(carbon)plan

APR 08 2022

Verra Secretariat (by email)

RE: Proposed updates to the VCS Program (February 2022)

Dear Verra Secretariat staff,

Thank you for the opportunity to comment on the Proposed Updates to the VCS Program.[1] Our comments focus on the proposed use of ton-year accounting, and are informed by recent research projects reviewing ton-year accounting and related permanence issues.[2]

For context, CarbonPlan is a non-profit research organization with expertise in climate science and carbon offsets. We actively publish our work in scientific journals and are engaged in the development and evolution of public and private standards for carbon markets. We are interested in ensuring the scientific integrity of market standards, including the validity of technical decisions that affect the permanence and additionality of credited carbon.

As explained further below, we are concerned about the potential adoption of ton-year accounting across Verra's VCS Program. Fundamentally, ton-year accounting is physically inconsistent with net-zero climate goals that seek to stabilize planetary temperatures. We urge Verra to reconsider the proposed adoption of ton-year accounting methods, as this approach opens the door for carbon offsetting practices that significantly increase long-term temperatures and are incompatible with net-zero climate goals.

If Verra decides to proceed with ton-year accounting, then Verra should (1) develop safeguards on a methodology-by-methodology basis to address novel additionality risks introduced by the ton-year accounting option, and (2) retain the proposed conversion rate to translate temporary carbon storage into carbon credits and ensure that no methodologies or projects deviate from this fixed parameter. Verra should also (3) clearly indicate that credits issued to short-duration projects are not consistent with canceling out the effects of ongoing CO_2 pollution.

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1 Verra, Proposed Updates to the VCS Program (Feb. 7, 2022) (hereinafter "Proposed Updates") (proposing to modify Verra's VCS Standard v4.2 (Jan. 20, 2022) (hereinafter "VCS Standard")); *see also* Verra, Additional Background Information on Tonne-Year Accounting (Apr. 1, 2022) (hereinafter "Additional Background").

2 Freya Chay et al., Unpacking ton-year accounting, CarbonPlan (Jan. 31, 2022); Bodie Cabiyo & Alex Dolginow, Accounting for Short-Term Durability in Carbon Offsetting, Carbon Direct (Feb. 28, 2022).

Section 4.3, Question 1. What concerns do you have about the introduction of tonne-year accounting as an alternative approach to non-permanence risk within the VCS Program?

We have two significant concerns with the proposed adoption of ton-year accounting.

- **Issue 1: Ton-year accounting is inconsistent with net-zero climate goals and global temperature stabilization.**

Issuing offset credits based on ton-year accounting is inconsistent with the physical climate outcomes required for net-zero climate goals and global temperature stabilization. Ton-year accounting asserts that temporary carbon storage is equivalent to the permanent effects of CO_2 emissions based on a peculiar physical criterion: when the cumulative radiative forcing of CO_2 emissions is balanced out by an equal reduction in radiative forcing brought about by temporary CO_2 storage.

Critically, this equivalence concept ignores temperature and is thus inconsistent with climate-stabilization outcomes. Global temperatures are highly responsive to the amount of CO_2 in the atmosphere.[3] If temporary carbon storage is used to offset emissions, post-storage temperatures reflect *both* the offset emission and the carbon emitted at the end of its temporary storage period — as well as a reduced rate of uptake in natural sinks during the temporary storage period. As a result, the system stabilizes at a higher temperature and leads to larger long-term climate impacts. These impacts must be taken into account to properly measure the value of temporary carbon storage, but they aren't included in ton-year accounting methods.

To illustrate the problem, we modeled the temperature outcomes of carbon offsetting based on Verra's proposed ton-year methods. Specifically, Verra's proposal would award partial credits for each year a ton of CO_2 is stored outside the atmosphere based on a "conversion rate" of 100:1.[4] In other words, Verra calculates that over a 100-year time period, 100 tons of CO_2 stored for 1 year is equivalent to 1 ton of CO_2 emissions. Figure 1 shows the temperature outcome of offsetting 1 $GtCO_2$ of emissions with a 10-year carbon storage project credited under Verra's proposed ton-year accounting method (green line).

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[3] M.U.F. Kirchbaum, Temporary carbon sequestration cannot prevent climate change, *Mitigation and Adaptation Strategies for Global Change* 11: 1151–64 (2006).

[4] Proposed Updates at § 4.2 (proposing to add ton-year accounting with a conversion rate of 100:1 to VCS Standard at § 3.14.4). For convenience, we note that CarbonPlan has elsewhere referred to what Verra calls a "conversion rate" as an "equivalence ratio." Freya Chay et al., *supra* note 2.

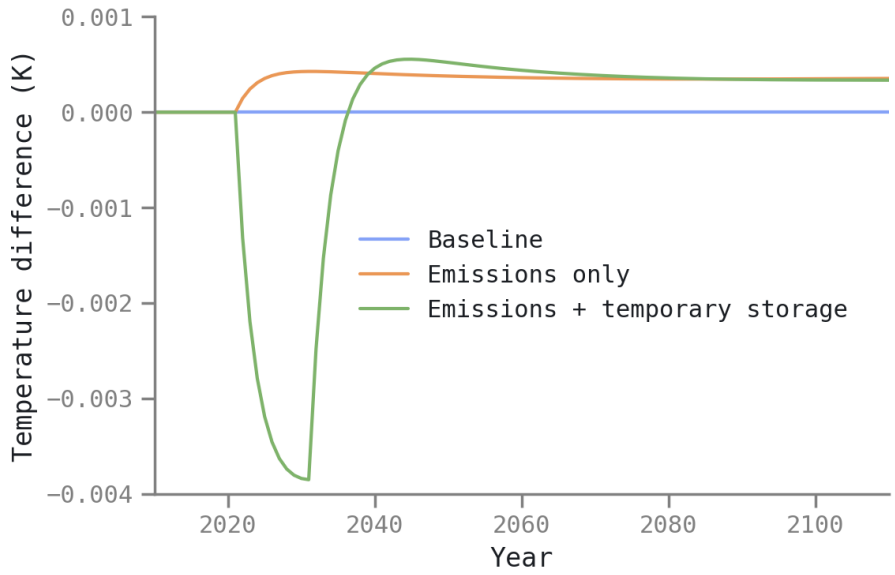

Figure 1: Temperature impacts of CO_2 emissions and temporary CO_2 storage.[5] Carbon offsetting based on Verra's proposed ton-year accounting method (green line) can produce initial temperature benefits, but leads to higher emissions relative to a baseline scenario (blue line). The long-term temperature impacts resemble those of an emissions scenario where no offsetting occurs (orange line).

Because Verra's proposed 100:1 conversion rate requires a 10-year project to store 10 times the CO_2 emitted, the offsetting scenario (green line) initially leads to a significant but temporary reduction in temperature. When the temporarily stored CO_2 is released after 10 years, however, temperature increases and briefly exceeds the emissions-only scenario (orange line). Although Verra's methods suggest that ton-year offsetting neutralizes warming, the long-term effect is essentially identical to the effect of initial emissions (orange line) and substantially higher than the baseline scenario (blue line). If Verra's assertion about physical equivalence were consistent with temperature stabilization, we would instead expect the green and blue lines to be similar.

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[5] We implemented these scenarios using the FaIR climate model. *See* Christopher J. Smith et al., FAIR v1.3: A simple emissions-based impulse response and carbon cycle model, *Geoscientific Model Development* 11: 2273-97 (2018); Richard J. Millar et al., A modified impulse-response representation of the global near-surface air temperature and atmospheric concentration response to carbon dioxide emissions, *Atmospheric Chemistry and Physics* 17: 7213-28 (2017). We used the SSP2-4.5 emissions scenario as the baseline scenario for our calculations (blue line). The emissions-only scenario assumes 1 $GtCO_2$ emitted in 2020 and no further changes (orange line). The 10-year temporary storage project scenario assumes 1 $GtCO_2$ emitted in 2020 and 10 $GtCO_2$ stored from 2020 through 2029 and emitted in 2030 (green line).

We are mindful that these concerns have ramifications for other temporary carbon storage projects. We also appreciate that temporary carbon storage provides some benefits to the climate. Climate researchers have identified scenarios where temporary carbon storage can help reduce peak warming and delay climate impacts, for example, but those scenarios depend on temporary carbon storage augmenting climate mitigation and not being used as a justification for additional emissions via offset credits.[6]

We are concerned that ton-year accounting is being considered for offset crediting despite never having been stress-tested for net-zero climate targets. Ton-year accounting was developed in the late 1990s and early 2000s as a way to estimate the benefits of temporary carbon storage in forests and other natural ecosystems,[7] about a decade before the scientific literature began to recognize that net-zero greenhouse gas emissions are required to stabilize temperatures.[8] The method's history is relevant because ton-year accounting has only rarely been used in practice and has largely remained an academic abstraction. Its recent revival — including Québec's cap-and-trade program regulator,[9] the Climate Action Reserve's Mexico Forest Protocol[10] and Soil Enrichment Protocol,[11] and now NCX's proposal to use ton-year methods in Verra's program[12] — has come without any discussion of whether an old method is relevant in a world aiming for global net-zero emissions.

The value of temporary carbon storage ultimately depends on a number of critical factors that must be analyzed comprehensively[13] — notably the global emissions scenario, the extent and pace of future climate impacts, and highly normative decisions around economic discounting and distributional impacts. Ton-year accounting does not account for any of these complexities and is based, instead, on an oversimplification of physical climate science dynamics. Issuing

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6 H. Damon Matthews et al., Temporary nature-based carbon removal can lower peak warming in a well-below 2 °C scenario, *Nature Communications Earth & Environment* 3: 65 (2022).

7 IPCC Special Report on Land Use, Land Use Change, and Forestry (2000) at § 2.3.6.3 (reviewing the history of academic papers that developed ton-year methods in the mid-to-late 1990s).

8 *See*, *e.g.*, H. Damon Matthews & Ken Caldeira, Stabilizing climate requires near-zero emissions, *Geophysical Research Letters* 35: L04705 (2008).

9 *See* Québec MELCC, Offset Credits. Québec has also proposed a new protocol that would use ton-year accounting.Québec MELCC, Draft offset credit regulation on afforestation and reforestation projects on private lands (Sept. 2020).

10 Climate Action Reserve, Mexico Forest Protocol Version 2.0 (Mar. 30, 2020).

11 Climate Action Reserve, Soil Enrichment Protocol Version 1.0 (Sept. 30, 2020) at 3.5.5. As of this writing, Indigo Ag, which sponsored CAR's protocol, has a very large project (CAR1459) that is in the initial process of crediting and has opted out of the ton-year accounting option.

12 Verra, Methodology for Improved Forest Management through Targeted, Short-Term Harvest Deferral (Mar. 17, 2021) (developed by NCX).

13 See, e.g., Ben Groom & Frank Venmans, The social value of offsets, working paper (Dec. 16, 2021).

offset credits based on conversion ratios derived from ton-year accounting does not indicate progress toward net-zero goals and may even lead to counterproductive outcomes that increase global temperatures.

- **Issue 2: Ton-year accounting introduces novel additionality concerns that require methodology-specific mitigation standards.**

The additionality standard requires projects to demonstrate that their credited climate benefits occur in addition to business-as-usual expectations, i.e. that credited emission reductions would not occur in the absence of the credit's financial incentive. According to VCS program rules, additionality must be "demonstrated and assessed in accordance with the requirements set out in the [crediting] methodology applied to the project."[14]

We strongly recommend Verra foreclose the option to use ton-year accounting with crediting methodologies that were not explicitly designed to address the novel additionality risks created by ton-year accounting. These risks are significant enough in their own right when it comes to methodologies that are designed primarily around ton-year accounting. What Verra is proposing, however, goes far beyond that. Verra's proposal includes the option for *any* project to petition Verra to use ton-year accounting under *any* methodology.[15] This is a problem because additionality risks vary depending on offset methodologies' crediting periods. As a result, protections designed for an existing methodology with a crediting period of 40 years might be wholly inadequate for a ton-year methodology based on 1-year crediting periods.

As proposed, ton-year accounting creates unique additionality risks because it gives projects the option to exit their carbon commitments on an annual basis. Specifically, projects could be issued credits on an as-you-go basis with a renewable crediting period of one or more years.[16] Projects electing ton-year accounting can choose to end the crediting period at any time with no penalty and do not have to make contributions to buffer pools.[17]

Giving projects the ongoing option to exit their carbon commitments creates multiple, novel additionality risks. Additionality depends on complex real-time market dynamics and can be gamed when projects can opt in or out of crediting.

For example, imagine a forest project with mature timber that has decided to defer harvest until market prices recover from an unexpected crash. With ton-year accounting, this project could

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[14] VCS Standard at § 3.13.1.

[15] Proposed Updates at § 4.2 (proposing to add VCS Standard § 3.14.4).

[16] Proposed Updates at § 4.2 (proposing to update the crediting period in VCS Standard § 3.8.7). Crediting periods can be renewed up to 100 years. *Id*.

[17] Proposed Updates at § 4.2 (proposing to add VCS Standard § 3.2.20).

receive non-additional credits over a flexible time horizon while it waits for more favorable market conditions to conduct its business-as-usual harvest plans. Alternatively, consider a forest project with a 40-year harvest cycle. Using ton-year accounting, this project could claim credits during its natural regrowth cycle without having to make any changes to long-term carbon stocks or change business-as-usual harvesting intentions. Because today's crediting methodologies are based around a minimum 20-year crediting period,[18] the possibility that projects would opt in and opt out of crediting on much shorter time horizons is not addressed — but would become an explicit additionality risk under ton-year accounting.

Additionality risks also depend on interactions between program rules and crediting methodologies. Although the Proposed Update includes potential changes to program rules that have direct ramifications for the additionality of ton-year accounting projects, the Proposed Update does not appear to contemplate how these changes might encourage non-additional crediting under ton-year methods. For instance, the VCS Standard contains a requirement that individual projects increase the total size of the terrestrial carbon sink by crediting the project in the context of its long-term harvest dynamics.[19] If ton-year projects were exempted from this requirement — as Verra appears to be contemplating[20] — then the additionality risk currently addressed by this requirement would need to be resolved by another, as-of-yet-unspecified mechanism.

Similarly, additionality risks depend on the rules governing when landowners can cycle in and out of credited projects. Under Section 5 of the Proposed Updates, landowners who were previously credited with ton-year accounting are allowed to move between projects and have gaps between leaving one project and starting in another. This could exacerbate the additionality concerns outlined above by allowing cyclical, non-additional crediting patterns that take advantage of business-as-usual harvesting and timber market dynamics.[21]

Because ton-year accounting offers projects the flexible option to exit carbon commitments on an annual basis, it creates new opportunities for projects to earn credit for business-as-usual behaviors. These risks must be addressed with methodology-specific additionality standards. Projects using methodologies that were not explicitly designed to address the additionality risks of ton-year accounting should not be allowed to use ton-year accounting.

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[18] VCS Standard at § 3.8.3.

[19] VCS Standard at § 3.2.

[20] See our comments below on Section 4.3, Question 2 for details.

[21] See our comments below on Section 5.3, Question 1 for details.

Section 4.3, Question 2. What concerns do you have with the proposed conversion rate of 100 tonne-years to one tonne? What do you think would be a more appropriate conversion rate, and why would this be more appropriate than 100 to 1?

The proposed 100:1 conversion rate should not be reduced. The current rate is appropriate for asserting a balance in cumulative radiative forcing over 100 years. A lower conversion rate would be inconsistent with the stated goal of balancing cumulative radiative forcing over 100 years, and a higher conversion rate is required to balance cumulative radiative forcing over a period longer than 100 years.

We believe the choice of conversion rate should be based on climate modeling that substantiates a ton-year method's claim of balancing cumulative radiative forcing. Using the FaIR climate model to balance cumulative radiative forcing, we calculate a conversion rate of about 104:1.[22] The correspondence between Verra's proposed conversion rate (100:1) and our climate-model-based calculation (about 104:1) suggests that Verra's proposal is reasonably well aligned with the goal of balancing cumulative radiative forcing over 100 years. We note, however, that the modeled conversion rate depends on the choice of global emission scenarios and can range from 82:1 to 121:1.[23]

Again, however, we stress that ton-year accounting is not consistent with net-zero climate goals or global temperature stabilization. It is also important to observe that Verra's choice of a 100-year time horizon excludes consideration of all subsequent warming impacts. A higher conversion rate is needed to justify physical equivalency claims that extend beyond 100 years.

We also want to address two alternative methods for choosing a conversion rate that should not be adopted, either in the present consultation or as an option for future methodologies.

First, some stakeholders have proposed introducing economic discounting concepts into the calculation of a conversion rate. NCX's recent white paper, for example, introduces a discount rate that reduces the reported ton-year impacts of emission scenarios over time. As a result of discounting, NCX calculates a conversion rate of 30.1:1 for a 100-year time horizon and only 30.8:1 for an infinite time horizon.[24] This approach is inappropriate because discounting radiative forcing calculations invalidates any claim to physical equivalency, including the

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[22] Specifically, we calculated a conversion rate by equalizing the cumulative radiative forcing over a 100-year period between an initial emissions pulse and a 1-year delay in emissions. As in Figure 1, we used the SSP2-4.5 emissions trajectory. We note that conversion rates derived from the FaIR climate model are sensitive to different emission scenarios. *See* Christopher J. Smith et al., *supra* note 5; Richard J. Millar et al., *supra* note 5.

[23] The modeled conversion ratio for a 1-year delay in emissions with a 100-year time horizon is 82:1 for SSP1-1.9 (a deep emissions scenario) and 121:1 for SSP5-8.5 (a high emissions scenario).

[24] Zack Parisa et al., The Time Value of Carbon Storage, Research Square preprint (Mar. 16, 2022).

claimed equivalency under Verra's proposal.[25] Decisions about discounting and time horizons should be made separately from physical equivalency assertions,[26] not co-mingled in ways that are all but certain to confuse market participants.

Second, in addition to the "Lashof" method on which Verra's proposal is based, a distinct approach known as the "Moura Costa" method exists and should not be used.[27] The Moura Costa method does not address the atmospheric impacts of emitting CO_2 after temporary storage. As a result, the Moura Costa method can produce the obviously absurd result that temporarily storing 1 tCO_2 justifies the emission of more than 1 tCO_2.[28]

Section 4.3, Question 3. Should [Aforestation, Reforestation and Revegetation] ARR and [Improved Forest Management] IFM projects using tonne-year accounting be exempt from the long-term average requirements outlined in Section 3.2 of the VCS Standard?

No. Section 3.2 of the VCS Standard is designed to ensure that individual projects increase the total size of the terrestrial carbon sink by crediting the project in the context of long-term harvest dynamics. Absent these safeguards, ton-year accounting could allow significant non-additional crediting of business-as-usual forest regrowth.

In many ways, Section 3.2 of the Verra Standard anticipates the additionality concerns surrounding ton-year accounting that we raise above. Like ARR and IFM projects that include timber harvesting, ton-year accounting can only be successful if it takes into account harvest dynamics to ensure the additionality of credited carbon. In the absence of these protections, projects could enroll business-as-usual land management activities in ton-year accounting and earn credit for non-additional carbon storage leading up to planned harvest activities.

To reduce the risk of these outcomes, Verra should retain the long-term average requirements in its current Standard, including the calculation and reporting of historical harvest/cutting cycle lengths in Section 3.2.3.21. Section 3.2 should also be expanded to prohibit the use of ton-year accounting to credit carbon stored in ARR and IFM projects when the trees are younger than the historic harvest/cut cycle. This would have the effect of prohibiting business-as-usual timber regrowth cycles from earning offset credits that are highly likely to be non-additional.

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25 Danny Cullenward et al., A critique of NCX's accounting methods, CarbonPlan (Jan. 31, 2022).

26 Liz Marshall, Biofuels and the Time Value of Carbon: Recommendations for GHG Accounting Protocols, World Resources Institute (2009); Kenneth R. Richards, The time value of carbon in bottom-up studies, *Critical Reviews in Environmental Science and Technology* 27: 279-92; Ben Groom & Frank Vehnman, *supra* note 13.

27 Verra, Additional Background, *supra* note 1.

28 Freya Chay et al., *supra* note 2 (see Table 1).

Section 4.3, Question 4. How should situations where partial credits are generated be handled? Should Verra allow projects to carry over excess tonne-years to the next verification period?

We have no objection to carrying partial credits forward, so long as the total number of credits issued never exceeds verified historical quantities.

Section 4.3, Question 5. What further clarifications on using tonne-year accounting do you think are needed?

The Proposed Updates define a ton-year as "[a] metric tonne (MT) of CO_2 stored for one year that approximates the radiative forcing that the tonne of CO_2 would have had in the atmosphere over a single year."[29] We believe this definition should be clarified to avoid potential misunderstandings.

In our view, a ton-year is an arbitrary but potentially useful way to refer to a combination of mass and time. Technically, ton-year accounting methods balance impacts denominated in ton-years — not cumulative radiative forcing. When a ton-year accounting method uses an impulse response function to calculate ton-years (as the Lashof method[30] does), it is true that ton-year calculations approximate radiative forcing calculations.[31] However, there is nothing about ton-year units that necessarily approximates radiative forcing. This is clearly demonstrated by the Moura Costa method, which balances impacts denominated in ton-years but produces physically inconsistent claims from the standpoint of radiative forcing.

Because ton-year units may have separate utility in climate accounting, we suggest defining a ton-year in the VCS Program Definitions simply as "[a] metric tonne (MT) of CO_2 stored for one year," as Verra has elsewhere in its explanatory materials.[32]

Section 5.3, Question 1. What concerns do you have with the proposed clarifications?

The revisions proposed under Section 5 of this consultation clarify that landowners would be allowed to move between offset projects and, if credited with ton-year accounting, to have

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29 Program Updates at § 4.2 (proposing to expand the VCS Program Definitions).

30 Philip M. Fearnside et al., Accounting for time in mitigating global warming through land-use change and forestry, *Mitigation and Adaptation Strategies for Global Change* 5: 239-70 (2000).

31 Freya Chay et al., *supra* note 2.

32 Verra, Additional Background, *supra* note 1.

gaps between leaving one project and joining another.[33] Without safeguards — such as those we recommend strengthening in Section 3.2 of the VCS Standard, in response to Question 3 in Section 4.3 of this consultation — this optionality could pose significant risks to the additionality criteria of the Verra Standard.

For example, imagine a landowner with industrial timberlands scattered throughout the American South, all in various age classes and managed on rotation lengths of about 30 years. The ability to indiscriminately enroll and un-enroll segments of that acreage could invite significant arbitrage opportunities, whereby the owner could enroll soon-to-be harvested parcels that they technically *could* harvest, but would not typically harvest until the trees were slightly older. To continue our example, the landowner might enroll trees in year 20 or 25 of their rotation. After collecting ton-year-based payments for a few years, they could un-enroll their land, execute their planned business-as-usual timber harvests, and, during the course of the next harvest cycle, re-enroll the land for additional carbon payments. Such a scenario could continue in perpetuity and would result in no additional carbon storage, but could nevertheless generate credits under a ton-year accounting approach.

It is unreasonable, if not impossible, to fully grasp how flexible enrollment and ton-year accounting might interact across all of Verra's methodologies. Because ton-year accounting presents significant and novel additionality risks, including as a result of landowners (or "instances") moving in and out of projects, ton-year accounting should only be allowed — if at all — under methodologies that were explicitly designed to address these risks.

Thank you for the opportunity to submit comments.

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[33] Proposed Updates at § 5.2 (proposing to add explicit flexibility for "instances" using ton-year accounting to leave and join different offset projects in VCS Program §§ 3.5.5 and 3.5.16).