Comment on Article 6.4-SB005-AA-A09

To whom it may concern,

Thank you for the opportunity to comment on the Information Note entitled "Removal activities under the Article 6.4 mechanism" (A6.4-SB005-AA-A09 version 0.40). We are writing from the Center for Negative Carbon Emissions at Arizona State University specializing in climate science, carbon management, and the certification of carbon sequestration.

Before we begin our comments, we would like to highlight that a week of commenting period on this informational note is much too short to gather meaningful public input. Unfortunately the note raises many concerns, including:

1. The proposed changes to the definition of removals creates more complexity which opens the door to greenwashing and shoddy accounting;
2. The recommendation for the time preference goes against the obligation to intergenerational equity as enshrined in the Paris Agreement and diminishes the value of permanent storage;
3. The recommendation restricting eligibility is based on subjective criteria and is biased;
4. The accounting recommendations continue to leave the door open to manipulation.

1. The proposed changes to the definition of removals invites unnecessary complexity

The note goes to great lengths to attempt to define "removals" and in doing so increases complexity and introduces subjective reasoning. Removals are nothing more than the capture and storage of CO_2 emissions **already** in the **environment**.

- Any attempt to treat temporary greenhouse gases just like carbon dioxide is scientifically questionable. See for example the detailed discussion about comparing methane to carbon dioxide in the AR6 report. Even nitrous oxide with its much longer residence time in the air is not directly comparable to carbon dioxide.[1] Combining these efforts introduce complexity and subjective choices, because it requires the use of Global Warming Potential to calculate equivalent tonnes between different greenhouse gas emissions. Not only can the GWP not be measured empirically and thus force accounting revisions, but it also requires a choice of the time horizon. As discussed at length in the informational document, the choice of the time horizon has consequences. More on that in Concern 2. A much better choice would be to develop separate control strategies for each greenhouse gas and let carbon removal be carbon removal.
- The definition ought to include all components of the mobile carbon pool, not just the atmosphere. Excess fossil carbon is in the atmosphere, in the surface ocean and in the biosphere[2]. Carbon removal activities ought not be defined by a narrow subset of where the CO_2 is captured, as this will restrict options. It would, therefore, be preferable to use the word "environment" or "mobile carbon pool".

[1] Lackner, K.S., 2020. Practical constraints on atmospheric methane removal. Nature Sustainability 3, 357. https://doi.org/10.1038/s41893-020-0496-7

[2] Lackner, Kl., 2010. Carbon capture: sequestration and storage, in: Hester, R.E. (Ed.), Issues in Environmental Science and Technology. Royal Society of Chemistry, Cambridge.

- The definition focuses heavily on where the carbon dioxide is sourced but omits one consideration for forest activities. If a tree has been growing for decades and is cut down for BECCS, this tree is no longer part of the mobile carbon pool. Extending the minimum sequestration duration to 200-300 years would open the door for cutting down old growth.
- The discussion of who has ownership, the removal company or the storage company, in paragraphs 26-28 arises because the entire mechanism focuses on removals. This ambiguity could be avoided by focusing on storage. If humanity wishes to return atmospheric concentration levels to a lower level, or to make a claim of neutralizing legacy emissions, then the definition of removals does matter. However, to meet the net-zero goals set under the Paris Agreement, **ALL** excess carbon from today onwards must be eliminated. Whether the carbon dioxide can be captured from the source or the environment makes no difference. All of it must be stored to stay within the carbon allowance and avoid exceeding the temperature commitments. A focus on storage not only simplifies rule making, it targets the one critical factor that needs to be measured for input and longevity.

2. The recommendation for time preference goes against the obligation to intergenerational equity as enshrined in the Paris Agreement and diminishes the value of permanent storage

- The note tries very hard to equate an emission avoided (reduced) with an emission removed. This effectively gives emitters the right to emit, and rewards them for relinquishing this right. In a world that has to go to net zero emissions, nobody has the right to emit. Therefore, one cannot treat reductions and removals on an equal footing. There is an asymmetry in impact on the climate of emission avoidance/reduction and carbon removal.[3] It may very well be useful to temporarily reward efforts in emissions reductions, but one should not equate emission reductions with carbon removal. The former is paying someone to not do something they shouldn't be doing anyway (releasing carbon dioxide into the commons), the latter is paying for a service.
- The climate problem requires that excess carbon remains sequestered for thousands of years, if ocean acidification is considered part of the problem, sequestration must last for tens of thousands of years.
- If carbon dioxide does not remain stored, then the removals serve nothing more than to deliberately delay climate change impacts and push associated problems to future generations. The note suggests that is it our time today that matters for decision making, but this goes against intergenerational equity (enshrined in the Paris Agreement)[4], the polluter pays principle[4], and the sustainability of net-zero goals in the long term[5]. We do not know if future generations will be better off or will have the technology to continue to manage carbon. The cost of inadequate

[3] Zickfeld, K., Azevedo, D., Mathesius, S., Matthews, H.D., 2021. Asymmetry in the climate–carbon cycle response to positive and negative CO2 emissions. Nature Climate Change 11, 613–617. https://doi.org/10.1038/s41558-021-01061-2

[4] Arcusa, S., & Lackner, K. (2022, February 23). Intergenerational equity and responsibility: a call to internalize impermanence into certifying carbon sequestration. https://doi.org/10.31219/osf.io/b3wkr

[5] Allen, M.R., Friedlingstein, P., Girardin, C.A.J., Jenkins, S., Malhi, Y., Mitchell-Larson, E., Peters, G.P., Rajamani, L., 2022. Net Zero: Science, Origins, and Implications. Annu. Rev. Environ. Resour. 47, 849–887. https://doi.org/10.1146/annurev-environ-112320-105050

action seems to indicate they will not[6]. In any case, we do not have the right to leave the burden of maintaining a net-zero condition for decades[7] with leaky storage sites to the future.[8] An assessment of the Microsoft and Stripe call for proposals in 2020 and 2021 demonstrated that 50% of the 150 million tons of proposed removals could have their liability passed onto the public within 30 years.[9]

- Defining the minimum storage period as 200 to 300 years would already be a step above current practice but pales in comparison to the duration of climate damage caused by carbon dioxide. The note acknowledges that the damage will continue for much longer and if carbon is released later the same damages will simply occur at a later time. Temperature damages will continue for millennia while damages to the oceans through acidification will continue for tens of thousands of years.[10]
- The note makes the case in paragraph 73 that 100 years has been used conventionally for the time horizon and therefore should continue to be used to equate temporary with permanent. Given the timescales of impacts is in tens of thousands of years, the time horizon choice of 100 years does not have scientific backing. This choice could be construed as hiding behind the traditional when it suits. The note seems to be capable of accepting new ideas as demonstrated by the recommendation to use tonne-year (ton-year) accounting which is not an accepted idea[11]. Several letters sent to the SBSTA also argued this[12,13,14] including my own[15].
- In fact, the practice of tonne-year accounting diminishes the value of sequestration activities that can deliver storage permanent on climate-relevant timescales like geological, mineral, and deep ocean reservoirs. As evidenced in Table 5, the longer the time horizon and the lower the discount rate, the more short-term tonnes must be purchased to be equivalent. Using a time horizon that is shorter than even 1,000 years does not make sense when damages will last tens of thousands of years[6]. Similarly, using a discount rate higher than zero does not make sense when it is used to discount the wellbeing of future generations of humans and other species. This is not a question of costs and benefits, but of the survival of species. Please see the

[6] SwissRe Institute, 2021. The economics of climate change: no action not an option.
[7] Allen, M.R., Friedlingstein, P., Girardin, C.A.J., Jenkins, S., Malhi, Y., Mitchell-Larson, E., Peters, G.P., Rajamani, L., 2022. Net Zero: Science, Origins, and Implications. Annu. Rev. Environ. Resour. 47, 849–887. https://doi.org/10.1146/annurev-environ-112320-105050
[8] Wong, P.-H., 2014. Maintenance Required: The Ethics of Geoengineering and Post-Implementation Scenarios. Ethics, Policy, and Government 17, 186–191. https://doi.org/10.1080/21550085.2014.926090
[9] Arcusa, S., & Lackner, K. (2022, February 23). Intergenerational equity and responsibility: a call to internalize impermanence into certifying carbon sequestration. https://doi.org/10.31219/osf.io/b3wkr
[10] Archer, D., Eby, M., Brovkin, V., Ridgwell, A., Cao, L., Mikolajewicz, U., Caldeira, K., Matsumoto, K., Munhoven, G., Montenegro, A., Tokos, K., 2009. Atmospheric lifetime of fossil-fuel carbon dioxide. Annual Reviews of Earth and Planetary Sciences 37.
[11] Brander, M., Broekhoff, D., 2023. Discounting emissions from temporarily stored carbon creates false claims on contribution to cumulative emissions and temperature alignment. SSRN Journal. https://doi.org/10.2139/ssrn.4353340
[12] https://unfccc.int/sites/default/files/resource/SB004-call-for-input-Derik%20Broekhoff%2C%20Matthew%20Brander%2C%20Lambert%20Schneider.pdf
[13] https://unfccc.int/sites/default/files/resource/SB002-call-for-input-CarbonPlan.pdf
[14] https://unfccc.int/sites/default/files/resource/SB002-call-for-input-Bellona.pdf
[15] https://unfccc.int/sites/default/files/resource/SB002-call-for-input-ArcusaS.pdf

following helpful analyses of tonne-year accounting by CarbonPlan[16] and CarbonDirect[17]. The use of tonne-year accounting with a 100 year time horizon is an attempt to keep temporary storage activities artificially economically viable when competing with geological, mineral, and deep ocean reservoirs that can bring storage that is permanent on climate-relevant timescales when, in fact, the very act of including monitoring and remediation costs make temporary activities more expensive.[18] More details on the technology in Concern 3.

- Tonne-year accounting would only be acceptable if emitters were held to purchase tonne-years for the next thousand years for every tonne they emit. The impracticality of this proposal shows that tonne-year accounting is a subterfuge to avoid paying for permanence.
- Table 10 summarizes some of the crediting approaches and yet excludes alternative mechanisms that could keep temporary storage activities into the Article 6.4 mechanism **without** compromising future generations. See *A conceptual framework for the certification of carbon sequestration* for one possible option that explicitly includes temporary storage through responsibility and a chain of custody.[19]
- The argument that the market must be cost-effective may be true, but not when the rules will artificially keep the cost down by neglecting the rights of future generations by not internalizing the cost of the failure of storage to be permanent.

3. The recommendation restricting eligibility is biased and based on a subjective method

The concerns on the eligibility recommendations are focused on the method to arrive at the eligibility recommendations, the intent of the recommendations, and the bias apparent in the note.

Subjective in nature:

- A pros and cons analysis is a crude method to define what activity type ought to be eligible. It does not make clear what is the intent, nor which are the criteria under consideration and therefore becomes subjective to the author. Despite the claim of extensive public input and consulting of other sources, presumably all the IPCC reports, Table 3 has only a minimalist and unequal analysis of the pros and cons of engineered vs land-based activities. The note references Fuss et al.[20] which itself contains many more considerations than Table 3. The unjustified omission of relevant pros and cons is one example of the issues that can arise from a subjective method that lacks criteria or intent.
- The Table 3 analysis lumps all activities under two categories, yet criteria like impacts, maturity, and cost will vary by activity and by technology. It will even vary by project. In fact, the analysis

[16] https://carbonplan.org/research/ton-year-explainer
[17] carbon-direct.com/insights/accounting-for-short-term-durability-in-carbon-offsetting
[18] Prado, A., Mac Dowell, N., 2023. The cost of permanent carbon dioxide removal. Joule 7, 700–712. https://doi.org/10.1016/j.joule.2023.03.006
[19] Arcusa S., Lackner K., Hagood, E. , Page R., Sriramprasad V. (2022). A conceptual framework for the certification of carbon sequestration. December 2022. Arizona State University KEEP Repository, https://hdl.handle.net/2286/R.2.N.172390.
[20] Fuss, S., Lamb, W.F., Callaghan, M.W., Hilaire, J., Creutzig, F., Amann, T., Beringer, T., De Oliveira Garcia, W., Hartmann, J., Khanna, T., Luderer, G., Nemet, G.F., Rogelj, J., Smith, P., Vicente, J.V., Wilcox, J., Del Mar Zamora Dominguez, M., Minx, J.C., 2018. Negative emissions - Part 2: Costs, potentials and side effects. Environmental Research Letters 13. https://doi.org/10.1088/1748-9326/aabf9f

does not make clear what criteria are considered. The note hints at sustainable development, technological maturity, cost, environmental and social risks but does not make these explicit nor does it apply them equally across the two categories. For example, some cons not mentioned are that land-based activities also have land, water, and food constraints[20], high cost of monitoring and remediation when done properly[19], as well as potential environmental and social risks of land grabbing[21] and ecosystem degradation[22].

- It would therefore be more objective to define eligibility based on defensible criteria. The establishment of criteria/standards ahead of judgements not only clarifies but tends to remove subjectivity.

Biased:

- Intended or not, the subjectivity of the pros and cons method renders the analysis biased towards land-based removals. First, in terms of the recommendation to use tonne-year accounting it puts land-based activities on an uneven playing field with engineering-based activities. Second, by omitting cons from the land-based removals category, it gives the appearance that land-based activities are benign. Third, by arbitrarily selecting a desirable price of $10/t today, it is making a subjective assessment on the possibilities of engineering-based activities to come down in price. Fourth, by subjecting engineering-based removals to seemingly different standards.
- On the third point, the note reads that a third of the mitigation potential from land-based activities to 2030 could be below $10/t. On the one hand that could sound appealing to the right audience from a cost perspective, as it will absolve companies of their emission responsibility for as cheaply as possible. On the other hand, it raises questions about whether that threshold factors the cost of monitoring, verification, and remediation; who will get to benefit from the purchase of such cheap credits; and what is the price of the other two thirds of the mitigation potential. It seems questionable to base eligibility on the current price of a fraction of the supply.
- On the fourth point, the cost of the activities is mentioned as an exclusion criterion, arguing that engineering activities are economically unproven. Yet, Table 4 lists the estimated costs for land-based and engineering-based removals within the same range. Furthermore, the costs do not include the costs of monitoring and remediation to deliver a permanent tonne of storage rendering the estimates incomplete. Engineering based activities are also still emerging, with the cost expected to fall over time with innovation and competition - like other mass-produced technologies - as projected for DAC, for example[23].
- Ruling out an approach to carbon management based on its perceived cost is an attempt to bias a playing field. If indeed a technology is too expensive to be deployed there is no reason to rule out its use by regulation. Economics reasoning alone will suffice. The only motivation to prevent such technologies from trying is the expectation that they could in the future compete with the “favorite” technology.

[21] Lyons, K. and Westoby, P., 2014. Carbon colonialism and the new land grab: Plantation forestry in Uganda and its livelihood impacts. Journal of Rural Studies, 36, pp.13-21.

[22] Bond, William J., Nicola Stevens, Guy F. Midgley, and Caroline ER Lehmann. "The trouble with trees: afforestation plans for Africa." Trends in ecology & evolution 34, no. 11 (2019): 963-965.

[23] Lackner, K.S. and Azarabadi, H., 2021. Buying down the cost of direct air capture. Industrial & engineering chemistry research, 60(22), pp.8196-8208.

- Furthermore, the implicit criteria of requiring activities to be a proven technology is applied to the entire category of engineering-based activities despite 50 years of experience with injection into geological storage, for example. The IPCC wrote a report in 2005 detailing the status of the technology[24]. Not much has changed since except that technology has improved and there are more than two decades of testing at Sleipner[25] and other sites without known incidents.
- Contrary to the arguments in the note, meeting the Paris Agreement commitments will require a wide range of storage options[26]. A wide portfolio is also more likely to minimize impacts on energy, food production, water, and land-use.[27] Countries will also have access to different types of storage sites and need support to deploy all viable options. This late stage of the climate crisis, with three decades of delay in meaningful climate action, is not the time to restrict options.
- The note makes the case that engineering-based activities should be excluded from the mechanism in a fashion that is biased and subjective as detailed above. Now we draw your attention to the bolded clause in the sentence used in Table 3 that reads "These activities do not contribute to sustainable development, **are not suitable for implementation in the developing countries** and do not contribute to reducing the global mitigation costs, and therefore do not serve any of the objectives of the Article 6.4 mechanism." It could be that this sentence was poorly formulated, but as currently written the meaning has negative connotations. The idea that anyone, and presumably developed countries, know better than developing countries about their capabilities is paternalistic, if not aggressively neo-colonialist. It also implies that developing countries will not advance in economic standing (and lumps all developing countries and their capabilities into one very small, homogenous group).
- The note further argues that engineering-based activities cannot be eligible because they do not advance sustainable development. Yet, analyses demonstrate that engineering-based activities have, and will generate employment opportunities. For example, DACCS would stimulate job creation with estimates that a megaton facility can provide as many as 3500 jobs across the value chain[28]. Kenya, for instance, is emerging as a prime location for DACCS with its vast basaltic reserves, fast-growing workforce, and renewable grid. It would be a disservice for sustainable development to cut off developing countries from the opportunity to develop their own engineering-based activities. Developing countries need financial and technological transfer and capability support as already included in the UNFCCC[29], not "protection".

[24] IPCC, 2005. IPCC Special Report on Carbon Dioxide Capture and Storage. Prepared by Working Group III of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and NewYork, NY, USA.
[25] https://www.sciencedirect.com/science/article/pii/S1876610217317174
[26] Minx, J.C., Lamb, W.F., Callaghan, M.W., Fuss, S., Hilaire, J., Creutzig, F., Amann, T., Beringer, T., De Oliveira Garcia, W., Hartmann, J., Khanna, T., Lenzi, D., Luderer, G., Nemet, G.F., Rogelj, J., Smith, P., Vicente Vicente, J.L., Wilcox, J., Del Mar Zamora Dominguez, M., 2018. Negative emissions - Part 1: Research landscape and synthesis. Environmental Research Letters 13. https://doi.org/10.1088/1748-9326/aabf9b
[27] Fuhrman, J., Bergero, C., Weber, M., Monteith, S., Wang, F.M., Clarens, A.F., Doney, S.C., Shobe, W., McJeon, H., 2023. Diverse carbon dioxide removal approaches could reduce impacts on the energy–water–land system. Nat. Clim. Chang. https://doi.org/10.1038/s41558-023-01604-9
[28] https://rhg.com/research/capturing-new-jobs-and-new-business/
[29] https://unfccc.int/napsupport

4. The accounting recommendations continue to leave the door open to manipulation.

The concerns with the accounting recommendations concerns counterfactuals and the focus on *net* outcomes.

Counterfactuals:

- The accounting of carbon removal requires a different approach than previously used to account for emission reduction or avoidance[30]. By focusing on accounting for storage, a distinct advantage arises of being directly measurable. One can measure the amount of carbon captured and added into a reservoir[31]. This measurability makes carbon storage verifiable. An auditor can independently measure the carbon content of the reservoir and check it against the values reported by the storage operator. This means that accounting rules can move away from using hypothetical "business as usual" baselines. There is no excuse for not directly measuring the baseline, i.e., the carbon content of the reservoir before activities. This is an important strength of carbon storage.
- A hypothetical baseline relies on counterfactual scenarios. Because the counterfactual does not happen, it cannot be verified, although it can be shown to be plausible, using external information. While conservative approaches can be taken, baselines are easily manipulated[32,33,34]. In fact, the use of counterfactuals has been the source of greenwashing scandals affecting credits of emission reduction and avoidance over the years. For example, West et al. found that 90% of REDD+ rainforest credits in the Brazilian Amazon were overestimated due to the counterfactual baseline.[35] Badgley et al. showed that the counterfactuals led to a systematic over crediting of 29.4% of the credits they analyzed from the Californian credit market.[36] Calel et al. estimate that 1 in 2 Clean Development Mechanisms credits were allocated to wind projects in India that would have happened anyway, another example of miscrediting

[30] Arcusa, S., Lackner, K., Page, R., Sriramprasad, V., Hagood, E., 2022. Carbon removal accounting methodologies: How to rethink the system for negative carbon emissions.

[31] Lackner, K.S., Brennan, S., 2009. Envisioning carbon capture and storage: Expanded possibilities due to air capture, leakage insurance, and C-14 monitoring. Climatic Change 96, 357–378. https://doi.org/10.1007/s10584-009-9632-0

[32] Fischer, C., 2005. Project-based mechanisms for emissions reductions: balancing trade-offs with baselines. Energy Policy 33, 1807–1823. https://doi.org/10.1016/j.enpol.2004.02.016

[33] Millard-Ball, A., 2013. The trouble with voluntary emissions trading: Uncertainty and adverse selection in sectoral crediting programs. Journal of Environmental Economics and Management 65, 40–55. https://doi.org/10.1016/j.jeem.2012.05.007

[34] Liu, X., Cui, Q., 2017. Baseline manipulation in voluntary carbon offset programs. Energy Policy 111, 9–17. https://doi.org/10.1016/j.enpol.2017.09.014

[35] West, T.A.P., Börner, J., Sills, E.O., Kontoleon, A., 2020. Overstated carbon emission reductions from voluntary REDD+ projects in the Brazilian Amazon. Proc. Natl. Acad. Sci. U.S.A. 117, 24188–24194. https://doi.org/10.1073/pnas.2004334117

[36] Badgley, G., Freeman, J., Hamman, J.J., Haya, B., Trugman, A.T., Anderegg, W.R.L., Cullenward, D., 2022. Systematic over-crediting in California's forest carbon offsets program 28, 1433–1445. https://doi.org/10.1111/gcb.15943

through the counterfactual.[37] The scandals of Verra[38], SouthPole[39], and now Chevron[40] should serve as cautionary tales of continuing with counterfactuals and current practice. The recommendation in section 6.3.1 to use counterfactuals in the baseline scenarios should be reconsidered.

- The alternative to the use of counterfactuals is to make the most of the strength of directly accounting for storage to ensure the highest level of verifiability. This means that accounting rules - for all types of activities - must be able to (1) delineate the boundaries of the reservoir, (2) quantify the carbon added to a reservoir, (3) quantify the carbon content of the reservoir, (4) estimate the measurement error in a way that is commensurate across all types of removal[41].

Net outcomes:

- It makes sense to want to measure net outcomes when focusing on removals. One needs to know that a project does remove more carbon dioxide than it emits to be a viable carbon removal activity.
- However, by focusing on removals and wanting to account for net outcomes, the system becomes overly complex, subjective, and inaccurate because it now requires the use of a Life Cycle Analysis.[42] LCAs are very useful when understanding where the emissions come from in a process or comparing the efficiency across different processes of the same type of system. Despite their wide and increasing application in carbon accounting, LCAs are not useful for carbon removal accounting purposes. Three decades of research have amassed a large body of literature on the issues with LCA (see references in reference 42), some of which are particularly pertinent to carbon removal, and many remain unresolved. LCAs require knowledge of elements that are not known but are approximated or rely on generic datasets. Drawing boundaries for LCAs is a subjective activity yet a highly important part of the process. This makes LCAs easy to manipulate and frequently inaccurate for accounting. LCAs also rely on large amounts of data that are guessed at or modeled, making the attribution of emissions a challenge. LCAs must make a value-judgment decision on the question of durability, which has major consequences as discussed in Concern 2. Moreover, because LCAs for carbon accounting wish to encapsulate other greenhouse gases (e.g., methane, nitrous oxide), it requires the reliance on GWP, another unverifiable and modeled approach that makes a value judgment on time horizons. Even with calls to switch from attributional to consequential accounting that purports to measure the change in emissions due to some action) many of these problems persist. For example, consequential accounting cannot produce definitive quantitative estimates of actual outcomes, a

[37] Calel, R., Colmer, J., Dechezleprêtre, A., Glachant, M., 2021. Do Carbon Offsets Offset Carbon? SSRN Journal. https://doi.org/10.2139/ssrn.3950103

[38] https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe

[39] https://www.ftm.eu/articles/south-pole-kariba-carbon-emission

[40] https://www.theguardian.com/environment/2023/may/24/chevron-carbon-offset-climate-crisis

[41] Arcusa S., Lackner K., Hagood, E., Page R., Sriramprasad V. (2022). A conceptual framework for the certification of carbon sequestration. December 2022. Arizona State University KEEP Repository, https://hdl.handle.net/2286/R.2.N.172390.

[42] Lackner, K., Arcusa, S., Azarabadi, H., Sriramprasad, V., & Page, R. (2023, February 17). Eliminating the Need for Life Cycle Analysis for Carbon Accounting and in the Certification of Carbon Sequestration. https://doi.org/10.31219/osf.io/q9pzb

clear issue if carbon accounting is to be verifiable. The complexity, expense, and time necessary to perform an LCA make it a poor candidate as a tool to account for carbon removal.

- While it is important to disclose the emissions from a project, accurate accounting for the purpose of certification should rely on direct measurement of carbon stored. Not carbon captured, but what is in storage. Measurements of what is in storage is also preferable to measurement of emissions from storage since it may not account for the full loss of carbon. More information on that can be found in reference 31 and 41.

In summary, it appears that the Informational Note tips the playing field in favor of land-based activities. To this end it weakens accounting methods, allows for counterfactual baselines, and ignores intergenerational equity by incorrectly equating sequestration duration of centuries with the permanence requirements from climate change and ocean acidification. To keep engineering-based activities out it resorts to economic criteria that should play no role in regulatory decision making. The implementation of these recommendations will make it harder to achieve net-zero emissions without pushing the problem onto future generations.

We urge the SBSTA to rigorously reevaluate.

Respectfully,

Dr. Stephanie Arcusa, Dr. Klaus Lackner, Robert Page, Marsha King, and Vishrudh Sriramprasad