

(carbon)plan

MAY 24 2023

Ms. Olga Gassan-zade, Chair
Mr. El Hadji Mbaye Diagne, Vice Chair
Article 6.4 Mechanism Supervisory Body
UNFCCC Paris Agreement

RE: Input to SB005 annotated agenda and related annexes for the UNFCCC Article 6.4 Supervisory Body

Dear Chair Gassan-zade and Vice Chair Diagne,

Thank you for the opportunity to respond to the call for input on the Information Note¹ related to carbon removal prepared for the fifth meeting of the Article 6.4 Supervisory Body.²

For context, CarbonPlan is a nonprofit research organization dedicated to improving the transparency and scientific integrity of climate solutions and carbon removal through open data and tools. Our comments are informed by extensive research on carbon removal,³ carbon market quality standards,⁴ and the value of temporary carbon storage.⁵

Building on the comments we submitted to the Article 6.4 Supervisory Body in October 2022,⁶ we are writing to express our concern that the Information Note fails to represent a balanced overview of the best available carbon removal science. Our comments focus on two foundational issues addressed within the Information Note. First, we remain deeply concerned by the one-sided presentation of tonne-year accounting, which fails to reflect on-going

¹ Article 6.4 Supervisory Body, Information note: Removal activities under the Article 6.4 mechanism, Document A6.4-SB005-AA-A09 (Version 04.0) (hereinafter “Information Note”).

² 5th meeting of the Article 6.4 Supervisory Body (SB005)

³ See, e.g., Jennifer Wilcox et al. (eds.), Carbon Dioxide Removal Primer (2021); Freya Chay et al., Verification Confidence Levels for carbon dioxide removal, CarbonPlan (2023).

⁴ See, e.g., Grayson Badgley et al. (2022), Systematic over-crediting in California’s forest carbon offsets market, *Global Change Biology* 28: 1443-45; Jane Zelikova et al., A buyer’s guide to soil carbon offsets, CarbonPlan (2022).

⁵ See, e.g., Freya Chay et al., Unpacking ton-year accounting, CarbonPlan (2022); Danny Cullenward et al., The cost of temporary carbon removal, CarbonPlan (2020).

⁶ Freya Chay and Danny Cullenward, 22 Sept 2022 Recommendations for the Article 6.4 Mechanism (2022).

discussions and uncertainties about how to properly value temporary carbon storage. Second, we urge the Supervisory Body to revisit the characterization and apparent dismissal of a wide variety of approaches to achieving long-duration carbon removal, which is in conflict with the best available science about what is necessary to achieve temperature stabilization.

1. Uncritically adopting tonne-year accounting methods under Article 6.4 risks undermining the Paris Agreement's goal of stabilizing global temperatures.

We are deeply concerned by the treatment of tonne-year accounting in the Information Note. As currently written, the Information Note provides an inappropriately optimistic and one-sided view of the merits of tonne-year accounting approaches that fails to reflect current scientific debates on how to value temporary carbon storage.

The Information Note ignores the fundamental fact that tonne-year accounting techniques — when used as part of a carbon crediting mechanism, as is being contemplated under Article 6.4 — make no assurances about stabilizing long-term global temperatures. As such, the potential adoption of tonne-year accounting methods risks undermining the minimum goal of the Paris Agreement to hold global temperatures well below 2 °C above pre-industrial levels.

It has long been recognized that no amount of temporary storage can physically compensate for fossil CO₂ emissions when viewed through the lens of long-term temperature stabilization.⁷ To emphasize this point, we've included the results of a simple modeling study that explores the temperature effects of using temporary carbon storage to justify additional fossil CO₂ emissions.⁸ Figure 1 shows the relative long-term temperature outcomes of three scenarios: emitting no additional fossil CO₂ (blue), emitting 1 Gt CO₂ (orange), and pairing the emission of 1 Gt CO₂ with the temporary storage of 10 Gt CO₂ for ten years (green; assuming a ratio specified in a tonne-year accounting method proposed by the offsets registry Verra).

⁷ Miko U. F. Kirschbaum (2006), [Temporary Carbon Sequestration Cannot Prevent Climate Change](#), *Mitigation and Adaptation Strategies for Global Change* 11, 1151–1164 (showing that "temporary carbon storage only reduces climate-change impacts related to the cumulative effect of increased temperature and could even worsen impacts mediated via the instantaneous effect of temperature or the rate of temperature change").

⁸ For more details, see Danny Cullenward et al., [Proposed updates to the VCS Program](#) (2022) at 3.

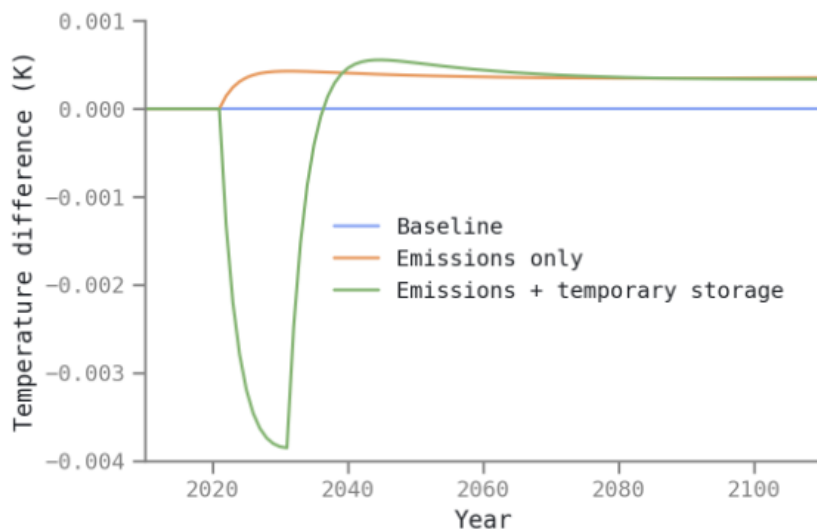


Figure 1: Marginal temperature from CO₂ emissions and temporary CO₂ storage.

Temporary carbon storage (green) results in short-term temperature benefits that quickly dissipate when the storage period ends, with temperatures converging to a new, higher temperature resulting from additional fossil CO₂ emissions. Physical neutralization claims based on tonne-year accounting would require the storage scenario to converge to a baseline of no temperature change (blue).

Neutralizing the effects of CO₂ emissions would require the tonne-year scenario (green) to have the same effect on temperature as not emitting any CO₂ at all (blue). But the tonne-year scenario exceeds the baseline because atmospheric CO₂ concentrations in that scenario reflect *both* the temporarily stored CO₂ and the additional emissions justified by the temporary carbon storage. Temporary carbon storage using tonne-year methods cannot be equated with emissions, especially when the goal is to stabilize global temperatures.

None of the “Response to the arguments” in Table 8 of the Information Note substantively address this fundamental, physical limitation of tonne-year methods, nor do they reflect the richness of the ongoing academic research and debate around this topic and the substantial criticism that tonne-year methods have received.⁹ Instead, the responses in Table 8 and

⁹ Examples of just two recent contributions to the growing literature include: Ben Groom and Frank Venmans (2022), [The Social Value of Offsets](#), *Research Square* (detailing a new approach to combine temporary storage with economic damages); H. Damon Matthews et al., (2022) [Reimagining tonne-year accounting to capture the climate benefit of temporary carbon storage](#), *Research Square* (recognizing that “tonne-year accounting to establish an equivalency of temporary with permanent storage is not grounded in climate science” but exploring possibilities of “a reimagined approach to tonne-year accounting could be effectively used as a metric to track the contribution of temporary carbon storage towards climate mitigation goals”).

throughout the Information Note make broad, often poorly supported assertions, some of which are simply incorrect or at the very least incomplete.¹⁰

It would be a mischaracterization to dismiss our concerns as a wholesale rejection of the value of temporary carbon storage. Temporary carbon storage can have distinct climate benefits, and mechanisms that appropriately value temporary storage have a role in achieving our climate goals. But given the above concerns, it is premature to advocate for the use of tonne-year accounting methods in the context of Article 6.4. Doing so risks undermining the temperature ambitions of the Paris Agreement. We also re-emphasize that the world's largest registry, Verra, paused adoption of tonne-year accounting based on stakeholder feedback and the Integrity Council for the Voluntary Carbon Markets has excluded tonne-year accounting from its Core Carbon Principles.¹¹ It should give the Supervisory Body pause that while large swathes of the voluntary offsets market reject tonne-year approaches, the Information Note continues to vigorously advocate for the inclusion of these scientifically incomplete methods under Article 6.4.

Given the many ongoing and vibrant debates throughout the academic literature about how we should value temporary carbon storage, it is misleading for the Information Note to treat critical questions within this debate — such as how to set time horizons, apply discount rates, and make trade-offs between short-term and long-term warming — as matters of settled science. Rather than suggesting that these matters are resolved, we respectfully request that the Supervisory Board pursue deeper consultation with climate experts, including those engaged with the Intergovernmental Panel on Climate Change, to more fully understand the risks posed by using tonne-year accounting.

¹⁰ See Information Note at 33 (Table 8, column titled "Response to arguments"), which asserts "The question, in unambiguous terms, is this: Can N t CO₂ of removals stored for 10 years produce the benefit to counteract the impact of 1 t CO₂ emission? The answer evidently is yes. Only the number N needs to be determined on some scientific and economic basis. That is what tonne-year accounting does[.]" The question raised is important, but the answer is far more nuanced. From the standpoint of making physical claims about the neutralization of CO₂ emissions, the answer is decidedly no; there is no number "N" that is large enough to make temporarily stored CO₂ fully compensate for additional CO₂ emissions. There may be approaches for integrating economic assumptions on top of the original, physical basis of tonne-year accounting. However, it remains unclear how those economic assumptions might interact with (and potentially undermine) temperature stabilization goals.

¹¹ Verra, [Verra Defers Updates to the VCS Program](#) (22 June 2022) (announcing that "Verra will not move forward with incorporating tonne-year accounting into the VCS Program at this time"); Integrity Council for the Voluntary Carbon Markets, [Core Carbon Principles, Assessment Framework, and Assessment Procedure](#): Draft for public consultation (July 2022) at 36.

2. The Supervisory Body should revisit the characterization and apparent dismissal of a wide variety of approaches to long-duration carbon removal.

The Information Note currently characterizes “engineering-based removal activities” as “technologically and economically unproven” and unable to “serve any of the objectives of the Article 6.4 mechanism.”¹² In our understanding, the Information Note defines “engineering-based” to include approaches such as direct air capture, enhanced weathering, and ocean alkalinity enhancement¹³ — a significant portion of the relatively small portfolio of methods currently being explored to achieve long-duration carbon removal. The suggested exclusion of this category of carbon removal activities from the Article 6.4 mechanism runs counter to the best available science on how to achieve the temperature stabilization goals of the Paris Agreement¹⁴ and ignores the trajectory of carbon removal science and project development.¹⁵

To stabilize global temperatures, we will need to balance any ongoing CO₂ emissions with carbon removal and long-duration storage that is comparable with the essentially permanent lifetime of fossil CO₂ emissions in the atmosphere.¹⁶ In contrast, land-based activities that result in only temporary storage cannot physically compensate for fossil CO₂ emissions. Although we are still learning about the realistic potential of “engineering-based” removal activities and how to deploy them responsibly, they can play a distinct and important role in achieving temperature stabilization.

Echoing our previous comments, we respectfully recommend that the Supervisory Body encourage the accurate characterization of the durability of different carbon removal pathways so that markets can price them accordingly. Further, we urge the Supervisory Body to recognize that “engineering-based” approaches that achieve long-duration carbon storage

¹² Information Note at 18 (Table 3).

¹³ Information Note at 91-95 (Annex I).

¹⁴ Intergovernmental Panel on Climate Change, Climate Change 2022: Mitigation of Climate Change, Summary for Policymakers (2022) at 36 (“The deployment of carbon dioxide removal (CDR) to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO₂ or GHG emissions are to be achieved.”); Miles Allen et al., Net Zero: Science, Origins, and Implications, *Annual Review of Environment and Resources* (2022) at 850 (“Durable, climate-neutral net zero strategies require like-for-like balancing of anthropogenic greenhouse gas sources and sinks in terms of both origin ... and gas lifetime.”)

¹⁵ Smith et al., The State of Carbon Dioxide Removal (2023) at 10 (“Virtually all scenarios that limit warming to 1.5°C or 2°C require “novel” CDR, such as BECCS, biochar, DACCS, and enhanced rock weathering. However, only a tiny fraction (0.002 GtCO₂ per year) of current CDR results from novel CDR methods. Closing the CDR gap requires rapid growth of novel CDR.”).

¹⁶ David Archer et al., Atmospheric Lifetime of Fossil Fuel Carbon Dioxide, *Annual Review of Environment and Resources* (2009); Raymond T. Pierrehumbert, Short-Lived Climate Pollution, *Annual Review of Environment and Resources* 42: 341-79 (2014).

represent an important component of plausible pathways for achieving our temperature stabilization goals. To completely ignore this category of carbon removal approaches is an inadequate response to the challenge set forth by Article 2 and we urge the Supervisory Body to revisit this determination.

Thank you for the opportunity to submit comments.



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