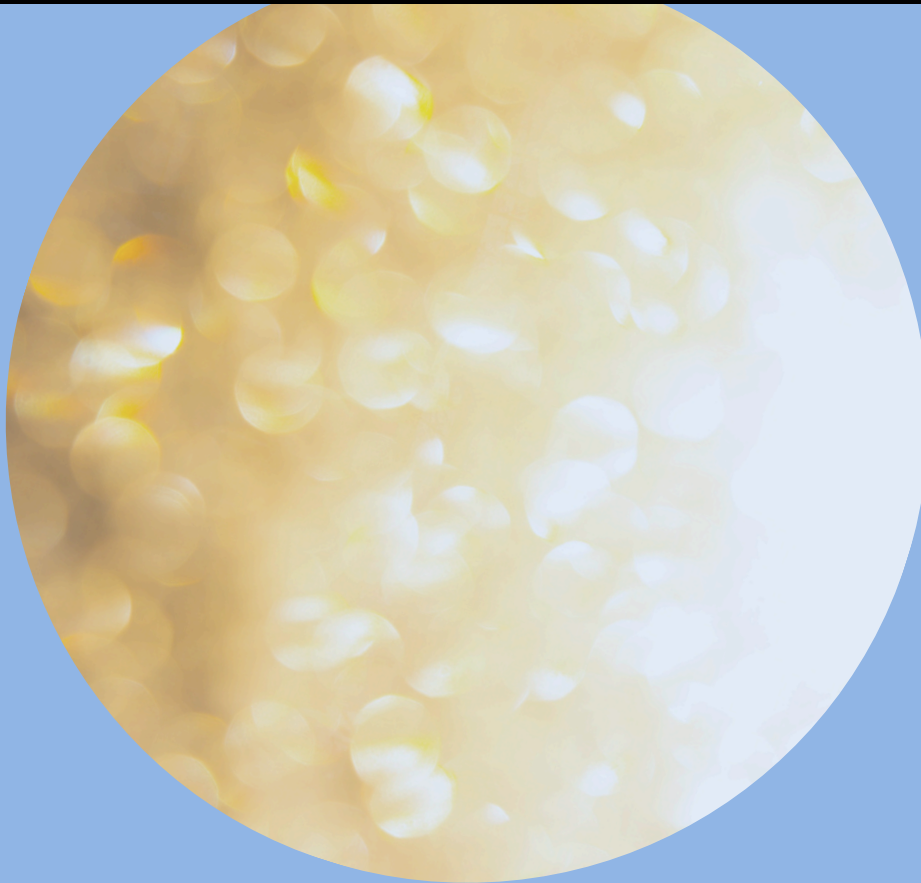


Faulty to the CORE

Analysing the Carbon Removal and Carbon Farming (CRCF) methodologies for permanent removals

POLICY BRIEF
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Executive summary

The Carbon Removal and Carbon Farming (CRCF) framework is being implemented through a range of methodologies, each representing different methods that are deemed to have the potential to deliver carbon removals or emission reductions and/or increased carbon sequestration in the land sector.

This document looks at cross-cutting and specific issues for the so-called 'permanent carbon removal' methods (direct air capture and storage (DACCS), biomass with carbon capture and storage (BioCCS), and biochar), based on the draft delegated act published by the European Commission in July 2025.

This analysis builds on Carbon Market Watch's (CMW) internal review of the draft delegated act, and the expert analysis of Oeko-Institut, which has collaborated with CMW to provide an independent review of an earlier version of the methodologies based on their extensive experience assessing voluntary carbon market methodologies.

The results are conclusive and damning. The draft delegated act contradicts the basic legal requirements of the CRCF and standard integrity rules present in many private sector methodologies.

There are four main concerns that are critical to resolve if these CRCF methodologies are to be considered credible.

First, additionality criteria are lacking, ignoring any potential future EU or member state level removals policy, and the emergence of public subsidies (which are already starting to be discharged).

Second, all biomass is wrongly deemed carbon-neutral (building on the definition written in the problematic Renewable Energy Directive - RED). Even though the CRCF legal text goes beyond the RED in terms of how it considers biomass accounting and sustainability. The methodologies should either quantify and address leakage concerns (such as indirect land use change), or, at the very least, explicitly ban the most damaging sources of biomass (such as forest biomass, imported biomass and dedicated crops). If not, the CRCF will lead to ecosystem degradation through demand (indirect or direct) for new land and biomass resources.

Third, long-term monitoring and liability is severely lacking from the biochar sections of the draft delegated act even though the CRCF legal text makes it clear that any

'permanent' removal methodology has to be consistent with the terms outlined in the CCS Directive. This rule is followed in the DACCS and BioCCS methodological sections.

Each of these concerns exacerbates a fourth problem: the lack of use cases for any units that are issued by certified projects. The European Commission [missed out on a once-in-a-decade opportunity](#) to push for a [permanent removals target in its proposal to revise the EU Climate Law, even ignoring the advice of their own scientific advisory body](#). Without a defined and environmentally sound use case, it is impossible to consider whether these methodologies are 'fit for purpose' as the purpose remains hypothetical and unknown.

[Oeko-Institut has warned](#) that the current draft methodologies, "continue to set a much lower standard than the Paris Agreement Crediting Mechanism and best practice in the voluntary carbon market", and that as it stands "the vast majority of CRCF units will not represent any actual emission reductions or removals".

In addition, Oeko-Institut researchers state that "[t]he proposed CRCF methodologies are among the lowest quality methodologies that [Öko-Institut has] reviewed so far," and that "[w]ithout fundamental improvement of the methodologies, the CRCF could seriously undermine EU climate action".

If the final delegated act does not address these overarching and key issues, it will likely be legally challenged, creating uncertainty for developers and any potential use cases of units. In addition, any projects or units certified will be considered low-quality, undermining overall trust in the CRCF and any climate policy that builds upon it.

Buyers beware - the CRCF, as it stands, is not at all a guarantee of quality.

RECOMMENDATIONS

- **Go well beyond the simplistic and wrong RED assumption that all biomass is carbon neutral.** Enact direct and indirect land use change monitoring rules, account for the real-world impacts of biomass use and regrowth (which is the actual carbon removal mechanism in any biomass-based removal scheme), enforce the cascading principle and waste hierarchy, and ensure no increase in biomass demand because of the CRCF. A short-term shortcut and basic safeguard to limit harm and mitigate risks of unsustainable and ecosystem harming biomass being used is to ban non-EU biomass, any forest biomass and dedicated crops.
- **Define use cases for units from certified BioCCS, DACCS and biochar projects so that stipulations on additionality,** monitoring and qualification of (potential) removals can be tested against the purpose of the units.
- Develop and incorporate rigorous financial and regulatory additionality tests to future-proof these CRCF methodologies and ensure that current and past projects cannot be certified as clearly the CRCF is not the factor making those projects financially viable.
- **Provide clarity on the process and content of future reviews.**
- **Certify carbon injected into safe long-term storage** rather than approximating it with complicated and imperfect formulas that start from the amount captured and then deduct a range of uncertain leaks along the processing, transport and storage chain.
- **Incorporate emissions associated with the transport of CO₂.**
- **Include provisions against double claiming,** either by two actors in the same project, or by one project certified in multiple schemes.
- **Follow the RFNBO rules on accounting for renewable electricity use** by forcing monthly matching till 2029, rather than undercutting those rules by falling back on annual matching.
- **Do not allow biochar projects to choose their own quantification methods,** but only allow for the use of the Woolf et al decay functions, while the assumptions on inertinite are tested through long-term studies in the real world (not in a lab). Use 500 year cut off points from the Woolf et al estimates (not 200 years) to ensure conservativeness.
- **Revisit the standardised zero baseline for biochar projects,** considering this product already exists and is used widely in the agricultural sector, and state support schemes (most notably in Denmark) are under development.
- **Enact meaningful monitoring and liability rules for biochar,** that are consistent with the CCS Directive. If biochar is to be included in the 'permanent removal' category, it should, of course, follow the rules from the CRCF legal text related to that category.



Background on the CRCF

In December 2024, the EU launched its [Regulation](#) governing permanent carbon removals, carbon farming and carbon storage in products, commonly known as the Carbon Removals and Carbon Farming (CRCF) certification framework. As its name suggests, the CRCF aims to certify acceptable standards for a series of practices or processes that either remove carbon permanently from the atmosphere, enhance the land sink or reduce emissions from it.

At the time of writing (July 2025), the methodologies detailing the rules for the certification are currently under development, with only the first draft [delegated act](#) on permanent carbon removal published for stakeholder feedback. Other methodologies (most notably those related to tree planting, peatland rewetting and soil carbon sequestration) are still in earlier phases of development. All methodologies are supposed to follow the so-called Q.U.A.L.I.T.Y criteria. These are the Quantification of climate impacts (against a baseline), the Additionality of the activity, its Long-term storage and liability for early release into the atmosphere, and Sustainability.



Overarching issues

Use cases

An important overarching issue in the draft delegated act across the three methodologies is the lack of clarity on use cases of removal certificates. De facto, the [Regulation](#) only specifies that the certified units, “should contribute to the achievement of the Union’s nationally determined contribution (NDC) and its climate objectives,” and that, to avoid double-counting, “they cannot be used to achieve third-party NDCs (Nationally Determined Contributions) or international compliance schemes (e.g., CORSIA scheme for aviation).”

The absence of clear provisions outlining appropriate usage of certificates means it is difficult to evaluate the ability of the CRCF to deliver real climate benefits. The methodologies should be fit-for-purpose, but without knowing the concrete ‘purpose’ they cannot be made ‘fit’.

As it stands, the methodologies are supposed to cover all potential use cases, yet, so far, the focus has been on enabling voluntary carbon market (VCM) offsetting schemes, with other use cases completely ignored.

Additionality

Article 5 of the CRCF Regulation states that carbon removal activities should be additional. However, the methodologies do not match that intention: the assumption is that carbon removal activities are always additional - both now and in the future. This is, at the very least, questionable.

A key prerequisite to measure additionality is a principle commonly referred to as “prior consideration”, which asks whether the income from selling the generated carbon credits is considered a decisive factor before the implementation of a project. In this context, it is worth recalling that all relevant quality assessment frameworks - such as the Integrity Council for the Voluntary Carbon Market (ICVCM) - as well as market-based mechanisms established by international treaties - like the Clean Development Mechanism (CDM) and Article 6.4 of the Paris Agreement - recommend or require the inclusion of ‘prior consideration’ provisions.

The draft delegated act is severely lacking in this regard - with additionality across the permanent removal activities assumed rather than evidenced, failing to take into account current national subsidies (e.g. in [Sweden](#) and [Denmark](#)) and potential future EU or member state level removals policy. Additionally, biochar is a widely used soil additive with an [active market](#) - assuming that all biochar produced is additional flies in the face of its current widespread use. [Setting lower standards](#) than what is recommended by many quality assessment frameworks is inconsistent with Article 5 of the CRCF Regulation and violates well-established principles for providing public funding.

Thorough financial viability and regulatory surplus tests are needed to ensure the methodologies are robust, as subsidies for permanent removals are already prevalent in the EU, and removals policy will develop and evolve over the coming years to decades. For example, if new legal requirements that mandate the installation of carbon capture and sequestration (CCS) technology on major emitting plants are introduced - whether the emissions are biogenic or not - then the resulting removal activity would not be considered additional and should not be considered eligible for certification.

In addition, the drafted methodologies enable the certification of activities that are ongoing or in the pipeline, with final investment decisions already taken. This is a clear breach of the additionality concept: these projects are possible without certification under the CRCF, so clearly should not be allowed to issue units. Rewarding past climate actions that were undertaken before the Regulation existed hinders continued climate investment and will cause significant negative impacts on the certificates' environmental integrity.

Quantification - accounting for biomass use

A robust and comprehensive accounting process is the pillar of any effective carbon removals assessment. However, the draft methodologies that rely on biomass (BioCCS or biochar) show deeply inappropriate and problematic accounting of the climate impact of biomass. Specifically, they do not ensure that biomass-based projects will actually lead to a net reduction in atmospheric CO₂ relative to the baseline. Instead, they certify the amount of CO₂ potentially shifted between storage media, rather than the amount of CO₂ that is net-removed from the atmosphere. At best, any biomass-based 'removal' shifts CO₂ storage from the biosphere to a more durable storage medium. The actual removal is achieved by biomass growth.

The methodologies all build upon the EU Renewable Energy Directive ([RED III](#)), which states that biomass can be considered 'carbon neutral' as long as it is compliant with

specific sustainability criteria. However, these criteria are far too lenient, meaning that [unsustainable biomass will be used in biochar and BioCCS projects](#) - continuing or even increasing harm to forests and other ecosystems, both in and outside of the EU.

The current drafts pose two distinct risks. Firstly, there is a significant overestimation of any potential removals due to BioCCS and biochar projects as only some are likely to - at best - result in emission reductions, while others may have an overall negative impact on the climate through increasing - positive - emissions.

Second, by incentivising further biomass use, CRCF-certified projects may add further pressure on the already [devastated land sink](#) - not only in the EU, but also abroad if it increases imports of biomass (with [linked and detrimental biodiversity and climate impacts](#)). European Commission officials have stated that the CRCF should not lead to additional biomass demand, a welcome intention that is unfortunately not operationalised in the draft delegated act.

As [previous research by the Joint Research Centre highlighted](#), reducing harvesting is crucial to increase the forest net sink in a Paris Agreement-relevant timeframe. Any CRCF methodology for CDR that depends on either biomass or significant land areas must take into account potential impacts on the overall EU land sink if it is to have a significant likelihood of actually having positive impacts on the climate crisis. Any risk that implementing the biochar and/or BioCCS methodologies will harm the [EU's already overpressured land sink](#) (and the achievement of related LULUCF Regulation targets) is unjustifiable, and must be addressed urgently and before any projects are certified.

● What should change?

No biomass should be labelled 'carbon neutral'. The full climate impact of any used biomass should be accounted for when quantifying potential climate benefits. This means that the impact of harvesting (including for example disturbances to soil carbon when harvesting forest biomass), processing and transporting biomass must be fully accounted for. This must include both direct and indirect land use change (ILUC). Current methodology drafts are clearly not in line with what is prescribed in the legal text of the CRCF or the [precautionary principle](#).

Article 4 of the [CRCF](#) goes further than the current draft delegated act, for instance, by demanding ILUC and other factors to be accounted for. ILUC must be taken into account to limit leakage effects in the value chain, such as forced deforestation or other land use changes caused indirectly by the project (e.g. where biomass to be used for a BioCCS plant was being used by a paper and pulp factory, which now needs to source

replacement biomass elsewhere). Accounting for ILUC is challenging, but that is no reason to completely ignore it.

The draft delegated act allows sourcing additional biomass from outside the European Union, which represents a high risk of indirect land-use changes and further emissions beyond the carbon of the biomass itself.

At the very least, the methodologies should limit harm by banning certain types of biomass and ensuring that no new biomass burning facilities are built because of the CRCF. This would bring the methodologies more in line with the precautionary principle.

The main biomass sources that should be excluded are:

1. Dedicated crops;
2. Forest biomass including so-called “forest residues” (as defined by the RED);
3. Any other biomass that can be used by local industries for bio-based products - this would enforce the cascading principle and waste hierarchy;
4. Imported biomass, to limit any potential for the EU to cause deforestation or direct and indirect land use change abroad (notably in countries with weaker nature protection legislation such as many developing countries).

The baseline must take into account alternative ‘uses’ of the biomass. For example, the opportunity cost of harvesting - as a forest left untouched or harvested less intensely will continue to function as a store of CO₂ and naturally soak up carbon.

Failing to include clear rules to account for lifecycle emissions of biomass feedstocks creates challenges over establishing additionality, ensuring accurate carbon accounting and verifying long-term carbon sequestration. The methodologies should discard the carbon neutral biomass concept that puts at risk the whole framework’s integrity.

A final gap that should be addressed is the lack of clear reference to the cascading principle for biomass use, which was developed as part of the [EU’s Circular Economy Action Plan](#). One of its requirements is to maintain carbon-storing biomass in its material form for as long as possible, take sustainable mobilised biomass as a starting point and promote the highest economic added value. Currently, the cascading principle for biomass use is not reflected in the methodologies. Given that, for certain types of biomass feedstocks, alternative uses might be preferable to direct biochar or energy production, safeguards precisely related to the cascading principle should be introduced.

However, the European Commission has also taken a positive, albeit small, step forward on biomass use in the draft delegated act by introducing a requirement that obliges

operators to report which biomass feedstocks they use. This recommendation could have been significantly stronger and more useful by demanding data not just on the type of feedstock but also its geographic origin.

Permanence

The issue of permanence - how long the carbon removed from the atmosphere is stored and stays out of it - is of critical importance when assessing the environmental effectiveness of carbon removal technologies and their potential climate benefits. Currently, the way this criterion is incorporated in the biochar sections of the draft delegated act makes its verification impossible, and in certain cases, open to different and problematic interpretations. Particularly, text dealing with vague monitoring processes, as well as with liability-related issues in relation to potential leakages, means crucial points need to be addressed for the methodologies' future development.

For example, the biochar methodology allows a choice from two different methods to calculate the biochar's permanence fraction. In the delegated acts, these are referred to as the 'inertinite assessment' and the 'decay function'.

In a real-world scenario, the ability to choose an option to determine the 'permanent' fraction enables moral hazard and a race to the bottom by allowing for projects to prioritise financial considerations rather than what is best for the climate. Using the inertinite pathway may be more robust (though related studies are short-term lab-based experiments, and [long-term real world experiments are lacking, raising questions about any statement on permanence of biochar](#)), but project developers have a financial incentive to maximise the quantification of units rather than climate impacts by choosing the method that will lead to the highest quantification for their specific project.

Review and ratcheting up

None of the methodologies contain any language on how the methodology will be reviewed or updated when new scientific findings are forthcoming. The draft delegated act only states that 'it is appropriate to periodically review' the delegated act, but doesn't state how often 'periodically' is, nor how such a review process should happen (for example, which elements must be revisited, which questions must be answered, how will the latest scientific findings be used).

The lack of clarity on timing and detailed procedures to review and update methodologies risks locking in weak rules. CDR is still not a mature technological or academic consideration, which means that science (both theoretical and applied by companies) is developing quickly and there is a need for automatic procedures to bring the CRCF as a framework in line with evolving scientific insights.



Digging deeper

BioCCS and DACCS

● Quantification

The first element to be tackled relates to the quantification of the permanent net removal benefit. Currently, the methodology determines the amount of CO₂ permanently stored indirectly, by quantifying CO₂ capture and subtracting estimated CO₂ losses from storage and transport. This modus operandi is flawed for both DACCS and BioCCS.

In the case of BioCCS the actual removal is the result of regrowth of any biomass used - that regrowth mechanic and timelag must therefore be an integral part of the quantification. This implies that biomass must be able to regrow in a Paris Agreement relevant timeframe. It also suggests that using woody biomass is unsuitable due to regrowth timelags (though it should be banned through sustainability requirements anyway to prevent biodiversity and ecosystem impacts).

For both types of permanent removals, the methodology should, at the very least, derive the amount of CO₂ permanently stored based on the amount of CO₂ injected at the relevant injection point (with any potential CO₂ leakage subtracted). This is because CO₂ losses from transportation and storage are associated with significant uncertainties and are challenging to factor into the calculation. Underestimating such CO₂ losses could lead to the absurd situation where the total credited amount exceeds the total amount injected.

It is unclear why emissions associated with the transportation of CO₂ are not included in the methodology, particularly since such emissions could be more material than

upstream emissions associated with the construction and implementation of facilities for CO₂ capture and CO₂ storage. The methodology should be revised to include this missing factor.

● **Additionality and double counting**

Double counting is another recurrent issue in this methodology. The current version clarifies that any operator within the chain of carbon capture, transportation and storage may claim EU CRCF units.

However, there are no provisions to avoid the situation where two different entities within the same value chain are able to claim the same removal credits, or issue credits under two different schemes. Usually, to address the risk of double counting, two separate measures should be established.

Firstly, the operator should be required to declare that no other carbon credits will be sought in relation to the removal under other schemes. Secondly, legally binding agreements should be stipulated with all other relevant entities that may potentially claim such removals to ensure that the operator has the exclusive right to claim removals credits under the EU CRCF. The methodology lacks such provisions and should be revised accordingly.

● **DACCS electricity use**

The emissions associated with energy used to power any DACCS facility must be accounted for, and a clear requirement to use and develop renewable energy should be stated. Additional renewable energy sources should be developed to ensure DACCS does not rely on existing renewables needed by other sectors of the economy (another potential form of leakage the draft delegated act does not address sufficiently).

Unusually, the draft delegated act takes a weaker position on this than [other comparable legislation on Renewable Fuels of Non-Biological Origin \(RFNBOs\)](#). The RFNBO delegated act states that until 2029 monthly matching between renewable energy sources and electricity consumption is possible (moving to far more stringent hourly matching starting in 2030). The draft DACCS rules, however, allow for annual matching till 2029. This sets two worrying precedents:

1. Weaker CRCF rules are used to water down other legislation

2. One CRCF element that is weaker than its counterparts could be used as a precedent to disrespect other links to legislation mandated in the CRCF

Clearly, the DACCS methodology must be adapted and brought at the very least in line with the RFNBO delegated act.

Biochar

● Quantification

The current biochar methodology fails to appropriately account for the greenhouse gas impact of increasing the use of biomass for the purpose of producing biochar.

As discussed above, the assumption that an increase of biomass to produce biochar does not lead to greater emissions or fewer removals elsewhere is inaccurate and would lead to significant overestimation of net removals.

The draft methodology determines permanence through the testing of biochar batches, but allows for two options (decay functions from [Woolf et al](#), or quantifying the inertinite fraction). One of the options (Woolf et al) is clearly more conservative than the other, and should be considered the sole option as it follows Article 4.7 of the CRCF legal text that calls for net carbon removals benefits to “be quantified in a [...] conservative [...] manner.” The assumptions on the permanence of inertinite fractions in biochar need (among other things) [real world testing](#) before they could be used to underpin biochar methodologies.

However, the Woolf et al decay function envisages a 200 year cutoff point, which is an inappropriate timeframe and should be extended, as the CRCF deliberately does not consider anything that stores exactly 200 years as permanent. A more conservative approach would be to use 500 years as the cutoff point.

● Biomass sources

As previously mentioned, a significant and recurring methodological issue is the inappropriate baseline. Setting the standardised baseline at 0 tCO₂/year for biochar activities does not correctly reflect the mitigation effects of producing biochar, and ignores that biochar is already being produced and used in the agricultural sector.

In some instances, the use of biomass for biochar production may only shift carbon from one pool to another, thus not resulting in any enhancement of removals relative to the baseline. To avoid this situation, the methodology should include provisions to identify appropriate biomass sources and separate between permissible and non-permissible biomass feedstocks for biochar production. Biomass should only be eligible when it is sourced from within the EU and where it stems from biomass residues not commonly used, or from newly established residual sources. The CRCF currently builds upon the RED definition of 'residues', which is prone to abuse.

● **Additionality and double counting**

The assumption that all biochar activities are to be considered additional is wholly problematic. Under the draft methodology, units from existing activities could be issued, an element which is diametrically opposite to the CRCF's logic.

Particularly, the proposed methodology fails to recognise - and prescribe - the necessity of supplementary financial and regulatory additionality tests. At present, biochar is already being sold as a soil additive and government support schemes for biochar are forthcoming (for example in [Denmark](#)). Ultimately, the methodology should include provisions to ensure that mitigation activities are only eligible if they are newly implemented and if they need the incentives from CRCF units when deciding whether or not to proceed with implementation.

Moreover, provisions are necessary to avoid that two entities within the carbon removal value chain claim the same removals from biochar production and application. As previously mentioned, this risk of double counting should be addressed by requiring the operator to declare that no other carbon credits will be sought in relation to the removal under other schemes, and to stipulate legally binding agreements with all other relevant entities that may potentially claim such removals. That will ensure its exclusive right to claim the removals under the EU CRCF. For there to be no overlap with CRCF carbon farming methodologies, certification for both carbon farming (especially increased soil carbon content) and biochar application should be explicitly banned for the same plot of land.

● Monitoring

The lack of monitoring after production of the biochar must be resolved. The CRCF legal act provides clear rules on monitoring and the consequent liability involved for any 'permanent' removals. The current draft delegated act completely ignores these rules.

If biochar is to be considered a permanent removal under the CRCF, then it must also follow the legal stipulations applied to permanent removals. In practice, this means that liability and monitoring rules must be 'consistent' with the relevant articles of the CCS Directive (Art 6.2 of the CRCF). At this stage, there are no 'consistent' monitoring or liability requirements in the biochar methodology. The focus is firmly on biochar production, with a list of eligible applications.

The monitoring of whether biochar actually ends up where it is stated is too weak. The key stipulation currently drafted is that certification schemes may optionally monitor an application site within a year after claimed application to determine if biochar has been applied. There is no real liability section for biochar either. This is not at all 'consistent' with the CCS Directive and contradicts the CRCF legal text, which poses a significant risk from a legal standpoint.

What the methodology should entail is the establishment of a monitoring process that verifies the application of biochar to soil or products, and that monitors the soil's uptake of the biochar. It should also set clear liability rules that place the financial liability for non-permanence squarely on the actors that have benefited most from the certification - which will most likely not be the farmers applying the biochar to their land.

The absence of application monitoring implies that any models or assumptions used to determine permanence and long-term effects of biochar application - mostly based on laboratory tests, and not on real-world tests - cannot be verified and improved over time. Therefore, monitoring should continue after biochar has been applied to the land or incorporated into products for sufficiently long time periods.



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