CARBON REMOVALS EXPERT GROUP TECHNICAL ASSISTANCE

Technical assessment of certification methodologies

for long-term biogenic carbon storage in buildings

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Summary of main findings

Drawing upon the insights and inquiries highlighted within this report, the following set of recommendations has been outlined to inform and guide future assessments. These recommendations cover key considerations and areas necessitating additional exploration to advance understanding and practice.

Quantification

Technical recommendations

1. **Scope:** It is recommended to adhere to the existing standards (EN15804+A2, EN 15978), emphasising the inclusion when and where necessary to the production phase emissions of A1-A5, (Cradle-to-Completion).
2. **Calculation of CR_{total}:** CR_{total} shall be calculated by summing the biogenic carbon content of biobased construction elements in the project. The biogenic carbon content for each eligible construction element can be derived from environmental product declarations (EPDs). In cases where EPDs are unavailable, alternative reliable sources may be considered, pending further deliberation on their acceptance and prioritisation.
3. **Applicability of certification methodology:** The certification methodology can be used for carbon storage in both new buildings and renovation projects, provided reference values for $CR_{baseline}$ are determined and provided for renovated and retrofitted buildings.

Further deliberation required

4. **Standardised baseline:** The use of a standardised baseline was advised to maintain a consistent, comparable, and transparent calculation of the baseline. A recent study into baseline values for embodied and stored carbon in buildings in the Union can be used to establish the figures[1].. These figures must be differentiated across various building types and geographic locations. Feedback from the expert group requires reconsideration of the standardised baseline. This is due to the fact that in the CRCF additionality is considered to be met when a standardised baseline is used, and the concern that regional differences in baseline calculations will not sufficiently be taken into account.
5. **Calculation of $GHG_{associated}$:** still needs to be determined to calculate $GHG_{associated}$ based on regional and building type specific baseline values combined with project specific EPD data. According to the expert group the approach needs to be relatively straight forward and easy to implement.

[1] An example of a potential standardised baseline is presented in the European Commission initiated study found here https://c.ramboll.com/whole-life-carbon-reduction

6. **Addressing uncertainty** in data used for quantifying net carbon removal benefit is crucial. While deducting percentages of certifiable stored carbon appears to be the best practice, determining these percentages warrants further discussion.
7. **Cross-cutting issues across certification methodologies** for carbon farming and biogenic building materials storage such as preventing double counting and avoiding overestimation of the potential harvested wood products (HWP) pool for national GHG inventories will be addressed in further discussions.

Additionality

Technical recommendations

8. Proof of additionality in this certification methodology should not solely be dealt with through a standardised baseline. Futher additionality checks are needed.

Further deliberation required

9. Options to prove and verify financial additionality that do not require full project financials should be further explored.

Long-term storage

Technical recommendations

10. The Provisional CRCF regulation mandates periodic re-certification audits for all activities at least every five years, deemed adequate for monitoring biobased construction products. Eligibility is restricted to elements with a minimum 35-year lifespan, it is recommended to focus on structural elements and insulation materials, if it can be proven that they have a minimum lifespan of 35 years.
11. Utilising a buffer pool as collective insurance against unplanned releases is recognised as the best available practice in current methodologies. Determining the portion of total certifiable carbon storage allocated to the buffer pool remains undecided. National insurance data is suggested for assessing region-specific risk of reversal.

Further deliberation required

12. The minimal lifespan of 35 years is regarded as too short by many experts. It is recommended that a longer minimal lifespan should be considered, even if that means that less materials will be eligible for certification.
13. Further deliberation is necessary to identify effective risk mitigation mechanisms aimed at minimising the risk of carbon storage reversal.
14. How can insurance agencies contribute to mitigating financial liability in the event of unexpected carbon release?
15. There is a need for continued discussion on how the certification methodology can incentivise building owners to extend the carbon storage lifespan beyond the minimum requirement of 35 years.

Sustainability

Technical recommendations

16. The minimum sustainability criteria outlined in the EU Taxonomy, having undergone a rigorous process, provide a solid foundation for this certification methodology. Leveraging these criteria ensures coherence with existing regulations, facilitating harmonisation across sustainability standards.
17. Additionally, Article 7 (2) of the provisional CRCF states that carbon removal activities are required to be in compliance with the Renewable Energy Directive (RED), Article 29 of Directive (EU) 2018/2001. Thus, aiming to provide additional safeguards around the protection of biodiversity and ecosystems.
18. The Level(s) framework, specifically Macro Objective 2, Taxonomy criteria and the Construction Product Regulation offer guidance on incorporating circularity into material life cycles.

Further deliberation required

19. Further deliberation is necessary for determining co-benefits.
20. How can stronger guarantees be created to incentivise circularity and the EOL management of biobased construction material?
21. How can alignment with Level(s), that is noted in the EPDB as a reference framework, be ensured without creating administrative redundancies?

Introduction

It should be noted that the information contained in this document reflects the best available knowledge as of March 2024. While updated to the provisional agreement on the establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products (CRCF Regulation) have been incorporated, some adjustments have prompted the need for further deliberation in subsequent phases of the assessment.

2.1 Goal

This document serves to inform the carbon removals expert group on the on the advancements in developing technical advice for certifying long-term biogenic carbon storage in buildings, according to the provisional agreement on the CRCF Regulation. It compiles insights from previous discussion, expert inputs, and analyses of existing methodologies. CRETA's consultants conducted in-depth technical focus groups, engaging a diverse set of experts. While these discussions provided valuable insights, it is important to note that they were independent of CLIMA and may not fully capture the collective opinion of the entire Expert Group. The purpose of this report is to serve as a guide for further discussions on the topic and address open questions.

Each chapter focuses on a quality criterion, outlining and discussing the options to cover the provisions of the CRCF Regulation, noting the best available option while also highlighting questions arising during the review of potential methodologies for application. Many sub-criteria are interconnected across the four quality criteria. Proposed solutions may draw support from other criteria, or issues may already be addressed under different criteria. Conclusions and unresolved questions often reference other sections within the document.

The outcome of this process presents three key points for orientation:

1. **Best available practice:** A best available practice in existing methodologies is provided and explained in further detail. It is crucial to acknowledge that, while these practices represent the current best practice, there is potential for further development and improvement. Instances where refinement is possible are outlined with accompanying explanations.
2. **Ongoing discussion:** This captures the ongoing discourse among experts regarding what constitutes the best practice. Conclusions from the CRETA consultants based on the discussions and review of existing methodologies are presented.
3. **Open questions:** If little or no discussion has taken place, or confusion and a lack of clarity still exists on a particular aspect, this is noted as an open question. Suggestions for potential solutions or comments that were made on the subject are noted. These sections serve as a placeholder for areas where further exploration, research or consensus may be required.

2.2 Context

The provisional agreement on the CRCF Regulation aims to contribute to the EU's climate and environmental goals and aligns with other EU initiatives. In December 2021, the Commission addressed the importance of developing a standard, robust, and transparent methodology for quantifying the potential carbon storage benefits of construction products in the Sustainable Carbon Cycles Communication.

This commitment is reinforced by various Commission initiatives, such as the 2030 Forest Strategy, the revised Construction Product Regulation, the revised Energy Performance in Buildings Directive, the revised LULUCF Regulation, and the New European Bauhaus. These initiatives all refer to promoting long-lasting carbon storage in construction products.

Simultaneously, stakeholder meetings on buildings and construction products consistently express interest in quantification of carbon storage in construction products, in particular in the preparatory work for the development of harmonised standards under the Construction Products Regulation. Several Member States are already (working on) incorporating carbon storage in building codes. This collective effort aligns with the EU's vision for a more sustainable and low carbon construction industry.

2.3 Overview: Concept direction for certification

The European Parliament, as of 10th of April 2024 has adopted the provisional agreement on the Carbon Removals and Carbon Farming (CRCF). This enables the EU to create the first EU based voluntary framework for certifying carbon removals, carbon farming and carbon storage in products across Europe. Once adopted, the legal text will enter into force upon its publication in the EU Official Journal. The next steps will be to establish the means of implementation, including the adoption of EU certification methodologies, third-party verification rules, EU recognition of certification schemes and set-up of EU-wide registry.

Based on the analysis presented in this report, the following conceptual trajectory emerges:

The certification will be on building level and primarily target biogenic carbon stored within construction materials designed for long-term carbon storage. This includes structural (load-bearing) elements, durable bio-based plastics like pipelines and potentially biobased insulation materials, aiming to mitigate the risk of unintended reversal and optimise storage potential. Both renovation and new construction projects will be eligible for certification, with products required to have a minimum lifespan of 35 years. The Commission is also looking into how to acknowledge both temporary and permanent carbon storage on building level, such as carbon sequestration achieved through biochar and mineralisation of concrete.

The CRCF Regulation differentiates between permanent and temporary removal units. This means that temporary units from carbon storage in products expire at end of the relevant monitoring period, unless the monitoring period is renewed, or permanent storage is demonstrated by the operator.

The certification methodology will be determined through a delegated act, with re-certification mandated at least every five years. Integration of certificate verification and monitoring into existing building check-up routines will be pursued.

To prevent unwanted burden shifting and rebound effects, minimum sustainability requirements will be established for projects, materials, and material sources. These will be based on methodologies on rules of existing EU initiatives like the Renewable Energy Directive (RED III), Level(s), a European framework for sustainable buildings, and the EU taxonomy for sustainable activities. Further details on these requirements are available in the sustainability chapter.

Building owners, as the intended recipients of the certified units, can utilise the units in various ways. They can be traded on the voluntary carbon market, utilised to declare the carbon storage indicator in Energy Performance Certificates (based on Article 16 and Annex V of the Energy Performance of Buildings Directive (EPBD)), or employed to substantiate claims regarding carbon storage in alignment with the Corporate Sustainability Reporting Directive (CSRD).

With the revised EPBD allowing building owners to declare the carbon storage capacity of their structures on their Energy Performance Certificate (EPC), they can provide reliable evidence through the CRCF certification methodology for carbon storage in products and related carbon storage in product units. This enables them to demonstrate their buildings' carbon storage capacity transparently. For example, construction companies or property owners investing in long-term sustainable building materials, such as wood-based ones, could earn additional income through the sale of CRCF units.

Carbon removals and carbon storage in the EPBD recast

In alignment with the recast directive, specifically Article 7, Member States are directed to address various aspects concerning new buildings, including carbon removals associated with carbon storage in or on buildings. Moreover, Annex II of the directive outlines the template for national building renovation plans, referring to Article 3, wherein Member States are required to provide an overview of implemented and planned policies and measures, including the reduction of whole life-cycle greenhouse gas emissions for construction, renovation, operation, and end-of-life phases of buildings, as well as the uptake of carbon removals. Additionally, Annex V details the template for energy performance certificates, as referred to in Article 16, which may include information on carbon removals associated with the temporary storage of carbon in or on buildings.

Quantification

3.1 Provisional agreement on CRCF Regulation

This criterium refers to Article 4 (2a) of the CRCF regulation. A carbon removal activity shall be quantified in a relevant, conservative, accurate, complete, consistent, comparable and transparent manner, in accordance with the latest available scientific evidence. As set out and defined in the provisional agreement on CRCF regulation *"carbon storage in products activity shall provide a temporary net carbon removal benefit, which shall be quantified using the following formula"*:

Temporary net carbon removal benefit = CRbaseline – CRtotal – GHGassociated > 0

(a) $CR_{baseline}$ *is the carbon removed under the baseline;*
(b) CR_{total} *is the total carbon removals of the carbon storage in products activity;*
(c) $GHG_{associated}$ *is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation, including indirect land use change, calculated, where applicable, in accordance with protocols set forth in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and any further refinement.*

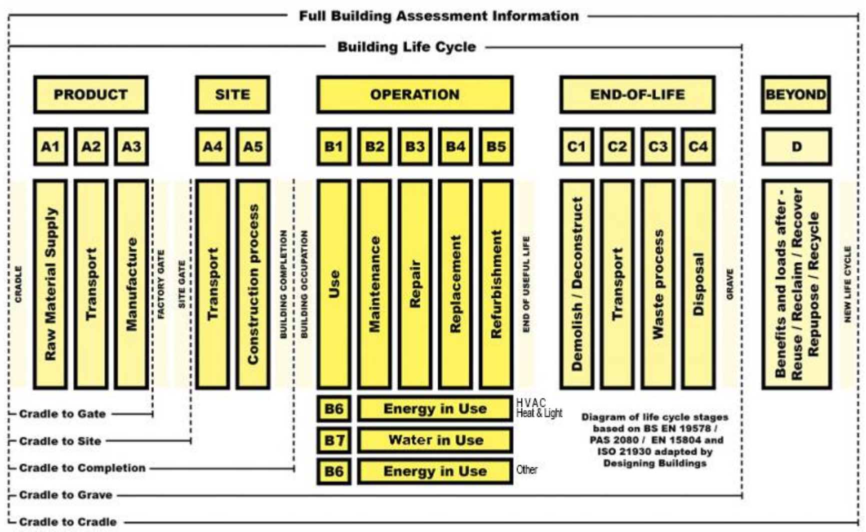
Furthermore the provisional agreement states that *"The baselines shall be highly representative of the standard performance of comparable practices and processes in similar social, economic, environmental, technological and regulatory circumstances and take into account the geographical context including regulatory conditions ('standardised baselines')…. The standardised baselines shall be established by the Commission in the certification methodologies set out in the delegated acts adopted pursuant to Article 8".* However, where duly justified, an operator shall use a baseline that corresponds to the individual, performance of a specific activity ('activity-specific baseline'). In this case, additionality shall be demonstrated through specific tests. Furthermore, the quantification of the carbon removals shall account for uncertainties in a conservative manner and in accordance with recognised statistical approaches. In the delegated act it must prescribed how these variables can be determined. The CRETA activities are the first steps in establishing the best practice of determining these variables. The associated aspects are laid out in the succeeding chapters.

Aspect	Status
Scope of calculations	Ongoing discussion
Quantification of a standardised $CR_{baseline}$	Ongoing discussion
Quantification of an activity-specific $CR_{baseline}$	Ongoing discussion
Quantification of CR_{total}	Best available practice
Quantifying $GHG_{associated}$	Ongoing discussion
Accounting for uncertainties	Ongoing discussion
Including both new buildings and renovations	Best available practice

3.2 Scope of calculations

Ongoing discussion

Definition	The scope refers to the system boundaries for the calculation, which lifecycle stages to include in the calculation and which processes and emissions are included within these lifecycle stages.
Issue	The challenge is to include the relevant stages of the life cycle of the building or construction product. For biobased building materials, particularly important considerations relate to factors such as land use change, transport distances and production process contribute to distinctions. Consequently, a crucial aspect within the certification scheme is determining which parties are allocated the associated GHG emissions. For instance, in Stage A1, the question arises: should forest owners or sawmills be allocated these emissions? Therefore, within life cycle the establishment of clear distinctions or sub-boundaries may be needed for determining the responsibility and ownership of carbon removals and GHG emissions throughout the process. Another consideration emerges when incorporating later stages of the life cycle, such as Phase C in the EN15804/EN15978 standard. If these stages are included, the overall balance reported for storage becomes zero, across the whole life cycle balance. In other words, all the carbon sequestered during the growth phase, stored in the products/buildings, is released at end of their life cycle (i.e. the release of the stored carbon is +/-). This results in negating the benefit of the “temporary” carbon storage.
Objectives	Clearly define which stages of the lifecycle of biobased construction products should be included in the calculation of $CR_{baseline}$, CR_{total}, and $GHG_{associated}$.
Existing, proven certification methodologies	The project scope for assessing the embodied and stored carbon varies in existing methodologies. Roughly, two thirds of the reviewed methodologies include the production stages of bio-based products within their scope. Many of these methodologies focus on the product stages A1-A3, with some extending their scope to include the disposal stage C4. Only a few methodologies include the use phase, mainly the general LCA methodologies rather than the certification methods. No methodology considers the circularity-related stage D as this is considered to be outside the scope .



The following options are not mutually exclusive, a selection must be made in relation to the stages and aspects that will be included in the scope of the calculations.

Options	Pros	Cons
Should the agricultural and forestry practices (A1) be included?	• Biogenic carbon removal from the atmosphere is captured in this stage. If it is not included, biogenic carbon removal as included in EPDs cannot be used to calculate CR_{total}. • Attributable emissions can vary significantly between different biobased resources and land management practices. • Unsustainable forestry and land-use practices would be discouraged by the methodology. • Discourages the exploitation of far-off natural sources with harder-to-verify sustainability certification and emission values. • Closer link with sustainability criteria.	• Might require data inquiry and validation at tier 2 and tier 3 suppliers, increasing effort for data collection and decreasing reliability/comparability. • Might overlap with certification of carbon removal/reduction in forestry and agriculture. • Regarding the scope of $GHG_{associated}$, harvesting emissions for sustainably harvested biomass that adheres to the criteria set out in Article 29 of the Renewable energy directive (RED) might be excluded, to be in line with the RED and the zero-rating of biomass in the ETS[2]. • The availability of other approaches that ensure sustainable land-use (e.g. as a requirement for material eligibility or considering its inclusion within a co-benefit mechanism) might make the inclusion of this stage in $GHG_{associated}$ redundant.
Should transport of raw material (A2) and manufacturing of constructing elements (A3) be included?	• Indirectly incentivises local sustainable sourcing of raw materials and/or sustainable transport.	• Data acquisition and inventory development could be challenging for novel biobased products.

[2] It is important to note that the biomass carbon accounting in RED is based on the UNFCCC inventory principle of counting biogenic CO_2 emissions as zero in industrial inventories because changes in standing biomass carbon stocks are to be dealt with in the land use, land use change and forestry sector.

	• EPD methodology EN15804/EN15978 can be used to uniformly assess direct and indirect emissions from manufacturing methods. • Ongoing EC study into GHG emissions of EU buildings and construction (Ramboll, 2023[3]) caution about the potential for significant emissions and environmental burdens associated with glue and paint use in timber construction. Thus, showing the potential need for inclusion.	• Additional boundary consideration may need to be addressed for recycling and refurbishment.
Should installation of the biobased construction elements in the construction stage of the building (A4 & A5) be included?	• Including transport (A4) incentivises local sourcing of products with (assumed) better oversight of working conditions and production emissions and improvement of local sustainable economic opportunities. • Fossil-based transport of large construction elements can have an impact, although the comparison with conventional construction elements remains uncertain. • Any losses that may occur (of carbon) during installation must also be accounted for otherwise this may lead to system losses unaccounted for and an overestimation of the carbon stored and or the net carbon benefit of the building.	• The stages A4 and A5 are not mandatory to report in an EPD according to EN15804+A2. The EPDs commonly report on a product-level, general values for transport to a construction site and construction-associated emissions cannot be included in these reports. The values for these stages will need to be taken from LCA's of the whole building, preferably studies in accordance with EN 15978. • Distinguishing the point at which a structural construction element is produced from the point where the construction stage begins can be challenging, especially with prefabricated modular biobased elements like walls with insulation and window frames. Determining system boundaries may require additional work. • Identifying which construction activities can be attributed to biobased elements versus conventional elements is challenging, complicating the allocation of associated emissions. Whether this is relevant depends on how $GHG_{associated}$ is calculated. Refer to section 2.5 "Quantification of $GHG_{associated}$ for more on this.
Should the use of the building (B1), specifically the effect of	• Over the lifespan of a building, small differences in, for instance, insulation properties can lead to	• Inclusion of these aspects in the calculation requires data on the operational performance of the

[3] Ramboll (2023) *Analysis of Life-Cycle Greenhouse Gas Emissions of EU Buildings and Construction* https://ec.europa.eu/docsroom/documents/58196

the biobased construction element on resource consumption for heating, cooling, and amenities be included?	significant variations in associated emissions for heating and cooling.	building and assumptions about its use over the lifespan of the building, for both the target building and a representative baseline. This requires extensive effort in data collection and validation. Experts are against including it in the scope. • Other approaches are available to prevent the certification from incentivising unsustainable material choices in these aspects. For instance, certifying only structural construction elements or exclusively certifying buildings with a certain minimal energy performance.
Should the rest of the use stage: maintenance, repair, replacement, refurbishment (B2 – B5) be included?	• Maintenance and repair can lead to significant variations in associated emissions throughout the lifespan of a building. • Actual data on maintenance, repair, and replacement since the initial certification can be integrated in a re-certification process.	• Inclusion of these aspects in the calculation requires assumptions about the lifespan of construction elements and resource consumption in their maintenance for both the target building and a representative baseline. However, these assumptions can be informed through EU projection studies into the maintenance and repair performed on defined building types in various regions in the Union.
Should the end-of-life stages (C1-4) be included?	• Biobased construction elements can undergo different disposal methods, resulting in either a rapid release of stored carbon (through incineration) or a gradual release of carbon over time (via biodegradation, e.g. landfilling). This emission process may generate different GHG emissions (CO, CO_2, CH_4) with different GWPs. Both aspects, release time and GHG type, may have a significant effect on the warming effect in the short term (decades).	• The stored biogenic carbon will be released at end of life. Including this release in the calculation will, per definition lead to no carbon removal benefit to be certified, and therefore, could potentially remove the valorisation potential of time-limited storage of biogenic carbon. • Predicting the end-of-life for building elements becomes challenging, especially without definitive proof of handling after a lifespan exceeding 35 years.
Should the potential recycling or reuse after end of life (D) be included? (cradle-to-cradle)	• Inclusion of the D stage would incentivise cascading use, increasing longevity and recirculation of biobased resources through reusing, recycling and recovery promoting a circular economy.	• Assumptions about the fate of materials or products many years in the future need to be made. • Effort would be required to align such an approach with other policies and directives. • Additional administrative effort would be needed to account for or

	• Designing construction elements with recycling or reuse in mind can be incentivised in the first use cycle. • Under the EU Taxonomy regulation the circularity potential of construction elements are being promoted. Design for reuse and recycling can be included and rewarded through the voluntary sustainability co-benefit mechanism. See further deliberations on this under 'Selection of co-benefits" in the Sustainability chapter.	to audit the inclusion of such elements. •
Technical conclusions	1. It is recommended to adhere to the existing standards (EN15804+A2, EN 15978), emphasising the inclusion when and where necessary to the production phase emissions of A1-A5, (Cradle-to-Completion). 2. Experts have flagged the allocation issues regarding construction emissions of a whole building to biobased construction elements. Despite this challenge, the inclusion of the construction process stage (A5) in the assessment is preferred. As the project developer or building owner will likely apply for the certification, they can be held responsible for all emissions up until the building is delivered. This incentivises emission reductions in transport and construction and captures material losses occurring at the construction site. 3. The current recommendation from experts is to exclude the "C stages and D stages". This recommendation has been justified in two ways. The first relates to the potential cancellation of the biogenic storage potential, as through the inclusion of EOL in the calculations the release of carbon at EOL will, per definition lead to no net carbon removal benefit over the lifetime of the building (e.g. 0/0). The second justification relates to the high uncertainties for quantification of the stored carbon. Predicting the fate of building elements and ultimately quantifying their carbon storage potential in a cascading system or at end of life is currently extremely complex to do robustly, with large uncertainties. Especially for products with lifespans longer than 35 years. Instead, the benefits of using construction elements with increased longevity and life span, as well as with a higher circularity potential for reusing or recycling after the end of life of the building should be included in the minimal sustainability criteria or the co-benefit mechanism. Although, this is a more qualitative approach, to begin with, it may enable a better system of inventorying to be developed that will allow for the future more robust tracking and quantifying of such carbon in these production stages. How this can be included is discussed in chapter "6. Sustainability".	
Open questions	• What should be the cut-off point in the A1 stage between carbon farming and carbon storage in products? Initiating the A1 stage at the extraction point of biobased materials, essentially starting from harvesting for GHG-	

	associated purposes, is proposed. While this approach is suitable for timber sourced from certified origins, it may not universally apply to all biobased materials. Excluding agricultural practices and land use change would be inappropriate for crops specifically cultivated for construction materials such as hemp, flax, and miscanthus. Regarding timber, this recommendation holds true only if the eligibility criterion mandates the use of certified sustainably sourced materials from within the EU. • Should partial rebuilding or refurbishment during the certification period be included in the quantification, even as a conservative assumption? If not, there would be no incentive to enhance the durability of a product.
Next steps	1. Evaluate whether and how GHG emissions from the A1 stage should be included in the calculation of GHG-associated emissions. Consider aligning with Renewable Energy Directive and existing EN standards, while ensuring alignment with other certification methodologies as well, like the biomass production or collection emission calculations for BECCS in the permanent removals methodology. 2. Further assess the appropriate cut-off point in the A1 stage between carbon farming and carbon storage in products. 3. Explore methods for quantifying emissions in the A4 and A5 stages consistently and comparably, especially if not referenced from Environmental Product Declarations (EPDs). 4. Develop a framework for allocating emissions associated with building construction (A5 stage) to biobased construction elements. 5. Determine how best to handle rebuilding and refurbishment in relation to the certification process.
Summary of feedback from the expert group	The expert pool is divided on the scope of the calculations. One part recommends that all life cycle phases should be included to have as complete and precise results as possible. Others would like to simplify the calculations and only included the stages A1-A5 as proposed, or brought additional pro and con argumentation forward to include in this table. There is a near unanimously agreement that the A1 phase emissions should not be excluded, not even when strict eligibility rules are used. This was one of the open questions that was discussed at the Expert group meeting.

3.3 Quantification of $CR_{baseline}$

3.3.1 Quantification of standardised $CR_{baseline}$

Ongoing discussion

Definition	The baselines shall be highly representative of the standard performance of comparable practices and processes in similar social, economic, environmental, technological and regulatory circumstances and take into account the geographical context including regulatory conditions.

	The standardised baselines shall be established by the Commission in the certification methodologies […]. The Commission shall review at least every five years and update, as appropriate, the standardised baselines in light of evolving regulatory circumstances and of the latest available scientific evidence. The updated standardised baselines shall apply only to activities for which the activity period starts after the entry into force of the applicable certification methodology.
Issue	A baseline, '*representative of the standard performance of comparable practices'*, needs to be clearly defined. Decisions must be made regarding the identification of these comparable activities and the functionality they are meant to fulfil. This can be interpreted as either "storage of biogenic carbon in buildings" or "storage of biogenic carbon in an equivalent biobased material, with a lifespan according to a general product pool". Based on the interpretation of the baseline, a method needs to be specified for the operator to calculate or determine a standardised $CR_{baseline}$.
Objectives	An effective method must be established for calculating baseline values that are representative and adaptable to the diverse regions across the EU. These values should be determined and applied by the operator in a relevant, accurate, complete, consistent, comparable, and transparent manner.
Existing, proven certification methodologies	**BBCA - Label Bas Carbone method for new buildings**: Reference values for carbon stored in buildings (in kg CO_2/m^2) are provided for the years 2015 and 2035, across three different building types. The 2035 values are derived through scenario development based on the official national climate strategy, allowing for linear interpolation to calculate reference values for any given year within this range. The baseline can be updated by the authority is needed. **SNK – Method for carbon storage in hemp:** Reference products and an average baseline value (kg CO_2/m^2) are specified, calculated based on material market share. Baseline accuracy is verified every 3 years, without region-specific baselines. **ONCRA - Construction Stored Carbon (CSC) concept version for 2024**: The operator calculates a project-specific baseline, summing up product-level baselines of all biobased elements. Product-level baselines reflect stored carbon after 100 years, following the IPCC half-lives approach, representing materials' stored carbon in an average scenario where they are not used in the building. **Timber Finance Initiative:** Similar to CSC, however the difference is that the baseline doesn't represent the average carbon stored in a typical building. Instead, it reflects the average carbon stored in Harvested Wood Products (HWP) in a scenario where the HWP is not utilised as timber in structural elements but in short-lived products. The methodology defines credible data sources to determine country or region-specific decay rates for HWPs. Timber sourced from vulnerable or fire-prone forests due to climate change has a carbon removal baseline of 0. **Anrechnung der Senkenleistung von Schweizer Holz als CO_2-Kompensationsmassnahme**: This methodology extends beyond timber-based

	construction materials to cover all harvested wood products (wood beams, paper and furniture). Applicants can certify the carbon storage in wood products that are additional to the expected market amount. The baseline is determined from the annual volume of harvested wood products in Switzerland, based on historical official data and market trends. The market situation is reassessed annually. In the event of major changes, the baseline is reviewed by an independent panel of experts and adjusted if necessary.

Options	Pros	Cons
Should the method provide reference values for stored carbon in buildings, the baseline storage factor in kg CO_2/m^2, differentiated across multiple building types and geographic locations? *(Please note that these values are aggregated to the building level.)*	• A straightforward, scalable value results in the lowest possible administrative burden for operators and auditors. • Creates a consistent and comparable calculation for all operators, irrespective of project specifics. • A methodology currently developed by Ramboll, KU Leuven, and others for DG GROW could potentially be used to calculate reference values (Ramboll, 2023). • Such an approach holds the potential to be integrated into building planning processes.	• Relatively high administrative burden across the EU: Requires data collection on material specifics and amounts in multiple regions and across multiple building types. • As market share of biobased materials evolve due to the market or regulations, the reference value can periodically be updated. • Experts have voiced the concern that this type of baseline set per m^2 might incentivise the overuse of resources with the sole goal to increase the carbon storage capacity. Others have pointed out that the potential financial gain from the certificates are not likely to outweigh the additional costs of the materials.
Should the baseline serve as a reference system, indicating the amount of carbon that would be stored in a product pool over a specified time period if the biobased material were not utilised in the targeted building? This quantity could be computed using either UNFCCC half-life rates or predetermined decay rates per material and region.	• Low administrative burden for all parties involved. • Creates consistent and comparable calculation method for all operators. • Flexible approach suitable for various construction elements. • Relatively accurate baseline can be determined for the specific project that will be certified. • Coherent approach with national inventories. • Incentivises redirection of HWP to long-lived products.	• Not in line with CRCF regulation, which requires a baseline of carbon stored in buildings, therefore, cannot be used. • Accuracy depends on how well the set time period matches the lifespan of the building. • Limited material consideration in inventories: Currently, only HWP is considered in national GHG inventories for the UNFCCC; this should be expanded to include more biobased materials and be differentiated across various regions. • For additionality, it must be substantiated that the biobased material used in the building is a redirection of that material used elsewhere.

What are the options to update the baseline over time?	Pros	Cons
Should there be a Revision recalculation of the inventory baseline values at defined intervals? *(every x number of years).*	• Most specific and reliable	• Highest administrative burden for EU. • Demands effective data management capabilities. • Creates uncertainties about the total amount of carbon storage that can be certified for the operator.
Should a present baseline be established and then with projected future baseline, interpolate linearly between the two?	• Simplicity in implementation and maintenance	• Less specific and reliable, as it heavily relies on assumptions. • There is a risk that projected standardised baselines reduce incentives to store biogenic carbon in long-lived products, if the projections are too ambitious.
Technical recommendations	1. 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. Baseline storage factors, expressed in kg CO_2/m^2, need to be determined. Operators will use these factors to compute $CR_{baseline}$, relying on the useful floor area of their projects. Experts recommend utilising accessible tools and basing the figures on transparent studies to establish a strong foundation. The useful floor area (in m^2) is the metric used in the Taxonomy, EPBD, and Level(s) and used in the Ramboll study and methodology that can be used to define baseline figures. 2. The market share of biobased construction elements should be periodically re-evaluated, as mandated by the CRCF Regulation, and the baseline figures for the standardised baseline adjusted accordingly. In the beginning, using projections of an evolving baseline over time is not advisable. 3. Based on the consideration that some Member States are contemplating the implementation of regular inventories and reports on the material composition of new builds and renovation projects, it is recommended to support and facilitate the establishment of such mechanisms. Combining this data with an evolving calculation methodology currently under development holds significant promise in enhancing the precision and timeliness of baseline assessments over time.	
Open questions	• Is there a necessity for future projected baselines, or are periodically updated baselines adequate? If future projections are deemed necessary, what methodology should be employed to ensure their accuracy while managing administrative burdens effectively? • How should the Commission review and update standardised baselines in light of evolving regulatory circumstances and scientific evidence? What criteria should guide this process?	
Next steps	1. Assess the necessity for future projected baselines versus periodically updated baselines. If future projections are required, determine the	

	methodology to ensure accuracy while managing administrative burdens effectively. 2. Establish criteria to guide the process review and update standardised baselines in response to evolving regulatory circumstances and scientific evidence.
Summary of feedback from the expert group	The choice of a standardised baseline over activity-specific baselines is not sufficiently justified. This is due to the fact that in the CRCF additionality is considered to be met when a standardised baseline is used, and the concern that regional differences in baseline calculations will not sufficiently be taken into account.

3.3.2 Quantification of an activity-specific $CR_{baseline}$

Ongoing discussion

The use of a standardised baseline approach is advised. In the case an activity-specific baseline is used, the operator should determine an activity-specific $CR_{baseline}$ in the same fashion as proposed for the standardised baseline. A baseline storage factor with the unit kg CO_2/m^2 must be determined and multiplied with the useful floor area of the building. The operator must determine this factor based on public, verifiable sources. For instance, based on local governmental reports on biobased material use or market statistics of industry organisations, and substantiate why the used sources are recent, reliable, and applicable to the storage activity.

When an activity-specific baseline is used, uncertainty about data reliability can be a cause of concern. It is advised to automatically require the use of a discount factor when the activity-specific baseline is used. Refer to "Accounting for uncertainties in data and calculation" in this chapter for further deliberation on discount factors. Furthermore, the additionality of the storage activity needs to be tested. Refer to the chapter Additionality for additionality tests.

3.4 Quantification of CR_{total}

3.4.1 Best available practice

The best available practice involves using prescribed calculations according to EN15804+A2[4] and EN15978[5] standards used in environmental product declarations (EPDs) for estimating the biogenic carbon flows throughout a product's life cycle stages.

An Environmental Product Declaration (EPD) is a standardised document that provides comprehensive information about the environmental impacts of a product. EPDs are typically based on life cycle assessments and require third-party review. The results of an LCA are

[4] *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.*
[5] *Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method.*

summarised in a standardised template that masks the competition-sensitive information but ensures consistency and comparability of results.

The EN15804+A2 standard outlines how EPDs for construction products should be reported. This standard specifies that the biogenic carbon content of a product should be reported. This carbon content can be multiplied with (44/12) and the characterisation factor of 1 to calculate the equivalent in kilograms of CO_2, as required in the CRCF regulation.

EPDs according to EN15804+A2 also need to declare a functional unit, such as m^2 of flooring, m^3 of insulation material, or '1 product' for prefabricated wall elements. Operators can combine EPD information with the construction project inventory to calculate the total amount of biogenic carbon stored for all biobased construction elements in the building using the formula:

$$CR_{total} = \sum_{i=1}^{n} CR_i * N_i$$

Where:

- CR_{total} is the total carbon removal potential of the carbon removal activity.
- n is the number of biobased construction elements in the building eligible for certification.
- CR_i is the biogenic carbon content in construction element i per functional unit, as of stage A3 (at the factory gate) outlined in the relevant EPD.
- N_i is the number of construction element i in the building (per functional unit as outlined in the EPD).

While EN standards provide a robust framework for quantifying and including biogenic carbon fluxes in the life cycle, there are open questions requiring clarification on sub-system boundaries for stages A1 to A3 and certificate awarding (refer to the 'Quantification of $GHG_{associated}$' section). Additionally, harmonisation of the applied functional unit may be necessary to ensure standardised results.

Summary of feedback from the expert group	CR_{total} should be based on the reported biogenic carbon content in the construction element as reported in EPDs, instead of on the value for 'GWP biogenic" as initially proposed.

3.4.2 Potential data sources

The creation of EPDs for construction elements has become increasingly common, though it is not yet obligatory. The regulation on harmonised conditions for the marketing of construction products (CPR) will require EPD results to be available for a limited selection of products from 2025 onwards, and eventually making it mandatory for all products covered by harmonised standards. Therefore, not all eligible construction products available on the European market might have an EPD according to the standard when the certification methodology is introduced.

To allow operators to quantify the carbon storage in all eligible elements of their projects, some flexibility is required in selecting sources to determine CR_{total}. However, to maintain credibility, the methodology should offer guidance on the types of data sources, their associated data quality and how they can be used and prioritised. Figure 1 shows an example of this practice in the LCBI Certification scheme for new construction.

Priority of use	Type of data	Definition and case of use
1	Product specific EPD	Product specific EPD. The product can be manufactured at different factories but comes from one supplier. Use authorized if the commercial reference of the implemented product is covered by the specific EPD.
2	Average EPD	Represents the average of multiple products from one or more companies provided by industrial associations that cover the product. Use authorized if the commercial reference of the implemented product is covered by the list of commercial references of the average EPD.
3	Generic dataset	Environmental data in accordance with EN 15804 calculated as an average of all manufacturers of this product, representative for a country or region. This type of product data, if available, can always be used, but for more assessment accuracy, it is recommended to use a specific or average EPD when available.
4	Equivalent product EPD	This is a product specific EPD or an average EPD for an equivalent product, with the same technical characteristics and the right geographical scope of application, but it does not cover the exact product (e.g. a different brand).
5	Product specific EPD or Average EPD (other country)	A specific company product or an average EPD for a group of products from one or more companies, based on data from foreign industrial associations. Meaning the application's geographical scope of this EPD does not cover the country or region of the project. These types of data found on foreign databases can be implemented if a lack of data for the product exists on the local database. This data will be relocated by adjusting the hypothesis to the project country, including production, transport, and end-of-life scenarios.
6	Generic dataset (other country)	Environmental data in accordance with EN 15804 calculated as an average of all manufacturers of this product, based on the average of all manufacturers of this product, from another country or region that is transferred to the project's country.

Figure 1: Example of data source prioritisation from LCBI Certification scheme for new construction.

3.5 Quantification of $GHG_{associated}$

Ongoing discussion

Definition	$GHG_{associated}$ is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation, including indirect land use change, calculated, where applicable, in accordance with protocols set forth in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and any further refinement.

Issue	In the first iteration of the proposed regulation this parameter was referred to as $GHG_{increase}$, , this inferred that there was an increase in relation to some baseline. However, in this provisional agreement the parameter has been adapted to $GHG_{associated}$ and this removes some of this confusion. However, the challenge is now to determine what needs to be accounted for within this emission category and how it should be calculated to ensure it aligns with the other emission parameters CR_{total} and $CR_{baseline}$	
Objectives	A method must be defined for operators to calculate $GHG_{associated}$ from baseline GHG emissions values in a relevant, accurate, complete, consistent, comparable, and transparent manner.	
Existing, proven certification methodologies	**Timber Finance Initiative:** Provides country-specific emission factors for common structural elements/materials, subject to periodic revisions. **Riverse - Bio-based construction materials:** Requires a comparative LCA based on EPDs to calculate increased emissions. The operator selects the baseline scenario and justifies its appropriateness for the case. **SNK - Method for determining CO_2 emission reduction and storage in hemp**: Provides default emission factors (kg CO_2eq/m^2) for conventional insulation materials and for the construction of two types of walls using hemp. Benchmark emissions are calculated based on the estimated reduction in the use of conventional materials with similar insulation functionality. **Aureus Earth - Mass Timber Building Protocol:** Calculates carbon avoidance using default emission factors for concrete mixes (kg CO_2eq/m^3), differentiated over strength ranges and US regions, and steel types (kgCO_2eq/kg). The avoided emissions are calculated by estimating the avoided concrete use. **Other reviewed methodologies** do either not include the associated emissions in the quantification or include the total of all associated emissions (within scope), rather than specifically focusing on the increase.	
Options	Pros	Cons
Should the method prescribe a standardised baseline for $GHG_{baseline}$ as an average amount of associated emission per building expressed in kg CO_2 eq./m^2 and differentiated per region and building type, similar to the baseline values given for $CR_{baseline}$.? This $GHG_{baseline}$ is subtracted from the total amount of associated emissions of the building, taken from EPDs of the construction elements, to arrive at $GHG_{associated}$.	• Consistent use of a standardised $GHG_{baseline}$ in combination with a $CR_{baseline}$. • Generates a lot of data on material composition of buildings.	• High administrative burden for operator to determine associated emissions for all constructions element, not only the biobased, based on EPDs. • High administrative burden on the EU and Member States to determine (and update) a $GHG_{baseline}$. • Not accurate when relying on an average value for emissions per m^2.
Should the methodology prescribe default values for both carbon	• Consistent and transparent: One standardised solution for	• High administrative burden for EU and Member States to

storage and GHG emissions for a specified list of materials and common structural elements, differentiated per region? *The operator calculates $GHG_{associated}$, CR_{total} and $CR_{baseline}$ by summing all biobased structural elements. The difference with the previous option is that baseline figures per material are given instead of per building type.*	calculating $GHG_{associated}$, CR_{total}, and $CR_{baseline}$. • Low administrative burden for operators.	generate and update default values for materials and structural elements across different regions. • Limits the standardised approach to the listed structural elements. • This would require the operator to define which and how many 'conventional' structural elements are replaced by biobased elements, to arrive at a baseline. This is an unrealistic representation of how buildings are designed.
Should the operator select their own reference scenario for biobased construction elements and calculates $GHG_{associated}$ as the 'delta' in a comparative LCA? *(within the prescribed system boundaries)*	• Improved accuracy when the operators can choose the most likely market alternative for the construction elements to compare with. • Requires no additional information on the building's composition. • No additional administrative burden on EU. • Can be aligned with international standards for comparative LCA reporting.	• Leaves room for the operators to create unrealistic reference scenarios, resulting in less consistency and comparability among operators. • Increased administrative burden for the operator to create a comparative LCA for each biobased construction element. • Increased administrative burden for auditors to review and scrutinise all comparative LCAs.
Should the $GHG_{associated}$ be determined by calculating the total GHG emissions within scope? *This can be calculated as sum of all GWP values in scope obtained from environmental product declarations (EPDs) of all structural construction elements, utilising EPDs in accordance with EN15804/EN15978.*	• Calculation aligns with international standards. • Relatively low administrative burden for all parties. • Reduces discussions on baseline calculations, fostering trust with more conservative estimates. • Encourages local forestry, short chains, and efficient production by including GWP, which is deducted from storage.	• This was initially not an option, because it was not in line with the regulation, as no 'increase' with respect to a baseline is calculated. But since the $GHG_{associated}$ in the provisional agreement does not imply this increase, this option is valid.
Technical conclusions	1. This aspect requires further discussion. Experts have pointed out issues with deliberated options. An approach must be found that balances a conservative, accurate estimation with the administrative burden.	
Open questions	• What methodologies can be employed to incorporate GHG emissions associated with indirect land use change (ILUC) into the calculation process? • Is it feasible to adopt standard emission factors for ILUC per material type, similar to those outlined for certain biofuel crops in Annex VIII of Directive (EU) 2018/2001?	
Next steps	1. Further explore options for calculation of $GHG_{associated}$.	

	2. Explore methodologies to incorporate GHG emissions associated with indirect land use change (ILUC) into the calculation process.
Summary of feedback from the expert group	The move away from $GHG_{increase}$ was good, as having to create a baseline to create an increase, was regards as too complicated and too uncertain. Therefore, further deliberation is still required on estimations of potential $GHG_{associated}$

3.6 Accounting for uncertainties in data and calculation

Ongoing discussion

Definition	The quantification of temporary carbon storage shall account for uncertainties in a conservative manner and in accordance with recognised statistical approaches. Uncertainties in the quantification of carbon removals shall be duly reported.
Issue	Uncertainties linked to data availability and quality pose challenges in calculating removals and embodied emissions. For insights into liability for uncertainties related to the long-term storage and risk of reversal, refer to the 'Liability' section in the Long-term Storage chapter.
Objectives	As per the CRCF regulation, these uncertainties must be addressed using established and recognised statistical approaches.
Existing, proven certification methodologies	**ONCRA- Construction Stored Carbon:** Uncertainties are disclosed, and in cases where precise data is unavailable, conservative assumptions are employed in calculations. **Anrechnung der Senkenleistung von Schweizer Holz als CO_2-Kompensationsmassnahme:** The applicant must demonstrate that the calculation method and assumptions adopted do not result in overestimation of emission reductions. Where there is a lack of precision, the applicant must implement scientific support measures. **Riverse - Bio-based construction materials**: Riverse staff reviews all applications and may request the operator to allocate 5-15% of the credits in a 'buffer pool'[6] to account for uncertainties. **Low Carbon Building Initiative (LCBI) – by Association BBCA:** LCBI uses a ratings system with stars (1-7) that are granted based on data completeness. Projects with too few stars (<4) are ineligible for certification. Partially incomplete data results in the addition of “lump sums” of assumed emissions to the Embodied

[6] A buffer pool is a certified amount of stored carbon kept aside as ‘insurance’ for the certification scheme. If storage in one project turns out to be lower than expected, the buffer pool can be used to indemnify creditors and maintain the whole certification scheme’s credibility. While a discount is an amount deducted from the estimated amount of stored carbon in a project to reach a conservative estimated amount that can be certified. We propose to use deductions to account for uncertainty in the data and calculation, and a buffer pool to address liability for uncertainty over long-term storage.

	Carbon calculations (a variable equivalent to $GHG_{associated}$). The certificate is rated based on overall carbon performance (embodied, operational, stored), with a higher rating assumed to be more valuable. **Royal Institution of Chartered Surveyors (RICS) - Whole life carbon assessment for the built environment**: Three types of data uncertainty are distinguished; each are assigned a factor in percentages (1-15%). “Contingency factor” evaluates the design's representativeness for the final result. “Carbon data uncertainty factor” assesses the emissions data's representativeness for the actual products. “Quantities data uncertainty” gauges how thoroughly estimated or measured the reported material quantities are. The three percentages are combined to create the WLCA uncertainty factor, added to the total amount as it calculates embodied carbon, not stored carbon.	
Options	Pros	Cons
Should a predetermined, fixed percentage of the total carbon storage be deducted from the certifiable amount?	• Ensures a uniform approach, unaffected by variations in the operator's or auditor's assessment of data uncertainty.	• Not a recognised statistical approach as intended by the CRCF regulation; functioning merely as a predetermined safety margin.
Should a variable percentage of the total carbon storage needs to be deducted to account for uncertainties? *This percentage is based on assessment of uncertainty by the operator, guided by prescribed guidelines or assessment matrices.*	• Rewards efforts to gather the most credible data. • Transparent towards operators on how reliable data gathering efforts are rewarded.	• Depends on operator’s own judgement posing the potential for misuse.
Should the certification auditor determine a percentage of the total carbon storage to be deducted? *The method prescribes guidelines or assessment matrixes to determine this percentage.*	• Rewards efforts to gather the most credible data.	• Depends on auditors’ judgement, with the potential for misuse when auditors distinguish themselves from the competition based on leniency.
Technical conclusions	1. The practice of deducting from the certifiable amount of stored carbon serves as a prevalent method for addressing uncertainties in the data.	
Open questions	• What criteria should be considered in determining the magnitude of deductions from the certifiable amount of stored carbon?	
Next steps	1. Engage in further dialogue with operators and auditors experienced in existing methodologies to weigh the advantages and disadvantages comprehensively.	
Summary of feedback from the expert group	A consistent method should be chosen that makes sure that the calculated amount is conservative and uncertainty related risks are mitigated. The EC3 methodology is proposed as example approach.	

3.7 Inclusion of both new buildings and renovations

Best available practice: Include both.

Experts emphasise the substantial potential for biogenic carbon storage in renovation and retrofit projects, especially when biobased insulation materials are eligible for certification alongside structural elements (Ramboll, 2023). Therefore, it is recommended that both new buildings and renovation projects can apply for certification, provided that the most appropriate scope and calculation methods are implemented for $GHG_{associated}$, $CR_{baseline}$, and CR_{total}. Allowing certification of both new buildings and renovation projects does not require many changes to be made to the methodology.

- If the scope for $GHG_{associated}$ is set to the production and construction stages (A1-A5) of construction elements, this variable can be calculated in the same way for both construction elements in renovation projects and for new buildings.
- If CR_{total} is calculated based on the value of GWP-biogenic from EPDs, representative databases, or similar sources this variable can be calculated for both renovation and new build projects.
- For the calculation method of $CR_{baseline}$ a comparable building can be used as the reference system, a method employed by the Association BBCA. In this scenario, reference values for renovated and retrofitted buildings need to be established, potentially drawing upon the work of Ramboll on European baseline figures, which includes renovated buildings.

Summary of feedback from the expert group	It was noted that carbon storage is only additional when biobased materials in a renovation project are additions to the structure or replace materials that store less or no biogenic carbon.

3.8 Cross-cutting open questions

A cross-cutting issue across all certification schemes (e.g. carbon farming, forestry and storage in biogenic building materials) is the issues relating to potential double counting or failure to include relevant $GHG_{associated}$ emissions, ultimately impacting the net removal values.

Throughout the discussions with the expert groups, the issue of double counting was a recurring concern, presenting challenges at two distinct levels: (1) within the production chain, there is the potential for double counting certified net removals due to unclear system boundaries, (2) at national level, in relation to national inventory reporting (NIR), in the case of stored biogenic carbon, this relates to the risk of potential accounting issues when dealing with the harvested wood products (HWP) pool in national GHG inventories (e.g. double counting).

Additionality

4.1 Provisional agreement on CRCF Regulation

Article 5

Additionality

1. Any activity shall be additional. To that end, it shall meet both of the following criteria:

   (a) it goes beyond Union and national statutory requirements at the level of an individual operator;

   (b) the incentive effect of the certification is needed for the activity to become financially viable.

2. Where the standardised baseline […] is used, additionality as referred to in paragraph 1 is considered to be complied with. Where the activity-specific baseline is used, additionality […] shall be demonstrated through specific additionality tests […] [*to be set out in the relevant EU certification methodology*].

Aspect	Status
How can statutory additionality be safeguarded?	Ongoing discussion
How can financial additionality be safeguarded?	Ongoing discussion

4.2 Safeguard additionality

Ongoing discussion

Definition	A carbon removal activity must be "additional", meaning that it must go beyond both Union and national legal requirements and must be driven by the incentive provided by the certification. When a certification methodology uses a standardised baseline and the project performs better than the standardised baseline, this additionality is considered to be met. If, however, it is decided that an activity-specific baseline shall be used for this certification scheme, additionality must be proven.
Issue	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.
Objectives	The concept of additionality of the carbon storage must be integral to the eligibility rules of the certification. Clear guidelines should be established to assist operators in substantiating and proving the additionality.
Existing, proven certification methodologies	**ONCRA- Construction Stored Carbon:** Statutorily required or (previously) subsidised carbon removals are excluded from the quantification of CR_{total}. A product class of biobased materials or construction elements with a market penetration exceeding 20% is also excluded from the quantification of CR_{total}. Operators must ensure that all biobased materials that are accounted for are not certified under any other carbon removal certification scheme.

	Puro.earth Biobased Construction Materials Methodology: All load bearing engineered wooden elements are considered to be additional, provided their market penetration is below 5%. **Puro.earth Woody biomass burial methodology:** Operators must demonstrate financial additionality by providing full project financials and confirming that the project is not mandated by existing laws, regulations, or other binding obligations. **Riverse - Bio-based construction materials**: The operator must describe current or expected regulations or incentives that promote the project's use of biobased materials and prove that the use is not compelled by regulation. Furthermore, the project must prove its financial additionality by demonstrating either: 1) its lack of profitability, 2) operational financial loss, or 3) the need for additional funding to facilitate short-term expansion. Alternatively, the operator must clarify why the storage activity is not common practice or describe a technological barrier and explain how carbon credit financing would enable the project to overcome this obstacle. **BBCA - Label Bas Carbone method for new buildings:** The operator must review and declare that local regulations do not include mandatory measures and funding relating to carbon storage. This declaration is essential to demonstrate regulatory and financial additionality. **Annex VIII B of Regulation (EU) 2022/996** on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria: Includes a financial attractiveness test that determines whether measures to increase yield in biomass are financially attractive and would have happened without financial incentive of the certification. However, this is specific for biomass production and the added value is determined by subtracting the cost of the additionality measure from the expected income from additional biomass over the investment's lifetime, discounted at a specified rate. A building that contains biobased construction elements is not expected to generate additional income or increase in value.	
The following options are not mutually exclusive, a selection must be made to cover the various forms of additionality.		
Options	Pros	Cons
Should the operator describe applicable regulations and explain how the carbon storage is additional?	• Given the absence of current regulations mandating or incentivising the use of biobased materials for this purpose, this imposes minimal administrative burden on the operator. • Member States can be asked to provide a list of local regulation and financial instruments to promote use of biobased construction elements. This can be used by operator in the application process and by	• The process of describing and aligning with regulations might be intricate and time-consuming for operators.

	auditors in the verification process.	
Should the operator provide project financials and a cost calculation for conventional alternatives to prove financial additionality?	• Low additional administrative burden: Project developers are likely to have cost calculations readily available.	• Increased burden for the auditor to understand and review the complete set of project financials. • Operators may be reluctant to disclose sensitive financial information.
Should the operator explain why the use of the biobased material is not common practice?	• Can be a straightforward explanation when substantiated with market statistics or proof that a the biobased material is applied in a novel way in the building.	• Arbitrary approach that depends on arguments of operator and judgement of auditor. • Does not prove that the material choice is incentivised by the certification. • Verifying claims about common practices might be challenging.
Should market penetration below a specified percentage be considered evidence of additionality?	• Low additional administrative burden on project developer and auditor. • Provides a dynamic and market-oriented approach.	• Does not prove that the material choice is incentivised by the certification. • May not capture immediate shifts in market dynamics, potentially resulting in delayed recognition of additionality. • Market penetration alone may not capture the nuances of individual projects.
Should the mandatory regulatory use of biobased materials and material usage financed through another certification scheme or subsidy be declared and excluded from the calculation of CR_{total}?	• Aligns with the challenge of deterring certification for activities that would occur regardless, ensuring regulatory compliance.	
Technical conclusions	1. Both financial and regulatory additionality need to be covered. If Member States contribute to an exhaustive and searchable list of local regulations and financial instruments that incentivise biobased construction, the requirement for the operator to declare applicable regulation is administratively manageable. Excluding regulatory required or incentivised use of biobased materials from the calculation of CR_{total} is manageable too. 2. Providing project financials and cost calculations for alternatives seems the best approach to prove financial additionality but can be administratively burdensome and is not a foolproof approach to exploitation. 3. It must also be noted that the regulation requires the additionality checks only for certification applications in which an activity-specific baseline is used. It does not seem unreasonable to require additional administrative work for these applications to better ensure additionality. 4. However, experts have expressed reservations, noting that the use of the standardised baseline alone does not ensure that the certification scheme effectively incentivises the use of biobased construction elements and it is not a sufficient approach to test additionality. Therefore, it is suggested that certain additionality checks need to be incorporated into the certification scheme in addition to the use of the standardised baseline.	

Open questions	• How can additionality checks be incorporated in the certification methodology, despite the stipulation in the CRCF regulation that additionality is considered to be complied with when a standardised baseline is used?
Next steps	1. Further explore options to prove and verify financial additionality.
Summary of feedback from the expert group	Proof of additionality in this certification methodology should not only be dealt with through a standardised baseline. Additional additionality checks are needed. The expert group is divided on whether financial additionality for this certification methodology can be proven. On one hand, the historical widespread use of biobased materials (mainly wood) for construction is regarded as proof that it does not need to be incentivised. On the other hand, the current low market share of biobased materials in new buildings shows that it needs to be incentivised, according to others.

Storage, monitoring and liability

5.1 Provisional agreement on CRCF Regulation

Article 6

Storage, monitoring and liability

1. An operator or group of operators shall demonstrate that an activity stores the carbon permanently or aims to store the carbon over the long-term.

2. For the purposes of paragraph 1, an operator or group of operators shall comply with both of the following criteria:

(a) they shall be subject to rules to monitor and mitigate any identified risks of reversal occurring during the monitoring period;

(b) they shall be liable to address any reversal of the carbon captured and stored by an activity, occurring during the monitoring period, through appropriate liability mechanisms as set out in the delegated acts adopted pursuant to Article 8.

(2a) The monitoring rules referred to in paragraph 2, point (a), shall:

(c) for carbon farming and carbon storage in long lasting products, be set out in accordance with the rules laid down in the certification methodologies set out in the delegated acts adopted pursuant to Article 8.

(2b) The liability mechanisms referred to in paragraph 2, point (b), shall:

(c) for carbon storage in long lasting products and for carbon farming, be set out and duly justified in the applicable certification methodology and may include up-front insurance or collective buffers.

The conditions outlined in Article 6(1) can be translated into eligibility requirements, specifying that only biogenic carbon storage within structural construction elements and insulation materials can be certified. It is determined that eligible construction elements must have a minimal expected lifespan of 35 years.

Article 6 in the first iteration of the proposed regulation was referred to as "Long-Term storage"[7]. In the provisional agreement, this article has now been adapted to reflect the discussions and feedback from the experts and to reflect the temporal nuances of the different certification schemes. Additionally, it must also be noted here, that there was a general consensus among the experts that the use of dynamic life cycle assessment approaches was too complex to account for the long term effects of carbon storage in biobased building materials. Furthermore, the experts agreed that it did not bring additional value to the more commonly used conventions for estimating global warming potential, for example, the global warming potential of carbon at 100 years is 1 kg $CO_{2\,eq}$ (i.e. a characterisation factor of 1 at 100 years).

Aspect	Status
Monitoring interval	Best available practice
Liability for unplanned release of carbon	Ongoing discussion
Inclusion of risk mitigation in certification	Open question
Partial rebuilding or refurbishment during certification period	Best available practice

[7] It was the "L" part of the QuALITY criteria of the proposed underlying framework.

Incentive to prolong storage time	Open question

5.2 Monitoring interval

Best available practice

A monitoring protocol needs to be developed, specifying the interval at which it should be checked whether the certified carbon remains stored within the building. The provisional agreement on the CRCF regulation mandates that all activities undergo periodic re-certification audits at least once every five years. This cadence is considered adequate for monitoring biobased construction products, particularly when eligibility is restricted to structural elements and insulation materials. For clarification purpose – this phase of the certification process refers to the operational phase of the building (i.e. B1-B5).

Summary of feedback from the expert group	The experts are divided on the required monitoring interval. One part would like an annual monitoring, while other mentioned that a five-year interval is too short. If the certification is limited to products that can reasonably be expected to last the entire lifetime of the building, a five-year interval should be sufficient.

5.3 Liability for unplanned reversal

Ongoing discussion

Definition	An operator or group of operators shall be subject to appropriate liability mechanisms in order to address any release of the stored carbon occurring during the monitoring period.
Issue	Risks such as fire or premature demolition pose threats to the stored carbon but also to the credibility of the certification. Climate-related risks, such as fires, floods, and other extreme weather events should be addressed, especially since these risks increase non-linearly alongside rising global temperatures. For insights into liability for incorrect quantification of the net carbon removal benefits, refer to the 'Accounting for uncertainties' section in the Quantification chapter.
Objectives	Liability mechanisms designed to indemnify certificate holders in case of unplanned reversal.
Existing, proven certification methodologies	**Puro.earth Biobased Construction Materials Methodology:** A 'buffer pool' is integrated into the methodology to account for uncertainties about loss after production and other potential losses. The standard percentage for this buffer is set at 10%, subject to adjustment by the auditor. **Verra VCS Standard:** Using a risk assessment with a 'non-permanence' risk tool is required. This tool determines the number of credits to be deposited

	in a buffer pool (specifically for agriculture, forestry, and other land use projects). **Riverse - Bio-based construction materials:** A standard 10% of the credits is reserved in a 'provisions pool' to mitigate identified risks. **BBCA - Label Bas Carbone method for new buildings:** A 10% discount on the total stored amount (equivalent to CR_{total}) is applied to cover all risks associated with the project. The liability mechanisms listed below are similar to the approaches to deal with data uncertainty in the quantification of the net carbon removal benefit. However, unlike discounts, these methodologies exclusively utilise solutions involving a 'buffer pool.' This pool represents a certified amount of stored carbon set aside as 'insurance' for the certification scheme. In the event of unintentional reversal in one project, the buffer pool can be leveraged to indemnify creditors and maintain the overall credibility of the certification scheme. This stands in contrast to discounts, which deduct an amount from the estimated stored carbon, providing a conservative certification estimate but lacking the ability to address the problem when it occurs.	
Options	Pros	Cons
Should a set percentage of the total certified units be allocated to a buffer pool?	• Consistent approach, irrespective of the operator's or auditor's risk assessment.	• May be considered a blunt approach, necessitating clarification regarding the basis for determining the percentage.
Should a varying percentage of the total certified units need to be placed in a buffer pool? *This percentage is contingent upon the operator's risk assessment. The method provides guidelines or assessment matrices to ascertain this percentage.*	• Transparent for operators, outlining how risks are evaluated.	• Increases administrative complexity for operators. • Depends on the operator's own judgement, posing the potential for misuse.
Should the certification auditor allocate a percentage of the total certified units to a buffer pool, guided by prescribed methods and assessment matrices?	• Combines project-specific risks with independent judgement.	• Increases administrative complexity for both the operator and auditor.

Technical conclusions	1. After reviewing existing methodologies, no specific liability mechanisms were found, except for buffer pools used as 'insurance' against unplanned releases. Experts hesitated on the suggested buffer pool of 5-10%, fearing it could reduce certification incentives and hinder biobased product use. To mitigate this issue, a proposed solution involves leveraging national insurance data to assess the region-specific risk of reversal. By incorporating such data, a more tailored and nuanced approach to establishing buffer pools can be achieved. This ensures risk mitigation without dampening certification motivation.
Open questions	• What factors should be taken into account when determining the ideal percentage or range of percentages for a buffer pool? • It needs to strike a balance between adequately covering potential losses from unplanned releases across the certification program while also maximising incentives for certification and the adoption of biobased construction materials. How can we ensure that this balance is achieved effectively?
Next steps	1. Alternative options for liability mechanisms must be explored in a next stage of the assessment. One proposed option is to investigate the feasibility of establishing insurances through insurance agencies to cover the financial liability for unplanned reversal of carbon storage. This entails conducting further research into the practicality, cost-effectiveness, and potential benefits of this approach to determine its viability for implementation.
Summary of feedback from the expert group	The use of buffer pools, and alternatives to buffer pools, should be further examined. It was proposed to require companies to report on certification credit units that expire each year to increase transparency on planned and unplanned reversal.

5.4 Risk mitigation

Open question

Unplanned release risks, such as fire or premature demolition, pose threats to the long-term stored carbon. Mitigation and prevention plans must be in place to reduce the risk and impact of such unplanned releases from a completed building project. Two examples from existing certification schemes were found. Both use a list of potential risks that need to be considered by the operator (explained below). The liability for unplanned reversal has been discussed however, an open question remains about which risk mitigation mechanisms are best to use and therefore, this requires further deliberation.

The Puro.earth Woody biomass burial methodology addresses risks within the certification eligibility rules by employing a risk and mitigation matrix. Some identified risks lead to eligibility requirements to the projects for certification. Others need to be considered in a ‘risk mitigation plan’ that needs to be delivered when applying for certification. The identified risks and mitigation strategies, initially designed for biomass burial, are partially applicable to carbon storage in construction products.

The Riverse methodology bio-based construction materials requires an evaluation of the risk of reversal using a prescribed format that outlines potential causes and their likelihood. The operator has to indicate the level of risk for each potential threat with a number, scaled from 0 (no risk at all) to 10 (high risk). In the certification process the operator is required to deliver a risk assessment that includes the results.

5.5 Partial rebuilding or refurbishment during certification period

Best available practice

Concerning monitoring and liability, experts have raised questions regarding how the refurbishment or partial rebuilding of a construction project during the certification period would be addressed.
The expert feedback indicated that these activities should not fall within the scope of $GHG_{associated}$, as outlined in the Quantification chapter. This decision stems from the inherent difficulty in accurately predicting and quantifying the repair, refurbishment, and replacement of parts over the building's lifespan.

The concerns raised by the experts were not about accurate quantification, but about the issuance of certificates for theoretically stored carbon that might be released in practice due to replacements during the certification period. To mitigate this risk, the use of time-limited certificates is incorporated in the CRCF regulation. To further safeguard against this risk, provisions can be included in the delegated act, stipulating that eligibility is restricted to structural elements and any removal of biobased elements included in the certification would automatically trigger certificate withdrawal, necessitating recertification.

5.6 Incentive to prolong storage time

Open question

Further discussion is needed on how to incentivise building owners through certification to extend the storage of carbon in a building beyond the minimum requirement of 35 years. The aim of the certification is to encourage and facilitate the long-term storage of biogenic carbon in construction products. The provisional agreement limits the eligibility to biobased construction products with a minimum lifespan of 35 years and implements time-limited certification. Re-certification audits will occur at least every 5 years. This strategy ensures a climate benefit over the 35-year storage period and includes monitoring as frequent as the certification period, providing assurance of the stored carbon during re-certification.
However, under this approach, project developers or certificate holders do not gain any advantage from a storage time exceeding the 35-year minimum. This has led to the exploration of how the certification mechanism can incentivise even longer storage times.

One potential solution is to gradually release certificates from a buffer pool over time after the initial 35 years, rewarding building owners for extended lifespans. Alternatively, additional value could be assigned to certificates for projects with a lifespan exceeding 35 years through the co-benefits mechanism. Differentiation in minimal lifespan per function of the elements in the building has also been proposed. Structural elements would need a longer lifespan, while for instance insulation materials would need the minimal lifespan set in the provisional agreement. Various approaches can be developed and evaluated to prevent unintended consequences.

Summary of feedback from the expert group	The minimal lifespan of 35 years is regarded as too short by many experts. It is recommended that a longer minimal lifespan should be considered, even if that means that less materials will be eligible for certification.

Sustainability

6.1 Provisional agreement on CRCF Regulation

Article 7

Sustainability

1. An activity shall not significantly harm and may generate co-benefits for one or more of, the following sustainability objectives:
   (a) **climate change mitigation** beyond the net carbon removal benefit and net soil emission reduction benefit referred to in Article 4(1) and (1a);
   (b) climate change adaptation;
   (c) **sustainable use and protection of water and marine resources**;
   (d) **transition to a circular economy**, including the efficient use of sustainably sourced bio-based materials;
   (e) **pollution prevention and control**;
   (f) **protection and restoration of biodiversity and ecosystems** including soil health, as well as avoidance of land degradation.
2. For the purposes of paragraph 1 of this Article, an activity shall comply with minimum sustainability requirements laid down in the certification methodologies set out in the delegated acts adopted pursuant to Article 8. The minimum sustainability requirements shall take into account the impacts both within and outside the Union and local conditions. **Those minimum sustainability requirements shall, where appropriate, be consistent with the technical screening criteria for the 'do no significant harm'** principle. **The minimum sustainability requirements shall promote the sustainability of forest and agriculture biomass raw material in accordance with the sustainability and GHG saving criteria for biofuels, bioliquids and biomass fuels laid down in Article 29 of Directive (EU) 2018/2001**.
3. Where an operator or group of operators report co-benefits that contribute to the sustainability objectives referred to in paragraph 1 beyond the minimum sustainability requirements referred to in paragraph 2, they shall comply with the certification methodologies set out in delegated acts referred to in Article 8. The certification methodologies shall incentivise as much as possible the generation of co-benefits going beyond the minimum sustainability requirements, in particular for the objective referred to in paragraph 1, point (f).

Aspect	Status
Minimum sustainability requirements	Ongoing discussion
Selection of co-benefits	Open question
Incentivise generation of co-benefits	Open question
Monitoring of minimal requirements and co-benefits	Open question

6.2 Minimum sustainability requirements

The CRCF Regulation requires the certification methodology to implement minimum sustainability requirements across the six environmental objectives of the EU Taxonomy. These requirements establish the basic standards a project must meet to be eligible for certification. They serve as safeguards, ensuring carbon removal activities are conducted without causing significant harm to the environment, thereby supporting the objectives of the Taxonomy Regulation.

The minimum sustainability criteria outlined in the EU Taxonomy, having undergone a rigorous process, provide a solid foundation for this certification methodology. Leveraging these criteria ensures coherence with existing regulations, facilitating harmonisation across sustainability standards. Thus, ensuring the best available safeguards. Additionally, Article 7 (2) of the provisional CRCF states that carbon removal activities are required to be in compliance with the Renewable Energy Directive (RED), *Article 29 of Directive (EU) 2018/2001*. Thus, aiming to provide additional safeguards around the protection of biodiversity and ecosystems. Further alignment with the 'Do No Significant Harm' (DNSH) criteria from the Taxonomy and the macro-objectives from the Level(s) framework, alongside the safe guards outlined in *Article 29 of Directive (EU) 2018/2001 REDIII,* should be explored.

DNSH criteria

The DNSH criteria mandate that an economic activity should do no significant harm to any of the six environmental objectives of the EU Taxonomy to be considered sustainable. Annex II of the Taxonomy Regulation provides technical screening criteria for different economic activities, including the construction of new buildings and renovation of existing buildings[8]. These criteria assess whether activities contribute to the EU's transition to a circular economy while avoiding significant harm to other environmental objectives. In this context, the screening criteria function as a minimum threshold to be met.

A table summarising the Technical Screening Criteria (TSC) for construction, as outlined in the Taxonomy Regulation, per minimum sustainability criteria of the CRCF is provided below.

[8] These are defined as NACE codes, for new builds: F41.1, F41.2 and F43 and for renovations F41, F43

Criteria	*Technical Screening Criteria (TSC) for construction (summary)*
Climate change mitigation	***New builds and Renovations:*** The building must not be used for the extraction, storage, transport or manufacturing of fossil fuel. ***New builds*** *:* The building's primary energy demand (PED) must comply with the Energy Performance of Buildings Directive (EPBD; EU/2010/31).
Climate change adaptation	***New builds and Renovations:*** While no specific Technical Screening Criteria (TSC) for buildings are provided, DNSH principles require building designs and construction to address resilience to climate change impacts, such as reducing the urban heat island effect, as outlined in Annex II, Appendix A.
Sustainable use and protection of water and marine resources	***New builds and Renovations****:* Many TSCs focus on the water use efficiency of appliances during the building's use phase (B1-B5). Relevant criteria are in the Commission Delegated Regulation (EU) 2021/2139, Annex 1 Appendix E. ***New builds:*** For construction sites, generic DNSH criteria (Annex II, Appendix B) apply. These ensure water quality, ecological potential, and compliance with the Water Framework Directive and Marine Strategy Framework Directive, alongside Commission Decision EU 2017/848.
Transition to a circular economy	This is a key criterion, with clear TSCs for both new buildings and renovations, summarised below. For more details, refer to the Taxonomy Regulation. ***Newbuilds:*** All construction waste generated on site must comply with the EU waste legislation. At least 90% of non-hazardous waste (by mass) generated on site must be prepared for reuse or recycling. ***Renovations:*** At least 70% of non-hazardous waste generated on site must be prepared for reuse or recycling. ***Newbuilds:*** Life cycle Global Warming Potential (GWP) must be calculated for each life cycle stage. ***Renovations:*** Life cycle GWP must be calculated from the point of renovation. **Newbuilds and Renovations:** The design and building techniques should support circularity through adaptability and deconstruction concepts, as per Level(s) indicators 2.3 and 2.4. ***Newbuilds:*** The use of primary materials must be minimised by incorporating secondary raw materials wherever possible. Different maximum allowable percentages apply for primary raw materials, depending on the building material. For bio-based products, the maximum

	permissible use of primary raw materials is capped at 80%. ***Renovations:*** A maximum of 90% of the material may come from primary raw materials. ***Newbuilds:*** Operators must use electronic tools, like EN ISO 22057:2022, to describe the building's materials and components for future maintenance and reuse, with Environmental Product Declarations (EPDs) required.
Pollution prevention and control	**Newbuilds and Renovations:** Building materials must comply with TSCs in Annex II, Appendix C. These mostly involve the avoidance of chemicals covered by regulations such as REACH (1907/2006), and the exclusion of persistent organic pollutants, mercury/mercury compounds, ozone depleting substances.
Protection and restoration of biodiversity and ecosystems	For these criteria a summary is provided. Please read the Taxonomy Regulation for more details. This is applicable to ***New builds*** only. *" The new construction is not built on one of the following:* *(a) arable land and crop land with a moderate to high level of soil fertility and below ground biodiversity as referred to the EU LUCAS survey(94);* *(b) greenfield land of recognised high biodiversity value and land that serves as habitat of endangered species (flora and fauna) listed on the European Red List(95)or the IUCN Red List(96);* *(c) land matching the definition of forest as set out in national law used in the national greenhouse gas inventory, or where not available, is in accordance with the FAO definition of forest(97)."* The activity must also comply with the generic TSC in Annex II, Appendix D.
1. *For the purposes of the Delegated Act, 'secondary raw materials' are those prepared for reuse or recycling under Article 3 of the Waste Framework Directive and are no longer considered waste under Article 6 of the same Directive.*	

Renewable Energy Directive

Article 7(2) of the CRCF Regulation notes that biomass utilised for the activity shall comply with the sustainability requirements detailed in Article 29 of the RED III. This means that minimum sustainability requirements shall promote the sustainability of forest and agriculture biomass raw material in accordance with the sustainability and GHG saving criteria for biofuels, bioliquids and biomass fuels laid down in Article 29 of Directive (EU) 2018/2001.

Building on the Taxonomy's Technical Screening Criteria (TSC) for sustainability, the Renewable Energy Directive (RED) introduces stricter safeguards for protecting biodiversity and ecosystems. The RED sustainability rules prohibit harvesting in areas with high-biodiversity land (Article 29(3)), high-carbon stock (Article 29(4)), peatland (unless it is proven that cultivation does not involve the drainage of undrained soil) (Article 29(5)). Furthermore, the harvesting must adhere to legal standards outlined in Article 29(6), namely ensuring the legality of harvesting operations, forest regeneration & long-term productivity, protection of soil quality, biodiversity & protected areas and sustainable management systems at the forest level when national or sub-national laws are not available. Similarly, Article 29(7) sets land-use, land-use change, and forestry (LULUCF) criteria, requiring countries of origin to comply with the Paris Agreement and properly account for carbon stock changes, ensuring that reported LULUCF-sector emissions do not exceed removals."

While forestry certification systems like FSC and PEFC are well-established, certification systems for non-forestry-based biobased products are less well-known. Several certification systems exist for biomass, including ISCCplus, RSB or Better Biomass[9]. These systems, which incorporate guidelines from RED III and ISO 13065/EN 16751, could be applied to biobased construction products. However, differing sustainability criteria, targets, and thresholds across these systems mean further work is needed.

Level(s)

Level(s) is a European framework designed to promote sustainable building design, construction, and performance across the EU. It is a voluntary assessment and reporting tool that evaluates the sustainability of buildings during their construction, renovation, and operational phases. The framework is structured around six macro-objectives:

1. GHG emissions from a building's life cycle
2. Resource-efficient and circular material life cycles
3. Efficient water resource use
4. Healthy and comfortable spaces
5. Adaptation and resilience to climate change
6. Optimised life cycle costs and value

These macro-objectives closely align with the "Do No Significant Harm" (DNSH) principles. While Level(s) is voluntary and does not set specific targets, it provides indicators and methodologies for assessing each objective. The framework can be applied at different development phases, referred to as "levels." It can be used during:

- **Level 1**: The design phase to assess the basic conceptual design.
- **Level 2**: The detailed design and construction phase, where quantitative assessments and construction monitoring occur.
- **Level 3**: After completion, to evaluate the building's performance "as-built and in-use."

This phased approach allows for continuous assessment and improvement throughout the building's life cycle.

[9] For further details on potential standards, please visit the EU project site SUSTCERT4BIOBASED, where various options and opportunities for enhancing transparency and accountability in biobased systems are explored. This resource also provides information on the different Chain of Custody (CoC) options offered by certifying bodies. Notable examples include the **International Sustainability and Carbon Certification (ISCC)** and the **Roundtable on Sustainable Biomaterials (RSB)**, which are both widely recognized for their rigorous sustainability criteria.

Increasing transparency with digital product passports
To improve transparency, experts suggest aligning biobased construction elements with the Ecodesign for Sustainable Products Regulation. The provisional agreement for Harmonised Conditions For Marketing Construction Products (CPR) mandates Digital Product Passports (DPP) for construction products from 2028 onwards. This would increase traceability and transparency, making it easier to evaluate compliance with minimum sustainability criteria.

Circularity and End-of-Life (EOL) considerations
Another crucial pillar of the sustainability criteria is ensuring the circularity and end-of-life (EOL) management of biobased building materials. This involves guaranteeing that materials can be recycled or reused after their minimum 35-year lifespan, with landfill or incineration being used only as a last resort.

The EU Circular Economy Action Plan provides several legislative tools and instruments to support these circularity goals, including:

- **Taxonomy Regulation**: Sets minimum criteria to ensure construction waste is reused or recycled rather than sent to landfill or incineration.
- **CPR Regulation, Annex 1.7**: Sustainable use of natural resources, stipulates that *".. construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following:(a) reuse or recyclability of the construction works, their materials and parts after demolition; (b) durability of the construction works; (c) use of environmentally compatible raw and secondary materials in the construction works".*
- **Level(s) Framework**: Macro Objective 2 on resource-efficient and circular material life cycles[10] offers guidance for incorporating circularity and EOL strategies into the CRCF framework, particularly at the design phase. Key indicators include:
    - Indicator 2.2: Construction and demolition waste and materials.
    - Indicator 2.3: Design for adaptability and renovation.
    - Indicator 2.4: Design for deconstruction, reuse, and recycling.

Key ongoing discussions
1. **How can stronger guarantees be created to incentivise circularity and the EOL management of biobased construction material?**

2. **How can alignment with Level(s), that is noted in the EPDB as a reference framework, be ensured without creating administrative redundancies?**

6.3 Reporting of co-benefits

The reporting of co-benefits is outlined in Article 7(3) of the provisional agreement, which states: "Where an operator or group of operators report co-benefits that contribute to the sustainability objectives referred to in paragraph 1 beyond the minimum sustainability requirements referred to in paragraph 2, they shall comply with the certification

[10] The scope and focus of this Macro Object is as follows: "Actions at building level with a focus on material efficiency and circular utility. This shall encompass actions along the life cycle relating to: 1) building design, 2) structural engineering and construction management, 3) construction product manufacturing, 4) replacement cycles and flexibility to adapt to change, and 5) the potential for deconstruction. The overall objective shall be to optimise material use, reduce waste and introduce circularity into designs and material choices."

methodologies set out in delegated acts referred to in Article 8. The certification methodologies shall incentivise as much as possible the generation of co-benefits going beyond the minimum sustainability requirements, in particular for the objective referred to in paragraph 1, point (f)". (Protection and restoration of biodiversity and ecosystems)

Open question

During the expert discussions, several co-benefits were suggested for inclusion. However, the reporting of co-benefits for the projects is a crucial step that still remains to be determined. Inspiration can be drawn from existing certification methodology, e.g. LBBC, Riverse or ISPCCplus. When determining the co-benefits, the goal is to ensure that they contribute to the six sustainability objectives and demonstrate efforts that go beyond the minimum requirements.

Further expert discussion is needed to reach a consensus on key questions: **Which co-benefits should be prioritised?** and **How can they be effectively aligned with the minimum sustainability criteria to promote more sustainable practices in the building sector?**

6.5 Monitoring of minimum sustainability requirements and co-benefits

Open question

In addition to monitoring carbon storage, it is crucial to track minimal sustainability requirements and co-benefits throughout the activity period. The CRCF regulation specifies that the carbon storage should allow for on-site monitoring. How can monitoring of these requirements and co-benefits be included in the regular monitoring process? The two existing certification methodologies mentioned earlier, which already incorporate a co-benefit mechanism, offer insights into how sustainability requirements and co-benefits can be effectively monitored.

Riverse - Bio-based construction materials

The Riverse staff determines a reporting frequency for each project, ranging from every 3 months to once a year. Operators are required to update progress on co-benefits through an online portal. This approach is suitable for sustainability objectives that evolve over the monitoring period, such as the gradual restoration of biodiversity in the area of the construction project, measurable over time.

Association BBCA - Label Bas Carbone method for new buildings

The indicators are documented in a monitoring report, which is subsequently submitted to an auditor. The validation of these indicators, along with the necessary supporting evidence, is carried out by an auditor during the verification of emissions reductions. The audit is performed once, initiated at the earliest upon the building's completion and concluding no later than two years post-completion. This method is particularly fitting for sustainability objectives that remain constant, such as achieving a minimum or threshold whole building embodied carbon value.

Glossary

Activity period	Period over which the carbon in stored in the construction elements in the building.
Avoided carbon	Avoided carbon refers to the reduction in greenhouse gas emissions achieved when low-carbon products replace more emission-intensive materials. This is commonly referred to as the substitution effect.
CRCF	Carbon Removals Certification Framework (CRCF) is a legislative initiative within the European Union that defines and formulates methodologies for certifying carbon removals.
DG GROW	Directorate-General of the EU for Internal Market, Industry, Entrepreneurship and SMEs
Embodied carbon	Embodied carbon encompasses greenhouse gas emissions resulting from the production, usage, and disposal of a construction element over its lifecycle.
EN15804+A2	European norm for Environmental Product Declarations (EPDs) core rules for the product category of construction products.
EN15978	This European Standard specifies the calculation method, based on Life Cycle Assessment (LCA) and other quantified environmental information, to assess the environmental performance of a building, and gives the means for the reporting and communication of the outcome of the assessment. The standard is applicable to new and existing buildings and refurbishment projects.
EPD	Environmental Product Declaration (EPD) is a standardised document quantifying environmental information on a product's life cycle, facilitating comparisons between products with similar functions.
GHG	Greenhouse Gas (GHG) is a collective term for gases that trap heat in the Earth's atmosphere, contributing to the greenhouse effect.
GWP	Global Warming Potential (GWP) measures the heat-trapping capability of greenhouse gases over a specified time period, usually 100 years. It is a key metric used in climate change assessments and comparisons between different gases.
GWP-biogenic	The GWP-biogenic indicator, used in Life Cycle Assessments (LCAs) and EPDs, measures CO_2 absorbed by biomass and CO_2 equivalent greenhouse gas emissions from stored biogenic carbon.
GWP-luluc	The GWP-luluc (Global Warming Potential from Land Use and Land Use Change) measuree the greenhouse gas emissions and removals associated with changes in land use, forestry activities, and other land management practices

LCA	A life cycle assessment (LCA) is a systematic methodology that evaluates all stages of a product's life, including extraction, production, transportation, use, and disposal.
Monitoring period	Period over which the storage of carbon is monitored by an operator as determined in the certification methodology
Operator	Any legal or natural person or public entity who operates or controls the storage activity, or to whom decisive economic power over the technical functioning of the activity has been delegated. In this specific case: project developer or building owners who apply for certification.
PEF	The Product Environmental Footprint is a standardised LCA methodology developed by the EU's Joint Research Committee as a common way of measuring environmental performance of products.
Scope	"Scope" refers to the different stages of the building process defined in standard EN 15804 that the methodology aims to encompass.
SDGs	Sustainable Development Goals (SDGs) are a set of 17 goals established by the United Nations to promote peace, prosperity, and sustainability for people and the planet.
Stored carbon	In this context, stored carbon refers to the biogenic carbon sequestered by natural processes in materials, remaining locked within bio-based construction products throughout the building's lifespan.
WLC	Whole Life Carbon (WLC) represents the combined total greenhouse gas emissions of embodied and operational emissions over the entire life cycle of a building.