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Assessment of the draft technical specifications for certification under the EU CRCF

Long-term temporary biogenic carbon storage in buildings

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Summary of key findings and recommendations

This document provides an assessment of the document “Technical assessment of certification methodologies for long-term temporary biogenic carbon storage in buildings”, dated 19 September 2024. The most important findings include the following:

- **Only new mitigation activities should be eligible:** The methodology allows rewarding past climate action. The methodology should include provisions to ensure that mitigation activities are only eligible if they are newly implemented and if they have considered the incentives from CRCF units when deciding to proceed with the implementation of the mitigation activities (see our textual proposal in our cross-cutting findings).
- **Storage in buildings may not necessarily lead to removals but could merely shift carbon from one carbon pool or use to another:** The transfer of biomass from forest carbon pools to buildings (harvested wood products) does not generate any removals (i.e. an additional uptake from CO_2 from the atmosphere). Available research shows that, depending on the circumstances, such transfer of biomass between carbon pools could lead to higher emissions to the atmosphere compared to a scenario where the biomass would be left in the forests (Soimakallio et al. 2022).

  Similarly, biomass may be diverted from other uses (e.g. for energy purposes) to storage in buildings. This would also not involve any enhancement in removals. Moreover, alternative uses of biomass may have larger benefits in terms of CO_2 removals or lower emissions compared to the storage in buildings. Such considerations need to be reflected in the baseline. It is important to identify the circumstances in which storage in buildings is favourable and additional. The document does not account for these dynamics.

  We further note that the storage of biomass in buildings is likely to mainly generate emission reductions, rather than removals, by substituting materials that are associated with

CO_2 emissions (cement, steel, plastics). We note that claiming such emission reductions is not eligible under the CRCF.

The methodology would need to identify the baseline scenario for different biomass types. The methodology would further need to be limited to those circumstances where the use of additional biomass for storage in buildings would result in an enhancement of removals. This may be the case where the biomass source would in the baseline scenario decay or if the biomass source would be newly established (see our cross-cutting findings on accounting for biomass for more details).

- **Additionality:** The storage of carbon in buildings is already widespread. The document fails to establish procedures that ensure that only an increase in the storage is credited. Using average biomass storage factors will lead to a large amount of units being issued for activities that take place anyhow.

More detailed and further comments are provided below.

Detailed comments

Introduction

Long-term temporary biogenic carbon storage in buildings occurs since centuries, especially in form of wood, and changes in carbon pools of harvested wood products are already part of national GHG inventories. Unfortunately, this situation does not facilitate the certification under the EU CRCF and further aspects make it even more complicated:

- Many biogenic products are already used in buildings. For example, wooden roof construction is very common, but also other wooden products like wooden flooring and wooden facades as well as complete wooden houses are also being built today. The aim of the EU CRCF is to increase the proportion of biogenic products in buildings, but it is very challenging to determine which of these products are additional, i.e. is driven by the incentive provided by the certification under the CRCF.
- Biogenic products should be considered only when their lifespan reaches at least 35 years (see EU CRCF Regulation Art. 2 (i)). In practice, different products may be produced by the same semi-finished goods, but their lifespan may differ. Furthermore, the lifespan of a single product used for the same function can vary depending on the homeowner.
- The carbon dioxide removal from the atmosphere takes place during the photosynthesis of plants in forests and on agricultural land. This means that the CO_2 is already stored in carbon pools of these land categories. Harvested biomass is taken out of these pools and is then transferred via biogenic products into buildings. This shift from one carbon pool to another does not necessarily result in the enhancement of removals. Moreover, biomass losses often occur during the production of biogenic products and not all harvested biomass is moved into buildings. Depending on the biomass production area, it might be more efficient to increase the carbon pool of an area e.g., wood stock in climate resilient forests, than storing the wood in buildings. In other situations, increasing the wood stock in buildings instead on the forest area can be favourable, e.g., for unstable spruce stands with a high risk of dieback (see our cross-cutting findings on accounting for biomass for more details).
- Biogenic products may replace more emission-intensive products. This is commonly referred to as the substitution effect, but such replacement is not eligible for crediting under the EU CRCF, as such effects do not constitute removals (see our cross-cutting findings on accounting for biomass for more details).
- The sustainability of biogenic products – as addressed under EU CRCF Regulation Art. 7 – strongly depends on the origin of the biomass, i.e., the former land use and the land-use intensity. Furthermore, displacement effects including indirect land-use change may occur. For example, an increase of wood use in buildings may come from former firewood. If the demand for firewood remains, the needed wood may be produced in other regions within a country or may be imported. However, the sustainability of this displaced production is not part of the sustainability assessment of the use biogenic product.

- Biogenic products may originate from reuse or recycling processes. These pathways differ significantly from primary biomass pathways. This must be reflected in the quantification.
- It is also challenging to determine the carbon removed under the baseline ($CR_{baselines}$) due to the high variety of biogenic products that can be used in buildings.

Against the background of these challenges, the technical assessment of certification methodologies for long-term temporary biogenic carbon storage in buildings includes several statements that elements are still under "ongoing discussion" or are "open questions". The focus of this assessment is to support the needed ongoing discussion.

Scope

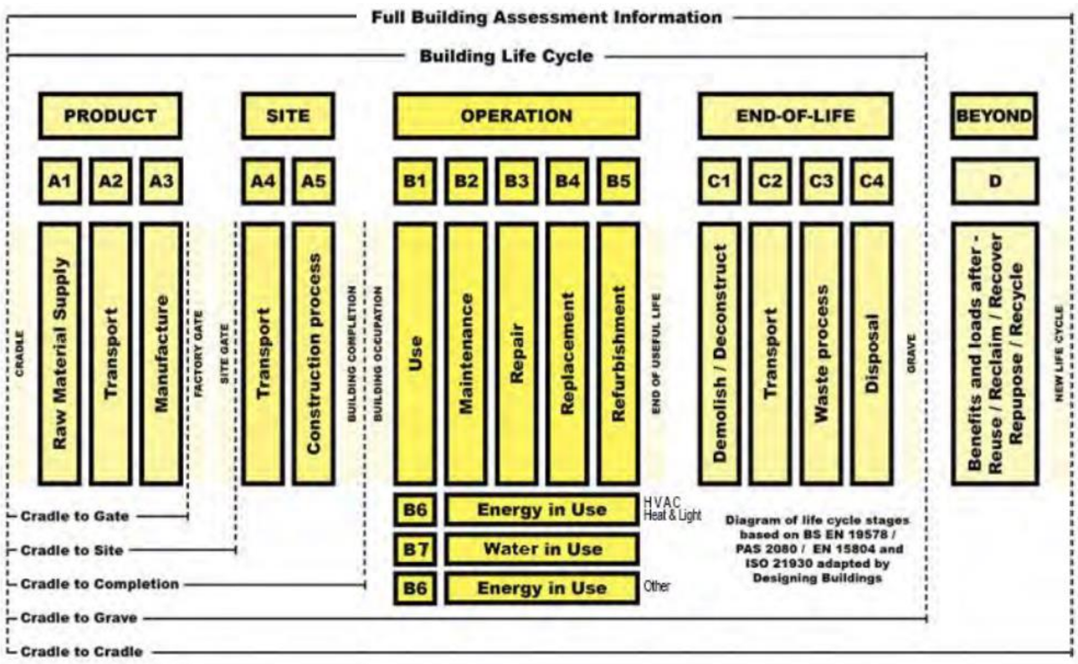
Only new mitigation activities should be eligible: The methodology does not include any provisions that prevent rewarding past climate action. The methodology should include provisions to ensure that mitigation activities are only eligible if they are newly implemented and if they have considered the incentives from CRCF units when deciding to proceed with the implementation of the mitigation activities (see our textual proposal in our cross-cutting findings).

Quantification

Scope

Inspired by the method of life cycle analysis, the following structuring of the process steps of biogenic products is proposed in the report (p. 11):

Figure 1: Elements of the life cycle of buildings



Source: Partners for Innovation and Wageningen University and Research (2024)

This approach is a good starting point, but – as highlighted in the introduction – the document lacks a link to the carbon pools on the biomass production areas. The easiest way to integrate such effects would be a subdivision of A1 "Raw Material Supply" in "Impacts on carbon pools in relevant land areas" and "Production Activities". The latter would cover aspects like fertilisation and harvest activities. "Impacts on carbon pools in relevant land areas" would describe the change of carbon stocks in carbon pools in the relevant land areas where the biomass is sourced from, due to the biomass harvest (see examples below).

Box 1: Forest biomass

Soimakallio et al. (2022) analyzed 152 scenario pairs out of 44 forest modeling studies. Each paired simulation scenarios with extensive vs. intensive forest management was used to calculate how much the sink performance changes per cubic metre of removed wood based on sink performance (t CO_2; SP) and wood removal (m^3; WR). The sink performance (SP) describes the change in the carbon pools, e.g. the increase or decrease of the carbon stock in living trees during a time period. The resulting ratio is termed the Carbon Indicator (CI), and it can be expressed with the unit "t CO_2 per m^3".[1]

$$CI = (SP_{scenario1} – SP_{scenario2}) / (WR_{scenario1} – WR_{scenario2})$$

This factor is already used in other studies. The results showed that boreal and temperate forests have a mean Carbon Indicator of 1.2 t CO_2/m^3, but with considerable variation (±0,7 t CO_2/m^3). The Carbon Indicator is made up of two aspects: Firstly, from the wood removal itself, whereby the CO_2 emissions are determined by the CO_2 stored in the wood (broadleaf wood approx. 1.0 t CO_2/m^3, needleleaf approx. 0.7 t CO_2/m^3). Secondly, more intensive management has further effects on forest development, however, to a much lesser extent (about 0.4 t CO_2/m^3; interplay of e.g. release of additional CO_2 during rotting of crown top wood and roots, changed growth dynamics of the trees, etc.).

The LULUCF Regulation and national legislation (e.g. Climate Protection Act in Germany) set sink targets for the LULUCF sector. Both the C pools of forests and the C pools of wood products are included in the inventory accounting of the LULUCF sector. If carbon is shifted from the forest pool to the wood product pool, it has little or no impact on the overall LULUCF GHG balance, and does not lead to a removal of carbon from the atmosphere.

Soimakallio's study (Box 1) clearly shows that in most cases the loss of carbon from the carbon stocks in the forest C-pool is as high or higher than the amount of carbon removed with the wood. If 100% of the harvested wood is stored in wood products in buildings, it is a zero-sum game at best. If wood losses occur, e.g., as sawmill by-products along the process chain, the balance of C pools in the wood products in buildings is worse than if the wood is left on the forest area to build up the storage there.[1] The GHG balance of wood products used in buildings becomes positive only if additional substitution effects occur due through the displacement of GHG-intensive

[1] In Germany, new forest inventory data show that broadleaf stands were able to sequestrate CO_2 even under unfavourable conditions (draught, beetles). However, needleleaf stands in the wrong locations were very vulnerable against unfavourable conditions (data under https://bwi.info/ and analysis under https://www.oeko.de/en/blog/earlier-estimation-of-developments-in-the-co2-storage-capacity-of-forests-categorising-the-results-of-the-german-national-forest-inventory/).

non-biogenic products (see Fehrenbach et al. 2022 and Rüter 2023). However, substitution effects are not eligible to be credited under the EU CRCF.

Box 2: Agricultural biomass

The cultivation of annual cropland (CL) ensures that the cultivated crops grow optimally and that the areas are kept open. In this way, natural succession to woody grassland (WG) or forest (FL) is prevented every year through active management. According to the CRF tables, if annual cropland becomes woody grassland or forest, there is a significant annual carbon sequestration over the first 20 years (Germany: 16,5 t CO_2/ha/a for AL to WG and 6,5 t CO_2/ha/a AL to FL; Spain: 8,0 t CO_2/ha/a for AL to FL; Finland: 3,3 t CO_2/ha/a for AL to FL). Agricultural management is responsible for the fact that carbon sequestration does not take place (compare Fehrenbach and Bürck 2022; Searchinger et al. 2018).

The methodological challenge is to include results from dynamic process models into a life cycle assessment. As a pragmatic solution for GHG emission balances, based on life cycle analysis, Rüter (2023) and Hennenberg et al. (2024) propose to consider the carbon stored in the harvested wood as a CO_2-emission and to ignore the additional carbon-pool changes due to dynamic processes on the forest area for forest biomass and wood waste streams. For agriculture biomass, carbon-pool dynamics reported in national GHG inventories may be used to consider land related carbon effects in the quantification (see Box 2). Please note that both proposals are compatible with the rules of the IPCC Guidelines; however, ignoring the effects on carbon pools in the LULUCF sector is not.

The technical assessment report states: „There is a near unanimously agreement that the A1 phase emissions should not be excluded, not even when strict eligibility rules are used“. We strongly support this point of view and emphasize that impacts on C-pool in the LULUCF sector must be considered under A (see Figure 1).

Regarding B (see Figure 1), it must be considered that the biogenic product will in general be used in a building for the same function as the non-biogenic alternative. This means that no or only low differences are to be expected, e.g., in energy consumption (B6) as an important source of GHG emissions or in water use (B7). Repair (B3) and replacement (B4) should not occur within the required minimum lifespan of 35 years for biogenic products. Also, for use (B1), maintenance (B2) and refurbishment (B5) no or only low differences compared to non-biogenic products can be expected. Compared to GHG-emission effects under A, the effects under B may play a subordinate role. It should be examined whether they can be neglected.

When looking at C and D (see Figure 1), the report states: "The current recommendation from experts is to exclude the "C stages and D stages"." The recommendation is reasonable as end-of-life and possible reuse/recycling occurs in 35 years or later.

In conclusion, the general structure of the proposed quantification is reasonable, but the highly important linkage between biomass use for biogenic products in buildings and effects on carbon pools of land types in the LULUCF sector is missing. We propose to consider the carbon stored in wood as CO_2 emissions for both, wood from forests and wood from the HWP-pool under A1. For agricultural biomass, we propose to integrate values from national GHG inventories on land-use change that are suppressed by agricultural use (e.g., succession of cropland to forest).

We also note the following points (compare Figure 1):

- Graph on p 11: The frame on “Cradle to Site” should include transport.
- Stage A1: The cultivation of renewable raw materials emits for instance N_2O. Omitting this would be an oversimplification.
- Stage C: An alternative way of neglecting emissions from the use phase would be to assume the same as alternative components: The same emissions are assumed in the use phase for the biogenic product as in the baseline, unless specific data is available that proves differences between the use phase of biogenic products and the baseline.
- Stage D: There are established methods in life cycle assessment for dealing with subsequent use without detailed data being available, e.g. the 50:50 method. For a short introduction see Nicholson et al. (2009) and Obrecht (2021).

Quantification of $CR_{baseline}$, CR_{total} and $GHG_{assosiated}$

Biogenic products are already used in buildings (see introduction). This makes it challenging to define a baseline. The report states: “It is recommended to define the baseline as the "carbon stored in average new buildings in a region or country", which provides a solid foundation for calculating carbon storage potential.”

The proposed approach will lead to the issuance of many CRCF units that are not additional, i.e. where the removals would have occurred in the absence of the incentive effect of the certification:

- $CR_{baseline}$: The average of carbon stored in new buildings is calculated from a building stock. The average called “baseline storage factor” (BSF) is expressed as kg CO_2/m^2 stored in biogenic products in buildings. Some buildings of the stock will be below and others above this mean.
- CR_{total}: This value will be calculated for a single building. Assuming $GHG_{associate}$ is zero and a building reaches a value above $CR_{baseline}$, the operator would get certificates according to the difference between $CR_{baseline}$ and CR_{total}.
- If there was a normal distribution of carbon stored in buildings, about half of the carbon that is stored anyways in buildings would be credited. If the incentives from the CRCF increase the carbon stored in buildings by 20% on average, this would still imply, that most CRCF units would not represent any additional removals.

Moreover, the proposed approach is problematic because a link to the carbon pools is missing:

- The BSF is a sum of different biogenic products. Some of these products will require a linkage to LULUCF-carbon pools, others not.
- Values for $GHG_{assosiated}$ can be calculated for single biogenic products only. BSF as a mean value over buildings does not differentiate between single biogenic products. Thus, $GHG_{assosiated}$ and BSF as $CR_{baseline}$ cannot be offset against each other because the mean value used for BSF no longer provides the necessary information on individual biogenic products.

Due to these problems, it appears reasonable to develop an approach that is related to single biogenic products. Also the feedback from the expert group highlights: "CR_{total} should be based on the reported biogenic carbon content in the construction element as reported in EPDs[2]" (p. 20 of the report).

Proposal for a product-based approach:

- Proposal for definitions and assumptions:
  - A product in a building is a building element that fulfils a specific function. Examples: wall, window, ceiling construction, flooring, roof construction, roof cladding, wastewater pipes etc.
    Comment 1: Products like "wall" could be further divided in wall construction, isolation, outer wall skin and exterior wall skin. However, wall constructions can be very different so that a comparison is only possible at the higher level "wall".
    Comment 2: Products in buildings my differ for different building types like single-family houses and multi-family houses.
  - A biogenic product in a building consists of at least [50%] biomass (mass balance) and has a life of typically at least 35 years.
    Comment 1: The proportion may differ for different products in buildings.
  - A non-biogenic product in a building does not fulfil the definition of a biogenic product in a building.
  - The lifespan of a product is defined as a typical reinvestment cycle.
    Comment: Reinvestment cycles may come from the literature or from surveys. For example, windows and flooring have a reinvestment cycle mostly below 35 years; for ceiling and roof construction reinvestment cycles are supposed to be above 35 years.
  - Only biogenic products shall be covered in the quantification.
- Which biogenic products are used in a building?
  - List of biogenic products in a building, including the used biomasses as well as their proportions and their origins.
  - List of assumed non-biogenic products that are substituted by the biogenic products, including the used biomasses as well as their proportions and their origins.

Accounting for uncertainties in data and calculation

The methodology should align with international best practice in carbon crediting in accounting for uncertainty. Key definitions and concepts used in the voluntary carbon market are missing from this document. The proposed approach is inconsistent with, and sets a lower standard than, the requirements under the Clean Development Mechanism (CDM), the Article 6.4 mechanism and the Integrity Council for the Voluntary Carbon Market (ICVCM). The ICVCM requires that, in estimating overall uncertainty, "all causes of uncertainty shall be considered, including assumptions (e.g., baseline scenario), estimation equations or models, parameters (e.g., representativeness of default values); and measurements (e.g., the accuracy of measurement methods). The overall uncertainty shall be assessed as the combined uncertainty from

2 Calculations according to EN15804+A24 and EN159785 standards used in environmental product declarations (EPDs) for estimating the biogenic carbon flows throughout a product's life cycle stages.

individual causes" (ICVCM 2023). Similar rules apply under the CDM and the Article 6.4 mechanism. To follow best scientific practice, the consideration of uncertainty should include all relevant causes of uncertainty and be addressed in a systematic manner. The larger the degree of uncertainty, the more conservative should the quantification of removals be.

Inclusion of both new buildings and renovations

Aspects stated above are also relevant for renovation activities and should be considered here. The proposed product-based approach could also be applicable for renovation activities in a building.

Additionality

The issue is well described in the report (p. 27): "The certification must actively encourage biogenic carbon storage in biobased construction products. It is crucial to deter operators from certifying carbon storage in their projects (and possibly monetise credits) if they would have used the biobased materials in their projects regardless."

However, the "baseline storage factor" (BSF) proposed in the report cannot sufficiently address the additionality of biogenic products in buildings (see explanations above). Therefore, we propose a product-based approach which should be the basis for developing suitable approaches to assess additionality.

Storage monitoring and liability

It is questionable whether monitoring of potential release of carbon throughout the 35 years for which carbon is assumed to be stored in buildings is appropriate (see section 5 of the report). What consequences would it have, for example, if a biogenic product was removed from a building after 30 years instead of 35 years? It seems straightforward to determine an expected lifespan for individual biogenic products. Monitoring should consist of checking the assumption of this expected lifespan through regular assessments.

In the proposed product-based approach the determined lifespan is used to exclude biogenic products with a lifespan below 35 years from quantification. However, whether the threshold value of 35 years specified in the EU CRCF is suitable for the lifespan requires further assessment.

Sustainability

The document gives a sound overview of existing regulations and initiatives dealing with sustainability aspects (section 6 of the report). Most crucial sustainability risks are associated with the origin of raw materials. For example, wood from deforestation shows high risk for biodiversity and carbon stocks, but low risks are associated with waste wood. It should also be further discussed whether additional risks may arise from the production of specific products, and how they could be addressed on a product level.

However, it is important to stress that the linkage of biomass harvest with LULUCF-carbon pools – as included in the proposed product-based approach – cannot be sufficiently addressed by the sustainability criteria of RED III, Art. 29 as referred to in the report (p. 39). Impacts of land management on carbon pools are not appropriately accounted for by the provisions of this article.

Monitoring of minimum sustainability requirements and co-benefits

As stated in the reviewed report, provisions from existing certification methodologies are suitable to assess whether biomass use complies with relevant sustainability criteria.

However, the level of ambition of the existing certification methodologies differs significantly. Thus, it is necessary to develop an evaluation catalogue on the recognition of certification systems under the EU CRCF. Thus, it is necessary to critically assess sustainability provisions of existing certification methodologies in order to develop appropriate provisions for carbon storage in buildings under the EU CRCF.

References

Fehrenbach, Horst; Bischoff, Mascha; Böttcher, Hannes; Reise, Judith; Hennenberg, Klaus Josef (2022): The missing limb: Including impacts of biomass extraction on forest carbon stocks in greenhouse gas balances of wood use. In: Forests 13, 365, S. 1–14. https://doi.org/10.3390/f13030365 (21.07.2024).

Fehrenbach, Horst; Bürck, Silvana (2022): CO_2-Opportunitätskosten von Biokraftstoffen in Deutschland. ifeu Institut für Energie- und Umweltforschung Heidelberg (Hg.). Heidelberg. Online available at https://www.ifeu.de/fileadmin/uploads/pdf/CO2_Opportunit%C3%A4tskosten_Biokraftstoffe_1602022__002_.pdf (11.10.2024).

Hennenberg, Klaus; Pfeiffer, Mirjam; Benndorf, Anke; Böttcher, Hannes, Reise, Judith; Mantau, Udo; Köppen, Susanne; Fehrenbach, Horst; Bürck, Silvana (2024): Auswirkungen der energetischen Nutzung forstlicher Biomasse in Deutschland auf deutsche und internationale LULUCF-Senken (BioSINK). Im Auftrag des Umweltbundesamtes, Dessau-Roßlau. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/cc_33-2024_biosink.pdf (08.11.2024).

ICVCM (2023): Core Carbon Principles, Assessment Framework and Assessment Procedure. Online available at https://icvcm.org/ (08.11.2024).

Nicholson, A.L. et al. (2009): End-of-life LCA allocation methods: Open loop recycling impacts on robustness of material selection decisions. DOI: 10.1109/ISSST.2009.5156769.

Obrecht, T.P.; Jordan, S.; Legat, A.; Mendes Saade, M.R.; Passer, A. (2021): An LCA methodology for assessing the environmental impacts of building components before and after refurbishment, Journal of Cleaner Production, Volume 327, 129527, DOI: https://doi.org/10.1016/j.jclepro.2021.129527.

Partners for Innovation & Wageningen University and Research (2024): Technical assessment of certification methodologies for long-term temporary biogenic carbon storage in buildings.

Rüter, Sebastian (2023): Abschätzung von Substitutionspotentialen der Holznutzung und ihre Bedeutung im Kontext der Treibhausgas-Berichterstattung. Thünen Working Paper 214, Johann Heinrich von Thünen-Institut, Braunschweig. Online available at https://literatur.thuenen.de/digbib_extern/dn066391.pdf (21.06.2024).

Searchinger, T.D.; Wirsenius, S.;Beringer, T. et al. (2018): Assessing the efficiency of changes in land use for mitigating climate change. Nature 564, 249–253 (2018). https://doi.org/10.1038/s41586-018-0757-z (11.10.2024).

Soimakallio, S.; Böttcher, H.; Niemi, J.; Mosley, F.; Turunen, S.; Hennenberg, K.J., Reise, J., Fehrenbach, H. (2022): Closing an open balance: The impact of increased tree harvest on forest carbon. In: GCB Bioenergy, 14 (8), S. 989-1000. https://doi.org/10.1111/gcbb.12981 (21.06.2024).

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