



“Reduce, reduce, reduce
... and remove the rest”

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On the critical role of carbon removal and how companies can use it smartly

An educational slide deck from CEOs to CEOs,
November 2021

Preread version - fully annotated, no speaker notes

Developed by the Alliance of CEO Climate Leaders' Carbon Removal Action Group with contributions of members of the Forum's Global Future Council on Net-Zero Transition

“Reduce, reduce, reduce
... and remove the rest”

On the critical role
of carbon removal
and how corporates
can use it smartly



To limit global warming to safe levels in line with the Paris Agreement, science calls for three things:

- | | | | |
|---|------------------------------------|---------|--|
| 1 | Halve emissions by 2030: | Reduce! | ... and in parallel start the timely scale-up of carbon removal |
| 2 | Net-zero emissions by 2050: | Reduce! | ... and balance any residual emissions with carbon removal |
| 3 | Net-negative emissions after 2050: | Reduce! | ... and remove up to 5-20bn tonnes of CO ₂ every year |



The [carbon removal landscape](#) spans across nature-based, hybrid, and technological solutions



Nature-based removals are ready now, but [quality is key](#). and they won't do the job alone: [Technological solutions are needed over the long-run](#).



How can companies use carbon removal credibly? “Net-zero” means focus on reductions and ramp up removals. On top, help others to reduce as well.



How can companies use removals smartly?

Concerted action and a balanced mix today prevent high price in the future

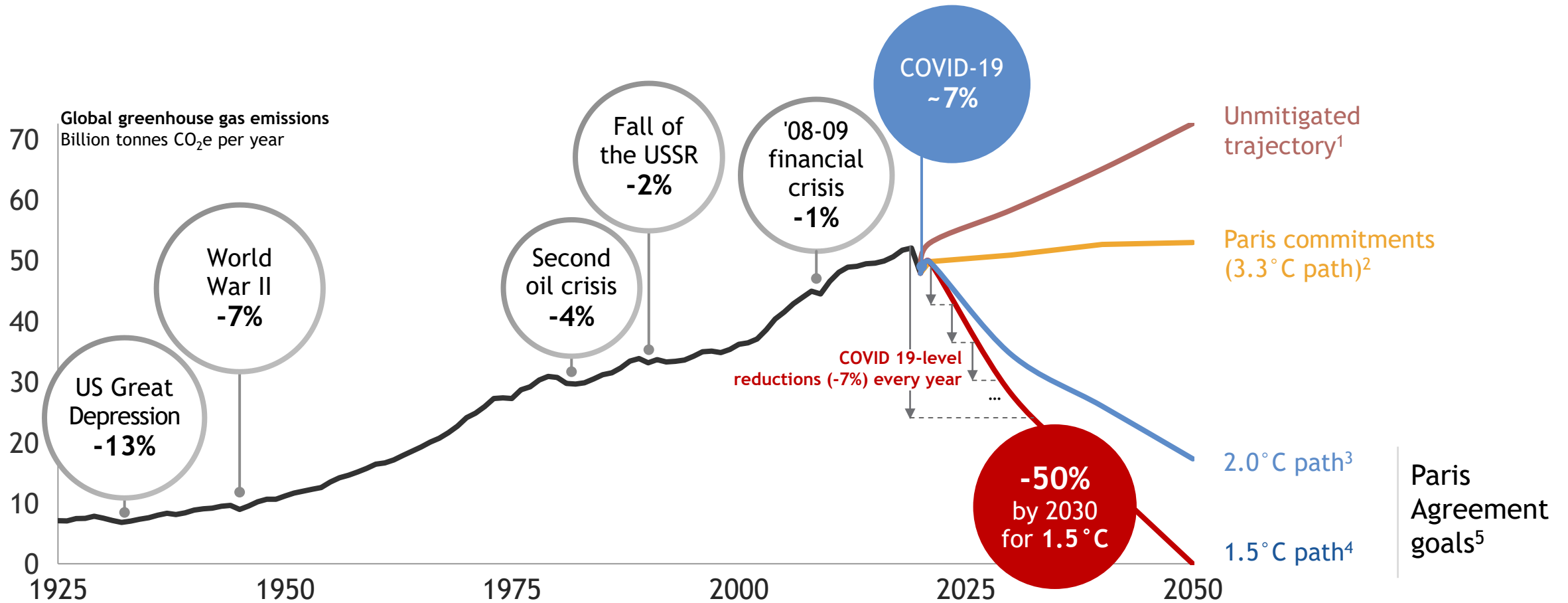


The Group worked to [facilitate access to impactful removals](#):

- Best-practice [Procurement Guide](#) for high-quality nature-based removals
- Tech-removals buyers club “[NextGen Carbon Removal Purchase Facility](#)”

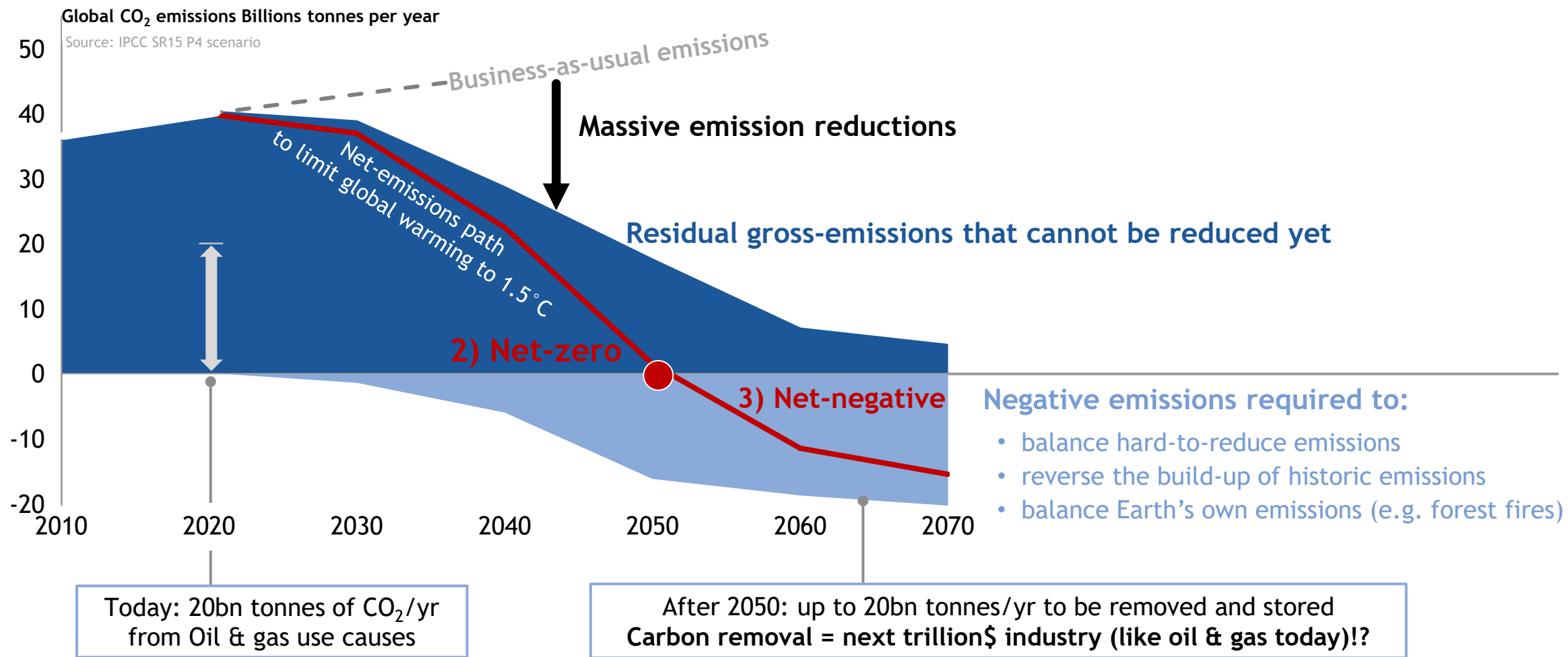
To achieve Paris Agreement goals, we need three things:

1) halve emissions by 2030 - equivalent to COVID-19-level reduction of 7% every year

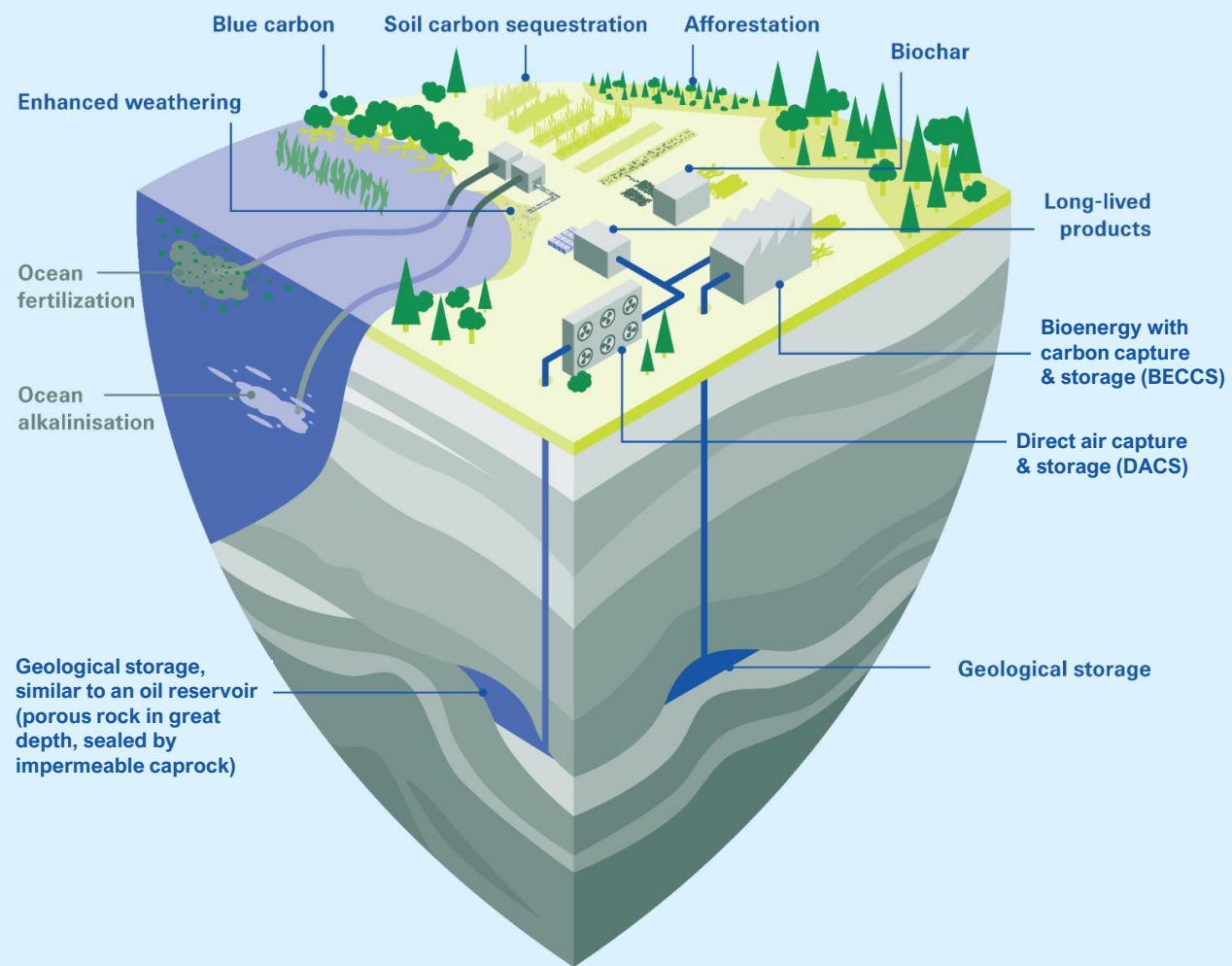


Note: As of Mar 31, 2021. These figures exclude land use, land-use change, and forestry
 1. Assumes GHG emissions rebound and grow from 2020 at the same rate as the current policies scenario in UNEP 2019 Gap report to 2050 (1.1% CAGR). 2. Assumes countries decarbonize further at the same annual rate required to achieve their INDCs between 2020 and 2030. 3. Assumes 25% reduction by 2030 and net-zero by 2070. 4. Assumes 45% reduction by 2030 and net-zero by 2050. 5. Paris Agreement goals are to limit global warming to 2.0°C, preferably 1.5°C, while Paris commitments are emission reductions commitments from individual countries
 Source: EDGAR 5.0; FAO; PRIMAP-hist v2.1; Global Carbon Project; IPCC; UNEP Emissions Gap Report, WRI; Climate Interactive; BCG analysis

- 2) net-zero emissions by 2050
- 3) net-negative emissions after 2050 with up to 5-20bn tonnes CO₂ removed per year



The carbon removal landscape spans across nature-based, hybrid, and technological solutions



Nature-based solutions



Forestation: Restore or plant trees on previously woodless land or apply practices that improve forest health



Soil sequestration: Increase the soil carbon content through changes in land mgmt. (e.g., no-till, cover crops)



Blue carbon: Better manage the carbon content of wetland and marine ecosystems (e.g., mangroves, kelp)

Hybrid solutions



Biochar: Produce charcoal from biomass and use e.g., as soil amendment or chemical additive



Bioenergy with Carbon Capture and Storage (BECCS): Burn biofuels, strip the CO₂ from the flue gas, store it permanently (e.g., in depleted oil fields)

Technological solutions



Enhanced weathering of natural minerals to react with and thereby fix atmospheric CO₂



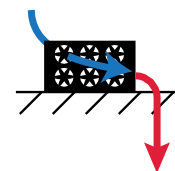
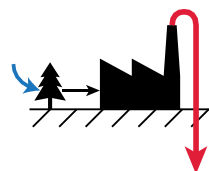
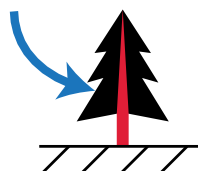
Direct Air Capture and Storage (DACs): Filter CO₂ directly from air and store it geologically or in long-lived products

Nature-based removals are ready to use, but quality is key

Nature-based
e.g. Forestation

Hybrid
e.g. Bioenergy carbon capture & storage (BECCS)

Technological
e.g. Direct air capture & storage (DACs)



Readiness/
affordability today



Durability
of storage



Scalability



Co-benefits



only if done sustainably

only if done sustainably

“High-quality removals”

=

- high durability
- high scalability
- high co-benefit

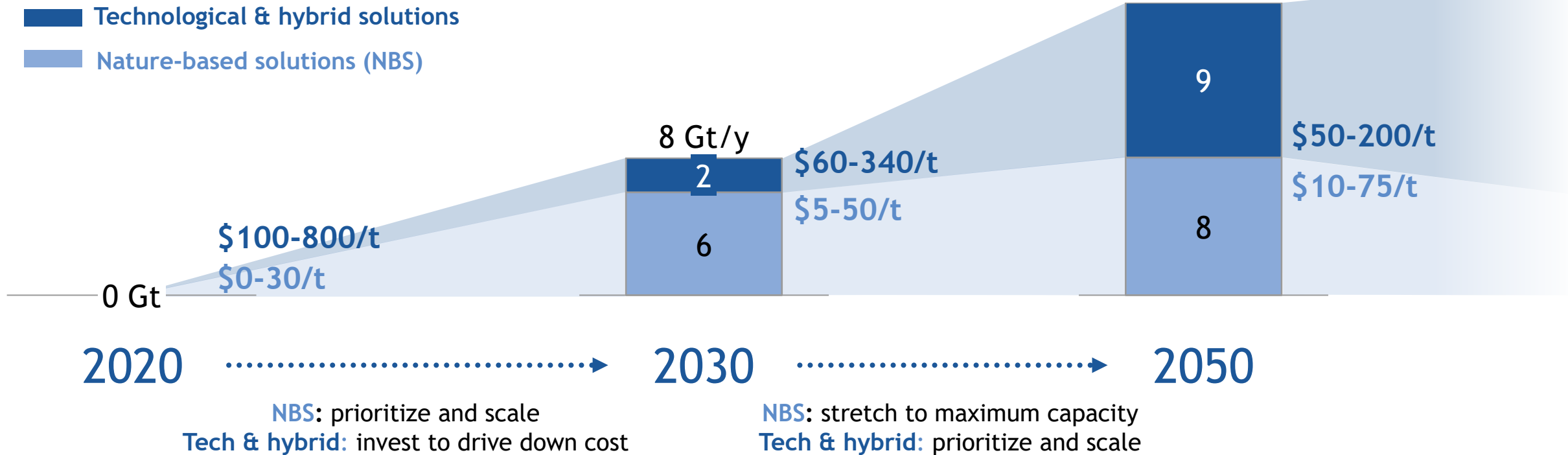
and overall

- no harm
- high integrity (standardized, verified)



Nature-based solutions are ready to use but will not do the job alone: we need to invest in technological and hybrid solutions now to scale for later

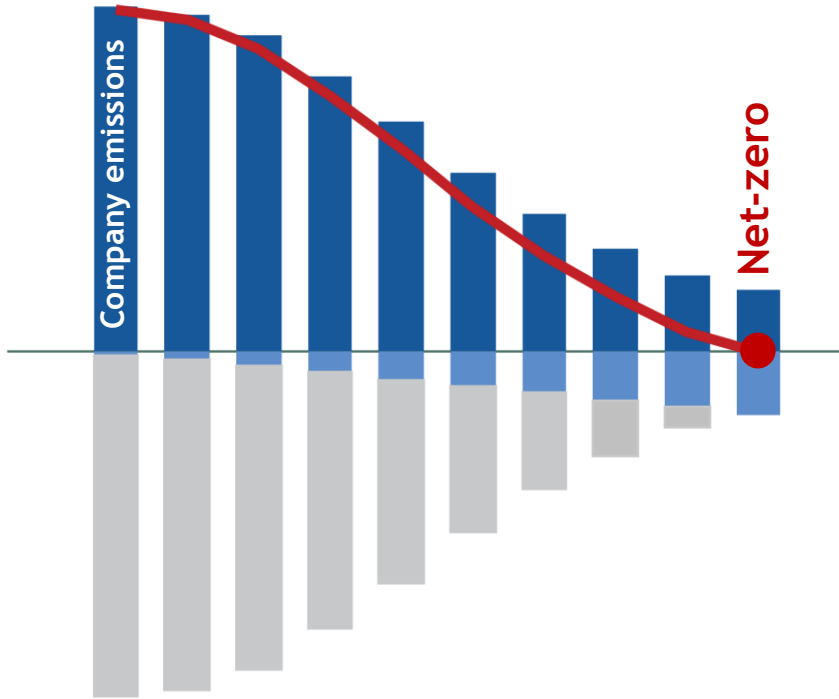
Annual removal potential (GtCO₂/year) and weighted average cost (\$/tCO₂)



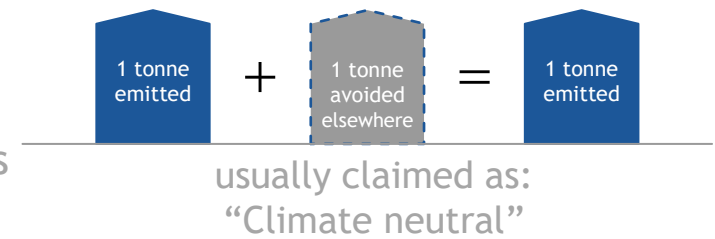
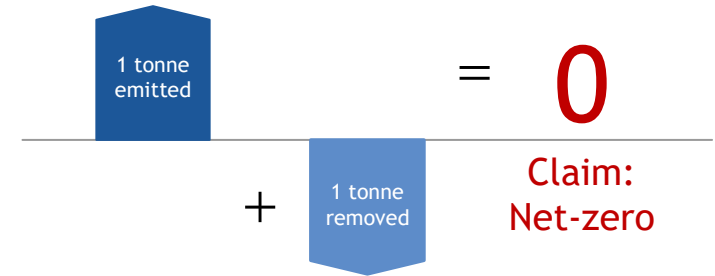
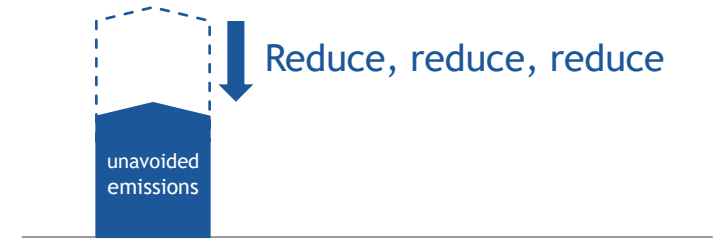
Note: Nature-based solutions include forestation, soil sequestration and blue carbon; technological solutions include BECCS, DACCS, biochar and enhanced weathering
 Source: IPCC; Blue Carbon Initiative (2021); Hanna et al. (2021); Beerling et al. (2021); Systemiq (2021); Zeng et al. (2021); Austin et al. (2020); Project Drawdown (2020); van Vuuren (2020); Rhodium Group (2019); Tisserant, Cherubini (2019); Roe et al. (2019); Keith et al. (2018); Bui et al. (2018); Fuss et al. (2018); Stefler et al. (2018); Wolosin (2017); The Royal Society (2017); Smith (2016); Teichmann (2016); Swiss Re and BCG analysis

How can companies use removals credibly?

“Net-zero” means focus on reductions and ramp up removals. On top, they can support others to reduce their emissions as well.

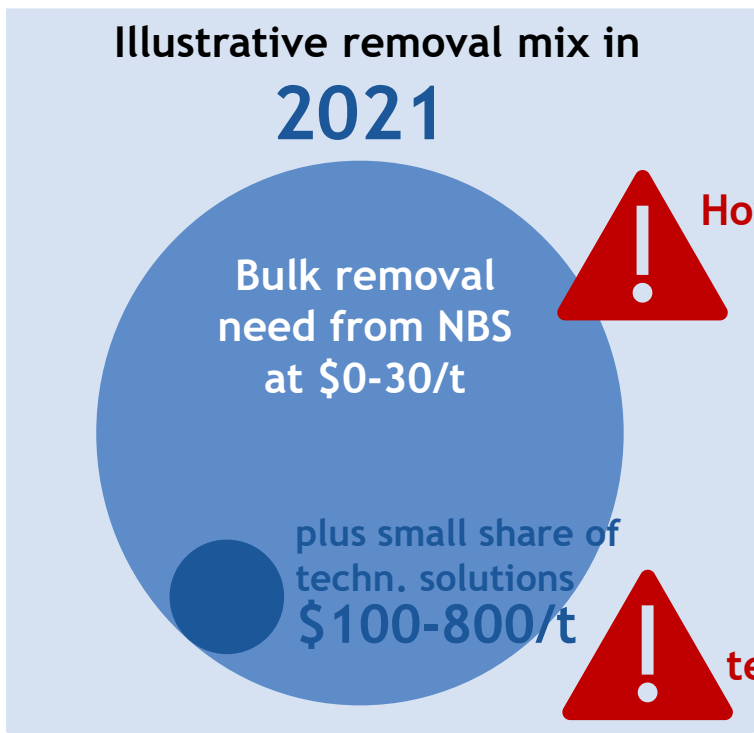


- 1 Set a science-based/Paris-aligned reduction path with interim targets
- 2 Set a separate removal path and balance all residual emissions in the **net-zero** target year, e.g. via carbon removal certificates
- 3 Compensate beyond own value chain by funding solutions that benefit climate, people, and nature, e.g. via carbon avoidance certificates



How can companies use removals smartly?

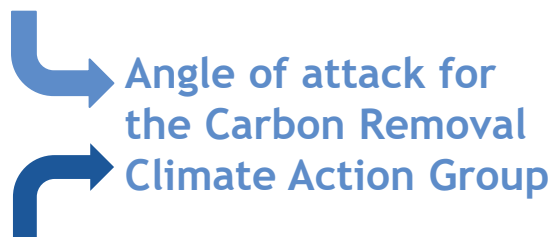
Concerted action and a balanced mix today prevent high price in the future



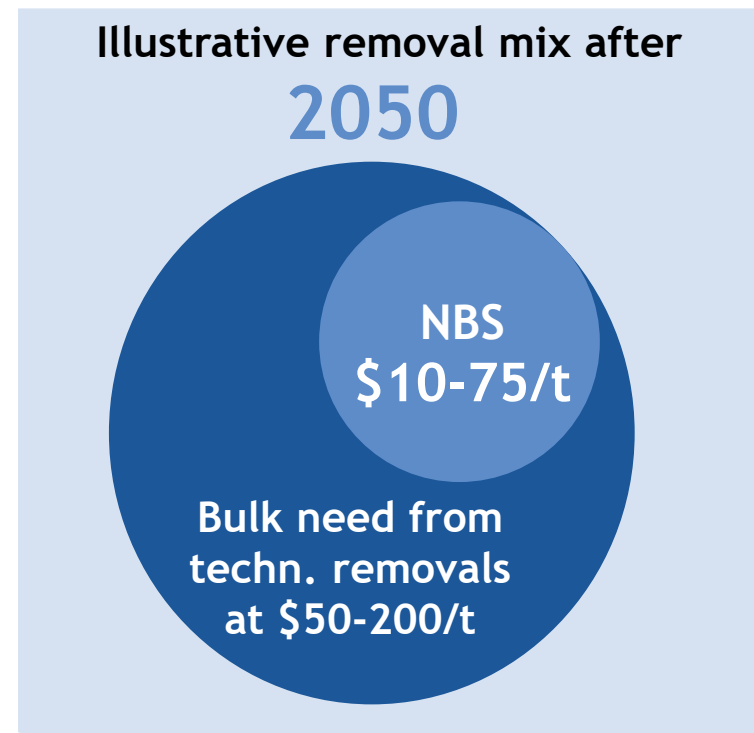
This mix can keep average removal price well below \$100/t

How to source NBS of high-quality?

How to access techn. removals?



If we act together today, ...



...we prevent a price rise and keep average removal price to ca. \$100/t

If we don't act now, NBS will deplete faster and tech removals remain costly → higher average removal cost for all!

The Group worked to facilitate access to impactful carbon removal for the Alliance

To limit global warming to safe levels, we shall...

- 1 ...reduce, reduce, reduce - and
- 2 ...remove the rest to tackle the unavoided, overshoot, and Earth's own emissions.

Use **nature-based solutions** in its own right, observing strict quality criteria,

and

... use a part of your removal budget for **technological solutions** already now.



The Action Group prepared a short **Procurement Guide for high-quality NBS** based on current best-practice¹



The Action Group recommends technological removals via a **carbon removals purchase facility**

1) In collaboration with WEF Natural Climate Solutions Alliance and WBCSD

Contributors

This slide deck was produced by the Alliance of CEO Climate Leaders Carbon Removal Action Group, chaired by Christian Mumenthaler, Co-Chair of the Alliance of CEO Climate Leaders; Group Chief Executive Officer, Swiss Re, Switzerland.

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The slides are the product of a collaboration between the Carbon Removal Action Group and the Forum's Global Future Council (GFC) on Net-Zero Transition, represented by Myles Allen (GFC Member, Professor of Geosystem Science, Director, Oxford Net Zero, University of Oxford) and Eli Mitchell-Larson (Associate, Oxford Net Zero; Carbon Gap).

World Economic Forum project team:

- Jonathan Eckart, Lead, Corporate Climate Action, World Economic Forum
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The logo for the World Economic Forum, featuring the words "WORLD ECONOMIC FORUM" in a bold, white, sans-serif font. A white arc is positioned behind the text, curving from the top right to the bottom right, partially enclosing the letters "RUM".

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