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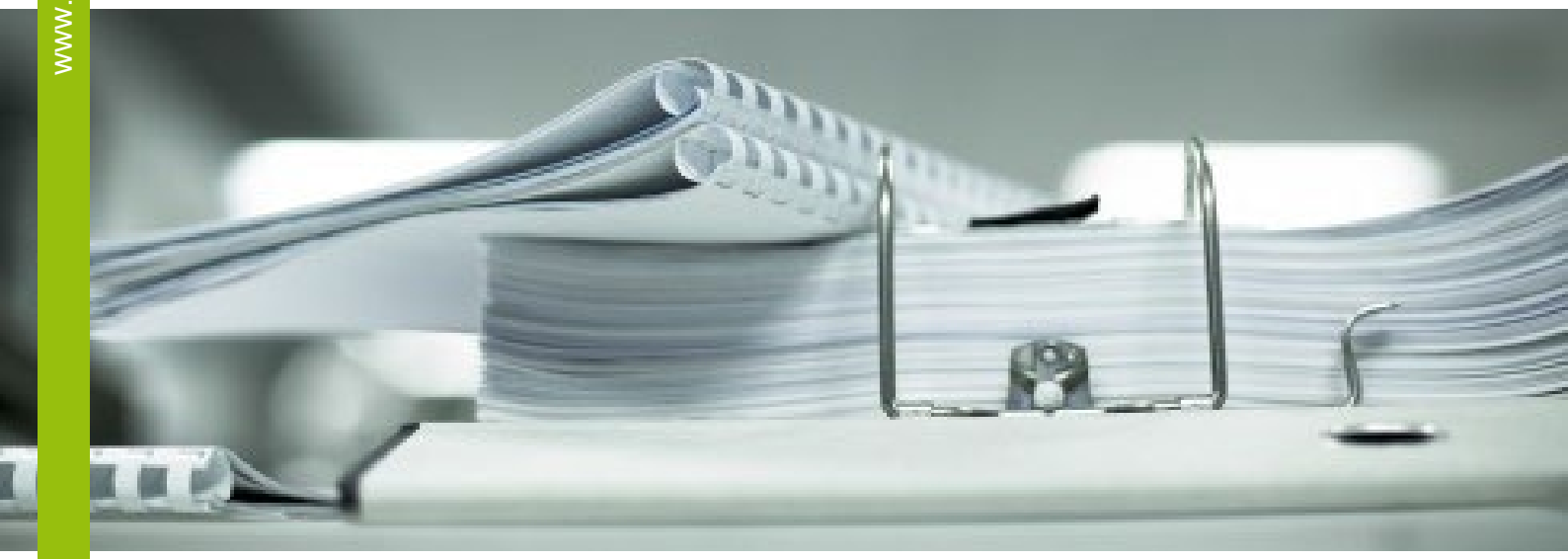

Does the CRCF methodology for permanent removals align with the PACM?

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This policy brief assesses the extent to which the methodology proposed by the European Commission under the Carbon Removal and Carbon Farming Regulation (CRCF) for Direct Air Capture with Carbon Storage (DACCS), Biogenic Emissions Capture with Carbon storage (BioCCS) and Biochar Carbon Removal (BCR) is aligned with the requirements of the Article 6.4 Paris Agreement Crediting Mechanism (PACM). As PACM methodologies are not yet available, we compare the CRCF methodology against key overarching PACM standards.

Key findings and recommendations

- For most aspects that are key for ensuring unit integrity, the proposed CRCF methodology sets a lower standard than the PACM requirements. Only in one issue (non-permanence for BioCCS and DACCS) it has a comparable stringency as the PACM. In few cases, a comparison is not yet possible, as the PACM rules have not been fully elaborated.
- Accounting for biomass use and treatment of leakage emissions from indirect land-use change are particularly problematic under the proposed CRCF methodology and set a considerably lower standard than under the PACM and best practice in carbon crediting programmes on the voluntary carbon markets. This could potentially lead to many CRCF units that are not backed by actual emission reductions or removals.
- Overall, the lack of alignment with PACM requirements results in non-additionality and over-crediting risks. These risks are likely higher for biochar activities.
- We recommend that the proposed methodology be revised in many areas before its adoption, considering the requirements under the PACM and well-established best practice in carbon crediting programmes on the voluntary carbon market.

1 Introduction

This document assesses the extent to which the methodology proposed by the European Commission under the Carbon Removal and Carbon Farming Regulation (CRCF) is aligned with the requirements of the Article 6.4 Paris Agreement Crediting Mechanism (PACM). The evaluation is based on the draft delegated regulation for Direct Air Capture with Carbon Storage (DACCS), Biogenic Emissions Capture with Carbon Storage (BioCCS) and Biochar Carbon Removal (BCR), published in July 2025.[1] This policy brief does not cover an analysis of the other proposed CRCF methodologies which are at an earlier stage of development.

The evaluation of rules under the PACM is based on the Methodologies Standard (A6.4-STAN-METH-001), the Removals Standard (A6.4-STAN-METH-002), the Additionality Standard (A6.4-STAN-METH-003), the Baseline Standard (A6.4-STAN-METH-004), the Leakage Standard (A6.4-STAN-METH-005), the Sustainable Development Tool (A6.4-TOOL-AC-001), the Activity Standard for Projects (A6.4-STAN-AC-002), the Article 6.4 activity cycle procedure for projects (A6.4-PROC-AC-002) as well as other regulatory documents referred to below.[2]

1.1 Why the PACM requirements are a useful benchmark to assess quality of the CRCF methodologies

Both – the PACM and the CRCF – are carbon crediting mechanisms which define a set of rules and requirements to certify that project proponents have implemented a mitigation activity which results in additional GHG emission reductions or removals. Both mechanisms are designed to generate tradable carbon credits or units, accounted in one metric ton of CO_2e. At their core, the PACM and CRCF are therefore the same type of policy instrument. Hence, the robustness of their provisions and methodologies and their integrity in terms of their effectiveness to mitigate GHG emissions hinge on the same methodological aspects which can be compared well with each other.

However, the PACM and the CRCF differ in terms of their policy objective, governance, and degree of integration into existing policy frameworks.

The PACM is a stand-alone crediting mechanism with global scope and participation as well as a centralized, multilateral governance structure. Its main policy objective is to increase global climate ambition through voluntary cooperation among signatories to the Paris Agreement. Countries may use the PACM for transferring mitigation outcomes among themselves and account them for their NDC achievement. In addition, the PACM explicitly allows countries to use it as a mechanism to reduce domestic emissions without international transfers.

The CRCF on the other hand is a crediting mechanism integrated into the wider EU climate policy framework, with the specific objective to incentivize removals required to achieve climate neutrality by 2050 as enshrined in the European Climate Law and

[1] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14573-Carbon-removals-and-carbon-farming-methodologies-for-certifying-permanent-carbon-removals_en

[2] https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

thus to reach the EU NDC. Participation is restricted to projects implemented in the EU and units cannot be transferred to other countries. The CRCF uses a decentralised governance structure in which 'recognized certification schemes' provide the operational infrastructure for project proponents to implement removal projects and carbon farming activities in accordance with CRCF rules and applying CRCF methodologies or equivalent voluntary carbon market methodologies which meet CRCF requirements. When comparing the CRCF methodology with the PACM requirements we have considered the differences between the two mechanisms, where relevant.

1.2 Why integrity of CRCF units matters for CRCF policy objectives

Carbon credits generated under the PACM can be used for different purposes. First, they can be used by buyer countries to achieve their NDC if they are authorised for such use and corresponding adjustments are applied. Authorised carbon credits can also be used by airlines under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and by buyers in the voluntary carbon market. In addition, the mechanism issues mitigation contribution units that are not subject to corresponding adjustments. These can be used by voluntary buyers of countries or used by countries as voluntary or compliance instrument to reduce domestic emissions. For all these purposes, the same standards apply to ensure the integrity of these credits through robust methodologies.

In contrast to the PACM, the EU CRCF only includes a sub-set of the broad scope of the PACM. It only generates non-authorised units that can potentially be used by voluntary buyers or be used in domestic compliance schemes within the EU. The CRCF aims to support the achievement of the EU's climate neutrality objective, yet measuring progress towards these targets is based on the relevant EU legislation and inventory reporting according to IPCC rules. Whether removals or emission reductions achieved through the CRCF are visible in the EU's national GHG inventories depends on the inventory approaches applied. Rules for reporting on permanent removals in national GHG inventories yet remain to be developed. This means that the removals achieved through DACCS, BioCCS and biochar activities are currently not visible in the EU's GHG inventory. However, inventory methods can be improved over time and inventories may be recalculated based on improved methods. Over time, it is therefore likely that most removals and emission reductions will become visible in national GHG inventories.

A lack of stringent requirements in the CRCF certification methodologies can lead to overestimation of removals. As there is no direct link between CRCF units and GHG inventory accounting, such an overestimation is not reflected in the EU's GHG inventory. Overestimating the removals caused by CRCF activities therefore does not result in inaccurate accounting of removals towards the EU NDC.

Nevertheless, integrity issues with CRCF units remain essential. Particularly, if permanent carbon removal units became eligible for compliance purposes, e.g. under the EU ETS, it must be ensured that certified removals are robustly quantified and additional to climate action that would have happened in the absence of the incentive of the CRCF. If associated removals are overestimated or not additional due to weaknesses in the certification methodologies, the issuance of a given number of CRCF units suggests that higher removals have been achieved than the amount of removals that will be reported in the EU's GHG inventory on the basis of inventory reporting

methodologies. Aggregate emissions in the EU's GHG inventory will thus be higher than the amount of CRCF removal units suggests. That way, using overestimated CRCF units for compliance purposes could undermine reaching the EU's mitigation targets.

Lastly, integrity is also important if units are used by private actors for voluntary purposes. If a buyer of CRCF units makes a climate neutrality claim based on the use of these units, this claim would not be backed by corresponding climate mitigation if the associated removals are overestimated. Thereby, the lack of robust certification methodologies can lead to greenwashing.

1.3 Overview of findings

Table 1 below provides an overview of our findings for each of the assessed methodological requirements. The table shows that the proposed CRCF methodology is in most areas not aligned with the PACM requirements.

Table 1 Comparison of PACM and CRCF requirements

PACM requirement	CRCF alignment	Risk for CRCF unit integrity
Additionality		
No retroactive crediting	No	Likely low
Consideration of legal requirements	No	Likely low
Investment analysis	No	Likely low except for biochar and large investments
Consideration of public funding	No	Medium
Quantification of emission reductions and removals		
Conservativeness and consideration of uncertainty	Partially	Partially high
Baselines to be set below business-as-usual (BAU)	No	Medium
Enhancing the ambition of baselines over time	Unclear	Medium
Rules for updates of standardised baselines	No	High
Accounting for biomass use	No	Very high
Consideration of indirect land-use change	No	Very high
Materiality thresholds for exclusion of emission sources	No	High
Non-permanence	CRCF provides at least comparable stringency for DACCS and BioCCS No rules for biochar yet	Low
Safeguards and sustainable development impacts	No	Unclear

By 31 July 2026, the Commission must assess additional requirements needed to align the CRCF Regulation with Article 6 of the Paris Agreement and best practices, including corresponding adjustments, host party authorisation and methodologies. This assessment can support the identification of aspects that should be revised as part of this review.

2 Additionality

The PACM and the CRCF use different approaches to assess additionality. This could have substantial implications for the robustness and effectiveness of respective provisions to filter out activities that are unlikely to be additional.

A main conceptual difference is the CRCF's exclusive reliance on a standardised approach to demonstrate additionality for permanent removals. This means that the CRCF methodology defines which types of activities are additional, rather than requiring that proposed projects must demonstrate additionality on the project level. Under the PACM, methodologies can either use an activity-based or standardised approach, while there are more stringent requirements if the latter is used, as discussed below.

2.1 No retroactive crediting

An important approach of filtering out non-additional activities is a requirement for project proponents to demonstrate that the incentives from carbon credits were considered in the decision to proceed with the activity (often referred to as *prior consideration* requirement). Such provisions are a well-established and effective approach in carbon markets for minimising the risk that credits are claimed for activities when carbon finance was neither considered nor needed for the activities to proceed.

The PACM requires activity participants to demonstrate prior consideration of the benefits of the mechanism. This applies to all approaches to demonstrate additionality, including standardised approaches.[3] This is implemented by requiring activity participants to submit a prior consideration notice to the PACM secretariat at the latest 180 days after the decision to implement the activity.[4] By contrast, the proposed CRCF methodology does not contain such requirements, which could lead to allowing rewarding past climate action.

In conclusion, the CRCF methodology does not meet the PACM standard. As the volume of current projects for permanent removals is small, this issue does not have a very large impact but will nevertheless lead to the issuance of some non-additional emission reductions or removals.

2.2 Consideration of legal requirements

Under the PACM, an analysis of whether proposed activities are already required by legal mandates must always be performed, regardless of whether an activity-specific or standardised approach is used to demonstrate additionality. Differences apply only regarding the entity which must perform this analysis:

[3] See paragraph 73 of the Methodologies Standard (A6.4-STAN-METH-001)

[4] See paragraph 14 of the Activity Standard for Projects (A6.4-STAN-AC-002) and paragraph 13 of the Article 6.4 activity cycle procedure for projects (A6.4-PROC-AC-002)

- Under activity-specific approaches, it must be performed by activity participants (i.e. project developers);
- Under standardised approaches it must be performed by the entity proposing the methodology or the standardised baseline (i.e. either the proponent of a PACM methodology or a host country).

PACM provisions further stipulate that for standardised approaches proponents shall provide documented evidence and justifications in the methodology that the requirement for regulatory surplus is satisfied for all activities that may use the methodology. Further, proponents of the mechanism methodology must specify the duration of the validity of the proposed methodology or standardised baseline (e.g., three years).

For permanent removals, the CRCF exclusively relies on standardised approaches to demonstrate additionality. This means that individual projects applying for certification do not have to demonstrate that their activities go beyond EU and national legal requirements. In contrast to the PACM, there are also no requirements in the CRCF regulation which mandate the EU Commission (as the methodology developer) to provide documented evidence and justifications on how it determined that eligible activities under the methodologies go beyond existing legal requirements. Consequently, this issue is not discussed in the proposed methodologies.

In conclusion, the provisions of the CRCF are weaker than the PACM. However, given that there are likely currently no legal requirements in the EU for pursuing the type of mitigation activities eligible under the proposed methodology, the material risk of this shortcoming is currently low. This might however change in the future if Member States introduce such requirements. This underscores the need to periodically reassess whether eligible activities still go beyond EU and national legal requirements.

2.3 Investment analysis

For activity-specific approaches under the PACM, project proponents must demonstrate that the activity is not viable in the absence of the incentives provided by the PACM. The default approach to demonstrate this is an investment analysis combined with a common practice analysis. In some specific cases, project proponents can replace the investment analysis with a barrier analysis. The PACM also allows using performance-based approaches to demonstrate that incentives from the PACM are needed for the activity to be viable. The PACM additionality standard restricts this however to certain conditions: (1) the activity must involve the production of a highly homogenous product or provision of highly standardized service (2) the performance of the type of activity can be defined through one or several suitable indicators (3) information is available to demonstrate that activities with a better performance in respect to the indicator(s) have a higher likelihood of additionality (4) data is available or can be collected on the performance of activities with respect to the indicator(s) and the data is robust and representative. Proponents of methodologies that include standardised approaches must demonstrate that these conditions are fulfilled. Further requirements on the establishment of indicators, thresholds and use and collection of data apply.

Whether or not eligible activities under the methodologies need the additional incentives provided by the CRCF to become financially viable is not assessed at the level of the individual project. The CRCF methodology – claiming to use a standardised

approach – simply assumes that this is the case. Unlike the PACM, which requires methodology proponents to provide documented evidence and justifications in the methodology for such assumptions, no reasoning or justification is provided in the proposed CRCF methodology. Simply assuming additionality of removal activities without providing an analysis underpinning this assumption is also uncommon in existing removal methodologies on the voluntary carbon market. The PuroEarth standard, which is currently one of the most relevant carbon crediting programmes for removals on the VCM, for example, requires an activity-specific additionality assessment for all its projects, including DACCS, BECCS and Biochar. For biochar, for example, it is mandatory for project proponents to perform a cost or investment analysis. This must include a detailed assessment of current biochar prices and projected trends over the first crediting period as well as an assessment of the current and expected pricing of co-products and key cost components involved in biochar production.[5] Many of the PuroEarth projects take place in EU Members States. This suggests that simply assuming that any biochar activities would not be financially viable without support from the CRCF might not be an appropriate approach. As the EU selected a standardised approach to demonstrate additionality under the CRCF it would be prudent if the EU Commission would perform the same assessment that PuroEarth requires from each project, at the EU level. The results of this assessment should be used to establish conditions and thresholds under which projects are deemed additional, considering prices for projects and typical costs in the EU. Also for DACCS and BECCS projects, proponents under PuroEarth for large investments must provide calculations showing that the internal rate of return would be negative for these projects and state how expected revenues from carbon credits would change financial indicators. In addition they must provide a sensitivity analysis and demonstrate how they have considered other policy support such as tax credits in their calculations. Again here, it would be prudent for the EU Commission to undertake a similar analysis on the EU level to substantiate the assumption that all activities proposed in the EU are additional. However, non-additionality risks for DACCS and BECCS projects, especially smaller ones, might be less material than for biochar projects. The CRCF requirements therefore do not meet the PACM standard nor existing common practice for removal projects on the voluntary carbon markets.

2.4 Consideration of public funding

Under the PACM, blending revenues from PACM credits with public funding is possible. However, where public funding for a PACM activity, expressed in grant equivalents, is larger than the expected revenues from PACM credits, participants must demonstrate that public funding would not have filled the funding gap in the absence of revenues from PACM credits. In addition, the PACM Supervisory Body mandated its Methodological Expert Panel (MEP) to conduct further work on this matter.

The proposed CRCF methodology explicitly allows that other sources of finance may be combined with revenues from EU CRCF units and includes an aspirational statement that overcompensation of costs should be avoided. In context of the latter, activity proponents must include information on other sources of finance into the activity

[5] PuroEarth, Biochar Methodology for CO_2 Removal Edition 2025 V1, June 2025, section 3.3 https://7518557.fs1.hubspotusercontent-na1.net/hubfs/7518557/Puro%20Biochar%20Methodology%20-%20Edition%202025%20-%20Approved%20Version%20-%20Pending%20Copy%20Edit.pdf

plan. However, there are no operational provisions in the methodology outlining how overcompensation will be avoided in practice (simply including information on this in the activity plan will not have any impact on avoiding overcompensation). If DACCS, BioCCS or biochar activities receive both public subsidies and CRCF units, this could lower CRCF unit prices and implicitly subsidise continued fossil fuel use by the buyers of the units. Further, if revenues from CRCF units only constitute a small part of the budget this also poses the risk that activities are not additional. The provisions in the CRCF methodology are therefore weaker and not aligned with the PACM requirements.

3 Quantification of emission reductions or removals

3.1 Conservativeness and consideration of uncertainty

Appendix 1 to the baseline standard of the PACM requires that methodologies must apply a conservative approach to ensure that emission reductions or net removals are very unlikely to be overestimated. It further stipulates that the degree of conservativeness in making assumptions, selecting parameters and applying discounts to estimated amounts must be based on the level of uncertainty associated with the calculations. Further, all causes of uncertainty must be considered, including in data (e.g. measurements), parameters (e.g. representativeness of default values), assumptions (e.g. in the baseline scenario) and methods (e.g. models to quantify emission reductions).

The CRCF's provisions on conservativeness only partially match the stringency of the PACM requirements. The proposed CRCF methodology contains requirements for project proponents to assess the uncertainty introduced when using measured, estimated or default data to calculate the mitigation impact of their activities. A description of the uncertainty assessment must be included in the activity plan. No requirements however exist to determine uncertainty stemming from assumptions made for establishing the baseline scenario or the application of models or other methods. Here, the CRCF does not meet the PACM rules, which are more robust for avoiding overestimation of emission reductions or net removals because they include mandatory requirements to account for uncertainty associated with assumptions. Additionality risks associated with this lack of alignment are likely more relevant for biochar than BECCS or DACCS activities where the baseline more likely is zero.

3.2 Baselines to be set below business-as-usual (BAU)

The PACM baseline standard, as a general principle and requirement, establishes that all baselines must be set below a conservatively determined BAU emissions level. It operationalises this principle by requiring methodologies to include provisions for project developers to demonstrate that the selected baseline is below BAU. It furthers restricts eligible alternatives for determining the BAU scenario to (a) a continuation of the historical situation (with downward adjustments – see next section), (b) establishment of an economically viable technology and/or practice, and (c) a combination of the first two. Only when it is justified that these alternatives are not suitable, another relevant scenario can be used. However, also these must be in line with the principles and requirements of the baseline standard, which includes the requirement for

baselines to be below BAU. Regardless which alternative is chosen, project developers must justify the choice and detail how it ensures conservativeness.

The proposed CRCF methodology for permanent removals simply sets the baseline to 0 tonnes of CO_2 per year. A justification why this can be considered as conservative is not provided.

3.3 Enhancing the ambition of baselines over time

The PACM baseline standard establishes that crediting baselines must decrease over time to encourage ambition of activities. Methodologies therefore must include factors or quantitative methods for downward adjustment appropriate to the sector as well as activity type and scale. Downward adjustments should be operationalised as an annual change or stepwise change implemented not less frequently than every three years. The PACM further sets 1% of the baseline emissions in the calendar year of the start date of the first crediting period as the minimum annual downward adjustment that all projects must apply. The PACM allows for exemptions from downward adjustments in specific circumstances, if these are approved by the Supervisory Body. It is still unclear in which instances such exemptions may be warranted. The baseline standard however specifies that economic viability of the mitigation technologies could be a consideration for exemptions, for example, where the application of a downward adjustment may result in no calculated emission reductions or net removals.

The proposed CRCF methodology does not have any provisions on downward adjustment or enhancing the ambition of baselines over time. One could argue, however, that permanent removal methodologies could be candidates for exemptions from the continuous downward adjustment under the PACM, as the eligible activities are technologies at an early stage of innovation and diffusion with relatively high abatement costs. Pending the decision of the PACM Supervisory Body on eligible exemptions it is still unclear whether the proposed CRCF methodology meet the PACM requirements.

3.4 Updating of baselines

The PACM baseline standard requires that proponents of mechanism methodologies specify the duration of the validity of the proposed methodology and regularly revise methodologies to update the underlying analysis. It further specifies that validity shall not exceed five years.

The CRCF regulation contains a requirement for the Commission to review and update the standardised baselines considering evolving regulatory circumstances at least every five years. This clause is not reflected in proposed CRCF methodology, which does not contain any restrictions on the validity of the baseline. This is a violation of the CRCF regulation which stipulates that rules for updating the standardised baseline shall be included in all certification methodologies.[6] If baselines are not periodically updated there is a risk that underlying assumptions are not valid anymore which could result in baselines being above BAU and inconsistent with regulatory circumstances in the worst case. Regular baseline reassessment is also a common

[6] See Annex I, numeral (h) of the CRCF regulation.

requirement in relevant carbon crediting programmes for removals on the voluntary carbon market.

3.5 Accounting for biomass use

3.5.1 Why robust accounting for carbon crediting requires different approaches than for GHG accounting in national inventories

An assessment of the emission impact of using biomass feedstocks for BioCCS and biochar activities is of utmost importance in carbon crediting mechanisms. Although biomass is considered as a renewable energy carrier, the release of CO_2 from biomass into the atmosphere is not necessarily carbon-neutral, and the capture and storage of CO_2 in BioCCS activities or a fixation of biogenic carbon in biochar do not necessarily result in a net removal.

In both, national greenhouse gas inventories and existing carbon crediting mechanisms, this is commonly well reflected:

- In national greenhouse gas inventories, CO_2 emitted from the consumption of biomass in the energy or industry sectors is accounted for in the land use, land use change and forestry (LULUCF) sector of the inventory. To avoid double counting of the emissions in the inventory, it is not counted in the energy and industry sectors.
- Likewise, in carbon crediting mechanisms, the emissions impact of using biomass in a project is commonly fully accounted for, for example by counting any losses of carbon stocks as result of a project as emissions.

A key difference between accounting emissions in national GHG inventories and carbon crediting mechanisms is that the latter accounts for changes in emission and removals between a baseline and a project scenario while the former accounts for the amount of emissions and removals in a geographic area at a given point in time. Accounting under national inventories therefore strives for accuracy of the inventory data while accounting under carbon crediting focusses on ensuring conservativeness of estimates to rather underestimate than overestimate the emission impact of project activities. Because carbon crediting involves comparison with a baseline it is not only important to look at emissions resulting from using the biomass in the BioCCS or biochar activity (project emissions) but also whether changes in demand and use cases result in emission elsewhere (leakage emissions). Two effects are relevant for biomass use:

- If the biomass for CRCF activities would not be used in the baseline scenario but remain stored in a carbon reservoir (e.g. remain stored on forest land or in wood products) in the baseline scenario, using it for CRCF activities does not necessarily bring about a climate benefit. This may – in the short and medium term – only lead to a shift in which reservoir carbon is stored but not enhance any removals (i.e. the uptake of CO_2 from the atmosphere). On the contrary, it could increase emissions due to losses in processing the biomass or the energy required to produce biochar.
- If the biomass would have been used in the baseline scenario for other purposes, for example, co-firing in a coal-fired power plant, the use of that biomass under CRCF activities may not bring about a climate benefit either. Due to the diversion of biomass to the CRCF activities, coal-fired power plants, for example, may need

to use more coal to compensate for the unavailability of the biomass they would have used in the baseline scenario.

In accounting for these effects, the temporal dimension must not be neglected as there may be long time-lags between the incorporation of atmospheric CO_2 into biomass through photosynthesis (physically the actual 'removal') and the transfer of the carbon in biomass into a reservoir by means of the BioCCS or biochar activity (accounted as 'removal' in the carbon crediting methodology).

3.5.2 PACM requirements for biomass use

The PACM requires project proponents to consider these effects when quantifying the mitigation impact of their activities. The PACM leakage standard, for example, contains specific provisions how to address leakage for cases where a PACM activity increases – relative to the baseline scenario – the consumption of resources that have competing use cases and where the availability of the resource is limited in the geographical relevant area. In these cases, methodologies must include procedures to account for any negative leakage resulting from resource diversion towards PACM activities. Exceptions only apply where project proponents can demonstrate that the respective resource is abundant in the relevant geographical region and that the volumes required for the PACM activities would not be used in the baseline. Such abundance demonstration must further account for the effects of using such resources on natural or human-managed ecosystems. For example, where biomass was left in the ecosystem in the baseline scenario, this would enhance carbon stocks in living biomass or – in case of decay – in dead wood, litter and soil carbon. In this case, the use of such biomass for BioCCS or biochar activities would thus reduce the amount of carbon stored elsewhere.

The PACM Supervisory Body will likely develop methodological tools which will further specify operational requirements for accounting for such leakage emissions. Under a comparable methodological tool under the CDM[7], for example, only biomass residues that are available in abundance or biomass from newly established plantations are eligible for claiming emission reductions. For demonstrating abundance in the CDM tool, project proponents must demonstrate that the total quantity of biomass residues annually available in the project region is at least 25% larger than the quantity of biomass residues which is utilized annually in the project regions.[8]

3.5.3 CRCF requirements for biomass use

The proposed CRCF methodology fails to appropriately account for the emission impact of using biomass for BioCCS activities or the production of biochar. The methodology sets the baseline to 0 t CO_2e. This means that the methodology assumes that the use of the biomass in CRCF activities does not lead to any emissions compared to the baseline. The methodology includes certain restrictions on the use of biomass, which however do not necessarily fully avoid leakage emissions.

7 CDM TOOL16 – Project and leakage emissions from biomass, paragraph 52 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v5.0.pdf

8 See paragraph 52 of TOOL16

3.5.3.1 Restrictions aiming to avoid increase in demand for biomass

Under the proposed CRCF methodology, restrictions are in place that aim to ensure that a large share of biomass would also be used in the baseline scenario and is not increased because of the CRCF activity. These restrictions are summarized in Table 2 below. For BioCCS, these restrictions have, in principle, the potential to reduce the increase in biomass consumption due to the CRCF when compared with the baseline scenario. The restriction that consumption of biomass is only eligible when its purpose is the production of another product than CO_2 ensures that biomass is not solely combusted for the purpose of generating CRCF certificates. The restriction that new biomass-consuming facilities which became operational one year before the start date of the activity period must demonstrate that they are financially viable without monetization of carbon removals may provide a safeguard against incentivising the construction of additional biomass facilities through the CRCF that would not be constructed in the baseline scenario. This may, for example, apply to situations where in the baseline scenario heat would be provided through heat pumps, whereas a BioCCS facility is established in the project scenario. While these restrictions might provide some safeguards for limiting the increase in demand for biomass due to the CRCF incentives, and thereby also a diversion of its use for other purposes, they do not ensure that demand remains the same as in the baseline scenario. BioCCS facilities are allowed to source the energy required to capture and store CO_2 from additional biomass consumption. This will result in higher biomass demand by these facilities than under the baseline scenario.

In the case of biochar facilities, all biomass consumption constitutes new biomass demand, as these facilities would not operate in the baseline scenario. The CRCF will thus increase competition for biomass, even if the CRCF methodology contains provisions restricting the use of other biomass categories than waste and residues (see Table 2).

The risk of leakage due to diversion of biomass from other purposes is therefore highly relevant for both BioCCS and biochar activities, although the amount of additional biomass consumption relative to the amount of removals is larger for biochar activities than for BioCCS activities. The lack of requirements to account for leakage in the proposed methodology is both inappropriate and weaker than the available requirements under the PACM.

Table 2 Use restrictions for biomass in BioCCS and Biochar facilities under the CRCF

Restriction	Applicable to
BioCCS	
Any biomass from which CO_2 is captured shall be consumed with the primary purpose of generating a product other than CO_2 for capture.	All facilities
The process shall not be adjusted in a way that increases the generation of CO_2 per unit of output if that adjustment is made to solely increase the quantity of CO_2 that is available to be captured.	All facilities

The operator shall demonstrate that the nameplate biomass consumption capacity of the facility has not increased by more than the amount necessary to supply energy for the capture process, as compared to the nameplate capacity on whichever date is later out of the date on which the facility became operational and the date three years prior to the start of the activity period. This includes facilities that have been retrofitted in parallel to the installation of carbon capture capacity.	Facilities other than waste to energy facilities: • For which the primary purpose of biomass consumption is to produce heat or electricity • That already were operational at least one year before the start date of the activity period • Where biomass is combusted for heat or power for onsite use for an industrial process
Operators shall demonstrate that if the facility had been constructed without carbon capture capacity it would still be economically viable, i.e. that the net present value would be positive for a version of the facility without the cost of carbon capture or the revenue from carbon removal units or any other support predicated on the delivery of carbon removals.	Facilities that became operational not more than twelve months before the start of the activity period.
Biochar	
Biomass feedstocks limited to waste or residual feedstocks as defined in Article 2, points 23 and 43 of Directive (EU) 2018/2021	Where biochar production – measured as energy content – is expected to account for 50% or more of the total outputs of the biochar production facility, biomass shall only come from residues and wastes. In case that the biochar production drops below the threshold of 50 %, biomass use is not restricted.

Source: Section 4.3.1 and 4.3.2 of the draft delegated regulation published in July 2025 for Direct Air Capture with Carbon Storage (DACCS), Biogenic Emissions Capture with Carbon Storage (BioCCS) and Biochar Carbon Removal (BCR).

Table 3 Eligibility of different biomass categories under the CDM and CRCF

Biomass Category			Eligibility under CDM	Eligibility under CRCF
Saw logs, veneer logs, industrial grade roundwood, sumps or roots	Existing Plantations	Biochar	No (Not an eligible activity under the CDM)	Yes – if the produced biochar is expected to account for less than 50% of the total energy outputs in the co-products of the biochar production facility
		BioCCS	No (No biomass use possible from existing plantations)	Yes
	New Plantations	Biochar	No (Not an eligible activity under the CDM)	Yes – if the produced biochar is expected to account for less than 50% of the total energy outputs in the co-products of the biochar production facility

		BioCCS	Yes (New plantations must be established as part of the project)	Yes
Residues and waste	Existing Plantations	Biochar	No (Not an eligible activity under the CDM)	Yes
		BioCCS	Yes	Yes
	New Planta-tions	Biochar	No (Not an eligible activity under the CDM)	Yes
		BioCCS	Yes	Yes

Source: Section 4.3.1 and 4.3.2 of the draft delegated regulation published in July 2025 for Direct Air Capture with Carbon Storage (DACCS), Biogenic Emissions Capture with Carbon Storage (BioCCS) and Biochar Carbon Removal (BCR); CMD TOOL16.

3.5.3.2 Restrictions related to eligible feedstock types

The proposed CRCF methodology also outlines **general sustainability criteria** which address the types and quality of feedstock used for the removal activities. These criteria include aspects such as climate change mitigation and adaptation, the sustainable use of water and marine resources, the transition to a circular economy, and the prevention or control of pollution.

In addition to these broader sustainability criteria, the proposed CRCF methodology requires that biomass used must fulfil certain sustainability requirements set out in Article 29 of the RED. **These requirements do not refer to the *quantity* of biomass used but the *quality* of the biomass.**

The sustainability requirements differ for biomass from agriculture and forestry. Agriculture biomass must not be sourced from primary forest, highly biodiverse forest, woodland or grassland, legally protected areas, other protection areas, converted high carbon stock areas (i.e. wetlands or forest converted to cropland) or from peatlands. Land-use changes related to agricultural biomass production are assessed with reference to January 2008. For some of these areas, biomass production may be permitted if there is evidence that it does not interfere with protection purposes or alter the wetting status of peatland.

Forest biomass must not be sourced from primary forest, highly biodiverse forest, woodland or grassland, legally protected areas, wetlands or from peatlands. Furthermore, sustainability criteria for forest biomass focus on production practices in forest areas. Harvesting activities must be legal, forest must regenerate after harvest, and soil and biodiversity must be preserved. This includes avoiding degradation of primary and old growth forests, preventing the harvesting of stumps and roots, complying with national limits on clear-cutting, respecting deadwood retention thresholds, and applying logging methods that minimize negative impacts on soil and biodiversity.

In addition, LULUCF-criteria outlined in Article 29(7) of the RED require that changes in carbon stocks associated with biomass harvest are either accounted for under a country's NDC, or that reported LULUCF-emission from harvesting do not exceed CO_2 removals. Where such information is not available, forest management systems must ensure that carbon stocks and sinks levels in the forest are maintained or

enhanced in the long run. EU Member States must report the volume of forest biomass available for energy use.

Article 29(1) of the RED exempts small bioenergy plants from mandatory audits of sustainability criteria. This exemption, however, applies only in case of carbon capture activities at these bioenergy plants (section 4.2 (a) (iii) of the methodology). Other plants pursuing other types of CO_2 removals or biochar production must comply with the sustainability criteria of Article 29 of the RED, regardless of plant size.

Furthermore, saw logs, veneer logs or industrial grade roundwood[9] are not excluded as feedstock for bioenergy production (see Table 3 above). Under the RED, using these products for energy can still be counted as 'renewable energy' under the RED, although the RED bans national financial support schemes for such energetic use under its Article 3c.

Generally, Article 29 of the RED is intended to ensure minimum sustainability standards, not to regulate the volume of biomass used. As a result, meeting the sustainability criteria alone does not prevent competition between material and energy uses of biomass, nor does it actively promote the cascading use principle. To address this, the proposed CRCF methodology requires certification bodies to verify that woody biomass is used in line with the cascading principle. Furthermore, operators must not receive direct financial support from Member States for using saw logs, veneer logs, industrial grade roundwood, stumps and roots for bioenergy purposes.

For biochar production (where biochar is the primary output), the draft methodology further restricts eligible biomass feedstocks to 'waste' or 'residues' as defined by the RED. However, if biochar represents less than 50% of the total energy output, the use of other biomass types (e.g. saw logs, veneer logs or industrial grade roundwood) may be permitted. This is likely the case when biochar is only a by-product of (waste or direct) heat production.

It is important to emphasise that these sustainability requirements concern only the quality of the biomass used. They do not regulate the overall quantity of biomass used and make no reference to the size of sustainably available biomass potentials.

3.5.4 Conclusion on biomass accounting

Overall, the requirements in the proposed CRCF methodology do not meet the requirements of the PACM and best practice in other carbon crediting programmes. The requirements regarding the use of biomass in the methodology do not support the assumption to set the baseline for biomass to zero emissions, and thus to assume that the use of biomass is *per se* carbon neutral, for the following reasons:

- First, the proposed CRCF methodology does not prevent that the amount of biomass consumed is increased because of the CRCF activities. This means that more biomass could be consumed as a result of the CRCF activities.

[9] Please note that 'industrial grade roundwood' covers a broad range of woody biomass. It means saw logs, veneer logs, round or split pulpwood, as well as all other roundwood that is suitable for industrial purposes, excluding roundwood the characteristics of which, such as species, dimensions, rectitude and node density, make it unsuitable for industrial use as defined and duly justified by Member States according to the relevant forest and market conditions.

- Second, the CRCF does not account for leakage emissions resulting from diverting biomass used for other activities in the baseline scenario to CRCF activities. Accounting for such emissions is critically important for ensuring that the removal effect of permanent CRCF units is indeed 1 tonne CO_2e. If the use of biomass results in leakage emissions, the effects depend on the origin of the biomass. Where the biomass is generated within the EU, this will lead to an increase in reported emissions in the LULUCF sector within the EU, making it more difficult for the EU to achieve its climate targets because the increase would need to be compensated for by further emission reductions elsewhere. This does not apply if biomass used for CRCF activities is imported from other countries. Here, any leakage emissions would show up in the respective national inventories of these countries, leading to higher emissions in these countries. The CRCF's lack of leakage accounting may thus result in a situation where the EU achieves its climate targets at the cost of higher emissions in other countries. This should be avoided in all cases. Article 29.7 of the RED stipulates that biomass exporting countries must be signatory to the Paris Agreement and must have submitted an NDC covering emissions and removals from the LULUCF sector. However, this does not prevent that the emissions in other countries increase because of the EU CRCF. The lack of accounting for leakage effects also raises questions about policy effectiveness as it may create a false impression of the CRCF's impact on incentivizing additional removals in the EU, potentially leading to misallocation of investments.

- Third, the sustainable biomass criteria do not ensure that the use of the increased biomass can be considered as carbon neutral (i.e. associated with a baseline emission factor of zero). It is not excluded that the biomass may originate from biomass pools that would not decline in the baseline. In many instances, it is a plausible scenario that biomass carbon stocks decline because of the CRCF activities. This is because the sustainability criteria address mainly other aspects like biodiversity and water issues. The covered LULUCF requirements even allow that the CO_2-balance in forests is negative.

3.6 Consideration of indirect land-use change (iLUC)

The Leakage Standard of the PACM requires activity proponents to identify all potential sources of leakage, seek to prevent any kind of leakage by changing the design of the activity and – where this is not possible – minimise any leakage and subsequently account for any remaining leakage in the calculation of net emission reductions or removals (unless the exclusion of leakage sources from the calculative is conservative, i.e. the exclusion of a source of positive leakage where the implementation of an activity results in a decrease in emissions or in an increase in removals). The Leakage Standard explicitly mentions competition for resource use as a source of leakage where an increase in the consumption of a limited resource by the mitigation activity could lead to an increase in GHG emissions or decrease of removals outside of the activity boundary. This holds in particular for the use of biomass in mitigation activities, which applies to BioCCS and biochar (see section 3.6). It also explicitly requires that indirect land-use change (iLUC) to be considered. This means that *any* emissions from iLUC must be accounted for.

The proposed CRCF methodology does not satisfy the PACM requirements. The CRCF methodology requires that the biomass from which emitted CO_2 is captured (i.e. biomass used for BioCCS activities) shall not be identified as a high iLUC risk

feedstock under the RED (paragraph 4.2.(c)). Based on this provision, the proposed methodology considers iLUC emissions for this type of biomass to be zero. Any iLUC emissions from feedstocks that are not classified as high risk are not considered. In many instances, these emissions can still be very large. This gap may lead to substantial overestimation of emission reductions or removals. To fully account for emissions through iLUC, the CRCF methodology should explicitly require that any emissions from iLUC must be considered (as is the case in the Leakage Standard of the PACM). In previous work, iLUC effects have been analysed for various feedstocks, including those that are not classified as high risk under the RED (see for example the Commission report on the status of production expansion of relevant food and feed crops worldwide[10] or values given in the Annex to the Delegated Regulation (EU) 2019/807[11]). This work could provide a basis for estimating iLUC effects of removal activities under the CRCF.

3.7 Materiality thresholds for exclusion of emission sources

Appendix 1 to the Baseline Standard of the PACM and the Leakage Standard of the PACM require that all emission sources, sinks or reservoirs that are controlled, related or otherwise affected by a mitigation activity shall be included in the quantification of emission reductions and removals. Omissions are only permitted if that leads to a more conservative quantification.

These requirements are not satisfied by the proposed CRCF methodology which includes a materiality test to exclude emission sources, even if their exclusion is not conservative. Moreover, to determine materiality in terms of emissions, emissions must be estimated. Once emissions are quantified, most of the benefit of a threshold is lost.[12]

4 Non-permanence

The PACM Removal Standard specifies rules governing non-permanence. Furthermore, a draft standard with specific provisions on how to address non-permanence risks has been published for consultation in July 2025.[13] The draft standard specifies

[10] https://eur-lex.europa.eu/resource.html?uri=cellar:b160eb62-4580-11e9-a8ed-01aa75ed71a1.0008.02/DOC_1&format=PDF

[11] Commission Delegated Regulation (EU) 2019/807 supplementing Directive (EU= 2018/2001 of the European Parliament and of the Council as regards the determination of high indirect land-use change-risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed and the certification of low indirect land-use change-risk biofuels, bioliquids and biomass fuels, see https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0807.

[12] The Greenhouse Gas Protocol. https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf#page=10

[13] https://unfccc.int/sites/default/files/resource/A6.4-MEP007-A04.pdf. This draft includes two versions of a draft standard to address non-permanence. Appendix 1 and 2 reflect the views of the majority of the members of the Methodological Expert Panel which developed the draft. Appendix 1 provides a draft standard directed to mechanism methodology proponents. Appendix 2 provides a draft element for inclusion in the activity standards and activity cycle procedures. Appendix 3 reflects the views of one member of the Methodological Expert Panel and provides a draft standard directed to activity participants. The analysis in this brief refers to the rules included in Appendix 1 and 2.

for which type of mitigation activities non-permanence is an issue. This includes all three activity types under the proposed CRCF methodology.

According to Appendix 2 of the draft standard under the PACM, monitoring and reporting of reversals can be terminated when activity participants can demonstrate that the stored GHG have a negligible risk of reversal or that the potential future reversal of this storage has been remediated (by replacing all credits issued for the activity).[14] Conditions or criteria to demonstrate such negligible risk yet remain to be defined in PACM methodologies. For CCS, such criteria could relate to the behaviour of the stored CO_2 in the geological reservoir. For biochar, such criteria could relate to excluding use cases of biochar that could result in the release of the carbon stored (e.g. through combustion) or criteria related to the characteristics of biochar.

For BioCCS and DACCS activities, the proposed CRCF methodology defines liability for any release of CO_2 from permanent geological storage according to the rules of the CCS Directive.[15] These rules effectively ensure that any reversals are being compensated for and thus imply at least a similar level of stringency as the PACM rules.

For biochar, the proposed CRCF methodology stipulates that only biochar activities that apply biochar to soils or incorporate it in cement, concrete or asphalt shall be eligible for certification. If used in this way, biochar is considered to have a negligible risk of reversal and monitoring of biochar is only required for one year after it has been applied to soils or until it has been incorporated in products. The proposed CRCF methodology requires to calculate a permanence fraction of the biochar which is supposed to reflect the share of carbon in the biochar that is stable. The draft methodology does not include any further measures to address potential future reversals from biochar activities (also ignoring potential priming effects[16] through which carbon losses may occur). For biochar, it is thus unclear whether the PACM rules are met, as these have not yet been specified for this type of mitigation activity.

5 Safeguards and sustainable development impacts

Environmental and social safeguards and sustainable development requirements are mandatory for all projects under PACM and provided in several standard documents, including the Sustainable Development Tool. The latter provides a systemic approach to assess potential negative environmental and social impacts and follows a hierarchy of avoiding, minimizing and mitigating clearly defined negative impacts. Both safeguards and sustainable development impacts are required to be monitored and reported under PACM based on activity-level indicators. Validation and verification as well as local and global stakeholder consultations are also mandatory.

[14] Detailed rules on the definition of “negligible risk” are yet to be finalised and adopted under the PACM (in a separate standard on addressing non-permanence/reversals; a draft is available under https://unfccc.int/sites/default/files/resource/A6.4-MEP007-A04.pdf).

[15] Directive 2009/31/EC

[16] The priming effect from biochar refers to the change in the rate of decomposition of soil organic matter (SOM) after biochar is added to the soil. This effect can be positive, meaning that adding biochar to the soil increases SOM decomposition or negative, meaning that it decreases SOM decomposition. There is considerable uncertainty about the direction of priming effects and their magnitude as they depend on soil and biochar properties.

In contrast to the PACM, the proposed CRCF methodology has no systematic approach to safeguards, i.e. no definition of the assessment procedure and specific criteria per impact category. It is unclear how the compliance with the broad requirements should be ensured and operationalized, and how monitoring should be implemented. It remains unclear how any potential risks are addressed and what actions need to be taken in case of identified negative impacts. Although the activity and monitoring plan shall include a proof of compliance with the sustainability requirements, it remains unclear what level of detail must be provided.

Although the CRCF Regulation states that the CRCF methodologies should incentivize the generation of co-benefits (i.e. positive sustainable development impacts), there is no requirement on this in the proposed CRCF methodology.

6 Conclusions

In this policy brief, we assess the extent to which the proposed CRCF methodology for permanent removals aligns with requirements in the PACM. We find that the proposed CRCF methodology is not aligned with the PACM and sets a considerably lower integrity standard. Out of the integrity issues assessed in this policy brief, the proposed CRCF methodology has only in one issue (non-permanence for BioCCS and DACCS) a comparable stringency as the PACM. Regarding the remaining integrity issues, it sets a lower standard than the PACM. In few cases, the comparison is not yet possible, as the PACM rules have not been fully elaborated.

Accounting for biomass use and treatment of leakage emissions from indirect land-use change are particularly problematic under the proposed CRCF methodology and set a considerably lower standard than under the PACM and best practice in other carbon crediting programmes. This could potentially lead to many CRCF units that are not backed by actual emission reductions or removals.

The PACM sets a considerably higher standard due to its more ambitious rules but also because it builds on the lessons learned under the CDM and other carbon crediting programmes and aims to avoid past mistakes. The proposed CRCF methodology does not seem to build on the wealth of experience that is available but uses rather unique approaches not pursued by other carbon crediting programmes. These partially draw on existing EU legislation, which was however not designed for the purpose of creating a carbon crediting mechanism. Whether the CRCF methodology in combination with relevant EU legislation will result in removal projects with high integrity will need to be evaluated once experience exists with a relevant number of projects. By not integrating best practices from more than 20 years of carbon crediting, the EU however takes on unnecessary risks that this will not be the case. Most shortcomings of the methodology further could be implemented without unduly burden on project proponents because part of the additional analysis which would need to be included in the methodology to align it more closely with the PACM requirements would need to be performed by the EU Commission under the CRCF's standardized approach to additionality and baseline setting.

We recommend that the proposed CRCF methodology be revised in many areas before its adoption. In revising the methodology, we recommend considering the

requirements under the PACM and well-established best practice in carbon crediting programmes on the voluntary carbon market.

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