Financing Carbon Dioxide Removal

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Agenda

01 Why and what?

02 Role of financial institution?

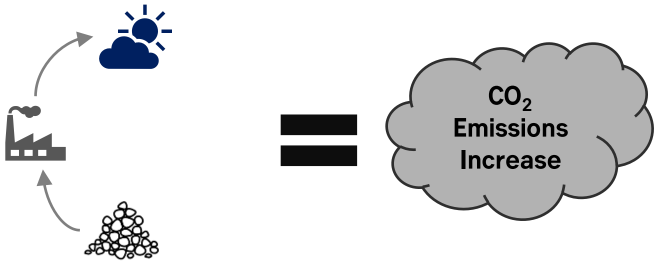
Corporate journey toward net-zero emissions

Rapid emission reduction and removal of hard-to-abate emissions following science-based trajectory

Abatable emissions: Carbon emissions from coal, oil or natural gas

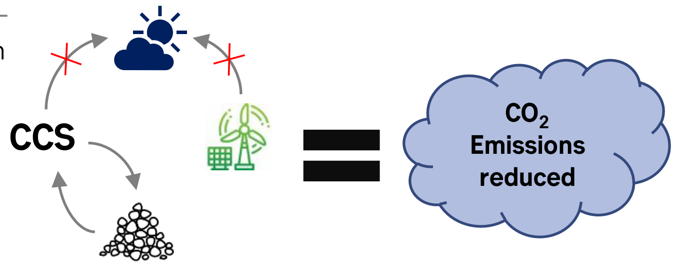
Status Quo

- Emissions from fossil fuels like coal or natural gas increase CO_2 in the atmosphere



Step 1 Reduction of abatable emissions

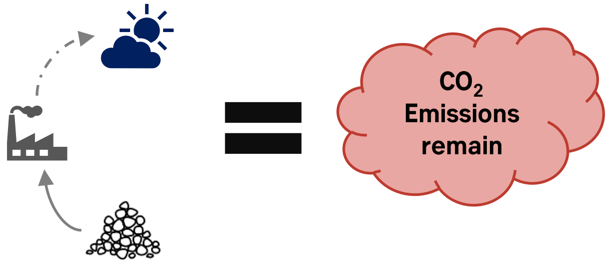
- Switching fossil fuels to clean energy lowers can help reduce CO2 emitted to the atmosphere
- Capturing fossil CO_2 reduces emissions but does not lower the CO_2 concentration in the atmosphere



Hard-to-abate emissions: Emissions that cannot be feasibly reduced

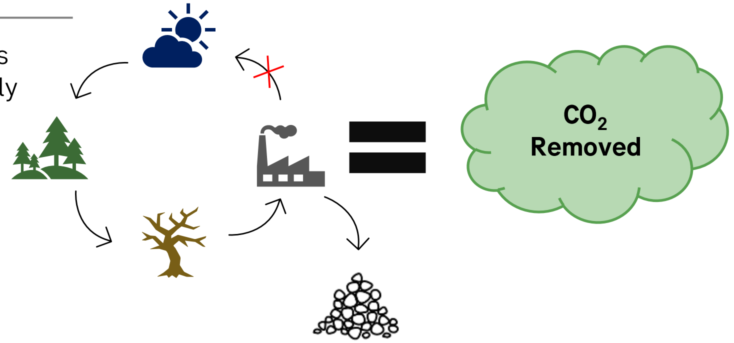
Step 2 Hard to abate emissions remain

- A small share of emissions cannot be fully reduced due to economic or technological barriers



Step 3 Removals to neutralize hard-to-abate emissions

- E.g. if biogenic emissions are captured and durably stored, CO_2 is removed from the atmosphere[1]

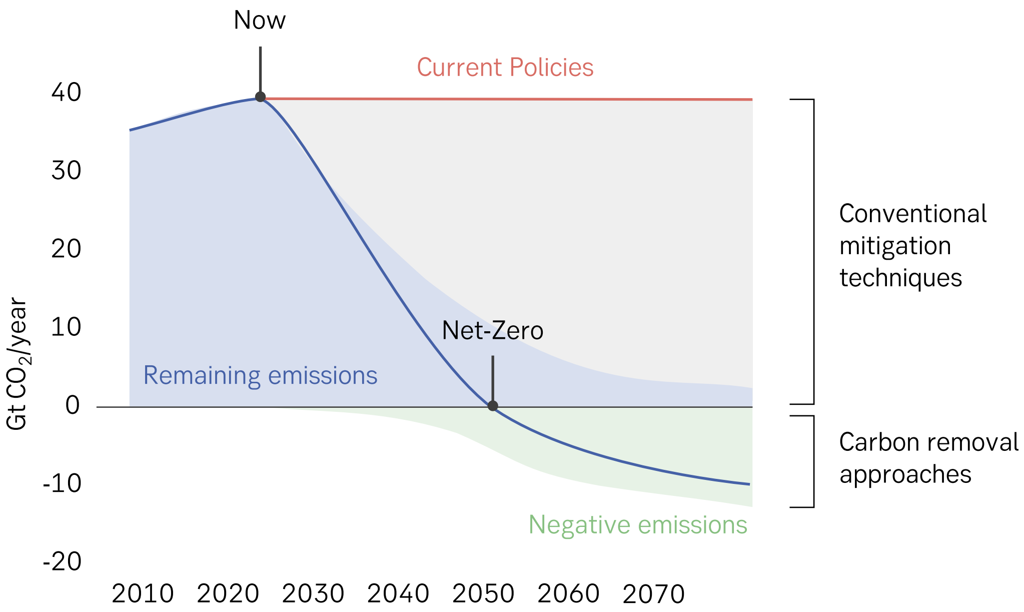


1. Sustainable management of biomass feedstock is required to achieve carbon removals

Carbon dioxide removals are critical to reach net-zero

Limiting warming to 1.5°C requires approx. 6Gt CO_2 of CDR annually by 2050[1]

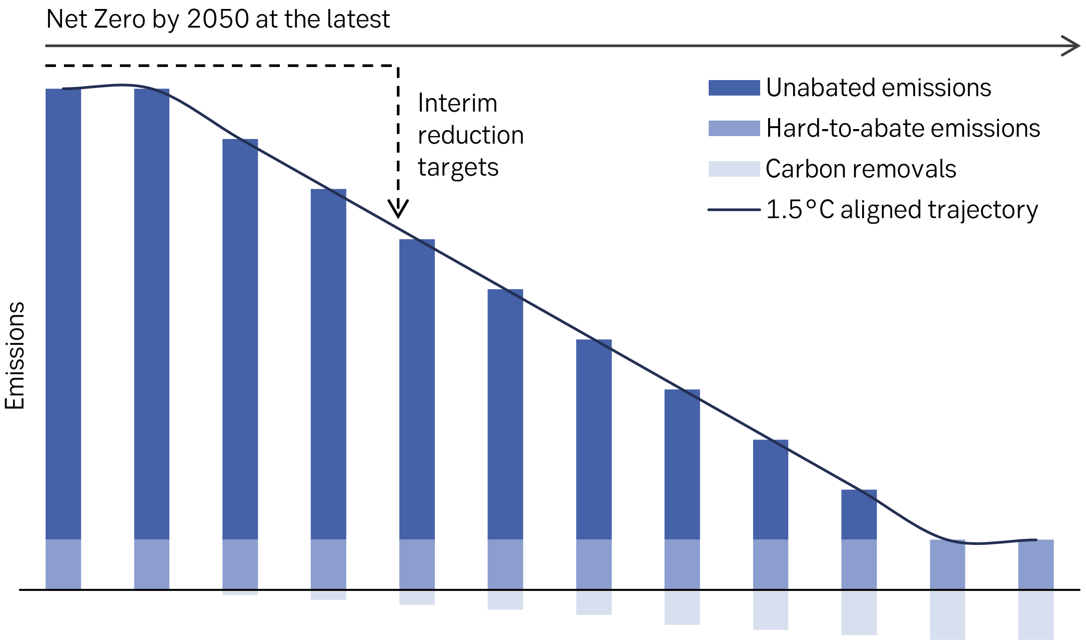
- All of IPCC's (Intergovernmental Panel on Climate Change) scenarios that meet the goals of the Paris Agreement include removals
- The IPCC considers removals as "unavoidable" to achieve net zero emissions



Source: World Resources institute, based on IPCC (2018) and Climate Action Tracker (2021)

Carbon removals – an indispensable part of any corporate net-zero strategy

- Science Based Targets initiative is one out of many net-zero standards that require carbon removals to neutralize residual emissions[2]
- The voluntary carbon market will shift towards carbon removals as companies move to achieve their net zero targets

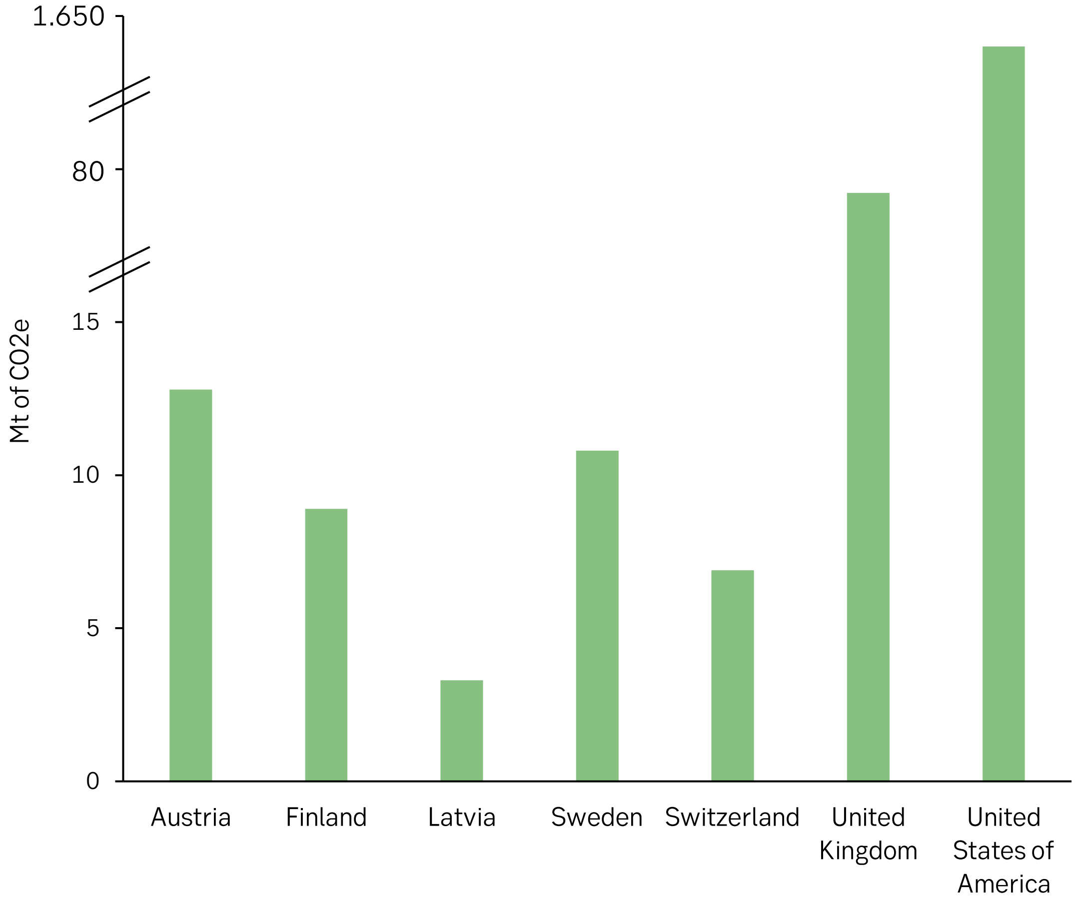


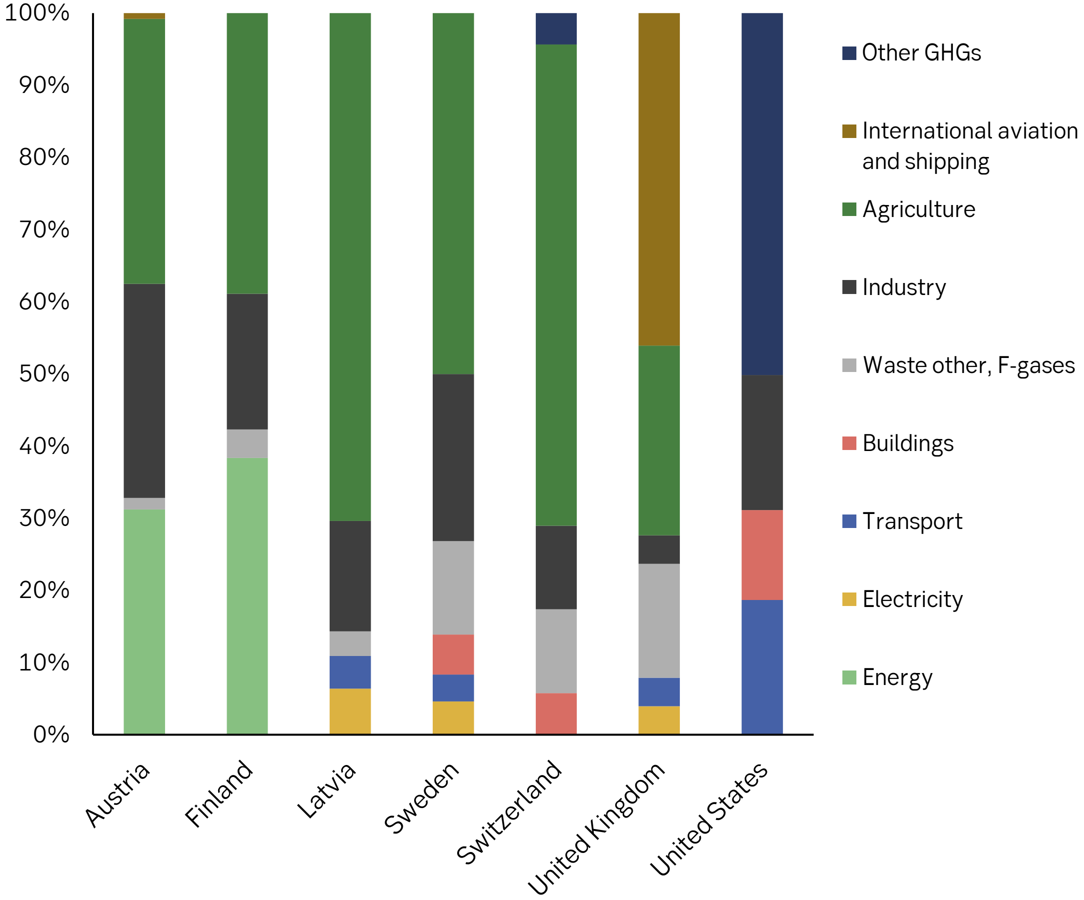
Source: SEB assessment based on SBTi Net Zero Standard

1. SEB assessment based on IPCC – Assessment Report 6.WGIII. Chapter 12, 2021 and The State of Carbon Dioxide Removal – An independent scientific assessment of Carbon Dioxide Removal 1st Edition, 2023
2. SBTI – Corporate Net-Zero Standard, 2023

Residual emissions by country and sector[1]

Billions of tonnes of GHG emissions from energy, industry, transport and agriculture will likely remain in 2050





1. Nature Climate Change, Why residual emissions matter right now, 2022

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Performance criteria for evaluating CDR solutions

Building a CDR strategy entails trade-offs – buyers may want to maximize climate impact and minimize greenwashing risks at the best possible price

Feasibility

Technical: Technological maturity of carbon removal solutions

Economic: Price and affordability of carbon removals technologies

Governance: Incentives and barriers to deployment, including MRV, regulations and public acceptance

Climate Change Effectiveness

Effect: Net-effect on climate, considering the likelihood of realizing removals and reversal risks and changes in albedo

Timeliness: Ability to remove carbon within the necessary timeframe to materially contribute to mitigating climate change

Durability: Permanence of carbon storage assuming no premature disturbance

Side impacts

Environmental: Negative and positive impacts on e.g. land- use and biodiversity

Economic: Negative and positive Impacts not directly related to removal cost such as diversification opportunities or impact on food prices

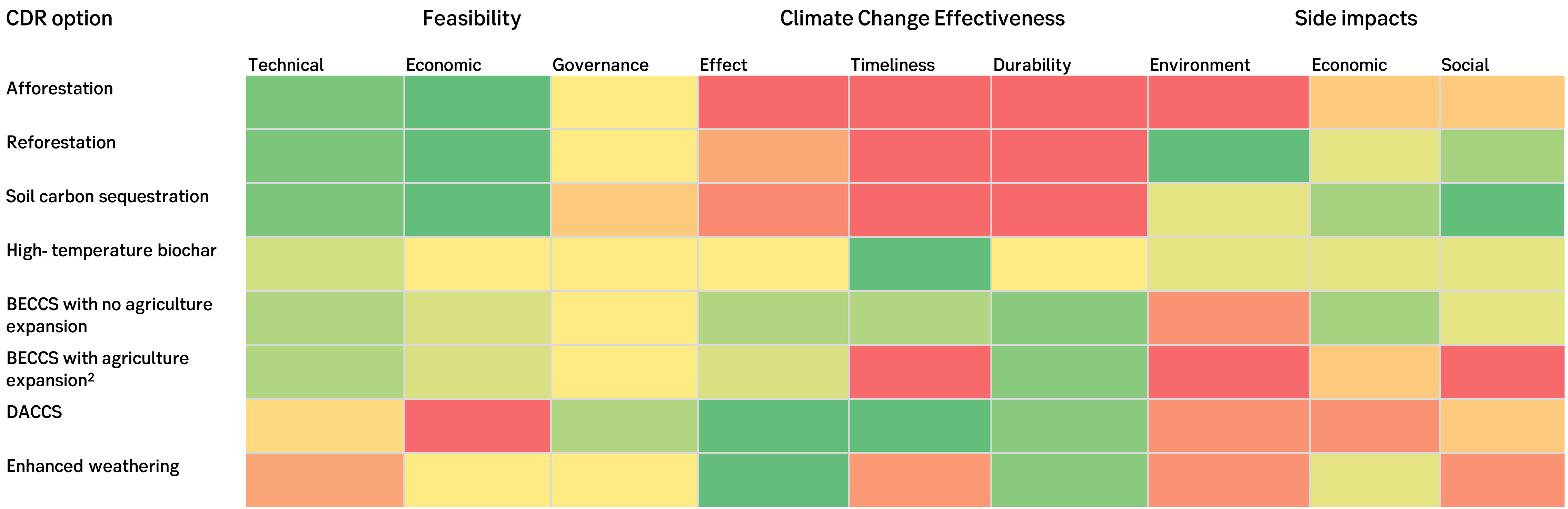
Social: Negative and positive impacts including climate change adaptation, income and energy security of local communities

All CDR credits should be additional – meaning that revenue from credits are crucial for the viability of removal projects

1. SEB assessment based on WBCSD Removing carbon responsibly 2023

CDR heatmap – analyzing different CDR options[1]

Dark red indicates worst performance and dark green indicates best performance



Different options have its certain drawbacks and benefits.

1. SEB assessment based on WBCSD Removing carbon responsibly 2023
2. Avoiding agriculture expansion to produce feedstock biomass essential to prevent negative social and environmental impact.

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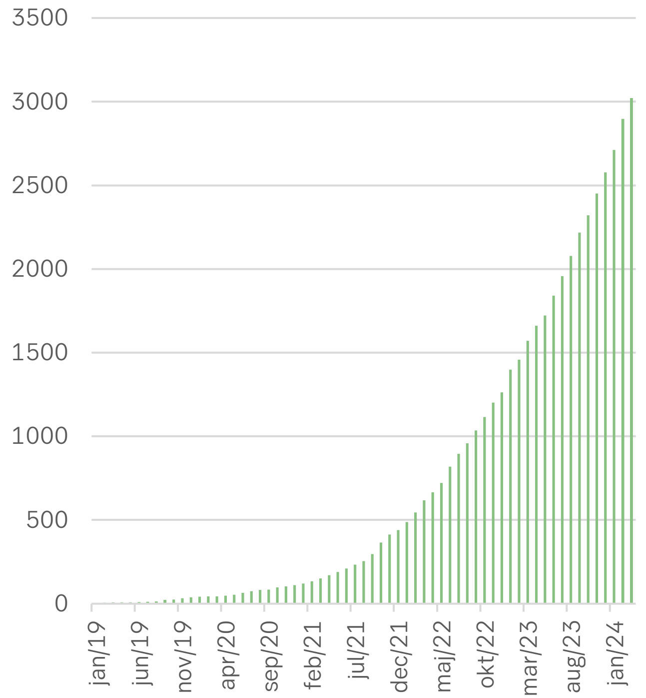
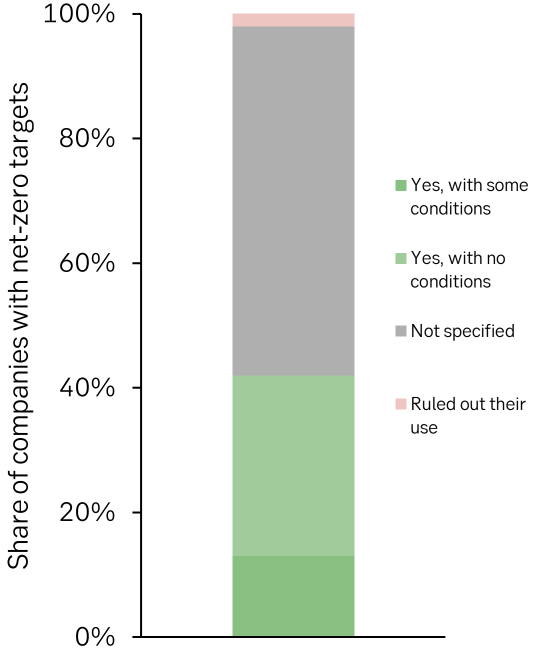
Demand for durable removals expected to vastly outstrip supply

Standards require that only permanent removals can neutralize residual emissions for a valid net-zero claim

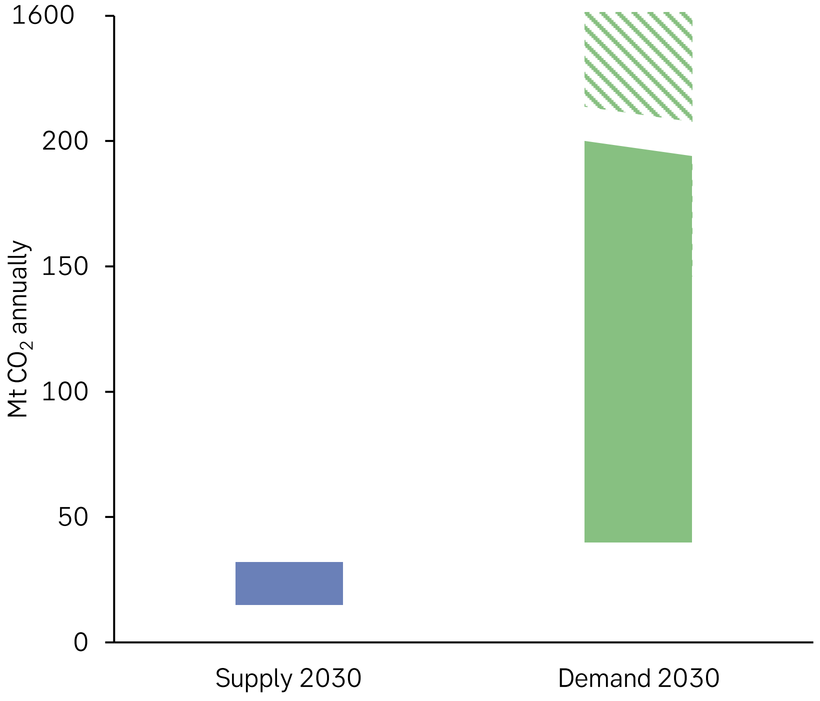
More than 3 000 companies have set net-zero targets[1]



Many of those are planning to use carbon credits to achieve their committments[2].



This will lead to a massive demand/supply imbalance[3]



Given future supply constraints corporates can act today to secure a portfolio of carbon removals with high climate change effectiveness

1. Science Based Target initiative – Data from Jan 2019 – March 2024
.2. The Net Zero Tracker, Global Stocktake report, June 2023. Sample consists of 929 companies with net zero targets. Please note that two different surveys are presented on this slide . Conclusion on SBTi approved companies' willingness to use carbon credits for net zero fulfilment should be done with caution.
3. Durable removals include BECCS, DACCS, enhanced weathering and ocean alkalinity enhancement. Boston Consulting Group – *The Time for Carbon Removal Has Come.* September 2023. Based on BCG Durable CDR Buyer Survey, July 2023, 113 respondents

Description of hedging process

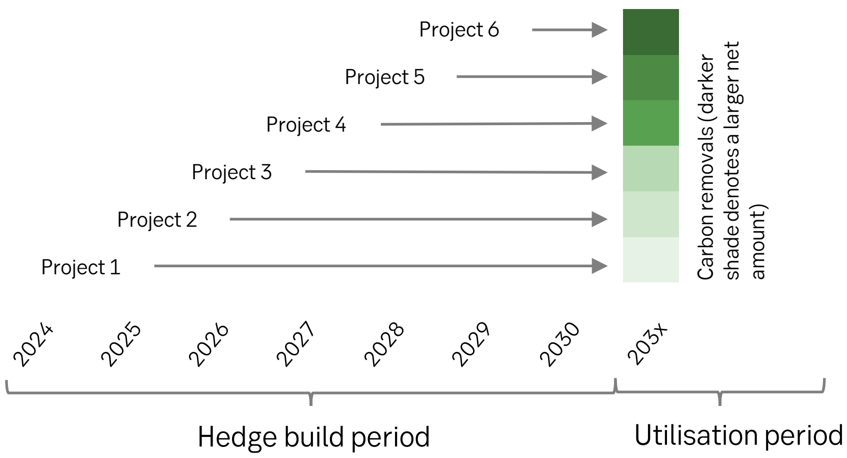
Step-by-step process that slowly builds up the hedging ratio by buying removals from individual projects either in the primary or secondary market using forward contracts

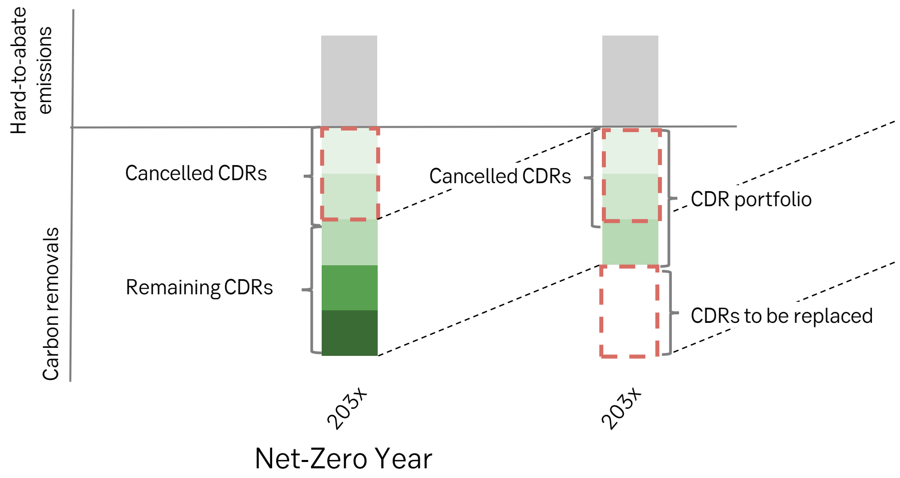
Build carbon removal portfolio

- To neutralize their hard-to-abate exposure buyers should start building up removal portfolio by accumulating carbon removal credits using forward contracts.
- By starting the process of locking in removals at an early stage the hedger can accumulate the required amount of removals not only to remove the first year's hard-to-abate emissions but also start building up the volume for future years' emissions.
- This not only reduces the overall risk but also provides time and technology diversification as the entire exposure is not hedged at one time using one project/technology.

Start utilising removals

- Starting from the "net-zero year", carbon dioxide rights (CDRs) are retired to neutralize the hard-to-abate emissions for a given year, reducing the size of the removal portfolio by an equivalent amount with the remaining CDRs banked i.e. remain on the balance sheet for future use.
- The retired CDRs will need to be replaced either through CDR deliveries from existing projects or through new projects.
- Managing this replacement risk is very similar to managing a corporate debt profile with attention given to the maturity profile and clustering risk i.e. avoiding the need for larger replacements in any given year.





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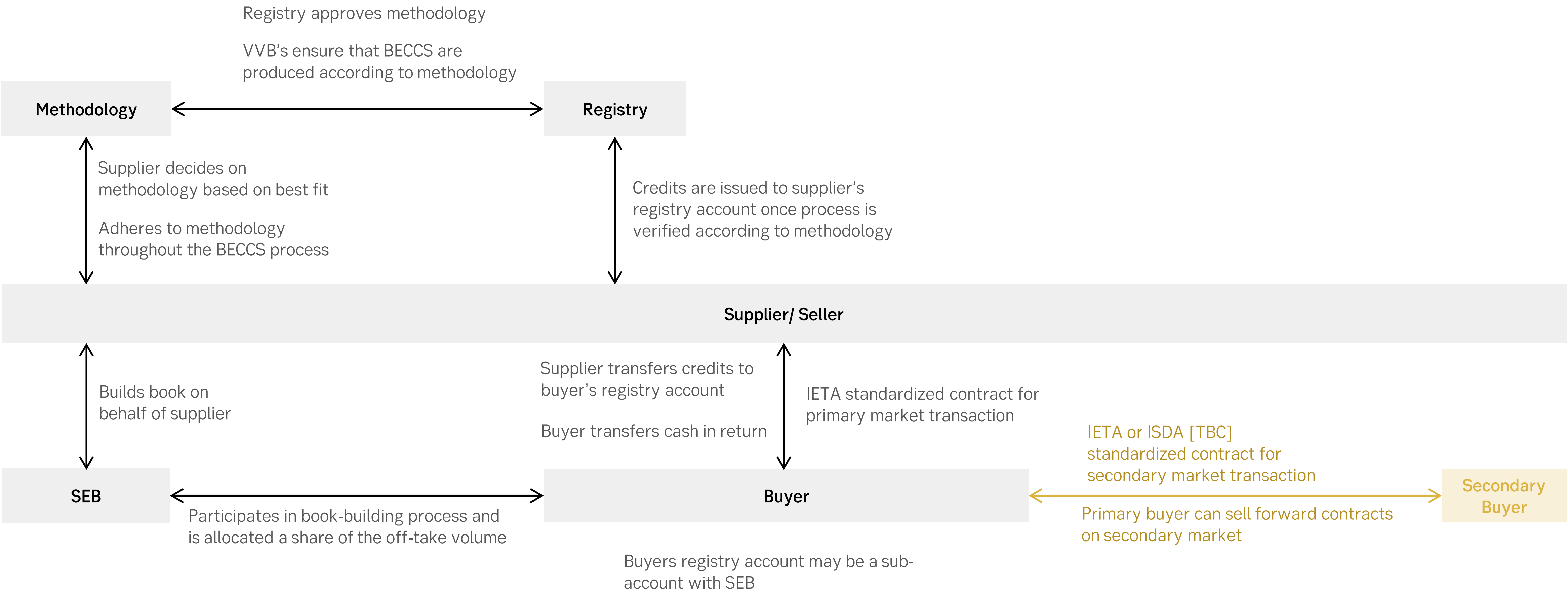
Indicative market illustration of CDRs

"Who is who" and the different potential market participants on the primary and secondary markets



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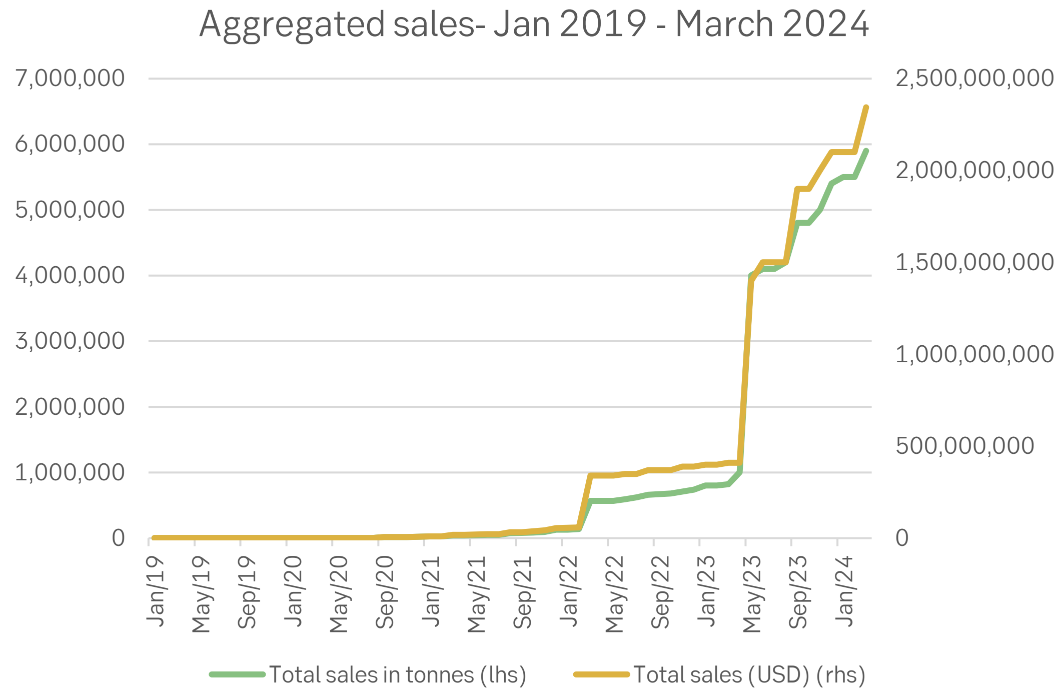
Carbon Removal Market – Market insights – April 2024

2.3bn	5.9m	347	3087
Spent on CO2 removal (USD)	Tonnes of credits sold	Number of purchasers	SBTi net-zero commitments



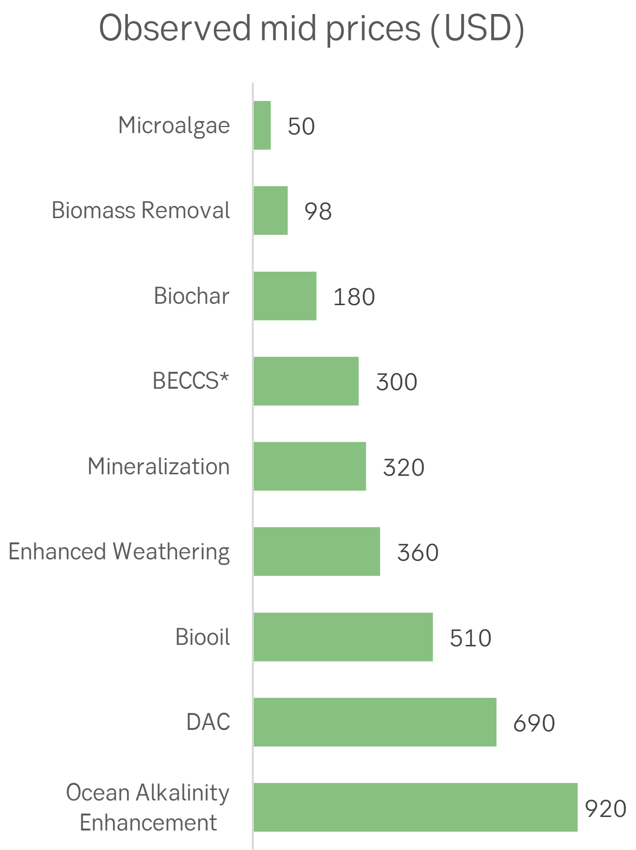
Data sourced from cdr.fyi and Science Based Target initiative. CDR survey sourced from cdr.fyi

Recent CDR news

- **EU Plans Big Scale Up of Carbon Removals to Reach Climate Neutrality** – By 2050, as much as 114 million tons of industrial carbon removal p.a.
- **EU Carbon Removal Certification Framework** agreed
- **End-to-end guidance on use of carbon removals** for Net Zero commitments presented by GHG Protocol, SBTi, ICVCM and VCMI

Takeaways for buyers

- **5 most important factors** when choosing a durable CDR supplier: 1.Price 2. Durability 3. Additionality 4. Boost new technologies 5. Proven safety of method
- **Majority of buyers will scale up** purchases until 2030 and beyond
- **More than 30 % of buyers** are willing to pay more than $250 for durable CDRs



* Two transactions logged in cdr.fyi database: Ørsted, heavily subsidized by Danish state. Volume 2.760 000 tonnes; CO_2 Energie | Regionalwerke AG Baden. Volume 21 800 tonnes. Sold for 10 mm CHF (avg. 458 CHF) according to the climate company (South Pole)

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