



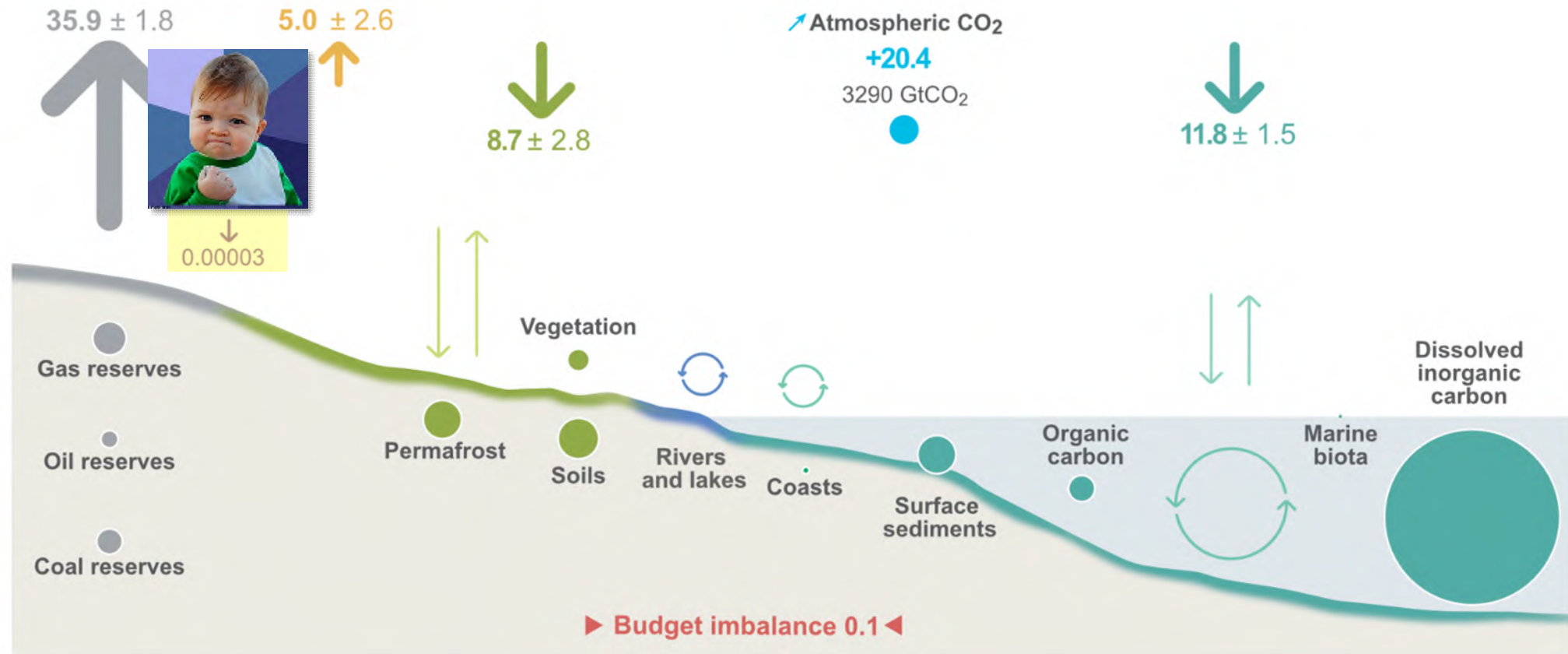
Carbon Dioxide Removal: current reality and future prospects

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with thanks to the 75 authors of the State of CDR 3rd Edition

The global carbon cycle



Anthropogenic fluxes
2015-2024 average
GtCO₂ per year

↑ Fossil CO₂ E_{FOS}

↑ Land-use change E_{LUC}

↓ CDR not included in E_{LUC}

↓ Land uptake S_{LAND}

↓ Ocean uptake S_{OCEAN}

+ Atmospheric increase G_{ATM}

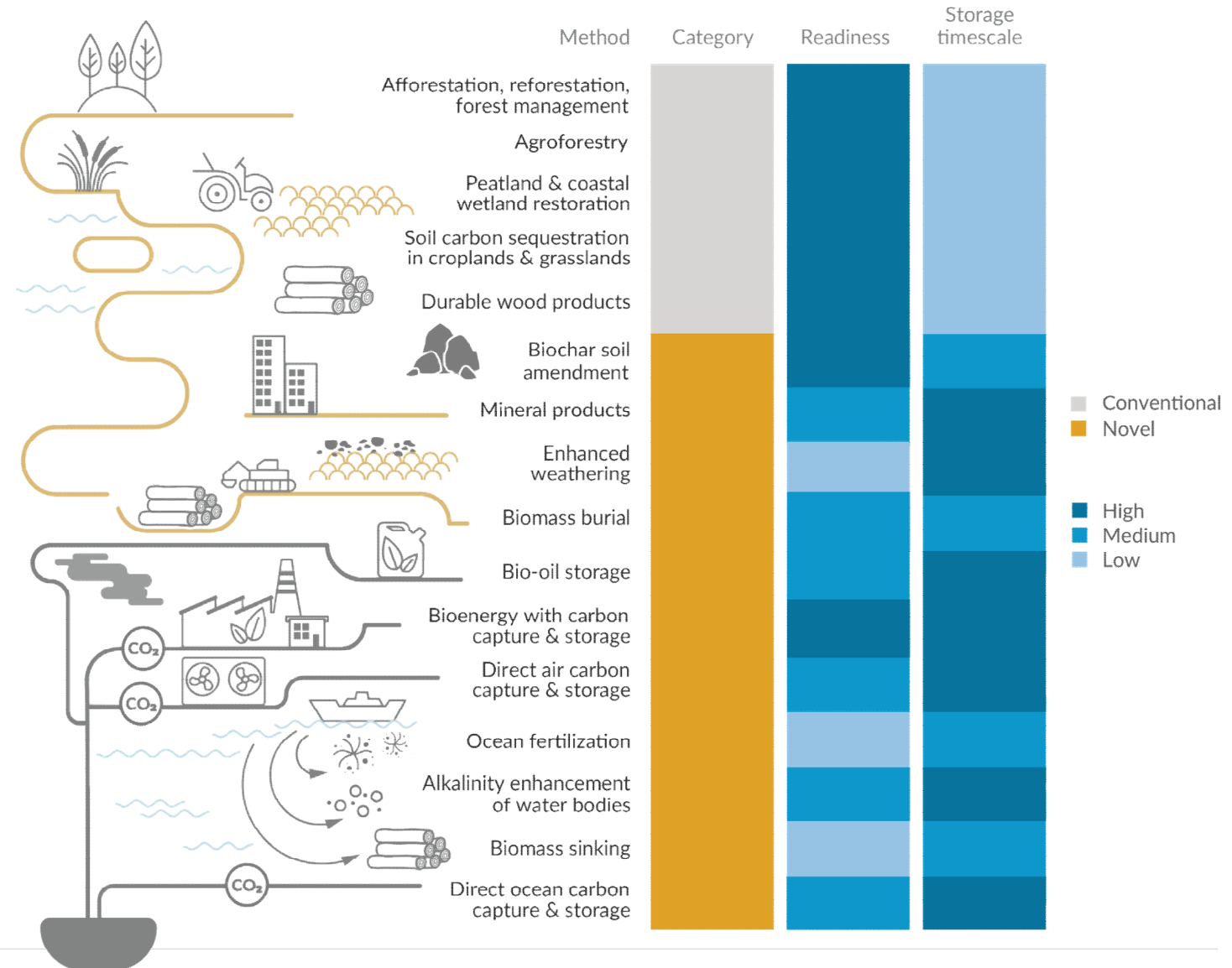
▶ Budget Imbalance B_{IM}

● Stocks

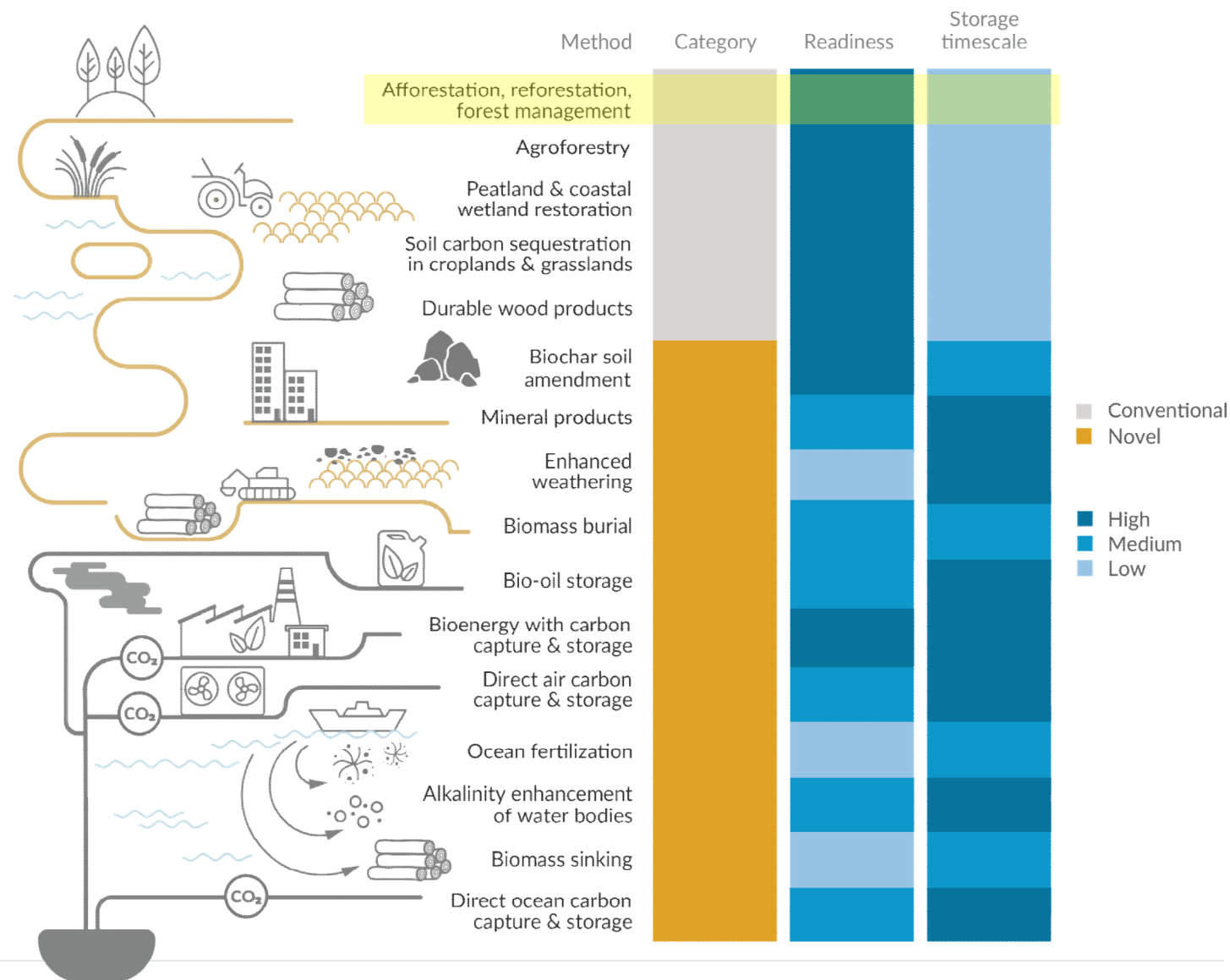
↕ Natural carbon fluxes

CC Global Carbon Project

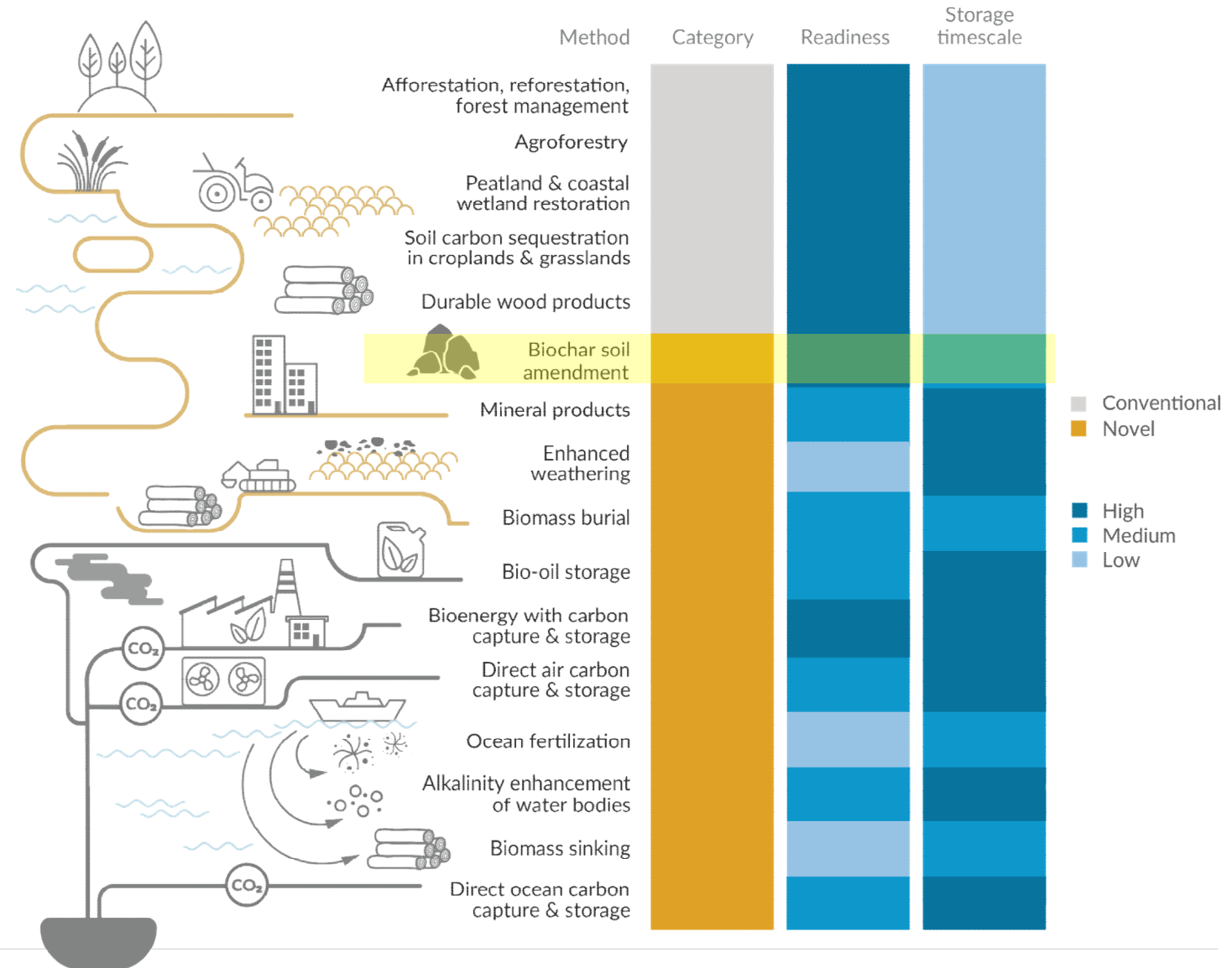
CDR is diverse



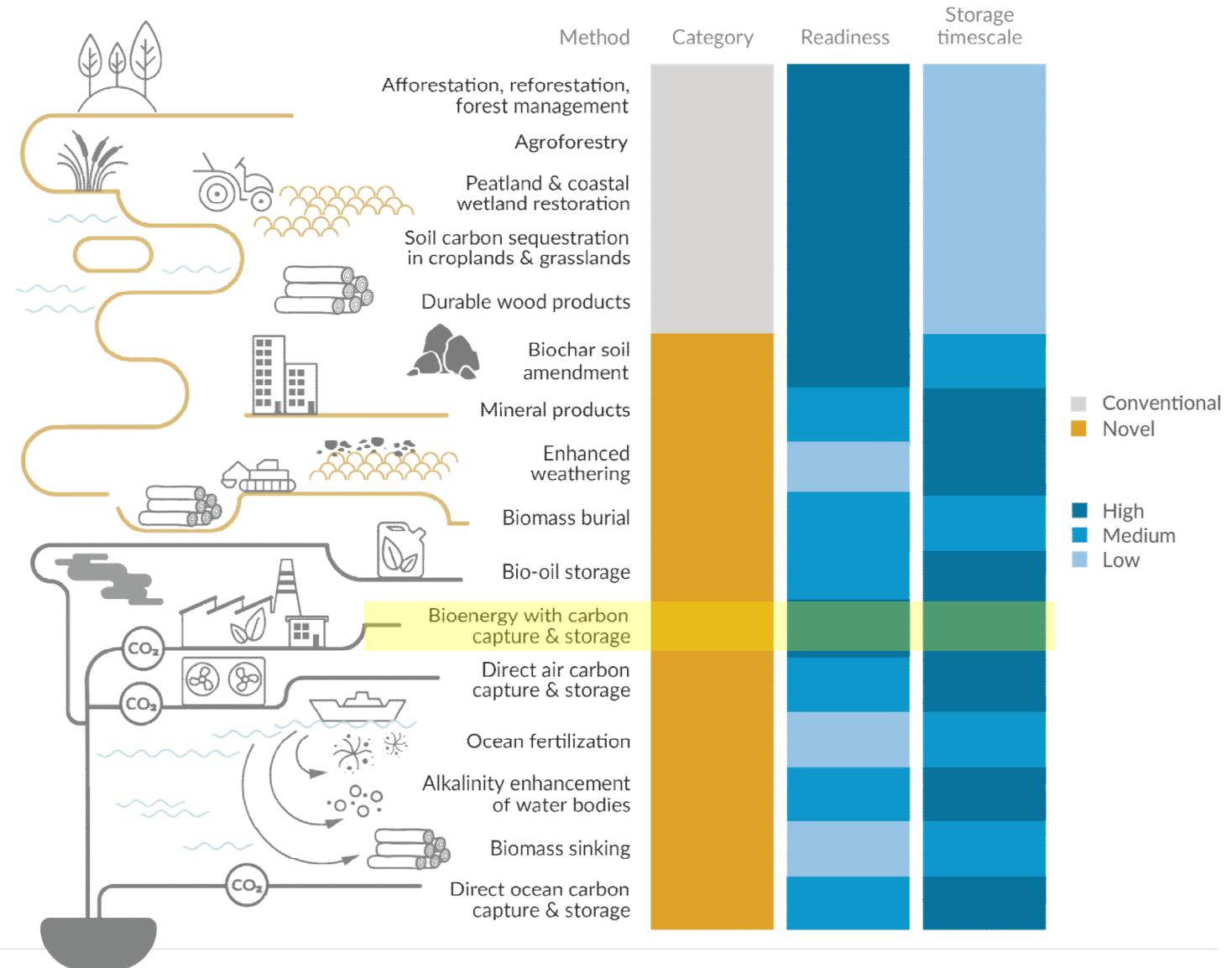
CDR is diverse



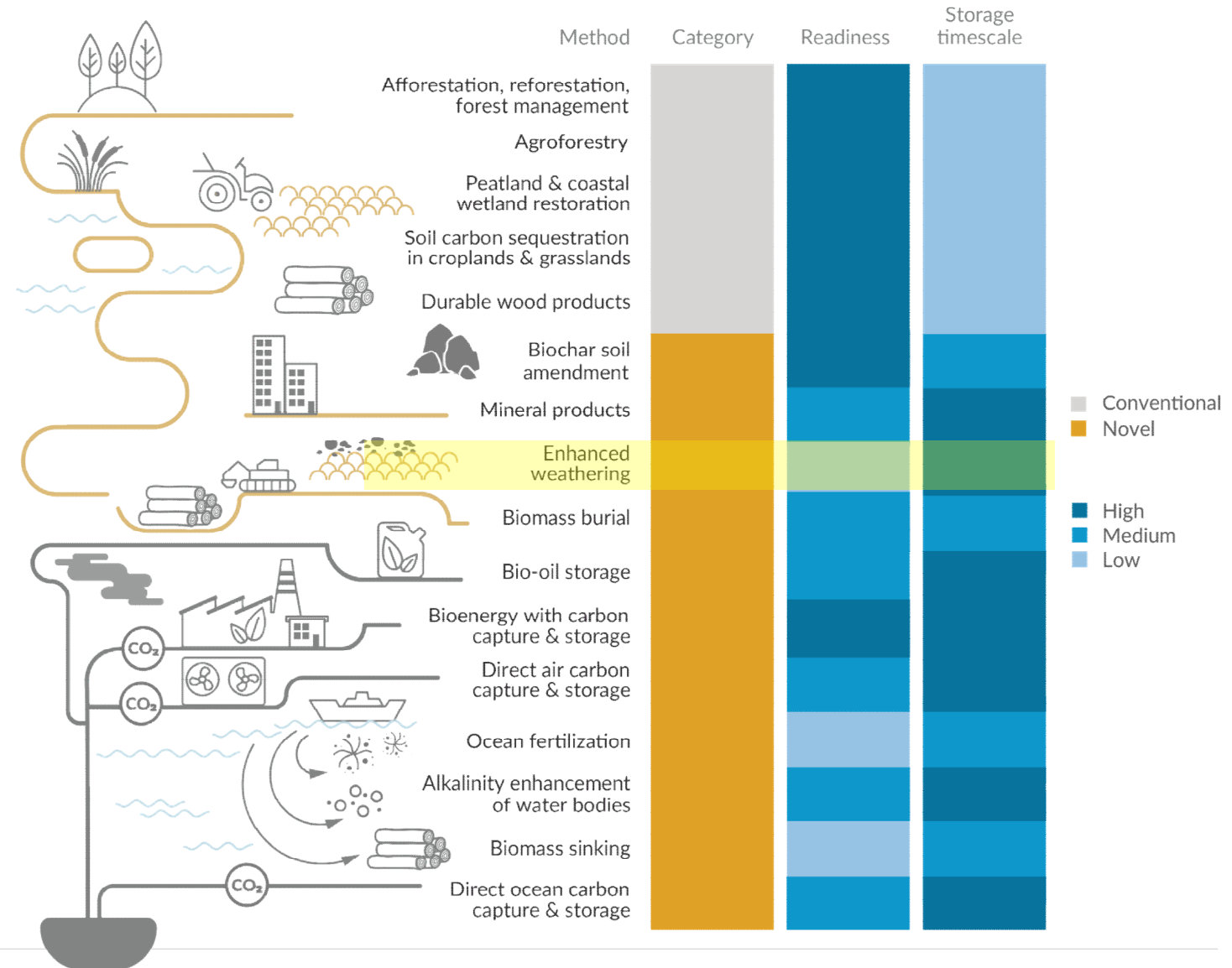
CDR is diverse



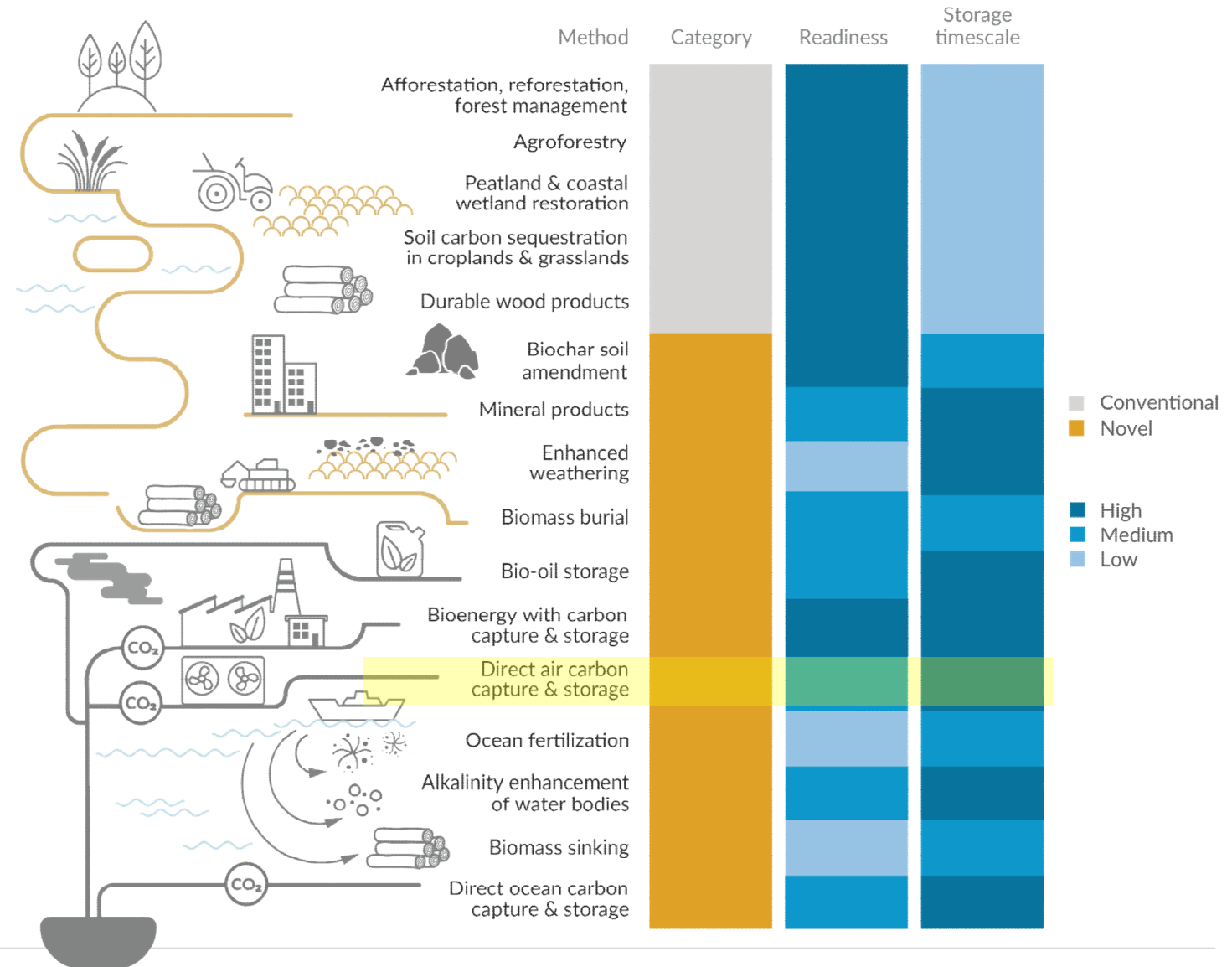
CDR is diverse



CDR is diverse



CDR is diverse





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Carbon Dioxide Removal

Current CDR

Essentially all conventional, but novel CDR is growing

Conventional CDR

Afforestation and reforestation



Durable wood products



Current growth trends of total CDR activity MtCO₂/year

10 year average: 2200

2015 2023

10 year average: 330

2015 2023

Novel CDR

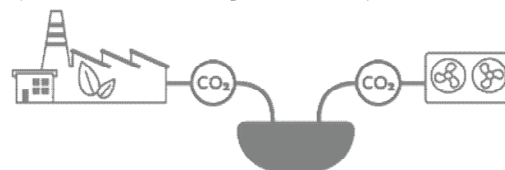
Biochar

Woody and annual biomass



BECCS

Bioenergy with carbon capture and storage



DACCS

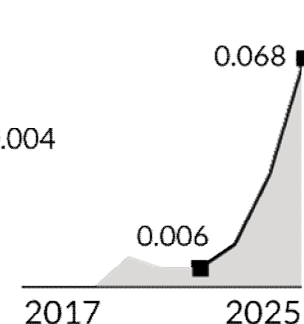
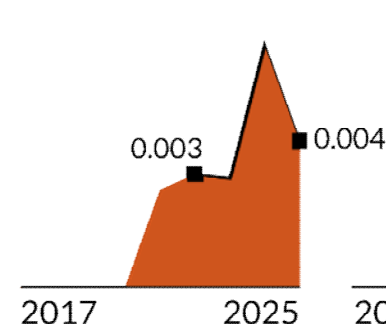
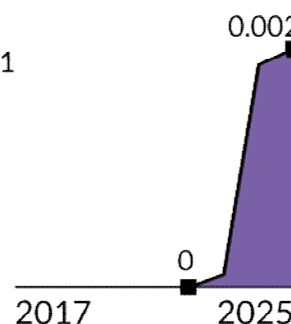
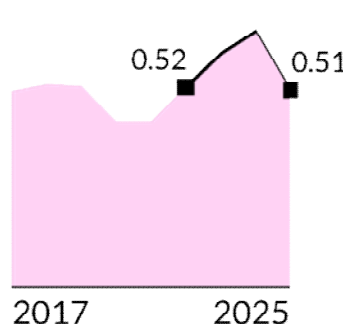
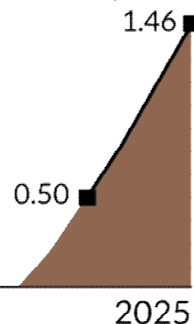
Direct air carbon capture and storage



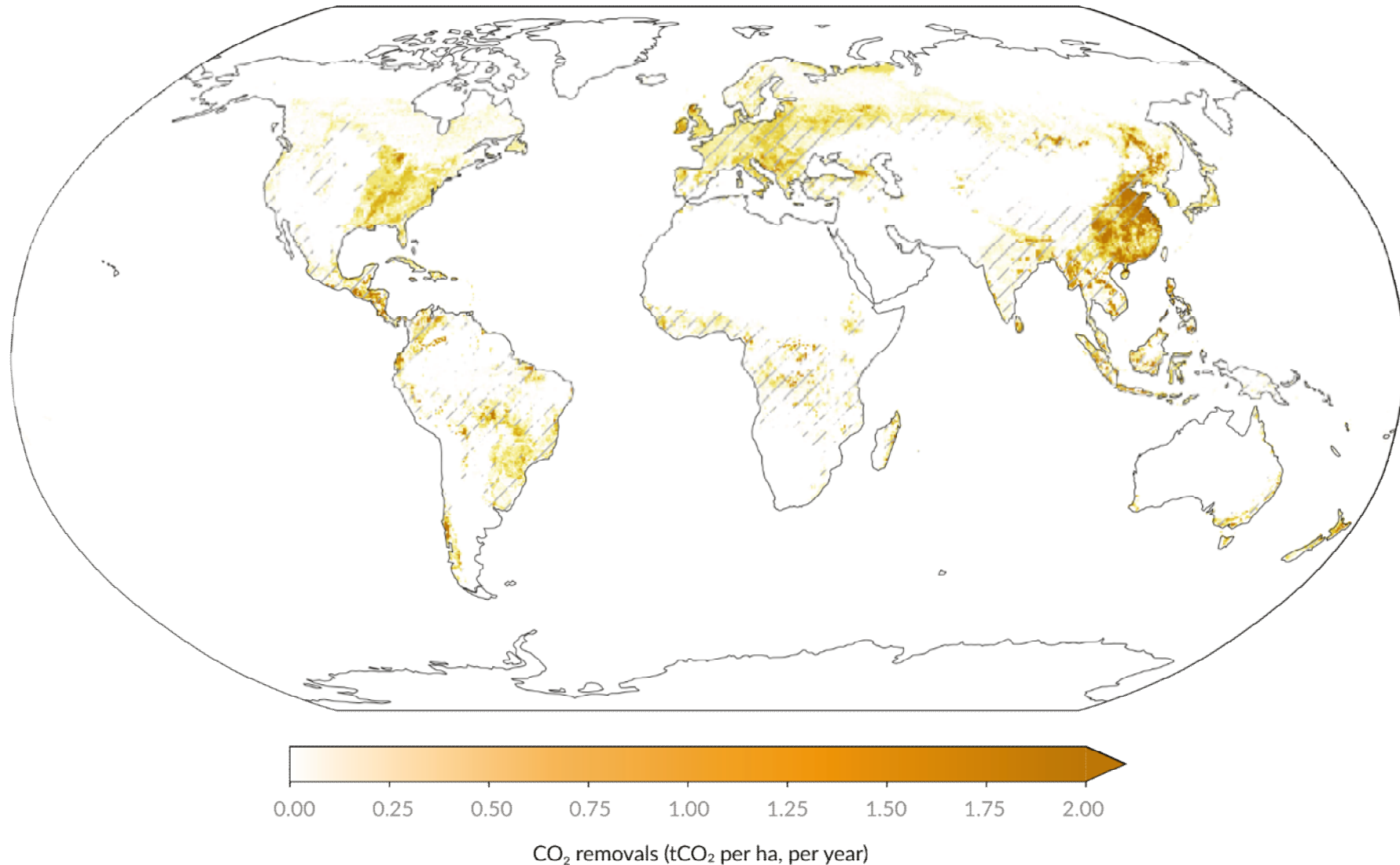
Enhanced weathering

Other novel CDR

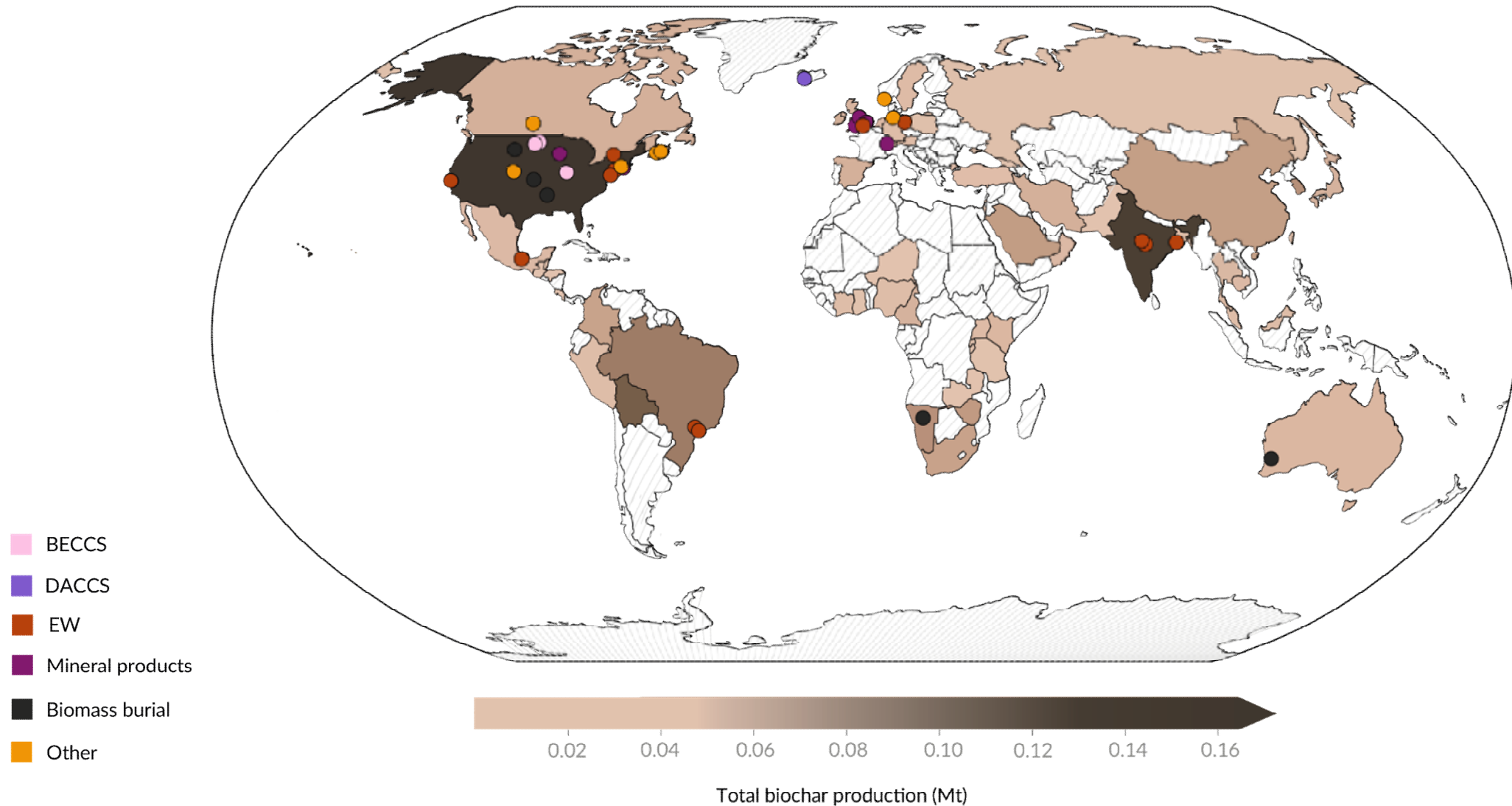
Biomass burial, mineral products & other



Where afforestation and reforestation are happening



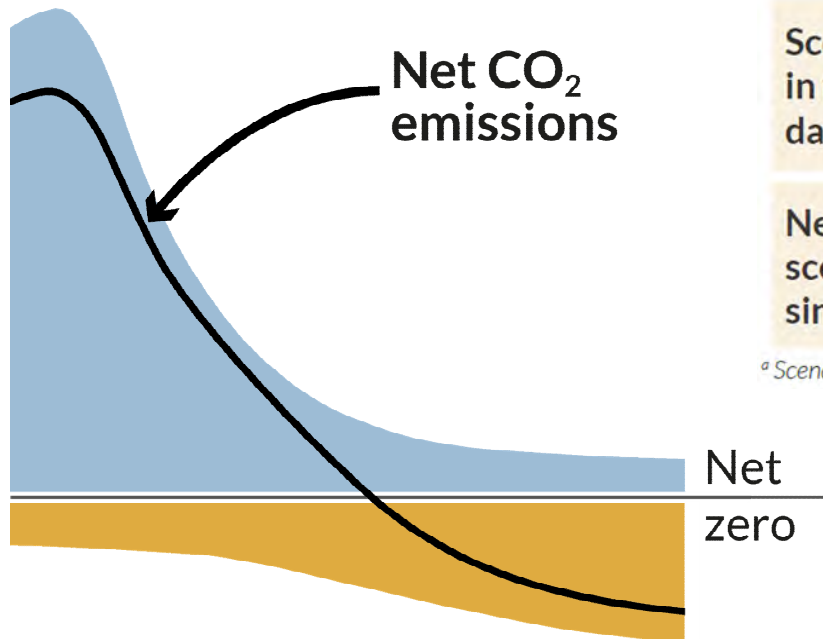
Where novel CDR methods are happening



Future CDR in scenarios



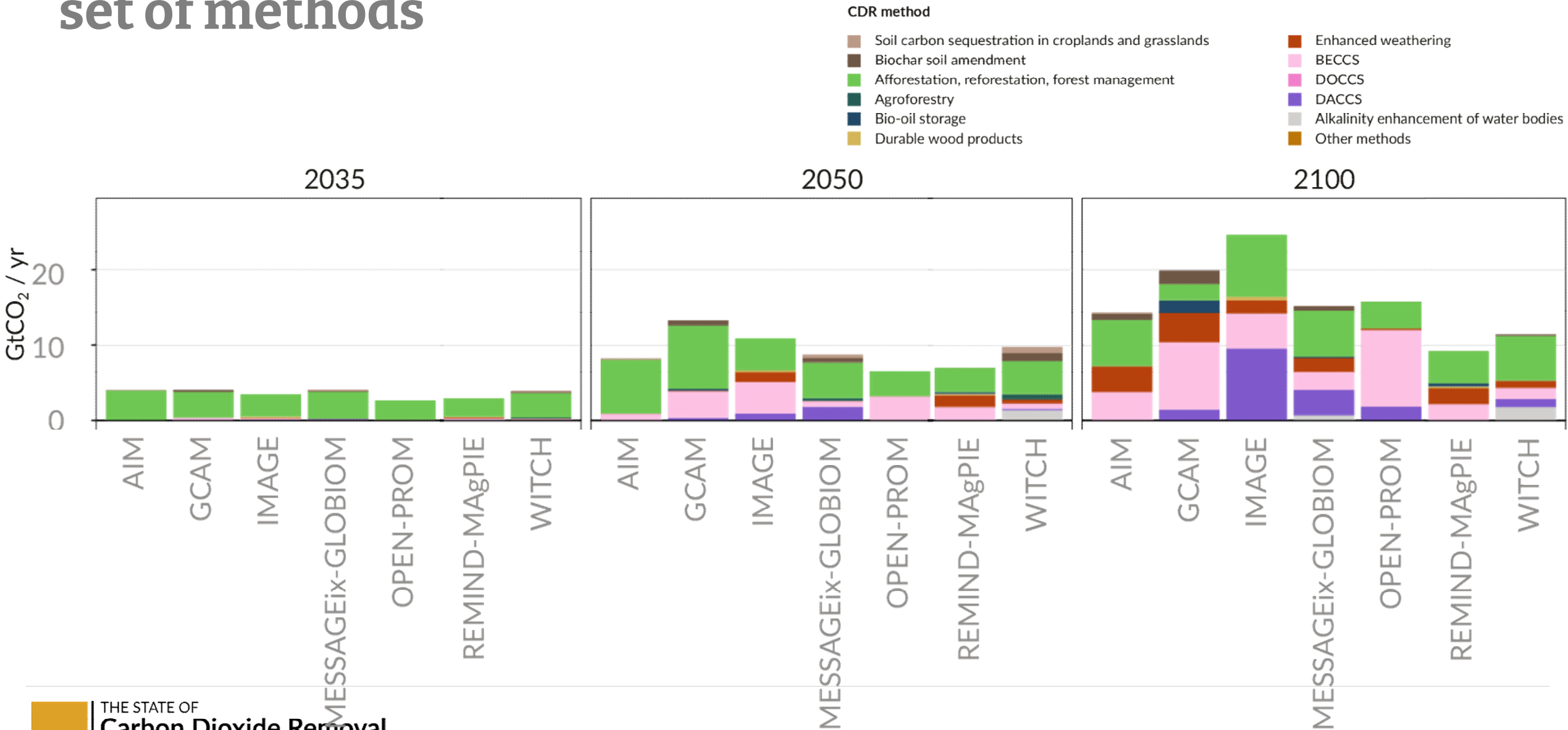
Modelled global scenarios essentially all use CDR



	Total number of 1.5–2°C scenarios (number assessed)	Number of scenarios with conventional CDR ^a (number for which CDR estimated)	Number of scenarios with novel CDR			
			BECCS	DACCS	ERW	Biochar
Scenarios in the AR6 database	540 (407)	530 (407)	516	146	4	1
New scenarios since AR6	90 (48)	90 (48)	85	71	11	0

^a Scenarios are considered to include conventional CDR if this value can be estimated using the methodology in Gidden et al., 2023.³³⁶

Latest 1.5°C scenarios involve CDR from a **diversifying** set of methods



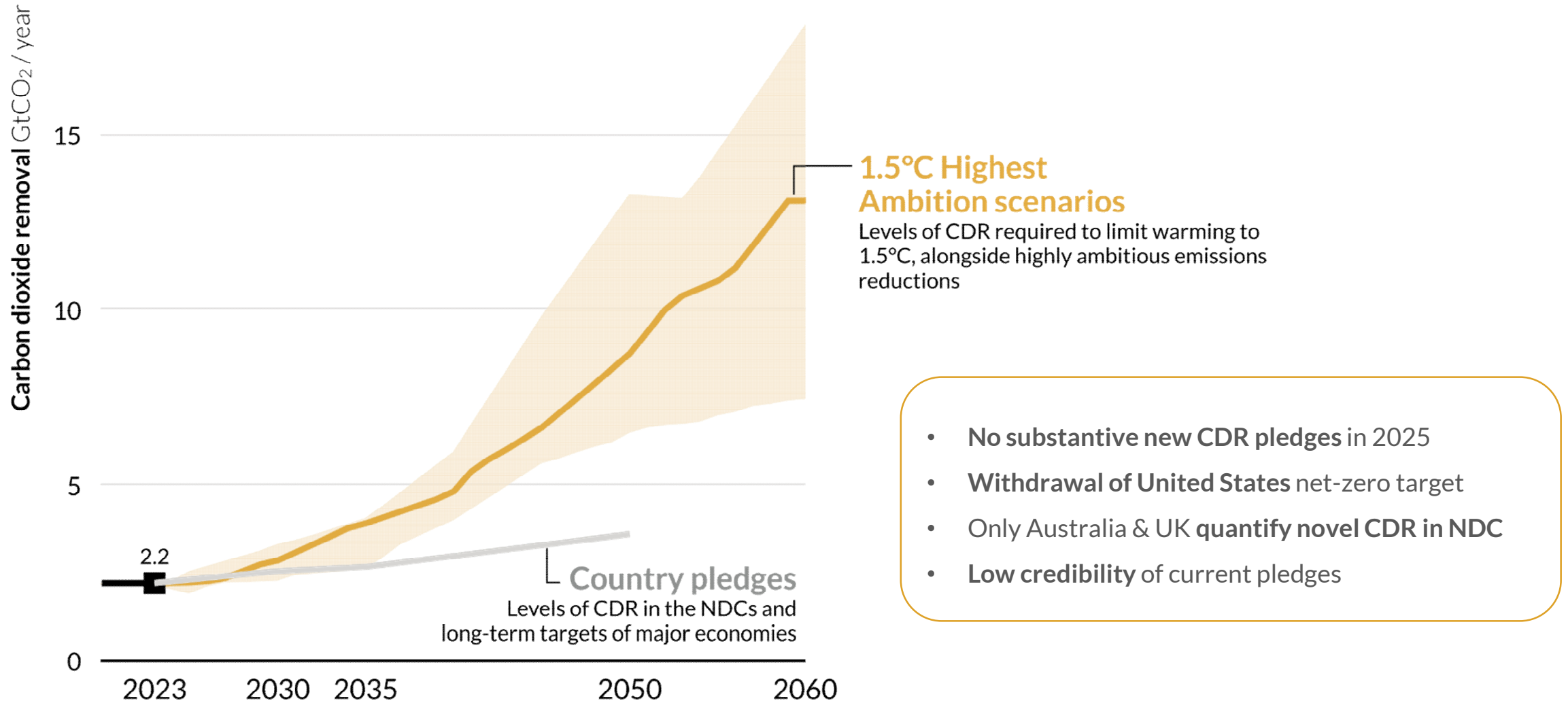


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Prospects and drivers



Country pledges under the UNFCCC are falling short

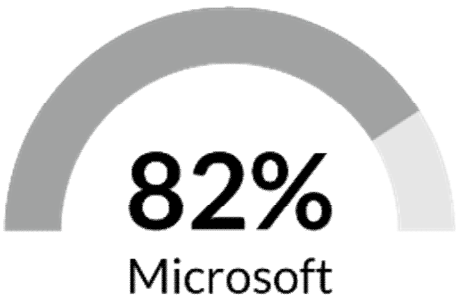


Most novel CDR demand comes from voluntary buyers

Voluntary CDR Market, 2025

	Contracted credits	Issued credits	Average price (\$)
BECCS	20,819,157	363,142	364
Biochar	2,964,559	793,796	136
Bio-oil storage	5,215,296	37,031	362
DACCS	238,453	848	593
Enhanced weathering	197,957	19,804	407
Mineral products	353,499	14,149	1,300
Biomass sinking	200,001	526	250
Alkalinity enhancement	117,641	3,323	279
Biomass burial	71,100	16,575	127
DOCCS	37,746	0	1,100

Novel CDR credit buyers
One buyer purchased most novel CDR credits



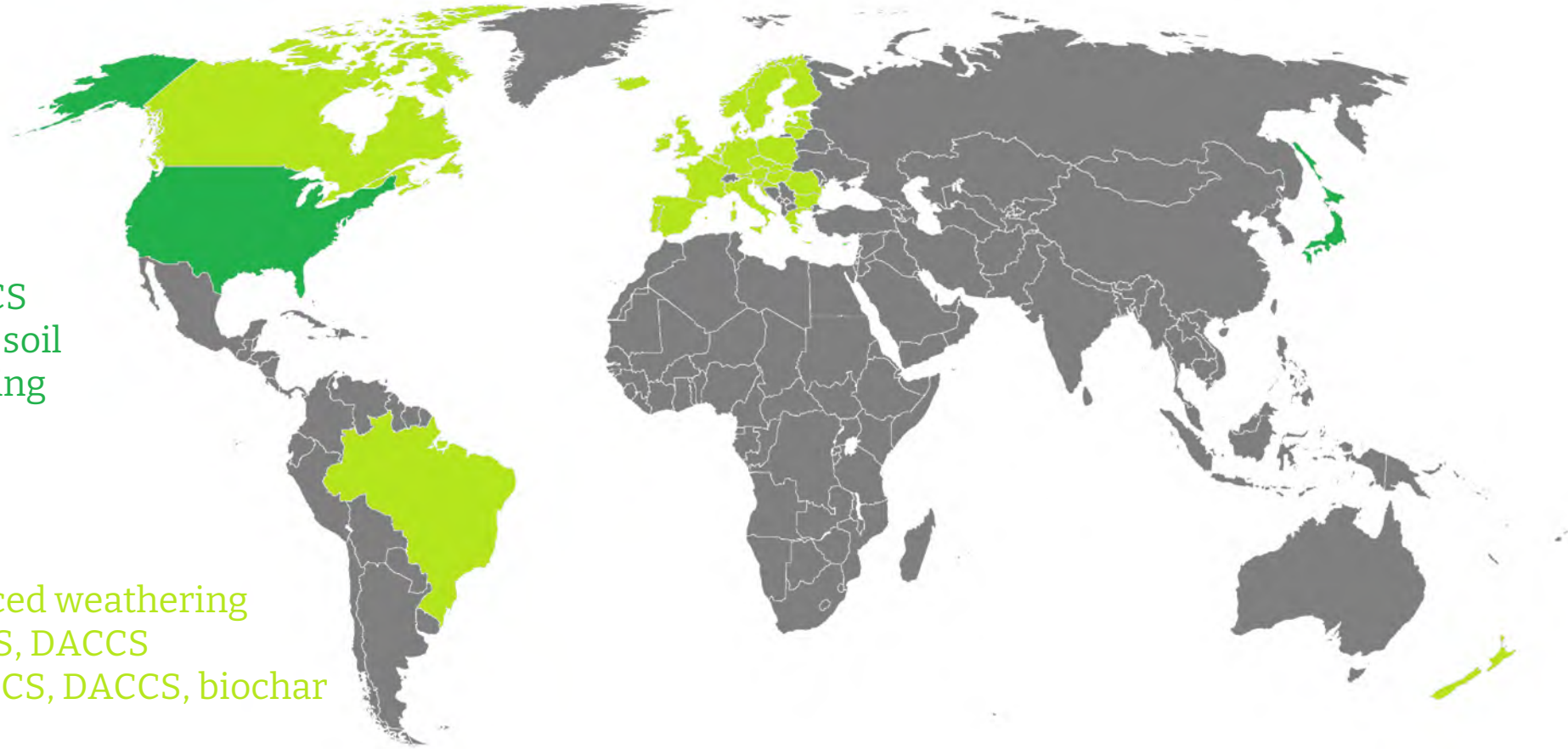
Ultimately, demand at Gt scale requires **governments**

Operating

- **US** – 45Q – BECCS, DACCS
- **Japan** – ETS – biochar to soil or concrete, CO₂-absorbing concrete

In development

- **Brazil** – credits – enhanced weathering
- **Canada** – credits – BECCS, DACCS
- **EU** – credits & ETS – BECCS, DACCS, biochar to soil
- **New Zealand** – ETS – “non-forestry removals”
- **UK** – ETS – BECCS, DACCS

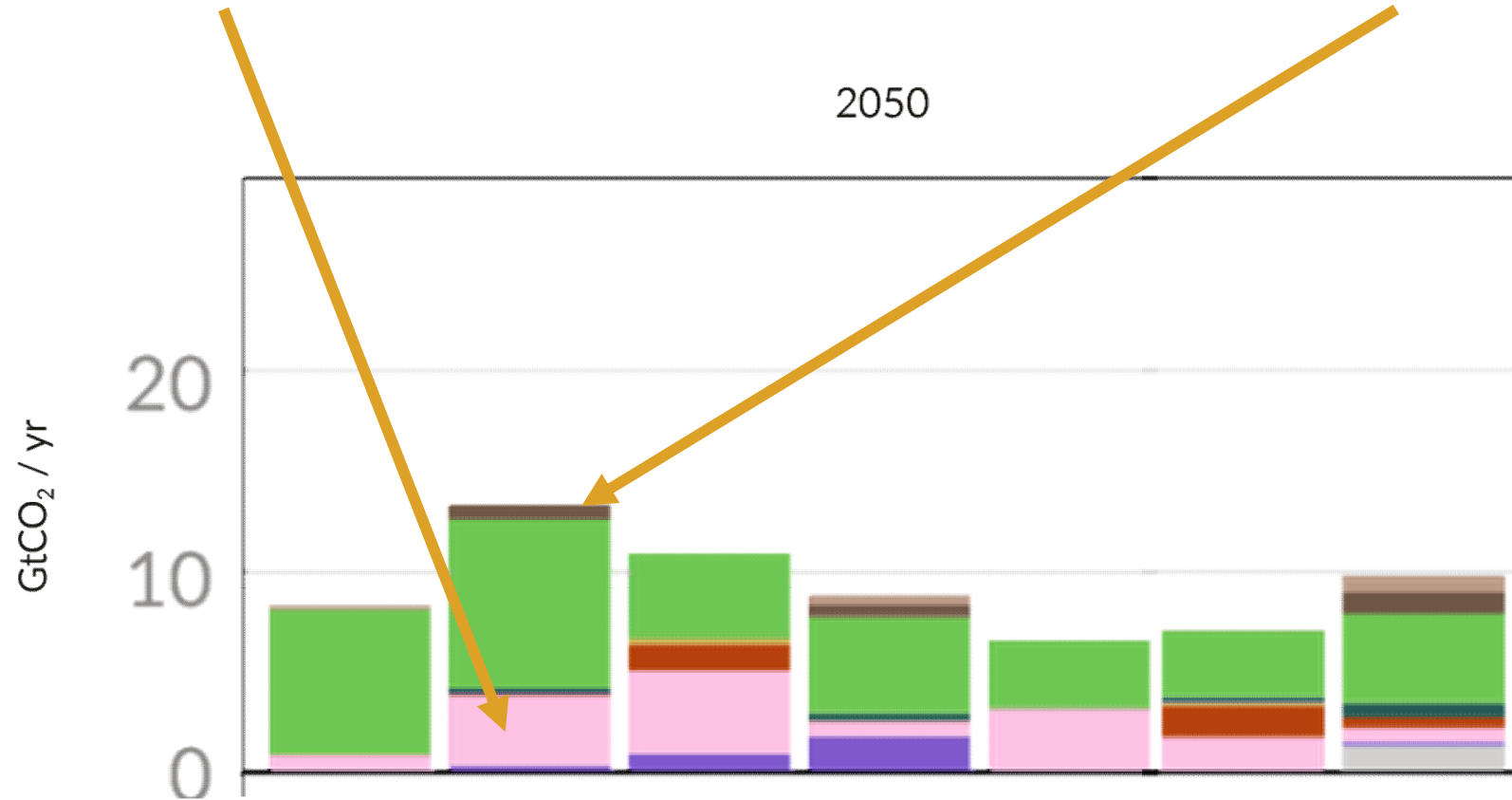


**G20 with demand-side policies
for novel CDR, 2025**

And will reality follow?

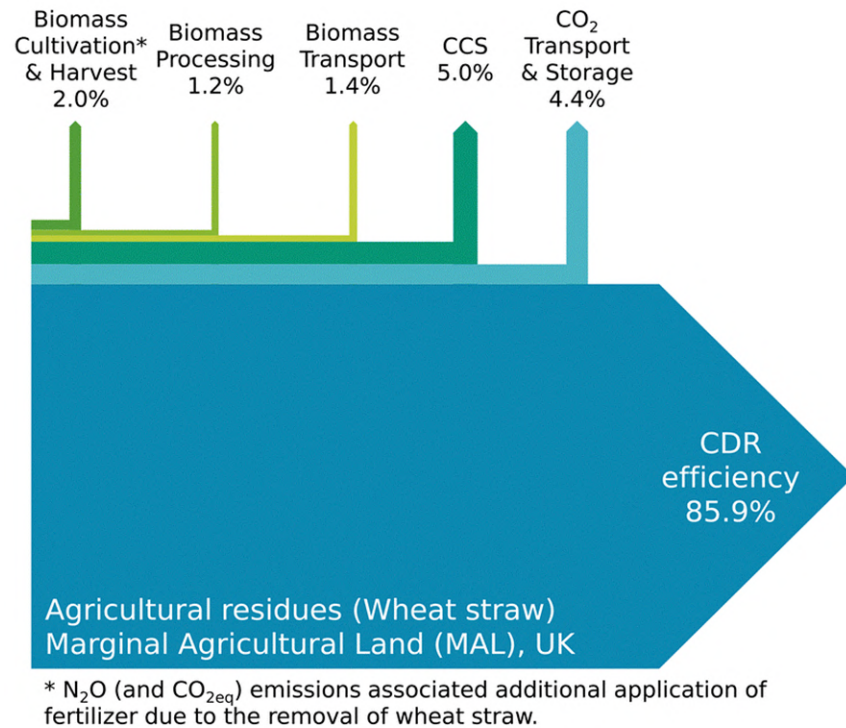
BECCS

Biochar

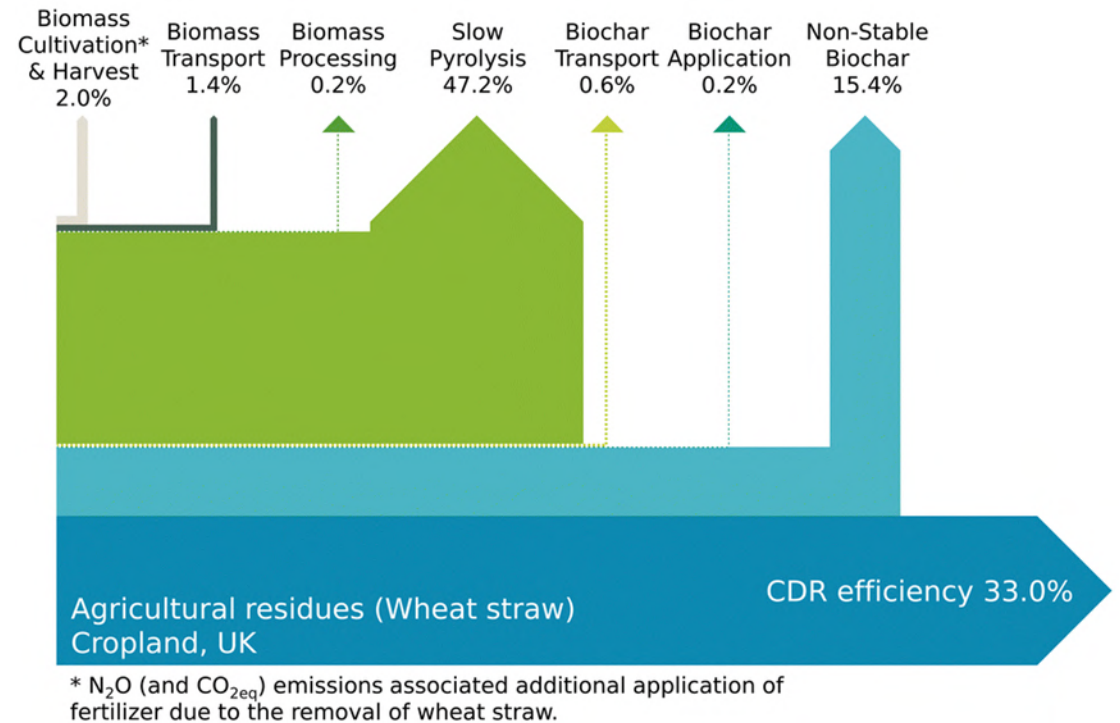


And will reality follow?

BECCS

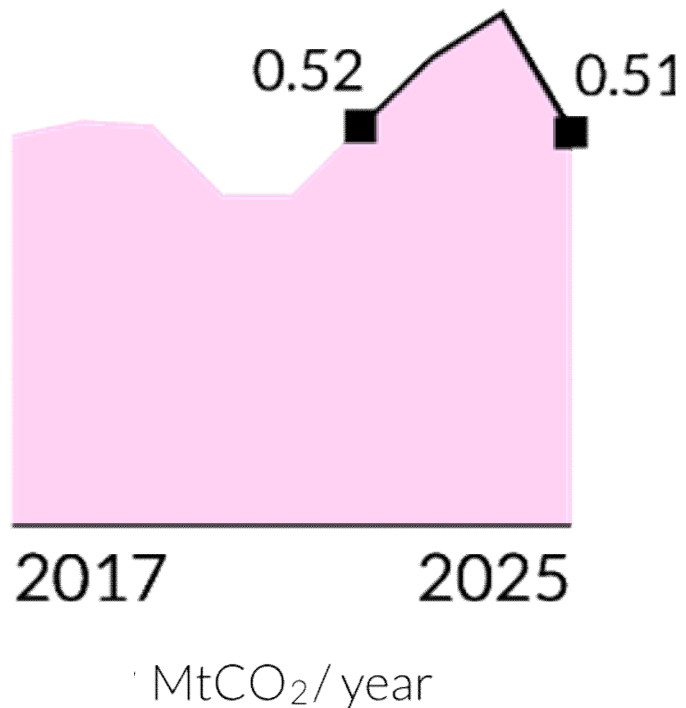


Biochar

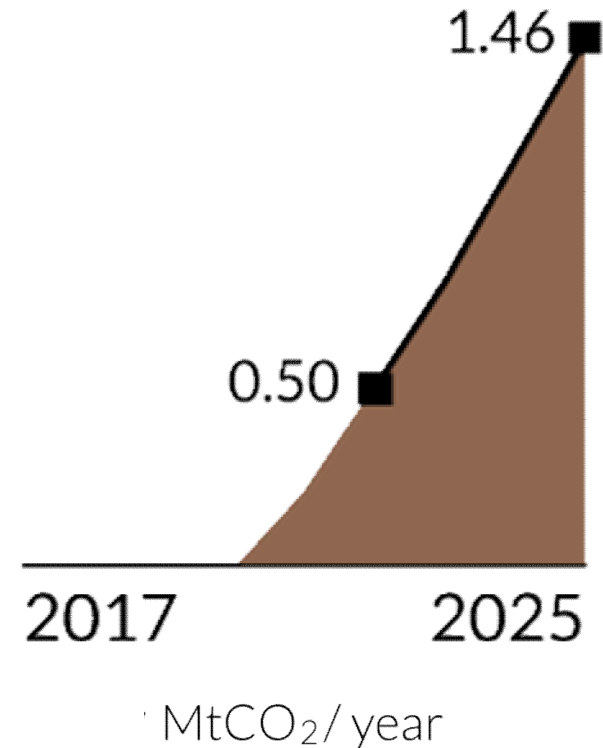


And will reality follow?

BECCS



Biochar



And will reality follow?

BECCS



Biochar





Thank you

Report available on
www.stateofcdr.org

