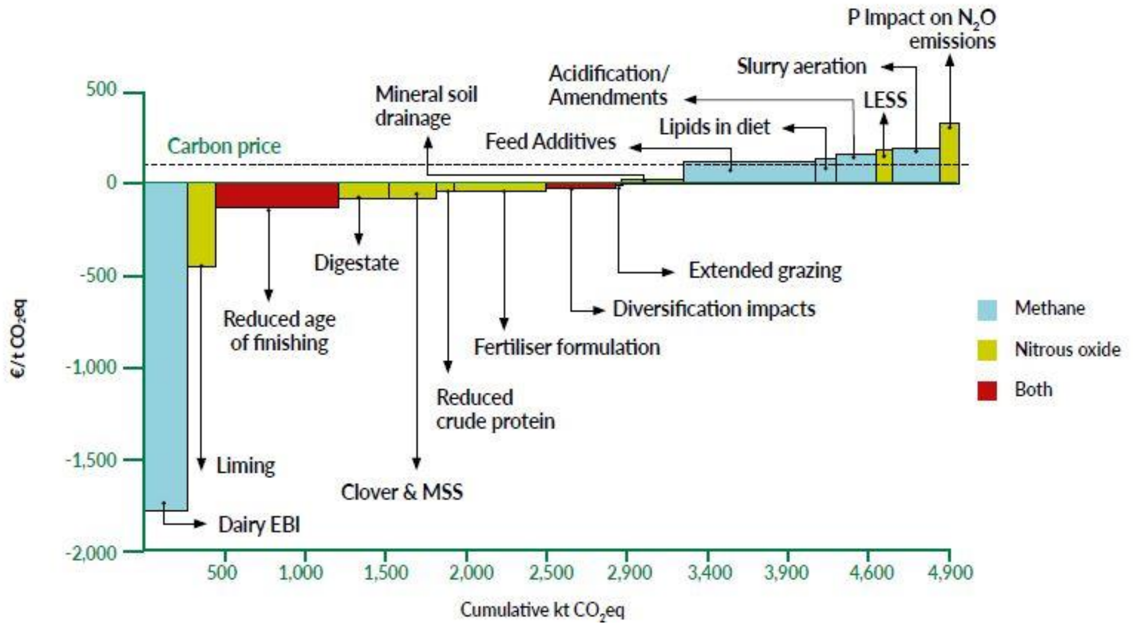
- The most active cohorts putting land put up for sale are individuals leaving agriculture
- More analysis required on who is buying the land (and for what purpose)





Marginal Abatement Cost Curve 2023

- Very ambitious adoption of measures required to achieve targets based on Scenarios in the analysis



Scenario/Pathway	2021-2030 Projected Emissions	% relative to 2018 Emissions Reduction Target
SEC	202	25%
S1P1	206.8	13.1%
S2P1	203.6	12.7%
S3P1	210.2	13.5%
S1P2	198.9	21.1%
S2P2	196.1	20.3%
S3P2	202.2	21.7%

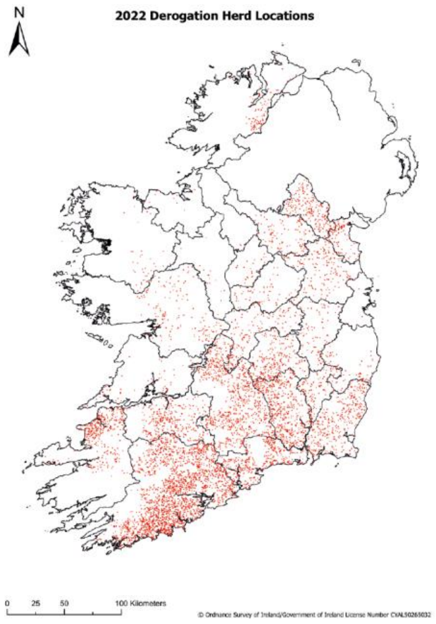
Negative price scenario should be also considered

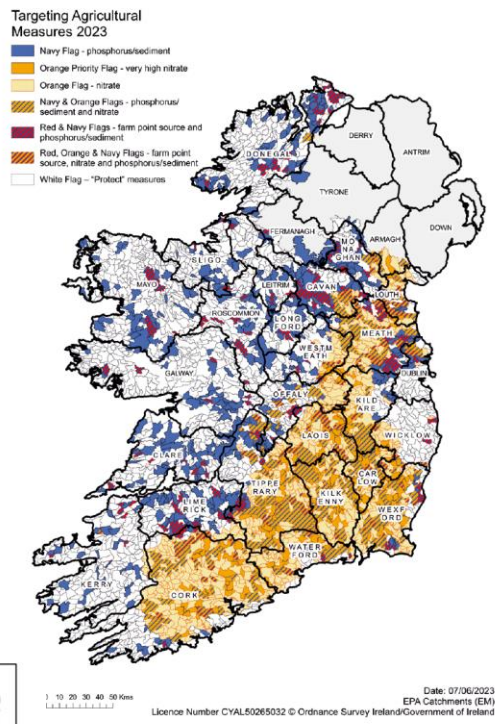
Nitrates Action Programme

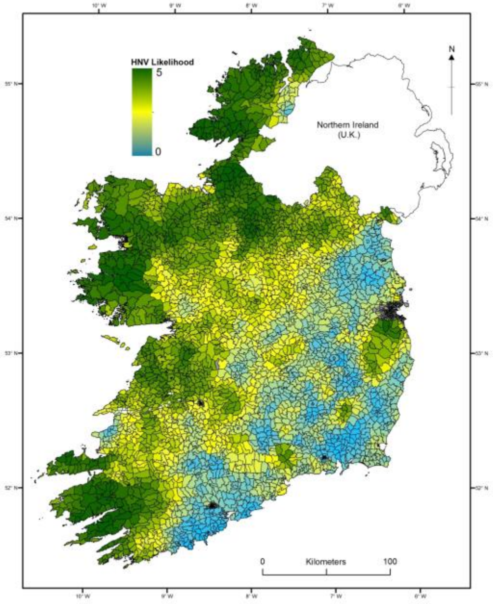
- ~5% of farms
- ~11% of agricultural land
- Likely to increase land pieces and rent
- Potential adverse impact on Tillage and up take of Organic Farming

- Derogation under continual review. Crucial decisions due in 2026.
- Impact on emission uncertain, but likely to reduce overall emissions

Year	2019	2020	2021	2022*
Number of derogation applicants	6,684	6,505	6,814	6,812
Total land area under derogation (ha)	448,900	449,435	479,196	500,913
Average farm size (ha) for derogation farms	67	69	71	73
Average Number of LU's[2] per derogation farm	156	134	163	Not yet available

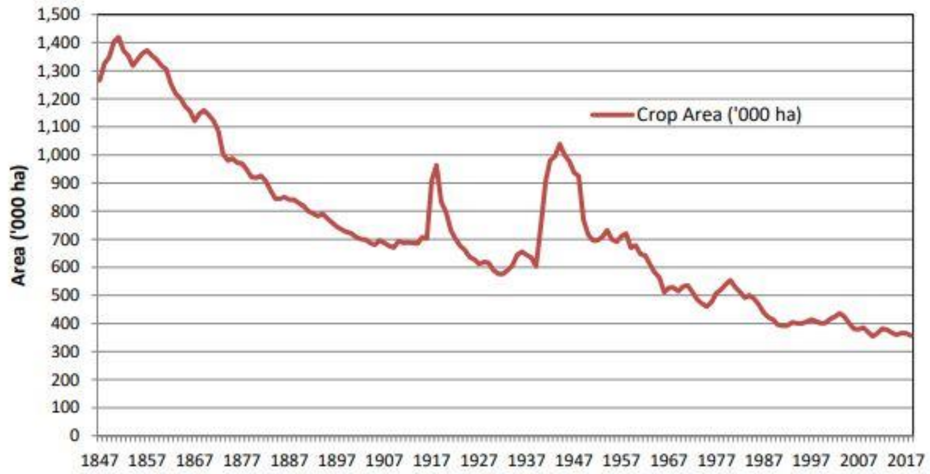






Land Use perspectives

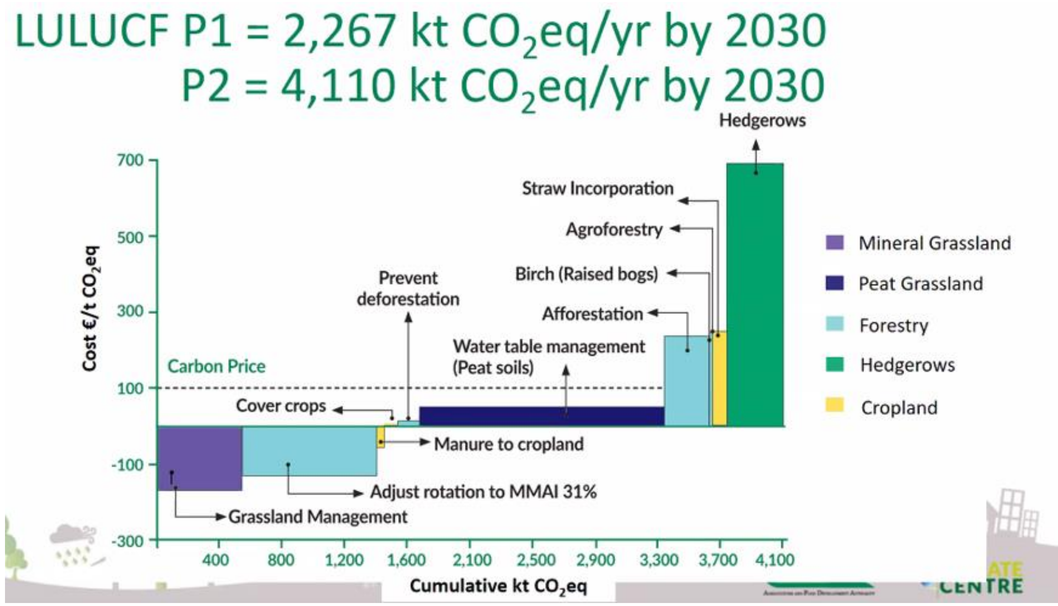
- Forest cover at levels not seen since before 1600s
- Cropland area at lowest levels since 1850s
- ~1million hectares croplands converted to grassland
- Extent and condition of drained peatlands very uncertain
- Ireland lacks a coherent land use strategy.
- High risk of policy incoherence and market rather than policy driven impacts

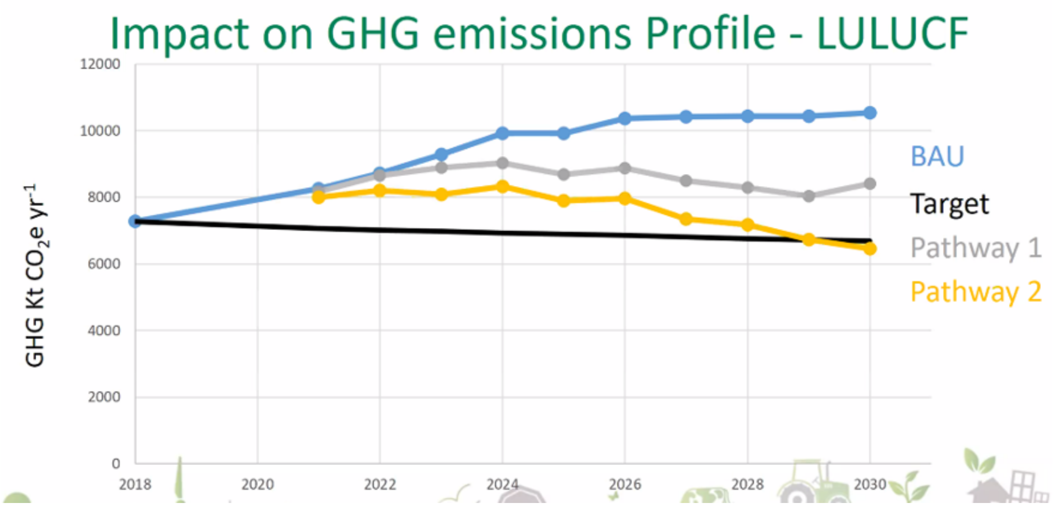


Year	1000 BCE	500 BCE	1	500	1000	1350	1400	1656	1850	1910	1985	2022	2050
Forest cover	64.5%	68.4%	69.7%	50.6%	38.0%	13.0%	19.0%	2.5	0.9%	1.8%	5.9%	11.6%	18%

Land Use perspectives

- MACC analysis identifies a pathway to EU target
- Cost negative measures include grassland management and forest management
- Water table management is a low cost measure, delivering the largest emissions reduction.





EU LULUCF rules

- Ireland has an agreed target from LULUCF to reduced emissions by 0.626MtCO_2 by 2030
- The EU framework assumes a linear pathway to achieving this target, from a 2018 start point
- An implicit LULUCF sectoral budget is evaluated for the period 2026-2030
- This will be formalised on the basis of the 2025 Inventory submission (due in April 2027)
- The accounting rules for the period 2021-2025 are on the basis of the "old" Kyoto Protocol procedures. These are complex.
- Current projected emissions/removals from LUULCF sector pose a risk to compliance in the period to 2025, but this will be assessed on the basis of the 2027 submission.