

Biogenic carbon and climate change mitigation: silver bullet or flash in the pan?

Rolf Frischknecht
treeze Ltd.

80th LCA forum
ETH, Zurich, 9 June 2022



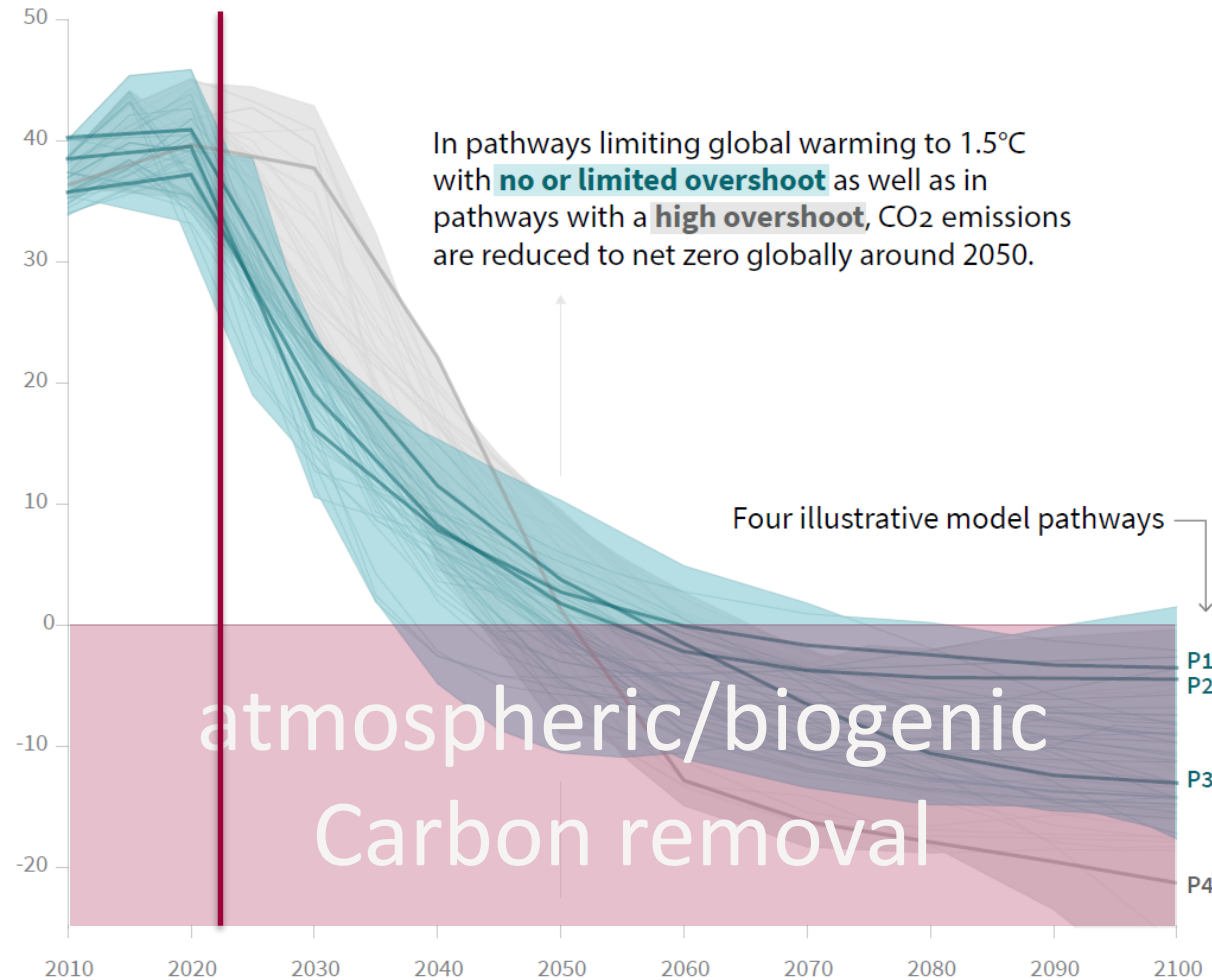
Sigriswil/BE

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IPCC special report: limiting global warming to 1.5°C

Global total net CO₂ emissions

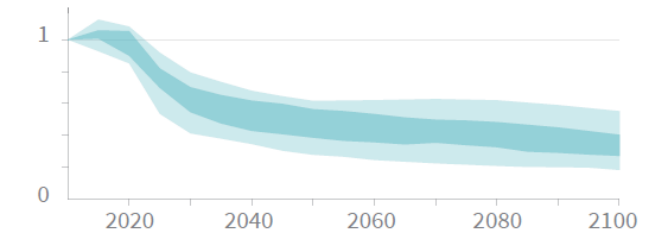
Billion tonnes of CO₂/yr



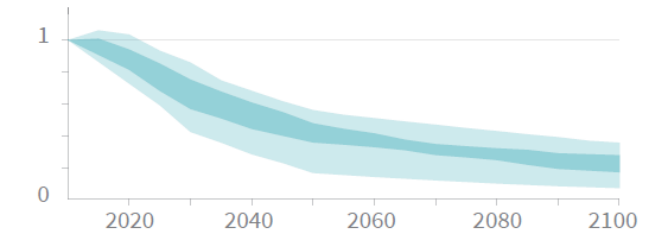
Non-CO₂ emissions relative to 2010

Emissions of non-CO₂ forcings are also reduced or limited in pathways limiting global warming to 1.5°C with **no or limited overshoot**, but they do not reach zero globally.

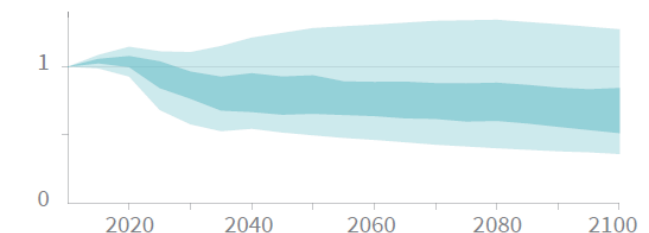
Methane emissions



Black carbon emissions



Nitrous oxide emissions



No smoking please ...



BEST PRACTICES

[Home](#) > [Practice](#) > [Best Practices](#) > [The Carbon Issue](#)

Posted on: January 15, 2020



The Carbon Issue

Meeting the urgent need for climate action, with decarbonization strategies for materials, design, practice, and policy.



PROJECTS



Meyer Memorial Trust
Headquarters
Lever Architecture



“net zero emissions” enters the buildings area



IGBC MISSION ON NET ZERO

300+ COMPANIES ARE NOW SIGNATORIES OF IGBC MISSION ON NET ZERO



WORLD ECONOMIC FORUM

26/10/2021 | Press release | Distributed by Public on 26/10/2021 13:09

From Climate Pledges To Action: New Principles Provide Roadmap For Net-Zero Buildings

Net Zero Energy Buildings and Built Environment – Opportunities, Challenges and the Way Forward



Net Zero Strategy: Build Back Greener



THE INDUSTRIAL DEEP DECARBONISATION INITIATIVE (IDDI)

Joint Working Group Kick-off

25 February 2022



Today's question and the role of biogenic carbon



<https://netzeroclimate.org/>



WHAT IS NET ZERO?

It is international scientific consensus that, in order to prevent the worst climate damages, global net human-caused emissions of carbon dioxide (CO₂) need to fall by about 45 percent from 2010 levels by 2030, reaching net zero around 2050. Global warming is proportional to cumulative CO₂ emissions, which means that the planet will keep heating for as long as global emissions remain more than zero. This implies that climate damages, caused by global heating, will continue escalating for as long as emissions continue.

How does a net zero GHG emissions building looks like?



Construction materials carbon footprint

The detail is crucial ...

www.materialepyramiden.dk/

THE CONSTRUCTION MATERIAL PYRAMID
THE DETAIL IS CRUCIAL



Biogenic CO₂ from biogas purification used to recarbonise recycled concrete aggregate

1m³ zirkulit® Beton

2350 kg

Primärrohstoffe

320 kg

Sekundärrohstoffe

1750 kg

Davon 10 kg gespeichertes CO₂

Zement

280 kg



Aus gutem Grund nachhaltig.

Baustoff Dienstleistungen Über uns Referenzen News Kontakt

WAIT A MINUTE!
10 kg CO₂ removed per m³ concrete

Der umweltfreundlichste
Schweizer Beton und mehr

Use biochar as raw material to produce concrete with biogenic carbon content



Use forests as biogenic carbon sink for offsetting CO₂-emissions of concrete



EVOPACTZERO DER KLIMANEUTRALE BETON EXKLUSIV BEI HOLCIM

WAIT A MINUTE!
How permanent is this forest sink?

Als führender Anbieter von Baumaterialien in der Schweiz, entwickeln wir laufend neue Produkte zur Förderung des nachhaltigen Bauens. Dabei verfolgen wir drei Ansätze: wir reduzieren die CO₂-Bilanz unserer Produkte, schliessen Stoffkreisläufe und ermöglichen Ihnen, mit weniger Material die gleiche Leistung zu erreichen.

Mit EvopactZERO lancierten wir den ersten vollständig klimaneutralen Beton der Schweiz.

- Klimaneutral: Die CO₂-Belastung des Betons wird vollständig kompensiert.
- Ressourcenschonend: Besteht aus rezyklierter Gesteinskörnung und ressourcenschonendem Zement Susteno.



Forest used as a CO₂- sink

©OAK Schwyz

OPTION 1: KOMPENSATION IN DER SCHWEIZ

Oberallmig (SZ), Schweiz: Waldschutz

Ziel des Projekts ist es, den Wald zusätzlich zur bisherigen nachhaltigen Bewirtschaftung auch als CO₂-Senke zu nutzen und damit auch einen Beitrag zum Klimaschutz zu leisten.

Kompensationskosten: 23.50 CHF/m³ Beton

Biobased materials after all? being reused or recycled



WAIT A MINUTE!
Reuse of building elements for next 100+ generations?

Is the devil in the detail ...

... or in the carbon stored in wood?

or is stored carbon rather the fairy
godmother?



Your day today

Morning

- The role of biogenic carbon for the climate, buildings and community targets
- How to deal with biogenic carbon in buildings LCA

Afternoon

- Short presentations on biogenic carbon modelling in the construction sector
- Carbon mitigation and carbon certificates
- LCA in view of net zero buildings
Discussion in Breakout Groups

Breakout groups

1. Time dependent GWP factors in carbon footprinting of buildings

Moderator: Frank Werner, Environment & Development

2. Temporal storage of biogenic carbon in buildings

Moderator: Rolf Frischknecht, treeze

3. Negative emission technologies and LCA

Moderator: Christian Bauer, PSI

Online participants:

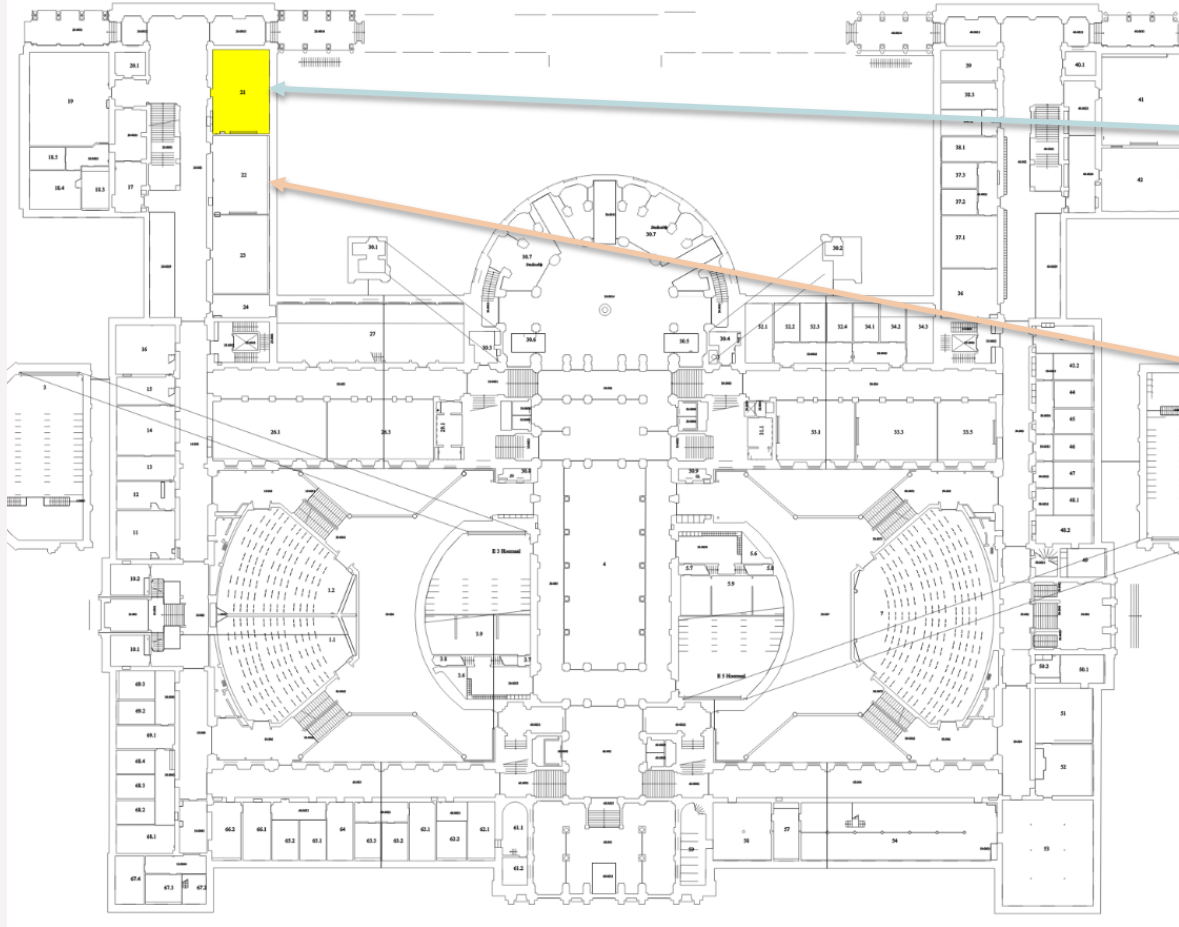
Scan QR code or use link provided in the program

Appoint moderator



Breakout groups

Where to go



1. Time dependent GWP factors and carbon modelling
Frank Werner
Main building HG E 21

3. Negative Emission Technologies
Christian Bauer
Main building HG E 22

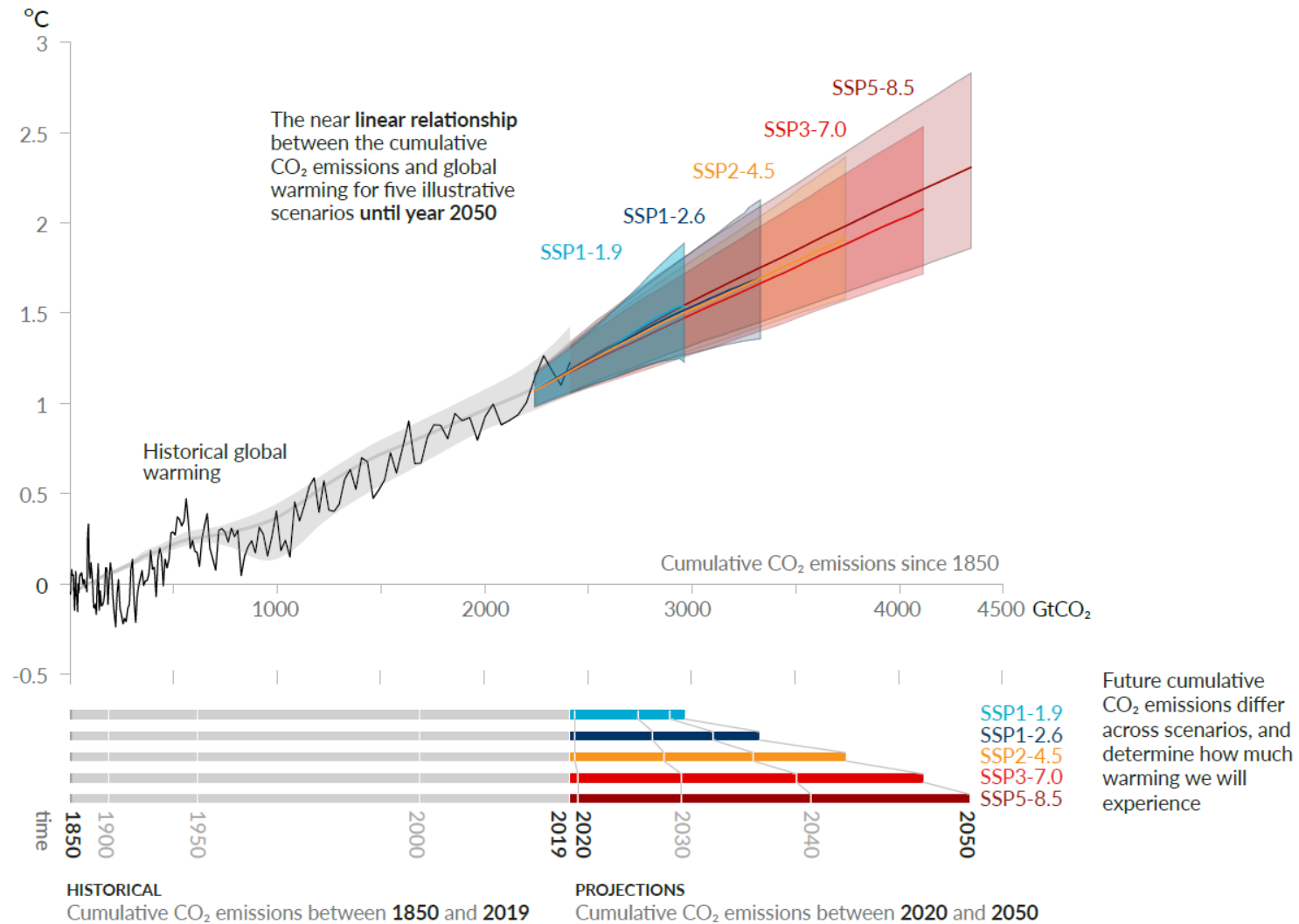
2. Temporary/permanent storage of biogenic carbon
Rolf Frischknecht
Alumni Pavillon (stay here)

Online participants:
visit wonder.me
Scan QR code

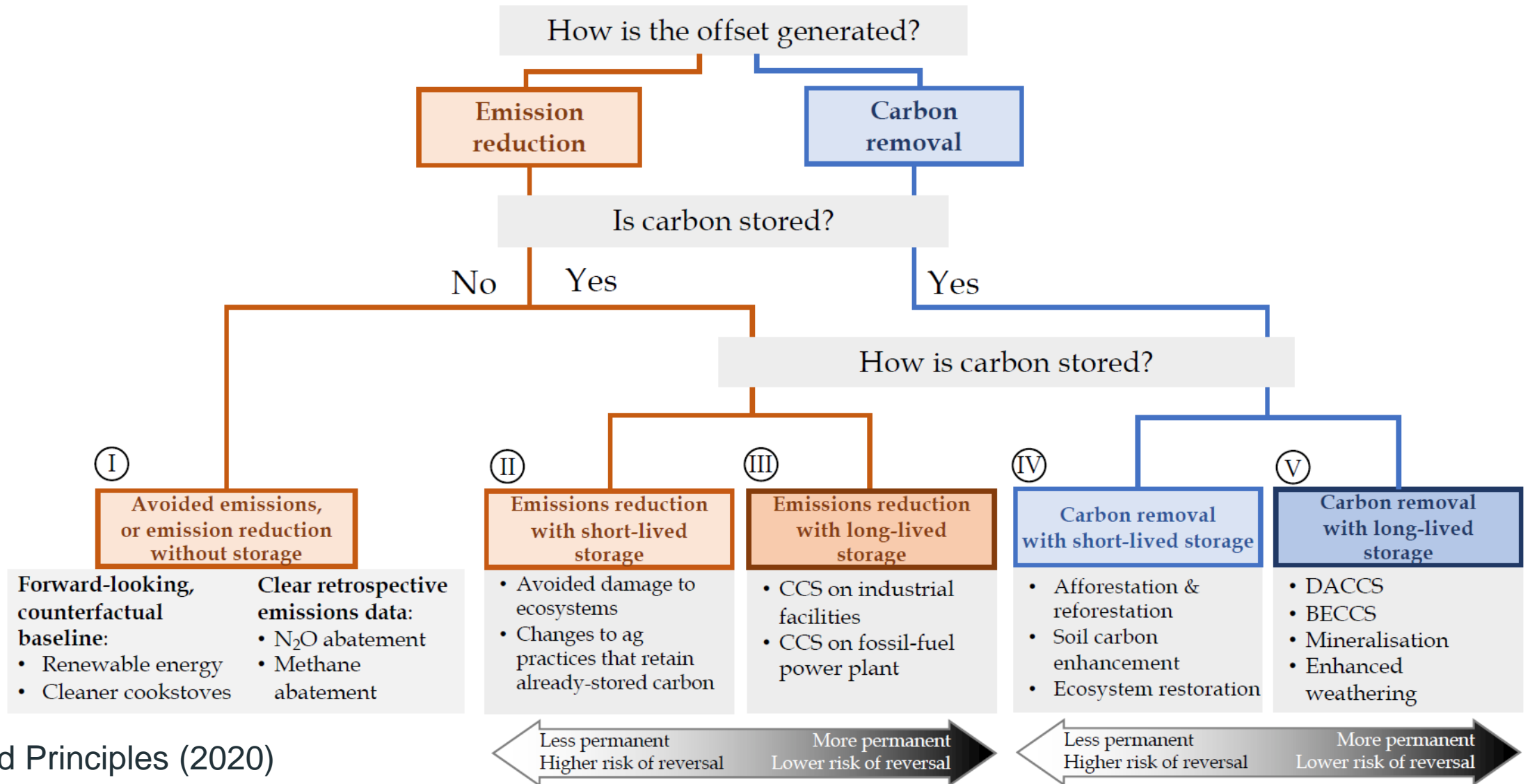


Every tonne of CO₂ emissions adds to global warming

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO₂ emissions (GtCO₂)



Taxonomy of Carbon offsets



Taxonomy of Carbon offsets

(adapted from Oxford Principles 2020)

How is the offset generated	Is carbon stored	How is carbon stored	Example
Potentially avoided emissions	No	-	Forward-looking, counterfactual baseline: Renewable energy potentially replacing fossil fuels
Emissions reduction	No	-	Clear retrospective emissions data: N2O abatement; Methane abatement
Emissions reduction	Yes	short	Changes to agricultural practices that retain already stored carbon
Emissions reduction	Yes	long	CCS on industrial facilities, fossil fueled power plants
Carbon removal	Yes	short	Afforestation, reforestation Soil carbon enhancement
Carbon removal	Yes	long	Direct air carbon capture and storage Biogenic energy carbon capture and storage Mineralisation, enhanced weathering

The Oxford Principles for Net Zero Aligned Carbon Offsetting

1. Cut emissions, use high quality offsets, and regularly revise offsetting strategy as best practice evolves
2. Shift to carbon removal offsetting
3. Shift to long-lived storage
4. Support the development of net zero aligned offsetting