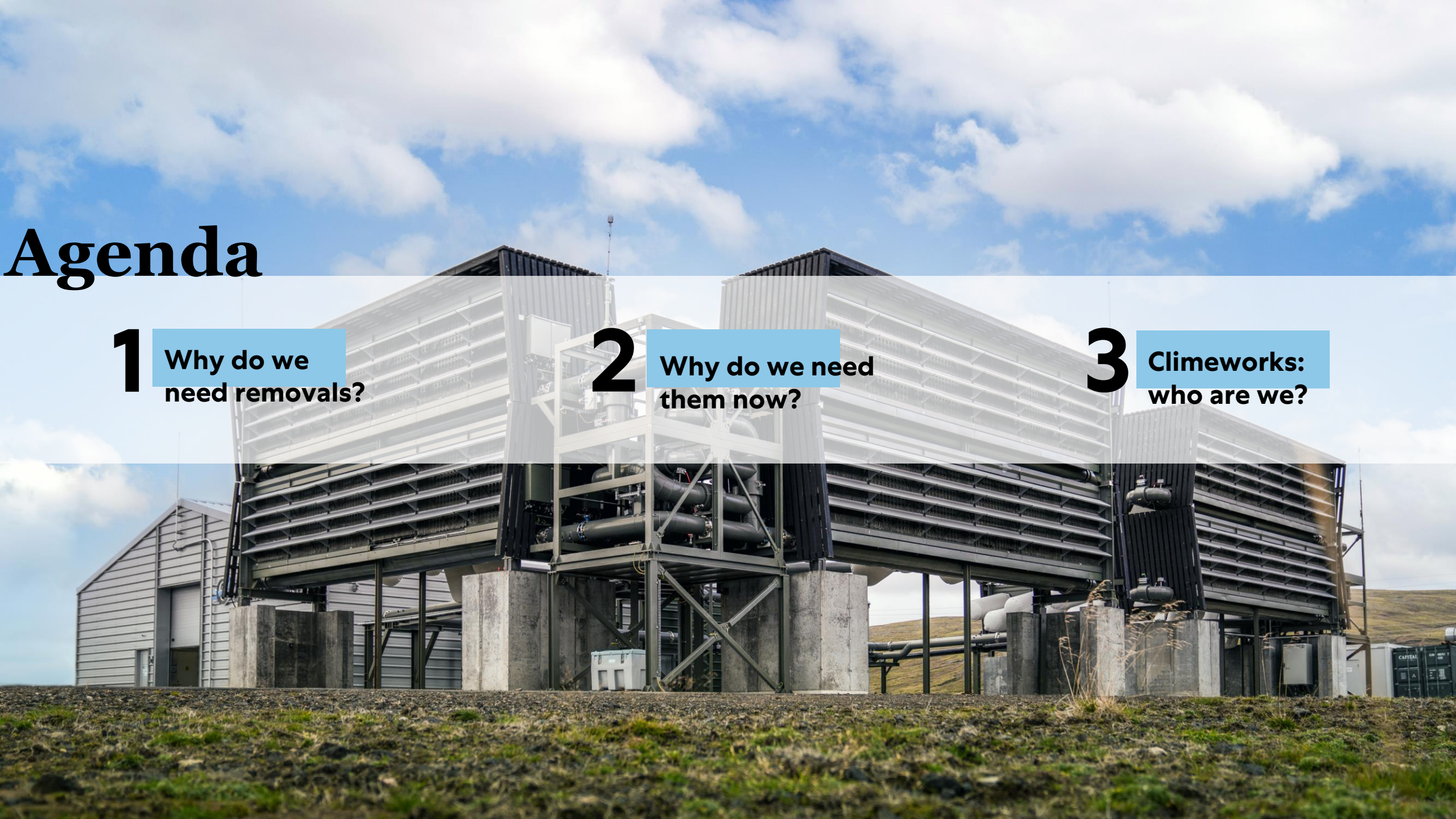

climeworks

Agenda

1 Why do we need removals?

2 Why do we need them now?

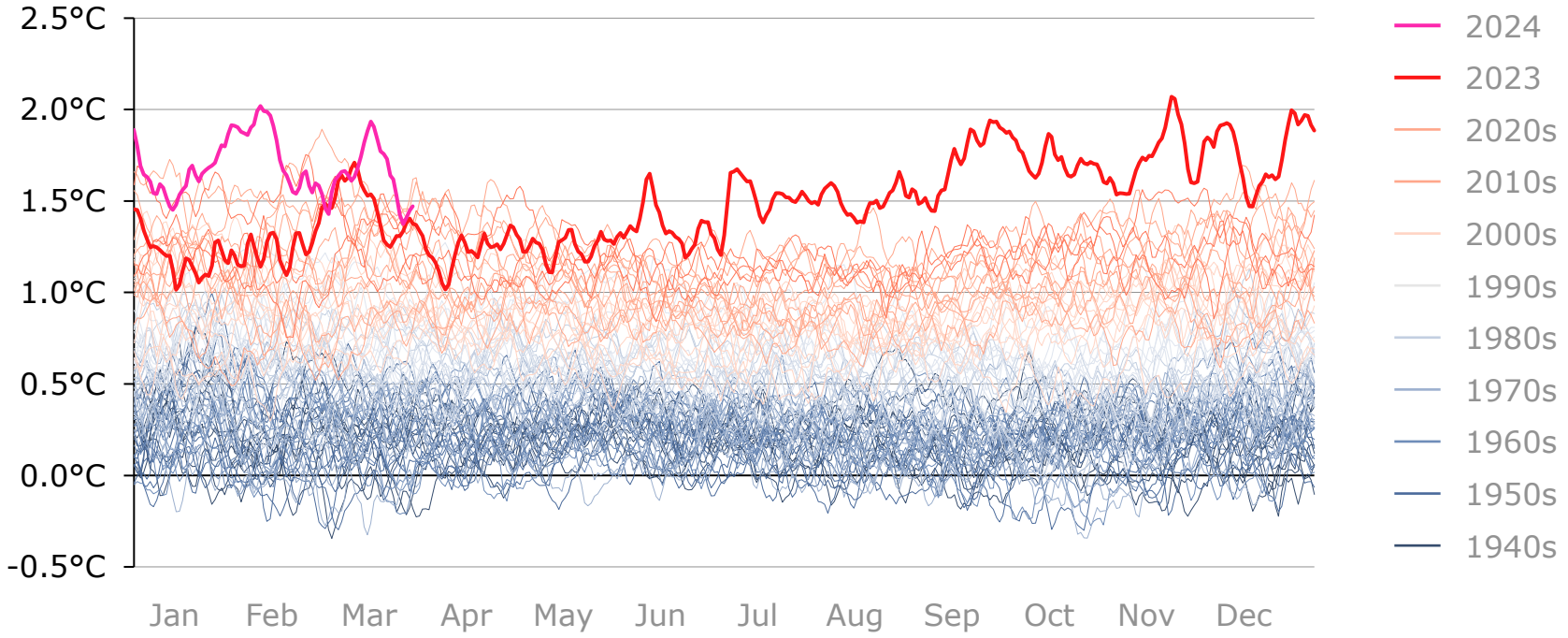
3 Climeworks: who are we?



Why carbon removal?

The Earth is warming at unprecedented levels

Daily global surface air temperature anomalies, 1940-2024
Relative to pre-industrial levels



+1.48°C

Average **temperature increase** above pre-industrial levels in 2023

+2°C

Temperature anomaly crossed twice in the last 4 months and for the first time in **3 million years**

>21°C

Sea surface[1] temperature exceeded for the first time in 2023 and **not undercut since February 2024**

1. Daily global average sea surface temperature
Source: ERA5 (1940-2024, Credit: C3S/ECMWF), Copernicus climate change

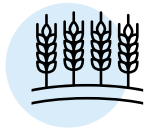
Impacts of a 2°C vs 1.5°C world: what can begin in just 5-10 years

~2 billion

More people exposed to **extreme heat**

>60 million

More people exposed to **droughts**



2x

Higher reduction in **crop yields**

50%

Of population exposed to **water stress**

0.1m

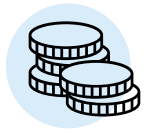
Sea level rise by the end of the century

>10 million

More people exposed to **flooding**

0%

Of **coral reefs** remaining

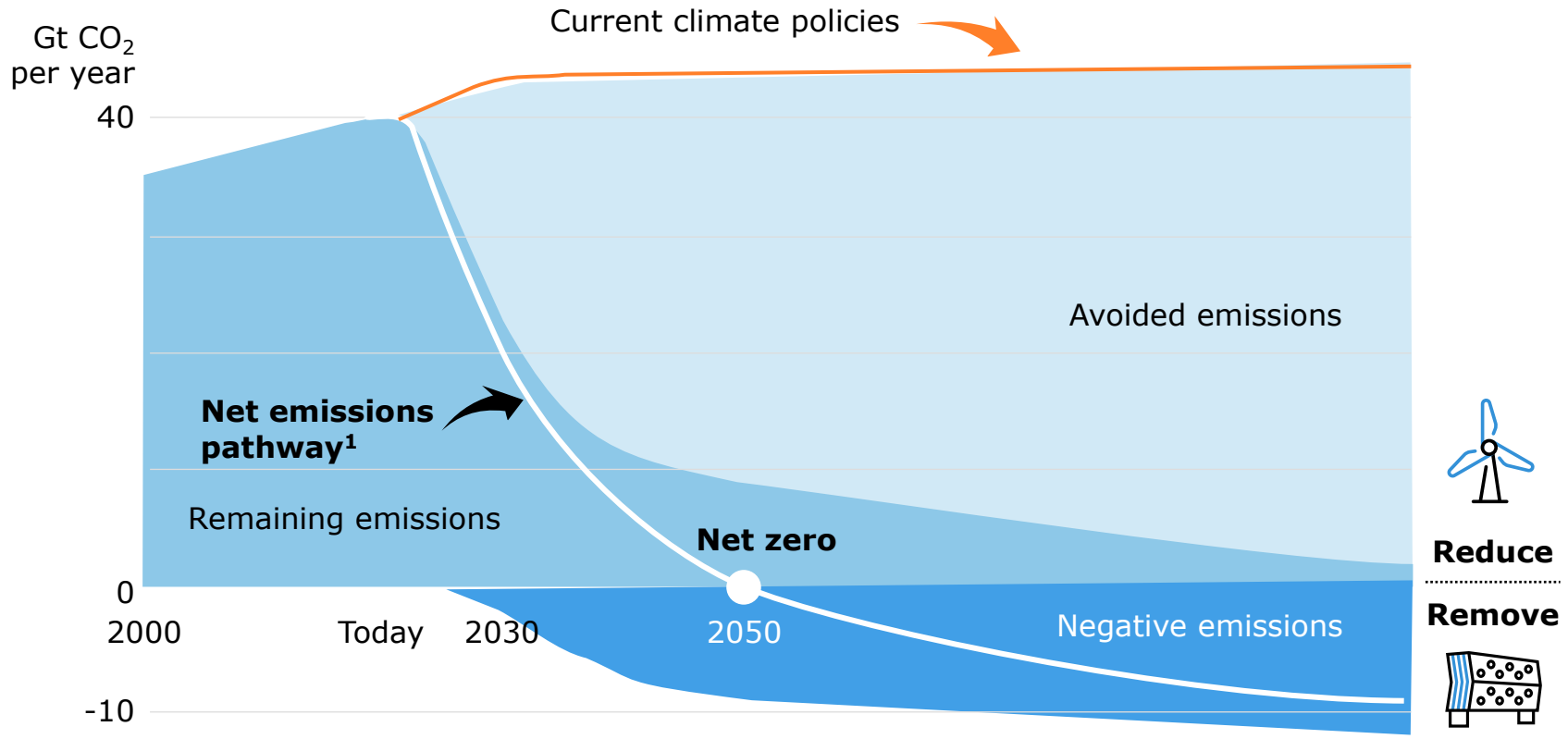


>$10 trillion

Or >5% of **global GDP lost** by 2050

Source: European Commission, IPCC 1.5°C special report, Swiss Re Institute

We have the recipe for limiting global warming, and carbon dioxide removal is a key ingredient



~6-16[2] Gt/y **Carbon dioxide removal (CDR) required by 2050**

Limiting global warming to 1.5°C requires deep emission reductions (~50% by 2030, ~90% by 2050) and **net zero emissions by 2050**

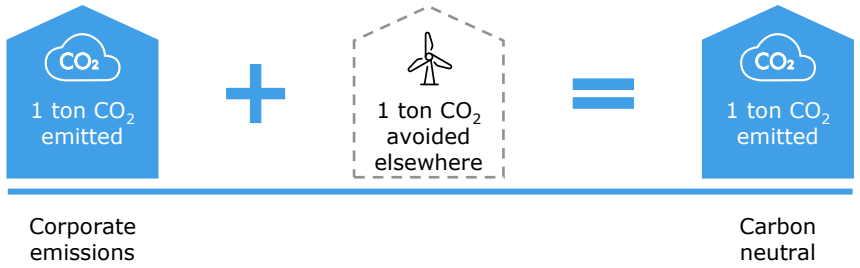
Carbon dioxide removal (CDR) is critical to achieve net zero, with ~6-16 Gt required annually by 2050

Sources: 1. Adapted from IPCC AR6 WG III (2022) for scenario keeping warming to 1.5ºC (>50% likelihood) with limited or no overshoot, 2. The state of carbon dioxide removal (2023) for scenario keeping warming to 1.5ºC
Note: The shaded areas for both avoided and negative emissions are illustrative only

Reaching net zero requires high-quality carbon removals, not avoidance credits

Avoidance offsets

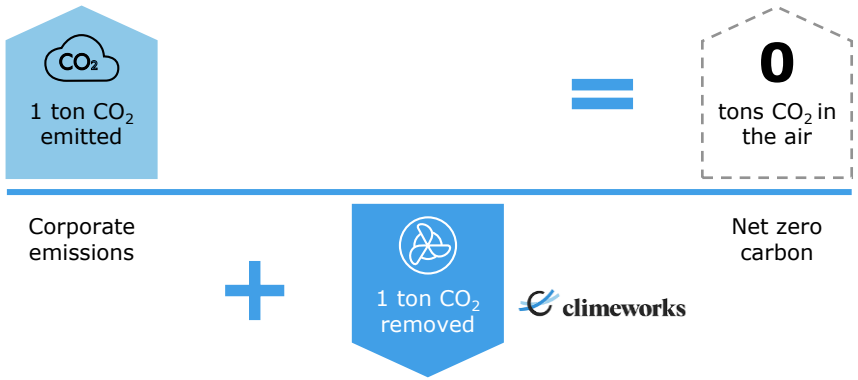
Company's emissions remain in the air, and carbon neutrality can be achieved



Does **not** enable net zero

Carbon removals (CDR)

Company's emissions are removed from the atmosphere, enabling net zero



Does enable net zero

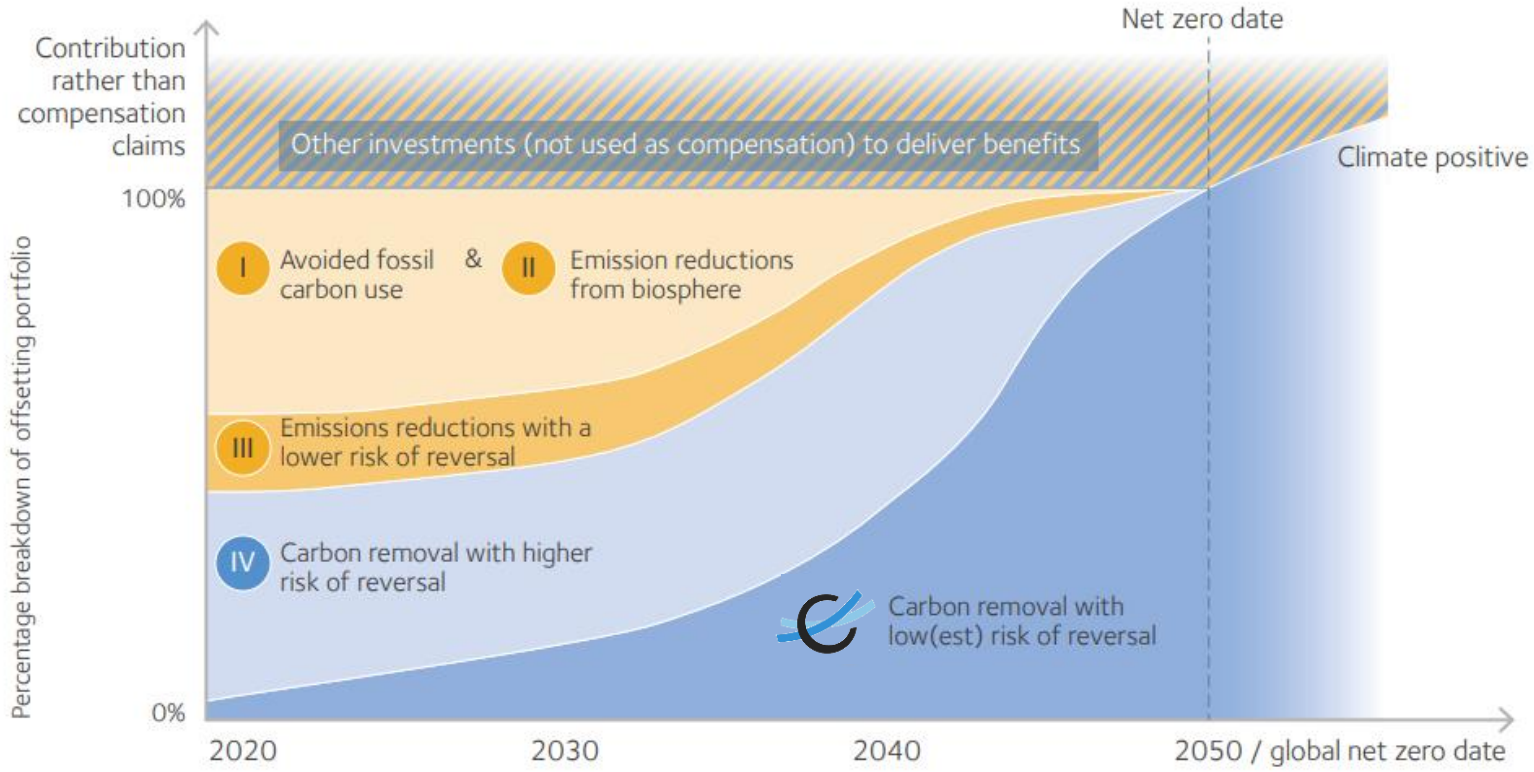
Even when avoidance offsets are well done, the **CO_2 emitted by Royal Unibrew remains**

SBTi encourages companies to **neutralize residual emissions with high quality CDR** by the net-zero year

Companies should disclose information such as intermediary **neutralization milestones and planned investments**

Revised Oxford Principles advocate for a shift towards durable carbon removal, starting today

Oxford principles for net-zero offsetting advocate for a shift from avoidance toward 100% permanent CDR over time – starting today



Source: Oxford Principles for Net Zero Aligned Carbon Offsetting (revised February 2024)

Key takeaways…

1. Buyers must **gradually increase the share of carbon removals** (vs. avoidance) in their net zero roadmap, **starting today**
2. Buyers must **shift towards removals with durable storage** (low risk of reversal) to compensate any residual emissions by the net zero target date
3. Buyers should **support the development of a market for high quality carbon removals** by, e.g., entering into long-term agreements, de-risking project finance, and collaborating with industry peers

Why carbon removal *now*?

The scale-up of CDR is critical <u>now</u> to minimize further permanent climate damage

Short term – minimize damage

CDR is critical now to **minimize climate overshoot**, as well as **avert significant damages** and Earth system tipping points

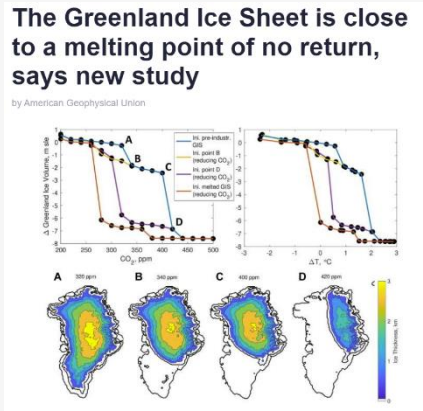
Medium term – achieve net zero

CDR will be crucial in unlocking net zero by **removing residual emissions** from sectors challenging to decarbonize

Long term – reverse climate overshoot

CDR will achieve **net negative emissions** and **reverse climate overshoot** by outpacing unavoidable emissions

Many Earth systems could pass a point of no return in coming years already

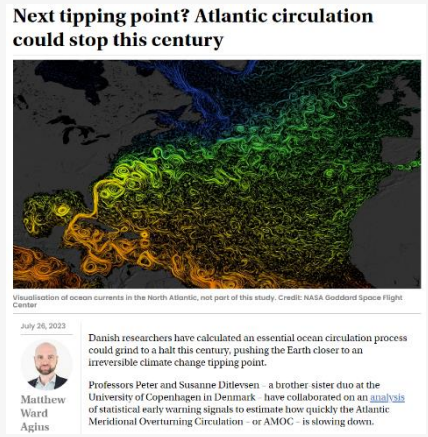

The Greenland Ice Sheet is close to a melting point of no return, says new study

by American Geophysical Union


South American monsoon heading towards 'tipping point' likely to cause Amazon dieback

'Shocking' study finds Amazon rainforest will be unable to sustain itself and transport moisture once 'regime shift' occurs

There have been three statistically one-in-100-year droughts in the Amazon in the space of a single decade. Photograph: Raphael Alves/EPA


Next tipping point? Atlantic circulation could stop this century

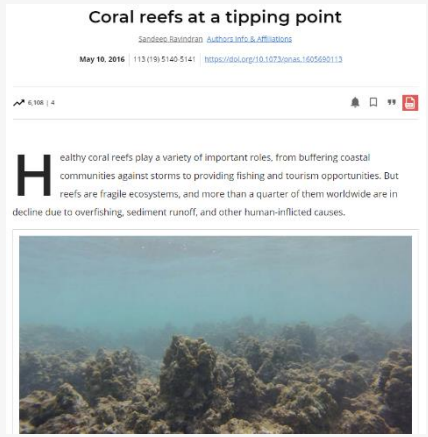
Visualisation of ocean currents in the North Atlantic, not part of this study. Credit: NASA Goddard Space Flight Center

July 26, 2023

Matthew Ward Agius

Danish researchers have calculated an essential ocean circulation process could grind to a halt this century, pushing the Earth closer to an irreversible climate change tipping point.

Professors Peter and Susanne Ditlevsen – a brother sister duo at the University of Copenhagen in Denmark – have collaborated on an analysis of statistical early warning signals to estimate how quickly the Atlantic Meridional Overturning Circulation – or AMOC – is slowing down.


Coral reefs at a tipping point

Sandeep Ravindran Authors Info & Affiliations

May 10, 2016 | 113 (19) 5140-5141 | https://doi.org/10.1073/pnas.1605690113

Healthy coral reefs play a variety of important roles, from buffering coastal communities against storms to providing fishing and tourism opportunities. But reefs are fragile ecosystems, and more than a quarter of them worldwide are in decline due to overfishing, sediment runoff, and other human-inflicted causes.

Source: ivl - The role of carbon dioxide removal in contributing to the long-term goal of the Paris Agreement; press research

Offtakes

Demand signals from companies

Public & private funding

Visionary investors & supply-side financing

4 key unlocks for CDR growth

Common standards, regulations, principles

A functioning market

Functioning supply chains, deployed technology

Project & tech development

climeworks

We remove CO_2 from the air and turn it into stone, permanently.

Climeworks is the trusted partner of CDR pioneers since, and is recognized as an innovation leader

We are trusted by 200+ pioneering partners, …

Selected examples

Microsoft · BCG · stripe · zendesk · JPMorgan Chase & Co. · Swarovski · Audi · The Economist · UBS · H&M Group · Mammut · Partners Group · shopify · Coldplay · LGT · Zurich

20k+ Individual pioneers[1]

… are recognized as innovation leaders, …

US Government · TIME 100 Most Influential Companies 2022 · MIT Technology Review 2023 Climate Tech Company to Watch · MIT · Climate Week NYC · TIME100 Climate · World Economic Forum · European Commission · CNBC Disruptor 50 2023

"Well, **I buy the gold standard**, […] Climeworks."

Bill Gates[2]

… and work with key voices, organizations & institutions.

Organizations/institutions

IPCC · RMI · VCMI Voluntary Carbon Markets Integrity Initiative · World Economic Forum · Science Based Targets – Driving Ambitious Corporate Climate Action · Bezos Earth Fund · United Nations Framework Convention on Climate Change · The Integrity Council for the Voluntary Carbon Market

Individuals

Katharine Hayhoe

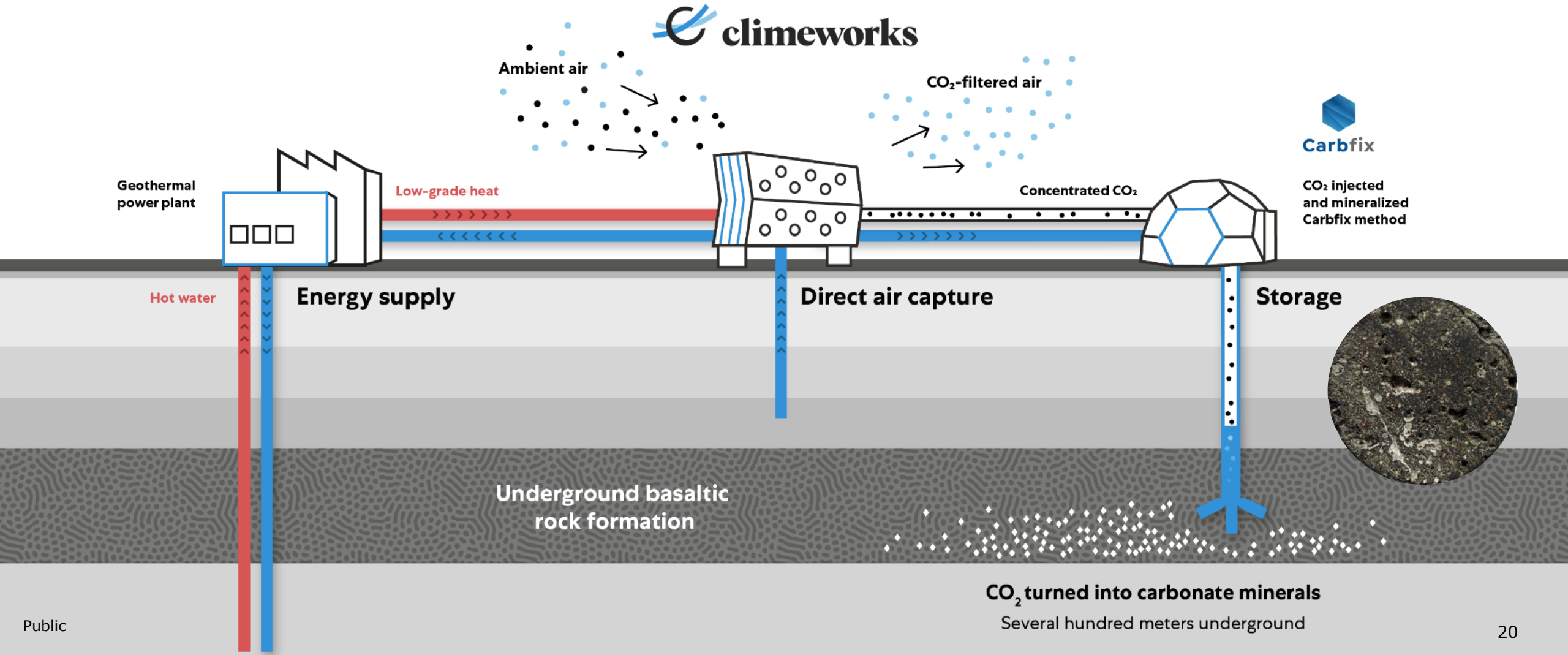
Johan Rockström

Robert Höglund

1. Individuals who support Climeworks 2. Source: Interview with BBC journalist Amol Rajan (2023)

What is direct air capture (DAC) and mineralization?

Energy supply, direct air capture and storage with Climeworks' Orca



World's first operating plants: megaton scale by 2030

Develop technology

Proven technology

2017

Switzerland - Hinwil

2021

Iceland - Hellisheiði

Scale up

Volume production

2024

Iceland - Hellisheiði

By 2030

USA - Louisiana

Hub 2 (Canada)

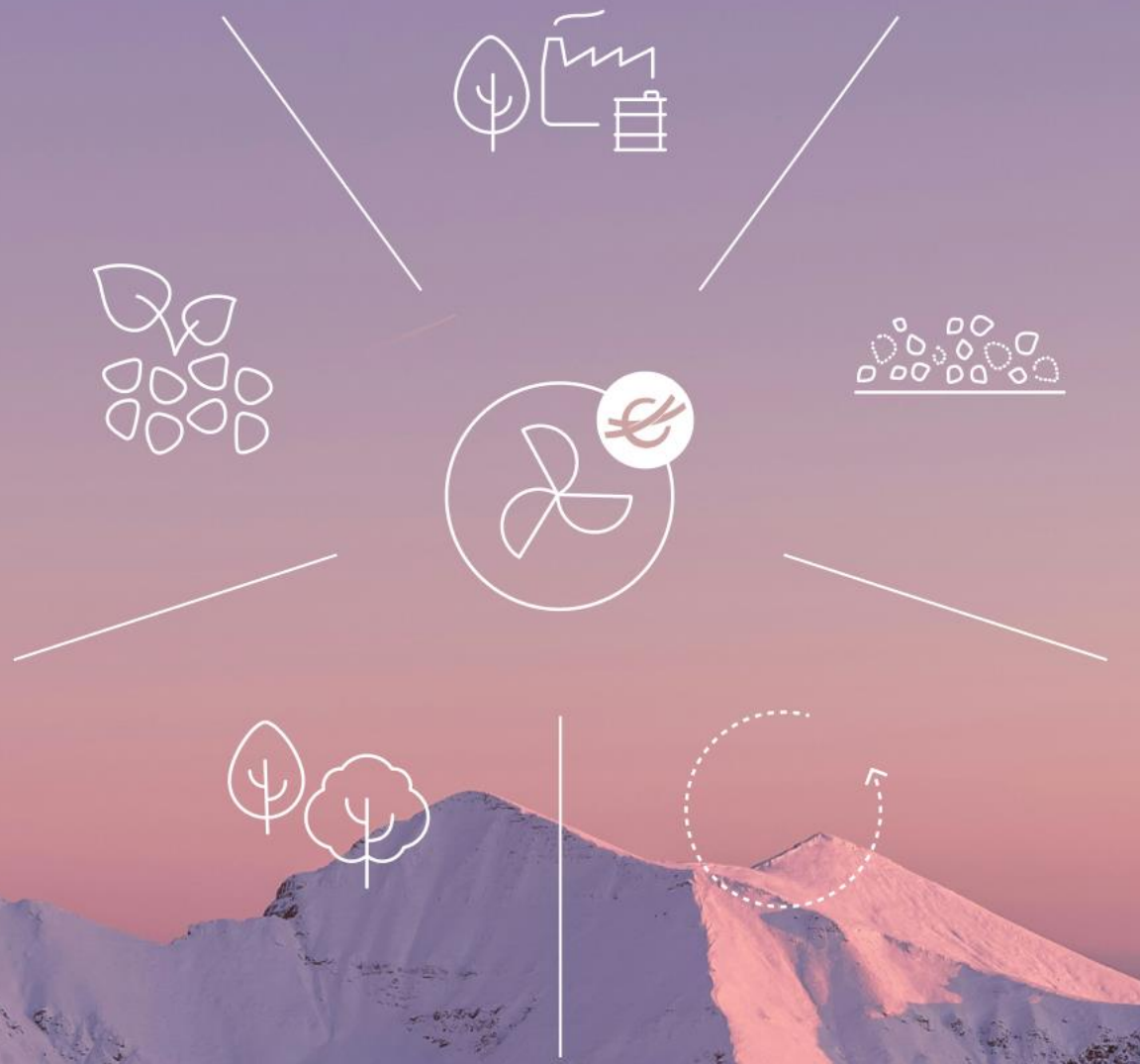
Hub 3 (e.g., Norway)

Confidential

Source: Company disclosure

This is where Climeworks comes in

Climeworks Solutions is now your provider for **holistic carbon removal portfolios**, uniting the **best-in-class suppliers** across **engineered and nature-based approaches** - including our cutting-edge DAC+S technology



Climeworks as your solution provider for high-quality CDR

Climeworks Solutions

Holistic CDR solutions uniting the **best-in-class suppliers across CDR technologies**

Uniquely tailored to your specific needs

In line with **climate science** and **regulation/standards**

Climeworks DAC+S

Highest-quality DAC+S, included in CDR portfolios

Multiple technologies need to work together to achieve the 6-16 Gt CO_2e/y target

	Global scaling potential by 2050[1]	Limiting factors for scaling
AF/RF	**0.5[3] - 3.6[4] Gt CO_2e/y**	**Competitive land use** for food production where 31% of total forest carbon storage potential lost due to urban areas, cropland and permanent pasture[5]
Biochar[2]	**2.6 - 6.2 Gt CO_2e/y[6]**	**Sustainable biomass sources,** competition with BECCS projects and availability of **suitable storage means/locations**
BECCS[2]	**3.3 - 7.6 Gt CO_2e/y[6]**	**Sustainable biomass sources,** competition with biochar projects and availability of **carbon capture and storage infrastructure**
EW	**0.5 - 2 Gt CO_2e/y[7]**	**Agricultural land** used for deployment and supply of **EW material**
DAC	**5 – 20 Gt CO_2e/y**	**Renewable energy** sources and availability of **carbon capture and storage infrastructure**

1. CDR potential is smaller due to losses from capture to removal; 2. Scaling potential assumes no competition from biochar/BECCS
Sources: 3. van Minnen, Jelle G., et al. "Quantifying the effectiveness of climate change mitigation through forest plantations and carbon sequestration with an integrated land-use model." Carbon Balance and Management 3 (2008): 1-20; 4. Houghton, Richard A., Brett Byers, and Alexander A. Nassikas. "A role for tropical forests in stabilizing atmospheric CO2." Nature Climate Change 5.12 (2015): 1022-1023.; 5. Mo, Lidong, et al. "Integrated global assessment of the natural forest carbon potential." Nature (2023): 1-10; 6. Nat Commun 1, 56 (2010); 7. Beerling, David J., et al. "Potential for large-scale CO2 removal via enhanced rock weathering with croplands." Nature 583.7815 (2020): 242-248.


You reduce what you can. We remove what you can’t.
www.climeworks.com

climeworks

Remove to zero

Are you ready to join
our mission to Net Zero?

Climeworks – We remove the CO_2 you can't reduce

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