Biochar FRC Feedback

-Responses to Stakeholder Questions and Comments-

The following document presents Sylvera's responses to questions and feedback submitted during the Framework Review Committee (FRC) comment period on the Sylvera Biochar Rating Framework Version 2.0.

CARBON ACCOUNTING

1. dMRV plays a vital role in quantifying carbon / carbon accounting. How can Sylvera identify misreporting or mistakenly reported numbers in carbon accounting? Is it included in the framework?

   Yes. Detecting misreporting is built into the Carbon Accounting pillar, which we assess through two lenses, qualitative and quantitative.
   - The qualitative lens is covered under Accounting Uncertainties. We assess data quality, LCA quality, and process control. To catch misreported or mistaken numbers, we cross-validate the developer's LCA against the validation report and the monitoring report. We also apply the judgment of experienced analysts, drawing on patterns seen across past assessments.
   - The quantitative lens tests the numbers directly. We replicate the developer's carbon accounting using validated primary inputs. Where our result disagrees with the developer's, we apply conservative assumptions rather than accept the reported figure.

   Together, these lenses let us flag inconsistencies between what a project claims and what its own evidence supports.

2. To what extent will monitoring and reporting (dMRV) and quantification of the biochar methodology be checked? These mostly sit under Carbon Accounting, which we feel carries significant weighting.

We assess dMRV across both Carbon Accounting and Permanence, reflecting its role in the accuracy of carbon quantification and in our confidence in long-term storage.

- Under Carbon Accounting, we run a dedicated dMRV test (within Data Accuracy) that assesses how secure, reliable, and widely applied a project's monitoring system is. MRV records also inform our broader assessment of Accounting Uncertainties, as the strength of the monitoring system determines how much confidence we can place in the project's reported data, LCA, and process controls.
- Under Permanence, we assess whether biochar quality, stability, and end use are monitored reliably. For quality and stability, this includes sampling representativeness, testing sufficiency, and the quality of key permanence inputs such as H/Corg and carbonization conditions. For end use, we assess traceability: the evidence that the biochar reached, and is likely to remain in, a carbon-preserving use, tracked through the chain of custody to the last credible point. Weak, unrepresentative, or poorly traced measurements reduce our confidence in the durability claim.

On quantification, we do not simply accept a methodology's reported figure. We independently reconstruct the project's net removal calculation, covering both gross removals and project emissions. We cross-check the developer's primary inputs against validation and monitoring reports, and where material discrepancies remain, we apply conservative assumptions. To judge the removal estimate itself, we consider peer-reviewed conservative models, including but not limited to those reflected in registry approaches, and we flag claims that materially exceed the defensible range.

The principle is consistent across projects: we assess the quality of the underlying data, measurement, and carbon claim, rather than relying on the methodology alone.

3. We don't see why random reflectance needs a case-by-case review. We understand the interest in treating it separately given the perceived lack of scientific consensus, but the real question seems to be whether to accept it as a rigorous method overall. If

accepted, there are clearly defined and rigorous ways of quantifying it that Sylvera could check were used correctly.

We agree that random reflectance (Ro) can be measured rigorously, and we do not reject it as a method. We already recognize Ro as a useful permanence indicator. The reason 1,000-year carbon-storage claims based on Ro remain subject to case-by-case review is that measuring reflectance and using it to quantify long-term carbon storage are two separate questions.

The measurement itself is well established, with defined protocols for sample preparation, reflectance analysis, and classification. However, the scientific basis for converting Ro into a comparable quantitative estimate of carbon remaining after 1,000 years is still evolving.

- The scientific literature illustrates this uncertainty. Sanei et al. (2026) support inertinite benchmarking and a strong, non-linear relationship between Ro and persistence, but their calibrated model does not equate Ro >2% with complete permanence. For example, their model estimates that biochar with a mean Ro of 2.20% retains 78% of its carbon after 1,000 years, while a mean Ro of 4.70% corresponds to 99% retention. Their approach also relies on a conservative scaling assumption rather than direct millennial observations. In contrast, Schmidt et al. (2025) argue that Ro should be treated as a relative proxy, noting that degradation can still occur in highly carbonized material and cautioning against directly equating modern biochar with fossil inertinite formed over geological timescales.
- The choice of approach can also materially affect credited removals. Petersen and Sanei (2025) illustrate that biochar characterized as essentially 100% inertinite may receive 100% crediting under a reflectance-based approach, compared with approximately 75% under an H/C-based standard. Given both the evolving scientific debate and the potential impact on credited volumes, we believe a higher evidence bar is appropriate.

- We also cannot yet confidently calibrate a standardized score: too few previously rated projects use this approach to support a defensible, calibrated treatment.

For now, we therefore assess each 1,000-year Ro-based claim on its own merits and look for a second, independent line of evidence. This is not a rejection of reflectance. Case-by-case does not mean ad hoc. Every Ro-based claim is assessed against consistent criteria: a trustworthy and representative Ro measurement, benchmarking of the claimed durable fraction against our multi-proxy range, and a documented rationale in the project commentary to ensure each decision is transparent and repeatable.

We also work directly with developers to refine this approach as new projects are assessed, using the evidence and questions raised in each review to strengthen our treatment of reflectance. As the science becomes more standardized and our evidence base grows, we expect to move towards a fully rules-based approach, as we already apply to H/Corg-based assessments.

4. Could you share how Sylvera analyzes biochar production consistency in carbon accounting — on what basis, and at what frequency?

Distributed systems inherently tend to require a more diffused and granular control, especially if an issuing project is set on the assumption that certain variables won't vary and will be kept within agreed/permissible ranges across every unit. When a project includes a high number of kilns, this becomes a significant risk that we believe can be mitigated as long as:

- Temperature control is enforced, especially if per-batch, rewarding continuous logging and non-conformity exclusion systems;
- Operator training occurs, rewarding training delivered by a qualified trainer, a passed proficiency exam, clear duty separations and refreshers;

- Biochar mass measurements are executed rigorously, rewarding direct mass measurements or evidence volume-based approaches.

5. We didn't see an evaluation criterion for the amount of biochar produced. We were advised that artisanal and distributed projects often don't directly weigh their biochar output, and instead it's provided by volume multiplied by bulk density. This emerged as being just as important/problematic as the methane topic for these project types. This method has a number of sub-components and measurements, and given how central biochar quantity is to final results, it deserves more attention, possibly under Accounting Uncertainties.

   Thank you for raising the point; this helped us improve the framework. We have incorporated an assessment around methods for biochar mass quantification. What this entails is that volume-based calculations can only compare to physical (mass) weighting if rigorous methods (with justifiable frequencies) are applied, while penalizing insufficiently conservative and less rigorous approaches.

6. How do expectations of sampling frequency vary across artisanal, distributed and industrial systems? Is there a minimum sampling frequency the Biochar Rating Team sees as above-and-beyond, resulting in a high score?

   We do not set different sampling bars by system type. We assess two things: sampling representativeness and testing sufficiency, and any project meeting the top tier scores high, whether artisanal, distributed, or industrial.

   - For sampling representativeness, best practice is either random or automated multi-point sampling across all units and the full production run, or a time-proportional composite at intervals of 24 hours or less throughout production. We also expect biochar from different feedstocks or operating conditions to be sampled separately.

- For testing sufficiency, best practice is testing at least quarterly, in triplicate. Frequency limits how much output relies on results carried forward from an earlier period. Replication in triplicate measures analytical uncertainty, which a single result cannot provide.

The same standard applies regardless of project scale or technology. Because the assessment is based on sampling representativeness and testing sufficiency, rather than size, small or artisanal producers can achieve the highest score by demonstrating robust sampling and sufficient testing.

7. For large industrial facilities operating under highly stable process conditions with continuous monitoring, how will Sylvera balance laboratory testing requirements against evidence from process controls and operational consistency?

We maintain laboratory testing sufficiency and recency requirements for industrial facilities, regardless of the strength of their process controls or operational consistency.

Continuous monitoring and stable operating conditions provide valuable evidence that production is consistent, but they do not directly verify the properties of the biochar itself, such as carbon content, H/Corg ratio, or contaminant levels. Laboratory testing therefore remains the primary evidence of biochar quality and cannot be replaced by process monitoring alone.

For industrial facilities, we do not score process consistency and operational consistency because they are generally expected as standard practice. This avoids rewarding projects for meeting a baseline expectation or allowing strong process controls to offset risks identified elsewhere.

8. The ISO/IEC 17025 requirement can be burdensome and is not felt evenly across the market. Many methodologies allow testing by national accreditation bodies (e.g. SCC

or CALA in Canada) provided international standards (ASTM, ISO, AS, DIN) are followed, and biochar-specific labs are scarce in North America. Projects should not be penalised by location or accreditation route; would Sylvera consider reframing this requirement?

We agree, and we do not require ISO/IEC 17025 accreditation exclusively. Our best practice is for biochar testing to be conducted by an ISO/IEC 17025-accredited laboratory or a recognized national equivalent, within 12 months of the latest credit issuance.

We recognize equivalent accreditation routes where laboratories demonstrate appropriate competence and testing is conducted using relevant recognized methods, including ASTM, ISO, AS, or DIN standards where applicable.

Thank you for highlighting the North American context. We have clarified these alternative routes in our internal guidance to ensure that projects are assessed on the quality and credibility of their testing, rather than being penalized because of their location or accreditation pathway.

9. On scoring uncertainty in process control and production consistency, we recommend treating temperature control via handheld temperature guns as poor quality. Integrated temperature sensors are feasible for many projects to implement and are far more reliable.

We agree that continuous logging with an integrated temperature sensor represents best practice, and we reward continuous monitoring across all production batches.

Handheld temperature readings are weaker on their own because they are manual, intermittent, and operator-dependent; they require stronger supporting controls to achieve the same level of confidence. These may include a tamper-evident dMRV system with timestamps and automatic exclusion of non-conforming batches, time-stamped photographs, device calibration records, and cross-checks against other process indicators. Where these controls are in place, handheld monitoring can score highly. Where they are absent, or where temperature is only loosely monitored or varies substantially between batches, confidence is lower, and the score is reduced.

10. Methane monitoring

a. For methane monitoring in artisanal / distributed systems, what is the minimum acceptable monitoring frequency to avoid a low score?

To ensure a higher score, we require recurring emissions testing across representative samples either annually or upon any change in feedstock or production units. Alternatively, we require monitoring of key methane drivers (e.g., moisture and temperature) for every batch produced. Scores are further improved by combining both systems (emissions testing alongside driver monitoring), with greater frequency and broader unit coverage yielding the best results.

b. For methane, how does carbon scoring take into account whether projects are taking a direct measurement approach versus a modelled approach?

Methane is central to small and mid-tech projects, so it is assessed in two places: how emissions are accounted for in the carbon quantification, and how they are monitored. In both, best practice and the highest-scoring approach is direct measurement, or accredited third-party emissions testing, on representative production units and used directly in the accounting.

Modeled or default approaches remain acceptable where they are conservative and evidenced, but they carry more uncertainty and do not reach the same confidence. Whichever approach a developer takes, we stress-test it: where a project uses a proxy or emission factor, we check that the value sits within a plausible range against the literature.

11. Baseline and leakage

a. Feedstock counterfactual and market-leakage analysis is very subjective to the 500km radius of the project, for which sufficient information is not available in a global-south context. How will Sylvera counter this, and what steps will be taken to account for the actual on-the-ground situation? Being unable to prove something does not mean something wrong is happening.

We agree that a lack of data is not evidence that something wrong is happening. Where such data is limited, particularly in Global South contexts, we place greater weight on credible primary and on-the-ground evidence.

- For Feedstock Counterfactual, we validate the likely fate of the feedstock. We stress-test whether the material is genuinely a waste or residue whose biogenic carbon would otherwise return to the atmosphere soon, and we validate the developer's baseline emissions. This test rests on the feedstock's local, observable fate, which is usually documented on the ground. Evidence can include supply contracts, waste-disposal records, invasive-species analysis, and a representative survey or regional study documenting the prior fate, such as open burning or dumping.
- For Market Leakage, we look for evidence that the feedstock is a genuine waste, and we check whether the price paid for the feedstock sits above the local market average. A premium price signals competing demand, which would undermine a waste claim.

Where comprehensive market data is unavailable, we use the best available evidence to assess the actual on-the-ground context rather than treating data gaps themselves as evidence of risk. We also welcome further input from developers and practitioners, particularly practical insights that can help us continue refining the framework.

b. Where a facility has transitioned from charcoal to biochar production, how will Sylvera assess leakage from displacement of existing charcoal markets, and what evidence would demonstrate a net climate benefit rather than a shift in emissions elsewhere?

We assess this through two components of the Carbon Score: Feedstock Counterfactual and Leakage Assessment.

- Under the Feedstock Counterfactual, we assess what would most likely have happened to the carbon without the project. Where charcoal would otherwise have been combusted, converting it to a durable biochar use may create an additional carbon benefit. Where it was already expected to remain in a stable form, that removal cannot be credited again. We assess evidence including historical production and use, the documented baseline fate of the charcoal, associated reversal risk, and biochar persistence indicators such as H/Corg.
- Under the Leakage Assessment, we consider whether withdrawing charcoal from an existing market could shift emissions elsewhere. For example, former buyers might source charcoal from another producer, potentially increasing pressure on forests, or switch to fossil coke or other higher-emission alternatives. We assess both the underlying leakage risk and the strength of evidence provided to address it.

The strongest evidence would demonstrate that no material demand has been displaced, for example through a pre- and post-transition mass and energy balance showing that market supply was maintained. Where supply has fallen, projects can instead provide evidence that displaced demand has declined or shifted to a lower-carbon alternative. Where displacement does occur, we expect the emissions associated with the likely marginal replacement to be quantified and accounted for.

The Carbon Score reflects the degree of residual risk and uncertainty. Incomplete evidence does not automatically imply that leakage has occurred, but material unresolved uncertainty will reduce the score and be reflected transparently in our commentary.

c. Under PURO, market and activity-shifting leakage need not be quantified if biochar production decreases relative to charcoal or charcoal demand has declined. Would that sufficiently demonstrate leakage is addressed, and how will methodology choices outside the project's control be taken into account in a methodology-agnostic framework?

   Not on its own. Meeting a registry's leakage exemption is relevant evidence and can reduce residual risk, but it does not automatically produce a zero-leakage result. We independently assess the project's likely climate outcome and the evidence behind the exemption, with any remaining uncertainty reflected in the Leakage Assessment Quality subscore.

   Our two-part assessment keeps this consistent across registries. Feedstock Risk-based Assessment captures the inherent leakage risk of the project context, and Leakage Assessment Quality evaluates how well that risk has been investigated and evidenced. A project whose methodology requires no further quantification can still score well by providing mass-balance or market evidence where material risks remain, and evidence already validated under a more stringent methodology is recognized rather than treated as an additional burden.

   Methodology choice therefore does not determine the score. The underlying leakage risk and the strength of evidence available to address it do.

d. Feedstock consistency for artisanal and distributed biochar is an important factor to assess, but we're unsure why it sits within the feedstock counterfactual section. In our view, its main relevance is to biochar output quality (for example, consistent carbon content and permanence indicators across all biochar produced in one batch). Also, we note that feedstock counterfactual impacts are part of the leakage assessment in registry methodologies — just a comment on structure, not substance.

Agreed on both counts. We have moved "feedstock consistency" to "Accounting Uncertainties", since its main relevance is to biochar output quality rather than the counterfactual.

On the overlap between Feedstock Counterfactual and Leakage, we recognize it, but keep them as separate components deliberately:

- Feedstock Counterfactual looks at the counterfactual fate of the feedstock and stress-tests the developer's baseline, i.e., whether that carbon would have been emitted anyway.
- Leakage captures effects beyond the project boundary: market and activity-shifting leakage, and ecological leakage.

The split keeps our structure consistent across CDR types, not just biochar. For other pathways, leakage extends well beyond feedstock to things like sorbent and electricity use, so housing it as its own component keeps the framework comparable across methods, even where, for biochar specifically, the two are closely linked.

ADDITIONALITY

12. Country and proponent risk:

    a. Regarding the Worldwide Governance Indicators (WGI) used to modify the Country Policy Score — how frequently is this refreshed, and does a WGI score change apply retroactively to previously issued ratings?

    Sylvera's WGI database is refreshed yearly, in line with the World Bank's annual WGI update. Updated indicators feed into a project's score when it is re-scored, whether for a new issuance or as part of a framework update. Beyond this, we conduct periodic reviews of existing Ratings, so projects are revisited and refreshed on an ongoing basis rather than left static after their initial assessment.

b. We're not in favor of accounting for proponent/country risk here. This seems like it would heavily penalize a new project developer operating in a country with jurisdictional risk, for reasons beyond their control, even if the project itself is well-run. Additionally, if a project meets all other end-use tracking requirements, this factor shouldn't need separate accounting.

   The rationale for including country and proponent risk is that permanence risk in biochar projects extends beyond physical and environmental durability to the risk that the entities responsible for maintaining monitoring, reporting, and long-term stewardship fail to do so, whether through incapacity, fraud, or misconduct. Removing these screens would mean the Rating no longer accounts for a category of risk that has materially affected project outcomes elsewhere in the carbon markets.

   - Country risk captures a structural risk to the durability of carbon storage that exists independent of project quality. A well-designed and well-run project in a jurisdiction with weaker governance or political stability carries genuine additional exposure to disruption of monitoring, enforcement, and long-term land-use continuity. This exposure is a real driver of permanence risk that Sylvera's Ratings are designed to capture.
   - Proponent risk is not an assessment of a developer's experience, size, or seniority in the market. Sylvera's assessment screens for documented red flags associated with the specific entities running the project, such as fraud, sanctions exposure, or other adverse findings tied to that proponent or developer. In the absence of such findings, the proponent receives the highest available score on this factor regardless of how new or established the developer is. A first-time developer with a clean record will score identically on this component to an experienced one with a clean record.

It is also worth noting that these risks are weighted minimally compared to end-use monitoring risks within the anthropogenic risk subscore, which is itself one of several inputs to the overall Permanence Score. The influence of country and proponent risk on the final Rating is thus proportional and bounded.

13. Slide 26 shows conflicting timelines (assessment at project inception versus over the project lifetime). Given large variability across industrial, distributed and artisanal projects, how will Sylvera account for uncertainty in future biochar demand, commodity pricing and market maturity when assessing financial additionality?

    Sylvera's approach to financial additionality is to assess the project's financial model under both a with-carbon-revenue and without-carbon-revenue scenario, using the most current available market data on biochar pricing, comparable transactions, and sector growth at the time of assessment. At present, Sylvera's financial modeling references pricing that is largely benchmarked to industrial-scale biochar and carbon market data, reflecting the fact that transaction volumes and price transparency are most established at that end of the production method spectrum. Sylvera recognizes that applying industrial pricing as a reference point may not fully capture the demand and pricing dynamics faced by smaller-scale or distributed producers, who often sell into different, less liquid markets or rely more heavily on carbon credit revenue in the absence of an established biochar sales market.

    However, where a non-industrial project's own financial disclosures include project-specific realized biochar, energy, or byproduct sales prices, these figures may be used directly in Sylvera's financial analysis if the figures are aligned with general industry benchmarks, or they have been evidenced through sales agreements/contracts or Letters of Authorization with offtakers. This partially mitigates this gap at the individual project level.

    Biochar demand and pricing are still maturing relative to more established commodity markets, and this evolution means that Sylvera will review underlying assumptions and recalibrate them as needed as new market data becomes available, rather than fixed at a single point in time.

14. How will projects be evaluated where IRR may exceed WACC in the near term but not over the full investment horizon?

    Sylvera's financial additionality analysis seeks to capture the project's investment profile over the entire lifetime of the project, not any single interim period. Sylvera evaluates the economics of the project at the time of investment (prior to project inception) to assess whether the presence of carbon finance enabled the initial investment in the project. This assessment comprises a full discounted cash flow analysis conducted over the full expected lifetime of the project, evaluating whether the project is sub-economic in the scenario without carbon credit revenue, and whether it becomes economic (e.g., clears the investors' hurdle rate) in the scenario with carbon credit revenue. Because the determination is based on the project's aggregate return across its full investment horizon, an interim period in which IRR temporarily exceeds the cost of capital does not, on its own, affect the outcome of the assessment; the important element considered by Sylvera is whether carbon revenue was necessary to clear the hurdle rate over the project's complete economic life.

PERMANENCE

15. Biochar sold through retail channels

    a. It would help to clarify whether biochar with high stability that is sold in retail environments counts as attributed to end use, and whether this applies if it's 100% biochar versus biochar mixed with other growing media or compost.

       We do not assess projects based on their choice of end use, but on the associated risks and how effectively those risks are mitigated. End-use attribution depends on traceability, which determines our confidence in the biochar's long-term carbon storage. The principle is consistent across end uses, while the evidence required scales with the associated reversal risk.

We assess three things:

- Where it ends up. A final end use places biochar in a carbon-preserving state, such as soil. A cascading use passes biochar through intermediate applications, and each step must provide sufficient evidence that carbon storage is preserved.
- How likely it is to stay there. Evidence requirements scale with the risk of diversion from the intended use, the durability of any downstream use, and traceability to the last point at which credible evidence can be collected.
- How it is blended. Where dilution makes the biochar impractical to separate or redirect, delivery to the user can reasonably mark the end use. We apply this principle while assessing the relevant threshold and its basis against each project's methodology, recognizing that methodological requirements differ and continue to evolve.

Some end uses carry materially higher risks and therefore require stronger evidence. Uses such as retail animal feed and short-lived materials have a higher risk of diversion, landfill, or other loss of stored carbon. Uses with a clearly non-permanent end-of-life pathway, such as certain water-system applications, fuel or reductants, are also flagged as higher risk. Lower-risk uses, such as gardening and landscaping, can receive a low end-use traceability risk assessment where there is sufficient evidence that the biochar reaches the intended use. Where some residual uncertainty remains, we may apply a reversal-risk discount on the project's Permanence Score.

b. Where methodologies only require chain-of-custody tracking to an intermediary, how does this affect the Permanence / Anthropogenic Risk score? What evidence from intermediaries would be sufficient to demonstrate a low reversal-risk pathway, and will direct verification of the final end user always be required?

No, we do not always require direct verification of the final end user. Where traceability ends at an intermediary, we assess the strength of evidence available at that point and the residual risk that the biochar could be diverted from a durable end use.

For uses such as retail gardening and landscaping, the retailer or last tracked intermediary may provide sufficient evidence to demonstrate a low reversal-risk pathway. This can include consumer guidance on appropriate use and disposal, packaging and labeling, evidence of distribution channels, and agreements or traceability records with the intermediary.

Where this evidence provides strong confidence in the biochar's likely final fate, direct verification of individual end users is not required. Where some uncertainty remains, we may apply a proportionate reversal-risk discount to account for residual misuse or diversion risk. The discount addresses residual uncertainty after sufficient evidence has been provided; it does not replace missing evidence.

16. How will Sylvera assess the likelihood of future repurposing (biochar reused, reprocessed, excavated or diverted into shorter-lived applications) when determining Anthropogenic Risk, and to what extent can contractual controls, end-use restrictions or product stewardship mitigate this risk?

We assess future repurposing primarily through the expected lifetime and end-of-life fate of the biochar, with particular attention to non-soil applications where reprocessing, diversion, or combustion may be more plausible.

For these uses, we assess the product's documented lifetime and end-of-life pathway to determine how much of the stored carbon can reasonably be considered durable.

Where biochar moves through multiple uses, we follow its cascading fate, and each downstream step must provide sufficient evidence that carbon storage is preserved.

Short-lived or oxidative uses, such as energy, filtration, and feed, carry higher reversal risk. For projects with multiple end uses, a high-confidence pathway cannot compensate for material carbon flowing into a poorly evidenced or non-durable pathway.

Contractual controls, end-use restrictions, and product stewardship can reduce this risk where they provide credible evidence that constrains the biochar's future use and end-of-life fate. This can include agreements with intermediaries, restrictions on downstream use, and guidance on appropriate use and disposal. Where these measures reduce but do not eliminate uncertainty, a proportionate reversal-risk discount may apply.

17. On anthropogenic risk — between end-use application and non-reversible mixing evidence, does Sylvera have any preference or leaning toward one? We understand registries are increasingly favouring the latter, given the challenges involved in obtaining end-use evidence. We would just note that an inability to provide such evidence does not necessarily indicate a lower-integrity project.

We do not favor one mechanism over the other. Both can provide strong evidence of low reversal risk, and our framework recognizes best practice in each.

The two routes are complementary rather than competing. For end-use applications, we assess traceability and the likely cascading fate of the biochar. Non-reversible mixing is one way to demonstrate that the biochar is unlikely to be diverted from a durable end use, strengthening our confidence in its long-term storage.

We assess reversal risk against the full body of evidence, weighting each form by what it establishes. Non-reversible mixing shows the biochar cannot be diverted once in place, securing the durability of the end use. It does not, by itself, establish chain of custody, the trail linking production to the point of mixing or application. We look for both: that the biochar reached its intended use, and that its fate there is durable. Best practice on the first is comprehensive digital MRV or attestation of use, supported by strong traceability and multi-layer verification. The score turns on whether the evidence, taken together, rules out a material reversal pathway.

18. If biochar application in soil is conducted at a target depth of ~5cm to maximise the agricultural benefit of the physical product (based on field-trial data), can this be taken into account so as not to unduly penalise the project developer's score compared to the recommended depths of 10–15cm?

Application depth is considered under Permanence, but it has a relatively small influence on the overall score, and the agronomic benefits are recognized separately.

We consider depth because the way biochar is incorporated into soil can affect its exposure to physical reversal risks such as erosion, runoff and fire. A shallow application may therefore score marginally lower than a deeper or well-incorporated application on this specific factor.

Several features prevent this from disproportionately affecting the project:

- The factor has a small weighting. Permanence is driven primarily by the biochar's intrinsic stability, particularly indicators such as H/Corg and carbonization conditions. A stable biochar applied at ~5 cm can still achieve a strong overall Permanence Score.
- Agronomic benefits are recognized separately. Soil-health and productivity benefits associated with the chosen application method are captured under Safeguarding & Co-Benefits rather than being used to offset carbon-storage risk.
- Blending can provide additional evidence. Mixing biochar with compost or growing media can strengthen confidence that it has reached its intended end use and is less likely to be subsequently diverted.

At this stage, we consider deeper incorporation or subsurface application to be best practice when focusing specifically on maximizing biochar persistence in soil. However, project-specific evidence matters. Evidence that biochar remains securely incorporated at a shallower depth, for example due to low erosion risk or a particular application method, can strengthen our confidence in its persistence.

We continue to monitor field evidence on the relationship between application depth and long-term biochar persistence. If stronger evidence shows that depth is not a material driver of reversal or decay risk, we will be more than happy to update the framework accordingly.

SAFEGUARDING AND CO-BENEFITS

19. Why are safeguarding and co-benefits excluded from the AAA-D rating?

Because they assess a different dimension of project quality. The AAA–D Rating focuses specifically on carbon integrity, combining three pillars: Carbon Accounting, Additionality, and Permanence. Together, they assess our confidence that a project's claimed carbon impact reflects its actual climate impact.

Safeguarding & Co-Benefits assess the project's wider environmental and social impacts, including outcomes for communities and biodiversity. These are scored separately on a 1–5 scale and reported alongside the overall Rating. A score of 5 reflects exceptional progress against targeted SDGs and strong biodiversity outcomes, while a score of 1 indicates limited demonstrated progress.

We separate these dimensions deliberately, allowing buyers to evaluate carbon integrity and wider impact independently. This prevents strong co-benefits from compensating for weaknesses in carbon integrity, or vice versa, while allowing buyers who prioritize co-benefits to consider them explicitly in their decisions.

20. We're unsure how many artisanal, or even some distributed, projects could provide formal feedstock certification, given their potentially informal nature. We'd like to see this accommodated through higher expectations for feedstock traceability, local stakeholder engagement, and confirmation of the project's right or approved access to the biomass feedstock.

    We agree, and formal certification is not a blanket requirement. Our framework accommodates community-based and informal sourcing models by assessing feedstock integrity through two main lenses: (1) evidence that the feedstock is either certified or a genuine waste or residue, and (2) chain of custody. To clarify a point that may not have been clear in our slides, we do not require certification in every case.

    For artisanal and distributed projects using on-site or locally sourced feedstock, evidence that the biomass is a genuine waste or residue can be sufficient when supported by clear traceability and confirmation that the project has the right or approved access to use it. Local stakeholder engagement can provide additional evidence of legitimate sourcing and access.

    We apply a higher bar to forestry-derived feedstock, where formal certification such as FSC or an equivalent standard is expected alongside evidence of waste or residue status. This reflects the greater risk that demand for woody biomass could contribute to unsustainable harvesting.

    The framework therefore does not increase the biodiversity safeguarding risks for projects where formal certification is impractical. Instead, it allows different forms of evidence to demonstrate the same underlying principles: sustainable sourcing, clear chain of custody, and legitimate access to the feedstock.

OTHER COMMENTS

21. The carbon-accounting mechanism and score currently give a sense of competing with registry issuances, which may not reflect well on the industry from an outside perspective. It might be worth considering something that sits on top of registry issuance instead — a confidence score or risk-deductions approach could work well.

Thank you; this is a useful challenge, and we take the perception point seriously. Our aim is not to compete with registry issuance but to give an independent, conservative view of a project's quality.

Sylvera is deliberately registry-agnostic, and we go beyond registry requirements. We estimate what we consider the conservative, science-based net removal of a project over a 200-year horizon. That rationale drives our benchmarked removal model, our in-house LCA model, and our methane proxy database built from a literature review.

The Carbon Accounting Score is therefore already designed as the type of confidence and risk-deduction mechanism you describe. We start from Sylvera-defined best practice and apply risk deductions where project evidence or accounting falls short of that benchmark.

22. System taxonomy: classify mobile reactors more precisely (mobility and engineered process control are independent axes); clarify whether continuous operation is the criterion for industrial and how batch industrial reactors with strong temperature/offgas control are treated; and consider clearer open versus closed naming instead of artisanal versus distributed

Thank you, and we agree the naming we presented during FRC can be confusing. Most importantly, our framework is technology-inclusive. We categorize by degree of engineered process control only so that we can vary the tests where a technology genuinely warrants it, for example methane handling. Where that is not needed, the tests are common across all tiers, so we always compare biochar to biochar on a like-for-like basis, with no bias toward any technology.

The three tiers, which we use internally to guide where tests differ:

Tier 1: Rudimentary Pyrolysis (RP) *(Informally: "low-tech" or "artisanal")*

Conversion of biomass to biochar with no engineered process control: no active temperature control, no engineered off-gas handling, and no design provision for continuously measuring process parameters. Combustion intensity and burn endpoint are judged by operator observation (flame, smoke, ember color). Off-gases, including methane, are vented or combusted within the open flame front, with no dedicated combustion chamber or engineered off-gas treatment system.

Includes: open-pit, unmodified flame-curtain (Kon-Tiki) kilns, simple cookstoves.

Tier 2: Managed Batch Pyrolysis (MBP) *(Informally: "mid-tech")*

Batch or semi-batch conversion in which at least one engineered mechanism intentionally constrains the process envelope, with process parameters made traceable per batch. The engineered mechanism is at least one of: (1) active off-gas treatment (chimney with secondary combustion, afterburner, flare, or syngas recirculation); (2) design-enforced temperature (refractory lining, forced-air control, thermocouple, or interlock); or (3) a formalized procedure recording temperature, mass, and duration per batch. Control need not be automated or continuous. The line between Tier 1 and Tier 2 is whether an engineered constraint exists at all, not how sophisticated it is.

Mobility is deliberately not a classification axis. A reactor is placed by its process control alone, so a mobile Kon-Tiki kiln is Tier 1, while a mobile retort with an afterburner is Tier 2.

Includes: retort kilns, modified flame-curtain kilns with afterburners, small-scale gasifiers, and mobile or relocatable reactors of these types.

Tier 3: Continuous or Instrumented Industrial Pyrolysis or Gasification *(Informally: "high-tech" or "centralized")*

Fully instrumented, closed-loop production: automated real-time control of temperature (and typically feed rate and residence time), integrated off-gas capture and combustion with energy recovery, and permanent monitoring and data logging.

Includes: centralized continuous rotary, screw or fluidized-bed pyrolysis and gasification plants; and fully instrumented, controlled batch industrial reactors.