SUMMARY OF COMMENTS: PUBLIC CONSULTATION ON ABACUS VCU LABEL

July 29, 2024

1 INTRODUCTION

The ABACUS label is a new market label designed to be applied to Verified Carbon Units (VCUs) from projects validated and verified using Verra's new *VM0047 Afforestation, Reforestation, and Revegetation* (ARR) methodology. This document summarizes the feedback and input from comments received during the November 23, 2023 – January 8, 2024 public consultation on the ABACUS label (PDF). It includes the conclusions the ABACUS Working Group (WG) and Verra drew from the comments (Section 2) and responses to each comment received (Section 3).

During the consultation, Verra and the ABACUS WG invited stakeholders to provide feedback and insights on the proposed requirements of the ABACUS label; these relate to additionality and baseline assessment, leakage, greenhouse gas accounting, and permanence.

Verra sincerely appreciates all 130 comments from 11 stakeholders received in this consultation. The ABACUS WG analyzed the feedback received and responded to the comments below. Verra has ensured that the label requirements meet the VCS Program rules, are compatible with the version of *VM0047* and *VMD0054 Module for Estimating Leakage from ARR Activities* current at the time of publication, and are workable for project proponents and validation/verification bodies. The final label requirements have been published in an *ABACUS Label Guidance* document, which is available on the Verra website.

2 SUMMARY OF COMMENTS RECEIVED BY QUESTION

The summary of comments below highlights the main feedback received in the consultation.

Applicability Requirements
Question 1: Please identify specific challenges to utilizing a census-based quantification approach with the dynamic performance benchmark and leakage quantification.
In general, the WG is agnostic to an area-based or census-based quantification approach as long as a dynamic performance benchmark is used and leakage is fully accounted for (which is not the case for census-based accounting in *VM0047*, which does not require these for census-based

quantification). Commenters did not provide clear feedback on integrating a performance benchmark of matched areas (i.e., pixels) with a census-based accounting framework in which the project area is the tree. Despite this, the WG believes it should be possible for project proponents to track/measure each tree *and* use the broader property boundaries, for example, as a project area to match a performance benchmark. For this reason, the ABACUS label will stay agnostic to the area-based or census-based approach so long as leakage and the performance benchmark are used.

Additionality & Baseline Requirements

Question 1: How should the ABACUS label ensure that the choice of annual time steps on which control plots are matched are representative and not selectively chosen? Please explain. Does requiring no less than five time periods for matching help avoid this?

Respondents generally felt that projects should go beyond simple composite time points to use the full range of temporal data that is accessible and available. How to define 'accessible' or 'available' data is unresolved. Nonetheless, they generally agreed that five time periods are better than three, as currently required in *VM0047*. In response, the WG emphasized the importance of using as many time points as possible and justifying the choice of time points in the label requirements.

Question 2: Should projects be able to include covariates from a shorter lookback (i.e., five years, instead of eight to ten, to provide consistency with satellite products that are not yet eight to ten years old) if they utilize a sufficient number of time points (i.e., no less than five)?

Generally, most respondents were open to a shorter lookback period than 8-10 years set out in *VM0047* under certain conditions: if remote sensing data is limited or as a way to utilize higher quality (and thus of shorter temporal availability) stocking index products or spectral imagery (i.e., Sentinel 2). One respondent said five years is insufficient or that curtailing the matching period is only appropriate if it is automated.

To balance this feedback, the WG considered proposing that a shorter than 8-10-year lookback could be used if all available data from the chosen satellite or product was utilized. Given that this would materially change the requirements of the *VM0047*, the WG decided this was not a possible change that could be made unilaterally in the label requirements.

Question 3: Is either option for the Investment Barrier Test - a Benchmark Analysis of NPV and an Investment Comparison Analysis of IRR – on its own sufficient to rigorously demonstrate financial additionality? Please explain.

Respondents agreed with the premise behind section 3.2.1(2) of the *Public Consultation on ABACUS VCU Label* (PDF) document that the traditional investment barrier test relying on internal

rate of return/net present value (IRR/NPV) demonstrations is insufficient to demonstrate additionality. While Verra stands by these approaches, the ABACUS label would also require projects to demonstrate prior consideration of carbon credits at project inception.

Question 4: How could financial additionality tests be strengthened within the ABACUS label?

Respondents provided multiple approaches that Verra should consider in updating its Investment Barrier Test for financial additionality–especially to differentiate financial additionality tests for industrial landowners versus smallholders. Most of these approaches go beyond the scope of the ABACUS label requirements, but Verra will take them under consideration. The WG added the phrase "Demonstrate, through verifiable documents and/or financial analysis published at or before project inception" to specify that prior consideration of revenue from carbon credits is required to earn the ABACUS label.

Leakage Requirements

Question 1: From the standpoint of global climate mitigation and food security, is it appropriate for projects to mitigate leakage effects by replacing the production of displaced commodities like-for-like or to provide flexibility to adjust commodity mix ('cross-commodity leakage mitigation') as long as a minimum equivalent land sparing effect is achieved?

Almost all respondents agreed that cross-commodity leakage mitigation, so long as a net land-sparing effect was achieved, provides increased flexibility, adaptability, and sustainability for projects, especially during market fluctuations or climate changes. One respondent felt that this would be challenging for community-led projects. The WG has proposed revisions to *VMD0054 Module for Estimating Leakage from ARR Activities* that enable leakage mitigation by increasing commodity production within or outside the project area and flexibility in the choice of mitigation commodity (cross-commodity leakage). This version of the current leakage tool would be more flexible and adaptable for community-led projects.

Question 2: Should the leakage tool assume that displaced production results in new production at the same productivity rates? In what cases should the tool assume regional, national, or global productivity rates for globally traded commodities?

The respondents all affirmed the need for different options for the assumed replacement productivity of displaced production depending on the likely market domain. One respondent insisted on the use of global-scale productivity rates to better optimize toward closing yield gaps and improving land allocation. A few respondents suggested that Verra (or another independent third party) define productivity replacement rates for different domains and commodities instead of leaving this to the project developer. The WG is open to Verra or another independent third-party providing commodity- and domain-specific metrics for leakage accounting.

Question 3: What agricultural products should be applicable for cross-commodity leakage mitigation (i.e., global commodities, subsistence agricultural products, deforestation-driving commodities)?
Respondents did not identify any specific types of agricultural commodities that should not be included, and one encouraged the WG to avoid ambiguous terms like 'deforestation-driving commodities,' which the WG has sought to do.
Question 4: What limitations are needed to ensure productivity enhancements are sustainable and avoid unintended consequences?
Respondents recommended sensible guardrails for leakage mitigation activities around fertilizer use, overstocking, cropping intensity, and water use. The WG agrees that guardrails and/or explicit emission accounting associated with these activities must be included to avoid unsustainable intensification that incurs environmental damage.
Question 5: Which methods should be used to set an allowable canopy cover threshold for a given region and production type? How should projects verifiably demonstrate that their restoration systems are currently, and are likely to stay under, this canopy cover threshold?
Two respondents offered a range of potential approaches to setting this threshold, including remote sensing, modeling, stakeholder, and expert elicitation approaches. Until a more widely agreed upon empirical or model-based approach exists for determining a threshold, the ABACUS WG proposes an approach using a conservative bound.

GHG Accounting and Uncertainty Requirements

Question 1: Should precise plot locations be required? Please explain. If not, how should the ABACUS label balance the need for data transparency in the market with landholder privacy?
Respondents were mixed, with about half insisting that transparency should be a higher priority than privacy in the voluntary carbon market (VCM) and half cautioning against providing plot locations for fear of trade secrets, landholder privacy, or reversal risk. The WG feels that the norm for the VCM should evolve to include more reproducible, detailed project information. In this spirit, the WG proposes to keep the requirement for publicly available plot-level data, with an option to withhold the precise geospatial location of each plot (e.g., by removing the final decimal points from a geo-location).
Question 2: Carbon stock estimates are sensitive to the choice of allometric equation and root-to-shoot ratio, some of which may be developed distant from the project area on a limited or unrepresentative sample of trees. How should projects systematically demonstrate that their allometric or root-to-shoot ratio selection is appropriate and conservative?
Respondents had many useful selection considerations for justifying an allometric equation is conservative and appropriate, many of which are already included as considerations in the label

requirement. It is still challenging to proscribe verifiable requirements around how to weigh the many considerations appropriately. We added a requirement to justify the number of parameters in the allometric relationship (i.e., diameter only or diameter and height). We also included a systematic data-driven approach to allude to systematic hierarchical approaches like that in Haya et al. 2023.[1] Finally, the WG clarified the requirements to include a methodological source, such as a peer-reviewed or government source, for any allometric equation.

Question 3: How can the ABACUS label enable more transparency in project measurement and uncertainty quantification?

Respondents focused on public inventory data, clear identification and justification of scaling models (i.e., allometric equations), reproducible data pipelines, published field standard operating procedures, and clearly articulated assumptions. These would all be valuable and may require an independent third party to develop open-source data templates that work across all project designs. Such development activities are beyond the scope of the ABACUS label requirements. For now, the WG believes that the transparency requirements in the ABACUS label requirements found in sections 3.4.1(1),(2), and (3) of the *Public Consultation on ABACUS VCU Label* (PDF) document will be an incremental step in the right direction. As standardized and reproducible project data templates become available, the WG will consider requiring their use.

Question 4: As currently written, is the requirement to provide all possible sources of bias an enforceable requirement? If not, how can this requirement be refined?

Respondents generally supported the requirement to document possible sources of bias but requested a sharpening of the requirement. The WG proposes changing "all possible sources" to "reasonably expected sources" of bias. Respondents also suggested including a non-exhaustive list of possible sources of bias; the revised requirements reflect such a list.

Permanence Requirements

Question 1: The ABACUS label defines 'ecologically appropriate' restoration systems in (1) above. Do you think this is an appropriate definition? Please explain.

Respondents contributed very helpful feedback on the definition and practicality of the ABACUS label definition of 'ecologically appropriate.' The main suggestions were to include the concept of ecologically appropriate for future climate conditions (not just historical conditions) and to recognize the need for short-term or occasional anthropogenic interventions, especially to catalyze restoration in very degraded lands. The WG changed the language to this effect. A few respondents did not agree with the prohibition of monocultures in section 3.5.1(2) of the *Public Consultation* document.

[1] Haya, B. K., Alford-Jones, K., Anderegg, W. R. L., Beymer-Farris, B., Blanchard, L., Bomfim, B., Chin, D., Evans, S., Hogan, M., Holm, J. A., McAfee, K., So, I. S., West, T. A. P., & Withey, L. (2023). Quality assessment of REDD+ carbon credit projects. Berkeley Carbon Trading Project. https://gspp.berkeley.edu/research-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/REDD+

Question 2: What additional kind(s) of auditable information could be provided to demonstrate that the project area historically sustained biomass with similar resource requirements?
Respondents were mostly in agreement with the auditable evidence types proposed in 3.5.1(1) of the *Public Consultation* document, which allows for observed, modeled, and/or peer reviewed approaches that use recent historical or forward-looking projections of biomass potential.
Question 3: The ABACUS label requires proponents to describe how they will address permanence after the crediting period, allowing buyers and the public to understand why the project believes stored carbon will remain durably stored after the crediting period. What kind of verifiable evidence for this would be practical and compelling?
Respondents supported the requirement to explicitly demonstrate–and update over time–a plan for stabilizing carbon stocks post-crediting period (once the Proponent is no longer liable for intentional reversals). They provided useful examples of types of potentially verifiable documentation. Most of these examples fall under the three broad categories in the existing label language. Because the types of verifiable evidence are so varied and project-specific, the WG will avoid specifying specific types of documents and leave this up to the verifier and scrutiny from buyers and the public.

ABACUS Areas of Future Innovation
Question: Please share any insights, questions, or additional information we should consider as we begin developing these innovations into actionable requirements.
Respondents provided useful insights on the 'areas of future innovation' that may be incorporated into future versions of the ABACUS label requirements– including innovations around biophysical impacts, non-destructive sampling, and effective permanence. Two respondents voiced specific concerns about the requirement for a 30-year crediting period, initially proposed to provide net climate mitigation after a reasonable investment return period. To clarify a potential misalignment with VCS's requirement for 40-year project longevity and to ensure that ABACUS projects are not unduly penalized for non-permanence risks, the WG modified section 3.5.1(5) of the *Public Consultation* document to require >80% of credits earned after project (or instance) year 30 to be put toward a post-crediting-period compensation mechanism. This approach helps respond to a concern that durability is not assured post-crediting period—allowing up to 20% of post-30-year credits to be monetized by the project for maintenance and MRV—without conflicting with the VCS longevity requirement.

3 FULL LIST OF COMMENTS RECEIVED AND THE CORRESPONDING WORKING GROUP RESPONSES

Applicability Requirements							
1) Please identify specific challenges to utilizing a census-based quantification approach with the dynamic performance benchmark and leakage quantification.							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
1	Allory	Kanop	Corporate/End User	France	From our perspective, there are no specific technical challenges in utilising the census-based quantification approach with the dynamic performance benchmark. The same protocols used for area-based approaches can be applied effectively to the project area using the census-based approach to establish the baseline. Regarding leakage quantification, the leakage quantification protocol relies on VMD0054, which currently does not differentiate between area-based and census-based approaches. Therefore, it should be compatible. The only potential issue that may arise with census-based projects applying the performance benchmark protocol is that these projects may align more with smaller projects (<100ha?). When selecting random project plots, there is a higher likelihood of obtaining homogeneous project plots, resulting in similar control plots. This could increase the risk of inaccurately measuring the baseline. For example, let's consider a 50 ha project with a census-based approach in a relatively uniform field. If we select 30 project plots within the project area, there is an increased chance that these plots will be very similar, leading to the selection of control	The respondent is concerned with using the performance benchmark approach with small project areas - which are more likely to be census-based accounting. While we recognize the challenge with small project areas, we don't believe it is appropriate for the Label to place a lower bound on project size. The Label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None

					plots that are closely clustered together. If the parcel where the control plots are located is not entirely representative of the true baseline, it would result in an incorrect measurement of the performance benchmark. While this situation is also possible with larger projects, it is more likely to occur with smaller projects.		
2	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Challenges of using a census-based quantification approach with a dynamic performance benchmark: <u>Data Collection and Monitoring:</u> a) Increased complexity and cost: Monitoring and collecting data for each tree in the project area are more complex and costly than area-based methods. b) Sampling limitations: Census-based approaches may struggle to accurately estimate carbon stock changes due to challenges in capturing tree growth variability. c) Data management burden: Maintaining detailed records for each tree poses significant logistical challenges. <u>Leakage Quantification:</u> a) Attributing leakage to individual trees: Estimating and attributing leakage emissions to individual trees is complex and prone to uncertainties. b) Limited guidance and tools: Scarcity of standardized tools for leakage quantification in census-based projects using dynamic benchmarks leads to inconsistencies and subjective interpretations. <u>Verification and Validation:</u> a) Increased workload for verifiers: Verifying data accuracy for each tree is more time-consuming than with area-based approaches. b) Uncertainty and risk management: Managing uncertainties in data collection, sampling, and leakage estimation is more challenging, impacting project risks and financing. <u>Transparency and Comparability:</u> a) Limited experience and data: Census-based projects using dynamic benchmarks lack sufficient experience and data, making it difficult to assess performance and compare with other methodologies. b) Potential for inconsistent application: The absence of standardized guidance and tools for leakage quantification	We recognize the respondent's listed challenges, and note that the Label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None.

					leads to inconsistencies, affecting transparency and comparability. <u>Access to Expertise and Resources:</u> a) Limited availability of expertise: Implementing census-based projects with dynamic benchmarks requires specialized skills not readily available to all project developers. b) Higher project development costs: The complexity and data requirements of census-based approaches result in increased development costs, limiting accessibility for smaller developers.		
3	ANONYMOUS #1	N/A	N/A	N/A	The main challenge lies in the methodology, which does not incorporate dynamic benchmarking within a census-based approach. Also, in most cases, leakage is assumed to be zero in this approach. Given the sparse nature of individual planting units associated with the census-based approach, it seems impossible to precisely or accurately measure individual trees against an area. To achieve this, you would need to combine individual units to form an area, which seems to contradict the purpose of a census-based approach.	We broadly agree that to do pixel or area-based matching, a census-based project would need to combine individual planting units, and potentially use the property boundaries instead of the planting unit boundary. The Label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None.
4	Shermila	stx commodities b.v	Project Developer	Netherlands	The census-based approach does not change the land use scenario. Selecting a similar type of reference area for the performance benchmark to match a similar project scenario is challenging. Project activities are very dynamic from project to project in the census-based approach. A census-based quantification approach is applicable in a non-forest area, and credits will be quantified based on the individual tree. In some project scenarios, there is no requirement to stop the existing agricultural practises or fuel wood harvesting practices in the project area, and planting will be done in available land areas. In such a case, leakage quantification is irrelevant for the census-based approach.	We take your point that there is a potential mismatch between performance benchmark control matching based on pixel-stocking indices, and a census-based accounting structure. While it is possible there could be no leakage in a census-based project, this isnt guranteed. The Label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None.

					Therefore, the label would only apply to the area-based approach, not the census-based one.		
5	ANONYMOUS #2	N/A	N/A	N/A	• Selection of the donor pool of control plots for census-based quantification approach is complex considering that the boundary is a planting unit. Although the ABACUS Label does require control plots to be replicas of project plots, securing the required number of appropriately sized control plots with high biophysical and socioeconomic variability could be challenging. Within a landscape, non-tree components of agroforestry systems may differ depending on the conditions of the area. • Considering the size of the areas using the census-based approach, the cost of implementing a performance benchmark approach to baseline setting and testing additionality could be high and possibly prohibitive.	We understand your concerns with cost and complexity. Instead of disallowing the census-based method altogether, the label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None.
6	ANONYMOUS #3	N/A	N/A	N/A	Utilising a census-based approach with the dynamic performance benchmark and leakage quantification would be challenging because: - The dynamic performance benchmark and leakage quantification methodologies are area-based. Using them with the census-based approach would require a common reference to make comparisons, i.e., delimiting an area in a way that is meaningful and consistent. In some contexts there could be a lot of variability in terms of carbon accumulation in different areas and it could demand much work and on-site checks to find matching areas. - The 10-meter radius buffer around the recorded GPS location of each planting unit could be considered, but this seems challenging as it means we would find high enough resolution remote sensing for the dynamic performance benchmark control plots, and may be irrelevant. - It would imply finding a control area of the same size as the project polygons, making the process more complicated: instead of having a set size of plots (30m) for all project and control plots, projects will have to spend more time tailoring their dynamic performance benchmark to their census polygons, instead of having a standardised/automated way of finding matching pairs of plots. - It will also be an issue in terms of the meaningfulness of the	We appreciate the detailed concerns. Instead of disallowing the census-based method altogether, the label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None.

					results: since all plots/polygons will have different sizes, it wouldn't make sense to treat them as equal data points. Statistics (mean, variance, etc) from larger polygons and smaller polygons will have a different meaning due to their different spatial sizes. - Using census-based quantification with the dynamic performance benchmark would be difficult because the location of the polygons will, by definition, not be random, which may introduce some bias in the dynamic performance benchmark		
7	Earthshot Labs	Earthshot Labs	Project Developer	USA	The census-based approach requires that no land use change occurs which is a protection against leakage. Using the census-based approach in a scenario where trees are planted at a very low density the planted trees may not be detectable by the stocking index for the performance benchmark and lead to large performance benchmark deductions. This favors census-based projects that plant trees at a higher density which is a greater risk for land use change to occur (e.g., very high shade tree density on cacao plantations leads to fungal growth and reduced cacao production which could in turn lead farmers to increase deforestation to grow cacao elsewhere). The census-based approach should remain eligible for the 0 baseline deduction.	We understand your concerns with the ability for the stocking index, and thus performance benchmark, to be effective in low-density plantings that don't change the land cover. The WG doesn't necessarily agree that small scale plantings (imagine hundreds or thousands of 0.9ha contiguous census plantings across a property) aren't at risk for regenerating naturally in a counterfactual, and couldnt cause displacement of a commodity (lekage). Instead of disallowing the census-based method altogether, the label is agnostic to a area-based or census-based accounting framework, so long as a dynamic performance benchmark is used and leakage is fully accounted for.	None.

Additionality & Baseline Requirements

1) How should the ABACUS label ensure that the choice of annual time steps on which control plots are matched are representative and not selectively chosen? Please explain. Does requiring no less than five time periods for matching help avoid this?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
8	Allory	Kanop	Corporate/End User	France	For recent projects, the choice of annual time steps could be fixed (e.g., every two years) since remote sensing data is systematically available from t=-10 to t=0. Alternatively, the ABACUS label could encourage the selection of the most recent years to increase the number of remote sensing data sources and make the time steps more representative (e.g., select remote sensing data from 3 different years between t=-4 and t=0, and 2 different years between t=-8 and t=-4). Additionally, models used to transform remote sensing data into stocking index should rely on multiple satellite images from the same year. It should be recommended to use more than 8 images within the year to infer the stocking index. This approach avoids selectively choosing satellite images for estimating the stocking index. This principle could be applied to each remote sensing data source used in the model. Still, requiring no less than five time periods for matching definitely helps to avoid selectively choosing time steps.	The language in ABACUS intends to encourage projects to use as much historical data as possible to match controls, without being overly proscriptive and disqualifying projects when quality issues (clouds, haze, etc) limit data availability. We chose 'ne less than five years' as a minimum bar that seems achievable.	None.
9	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	The ABACUS label ensures representativeness in choosing annual time steps for matching control plots by requiring a minimum of five time periods from the pre-project period. This enhances the process in several ways: Increased Sample Size: Using more time points boosts the sample size, resulting in statistically robust and representative control plots. This minimizes the risk of selecting atypical years. Capturing Variability: A broader timeframe captures natural carbon stock variability, providing a realistic baseline for project performance comparison. Reduced Bias: Requiring multiple time points hinders biased selection, promoting a fairer project-to-control plot comparison. Improved Confidence: A broader dataset enhances confidence in matching and baseline accuracy, ensuring environmental integrity of carbon credits.	Thanks for your supportive comments.	None.

					Additional considerations: Distribution of Time Points: Evenly spreading the five time points across the pre-project period captures potential changes and trends. Justification for Selection: Developers must transparently justify their time point selection to reduce bias risk. Independent Review: Third-party reviews strengthen credibility and fairness. Statistical Tests: Employing statistical tests provides evidence of a robust baseline. Flexibility: While five time points are a starting point, flexibility in time point selection is allowed based on project and landscape context, as guided by ABACUS.		
10	Lynn Riley	American Forest Foundation	Project Developer	United States	ABACUS could require that project proponent choose annual time steps that are evenly spaced, at least one year apart, or the only timesteps available. Five time periods does help avoid selective choices as it brings more nuance into the historical trajectories.	Thanks for your supportive comments.	None.
11	ANONYMOUS #1	N/A	N/A	N/A	ABACUS should adopt the same approach used in the new ARR methodology for control plots. This method already ensures that control plots cannot be selectively chosen by matching the most comparable control plot to the project plot. A good approach is to match 5 time periods, provided they are all at least a year apart and span over a ten-year period, if the available information permits this. However, when not feasible or overly burdensome (e.g., some projects in the tropics, where high-quality, cloud-free imagery is infrequent) there are other remote-sensing/statistical strategies that a project can employ to optimize the control set. Verra could consult experts on this and provide prescriptive guidance for what to do in those situations, such guidance should be accessible, practical to implement, and cost effective.	The respondent seems to suggest that the current *VM0047* requirement is sufficient, but that five time steps is a "good approach".	None.

12	Shermila	stx commodities b.v	Project Developer	Netherlands	Agree with no less than five time periods as more measurements provide more normality of data. To ensure it is not selectively chosen, make it a mandatory time span for matching the control plot. As an example, 9 years before 7 years before 5 years before 3 years before 0 years before	The respondent is supportive of the five time period requirement, and also suggests that these five time periods span the 10 year historical period.	None.
13	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	The number of annual time steps on which control plots are matched, should be fixed by Verra - possibly depending on the project location taking landscape dynamics into account. It woudl be ideal would be to cover five to seven continuous years. For optimum matching quality and representativeness, the use of (spectral) covariates at an annual time step (e.g., composites) should be replaced by covariates encoding the entire intra-annual spectral-temporal profiles. Compared to simple (annual) composites, this would minimise selection bias and take into account the full phenological cycle of control/project units.	The respondent suggests that time steps should be mandated by Verra, and include 5-7 continuous years. We believe the ABACUS 5 year requirement is aligned with this. The WG also agrees that annual composites should be replaced by covariates that consider the entire spectral-temporal dynamics.	None.
14	ANONYMOUS #2	N/A	N/A	N/A	The ABACUS Label should provide guidelines for ensuring that the choice of annual timesteps on which control plots are matched are representative. They should specify the following key aspects: • the use of statistical methods and tools (statistical packages, tables, etc) for unbiased selection of project and control plots through randomization, stratified randomization, and systematic sampling. • the use of 'blinding' to ensure handling, processing and analysis of data is unbiased. • application of stringent experimental procedures: use of formal experimental designs, including standardised methods of statistical analysis; and choice of appropriate	At this time, the WG believes proscribing all of the aspects the respondent listed would limit the ability for project developers and MRV companies to innovate in this space. For now, transparent demonstration of the techniques and methods used should be required.	We added 3.2.1(1)(a) "Matching time steps must be transparently reported in the project design document."

					stocking indices and other (dependent, independent & random variables). • determination of the number of project and control plots, and donor pool to ensure the comparative analysis of ecologically important treatment effects or stocking density (i.e., NDVI) has minimum noise. • conducting a power analysis – determination of the appropriate sample size, which is a function of the project treatment effect, standard deviation, the chosen experimental power, alternative hypothesis, and sample size. • the project developer should develop written protocols for selection of project and control plots, data collection and analysis, and quality assurance and quality control.		
15	Timothy Perez	Living Carbon	Project Developer	USA	There are several issues that may make it difficult to achieve the minimum number of sampling points, if limited to the criteria in Appendix 1, Table A2. If 5 temporal sampling points are required, it may create a bias against some regions from achieving ABACUS label status. For example, it may be difficult for some remote sensing products to achieve a satisfactory temporal resolution in regions that are obscured by cloud cover (e.g., rainy/wet climates like temperate/tropical rainforests/cloud forests), ultimately influencing ABACUS eligibility. Given the potential limitation of remote sensing data availability, sampling specific time points may be difficult. Temporal coverage should be satisfactory as long a time points that are sampled allow adequate coverage of pre-project SIs. The required sampling frequency/temporal resolution of 5 time points would provide a stronger statistical signal for changes in SI than three points. However, five seems like an arbitrary designation given that the most rigorous strategy would be to select all years where data is available, which will help assess any changes in SI. However, this may be difficult for the reasons stated above. VVBs also have the responsibility for ensuring that the remote sensing data used to establish SIs are sound, and	The language in ABACUS intends to encourage projects to use as much historical data as possible to match controls, without being overly proscriptive and disqualifying projects when quality issues (clouds, haze, etc) limit data availability. We chose 'ne less than five years' as a minimum bar that seems achievable.	We added language: "strive to use as many time points as possible" in 3.2.1 (1).

					that data is not being selected to artificially alter actual/representative SIs.		
16	ANONYMOUS #3	N/A	N/A	N/A	Requiring no less than five time periods for matching help ensure that the choice of annual time steps on which control plots are matched are representative, as a single year's data might not be sufficient to represent the conditions over several years due to potentially high environmental factors' variability. Having multiple time steps in control plot matching provides a more balanced view of the carbon stock under varying conditions throughout the years and a more accurate and unbiased baseline to compare with the project. To ensure that control plots are not selectively chosen, Verra should ask for a clear and transparent report on how control plots were selected. Verra could also set up a framework with clear guidelines for projects to select their control plots, limiting the risks for biased plot selection. Eg.: R package randomly selecting control plots matching project plots, based on standardised RS data and defined metrics. another option would be that Verra specifies default time steps, unless the project proponent can show that data is not available for those time steps, in which case the project proponent needs to stick as close to them as possible. Alternatively, Verra could require more supporting data if the project proponent doesn't use the default time steps, but these would add complexity.	The WG agrees that open-source tools to match and select control plots would be beneficial. We believe that five time steps (versus 3, as currently required in *VM0047*) is a meaningful improvement that should not exclude projects.	None.

17	Earthshot Labs	Earthshot Labs	Project Developer	USA	No, requiring five time periods does not avoid cheating. Imagine we wish to match a project plot that has been slowly afforesting for the past 6+ years to a barren control plot. By selecting 4 years at the beginning of the time series (or even 4 images in just the first year?), only the final year (t=0) will have a mis-match. We select an image for t=0 during a drought to minimize differences in the greenness-responding stocking index. The additional imagery at the beginning of the time series aids us by reducing the distance metric. We need only worry about getting under the 0.25 Cohen's d threshold. There should not be a choice in dates of imagery used. In 2023 high quality spectral and SAR imagery suitable for assessing vegetation dynamics is free and accessible. ABACUS projects should use all available imagery from a sensor or set of sensors selected at the start of the project, which is fed into an algorithm that generates a modeled time series, either on a year-over-year basis such as LandTrendr or VeRDET or a harmonic seasonal model such as CCDC or R's strucchange:breakpoints. Each of these algorithms are published and accessible either stand-alone or through Google Earth Engine's ee.Algorithms.TemporalSegmentation. Then, control plots should be assigned to project plots using an appropriate time series similarity metric and a global optimization technique to solve the assignment problem. The specific algorithms allowed for time series modeling, matching, and optimization should be broad to allow for a range of technical levels and innovation. However, all methods should be open and published with the project so that they are reproducible and transparent. The important aspect is that the methods are automated and minimize choices and hyperparameters that can be gamed.	Agreed that any ability to select historical data introduces the potential of 'gaming'. On the other hand, the WG was not able to define 'all available data' - given various quality contraints - sufficiently to be verifiable. The language in ABACUS intends to encourage projects to use as much historical data as possible to match controls, without being overly proscriptive and disqualifying projects when quality issues (clouds, haze, etc) limit data availability. We chose 'no less than five time points' as a minimum bar that seems achievable, though the WG agrees it does not in any way completely avoid bias in selection.	We added language: "strive to use as many time points as possible" in 3.2.1 (1).

2) Should projects be able to include covariates from a shorter lookback (i.e., five years, instead of eight to ten, to provide consistency with satellite products that are not yet eight to ten years old) if they utilize a sufficient number of time points (i.e., no less than five)?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
18	Allory	Kanop	Corporate/End User	France	Yes, this should definitely be useful. Covariates from a shorter lookback are more reliable because they can be calculated using more remote sensing data sources. For example, Sentinel-2B data has been accessible worldwide since the end of 2017.	Covariates may be more reliable (i.e., Sentinel 2). The question remains if the label should allow for a shorter lookback to avoid the need for pre-Sentinel 2 stocking index	The WG considered proposing that a shorter than 8-10-year lookback could be used if all available data from the chosen satellite or product was utilized. Given the fact that this would materially change the requirements of the *VM0047*, we decided this was not a possible change that could be made unilaterally in the label.
19	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Projects could use a shorter lookback (e.g., five years) for covariates, aligning with satellite product limitations. Benefits include consistency, reduced data burden, and increased flexibility. Drawbacks involve reduced statistical robustness, increased uncertainty, and potential bias. Mitigating measures include a minimum of five time points, the use of alternative data sources, and transparent justification to ensure accuracy and reliability.	Respondent seems to agree that a shorter lookback should be possible if due to satellite product limitations.	
20	Lynn Riley	American Forest Foundation	Project Developer	United States	It does seem reasonable for projects to use a shorter lookback period if that is the only time period available for the data sources available to the project. Project proponents could be asked to demonstrate why only a 5-year period is being used.	The respondent proposes a justification if a less than 8-10 year lookback is used, but the WG is concerned that this is not concrete enough to be verified.	

21	ANONYMOUS #1	N/A	N/A	N/A	Yes, if the available information does not allow for a lookback over a ten-year period, it's acceptable as long as there is a minimum of 5 time points measuring across the full range of the available lookback. However, it raises the question of why the methodology is so prescriptive about the 8-10 year historical period. This question seems better suited for a continued consultation on the methodology itself rather than an ABACUS-specific question.	Respondent seems to agree that a shorter lookback should be possible if due to satellite product limitations.	
22	Shermila	stx commodities b.v	Project Developer	Netherlands	Yes, three years and five years before. A shorter look-back period gives proper data to evaluate the project scenario.	Respondent affirms that a shorter lookback should be allowable.	
23	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	For consistent, scientific-grade data quality and high spatial resolution (10m), the lookback period should be solely based on Sentinel-2 availability, i.e., not going beyond 2017. In this period starting in 2017, no years should be allowed to be left out.	Respondent identifies 2017 - the latest date for Sentinel 2 data - as a useful cutoff for historical lookback.	
24	ANONYMOUS #2	N/A	N/A	N/A	Yes, the ABACUS Label should allow covariates from a shorter lookback to provide consistency with satellite products that are not yet 8 years based on two assumptions: First, the satellite products that are not yet five years old may be of a superior quality to older products; Second, the use of remotely sensed data, coupled with machine learning, increases the chance of generating enough data points within consistent with the time series in a five-years period. Most importantly, the five-year period prior to the project start date is likely to provide a more recent reflection of conditions in the project area and donor pool at t = 0 and a better basis for prediction of future stocking index.	Respondent affirms that a shorter lookback should be allowable.	

25	Timothy Perez	Living Carbon	Project Developer	USA	Yes. However, this excludes the potential use of the newest/state-of-the-art remote sensing products that may provide the most accurate and precise SI metrics. These products may have less than 5 years of temporal longevity. Validating these remote sensing products doesn't require temporal longevity - their accuracy can be tested within a single year using a "chronosequence" approach. In theory, newer remote sensing products can be trained to predict characteristics of older products and provide artificial, but statistically sound, look-backs.	Respondent points out that newer products may be better suited (but not have the historical span to meet 8-10 years).	
26	ANONYMOUS #3	N/A	N/A	N/A	Five years is too short of a time window in the past to see any meaningful changes (eg.: natural regeneration, carbon accumulation, etc). In cases where the best available remote sensing data does not go more than 5 years back, it should be combined with older, less accurate RS data would complement the RS analysis. In any case, they should use a sufficient number of time points (no less than 5).	Respondent believes 5 years is too short to see the meaningful changes in ecosystem c stocks and proposes combining with older RS imagery when necessary.	
27	Earthshot Labs	Earthshot Labs	Project Developer	USA	Yes, a shorter time period for matching is acceptable for cases where imagery is not available, provided that the matching is automated. Enabling a shorter time period without requiring an automated method simply introduces another hyperparameter that can be manipulated.A37:F42	Respondent thinks a shorter time period is appropriate only where matching is automated. We agree that automated, or open-source software tools, would increase transparency and reduce inter-project differences in matching	None.

3) Is either option for the Investment Barrier Test - a Benchmark Analysis of NPV and an Investment Comparison Analysis of IRR – on its own sufficient to rigorously demonstrate financial additionality? Please explain.

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?

28	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Neither the Benchmark Analysis of NPV nor the Investment Comparison Analysis of IRR alone is sufficient to rigorously demonstrate financial additionality. The NPV benchmark is subjective and may lead to misinterpretation, overlooking projects with positive social or environmental impacts. Similarly, the IRR comparison depends on individual circumstances, making it challenging to objectively assess financial additionality. For a more rigorous demonstration, it is recommended to use both methods along with other evidence such as project documentation, expert judgment, and sensitivity analysis. This comprehensive approach, combining quantitative and qualitative evidence, provides a holistic understanding of the project's financial viability and helps mitigate the limitations of individual methods for a more robust demonstration of additionality.	Respondent agrees with the use of both financial additionality tests together.	None.
29	ANONYMOUS #1	N/A	N/A	N/A	Not on their own. Additional information must be provided to show how projects came to their conclusions on these numbers.	No specifics about what kind of additional information is offered.	None.
30	Shermila	stx commodities b.v	Project Developer	Netherlands	IRR and NPV analysis are sufficient for the investment barrier analysis test. Since the accuracy of IRR and NPV values depends on the quality of the inputs and assumptions made to conduct the analysis, these assumptions and financial data should be deeply verified with sufficient references and evidence.	Respondent agrees that the NPV/IRR approach is insufficient alone	None.

31	ANONYMOUS #2	N/A	N/A	N/A	The current approach of using IRR or NPV benchmarks is unlikely by itself to be sufficient to demonstrate additionality with high levels of assurance for the reasons below: • Both methods may not consider hidden costs such as potential future costs that are not yet known at the time of investment decision, and input variables to the calculations can be subject to large variation. The projected profitability may be subject to large ranges which may allow gaming of the calculations unless very tight financial analysis guidelines are in place. • On their own, IRR or NPV calculations are not sufficient to demonstrate additionality. It is necessary to also look at regulatory surplus, common practice and, optionally, barriers. A project may appear profitable on paper but if in an area with security issues to landholder (e.g., areas under the influence of guerrillas, illegal mining, drug and/or agribusiness cartels, war zone, etc), it may not attract investment (on account of the risk) unless the gain is much higher than the minimum benchmark. Risks should be accounted for in cost of capital assumptions and IRR benchmarks, however this is not a perfect science. Overall, the challenge is that the world is very different so a one size to fit all approach is not very likely. In its current form this approach to financial analysis appears not enough. Below are some ideas that could help. They will likely have to be used in combination: • The issue with the current benchmark approach is not the rationale but the way it is done, so clearer and more specific requirements are needed on the assumptions, how to determine inputs, account for risk etc. • Mandate the VVB to recreate the financial analysis. Currently VVBs only audit the analysis done in the PD, which leaves room for error and inconsistency. The audit process could require the VVB to replicate the calculations ; this could force better auditing and rigor on the analysis. • One option could be to separate the audit of the financial analysis from the carbon audit i.e., the VVB or the administrator should designate a financial auditing firm or	Respondent agrees that the NPV/IRR approach is insufficient alone	None.

					specialist to audit the financial analysis, fee to be paid for by the developer but contract held by the administrator or VVB (note this is likely to add costs to the validation but should be reflected in the credit price). • Require regulatory surplus and common practice assessments to be done in addition to the financial analysis. • As an alternative to financial analysis, research into common practice, penetration rates, viability of activities in different jurisdictions etc. to determine automatic additionality indicators, creating a performance benchmark-like approach. However, such an approach, as a simplified approach, would need to set very conservative bounds on what projects are considered automatically additional. Projects that don't meet these bounds would be required to undertake a full financial analysis.		
32	ANONYMOUS #3	N/A	N/A	N/A	Using only a Benchmark Analysis of NPV or an Investment Comparison Analysis of IRR as an Investment Barrier Test may not serve as a sufficiently rigorous demonstration of financial additionality. NPV provides a monetary value of the project and facilitates the comparison with investment alternatives, but does not take into consideration the long-term time distribution of returns, important in carbon projects. Long-term viability and risk profile of the project is not captured by the NPV, and it is dependent on both the discount rate and the cash flow projections used, bringing much uncertainty due to variability and volatility of the markets. IRR provides a metric of profitability as an average rate of return over the project's lifespan, but it is also dependent on cash flow projections in a context of much uncertainty and irregular expected cash flows throughout the project. It can be particularly informative for investors as it is used for comparing the attractiveness of different investments, and could complement the Benchmark Analysis of NPV. Including other metrics such as the payback period analysis and the breakeven point analysis could help support need of carbon finance. However, in the context of an ARR carbon project, especially focusing on nature restoration, it may be sufficient to rely on one financial metric like NPV to	Respondent agrees that the NPV/IRR approach is insufficient alone	None.

					quantify the net monetary value of the project, considering the necessary investments for project implementation and project success and the future revenue from carbon credits. Such projects focusing on nature restoration and including other sources of revenues for improving community livelihood or improving the project attractiveness and sustainability (such as decreasing the non-permanence risks) would likely be costly and require high investments for implementation to the desired scale. The demonstration of financial additionality may be more relevant in commercial plantation projects or large scale agroforestry projects, but less so in nature restoration projects, for example. Thus, there could be a differentiation in the requirements according to the types of projects.		

4) How could financial additionality tests be strengthened within the ABACUS label?							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
33	Allory	Kanop	Corporate/End User	France	More general feedback Using as many annual time points as available in the pre-project period makes a lot of sense. However, it is important to remember that advanced remote sensing approaches for biomass estimation have specific requirements: Remote sensing data needs to be downloaded: Throughout the entire year to optimize the chance of obtaining non-cloudy optical images From multiple sources (Landsat / Sentinel-2 for optical images, ALOS-POLSAR / Sentinel-1 for SAR images) Accurately estimating biomass requires a relatively long processing time. These requirements may slightly increase processing costs (although remote sensing approaches are still much cheaper than field measurements). Nevertheless, using 5 time points instead of 3 is a good compromise.	This answers a different question.	None.

					Increasing the number of time points from 3 to 5 may increase the likelihood of one covariate failing the standardized difference of means (SDM) test. This could result in either reducing the number of control plots per project plot (k) or increasing the radius of the donor pool area. Both solutions are not favorable for the robustness of the performance benchmark: Has this possibility been anticipated? Will the expected value of SDM be raised? Has this been tested on a project? Do you need assistance in testing it?		
34	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Strengthening financial additionality tests within the ABACUS label can be achieved through the following key measures: <u>Enhance Investment Barrier Test:</u> Introduce quantitative criteria (e.g., IRR, payback period, debt-to-equity ratio) for a more objective evaluation. Compare project viability to regional land-use options, considering specific risks like climate variability. <u>Address "Expectation of Carbon Credits":</u> Define clear, verifiable criteria for demonstrating the expectation of carbon credits. Require projects to present a detailed financial model quantifying expected revenues from carbon credits. Explore alternative carbon-related revenue streams beyond traditional VER sales. <u>Promote Transparency and Third-Party Verification:</u> Mandate independent third-party verification for accuracy and objectivity. Increase public disclosure by requiring projects to share financial models and investment barrier test results. <u>Consider Additional Measures:</u> Implement ex-post verification mechanisms to ensure ongoing project financial performance. Conduct periodic reviews of ABACUS label requirements and financial additionality tests to align with market dynamics and best practices.	Respondent suggest multiple guardrails and seems to affirm that a clear, verifiable approach to demonstrate the expectation of carbon credits is a helpful additional piece of evidence.	We clarify what kind of verifiable documentation could be used to demonstrate expectation of carbon credits in 3.2.1(2)(b): b. Demonstrate, through verifiable documents and/or financial analysis published at or before project inception, an expectation of carbon credits at project inception.

35	Lynn Riley	American Forest Foundation	Project Developer	United States	Additionality tests within the label could be strengthened by expanding the definition of which barriers to implementation are assessed. Not all barriers to project implementation are financial; for example, low risk tolerance can prevent implementation even in scenarios of high rates of return (1). Barriers to implementation for small landowner, community-based projects tend to be significantly different than those faced by an industrial landowner, particularly when it comes to financial additionality ("community projects focus primarily on the financing of the project and its proponent instead of the financial analysis of the enrolled community land owners. This is because we find that these kinds of projects focus on overcoming non-financial barriers that land-owners face, which may include educational barriers or technological barriers such as access to equipment and saplings, or the human resource to undertake forest planting. In these scenarios, we often find that the project helps to overcome these barriers, and is often reliant on solely carbon finance to cover the ongoing costs of project activities." (2)). For small landowners, barriers are financial, technical, cultural, and educational in nature, and any one of those barriers can prevent project activity implementation in the absence of programs funded by climate finance and carbon credits. Two potential avenues for innovation that ABACUS could pave would be: - Allow financial additionality to be assessed at the project proponent level for non-industrial private (small) landowner projects. Project proponents would be required to demonstrate that enrolled acres meet a definition of a small, non-industrial private landowner to follow this path. - Alternatively, project proponents could be required to demonstrate that factors to delineate donor pool area or matching covariates result in similar presence of financial barriers and opportunities between the dynamic performance benchmark and project. For example, if the Land Tenure factor restricts the donor pool area to be only non-industrial private owners within a certain geography, as opposed the larger bucket of private land,	We agree with the respondent that it will be important to ensure - to the extent possible - that matched controls represent similar financial barriers (i.e., smallholders versus industrial landowners). We believe *VM0047* allows for this. In the medium term, the performance benchmark may be sufficient to demonstrate additionality, but for now, the WG opts to preserve these (flawed) approaches to financial additionality. We agree that financial additionality should be different for industrial landowners versus smallholders, but we feel it is not in the scope of ABACUS to define how to do that.	None.

					then it may be reasonable to assume that that landowners of the non-industrial private ownership type are likely to experience similar financial opportunities and barriers, and thus an additional additionality assessment may not be necessary, as it would be addressed via the dynamic baseline. (This is similar to the ABACUS WG's proposed thinking around Regulatory additionality in the consultation document under Areas of Future Innovation.) Adding these additional pathways to enhance robustness of *VM0047*'s additionality assessments would open up the ABACUS label to more project proponents and landowners working in the community-project/small landowner space, which makes up a significant proportion of land area that may be used for ARR projects, thus furthering the potential reach of ABACUS innovation. (1) Greiner, S., Michaelowa, A. 2003. Defining Investment Additionality for CDM projects—practical approaches. Energy Policy. 31, 10:1007-1015. (2) Turner, T., Achilleos, A., Fang, R., Bhatnager, S. 2023. Afforestation, Reforestation and Restoration - the root of carbon removals. BeZero. https://bezerocarbon.com/insights/afforestation-reforestation-and-restoration-the-root-of-carbon-removals. Accessed 12/15/2023.		
36	ANONYMOUS #1	N/A	N/A	N/A	To demonstrate additionality, it's important to provide real-world information on other activities available, such as timber income and farmer income. It's also crucial to consider social additionality, which involves examining the benefits and drawbacks of each choice beyond purely financial gain. This is important because it can help identify potential negative impacts on the environment, local communities, and other stakeholders that might be overlooked otherwise.	We agree with the respondent but require more information to add verifiable language that encompasses social durability.	None.

37	Shermila	stx commodities b.v	Project Developer	Netherlands	Most registered projects in Verra do not provide details relevant to the financial analysis. Also, there is a lack of transparency; details on relevant assumptions are unavailable in PDs and financial analysis, sensitivity analysis, and inclusion of tax benefits differ from PD to PD. Under the ABACUS label, there should be transparency on financial analysis and details properly described in the PD. It is suggested to provide detailed guidance on the financial analysis and include a structure of financial analysis to follow in the PD under the ABACUS label.	Respondent encourages more transparency of financial analysis.	We clarify what kind of verifiable documentation could be used to demonstrate expectation of carbon credits in 3.2.1(2)(b): b. Demonstrate, through verifiable documents and/or financial analysis published at or before project inception, an expectation of carbon credits at project inception.
38	ANONYMOUS #2	N/A	N/A	N/A	Please refer to the ideas suggested above on how to strengthen financial additionality tests.	Above.	None.
39	ANONYMOUS #3	N/A	N/A	N/A	Financial additionality tests could be strengthened by including a combination of different metrics that could help support need of carbon finance, but that should be differentiated per type of project and context (see above).	We agree that financial additionality should be different for industrial landowners versus smallholders, but we feel it is not in the scope of ABACUS to define how to do that.	None.

Leakage Requirements

1) From the standpoint of global climate mitigation and food security, is it appropriate for projects to mitigate leakage effects by replacing the production of displaced commodities like-for-like or to provide flexibility to adjust commodity mix ('cross-commodity leakage mitigation') as long as a minimum equivalent land sparing effect is achieved?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
40	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	In the context of global climate mitigation and food security, the choice between replacing displaced commodities like-for-like or allowing cross-commodity leakage mitigation with equivalent land sparing effect depends on efficiency, leakage risk, land-use change, adaptability, local context, and economic viability. Both approaches require transparent monitoring and stakeholder engagement, along with clear policy frameworks. Cross-commodity mitigation offers flexibility, adaptability, and potential economic benefits, making it more suitable in the long term, provided robust systems are in place to ensure effectiveness and minimize risks.	The WG agrees with your comments that, in the long term, cross-commodity mitigation allows for more flexibility and adaptability.	None.
41	ANONYMOUS #1	N/A	N/A	N/A	Providing flexibility to adjust the commodity mix is better as long as a minimum equivalent land sparing effect is achieved. This approach can help ensure that the project is able to adapt to changing circumstances and optimize its impact. It's important to make sure that the project understands the role that commodities play in the livelihoods of the farmers. Allowing for flexibility can provide entry points for gender-based approaches, which can help promote social inclusion and equity.	The WG agrees that it is of utmost importance to quantify and ensure that equivalent land-sparing is achieved.	None.
42	Shermila	stx commodities b.v	Project Developer	Netherlands	It is suggested to ensure that the production capacity of the land selected for the displacement of the agricultural activities (leakage mitigation area) does not exceed its threshold production level; otherwise, the land will have more potential for degradation. Also, these leakage mitigation activities should be aligned with the safeguard principles.	The WG strongly agrees that guardrails around the intensification and quantification of leakage mitigation area emissions are required.	None.
43	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	To avoid locking farmers into current production systems, it is recommended to provide flexibility by allowing cross-commodity leakage mitigation as long as the land sparing effect is achieved.	The WG strongly agrees that the methodology should avoid locking in farmers to a single commodity	None.

44	ANONYMOUS #2	N/A	N/A	N/A	If carbon revenue and additional income from other livelihood activities, supported by the project, increase household income, a land user might access food by buying rather than establishing a new agricultural field to replace a displaced commodity. However, if the commodity may not be readily available and its supply is erratic, it is appropriate for projects to mitigate leakage effects by replacing the production of displaced commodities like-for-like. Depending on the socioeconomic conditions of the area therefore, providing flexibility to adjust commodity mix can be appropriate. Providing flexibility to adjust the commodity mix is preferable as it can accommodate changes in revenue source, promote increased yields, and can adapt to market shifts and access to new markets. Food security could also be enhanced by increasing agricultural yields in existing fields without increasing the amount of land allocated to that product. If the given cross-commodity leakage amendment activity is not resulting in increased land use or is resulting in land sparing, the impact of the displaced commodity is mitigated. However, if there is a shift in agricultural product or land use system that involving additional land use, leakage needs to be accounted. The goal should be contributing to livelihood systems that reduce the pressure on the land by improving the productivity of existing land. It may be prudent to ensure that the new commodities are resilient to climate change or better for the soil/ecosystem. An average farmer has several enterprises and depending on market conditions, he/she can adjust the allocation of inputs to different enterprises through product-product substitution. Therefore, what could be observed as reduced production in one enterprise may have resulted in increased production of a different commodity.	The WG agrees with the need to provide adaptability in commodity selection as markets shift.	None.

45	Timothy Perez	Living Carbon	Project Developer	USA	Yes, but see next response	The respondent agrees.	None.
46	ANONYMOUS #3	N/A	N/A	N/A	Like-for-like replacement may be quantified and monitored more easily, and it is important to help ensure the availability staple crops or cultural and dietary important crops in local markets. However, it might not always be the most sustainable agriculture available, the most suited to the local ecological conditions, or it may be vulnerable to market fluctuations in some cases. It may also prevent opportunities for introducing alternative crops that more ecologically suitable or diverse. While cross-commodity leakage mitigation may be more challenging to quantify and monitor, introduce the risk that the new crops don't fully compensate for the displaced crop, may require to invest in capacity building of farmers and in the development of supply chains and may face barriers in market acceptance or integration, it also offers more flexibility and several benefits. As such, it may allow for the introduction of crops that are more ecologically suitable and have positive impacts on ecosystem balance. It allows for an opportunity of crop diversification, providing more stable income sources and making regions less dependent on a single crop and more resilient to market or environmental fluctuations. It may also contribute to improved food security through a more varied, nutritious and available food supply. It may also provide for opportunities to innovate in agricultural practices and help lower environmental impact of crops in the region if the selected crop mix has a lower environmental impact. Thus, as long as a minimum equivalent land sparing effect is achieved, it is appropriate to provide flexibility to adjust commodity mix for projects to mitigate leakage effects. The selection of crops for cross-commodity leakage mitigation is a complex and requires a balance of various factors. This process needs to involve local communities, experts and other relevant stakeholders for conducting thorough research and assessments to make the most context-appropriate sustainable crop choices.	The WG agrees with the sentiments of these comments, especially the principle that a minimim land sparing effect must be achieved.	None.

47	Earthshot Labs	Earthshot Labs	Project Developer	USA	Under section 3.3: "*The ABACUS label incentivizes project developers to effectively maintain or enhance agricultural production within a defined accounting area in the project area and surrounding landscape. The approach will require projects to assume that 100% of displaced agricultural production will result in converting natural ecosystems and associated GHG emissions. Because the GHG emissions from leakage under this conservative assumption would typically outweigh the project's carbon removal, projects must effectively eliminate leakage*" This favors projects from large landowners who control area outside of the project boundary rather than community-led projects who may not have access to areas outside of the project boundary. Furthermore, this ambitious goal will rarely be realistic for projects to attain.	The WG believes that because leakage mitigation can be achieved through enhancement of commodities within or outside the project area, and allows for flexibility in mitigation commodity (cross-commodity leakage), it is more flexible and adaptable for community-led projects. For example, a reforestation project displacing cattle could lead to a project investing in a community-owned agroforest or cropping system to mitigate the displaced production.	None.

2) Should the leakage tool assume that displaced production results in new production at the same productivity rates? In what cases should the tool assume regional, national, or global productivity rates for globally traded commodities?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
48	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Here are some specific cases where the tool should assume different productivity rates: 1. Globally traded commodities with significant regional variations in productivity: For example, if the project displaces the production of soybeans in an area with high productivity, the tool should not assume that the displaced production will occur at the global average rate. Instead, it should use a regional average rate that is more representative of the actual productivity of the displaced land. 2. Commodities with limited substitution possibilities: If the project displaces the production of a commodity that	The respondent emphasizes that replacement productivity rates should be sensitive to regional variations in productivity (even global commodities) and less fungible commodities (and thus more regional). The WG agrees and seeks an approach that can apply at a project-justified market 'domain'. The respondent agrees with lower leakage rates for distributed tree planting.	Forthcoming ABACUS leakage approach/revision will include domain options.

					cannot be easily substituted by other commodities, the tool should assume that the displaced production will occur at the same productivity rate. This is because there is no alternative for the displaced producers, and they will likely continue to produce the same commodity at the same level of productivity. 3. Dispersed or low-density tree planting: In cases where tree planting is dispersed and has minimal impact on existing agricultural land use, the ABACUS label recognizes the potential for de minimis leakage. In such situations, assuming lower leakage rates may be appropriate. Decision of whether to use global, regional, or national productivity rates in the leakage tool should be based on a careful consideration of the project's specific context and the available data.		
49	ANONYMOUS #1	N/A	N/A	N/A	If the same commodity that is displaced is the same that will be produced in the leakage area, it's acceptable to assume the same productivity rates. If a flexible option to adjust the commodity mix is adopted, a regional, national, or global rate could be assumed. However, it's important to keep a productivity lag into consideration for perennial crops like coffee and cocoa if those are displaced. To address this, we would propose using regional-level statistics or measurements through surveys or other empirical data for that specific location.	The respondent suggests regional-level production statistics to address replacement productivity rates. The WG agrees this should be one option.	
50	Shermila	stx commodities b.v	Project Developer	Netherlands	There should be options to use the same productivity rate and also the regional, national, or global productivity rates, for example, in a land where practice regenerative agricultural practices, the productivity rate can be less than the regional, national, or global productivity rates. If the general condition of the agricultural land is matched with the regional agricultural statistics, the project can use the regional, national, or global productivity rates.	The respondent is generally supportive of options for different domains.	

51	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	Current agricultural production systems sometimes have well-known yield gaps and/or poor land allocation, both compromising global food security. To minimise/revert agricultural expansion, yield gaps should be closed while optimising land allocation for different commodities so that the different crops are grown in their most favourable areas, respectively. For this reason, except for locally traded commodities, the leakage tool should not assume that displaced production results in new production at the same (low) productivity rates. Instead, global median (production-weighted) productivity rates should be used for all involved commodities, fixed by Verra for the major commodities. To incentivise rapid conversion of relatively unproductive land use into higher yield systems with high carbon sequestration potential, a multi-annual decay factor should be built into the commodity-specific reference productivity rates.	The respondent supports global-scale, Verra-defined reference productivity rates to promote closing of yield gaps. The WG is supportive of an independent third party (could be Verra) defining commodity yield productivity rates and/or carbon opportunity cost factors for key domains and geographies.	None.
52	ANONYMOUS #2	N/A	N/A	N/A	The assumption that that displaced production results in new production at the same productivity rates may not always hold for a number of reasons: (i) biophysical and soil conditions may not be exactly the same; (ii) if the land owner benefits from the project through microfinancing and capacity development in sustainable agriculture, agricultural yields per hectare may increase; (iii) if a farmer plants trees in the existing agricultural field, overall productivity may increase through diversification of products; (iv) access to markets/ability to sell products may dictate production impetus and capacity; and (v) existing infrastructure in one geography may greatly impact agricultural productivity (from roads, to irrigation channels to agricultural extension programs and professionals). A tool must assume regional, national, or global productivity rates for globally traded commodities if (i) the production requirements (soil, climate, topography, technology, ecoregion, etc) of a given commodity are similar across the region, country and the globe; (ii) the policies, laws and regulations are similar (i.e., subsidised vs liberalised production); (iii) sociocultural conditions are	The respondent cautions about the many parameters that can effect replacement productivity rates. While predicting the replacement productivity rates is impossible, estimating the local, regional, or global market for the displaced commodities is possible.	None.

					conducive for production of that commodity. If the yield of displaced commodities is achieved on a smaller land area, it is unlikely that the project activities will result in 100% of displaced agricultural production and equal conversion of land in every instance.		
53	Timothy Perez	Living Carbon	Project Developer	USA	As a rule, no. The effect that project activity will have on productivity at the local scale is unpredictable and is not feasible to measure for project developers. Furthermore, any effect is likely to vary by broader socio-economic factors and geography. For example, any effect that project activity is likely to have on leakage is expected to be greater for subsistence farmers than for commercial farmers who might be taking their agricultural fields out of production and face barriers to reforestation. Furthermore, the strength of any effect that project activity has on leakage is likely to decrease as the spatial resolution of leakage increases. Registries interact with several developers in different geographies, and because of this they have a more insight into any effect that ARR activities might have on production displacement. In other words, registries are data repositories and are already positioned to understand the criteria and scales at which leakage needs to be quantified and mitigated. Conversely, project developers are individual components of a much larger registry ecosystem, and while developers should have to understand the potential for production displacement as a result of their ARR project, the onus for determining the scale and scope of the criteria needed to quantify leakage more appropriately rests with registries. Specific guidance from registries should be given to project developers - especially in areas of high ARR project density or with ample public data (e.g., United States) where the effect of project activity on leakage is most likely to be quantified. Specific guidance should include the geographic scale of leakage and actual types of production/crops to monitor for change.	The respondent supports Verra-defined reference productivity rates that are tailored to areas of high ARR project density. The WG is supportive of an independent third party (could be Verra) defining commodity yield productivity rates and/or carbon opportunity cost factors for key domains and geographies.	None.

3) What agricultural products should be applicable for cross-commodity leakage mitigation (i.e., global commodities, subsistence agricultural products, deforestation-driving commodities)?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
54	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Regarding the agricultural products applicable for cross-commodity leakage mitigation, it is essential to consider commodities that have a significant impact on land use and can potentially drive deforestation if not managed sustainably. Therefore, both global commodities and deforestation-driving commodities should be included in the scope for cross-commodity leakage mitigation. Global commodities such as soy, palm oil, and beef are often associated with large-scale land-use changes and deforestation, especially in tropical regions. By including these commodities, the ABACUS label can help mitigate the risk of leakage where the production of these commodities might shift to other areas, potentially causing deforestation. Subsistence agricultural products are typically produced for local consumption and may not have the same global market drivers as the commodities mentioned above. However, they are still relevant for leakage mitigation, especially in the context of smallholder farmers and community-based projects. Ensuring that subsistence agriculture remains productive and sustainable can help prevent the displacement of agricultural activities to forested areas, thus contributing to leakage mitigation.	The respondent encourages including global and subsistence commodities for leakage accounting.	The ABACUS WG has proposed changes to *VMD0054* that would enable it to apply to all agricultural commodities.
55	ANONYMOUS #1	N/A	N/A	N/A	Any agricultural product could be applicable for cross-commodity leakage mitigation as long as the yield in the leakage area is the same (or more) than the forgone yield, and it is produced in the same area as it was produced in the project area from which it was displaced. However, the choice of crops is very context-specific, and any relevant combination of cash and food crops can be used. It's important to note that the term "deforestation driving	The respondent posits that any agriculture product can cause leakage and should be included.	

					commodities" should be avoided, as this really depends on the context.		
56	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	Besides subsistence agricultural products, all agricultural products should be applicable for cross-commodity leakage mitigation. For greater simplicity and transparency, possibly all agricultural products should be applicable for cross-commodity leakage mitigation (e.g., including subsistence agricultural products).	The respondent supports including all agricultural production.	
57	ANONYMOUS #2	N/A	N/A	N/A	The agricultural products that should be applicable for cross-commodity leakage mitigation depend on the geographical location of the project, the size of the project, the stakeholders implementing project activities, and their scale and purpose of production. Subsistence agricultural products from slash and burn agriculture (i.e., maize, millet, sorghum), uncontrolled grazing (sheep, goats & cattle), and rice production and shrimp production in mangrove areas may be applicable for cross-commodity mitigation. Several global commodities also qualify leakage mitigation. They include, inter alia, unsustainably produced oil palm, soybean, maize, coffee, tea, tobacco, and biofuel feedstock production.	The respondent supports including all agricultural production.	

4) What limitations are needed to ensure productivity enhancements are sustainable and avoid unintended consequences?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
58	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	To ensure sustainable productivity enhancements and prevent unintended consequences, consider the following limitations: <u>Data Limitations:</u> I. Limited pre-project data: ABACUS label requires at least 5 years of data, potentially insufficient for capturing long-term trends. II. Remotely-sensed data: May not capture all relevant variables, especially in diverse landscapes. III. Leakage estimations: 100% displaced agricultural production assumption may lead to conservative estimates and underestimation. <u>Monitoring and Verification:</u> I. Verification frequency: Proposal lacks specified verification frequency for leakage estimations. II. Cross-commodity leakage mitigation: Methodology requires accurate data, which may not be readily available for all regions and crops. III. De minimis leakage: Definition and assessment need careful monitoring to avoid underestimating potential risks. <u>Implementation and Enforcement:</u> I. Capacity building: Expertise in data analysis, leakage accounting, and project management is necessary for ABACUS label implementation. II. Enforcement mechanisms: Robust mechanisms required to prevent greenwashing and ensure compliance. III. Transparency and stakeholder engagement: Clear reporting and stakeholder engagement crucial for trust and accountability. <u>Long-Term Sustainability:</u> I. Land tenure and use rights: Secure land tenure essential for long-term maintenance of production and carbon sequestration. II. Community engagement: Involving local communities fosters ownership and promotes sustainable land management.	The WG appreciates this exhaustive list of challenges and limitations to implementing the ABACUS leakage approach. Many of these are not specific to ABACUS approach, however.	Noted for proposed revisions to *VM0054*.

					III. Climate change adaptation: Projects must be resilient to climate change impacts for long-term sustainability.		
59	ANONYMOUS #1	N/A	N/A	N/A	To mitigate cross-commodity leakage, it's important to ensure that the beneficiaries of the mitigation do not cause any harm to the environment. This can be achieved by including a penalty clause in the agreement between the project proponent and the beneficiary from the beginning of the project. It's also important to avoid using more fertilizer or implementing any practice that emits GHG above de minimis levels, as this will result in emissions being included in the carbon calculations. A focus on sustainable agricultural practices and not just shifting intensive agriculture from one area to another should be prioritized. To address the yield gap, activities need to prioritize responding to the agricultural limitations that cause the gap. Overuse of pesticides/herbicides should be avoided, and 4R principles for fertilizer should be promoted. Additionally, productivity enhancement programs should go hand in hand with well-implemented conservation policies at the local level for the new trees.	The respondent provides a few concrete recommendations, including avoiding or limiting fertilizer usage and pesticides. The WG believes that the emissions associated with these inputs need to be de minimis, or better, accounted for explicitly. If intensification occurs within the project area (i.e., agroforestry), these emissions must be included within the project boundary.	Noted for proposed revisions to *VM0054*.
60	Shermila	stx commodities b.v	Project Developer	Netherlands	Threshold and recommended limit for fertilizer applications (EX; Recommended by FOA) Intensity of the cropping cycle Water management good practices	The respondent identified fertilizer limitations, intensity of cropping, and water management. The WG agrees that these are priority areas to ensure good practice.	Noted for proposed revisions to *VM0054*.
61	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	To avoid unintended consequences such as (ground)water pollution and biodiversity loss, productivity enhancements should be limited to certain threshold levels deemed sustainable, according to local/national best agricultural practices recommendations. This should ideally be accompanied by incentives for practices enhancing biodiversity. For example, a well-balanced mix of different commodities and (tree) species, enhancing landscape connectivity, should be considered more valuable	The respondent proposes an approach in which 'indirect' sources of leakage mitigation should be allowed - including access to credit or technical assistance, which have been shown to enhance productivity. So long as the impact (productivity enhancement) is	Noted for ABACUS leakage module to ensure it is agnostic to the direct or indirect intervention that leads to

					compared to a monoculture crop or forest being planted. More indirect sources of leakage mitigation, such as increased access to formal financial institutions and expert-provided agronomic advice should also be considered as many peer-reviewed publications have demonstrated its significant positive effect on productivity (1,2,3,4). Moreover, Mantle Labs' past experience has proven that the introduction of satellite-enabled precision agronomy, along with ready access to credit and insurance products, has a strong beneficial impact on the production potential of agricultural systems. Therefore we believe this should be considered in the methodology as well. 1 Butler, A.W. and Cornaggia, J., 2011. Does access to external finance improve productivity? Evidence from a natural experiment. Journal of Financial Economics, 99(1), pp.184-203. 2 Jimi, N.A., Nikolov, P.V., Malek, M.A. and Kumbhakar, S., 2019. The effects of access to credit on productivity: separating technological changes from changes in technical efficiency. Journal of Productivity Analysis, 52, pp.37-55. 3 Assouto, A.B. and Houngbeme, D.J.L., 2023. Access to credit and agricultural productivity: Evidence from maize producers in Benin. Cogent Economics & Finance, 11(1), p.2196856. 4 Haryanto, T., Wardana, W.W., Jamil, I.R., Brintanti, A.R.D. and Ibrahim, K.H., 2023. Impact of credit access on farm performance: Does source of credit matter?. Heliyon, 9(9).	achieved, the WG believes these interventions (i.e., access to capital, technical assistance) could be appropriate.	sustainable intensification.
62	ANONYMOUS #2	N/A	N/A	N/A	· Avoid unsustainable agricultural practices that are likely to impact soil biological, chemical, and physical properties. · Use of exotic and invasive plant species that are likely to affect the biodiversity of the project area and the wider landscape. · Avoid production systems that demand intensive management and inputs and are likely to have negative	The respondent included a number of limitations. The challenge will be in how to define verifiable language to enforce these. The WG is appreciative of these suggestions.	Noted for proposed revisions to *VM0054.*

					environmental impacts, such as: (i) use of pesticides, herbicides and other agricultural inputs that have endocrine disrupting properties; (ii) activities that are likely to pollute water or affect water security; (iii) activities that will impact food and dietary intake of the local communities. · Avoid agricultural systems that are acutely vulnerable to the impacts of climate change.		

5) Which methods should be used to set an allowable canopy cover threshold for a given region and production type? How should projects verifiably demonstrate that their restoration systems are currently, and are likely to stay under, this canopy cover threshold?							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?

63	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	To set an allowable canopy cover threshold for a region and production type, methods include: <u>Remote Sensing:</u> Analyze historical land cover maps and satellite imagery. Use average canopy cover in similar areas as a reference. Monitor canopy cover with high-resolution satellite imagery. <u>Ecological Modeling:</u> Simulate canopy cover impact on ecological processes. Develop models for economic viability and assess risks. Consider pest outbreaks and disease spread risks. <u>Stakeholder Engagement:</u> Consult local communities, farmers, and experts. Conduct workshops and surveys for local knowledge. Involve stakeholders in consensus-based decision-making. <u>Expert Elicitation:</u> Convene a panel of experts. Use techniques like the Delphi method for diverse perspectives. Regularly update thresholds based on new findings. To verify compliance: <u>Remote Sensing-Based Verification:</u> Acquire regular high-resolution satellite imagery. Analyze imagery with automated algorithms. Validate data through ground-truthing campaigns. <u>Field-Based Verification:</u> Conduct periodic field surveys using established protocols. Document field data carefully for integrity. <u>Modeling-Based Verification:</u> Develop growth and spread models for trees. Use model outputs to predict future canopy cover. Update and validate models with field-based observations. <u>Stakeholder Engagement and Verification:</u> Establish a monitoring committee with local representatives. Conduct regular meetings and field visits to review data. Encourage stakeholders to report concerns or observations.	The respondent recommends an array of options, including remote sensing, modeling, stakeholder, and expert elicitation approaches, to define the proper thresholds.	The ABACUS WG proposes an approach based on expert elicitation, given the many approaches to empirically or mechanistically deriving these thresholds, and a lack of standardized data cross all biomas/crops.

64	ANONYMOUS #2	N/A	N/A	N/A	Geospatial modelling: the threshold for an allowable tree canopy cover should be determined according to the areal ratio of ecological zones determined from large-scale monitoring. Setting thresholds for regional areas and production requires testing the effects of different tree cover thresholds and selecting one with the highest overall user's and producer's accuracy. High-resolution Land Cover Mapping using remote sensing technology and high-resolution imagery (aerial or satellite) and/or elevation (LiDAR) datasets, coupled with AI, should be used to create detailed canopy cover maps. These data inform all other aspects of the project by categorizing a given landscape into specific classes such as tree canopy, other non-canopy vegetation, impervious or hardscape, bare soil, or water. This information is used to: quantify geographic distribution of each land cover to determine the location, size and distribution of tree canopy; identify potential tree planting areas; and to determine potential land use systems. i-Tree Landscape Approach: This approach uses land cover data to estimate the amount of tree canopy in the area and explore location data (census data, forest risk, future climate, etc.).	The respondent recommends remote sensing and large-scale monitoring approaches to set thresholds.	

GHG Accounting and Uncertainty Requirements

1) Should precise plot locations be required? Please explain. If not, how should the ABACUS label balance the need for data transparency in the market with landholder privacy?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?

65	Allory	Kanop	Corporate/End User	France	It would be very useful to have the precise location of the plots to form a solid database for the next generation of above-ground biomass models, but also to facilitate the auditing process. This would greatly improve the overall accuracy of the models. Eventually, locations could be concealed and provided only to academics or companies that can justify the need for them.	Respondent believes there should be precise plot locations for model training and auditing.	The WG feels that the norm for the VCM should evolve to include more detailed methodological information. In this spirit, the WG proposes to keep the requirement for publicly available plot-level data, with an option to withhold the precise geospatial location of each plot.
66	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Strong arguments for transparency, reproducibility, and improved data quality exist. However, concerns about landholder privacy, security risks, and cost burdens need consideration. To strike a balance, potential solutions include anonymizing or aggregating data, allowing opt-out options, developing secure data sharing platforms, and raising awareness to build trust among landowners and encourage participation in the program.	Respondent offers a balanced approach that anonymizes data, aggregates data, or provides secure data-sharing platforms. The WG agrees that a balanced approach is needed to protect landholder privacy but points out that VCM projects already need to provide polygons that delineate project areas.	
67	Lynn Riley	American Forest Foundation	Project Developer	United States	ABACUS should not require that precise plot locations be required. Unfortunately, this type of information has been used to the detriment of small private landowners when made inadvertently public. For example, the Forest Inventory and Analysis program can have problems with accessing small, private properties to with FIA plots due to landowners denying access (3). Part of this could be due to the unintentional publication of landowner data which erodes landowner trust and may also discourage them from participating in programs such as carbon project at all. It has been hypothesized that denied access for monitoring plots may also be correlated with more active land management—for example, geographies such as West Virginia may have high FIA non-access rates (some states have >20% (3)) and high active management rates (4), yet FIA data reveals low active management rates and low rates of harvesting. Perhaps the fear of monitored data being made public has resulted in a skewed sample within the data. In a similar way for ABACUS, there is a risk that requiring that data be made public could result in only landowners who don't mind their data being made public	Respondent offers a balanced approach that anonymizes data, aggregates data, or provides secure data-sharing platforms. The WG agrees that a balanced approach is needed to protect landholder privacy but points out that VCM projects already need to provide polygons that delineate project areas.	

					enrolling in carbon projects—both limiting enrollment and climate impact of such programs, and biasing studies of ABACUS properties to a non-fully-representative population. (3) Westfall, J., Schroeder, T., McCollum, J., Patterson, P. 2022. A spatial and temporal assessment of nonresponse in the national forest inventory of the US. Environmental Monitoring Assessment. 194:5230. (4) Caputo, J. and B. Butler. National Woodland Owner Survey Dashboard (NWOS-DASH) version 1.0. Accessed 2023-12-15.		
68	ANONYMOUS #1	N/A	N/A	N/A	Providing precise plot locations publicly could be useful purely from a transparency perspective, it would not have utility for the public per se. However, this information should be required for verification of the data. Institutions such as the US Forest Service do not make plot locations for their continuous forest inventory publicly available. Instead, Verra could require this information and hold it securely, only sharing it with research institutions.	Respondent suggests that Verra could hold the plot-level data securely and offer it to verifiers.	
69	Shermila	stx commodities b.v	Project Developer	Netherlands	Yes, in the light of making the VCM environment more transparent and, specifically for the project under the ABACUS label, doing the extra mile work for more precise, unbiased, and transparent GHG removal accounting, disclosing the location of the plots will bring benefits in i) long-term monitoring and ii) usage and comparison with future remote sensing tools.	Respondent agrees that it would be beneficial to require public data for transparency.	
70	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	Precise plot locations should be mandatory as otherwise data transparency cannot be guaranteed. In the voluntary carbon market, the need for verification should outcompete privacy concerns, which in this case are seen as negligible.	Respondent favors transparency over privacy for the VCM.	

71	ANONYMOUS #2	N/A	N/A	N/A	• Precise locations of the project areas should be required by ABACUS to ensure data transparency. These data could omit sensitive information. This will also allow interested third parties, such as scientists, rating agencies and investors, to independently verify the project developers' calculations. • It is important to define "project region" (at the end of the first paragraph describing the principle) more specifically to limit the geography from which default factors can be used. Does the text refer to project area, watershed, administrative jurisdiction, etc? If administrative jurisdiction, define what level (i.e., national, one level down from national, etc).	Respondent is supportive of requiring precise plot locations.	
72	Timothy Perez	Living Carbon	Project Developer	USA	No. Publicly available plot locations may increase the risk of reversal for some projects. It is plausible that bad actors, if given a precise location of project activity, may destroy trees within the project area or otherwise negatively impact project efficacy. However, data should be available to parties outside of registries that want to ensure project quality, but access to this data should be granted by project developers. Project developers can provide project locations to buyers for additional due diligence independently of registries. If registries unilaterally decide to make data public and this causes project reversals, then project developers should not be held responsible and no deductions from their buffer pools should be made. Furthermore, plot locations do constitute a degree of intellectual property associated with project development. Publicly disclosing precise locations may undermine a strategic component of a given project developer's business model.	Respondent cautions against revealing plot locations due to the risk of reversal. The WG points out that VCM projects already need to provide polygons that delineate project areas and questions if plot information substantially increases this risk of reversal.	
73	ANONYMOUS #3	N/A	N/A	N/A	While precise locations are essential for verification and research purposes, they are primarily useful to specific stakeholders directly involved in the project. Exact location disclosure risks compromising the landholder privacy and exposing them as well as the project to various risks, as	Respondent cautions against revealing plot locations due to privacy concerns but offers that data could be provided upon request. The WG feels this may	

					the data could be used for undesirable purposes, other than verification, research, or enhancing credibility. An approach to increase transparency could be to provide upon request to interested and relevant stakeholders such as researchers, third-party verifiers, or regulatory bodies while establishing strict agreements for responsible and ethical data use and confidentiality.	not be sufficient to guarantee transparency around plot data.	

2) Carbon stock estimates are sensitive to the choice of allometric equation and root-to-shoot ratio, some of which may be developed distant from the project area on a limited or unrepresentative sample of trees. How should projects systematically demonstrate that their allometric or root-to-shoot ratio selection is appropriate and conservative?							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
74	Allory	Kanop	Corporate/End User	France	We believe that allometric relationships should be justified by either: scientific literature, if the publication is dedicated to the species and the type of ecosystem (at the ecoregion level?) measurements in the field, using a representative sample of trees of the species in question. It is also highly recommended to use multi-factor allometric relationships whenever possible.	The WG agrees with these high level justifications. We believe the current text of the label includes these types of justificiations, and will add a phrase about the number of factors in the allometric relationship.	We add "number of factors in allometric relationships (i.e., diameter and height)"

75	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Ensure carbon stock estimates' reliability by following a systematic approach for allometric equation and root-to-shoot ratio selection. Prioritize equations specific to project area species, regions with similar conditions, and those based on representative samples. Justify choices with clear criteria, referencing scientific literature, and provide detailed documentation. Prioritize conservative options when uncertainty exists, validate choices through field measurements, and promote transparency by making in-situ inventory measurements publicly available. Clearly identify models and ratios used, discuss potential bias, and demonstrate efforts to eliminate bias for credible carbon accounting.	The WG fully agrees with these potential justifications but lacks a clear threshold to provide the verifiable language that requires them.	We add specificity in publishing sources of allometric equations, as well as include new considerations. The text now reads: 2) All allometric models (for aboveground biomass), root-to-shoot ratios (for belowground biomass), or other scaling approaches used in quantifying carbon stocks must be specifically identified in monitoring reports with a methodological source. Project proponents must articulate the appropriateness and conservativenes s of their choice of scaling factors using a systematic data-driven approach, and/or based on considerations
76	ANONYMOUS #1	N/A	N/A	N/A	To ensure that the selected equations/ratios are appropriate for the project context, three options exist: 1. There should be peer-reviewed evidence or other scientific data supporting their use. Allometrics and root-to-shoot ratios should be based on a literature review of equations appropriate for the region and conditions. A demonstration of appropriateness/conservativeness, via validation against destructive sample or similar, would be advisable. 2. Equations must be appropriately applied based on fitting data from the original models, to not go outside of predicted parameters. 3. Where no single option is best, Verra could require projects to do a sensitivity analysis and choose the most conservative equation. In case no equations are appropriate for the project area, the option for developing allometrics and publishing should also be available. Verra could require projects to conduct a literature review of the available allometry and demonstrate their choice is the most appropriate.	The WG agrees with 1 but is skeptical that requiring projects to validate against a destructive sample in situ is practical.	
77	Shermila	stx commodities b.v	Project Developer	Netherlands	I recommend using the guidelines and structure proposed by Haya et al. (2023) in chapter 4 of the book" Quality Assessment of REDD+ carbon Credit Projects.	The WG is familiar with this framework. We find it to be a good example of a 'systematic hierarchical framework'—which we now explicitly recommend in the verifiable language.	

78	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	For obvious reasons, globally only very few published studies have really measured tree root biomass. As such destructive measurements require tremendous efforts it cannot be expected that the situation will dramatically improve in the future. In a similar way, current process models (e.g., biogeochemical models) do rely on simplified parameterisations with respect to the assimilate allocation between above and below-ground biomass. Hence, generally applicable allometric relations will have to remain the backbone of attempts to quantify below-ground biomass. It is recommended that Verra prescribes conservative allometric equations to be used for all participants.	The respondent notes that there is no great alternative for belowground biomass ratios and suggests that Verra should proscribe these.	including number of factors in allometric relationships (i.e., diameter and height), sample size, tree species specificity, destructive sample proximity, and size classes included in destructive sample.
79	ANONYMOUS #2	N/A	N/A	N/A	• The project developer should justify the selection of the allometric equation by providing the criteria for selection of allometric equation (including sample size, ecoregion, forest type and conditions, tree species specificity, destructive sample proximity, and size classes) included in destructive sample. • If the allometric equation was not developed using data in the project area, its applicability should be verified through measurement or limited destructive sampling and additional series of statistical tests. Existing databases may be used to test the applicability of the model if they provide relevant measurements for the geographic area of interest. Correction factors should be determined if the difference between modelled and actual field measurements exceed 10% at 90% confidence interval. • Where species-specific allometric equations for species in the reforestation project exist, they should be used if they meet the eligibility criteria. But if they don't exist, validated generalized allometric equations can be used. • Several methods of statistical analysis should be employed to assess the adequacy of the candidate allometric equation. Assessment of the applicability of site-specific equations should include calculating relative bias, RMSE and determination of the proportion of observations falling outside the confidence interval for predictions. A Monte Carlo approach is strongly recommended.	The respondent provides multiple useful approaches to justify the choice of allometric, most of which are currently listed in 3.4.1(2). The WG feels that proscribing a single statistical test is not flexible enough for the myriad conditions that projects will face.	

80	Timothy Perez	Living Carbon	Project Developer	USA	It is the responsibility of the VVB to assess suitability of allometric models and approve project developers' quantification methods. It is unrealistic for most project developers to validate allometric models against measurements of observed biomass, in which case published allometric models (or root-to-shoot ratios) should be used. When multiple allometric models exist for a given species, VVBs must determine the acceptability of the model chosen. As validation/verification experts It is up to them to be familiar with different allometric models. VVB's should be able to ask a project developer for justification for the selection of an allometric model. If no empirical/statistically valid justification can be made, then the more conservative models/ratios must be used.	The respondent puts the onus on the VVB to assess the suitability. The WG believes this requirement 3.4.1(2) will offer the VVB (and the public) more explicit justifications for the allometric and scaling equations chosen.	
81	ANONYMOUS #3	N/A	N/A	N/A	To demonstrate that their allometric equations or root-to-shoot ratio selection is appropriate and conservative, projects should ensure to select models developed under similar ecological conditions and species relevant to the project, identify the most suitable allometric equations or root-to-shoot ratio in the context of the project, ensure that the models were validated using a diverse and representative sample of trees and sample size is large enough. Where there is uncertainty or high model variability, use conservative estimates to ensure no overestimation. The selection process for allometric equations and root-to-shoot ratios should be documented and expert opinion could be sought. Verra should develop specific guidelines on the process to undergo for the selection of those parameters. It is crucial to develop new allometric equations and models. Thus, Verra should encourage partnership developments with project developers and researchers to drive advancements in forest carbon stock estimation and more accurate carbon quantification in projects. Verra could develop partnerships and put together a list of acceptable allometric equations per region. It could be set up in the form of a map, where different regions (at different spatial scales, depending on what is available) would have a default allometric equation. Projects would then have the possibilibity of using different allometric equations, as long as they can demonstrate that it is more	The respondent mentions multiple guidelines for model selection, many of which are included in 3.4.1(2). They suggest a role for Verra in validating acceptable allometric equations in each region. This is a validation/verification body's function, not Verra's.	

					accurate/local/species specific than the default equations provided by Verra.		

3) How can the ABACUS label enable more transparency in project measurement and uncertainty quantification?							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
89	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	A. Publicly available in-situ inventory data: The requirement that in-situ inventory data be made publicly available (with the precise geospatial locations of inventory plots withheld to protect landholder privacy) will allow stakeholders to understand the quality of the data collected and reproduce results. This level of transparency will help to ensure that project measurements are accurate and reliable. B. Identified allometric models and root-to-shoot ratios: This will provide stakeholders with a clear understanding of how carbon stocks are being calculated and allow them to assess the appropriateness of the models used. C. Discussion of all possible sources of bias: Project proponents to include in their project description and monitoring reports a discussion of all possible sources of bias in estimation, efforts taken to eliminate bias, and any quantitative or qualitative indications of the absence of bias. This will help to ensure that project measurements are not affected by systematic bias. D. De minimis leakage for dispersed or low-density tree planting: Projects that can demonstrate dispersed tree planting with sufficiently low levels of added canopy cover can assume de minimis leakage. This will help to reduce the amount of leakage that needs to be accounted for, making it easier to accurately quantify the net GHG impact of the project.	The WG has already included each of these recommendations into the ABACUS text. The ABACUS Label 3.4.1(1) and (2) already require explicit publication of field data and clear justification for every scaling approach used.	None

90	ANONYMOUS #1	N/A	N/A	N/A	To promote transparency, it is suggested that a simple and enforceable requirement be established that all monitoring procedures and results must be provided in the project documents. While the ABACUS label does not need to be the mechanism by which this is enforced, it is recommended that projects provide this information. Projects should be encouraged to provide this information, and VVBs and Verra should do a better job of ensuring that it is included. To enable transparency, it is recommended that a requirement for the SOPs for measurement be included in the PDD. Any requisite deviation should be published in the Monitoring Report, rather than just a reference to an external document. Finally, to ensure that stratification data is publicly available, the project should be required to make shapefile/kml data publicly available.	The WG agrees with this comment, and we believe that the requirements currently in the label will help require more transparent reporting on the measurement approach and data.	None
91	Shermila	stx commodities b.v	Project Developer	Netherlands	The project developer could prepare a dedicated two-page summary of the general statistical procedure used to treat and analyse the data for uncertainty.	The WG believes this uncertainty quantification should be included in the PDD.	None
92	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	To enhance transparency and trustworthiness of carbon projects, field measurements should be made available with clear descriptions of the recordings, the inventory design and measurement locations, etc. The data collection and subsequent data analysis should be described in a way that any skilled personnel could recalculate/verify the calculations, including any quantification of uncertainty.	The WG agrees and thus proposes requiring that ABACUS projects publish field data and identify and justify all scaling models used. The ABACUS Label 3.4.1(1) and (2) already require explicit publication of field data and clear justification for every scaling approach used.	None

93	ANONYMOUS #2	N/A	N/A	N/A	• ABACUS label should require that projects have documented Standard Operation Procedures (SOPs) to specify how the data is gathered, managed, and processed. Projects should provide technical specifications including how they calculated and measured different parameters of their project. These should be included within and/or annexed to the PDD. • Projects should develop databases in compliance with standard quality management systems and they should be accessible to the public, if a legal agreement is entered into. • All measurement data and results should be accompanied by error values and confidence intervals. • The project should specify any methodological limitations and describe its impacts on further calculations. • There could be a template to document all assumptions made in terms of data selection, measurement techniques, and methodological and monitoring approaches, and discuss the expected implications of such assumptions and the rationale to ensure conservativeness and accuracy (and consistency, in cases of nesting) in estimates. This would also provide a platform for comparison across projects more easily on data integrity and quality.	The WG appreciates these specific recommendations. We believe a more standardized format for SOPs, data, and assumptions could be beneficial, but we believe developing these is Verra's work. For now, we believe that the requirements in ABACUS Label 3.4.1(1) and (2) already require explicit pubication of field data and clear justification for every scaling approach used.	None
94	Timothy Perez	Living Carbon	Project Developer	USA	Create open-source data templates that can be populated with project data and fed to R/Python packages that perform analyses with the desired methods. However, the equations for estimating uncertainty rely on the assumptions of frequentist statistics, which may not be suitable in all cases. Project developers should be able to report uncertainty using statistical methods that are suitable for their data.	We believe a more standardized format for SOPs, data, and assumptions could be beneficial, but developing these is the work of Verra or another independent party. For now, we believe that the transparency requirements in ABACUS Label 3.4.1(1) and (2) will be an incremental step in the right direction.	None

95	ANONYMOUS #3	N/A	N/A	N/A	To enhance transparency in project measurement and uncertainty quantification, the ABACUS label can provide clear guidelines for reporting detailed measurement methods, data used, and uncertainty used for the project carbon quantification, making publicly accessible key information for transparency and credibility enhancement, when feasible. It should encourage projects to regularly update the methods and data used based on new and latest relevant scientific developments. It could also establish partnerships with project developers, research institutions and experts for knowledge sharing and encourage sharing of best practices.	Given the range of approaches to measurement and quantification, it is not in the WG's scope to provide specific methods or guidance. For now, we believe that the transparency requirements in ABACUS Label 3.4.1(1) and (2) will be an incremental step in the right direction.	None

4) As currently written, is the requirement to provide all possible sources of bias an enforceable requirement? If not, how can this requirement be refined?							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
96	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Yes, the current requirement to provide all possible sources of bias is enforceable, but it could be strengthened through further clarification and guidance. Areas for improvement: A. Definition of "all possible sources": While the intent is clear, the requirement lacks a specific definition of what constitutes "all possible sources of bias." This could lead to interpretations and inconsistencies in implementation. B. Guidance on identification and mitigation: The requirement could be strengthened by providing more specific guidance on identifying and mitigating potential sources of bias. This could include examples, best practices, or references to relevant resources. C. Quantitative criteria: Adding quantitative criteria for assessing the significance of potential biases would further strengthen the enforceability. This could involve setting thresholds for acceptable levels of bias or requiring specific methodologies for quantifying and addressing bias.	The WG takes the respondent's recommendations to add some examples of bias and clarify what 'all possible sources of bias' means.	The requirement in question 3) Project proponents must include in their project description and monitoring reports a discussion of all reasonably expected sources of bias in estimation, efforts taken to eliminate bias, and any quantitative or qualitative

					Refinement suggestions: A. Define "all possible sources": Provide a non-exhaustive list of potential bias sources relevant to agroforestry and restoration carbon projects. This could include measurement errors, sampling bias, data processing errors, model limitations, and selection bias. B. Develop a bias identification checklist: Provide a structured checklist or framework to guide project proponents in identifying and documenting potential bias sources. C. Reference existing resources: Include references to relevant guidelines, best practices, or methodologies for identifying, mitigating, and quantifying bias in carbon accounting. D. Set quantitative thresholds: Consider establishing thresholds for acceptable levels of bias based on scientific consensus or expert judgment. This could involve sensitivity analyses or uncertainty assessments. E. Require mitigation plans: Mandate project proponents to develop and implement mitigation plans for identified significant bias sources. These plans should include specific actions to minimize or eliminate bias and demonstrate their effectiveness.		indications of the absence of bias. a. Sources of bias may include sampling bias, measurement error, data processing errors, model limitations, selection bias in controls, and others.
97	Lynn Riley	American Forest Foundation	Project Developer	United States	ABACUS could provide additional guidance that defines the scope of sources of biases that project proponents must discuss. A resource to look to for this scope and categories of uncertainty/bias would be section 3.1.5 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 3.	The WG takes the respondent's recommendations to add some examples of bias.	

98	ANONYMOUS #1	N/A	N/A	N/A	While it's important to identify all possible sources of bias, the phrase "all possible" could be interpreted in the extreme, leading to an endless list of potential biases. A better phrase might be "all reasonably knowable sources of bias". However, this requirement is still vague and likely to be interpreted differently by different people. It would be beneficial for Verra to indicate specific methodological elements where potential biases must be assessed.	The WG takes the respondent's recommendations to clarify what 'all possible sources of bias' means. We use a variant of your suggested language.	
99	ANONYMOUS #2	N/A	N/A	N/A	• The requirement to provide all possible sources of bias is not enforceable unless the there is a provision for independent monitoring of activities at all stages of project design and implementation. The ABACUS label should require project developers to provide detailed descriptions of project activities, ensure databases and documents are available, and VVBs must be trained to specifically evaluate aspects that may not be captured in the formal documentation.	The WG shares the enforceability concern. In lieu of verifiable language to implement the extensive requirements proposed by the respondent, ABACUS focuses on transparency. This requirement will explicitly require the Project to document sources of bias. The reader can judge whether their methodology is sufficient.	

Permanence Requirements

1) The ABACUS label defines 'ecologically appropriate' restoration systems in (1) above. Do you think this is an appropriate definition? Please explain.

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?

100	Allory	Kanop	Corporate/End User	France	"Remote sensing or geotagged photographic evidence of project region, demonstrating existence of ecosystems with similar or greater aboveground biomass levels" → This should be detailed. What kind of remote sensing evidence is expected? We believe that multispectral evidence should be required. How can the absence of anthropogenic intervention within the plots observed by remote sensing be demonstrated? Apart from that, the definition seems appropriate.	Given the challenges with proscribing verifiable language and requirements, we have provided multiple options for Developers to demonstrate 'ecologically appropriate'. We modified the language to be clearer about the 'remote sensing' data, changing it to generally 'observed' data, which could include remote sensing products, for example.	The requirement in question now reads: 1) Established restoration systems must be 'ecologically appropriate' for the geographic area. Restoration systems are ecologically appropriate for a geographic area when the climatic, edaphic, and topographical conditions can sustain the proposed restoration system's biomass without significant, sustained anthropogenic intervention (i.e., irrigation). This can be demonstrated through evidence such as: a. Remote (i.e., biomass mapping products) or
101	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	ABACUS label's "ecologically appropriate" restoration has strengths (long-term focus, local considerations, natural ecosystems) but weaknesses (lack of specific evidence criteria, potential exclusion of high-value low-biomass systems, no explicit ecosystem function focus). Improvements needed: detailed evidence criteria, holistic ecological value consideration, and explicit ecosystem function restoration.	The WG appreciates these comments. The ecologically appropriate requirement wouldn't preclude projects with relatively lower biomass. It is mostly designed to avoid projects planting systems that cannot be naturally sustained (i.e., too much biomass). Given the challenges of proscribing verifiable language to this effect, we have provided multiple options to demonstrate that it is 'ecologically appropriate'. We modify the language to be clearer.	

102	Márcia Silva de Jesus	Brazilian Tree Industry	Other	Brazil	We understand the intention of the ABACUS label to promote restoration activities and agroforestry systems. It is important to point out that monoculture plantations serve a different purpose in land use as they are intended for large-scale production. Additionally, monoculture plantations offer a variety of climate benefits. Serious and well-recognized multi-stakeholder initiatives have long debated the role of monocultures, and setting sustainability requirements for them. These initiatives concluded that the point should not be on monoculture per se, but rather on the way they are managed. Sustainability is a top priority of forestry companies' activities, which is directly reflected in how forests are managed. The great majority of planted forests in Brazil were established on previously degraded areas, such as pastures or pastureland. These planted forests have been managed in some cases for more than 20 years by the most stringent and internationally recognized sustainable forest management standards, such as FSC and PEFC. One of the most important sustainable features of plantation management in Brazil is landscape management, in which productive areas of different ages are intertwined with areas set aside for conservation purposes at the landscape level. This practice protects biodiversity and water availability, among many other benefits. Landscape management is a practice recognized by the UN in its guidelines for adapting to climate change (The United Nations World Water Development Report 2020). All the benefits generated by planted forests are observed by several studies, as indicated by Pádua and Chiaravalloti (2012), Gabriel et al.,(2013), Gabriel and Godoy (2019) and Homem et al., 2020, which proves the importance of planted forests in the conservation of biodiversity and in providing a myriad of other environmental and social benefits.	The WG appreciates the comments on the potential benefits of monocultures and agrees that monocultures provide an important and different land use. Due to concerns about financial additionality, resilience, and durability, the WG has decided to exclude monocultures for the ABACUS Label.	direct observations (i.e., biomass inventory data) of biomass in project region; b. Geospatial modeling of biomass potential given historical or future (i.e., crediting period) climatic, edaphic, and topographical conditions ; c. Peer reviewed publications demonstrating historical biomass or future biomass in the project region.

					We emphasize that it is widely recognized that monocultures, when managed sustainably, provide notable climate benefits as mentioned earlier. References: GABRIEL, V. de A.; VASCONCELOS, A. A.; LIMA, E. F. de; CASSOLA, H.; BARRETTO, K. D.; BRITO, M. C. de. A importância das plantações de eucalipto na conservação da biodiversidade. Pesquisa Florestal Brasileira, [S. l.], v. 33, n. 74, p. 203–213, 2013. DOI: 10.4336/2013.pfb.33.74.435. Available at: https://pfb.cnpf.embrapa.br/pfb/index.php/pfb/article/view/435. Cláudio Benedito Valladares Pádua e Rafael Morais Chiaravalotti. Silvicultura e biodiversidade. Cadernos do Diálogo; v. 4, Diálogo Florestal. Rio do Sul, SC : APREMAVI, 2012. Available at: https://dialogoflorestal.org.br/wp-content/uploads/2018/05/cadernos-do-dialogo4-silvicultura-e-biodiversidade.pdf Gabriel, V. A.; Godoy, F. I. Community of birds in a mosaic of Eucalyptus and native vegetation in Três Lagoas, MS, Brazil. Oecologiaaustralis, v. 23, n. 3, 2019. Available at: COMhttps://revistas.ufrj.br/index.php/oa/article/view/15597UNIDADE DE AVES EM UM MOSAICO DE Eucalyptus E VEGETAÇÃO NATIVA EM TRÊS LAGOAS, MS, BRASIL | Oecologia Australis (ufrj.br). Homem, D. H.; Lima, E. F.; Nobre, R. A.; Colas-Rosas, P. F.; Trevelin, L. C.; Lima, A. L. A. Mammal fauna in Eucalyptus plantations and forest remnants in Três Lagoas, Mato Grosso do Sul State, Brazil. Oecologiaaustralis, v. 24, n. 1, 2020. Available at: MAMM https://revistas.ufrj.br/index.php/oa/article/view/22691AL FAUNA IN Eucalyptus PLANTATIONS AND FOREST REMNANTS IN TRÊS LAGOAS, MATO GROSSO DO SUL STATE, BRAZIL | Oecologia Australis (ufrj.br)		

103	Lynn Riley	American Forest Foundation	Project Developer	United States	The inclusion of the ecologically appropriate requirement seems out of place within the context of this label. Particularly with reliance on historical indicators of land capacity for sustaining a planted seasons, this seems to miss the mark with anticipating shifting ecological capacities and species extents in coming decades as climate change impacts land systems. In many cases, human assisted adaptations may be required to sustain valued ecosystems (5), and that does not need to signal reduced integrity if such human assisted adaptation is planned for. Expanding this requirement to include the realities of climate change altering ecological capacities may be advisable to make this criteria more meaningful. Furthermore, excluding monoculture plantations should not be part of the definition of 'ecologically appropriate' restoration systems and excluding these may ultimately reduce climate benefits. Native monoculture systems can provide critical landscape biodiversity (6, 7). Additionally, plantation establishment costs may absolutely be a barrier for small private landowners but as discussed above, financial additionality can be decided separately. Finally, the permanence issue addressed here may be duplicative to the climate change impacts criteria recently added into the non-permanence risk tool. Project proponents are already heavily incentivized to plant species that will demonstrate durability via the non-permanence buffer contribution, and thus another mechanism or definition to meet via this definition in this label may not be required or may only serve to limit ABACUS project development. (5) Klein, R., Huq, S., Denton, F., Downing, T., Richels, R., Robinson, J., Toth, F. 2007. Inter-relationships between adaptation and mitigation. Contribution of WG II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK. 745-777. (6) Greene, R., Iglay, R., Evans, K., Miller, D., Wigley, W.,	The WG appreciates these thoughtful comments. The text has been modified for approaches that model future biomass-carrying capacity with a changing climate. The WG doesn't doubt that native monocultures can provide climate benefit. Still, due to concerns about financial additionality, resilience, and durability, the WG has decided to fence out monocultures for the ABACUS Label and focus on a diverse, resilient system.	

					Riffell, S. 2016. A meta-analysis of biodiversity responses to management of southeastern pine forests—opportunities for open pine conservation. Forest Ecology and Management. 360:30-39. (7) 2021. Private, Working Forests and Biodiversity in the Southeastern United States. NCASI. https://www.ncasi.org/wp-content/uploads/2021/01/Briefing-Note-Forest-Management-and-Biodiversity-2-21.pdf. Accessed 12/15/2023.		
104	ANONYMOUS #1	N/A	N/A	N/A	Indeed, the definition is fitting. Nonetheless, it's crucial to pay extra attention to lands that have been managed over-extensively in the past and to the impacts of climate change. For instance, some regions that have been managed improperly or detrimentally might require intervention to become viable for ecological restoration. Such regions should not be overlooked. Moreover, it's important to factor in climate adaptation to avoid potential catastrophic losses at restoration sites due to impacts associated with climate change.	To address the reality that degraded lands may require temporary anthropogenic inputs like irrigation or soil amendments to restore, we change the language to 'without sustained anthropogenic intervention.' We believe diverse ecologically appropriate systems are more likely to be resilient to climate change.	
105	Shermila	stx commodities b.v	Project Developer	Netherlands	Yes, this is ecologically appropriate.	Respondent fully agrees.	
106	ANONYMOUS #2	N/A	N/A	N/A	• No, the definition for 'ecologically appropriate' restoration system is inappropriate because it could technically allow for monoculture plantations that have adapted to climatic, edaphic and topographic conditions as long as they can produce large quantities of biomass. The use of biomass yield as a metric underrates the significance of key ecosystem attributes including absence of threats, species composition, community structure, physical conditions, ecosystem function, and external exchanges. The objective of sustainable agroforestry and reforestation systems is to maximize net gain for biodiversity, ecosystem health and integrity, and human health and well-being from all types of	The WG appreciates these suggestions. 3.5.1 (2) already requires a diverse polyculture. The WG believes that given the complexity, universally defining species combination, diversity metrics, or habitat provision requirements is not advisable. 3.5.1(1) is meant to avoid systems that contain more biomass than is ecologically appropriate. These	

					restorative projects, programmes and initiatives. • The definition should also reflect the following ecological attributes: (1) species combination/diversity, (2) stability and resilience, (3) habitat provision, (4) ecosystem functionality, (5) absence of threats from ecosystems. This will provide an ecosystem that protects soil and topographic condition, rather than simply biomass.	requirements aim to promote the stabilization of carbon in resilient systems over the maximization of carbon in monocultures. Verra already has provisions on the use of exotic or invasive species.	
107	Timothy Perez	Living Carbon	Project Developer	USA	Yes, as long as this allows for practices like thinning, which is common practice for maintaining growth, avoiding pests, and mitigating fire hazards. This definition should also allow for soil amendments since they may be necessary for restoring forest cover. For example, degraded lands in the Appalachians of the US, like strip mines, often receive poor-quality soil as backfill and as part of the mining reclamation process. Soil amendments such as lime may be necessary in such cases to reduce soil pH. Application of these soil amendments may need to be applied several times during the project duration to ensure tree growth. Not doing so can result in arrested succession and failure of forest reestablishment. The rate of temperature increase as a result of climate change is outpacing the rate at which trees can shift their distribution to cooler climates, and CO2 emissions are currently aligned with worst-case scenarios for climate change that forecast temperature increases of 3-8 degrees celsius by 2100. In order for reforestation projects to be successful in years 2050 or 2100, and be effective for carbon removal, trees will need assistance migrating. In some cases, trees will need to be planted outside of their present-day ranges. Therefore, “ecologically appropriate” restoration systems should consider forward-looking practices, and not solely historical indicators since they might become less relevant in future climates.	To address the reality that degraded lands may require temporary anthropogenic inputs like irrigation or soil amendments to restore, we change the language to 'without sustained anthropogenic intervention'. The WG doesn’t intend this to prohibit systems that would benefit from thinning or other occasional management. The WG agrees with your suggestion to include appropriate systems for the future. The text has been modified for approaches that model future biomass carrying capacity with a changing climate.	

108	ANONYMOUS #3	N/A	N/A	N/A	The label's definition of 'ecologically appropriate' restoration systems seems appropriate. It is aligned with ecological principles and promotes sustainable practices that limit anthropogenic interventions and unsustainable use of natural resources.	Respondent fully agrees.	
109	Earthshot Labs	Earthshot Labs	Project Developer	USA	In some highly degraded systems or regions that experience extreme climatic conditions the lack of soil quality or water during seedling establishment can be the barrier to spontaneous reforestation (e.g., African Sahel). Successful restoration has been demonstrated using organic fertilizer and irrigation during the first 1-3 years of seedling establishment to enable these seedlings to reach size thresholds where they can survive dry periods. This is ecologically appropriate restoration and the language in this section should be changed to “without sustained anthropogenic intervention”. The anthropogenic intervention is often required to the shift in conditions that makes the project additional and prevents unaided/spontaneous reforestation from occurring. We agree with the stated examples of data sources that could demonstrate ecological appropriateness.	We appreciate the comment. To address the reality that degraded lands may require temporary anthropogenic inputs like irrigation or soil amendments to restore, we change the language to 'without sustained anthropogenic intervention.'	

2) What additional kind(s) of auditable information could be provided to demonstrate that the project area historically sustained biomass with similar resource requirements?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?

110	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	To show historical biomass sustainability, use auditable data like land cover maps, pollen records, and palaeoecological studies. Include climate modeling, soil analysis, and insights from community knowledge, such as interviews and traditional ecological knowledge.	The WG appreciates these ideas, most of which would be allowable under the current language, allowing for observed, modeled, and/or peer-reviewed approaches.	The requirement in question now reads: 1) Established restoration systems must be 'ecologically appropriate' for the geographic area. Restoration systems are ecologically appropriate for a geographic area when climatic, edaphic, and topographical conditions can sustain the proposed restoration system's biomass without significant, sustained anthropogenic intervention (i.e., irrigation). This can be demonstrated through evidence such as: a. Remote (i.e., biomass mapping products) or direct observations
111	Lynn Riley	American Forest Foundation	Project Developer	United States	Historical chrono-series of remote sensing data / aerial imagery Pre-existing inventory data Agricultural systems: historical harvesting data/volumes	The WG appreciates these ideas, most of which would be allowable under the current language, allowing for observed, modeled, and/or peer-reviewed approaches.	
112	ANONYMOUS #1	N/A	N/A	N/A	The additional information presented is suitable. It considers a wide range of information, including both project area and wider proximal areas in determining what is appropriate.	The repondent fully agrees.	
113	Shermila	stx commodities b.v	Project Developer	Netherlands	If the project is ecologically appropriate with the proof for the proposed label requirement, by default, the project area will sustain the biomass proposed. Therefore, no additional requirements are necessary.	The repondent fully agrees.	
114	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	To demonstrate that a project area historically sustained a higher biomass, data mining approaches could be allowed, where proponents derive the potential biomass through identification of locations with similar pedo-climatic conditions(1). In addition, using historical Landsat data, proponents could demonstrate the sustained maximum biomass in the past decades. 1 Hackländer, J., Parente, L., Ho, Y.F., Hengl, T., Simoes, R., Consoli, D., Şahin, M., Tian, X., Jung, M., Herold, M. and Duveiller, G., 2023. Land potential assessment and trend-	The WG appreciates these ideas, most of which would be allowable under the current language which allows for observed, modeled, and/or peer reviewed approaches.	

					analysis using 2000–2021 FAPAR monthly time-series at 250 m spatial resolution.		(i.e., biomass inventory data) of biomass in project region; b. Geospatial modeling of biomass potential given historical or future (i.e., crediting period) climatic, edaphic, and topographical conditions ; c. Peer reviewed publications demonstrating historical biomass or future biomass in the project region.
115	ANONYMOUS #2	N/A	N/A	N/A	• Historical geospatial databases on forest cover and carbon densities. • National forest inventories • Research publications and scientific reports • Open-source databases and big-data	The WG appreciates these ideas, most of which would be allowable under the current language which allows for observed, modeled, and/or peer reviewed approaches.	
116	ANONYMOUS #3	N/A	N/A	N/A	To demonstrate that the project area historically sustained biomass with similar resource requirements, auditable information could include historical documented evidence such as historical aerial photos and land use records, studies and other relevant documentation about the area that evidenced the local ecological conditions in the past. It could also include policies and regulations that could have influenced the landscape transformation in the past. Surveys and records from local communities and indigenous peoples that lived in the area in the past and that could provide valuable traditional knowledge could be considered as evidence as well. Depending on the context and the confidence in the pieces of evidence, triangulation and cross-check processes may be used, if necessary.	The WG appreciates these ideas, most of which would be allowable under the current language which allows for observed, modeled, and/or peer reviewed approaches.	

3) The ABACUS label requires proponents to describe how they will address permanence after the crediting period, allowing buyers and the public to understand why the project believes stored carbon will remain durably stored after the crediting period. What kind of verifiable evidence for this would be practical and compelling?

#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
117	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	Legal: Easements, zoning, protected areas, Financial: Endowment, service contracts, sustainable profits. Community: Local ownership, benefit-sharing, capacity-building, Monitoring: Annual checks, transparent reporting, adaptive management, Additional Evidence: Scientific studies, historical analysis, future carbon modeling	The WG appreciates these ideas. Many of them would suffice under the existing language.	The requirement in question now reads: 4) At project validation and each verification event, project proponents must document or update the project's proposed approach to stabilizing project carbon stocks after the crediting period. Evidence may include: a. Demonstration of projected financial sustainability after the crediting period; b. A specific plan to attain
118	Lynn Riley	American Forest Foundation	Project Developer	United States	We support the proposed evidence suggested in the consultation document. The non-permanence risk tool may offer other language to draw from for verifiable evidence, such as "financial plans submitted to public institutions or financial institutions." An addition to consider would be if a project proponent commits to a horizontal stacking approach, for example, by creating a viable plan and committing to generating or purchasing long-term storage credits (such as geologic storage) where post-crediting period reversals are identified beyond what was contributed to the buffer pool or already used to refill the buffer due to crediting-period reversals. This could be another way in which a project proponent ensures credited carbon stocks after the crediting period. (This may be addressed under areas of future innovation later in the consultation document.)	The suggestion of commitment to horizontal stacking is one that the WG is interested in pursuing in future ABACUS versions.	

119	ANONYMOUS #1	N/A	N/A	N/A	To ensure the permanence of forested areas, it is recommended that a legal mechanism (such as a conservation easement) be established where available. This mechanism should limit the future use of the land and explicitly require maintenance of minimum stocking levels. Otherwise, strong co-benefits for local stakeholders and communities must be demonstrated that provide financial incentives or otherwise for the ongoing management of the forested area beyond conventional harvesting and restocking. The benefits should demonstrate at verification at least 1) the additional finance generation for local stakeholders to ensure ongoing management takes place and how long this can be anticipated to continue, and 2) what continual ongoing training and employment is undertaken to ensure locals understand the importance of protecting forests' permanence.	The WG agrees with these three approaches (legal mechanism, financial sustainability, and ongoing training/employment) and believes they are each represented in the existing language.	legal protection beyond the crediting period; or c. Ongoing technical capacity-building or employment that facilitates long-term carbon stock stewardship.
120	Shermila	stx commodities b.v	Project Developer	Netherlands	Conservation agreements with landowners for extended periods.	This would fall under "legal protection beyond the crediting period."	
121	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	Apart from financial performance, sustaining the project hinges on continuous monitoring via remote sensing in specific areas. This enables near-real-time assessment of carbon levels and swift responses to fluctuations. Technologies like satellite imaging and other EO systems offer affordable and transparent means to track changes in vegetation and land use, ensuring early detection of potential threats such as selective logging in forests. In areas prone to wildfires, it's crucial to employ risk mitigation tactics like fire breaks to protect stored carbon in the long term. Implementing proactive measures like fire breaks not only reduces the risk of major losses but also demonstrates a commitment to responsible management, enhancing the credibility and long-term success of these climate change initiatives. Evaluating fire break conditions can be done through remote sensing techniques.	The WG agrees that long-term monitoring is essential and necessary to ensure the presence of carbon stocks after the crediting period. Verra is proposing a program to do this.	

122	ANONYMOUS #2	N/A	N/A	N/A	• A project sustainability strategy is needed that details an action plan explaining how an existing project/program will withdraw support in terms of financial and personnel resources without compromising the quality and continuity of reforestation and agroforestry objectives. It should explain how the project objectives will be perpetuated beyond the crediting period. • Capacity development plans to ensure the land users: internalise the bioeconomic value of agroforestry and reforested ecosystem; and develop deforestation-free sustainable livelihood systems that generate income exceeding benefits from destroying carbon removal activities. • A land use plan that is integrated within landscape and regional sustainable development plans. • Legal documents that require the agroforestry and reforestation areas to be maintained regardless of who owns the land. • Regional director plans for jurisdictions where the project is inserted, demonstrating geopolitical aptitude to restored land in long-term regional plans, such as eco-agricultural zoning, policies of incentives and support to forest landscape restoration, tax incentives to attract private capital and industries that benefit from and foster restoration activities.	These are good suggestions, and many would suffice under the existing language in 3.5.1(4)(a-c). Because the types of verifiable evidence are so varied, we will avoid mentioning specific types of documents and leave this up to the verifier.	
123	ANONYMOUS #3	N/A	N/A	N/A	Practical and compelling verifiable evidence for demonstrating how the stored carbon will remain durably stored after the crediting period include the following: detailed robust and credible long-term management plans for the project, including monitoring and reporting plans that address transparency and credibility; legal documentation that bind the land to a certain sustainable land-use practices or that ensure legal protection of the ecosystem; investment plans and financial analyses demonstrating the long-term financial sustainability of the project; documented evidence of the relevant communities and other stakeholders appropriately involved to ensure sustainability, including land agreements and commitments to specific management practices aligned with the project	These are good suggestions, and many would suffice under the existing language in 3.5.1(4)(a-c). Because the types of verifiable evidence are so varied, we will avoid mentioning specific types of documents and leave this up to the verifier.	

					goals and long-term objective of permanent carbon sequestration on the land beyond the crediting period; specific plan to regularly monitor and reassess risks in the long term and specific long-term adaptive management plans.		

ABACUS Areas of Future Innovation							
Please share any insights, questions, or additional information we should consider as we begin developing these innovations into actionable requirements.							
#	Name	Organization	Stakeholder type	Country	Comment	WG Response	Changes?
124	Allory	Kanop	Corporate/End User	France	We believe that adverse selection is a particularly good fit for our work. Including socio-economic factors in the selection of control plots could be a significant improvement to the methodology. At Kanop, we support project developers with the selection of control plots and their matching project plots according to the *VM0047* methodology. We would be excited to collaborate with you on such an innovative approach.	The WG would like to strive to increase control selection rigor so that socio-economic factors are more explicitly utilized when available. We look forward to innovating on this.	None.

125	Dr. Nripanka Das	Mundo Verde Climate	Project Developer	Switzerland	I. Monitoring and Reporting Frequency: While annual reporting of disturbance events is commendable, would more frequent monitoring (e.g., bi-annual) be feasible and beneficial for early detection of potential reversals? II. Flexibility in Leakage Management: The approach to leakage through incentivizing agricultural productivity seems promising. However, how will projects be able to demonstrate actual land-sparing effects and avoid unintended consequences? III. Scaling Potential and Global Applicability: The ABACUS label seems well-designed for forested landscapes. How will it be adapted for application in other ecosystems like grasslands or wetlands? IV. Non-destructive Allometric Equation Validation: While the goal of using non-destructive methods for allometric equation validation is commendable, will these methods be accurate enough to ensure reliable carbon accounting? V. Regulatory Framework and Stakeholder Engagement: How will the ABACUS label be integrated with existing regulatory frameworks governing carbon projects and forestry? How will stakeholders, particularly local communities, be involved in project implementation and monitoring? It would be helpful to have access to the ABACUS Label Guidance document for a more detailed understanding of the specific requirements. Information on the expected timeline for implementing the proposed innovations would be beneficial.	I. Annual reporting of potential reversals is required, but projects should be encouraged to develop near-real-time detection of reversals. II. Leakage specifics will be outlined in the forthcoming ABACUS food forward leakage approach or revision to the existing ARR Leakage Module. III. This ABACUS Label is focused on ARR exclusively.	None.

126	Lynn Riley	American Forest Foundation	Project Developer	United States	First, we wanted to offer gratitude to the WG for thinking about these issues and bringing them forward for innovation, as we believe they are critical to continued advancement of the integrity of carbon credits. Thank you! Biophysical impacts: The idea to use thresholds to avoid negative impacts is a good first iteration to be able to incorporate these important impacts into carbon project accounting. Ideas include: - Incorporate latitudinal maximums for ARR projects, following the body of research that has found that forestation at higher latitudes generates a net warming effect, net of biophysical and biochemical impacts (8). - Other thresholds for relevance in accounting could include spring snow cover (indicating greater relevance); persistent cloud cover (indicating less relevance); topography and its impact on incident solar radiation (9). - Use a breakeven time assessment to test the significance of albedo effects on a given project activity, such as the approach used by (10). For example, an analysis could be run that determines the number of years required for the radiative forcing from biogeochemical project impacts to balance the radiative forcing from biogeophysical impacts, and if the breakeven time is past a certain threshold (for example, 10 years), then the project could be ineligible or required to account for or discount impact due to albedo effects. - Additionally, there could be a “biogeophysical impact mitigation” made available to project proponents, whereby if a project proponent can demonstrate that nonradiative biophysical effects (evapotranspiration efficiency and surface roughness, for example) counterbalanced the albedo effects, the albedo accounting could be reduced. See (11). - Additionally, as ABACUS extends its scope beyond ARR, biophysical benefits that enhance the climate change mitigation of projects such as REDD should also be considered for incorporation (12). In this way, the incentives associated with REDD projects could better align with the full impact generated.	The WG appreciates this and the thoughtful feedback throughout. We intend to integrate biophysical impacts (potentially utilizing the proposed approaches) and horizontal stacking in future versions of ABACUS.	None.

					Effective permanence: Please consider AFF an available thought partner regarding a permanence strategy in which funds are set aside from credit revenues to be used for future horizontal stacking based on dynamic post-crediting period reversals identified via long-term remote monitoring systems. We have designed strategies around this for our projects, and would like to see such strategies employed and made scalable to others, further enhancing the integrity and role AFOLU projects can play in producing durable climate impacts. Adverse selection: Please consider AFF an available thought partner regarding adverse selection in matching protocols. AFF has designed projects that have had to incorporate safeguards where matching data is not available, for example, through VM0045 which is currently reliant on data available in the FIA database. We have thought through ways to do this within or alongside matching (for example, if a critical criteria to avoid adverse selection is not available for matching, perhaps it can be used as an eligibility screener), and would be thrilled to explore more, test, and innovate together. Additionally, we recommend that VM0045 be considered for ABACUS as well in upcoming iterations of the label. We see VM0045 as another ripe ground for this type of innovation, and it already meets some of the same requirements posed here. Adding this methodology would expand the reach of ABACUS innovation, particularly once removals and reductions differentiating equations are built in to VM0045, which is a revision underway. (8) Windisch, M., Davin, E., Seneviratne, S. 2021. Prioritizing forestation based on biogeochemical and local biogeophysical impacts. Nature Climate Change. 11:867-871. (9) Bright, R., Bogren, W., Bernier, P., Astrup, R. 2016. Carbon-equivalent metrics for albedo changes in land management contexts: relevance of the time dimension. Ecological Applications. 26:6 1868-1880.		

					(10) Stern, R., Muller, J., Rotenberg, E., Amer, M., Segev, L., Yakir, D. 2023. Photovoltaic fields largely outperform afforestation efficiency in global climate change mitigation strategies. PNAS Nexus. 2, 11:1-10. (11) Davin, E., Noblet-Ducoudre, N. 2010. Climatic Impact of Global-Scale Deforestation: Radiative versus Nonradiative Processes. Journal of Climate. 23, 1:97-112. (12) Culbertson, M., Seymour, F., Wolosin, M. 2022. How UNFCCC Parties Can Act on Forests' Non-Carbon Climate Effects. World Resources Institute.		
127	ANONYMOUS #1	N/A	N/A	N/A	In order to enhance market comprehension and implementation, it is crucial that Verra provides a comprehensive explanation for the ABACUS label, as well as any forthcoming labels. The current market situation can be perplexing for the general public, and the introduction of numerous labels with varying characteristics could exacerbate this confusion, making it challenging to distinguish quality among labels. Therefore, it is essential to articulate the unique benefits of the ABACUS label, particularly in relation to CCB, removal labels, CORSIA labels, and potential ICVCM labels. This will significantly contribute to a clearer understanding of the market.	Thank you for this note. On and after publication, information will be available at https://verra.org/programs/verified-carbon-standard/verified-carbon-units-labels/; Verra and the ABACUS WG will explain the market demand for this label and how it is being used for piloting new ideas that Verra is not yet ready to require for all projects.	None.
128	Jonathan Pierre	Mantle Labs	Independent	United Kingdom	It is not recommended that the SI used for the dynamic baseline be identical to that utilized for the selection of control units. In the latter case, a 'finer' set of selector variables is essential, given that factors such as the current or past aboveground biomass (AGB) may not adequately capture the potential AGB. Increased incorporation of "digital twins" - combinations of biologically-inspired process models and remote sensing techniques would help overcome scaling issues and applicability of models regionally. It should be considered whether a particular control unit needs to be exclusive to the project that selects it. This approach would require the maintenance of a	These are important notes for updates to the *VM0047*.	None.

					comprehensive registry of all control units to ensure they are not re-used and may, in turn, impose limitations on the quantity and quality of controls available in regions characterised by a higher density of carbon projects.		
129	ANONYMOUS #3	N/A	N/A	N/A	The requirement 'The crediting period for any given activity instance must not exceed 30 years.', may not bring added value here and should be reconsidered, unless clarification on its purpose is provided. It might bring unnecessary additional complexity in the context of the new VCS Standard requirements that include the necessity of demonstrating the project longevity for a minimum length of 40 years and monitoring of the carbon stocks throughout the project longevity period. While some projects may choose to keep a crediting period for less than 40 years, others may prefer to align it with the minimum project longevity, to ensure the project benefits are accounted in the budgets for that period. Nevertheless, more perspective and potentially guidance from Verra is necessary to navigate through those requirements, especially on what is acceptable as evidence to demonstrate longevity, for example, as some of those concepts are still new.	The *VCS Standard* requires project longevity of at least 40 years - this is the length of the project activities. It does not appear to require the crediting period to be 40 years [*VCS Standard 4.5*, Section 3.2.11]. Limiting the crediting period to 30 years was proposed because future, time-discounted revenue has little to no bearing on project investment decisions at the outset. A project liability for compensating for reversals continues until 40 years of longevity [3.3.25]. This effectively means that ABACUS projects will contribute ten years of uncredited carbon removal to climate change mitigation. To clarify this and ensure that ABACUS projects don't get penalized in the non-permanence risk deductions, we modify 3.5.1(5) to require >80% of post-30-year credits toward a post-crediting-period compensation mechanism. This approach helps enhance the durability of the climate benefit, allows up to 20% of credits to be monetized for maintenance and MRV, and doesn't conflict with the 40-year (or more) longevity.	3.5.1(5) now reads: 5) Projects must contribute at least 80% of issued credits earned after project (or instance) year 30 to compensate for post-crediting period reversals. Credits must utilize an approved durability mechanism, including a buffer pool, insurance product, or stacking approach.

130	Earthshot Labs	Earthshot Labs	Project Developer	USA	30-year crediting period: Under section 3.5.1 point 5: “The crediting period for any given activity instance must not exceed 30 years”. This is in direct contradiction to the VCS standard of ensuring project duration for at least 40 years. Removing the financial incentive to maintain the integrity of the project beyond 30 years puts the long-term success of the project in jeopardy. In many project areas carbon removals will continue beyond 30 years and projects should be eligible for credits during this period. We acknowledge that an excessively long crediting period may be unrealistic given land tenure, however, aligning incentives with the VCS standard is important. This also conflicts with the non-permanence risk tool table 4, where legally binding agreements of 100 years reduce the internal risk. Publish in-situ inventory data: Section 3.4 “Projects must publish in-situ inventory data and allometric equations to allow stakeholders to understand the quality of the collected data and reproduce results.” We agree that this data is essential for quality control, oversight, and improvements in biomass forecasting in the field. Additionality & Baseline: Under section 3.2.1 point 1: Replacing "less" with "fewer" throughout this section would increase clarity. For example, "no less than five years" can be initially ambiguous, meaning something like "at least a five year lookback".	The *VCS Standard* requires project longevity of at least 40 years - this is the length of the project activities. It does not appear to require the crediting period to be 40 years [*VCS Standard 4.5*, Section 3.2.11]. Limiting the crediting period to 30 years was proposed because future, time-discounted revenue has little to no bearing on project investment decisions at the outset. A project liability for compensating for reversals continues until 40 years of longevity [3.3.25]. This effectively means that ABACUS projects will contribute ten years of uncredited carbon removal to climate change mitigation. To clarify this and ensure that ABACUS projects don't get penalized in the non-permanence risk deductions, we modify 3.5.1(5) to require >80% of post-30-year credits toward a post-crediting-period compensation mechanism. This approach helps enhance the durability of the climate benefit, allows up to 20% of credits to be monetized for maintenance and MRV, and doesn't conflict with the 40-year (or more) longevity.	3.5.1(5) now reads: 5) Projects must contribute at least 80% of issued credits earned after project (or instance) year 30 to compensate for post-crediting period reversals. Credits must utilize an approved durability mechanism, including a buffer pool, insurance product, or stacking approach.