



Climeworks' DAC Summit Highlights

June 30th 2022



Intro



I am very convinced that we will be achieving **multi-megaton scale by the end of this decade**. Because we are already out there, **collecting experience on the field**. This makes us stronger with every step that we are taking.

Dr. Christoph Gebald



In the alarming context of the climate crisis, the IPCC is clear: direct air capture (DAC) has a key role to play. Carbon dioxide removal (CDR) methods like DAC and storage (DAC+S) must be enabled at **gigaton scale** to help limit global warming to 1.5°C.

Climeworks closed a record equity round of USD \$650 million in 2022 that enabled **the groundbreaking of its newest and largest direct air capture and storage (DAC+S) facility, Mammoth**. Designed for a nominal CO₂ capture capacity of 36'000 tons per year, Mammoth represents a demonstrable step in Climeworks' ambitious scale-up plan.

Climeworks' roadmap splits into two parts: scale-up in iterations towards a robust **multi-megaton capacity** by 2030. Then, onwards to **gigaton capacity** through large-scale global deployment by 2050.

For this to become a reality, USD 30 to 50 billion must be invested per year from 2030 onwards to build up capacity. This represents **10% of the annual investments made into renewable energy capacity today**: it is achievable, yet government support, in close cooperation with the private sector, is required to help catalyze this level of investment.

The green energy requirement to power DAC facilities will be the second factor influencing this large-scale deployment. Conservative projections add up to 25GW of wind and solar capacity necessary per year from 2030 onwards. This represents roughly **10% of the installed capacity in 2021**, or 3% of the annual capacity projected as of 2030.

The gigaton target is ambitious, but the numbers are clear: it is doable. To make this happen, corporate action, investments, policy shapers and regulatory guidelines need to come together.

Dr. Christoph Gebald and Dr. Jan Wurzbacher, Climeworks



Key insights

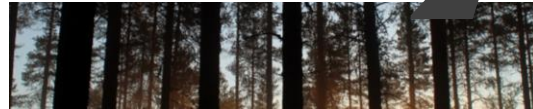


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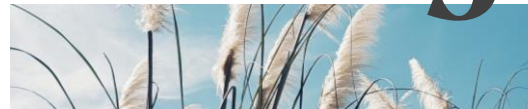
Drastic emissions reduction is a priority, yet not sufficient. **A CDR industry with multi-gigaton capacity is required to hold the 1.5°C line** – the IPCC made it clear.

2



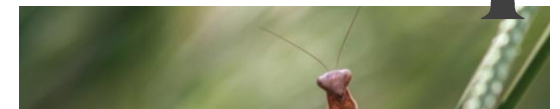
More clarity is needed to **differentiate between conventional carbon offset credits and high-quality CDR solutions such as DAC+S**. Education is important to strengthen clarity and consistency.

3



The massive scale-up needed can be done. Renewable energies have a proven track record: strong annual capacity growth, **modular design yielding fast learnings** and a drastic cost decrease over a few decades.

4



On top of a great traction from the voluntary market, **policy support is essential to incentivize demand, enable investments, and build infrastructures** towards high-quality CDR solutions.

5



High standards and independent certifications are needed to ensure the focus is on high-quality solutions. Factors such as **permanence and additionality are key**.

6



Corporate action is essential and time-critical. **Businesses with net-zero commitments need to integrate high-quality CDR offtake agreements** in their portfolio to send strong market signals.

7




While DAC represents an attractive opportunity for investors, significant investments are still to be made. To accelerate this, **projects need to be bankable**; decreasing the technology risk over time is a key factor.

8



CDR providers must be enabled to rapidly pilot their solutions commercially to learn, improve, and show their ability to **supply high-quality CDR volumes at scale**.

The moment of truth



The IPCC now recognizes the **drama of the climate crisis**. We've reached 1.2°C of global temperature rise and we are moving to a path that would take us to up to 2.4 – 2.5 °C by the end of the century.

1.5°C is not an arbitrary number, but a real climate planetary boundary where we shift from moderate risks to high risks **of destabilizing the entire planetary system**.

It is urgent to remove the CO₂ and the greenhouse gases that are causing the warming in the first place. It's not only about phasing out CO₂ and fossil fuels-based emissions. It's also about securing the resilience of the carbon sinks. It's not only reducing emissions, but also repairing the Earth system.

A massive effort is required for rapid decarbonisation. We need to cut emissions by around 7% per year – a revolutionary pace.

To support the resilience capacity of the Earth system, we need to remove between 12 and 15 gigatons of CO₂ per year. We must reach that scale in one generation.

Prof. Dr. Johan Rockström



How do we get the DAC industry faster at scale?

As well as coordinating the ecosystem, we need to **embed CDR in the wider climate conversation**. Both to look for opportunities and to ease fears.

CDR goes along other climate actions, like the phase out of fossil fuels investments, the required 7% reduction of emissions or the protection of existing sinks and rainforests.

This is a moment of truth. We have an **immense challenge and an immense opportunity** ahead of us.

Dr. Gabrielle Walker

DAC as an effective CDR solution



DAC is a time machine. It can do the things we wished we'd done in the past. You're the only one who can go backwards in time.

Paul Judge, GE Renewables



Most of the carbon market today is made of low-quality carbon offsets that we need to move away from. We need to create the standards and the momentum around **high-quality CDR that should take over the majority of that market.**

Dr. Clea Kolster, Lowercarbon Capital

It's about net negativity: more CO₂ must be removed from the atmosphere, with scientific validation.

Dr. Lucas Joppa, Microsoft



We are facing a massive three-way clash for land and ocean on the planet. We've got a growing population. We need more land for food, so we need a food revolution. We need to restore land for biodiversity. We need biofuel to decarbonize but that is increasing land demand. **One of the great things about DAC is that it is very land efficient.**

Keith Tuffley, Citi





Learnings from the renewable energies industry



From thousands to billions of tons of CO₂ removed in 2050, it needs a massive scale-up. Yes, solar grew 30% a year for 30 years. But **we need to go faster, with 45% a year to get to billion tons in 2050.**

Let's get inspired by solar. **The US created the technology, Germany created the market and China made it cheap.** The international flow of people, capital and machines was crucial to make it happen.

DAC needs to go faster. **When the Germans were thinking in megawatts, the Chinese were thinking in gigawatts.** That's the thinking we need.

Prof. Dr. Greg Nemet

15 years ago, the wind industry was viewed as mature. More expensive than gas, we needed subsidies. There were lots of believers in what we were doing and a lot of problems to solve.

From that very mature space, **we've come down 70% in costs in the last 10 years. And did this by solving a series of small problems.**

Modularity is essential. Incrementalism is not always the most exciting, but it allows steady scaling, which is very important to build trust.

Paul Judge, GE Renewables





Time to enable

A call to policymakers

Policy makers often don't understand the difference between the solutions. Whether it is DAC+S, CCS or CCU - they think it's removal. **We need clear standards. Otherwise, it might look good on our books but not for the climate.**

Dr. Oliver Geden, SWP

You need to create expectations through policies that there will be large and growing markets in the future, that are strong, clear and credible.

That takes away the risk and leads to private investment in scaling up. It leads to people orienting their careers and starting new businesses.

Prof. Dr. Greg Nemet

We need people to understand and feel that we need CDR. We need so much political will behind this, that **policy does not have a choice but taking climate action.**

Eli Mitchell-Larson, Oxford and Carbon Gap



We need **clear standards to differentiate between low-quality offsets and high-quality CDR.** This involves pricing high-quality credits efficiently by rewarding **permanence, clear additionality, clear verification and approaches that value things like land efficiency and environmental justice.**

When we think about how to support the scale-up of DAC, it's about

supporting the development of infrastructure that will be needed to support the industry's growth - from new renewable energy projects, to additional CO2 storage, and more robust supply chains for concrete, steel and sorbents. **We need policymakers to develop the infrastructure now, ahead of the rapid growth of this industry in the coming years.**

Shashank Samala, Heirloom



Time to act

A call to the voluntary market



If you have a net zero target, you already said yes to CDR. Because otherwise it would only be a zero emission target, not a net zero emission target.

Dr. Oliver Geden, SWP



We have to start today.

Looking at the science, it became clear that there weren't many solutions without removing CO₂. And we started to worry about who was going to do that - we couldn't wait until 2050 to then mature the market. Someone had to start now.

If you can include CDR in your strategy, please do so. It doesn't have to be 100%. And you can start growing it. Whatever you can put in CDR today is going to be worth it.

If you think the climate crisis is just the crisis of the day and in 5 years no one is going to be talking about it - then CDR through DAC is a bad deal. But if you actually believe that **the climate crisis is the crisis of our generation and our species**: then there is no way CDR purchase is a bad investment.

Dr. Lucas Joppa, Microsoft

The voluntary market was crucial for solar. None of the early supporters had policy supporting their investment.

It was people who preferred to have off-grid homes, people who wanted to pay more because they favored some attributes of the technology.

This was very small scale, on individual level or company level.

Even with limited volumes, this did get things started.

Prof. Dr. Greg Nemet

Time to scale

A call to CDR developers



Build volume

We drastically need to **scale CDR supply at an exponential rate.**

Anders Porsborg-Smith, BCG

Get pilot projects going. See how they work at scale, review their business models.

Christian Holzleitner, EU Commission

We are not moving fast enough. Companies can't find the offer of CDR at the scale they would be hoping for.

Bas Sudmeijer, BCG

The focus needs to be on **volume. Price will follow.** The market is too early to let price be a significant signal.

Dr. Lucas Joppa, Microsoft



Work together

We will set up an expert group and **talk about the certification methodology together** to establish the best one globally, one that can be trusted by all stakeholders.

Christian Holzleitner, EU Commission

We **need robust infrastructures** to really scale the CDR market. With that, millions of customers will be able to buy carbon credits, achieving emissions reductions at scale.

Dominique Barker, Carbonplace

From talents to capital, **all need to cohesively come together to build the ecosystem.** There is no chance for just one solution to solve the challenge alone, partnerships are needed.

Jonathan Goldberg, Carbon Direct



Catalyze investment

"In order to **attract bank lending**, Carbon Dioxide Removal projects can minimize risk by demonstrating that their technologies work as expected at a **commercial scale.**"

Allison Fleming, J.P. Morgan

Fixed price, long contracts, high credit for the off-takers: if you have that, finance will be thrilled to invest. And that can come from a deployment incentive from governments.

Eli Mitchell-Larson, Oxford and Carbon Gap

There has **never been a better time** to found a DAC company.

Dr. Clea Kolster, Lowercarbon Capital



**Thank
you**



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