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Injecting integrity

Aligning the use of offsets in company transition plans with science

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Executive Summary

Offsetting practices to date have contributed to our failure to achieve global greenhouse gas emissions reductions.

The voluntary carbon market has been plagued with unresolved integrity challenges, including a lack of real, additional emissions reductions.

Integrity issues have persisted globally across nature-based, household and industrial crediting methodologies that primarily seek to avoid the generation of CO_2 emissions (avoidance credits), rather than to remove CO_2 from the atmosphere (removal credits).

The use of offsets to meet emissions reduction targets can also lead to mitigation deterrence among purchasers, with companies choosing lower cost offsets over the prioritisation of direct emissions reductions. It also decreases the imperative for companies to engage with policymakers to ensure that the policy settings required to achieve real, direct emissions reductions are in place.

This situation must change. There is no net zero without real, gross emissions reductions.[1]

Injecting integrity with a science-informed approach

The following principles, informed by the best available climate science, should be followed to ensure integrity when using offsets in company transition plans:

No use of nature-based solutions to offset fossil CO_2 emissions – Crediting methods for biological carbon avoidance or removal activities, such as those involving the plantation or protection of vegetation, are not a permanent form of CO_2 storage. These methods cannot be used to neutralise or offset CO_2 emissions generated through the consumption or production of coal, oil or gas.

No use of avoidance credits[2] as offsets - Due to unresolved integrity issues and the persistent challenge of mitigation deterrence, the use of avoidance credits created through household or industrial crediting methods to offset fossil CO_2 emissions is not currently credible in a company transition plan.

Limited use of permanent carbon dioxide removal (CDR) credits - Permanent CDR is required to achieve net zero in line with the Paris Agreement, but only when accompanied by rapid gross emissions reductions. Permanent CDR credits can be used to offset residual fossil carbon emissions. However, due to constraints in supply, along with a need to ensure that sufficient ‘preventative’ CDR capacity remains in case of a worse-than-anticipated climate response,

[1] Gross emissions reductions refer to the decrease in total emissions before accounting for any CO_2 removals.

[2] Sometimes referred to as ‘reduction credits’.

reliance upon CDR credits must be minimised and *never* be deployed for fossil CO_2 emissions that can be prevented in the first place.

A role for Beyond Value Chain Mitigation (BVCM) - Companies may choose to continue investing in nature-based solutions as a form of Beyond Value Chain Mitigation, however such investments should be tracked and disclosed separately to the meeting of emission reduction and CO_2 removal targets. These are distinct and non-fungible accounting schemes that should not be compared with one another.

A new model

Company climate transition plans should set **separate emissions reduction and removal targets** as follows:

Short-, medium- and long-term reduction targets informed by Paris-aligned sectoral pathways that solely reflect a corporation's path for direct reductions of Scope 1, 2 and 3 emissions. Where direct emissions reductions are currently uncommercial, companies should engage with governments on the policy settings required to ensure that direct emissions reductions can be expedited and residual emissions minimised.

Short-, medium- and long-term permanent carbon removal[3] targets **that apply only** to the lowest possible residual CO_2 emissions.[4] Such targets should be set at one tonne of removal per tonne of residual emissions. Considering the nascent state of the permanent CDR industry, companies should disclose a CDR strategy that details how they will ensure sufficient supply of quality credits in the net zero year. This should include details on which permanent removal methods will contribute to meeting this target.

The relationship between reduction and removal targets is expected to be dynamic. As further opportunities for direct decarbonisation in a company's value chain expand, reduction targets can be strengthened, and corresponding adjustments can be made to removal targets due to lower residual emissions.

The following paper synthesises the scientific literature that underpins the above position.

The principles discussed are equally relevant to government mitigation policy as to voluntary corporate mitigation efforts.

This position will be reviewed against the best available science as research evolves.

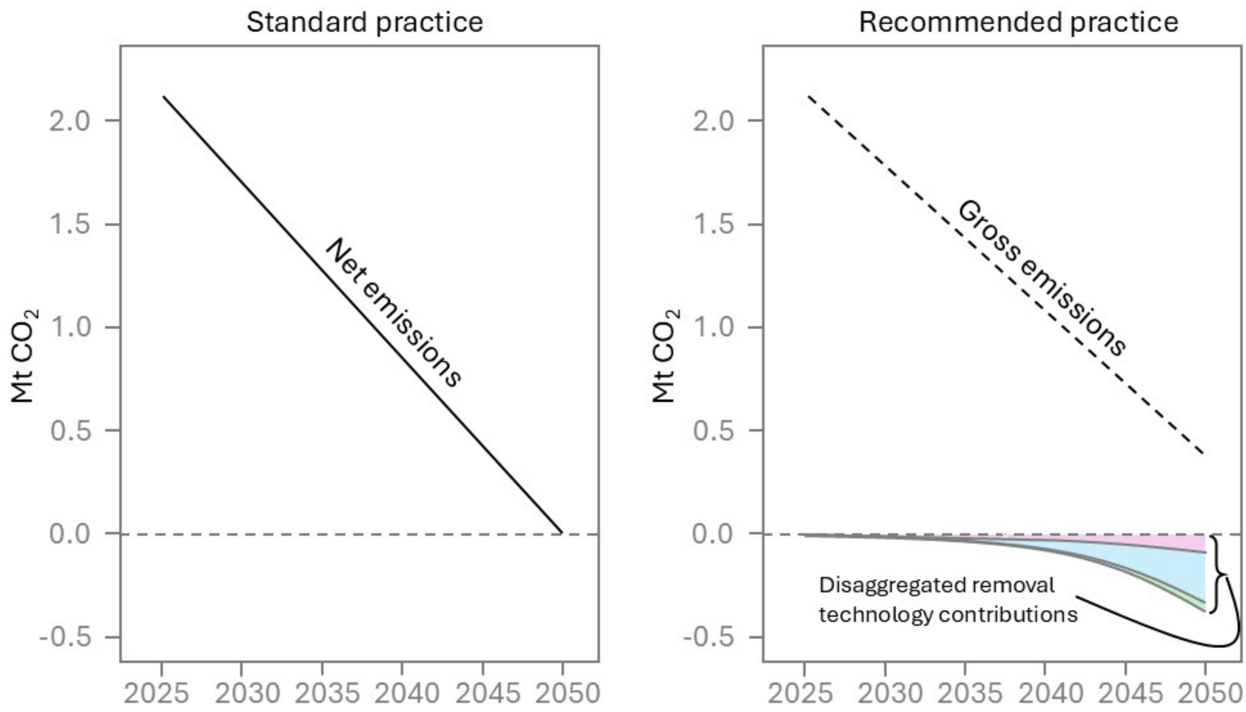
[3] Carbon removals do not address non-CO_2 greenhouse gases such as methane, nor locally polluting aerosols such as sulphur. In addition, the science studying the effect of removals on temperature is evolving and should be monitored for developments that might necessitate changes to this position.

[4] Residual emissions represent an expected failure to achieve absolute decarbonisation (real zero or zero carbon emissions) within a timeframe aligned to global climate goals. They are a dynamic quantity influenced by innovation and governance as decarbonisation technologies and regulatory frameworks develop. Lower residual emissions will intuitively imply lower removals necessary to offset these. Companies must apply the best available science in their definition of residual emissions in lieu of expected future regulatory guidance and supervision.

Table 1: Comparison of standard and recommended approach to voluntary emissions reduction target setting

	Company target type	**Indicative 2030 target**	**Indicative 2050 target**	**Activities to meet target**
Standard approach	Net Zero target	50%	100%	A variable mix of direct reduction projects and offsets from a range of nature-based and other projects. Often unclear what real reductions will be achieved by 2050.
Recommended approach	Reduction target	40%	95%	Direct emissions reductions within the company value chain
	Permanent removal target	0.5%	5%	Set target and strategy to ensure availability of permanent CDR credits for unavoidable residual CO_2 emissions in the year of net zero. Ensure transparency around which permanent removal methods will contribute to target.
	BVCM pledge	Consider the Science-Based Targets initiative guidance for setting, executing and reporting on a BVCM pledge (Benson *et al* 2024)		e.g. Set contributions to the preservation of temporary natural carbon sinks through high quality NBS credits that have been screened for integrity, human rights and environmental risks.

Figure 1. Comparison of standard and recommended approaches to voluntary emissions reduction target setting.



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About ACCR

The Australasian Centre for Corporate Responsibility (ACCR) is a not-for-profit, philanthropically-funded shareholder advocacy and research organisation that engages with listed companies and investors globally, enabling and facilitating active stewardship. Our research team undertakes company-focused research into the climate transition plans of listed companies, offering analysis, research and insights to assist global institutional capital understand investment risks and opportunities during the energy transition. For more information, follow ACCR on LinkedIn.

Why gross emissions reductions matter

There is no net zero without gross emissions reductions

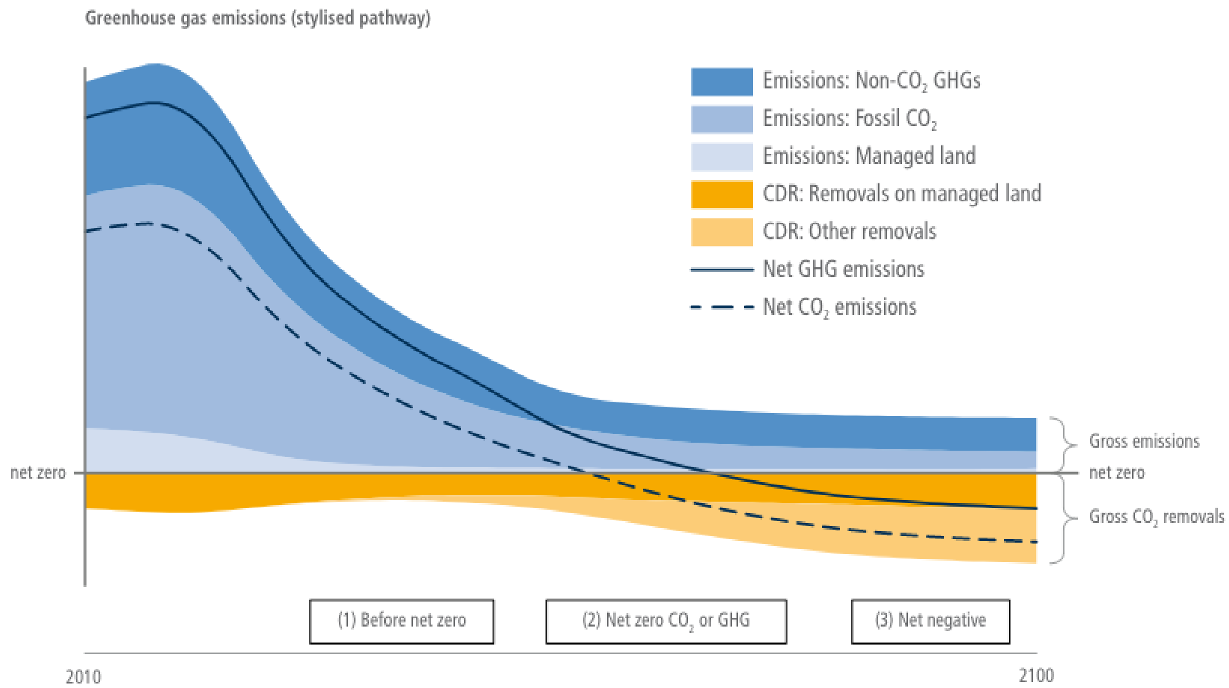
At the global level:

- Gross emissions reductions refer to the decrease in total emissions before accounting for any CO_2 removals (Figure 2). They are the primary component of any climate change mitigation strategy.
- The pace of global gross emissions reductions directly influences the likelihood of meeting the long-term temperature goal agreed to in the Paris Agreement. Due to insufficient action to date, some level of temperature goal exceedance, or overshoot, is now expected even under the most ambitious scenarios.
- **To minimise this overshoot and associated increase in climate damages, near-term global gross emissions reductions are more relevant than long-term global net-negative emissions** (IPCC 2022, p 319).

At the company level:

- The pace of achieving gross emissions reductions should be mapped to a reputable, Paris-aligned sectoral pathway. The nature of the sector will influence the magnitude of 'residual' gross emissions at the year of company net zero.
- It is expected that companies in harder-to-abate industries will have higher residual emissions. However, as avoidance of fossil CO_2 emissions is the highest priority, companies should engage with governments to secure supportive policy settings to expedite the adoption of otherwise uncommercial mitigation technology.
- While a company's anticipated residual emissions will influence the magnitude of its removal targets, permanent carbon dioxide removal (CDR) capacity is also required for reducing temperature overshoot and for outcomes where the climate response is worse than anticipated. Therefore, the available cumulative CDR capacity for an individual company may be less than what the company determines is required based on its anticipated residual emissions. As such, companies should also factor in the availability of removal capacity when setting removal *and* reduction targets.

Figure 2. At a global level, gross emissions reductions are the primary lever to achieve net zero. In the near-term gross emissions are reduced (1); at net zero, CDR counter-balances residual emissions (2); and in the long-term, CDR supports achieving and sustaining net-negative emissions (3). Source: (IPCC 2022 in Cross-Chapter Box 8, Figure 2)



How incorrect offset use can undermine global gross emissions reductions

While **permanent, high quality carbon removals** can be deployed in limited circumstances, other forms of offset use have consistently undermined necessary global gross emissions reductions due to issues with non-additionality, leakage, rebound and double counting (Table 2).

Measures are available, but not proven, to mitigate some of these issues. For example, the IPCC notes that 'procedural and management' advances may address risks of non-additionality and double-counting in bilateral trade or market-based mechanisms (IPCC 2022, p 1386). Were these market issues to be resolved through governance and regulatory mechanisms, the thorny issue of mitigation deterrence (see Table 2) would remain.

Table 2 - Overview of mechanisms by which company offsets may undermine global gross emissions reductions

Mechanism	Implication
Non-additionality: The reductions, removals or avoidances claimed as offsets that would have occurred anyway, in absence of the activity. (IPCC 2022, pp 820 & 1794).	If the company offset activity is not additional, it will not lead to a reduction in global gross emissions.
Leakage, rebounds and double counting: The reductions, removals or avoidances result in the same amount of emissions occurring elsewhere, or have been double counted (IPCC 2022, p 124).	If the company offset activity suffers from leakage, rebounds or double counting, it will not lead to a reduction in global gross emissions.
Mitigation deterrence: Near-term, cost-effective gross emissions reductions are slowed due to the perceived availability of future lower-cost offsets (Markusson *et al* 2018, Grant *et al* 2021, Carton *et al* 2023).	If a company's offset activities or expectations delay near-term, cost-effective reductions in gross emissions, the missed reductions will accumulate over time, increasing the company's carbon liability. This liability must either be offset annually or addressed later as a cumulative total, along with the delayed gross emissions reductions. Addressing it later will result in higher peak cumulative carbon emissions, requiring larger net-negative emissions in the future. This, in turn, would lead to higher peak temperatures.

Active removal and permanent storage - the most appropriate approach to offset fossil CO_2 emissions

Residual company fossil CO_2 emissions must be offset by active removal[5] and permanent storage of CO_2.

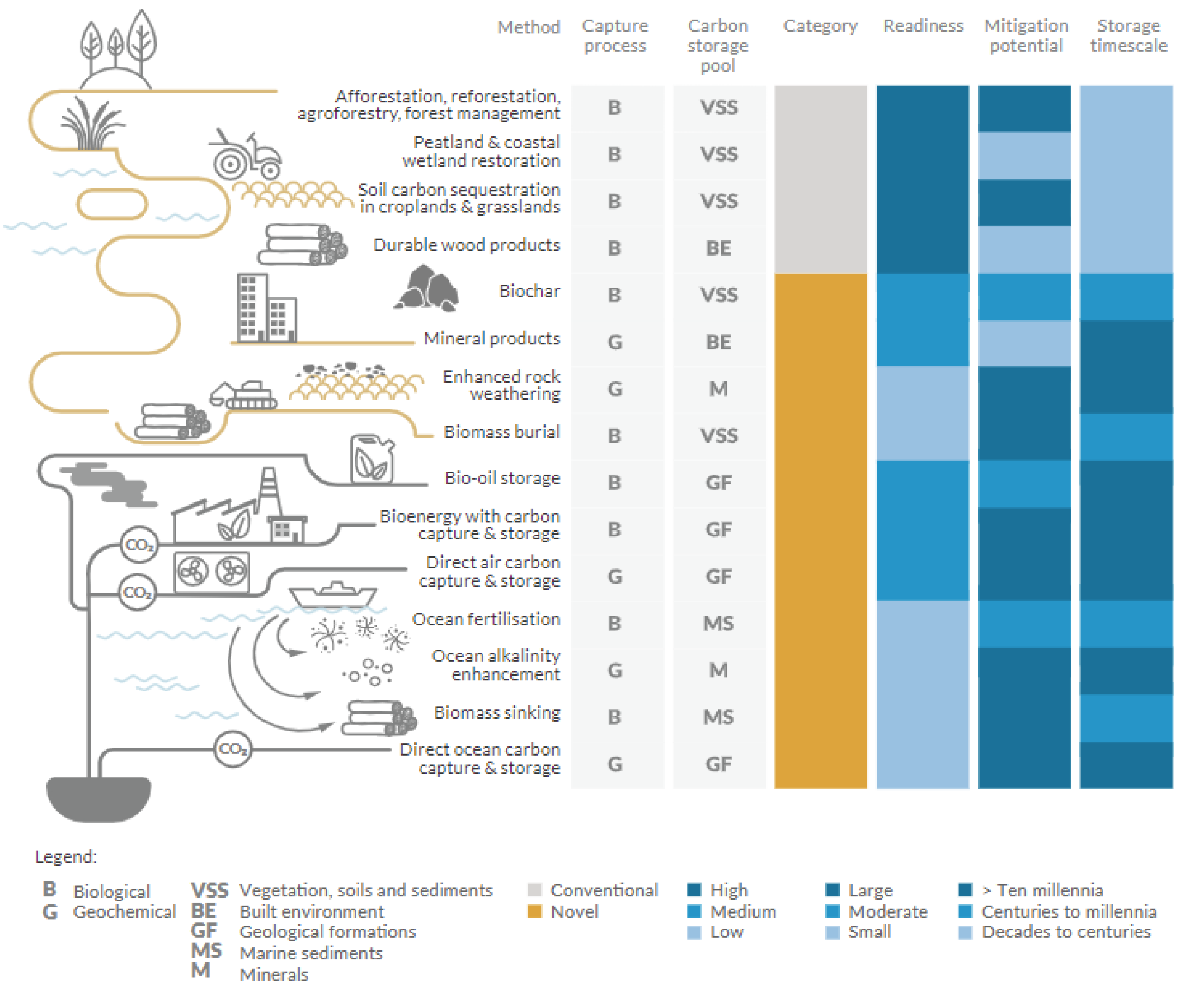
By several estimates, CO_2 removal and storage requires storage on timescales of at least 1,000 years. It largely excludes activities reliant on carbon storage in vegetation, soils and sediments, as indicated in Figure 4. This is because storage in vegetation, soils and sediments typically functions within the fast carbon cycle, where carbon sinks can reach saturation within a few

[5] Avoided emissions offsets are an often-discussed alternative to CO_2removal offsets. Such offsets require an additional level of scrutiny and the setting of appropriate baselines, as indicated in Table 1, that must be scientifically assessed on a case-by-case basis such that a general position cannot be taken.

decades (Dooley *et al* 2022). Over the long-term (beyond 2050), these saturated carbon sinks could diminish or even become sources of emissions (IPCC 2022, p 347).

By contrast, storage in geological formations, typically necessary for novel carbon dioxide removal (CDR) technologies such as direct air carbon capture and storage (DACCS) or bioenergy carbon capture and storage (BECCS), involves removing CO_2 from the fast carbon cycle and may be able to be maintained for thousands of years. This is not an unlimited resource - cumulative storage capacity, injection rates and local pollution issues are important areas of further research (Fuss *et al* 2018).

Figure 4. An overview of carbon dioxide removal (CDR) methods, indicating their readiness, mitigation potential and storage timescale. Source: (Smith *et al* 2024)



What is the appropriate role for offsets - and what isn't?

Permanent, high quality carbon removal credits are appropriate to address 'residual' gross fossil CO_2 emissions on the way towards and following company net zero.

The definition of what is 'residual', and thus the required gross emissions reduction pathway to net zero, is critical. Communicating offset use requires the separation of gross emissions reductions and offset targets, transparently separating the necessary components of a net zero claim (Bjørn *et al* 2023). This separation aligns with the activities involved, each typically requiring planning and investment in different areas of the corporate structure, and possibly under distinct governance requirements (IPCC 2022, p 1278, Markusson *et al* 2018).

This separation of targets must extend to the specific elements of the removal target, distinguishing between activities that comprise the aggregate removal offset, as shown in Figure 1. This is necessary for a range of climate science reasons and is important to enable 'a prioritisation of preferred methods according to characteristics such as removal processes or timescales of storage' (IPCC 2022, p 1278, Smith 2021). In the absence of clear and transparent disclosures, the use of offsets cannot be assessed in line with the best available science.

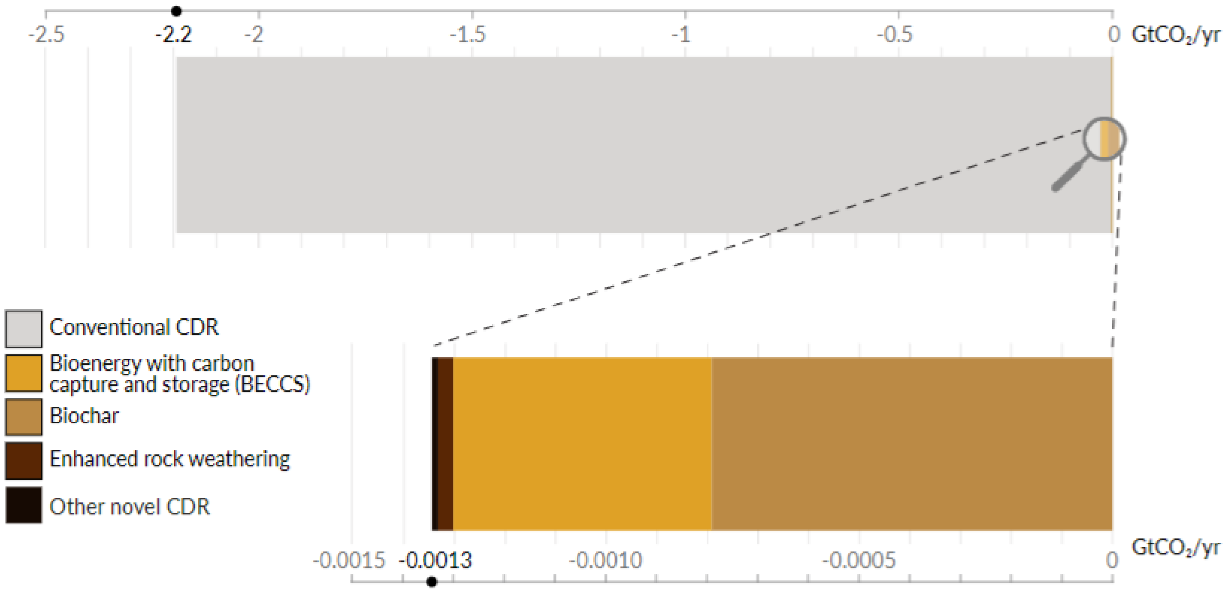
The physical limitations to durable CO_2 removals and storage

While several novel carbon dioxide removal (CDR) technologies rely on CO_2 storage in geological formations, we focus here on bioenergy carbon capture and storage (BECCS) and direct air carbon capture and storage (DACCS) as they are the two approaches most relied upon in modelling studies, before considering the overall finite geological carbon storage potential on which they both rely.

BECCS is the primary mode of novel CDR in scenarios assessed under the IPCC AR6 (WGIII), and has been the subject of much contention due to the risks it poses to desertification, land degradation, food insecurity and water table degradation, with some studies exploring remedies like agricultural innovation and dietary shifts to balance food and energy needs (IPCC 2022, pp 67, 438 & 841). BECCS currently delivers approximately 0.0005 $GtCO_2$/yr of removals (see Figure 5). Newer scenarios that consider sustainability constraints find feasible novel sequestration rates in the range of 1-3.7 $GtCO_2$/year globally in the year 2050, to which BECCS typically contributes a little less than 50% (Smith *et al* 2024).

DACCS is a far more nascent technology, currently understood to have the highest costs and energy requirements, but also the largest potential to scale. BECCS costs are projected to range from \$15 to \$400/tCO_2, and DACCS costs from \$200 to \$1,000/tCO_2 (Smith *et al* 2024). Both are ultimately constrained by the total available geological storage capacity, which is understood to be strongly regionally mediated (Lane *et al* 2021, Zhang *et al* 2024).

Figure 5. Estimated current CDR, split into conventional and novel methods. Source: (Smith *et al* 2024)



Re-analysis of required geological CO_2 storage in scenarios assessed under AR6 found that "limiting sustained annual [geological sequestration] growth to <10%, a rate still greater than what has been achieved in the past 20 years in the CCS industry, inhibits the attainable aggregate global storage rate to a maximum of 1 Gt/year, below any projections of storage deployment in the 1.5 and 2°C pathways of the AR6" (Zhang *et al* 2024). Relaxing this constraint allows geological storage required across the 33-66% range of 1.5°C low overshoot AR6 scenarios as well as the IEA Net Zero scenario to be met (Ibid.), with an upper bound in global potential of 6 Gt/year when considering government plans.

In parallel to these considerations, recent work has called for the development of 'preventative' CDR capacity to hedge against stronger than expected climate response and warns of an uncertain hysteresis[6] in climate impacts due to overshoot (Schleussner *et al* 2024, Möller *et al* 2024).

Considering these constraints on sequestration rates, we find emerging evidence of a scientifically grounded precautionary argument against unnecessary consumption of this sink potential. Instead, it can be argued that this must be made available and used to mitigate climate response uncertainties already evident under deep mitigation pathways. Similar arguments have been made in a recent perspective (Ho *et al* 2024).

[6] Hysteresis is the dependence of a state or system on its history, such that the behaviour of, or the impact on, a system is different when an action is reversed. There is emerging evidence to indicate that climate impacts occurring because of overshoot will not reduce at the same pace as they increased.

What about ocean enhanced alkalisation or enhanced weathering?

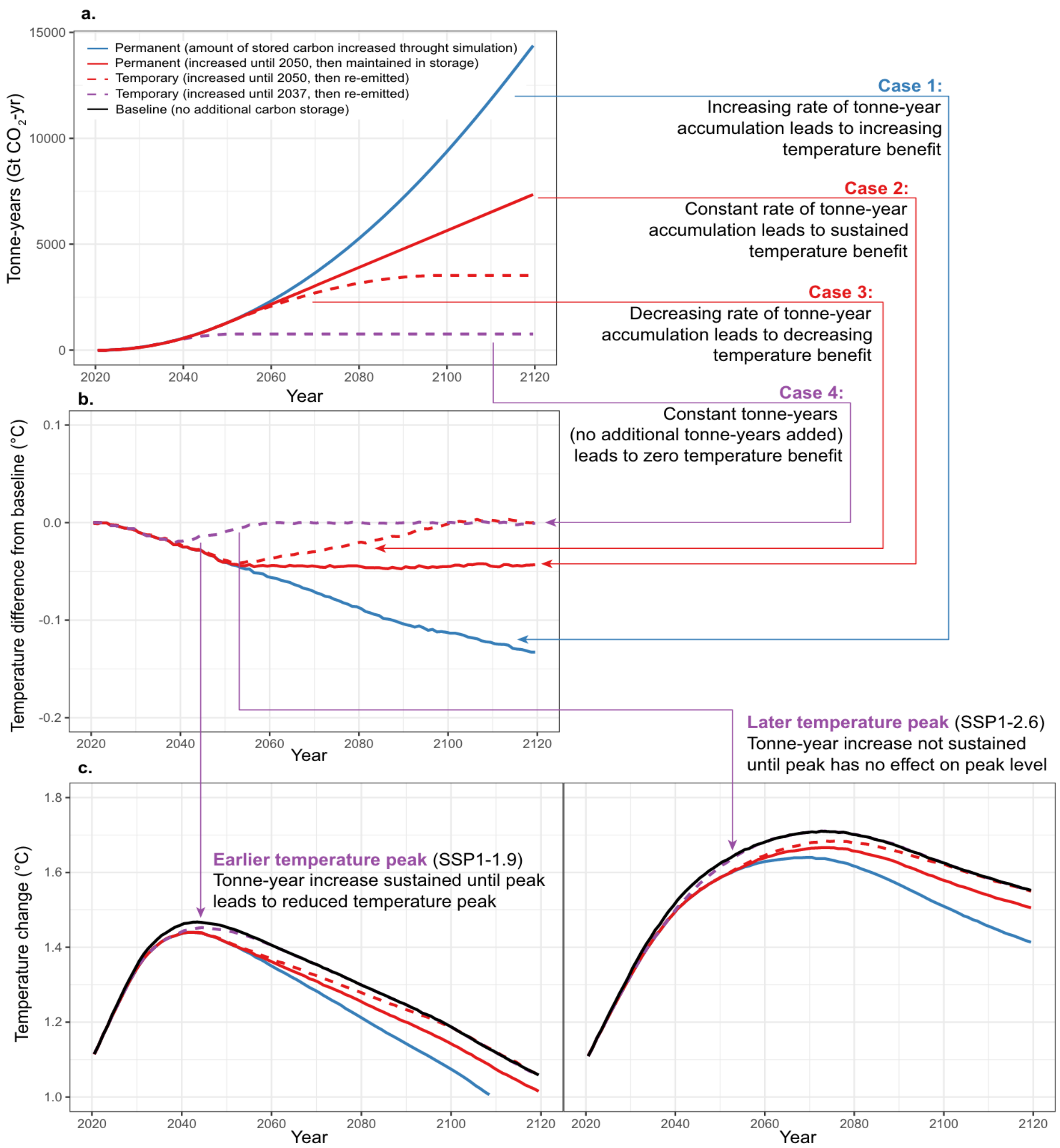
Enhanced weathering relies on the geochemical reaction of certain rocks with CO_2, forming mineral carbonates that are typically either dissolved in water and stored in the ocean or crushed and spread on land. Ocean enhanced alkalisation relies on the chemical binding and sinking of CO_2 with alkaline substances crushed and distributed into seawater (typically from minerals mined on land). At present, the sequestration potential and local ecosystem effects associated with these activities are highly uncertain. These are thus nascent areas of research requiring separate assessment, especially in terms of governance (Boettcher *et al* 2021).

Can Nature Based Solutions projects offset fossil CO_2 emissions?

Nature Based Solutions (NBS) were recently defined under the United Nations Environment Assembly (UNEA) as "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits" (UNEP 2022). CO_2 storage in vegetation, soils and sediments through Nature Based Solutions can only offset fossil CO_2 emissions if preserved and managed for at least 1,000 years, a timescale that is broadly understood to be extremely unlikely given a range of factors including our current warming trajectory. The literature clearly stipulates that NBS ought to be seen "as a complement to (rather than as an offset for) fossil fuel emission reductions" (Matthews *et al* 2023).

Questions as to whether temporary carbon sequestration can offset fossil CO_2 emissions have been thoroughly answered in the negative. Tonne-year emissions accounting was developed to quantify this temporary storage, multiplying the CO_2 temporarily sequestered by the number of years it was sequestered before release (Moura Costa and Wilson 2000). An early criticism of this approach and efforts to define a corresponding monetary (offset) equivalence between one tonne of fossil CO_2 emissions and one tonne of temporarily stored CO_2 emissions has been the necessary definition of a discount rate to reconcile subsequent release (Parisa *et al* 2022). This discount rate represents the time preference of our society regarding present and future mitigation costs and climate change impacts. Recent work has shown that even if such a discount rate could be agreed upon, the proposed emissions equivalences discussed in the literature (ranging from 30 to 130 tonne-years of temporary storage for every tonne of fossil CO_2 emissions) do not correspond to an equivalent peak temperature offset, as illustrated by Case 4 in Figure 6 (Matthews *et al* 2023). This work also finds that constant tonne-year accumulation in perpetuity (ensuring the dynamic equilibrium or saturated state of the storage is never disturbed) is necessary to materially shift both peak and long-term warming due to fossil CO_2 emissions (ibid).

Figure 6. Comparing cases of tonne-year removal and global mean temperature change. Source: (Matthews *et al* 2023)



What is Beyond Value Chain Mitigation (BVCM)?

BVCM is a mechanism for corporate actors to contribute to global climate change mitigation outside their value chain (outside their Scope 1, 2 and 3 emissions). It was first defined by the Science-based Targets initiative (SBTi) in the context of their original Net-Zero Standard.[7] The underlying rationale for BVCM is that contributions outside the scope of an organisation's value

[7] The first draft of this standard was released in October 2021. A revised version can be found here: https://sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf.

chain can support meeting global climate change mitigation efforts. These contributions are argued to be necessary by the SBTi to support sectors of the economy that do not have sufficient available capital to implement mitigation activities in line with global climate goals.

Does BVCM contribute to company net zero targets?

BVCM does not contribute to company net zero targets and has no place in any removal target. BVCM contributions must be strictly demarcated from any net zero target or emissions reduction plan. Their equivalence to company fossil CO_2 emissions or any notion of an implicit offset is not appropriate.

Does BVCM contribute to global gross emissions reductions?

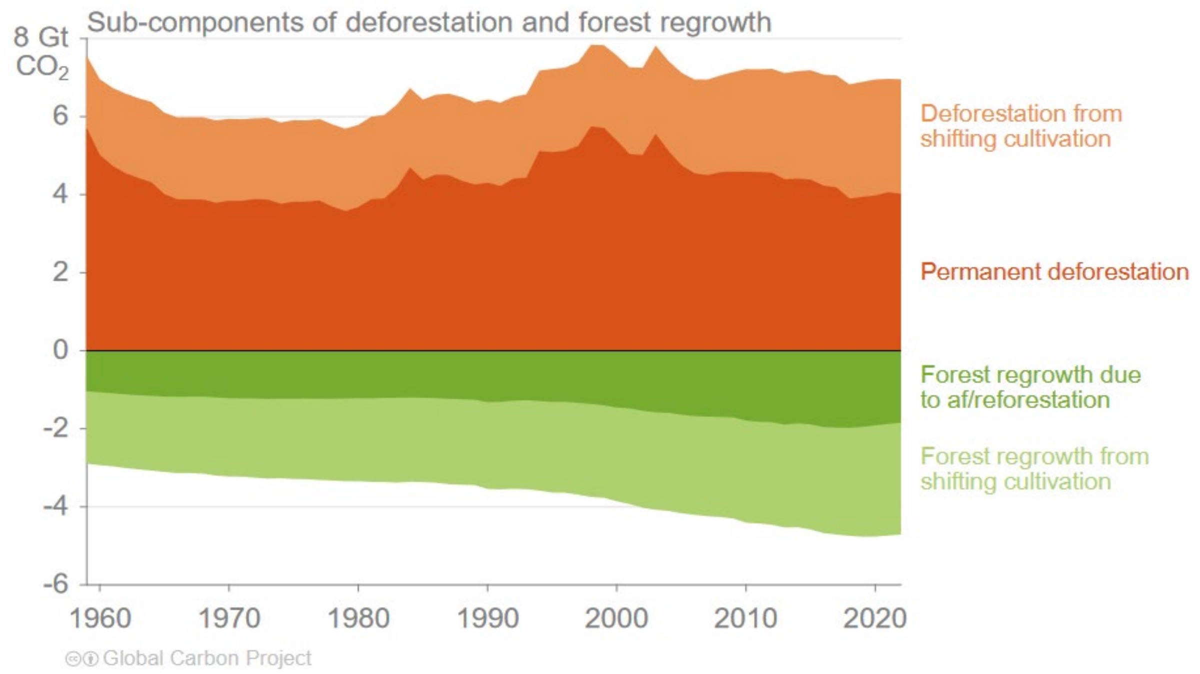
BVCM may contribute to global gross emissions reductions through the land sink if no equivalence to fossil CO_2 emissions is claimed. Were the risks described in Table 3 to be sufficiently addressed, BVCM could therefore represent a source of finance for reducing land degradation and deforestation, the importance of which is highlighted in Figure 7. Permanent deforestation accounted for ~4.2 $GtCO_2$/year of emissions between 2013-2022, relative to the ~-1.9 $GtCO_2$/year reforestation sink over the same period.

Table 3 - Overview of mechanisms by which BVCM may not achieve overall emissions reductions

Risk mechanism	Implication
Non-additionality: The reductions, removals or avoidances intended would have occurred anyway, in absence of BVCM finance.	If the BVCM activity is not additional, it will not lead to a reduction in global gross emissions.
Leakage, rebounds and double counting: The reductions, removals or avoidances intended with BVCM finance result in the same amount of emissions occurring elsewhere, or have been double counted.	If the BVCM activity suffers from leakage, rebounds or double counting, it will not lead to a reduction in global gross emissions even if it is additional.

Both reducing degradation and reducing deforestation are measures that increase the natural land sink but do not count towards agreed definitions of anthropogenic carbon sequestration. They are thus unlikely to be credibly addressed via market mechanisms. These are measures where credits should arguably not be bought and sold, but which have substantial influence on the natural land-sink and thus could benefit from BVCM investments. Such investments in NBS projects must, however, also carefully address a range of other considerations, including indigenous rights, human rights and ecosystem integrity (Dooley *et al* 2018, 2022, 2024).

Figure 7. Delineating land use emissions related to deforestation and regrowth. Source: (Friedlingstein *et al* 2023)



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