CARBON DIOXIDE REMOVAL

The state of play and the scale-up challenge

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CO2RE

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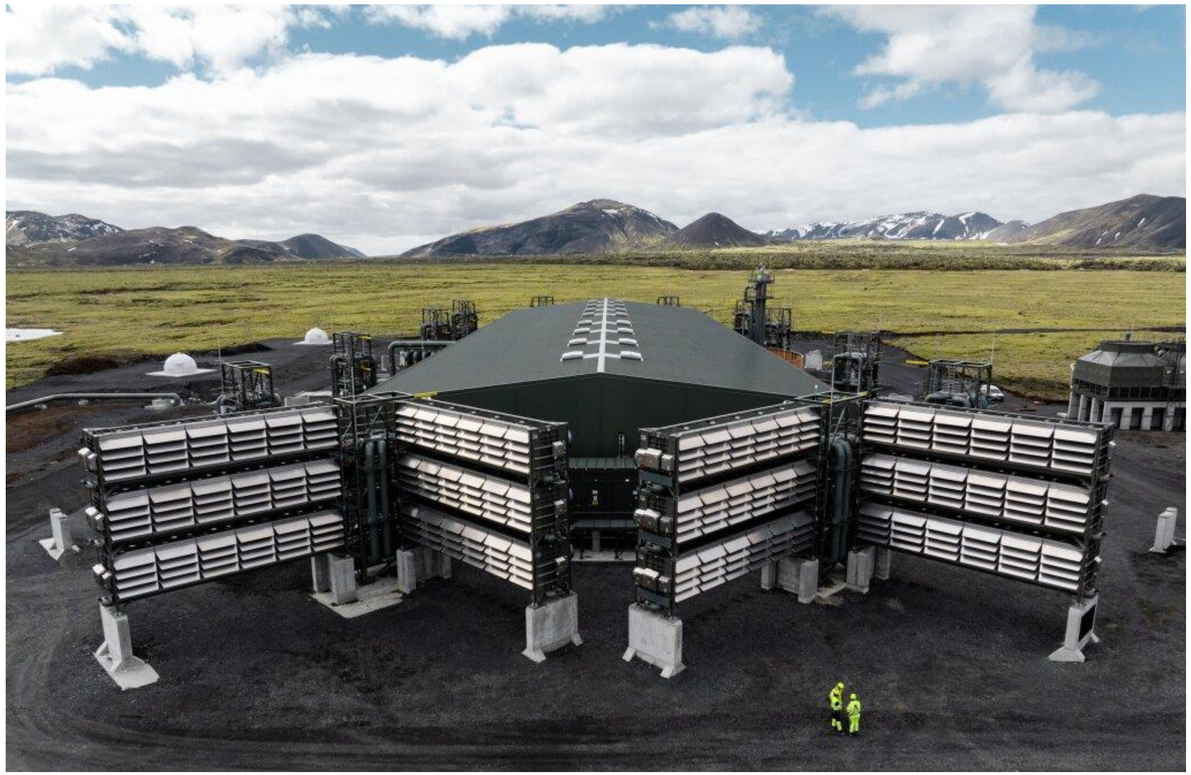
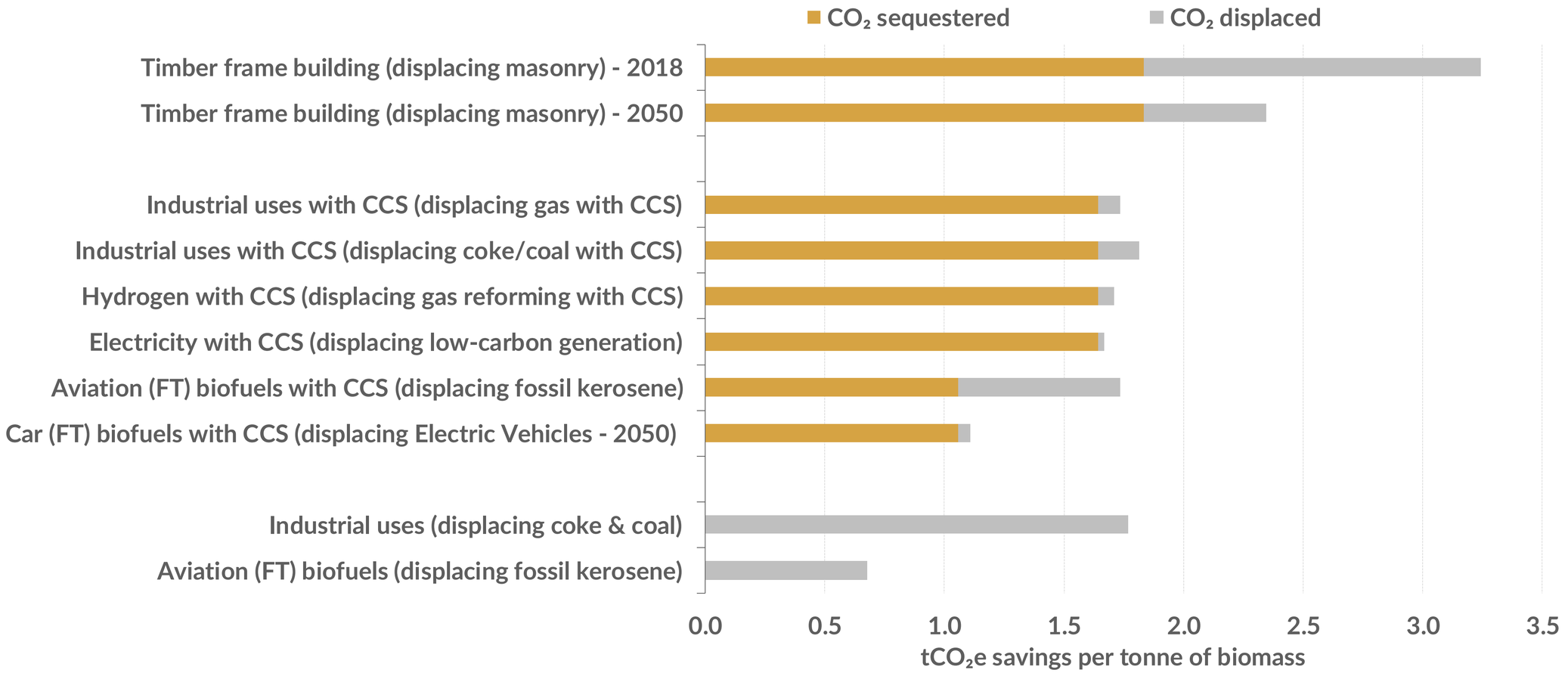
Biomass is excellent at capturing CO_2 from the atmosphere

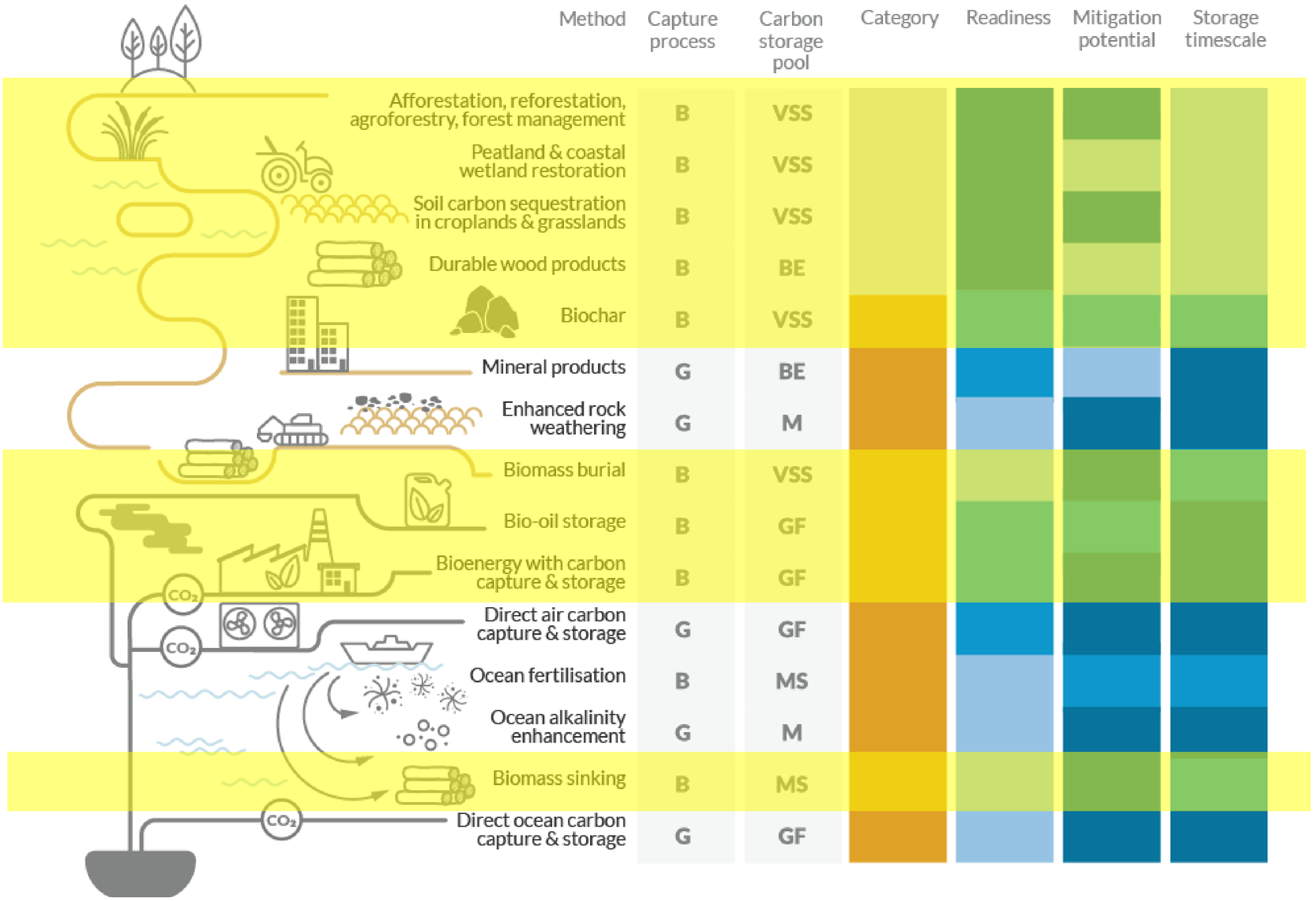


The best uses of biomass involve durable storage of as much carbon as possible



Source: CCC (2018) Biomass in a low-carbon economy

Many different ways to do CDR, mostly involving biomass



Method	Capture process	Carbon storage pool	Category	Readiness	Mitigation potential	Storage timescale
Afforestation, reforestation, agroforestry, forest management	B	VSS	Conventional	High	Large	> Ten millennia
Peatland & coastal wetland restoration	B	VSS	Conventional	High	Moderate	> Ten millennia
Soil carbon sequestration in croplands & grasslands	B	VSS	Conventional	High	Large	Centuries to millennia
Durable wood products	B	BE	Conventional	High	Moderate	Centuries to millennia
Biochar	B	VSS	Novel	High	Moderate	> Ten millennia
Mineral products	G	BE	Novel	Medium	Low	> Ten millennia
Enhanced rock weathering	G	M	Novel	Low	High	> Ten millennia
Biomass burial	B	VSS	Conventional	High	Moderate	> Ten millennia
Bio-oil storage	B	GF	Conventional	High	Moderate	> Ten millennia
Bioenergy with carbon capture & storage	B	GF	Conventional	High	Moderate	> Ten millennia
Direct air carbon capture & storage	G	GF	Novel	Medium	High	> Ten millennia
Ocean fertilisation	B	MS	Novel	Low	Moderate	Centuries to millennia
Ocean alkalinity enhancement	G	M	Novel	Low	High	> Ten millennia
Biomass sinking	B	MS	Conventional	High	Moderate	Centuries to millennia
Direct ocean carbon capture & storage	G	GF	Novel	Low	High	> Ten millennia

Legend:

B Biological
G Geochemical

VSS Vegetation, soils and sediments
BE Built environment
GF Geological formations
MS Marine sediments
M Minerals

Conventional
Novel

High
Medium
Low

Large
Moderate
Small

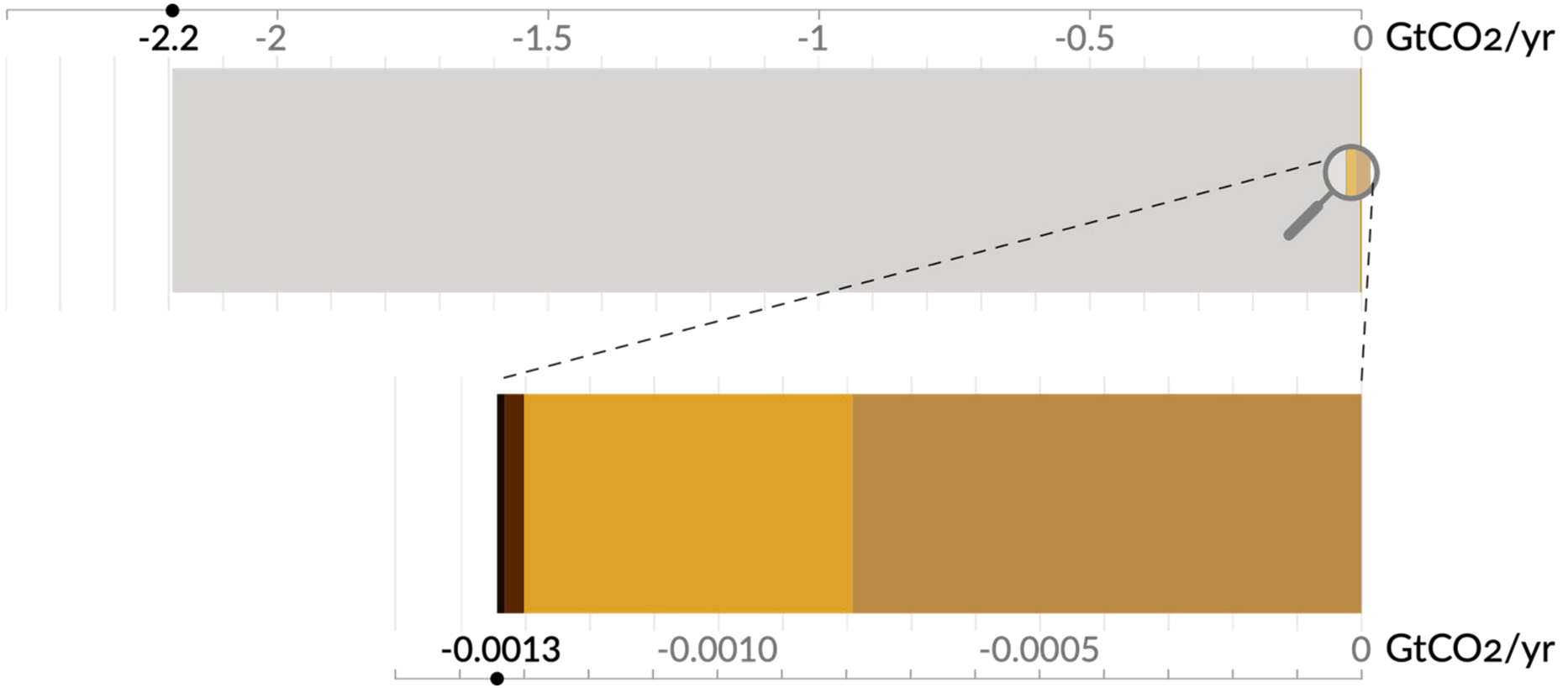
> Ten millennia
Centuries to millennia
Decades to centuries

CDR is emerging in carbon markets, and is currently expensive

CDR method	Weighted average price ($)	
	2022	2023
Afforestation/reforestation	12	16
Bioenergy with carbon capture and storage	No data	300
Biochar	212	131
Biomass burial	92	111
Bio-oil storage	600	505
Direct air carbon capture and storage	1,261	715
Direct ocean carbon capture and storage	984	1,402
Enhanced rock weathering	434	371
Forest management	15	12
Mineral products	471	No data
Ocean alkalinity enhancement	No data	1,608
Total	303	488

CDR is happening now, although novel methods are at small scale

- Combined estimate of **conventional** (averaged over 2013-22) and **novel** methods (2023)



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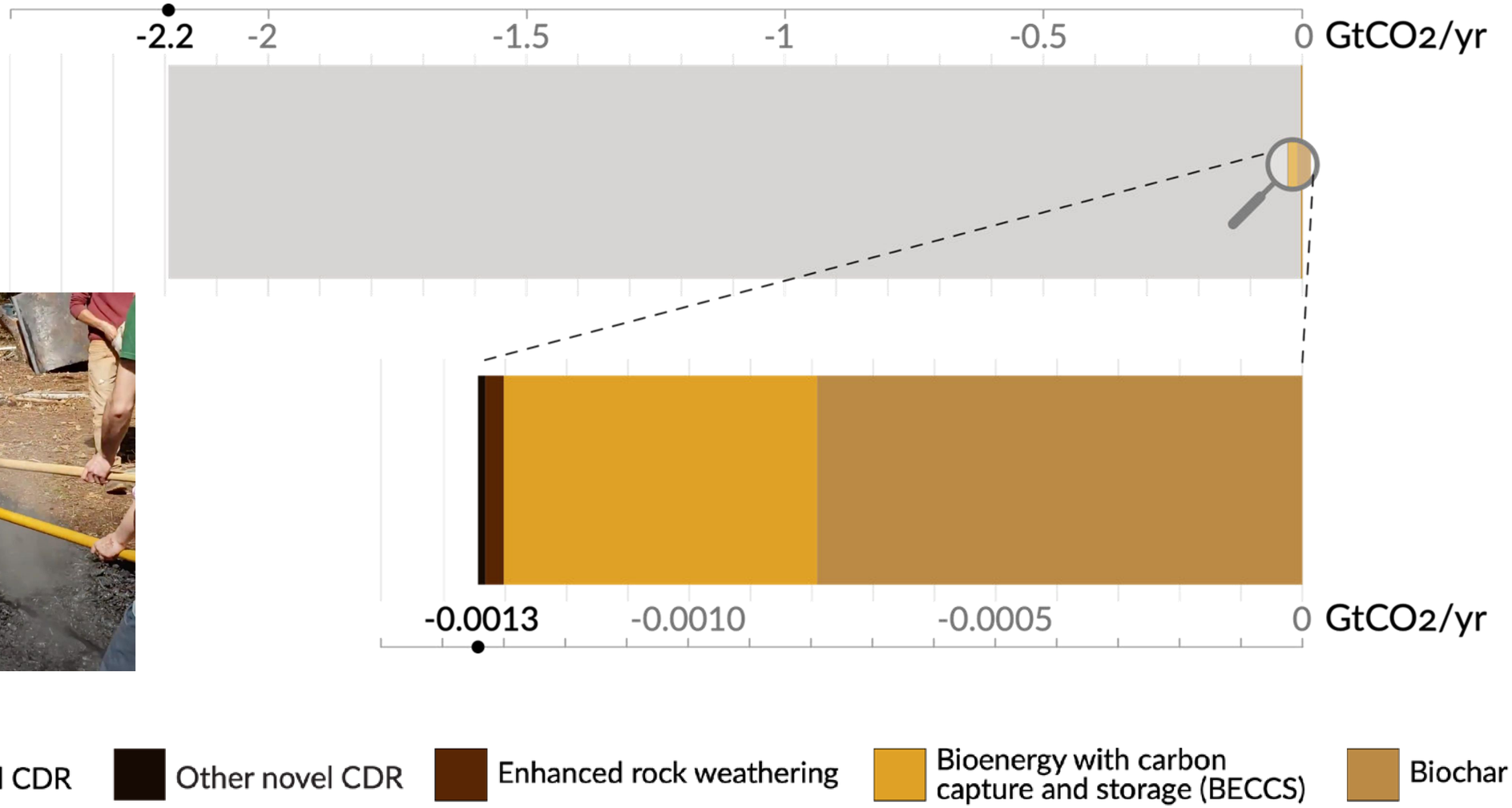

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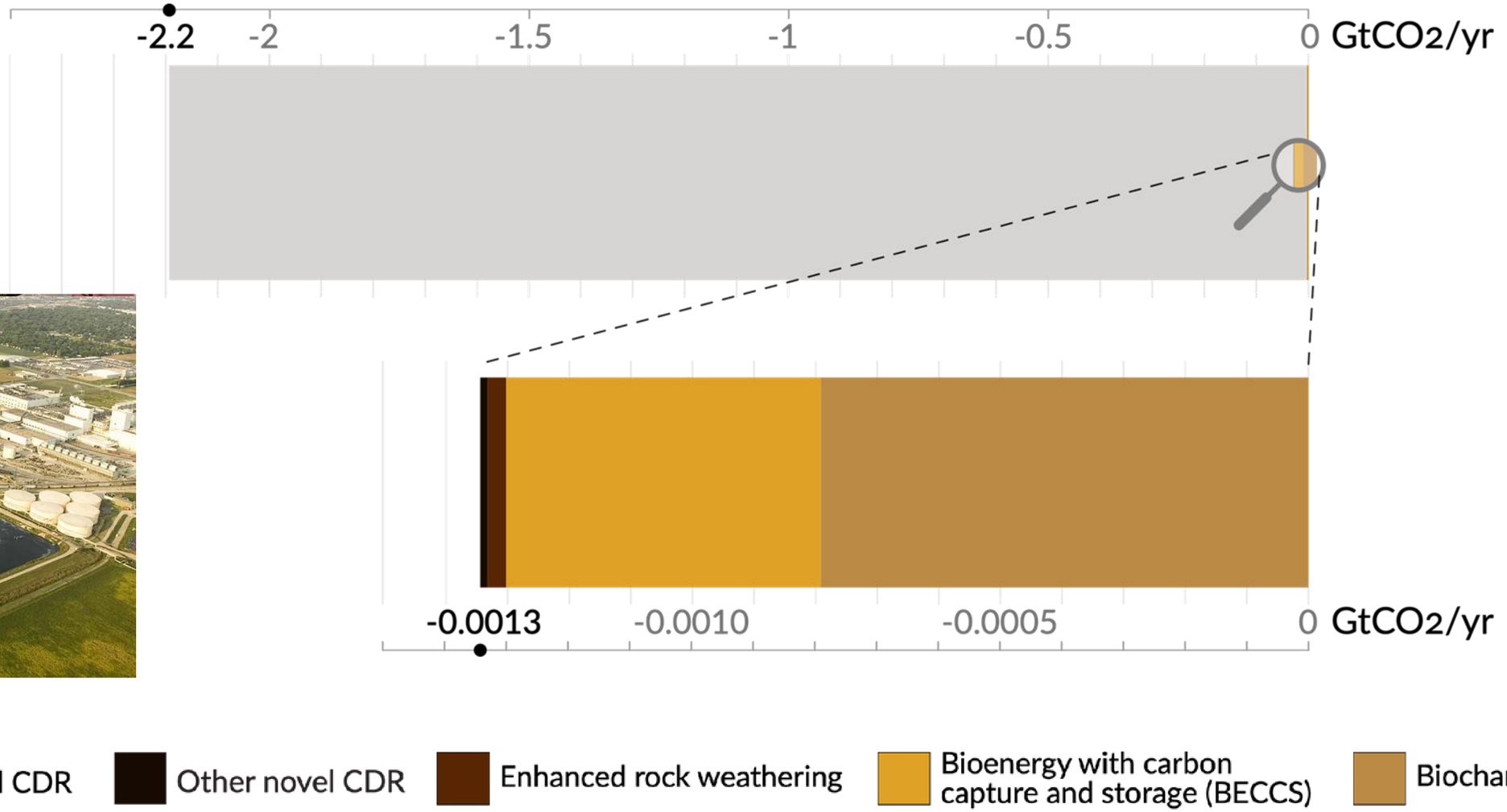

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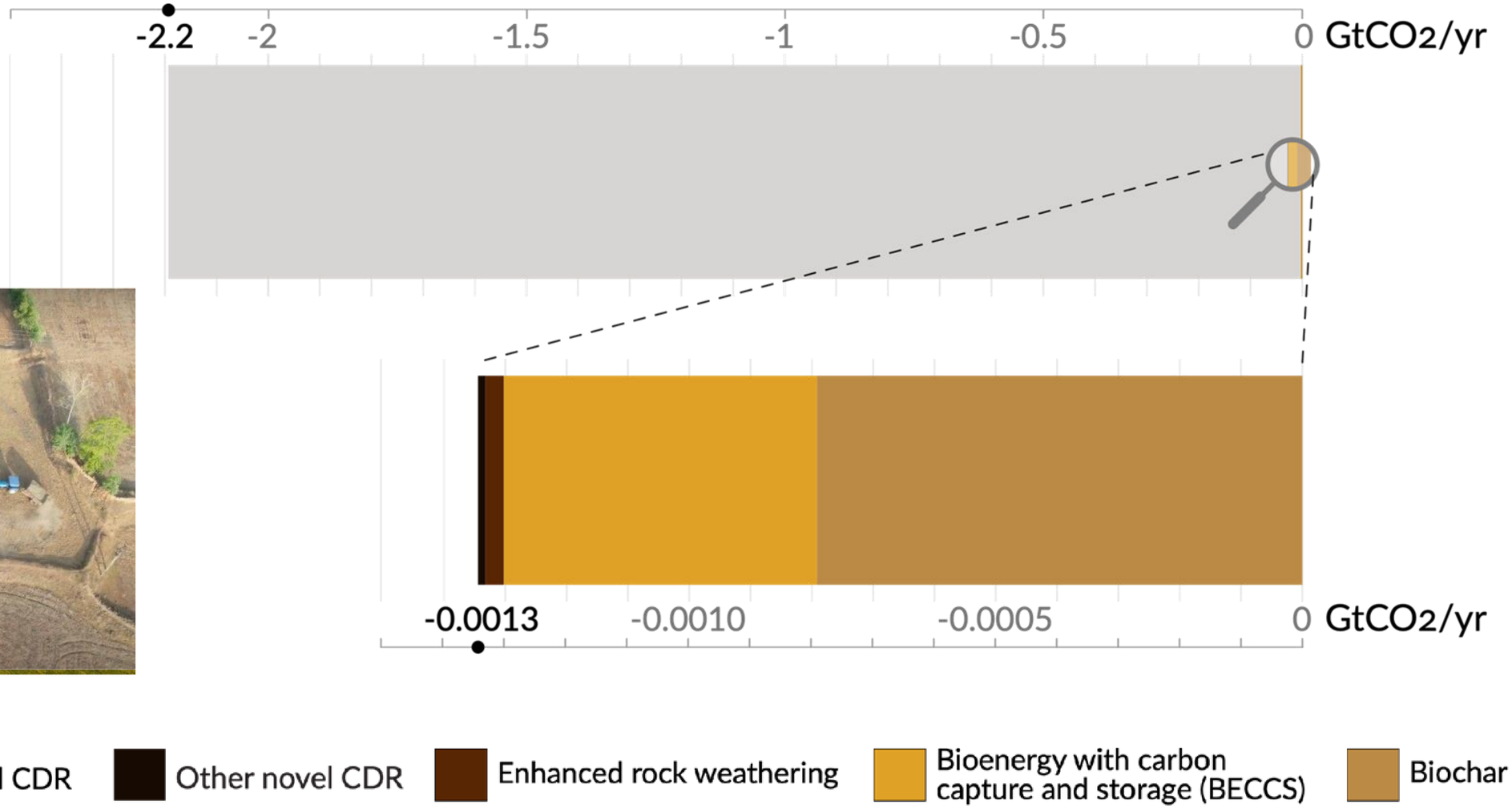
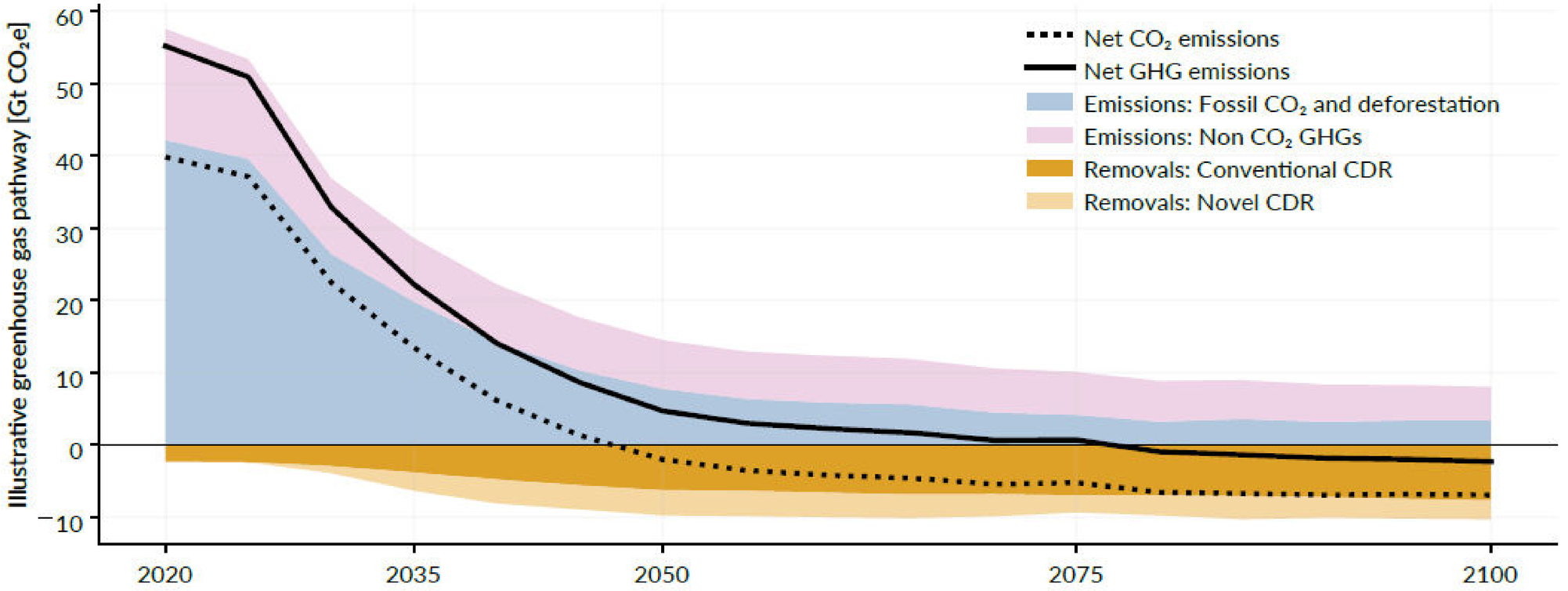


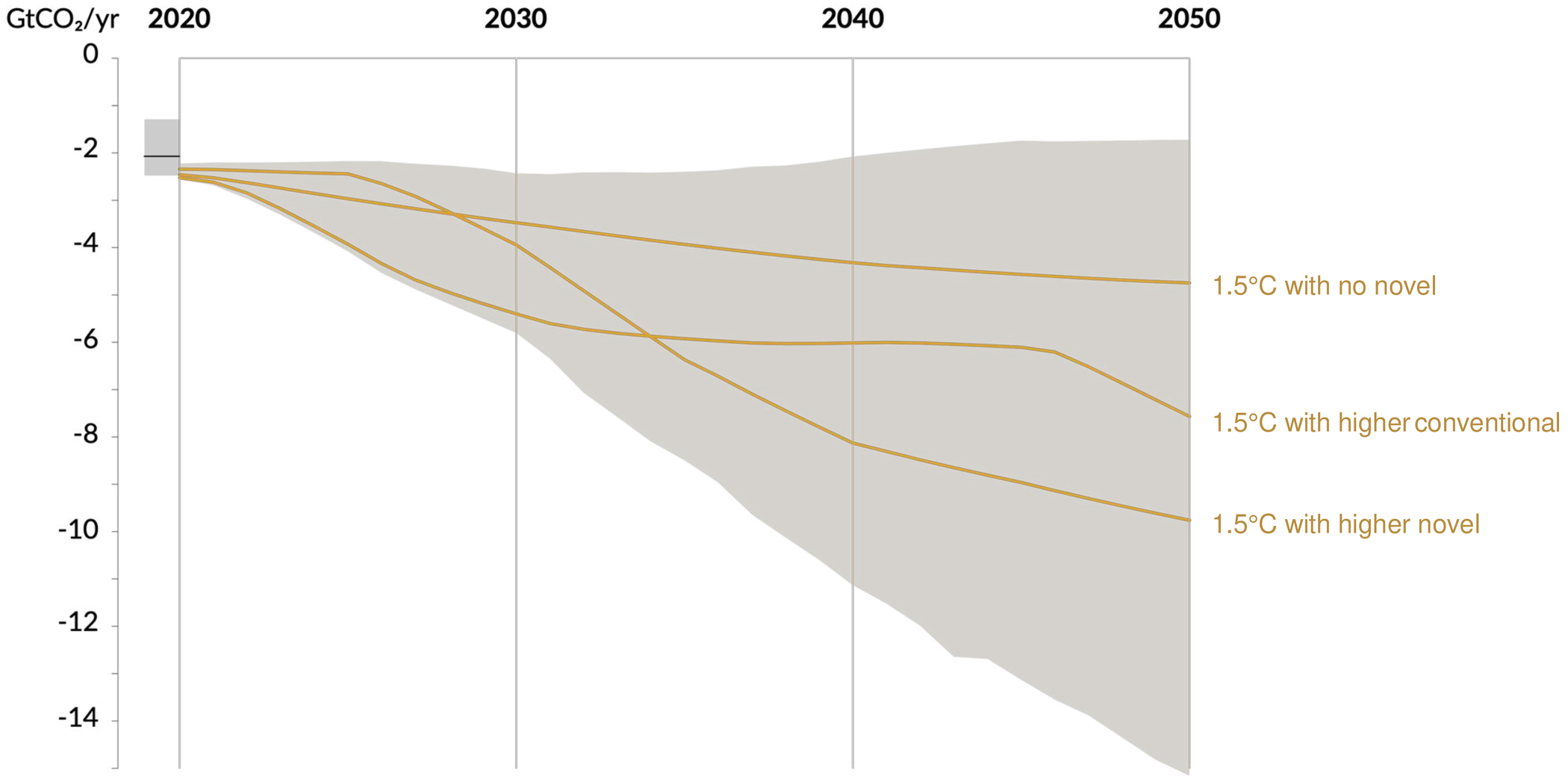
All Paris-relevant scenarios assessed by the IPCC involve CDR



CDR is crucial for **counterbalancing** remaining levels of CO_2 and other GHGs to achieve net zero emissions

… and open the door to net negative emissions if needed

The amount of CDR we need depends on the scenario we follow



The scale-up challenge

For novel CDR:

- Median scenario scales novel CDR 30x by 2030…
- … and 1,300x by 2050

For conventional CDR:

- Median scenario doubles the land sink by 2050…
- … and puts an end to deforestation


Thank you
www.co2re.org | www.StateofCDR.org