Grantham Research Institute on Climate Change and the Environment

Response to the UNFCCC's A6.4-SB005-A02 Information Note: *Guidance and questions for further work on removals*

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About this response

This is a response made on behalf of the Grantham Research Institute on Climate Change and the Environment to the United Nations Framework Convention on Climate Change (UNFCCC) Information note 'Guidance and questions for further work on removals' published in June 2023. The information note is available at: https://unfccc.int/documents/628761

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General comments

The Grantham Research Institute welcomes this request for further input on greenhouse gas removals (GGR) under Article 6 of the Paris Agreement. This document collects input from research and policy staff at the Institute.

We see a lack of confidence in the integrity of carbon trading mechanisms as an overarching threat to the success of all activities, including removals, under Article 6.4. Addressing this threat requires a careful, conservative, and demonstrably rigorous approach to crediting mitigation from removals. In general, crediting practices in both voluntary and compliance markets thus far have not achieved either scientific or public credibility. To overcome this problem, policymakers must now focus on identifying and crediting only those removal activities that have a known and demonstrable mitigation impact. Quality (which will lead to market confidence and thence demand) is now a precondition for achieving scale. Distinguishing high- and low-quality removals is also essential to prevent low-quality offerings from suppressing prices and blocking the entry of high-quality interventions with more assured climate impact.

On the supply side, we see the integrity/confidence issue as most severe for removals based on interventions in ecosystems (i.e. 'nature-based solutions', or NbS). However, these 'open-loop' interventions can be scaled up rapidly in this decade and should be a key element of short-term mitigation strategies. Recognising high-quality NbS removals should therefore be a priority for crediting mechanisms. On the demand side, we urge action to ensure that companies with legitimate residual emissions (i.e. those in agriculture, heavy industry, baseload electricity generation and so on) are purchasing removals, as opposed to the tech and financial services companies who dominate removals purchases presently.

Turning to technical issues, we highlight the importance of properly accounting for the time value of removals (and the intertwined issue of liability for reversals), the need for current-generation statistical techniques to assess additionality (i.e. quasi-experimental statistical methods), and the need to address leakage from interventions (both in terms of mitigation impact and for other values, such as biodiversity). Temporary removals should be permitted under Article 6.4, if and only if appropriate accounting frameworks can be put in place.

Specific comments

A. Definitions

Any definition of GGR eligible for crediting under Article 6.4 must be the outcome of processes that lead to a net reduction of greenhouse gases in the atmosphere. We welcome a broad definition of 'removals' that accommodates future innovation, but urge that different removal pathways have different considerations in terms of real carbon impact (i.e. additionality, leakage and permanence) that should be understood and taken into account when designing crediting and monitoring frameworks.

A broad definition of removals has advantages, encouraging the development of as many removal pathways as possible and maximising the potential for innovation. However, different removal activities raise different risks and each requires a different policy framework. For example, NbS removals that reduce the supply of economically productive land (such as afforestation of croplands) can have important leakage effects; given the current lack of robust methods for measuring leakage (Filewod and McCarney, 2023) the climate impact of such removals is uncertain. Other NbS removals (such as restoration of degraded-but-unused lands or the development of green infrastructure) do not face this problem, and their impact can currently be quantified with higher certainty. Accommodating such differences is important to encourage high-quality projects (and build confidence and scale) within Article 6.4 activities.

Further, the time value of carbon will be a critical consideration for regulators seeking to define acceptable removal activities given that there is substantial variance in the time value of carbon between NbS pathways and engineered methods (i.e. carbonation and geological storage). NbS pathways are most scalable in the short term (i.e. this decade), but come with significant trade-offs in terms of the durability of the carbon stock. A definition of removals will need to reflect the near-term risks (but scalability) of NbS removals but the durability benefits of engineered solutions, which are expected to be scaled up rapidly in the 2030s and 2040s.

B. Monitoring, reporting and verification (MRV)

We recommend promoting technology-enabled continuous monitoring (i.e. digital MRV/ dMRV) wherever possible to ensure that the real climate impact of removal activities (including temporary removals) is evaluated and tracked over time with high accuracy.

Most NbS removal activities involve changes in the reflectance or texture of the planetary surface and can be effectively monitored from space using current technologies, many of which are publicly available. For such activities dMRV monitoring should be mandatory. Observation of an adverse event should trigger more detailed investigation, including site inspections if necessary.

We commend past successes in centralising the provision of dMRV (e.g. by Global Forest Watch), which can achieve economies of scale and increase overall environmental activities. We recommend that the UNFCCC explore opportunities for centralised provisioning of dMRV by endorsing or partnering with other institutions to provide guidance and monitoring tools, providing a scientifically defensible minimum standard for automatic monitoring (acceptable sensor characteristics, classification model accuracy, detection thresholds, and so on). Without minimum MRV standards, risks will persist for all GGR methods if the sector continues to develop without a clear understanding of what constitutes best practice across all relevant Article 6.4 activities.

For activity types not amenable to automatic monitoring, monitoring reports should be submitted on a schedule sufficient to capture variation in ecological dynamics and maintain overall integrity. Regulators should look to develop risk-based reporting protocols for removals with higher reversibility risk or low MRV certainty.

Promising but under-researched GGR methods, such as ocean-based biological and geochemical methods, suffer from a lack of foundational science, which hampers MRV development. Targeted funding is needed for longitudinal experiments to explore the GGR potential of these methods, to create an empirical research base and dedicated community from which to build MRV frameworks (Mercer and Burke, 2023).

C. Accounting for removals

Crediting for removals activities must quantify *net* effects in the economic and/or environmental systems altered by an offset-generating intervention. To do so, mitigation implications in all relevant portions of the perturbed system(s) should be considered, using conservative assumptions. Given that globally consistent carbon accounting remains elusive, this means that leakage considerations must be directly addressed in carbon accounting. It is not scientifically credible to rule out impacts beyond an arbitrary accounting boundary (for example, by ruling leakage beyond country borders out of scope).

Uncertainty in accounting (hence in the real climate impact of an issued credit) is acceptable only if it matches uncertainty in the action for which a credit substitutes, i.e. when it is used as an offset. Failing to recognise this fundamental requirement of accounting integrity risks delaying or (potentially) reversing mitigation progress, if highly uncertain removals credits are used to substitute for relatively certain emissions reductions. While the need to quantify measurement uncertainty in carbon accounting is well understood (for example, as in the IPCC Assessment Report guidance on uncertainty calculations), the overarching issue of matching offsets and substituted actions on uncertainty is not. Knowing what offsets substitute for (i.e. within purchasing entities) is essential to developing frameworks to accommodate uncertainty, and mandating data disclosures or use statements would significantly advance efforts to maintain accounting integrity.

While various approaches have been proposed to financially incentivise removals projects, such as front-loading carbon payments, any issued credits must be guided by a scientifically robust understanding of net impacts on atmospheric radiative forcing. This implies careful attention to tonne-year accounting methodologies (see Section D).

Given that issued carbon credits vary widely in real mitigation impacts (i.e. additionality, permanence, and leakage) equivalence factors are an important accounting innovation and should be explored as a solution to variable credit quality. Groom and Venmans (2023) develop a proposal for such equivalence factors, which must (in practice) be based on verifiable evidence about real climate impacts.

Notably, equivalence factors are an important solution to impermanent storage, given that perpetual commitments are difficult to monitor. Groom and Venmans (2023) discuss a 50 year temporary offset, which has the equivalence of 33% in welfare terms (meaning 3 such offsets are equivalent to a permanent offset). To avoid difficult-to-monitor perpetual contracts one solution would be to have shorter equivalent contracts of 50 years for 3 tons of emissions reductions. Shorter contracts would be easier to monitor in terms of liability and additionality. Note that Balmford et al. (2023) proposes shorter term contracts of about 10 years and associated monitoring to ensure additionality and equivalence over time.

D. Crediting period

There are serious problems with the use of tonne-year accounting as a means of comparing temporary storage with permanent storage.

First, establishing tonne-year equivalences using Global Warming Potential (GWP) misestimates the relative benefits (hence equivalence) of temporary emissions reductions. GWP relates to carbon concentrations in the atmosphere, integrating the changes in cumulative carbon concentrations over time and comparing to a time horizon of 100 years, which is taken as equivalent to a permanent carbon removal. However, carbon concentrations do not indicate linearly the effect on global temperature, which is the key cause for concern and source of climate damages. Due to thermal inertia, the temperature effect of an emission of carbon lasts a lot longer than the carbon concentration effect (see Groom and Venmans, 2023).

Second, establishing equivalence using physical quantities means that arbitrary decisions need to be taken with regard to the time horizon so that temporary emission reductions can be compared to a concrete definition of a permanent reduction. In the 'physical' literature, temporary emission reductions are compared to a definition of a permanent reduction (i.e. emissions reduced for 100 years). This has the effect of treating all time periods equally between zero and 100 years but makes the comparison of different temporary projects that occur at different points in time impossible: early and late emission reductions are equivalent within the 100-year horizon.

The A6.4-SB002-AA-A06 Information Note responds to these issues by assuming a finite horizon of 100 years to define permanence and then applies a discount rate within that time horizon. This hybrid solution is problematic, notably because using a discount rate associated with a standard consumption bundle (all marketed goods and services) as per the Ramsey Rule is conceptually incorrect. We do not know the discount rate for carbon; rather we know what the discount rate is for carbon only when it has been turned into equivalent units of consumption. A hybrid approach also effectively assumes that the social cost of carbon is constant in current value terms for all time horizons, which is highly unlikely to be true. The approach proposed in A6.4-SB002-AA-A06 may therefore lead to erroneous valuations and comparisons for carbon mitigation solutions.

An alternative solution is to establish the value of impermanent removals in welfare terms and use welfare equivalence as a means of comparing temporary storage. Groom and Venmans (2023) describe a welfare-based approach that allows for infinite horizons to value permanent emission reductions and exploits the linear relationship between cumulative emissions and temperature changes (rather than GWP) to establish the damages and avoidance of damages that temporary NbS can provide. This approach solves both the problems associated with GWP and those concerned with the timing of emission reductions, in a consistent way. The equivalence is framed in terms of the value of damages avoided compared with a permanent ton of emission reductions. The equivalence measure also takes into account the risk of reversal and the risk of non-additionality and leakage.

E. Addressing reversals

Buffer pool approaches to removals are inadequate in cases where potential reversals include emissions of 100% of stored CO_2-equivalent – in such cases, buffer pools must equal 100% of issued credits, *unless* the accounting methodology explicitly accounts for temporary storage, in which case no buffer pool is necessary because emissions are also credited. In contexts in which there are limited physical potential for reversals (e.g. some carbon sequestration in the built environment, most geological storage technologies), buffer pools should equal the expected value of future reversals (evaluated conservatively at some confidence interval of the distribution of possible future values, rather than the mean).

As an alternative to the buffer pool approach, full liability for reversals could be located with either the credit issuer/project proponent or the buyer – it depends on what this liability means for net present values (hence market participation) in either case, which in turn depends on a lot of unknowns. Locating liability with certifiers has precedent (via the buffer pool approach) and seems like a good compromise that lets the certifier act as an insurer of individual projects. This could, of course, lead certifiers to collapse.

In principle, the liability for reversal risk could rest with either the buyer of credits (buyer-liability) or the seller of credits (seller-liability). In the latter case the host country, in effect, would assume the leakage risk. However, experience of afforestation and reforestation projects under the Clean Development Mechanism shows that a buyer-liability regime may substantially reduce demand for carbon credits generated from relevant activities.

Insurance schemes may offer an alternative to buffer pools. This could include shared responsibility whereby selling platforms have initial liability, but this is underpinned by government-backed carbon insurance schemes that sellers must procure. There is precedent for this in the UK government's FloodRE reinsurance scheme, which ensures flood insurance is available in high-risk areas that may be classed as uninsurable (Mercer and Burke, 2023).

F. Avoidance of leakage

The methods currently in use to evaluate leakage are inadequate, and current adjustment factors appear to systematically (and drastically) underestimate leakage rates as compared with the evidence base (Filewod and McCarney, 2023).

The tools available to measure leakage (particularly market leakage) are not very accurate: in general, they depend on context-specific estimates of leakage effects that are significantly affected by both subjective methodological choices and the availability of data sources. So far, these have proved to be insurmountable problems in carbon offset markets. This has led credit issuers to apply rule-of-thumb approaches that introduce major asymmetric information problems, adverse selection problems, and conflicts of interest.

In some cases, leakage measurement can be refined: leakage from both technological or land-based removals can be modelled, given sufficient resources, in data-rich environments (e.g. where detailed economic statistics are available for impacted markets). The UNFCCC should identify a set of minimum criteria and modelling standards for such cases, which need to be dramatically improved in rigour compared with current methodological approaches.

In cases where the necessary statistics do not exist and financial incentives are insufficient to collect them, leakage measurement cannot be refined. In such cases, leakage must be avoided by the careful design of offset projects – and projects that cannot conservatively avoid leakage should not be credited.

G. Avoidance of other negative environmental and social impacts

We recognise the importance of removal projects adhering to environmental and social safeguards and, ideally, contributing to the Sustainable Development Goals. Where the context requires, removals activities should also ensure free, prior and informed consent processes with Indigenous Peoples and Local Communities (IPs and LCs). However, ensuring that credited activities have a known climate benefit is an existential requirement for removal activities under the Article, and associated technical issues should be prioritised.

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