Requirements on Global Biochar C-Sink Projects for EU-CRCF Compliance

Preamble

The EU Carbon Removal and Carbon Farming Regulation (EU-CRCF) — formally Regulation (EU) 2024/3012 of the European Parliament and of the Council of 27 November 2024 establishing a certification framework for permanent carbon removals, carbon farming and carbon storage in products[1] — establishes an EU-wide, voluntary certification framework. It applies to permanent CO_2 removal, carbon farming, and CO_2 storage in products, for projects located within Europe. Its goal is to harmonize the market and establish uniform quality and trust standards across the EU. The EU-CRCF is expected to become the de facto reference framework for quality in the European carbon sink market.

Aim of the document

To be compliant with EU-CRCF regulations and get the respective Label in the Global C-Sink Registry C-Sinks certified under Carbon Standards International's Global Biochar C-Sink Standard must meet additional requirements, and in some cases, not the full range of options available under the Global Biochar C-Sink applies. This document sets out to provide clarity on these additional requirements and limitations.

[1] https://eur-lex.europa.eu/eli/reg/2024/3012/oj/eng

1. Additional aspects and terminology

1.1. Terminology

Global C-Sink Standards	EU-CRCF
Project	Activity
Activity proponent	Operator
Validation and verification body	Certification body
Validation	Certification, certification audit
Project verification	Re-certification, recertification audit
Re-validation	Corresponds to: Certification of new activity
Project Design Document (PDD)	Covers aspects of: Activity plan and monitoring plan
C-Sink verification	Monitoring audit
Validity period of PDD (5 years, see Principles document Ch. 6.6)	Activity period

1.2. Certificate of compliance

Projects adhering to EU-CRCF receive a certificate of compliance at their validation (certification) in case of a positive outcome. This certificate gets renewed at project verification (re-certification). In case of a failure of the annual project verification, the certificate gets withdrawn (see Ch. 1.3., withdrawn certificate).

1.3. Inactive projects

In case of projects in line with EU-CRCF, the certificate of compliance of an inactive project are deemed either terminated, withdrawn or expired:

Terminated certificate

The certificate of compliance is referred to as 'terminated', if the certificate was voluntarily cancelled while it was still valid.

Withdrawn certificate

The certificate of compliance is referred to as 'withdrawn', if the certificate was permanently cancelled by CSI or the VVB (Certification body).

Expired certificate

The certificate of compliance is referred to as 'expired', if the certificate is no longer valid and the project has not been re-validated after the end of the activity period.

See also Ch. 6.4.7. of Principles of Global C-Sink Standards for further information on the definition of inactive projects. Activity proponents with a withdrawn, terminated or expired certificate will be labelled as such and listed on the Global C-Sink Registry for 36 months after the date of withdrawal, termination or expiry of the certificate. Changes to the certificate status of a project will be updated in the public registry promptly.

1.4 Certification period

The period between the re-certification (project verification) and the most recent preceding re-certification or certification (validation) is referred to as certification period.

1.5 Reapplication after non-conformities closed

Operators may reapply once all non-conformities have been resolved.

1.6 Provision of reports and certificates to EU Commission and national authorities

Upon request, CSI will provide the Commission and the national authorities responsible for supervision of the certification bodies with access to the respective audit reports and certificates of compliance.

2. Additional Requirements

To be compliant with CRCF projects must comply with the following additional requirements beyond the requirements of Global Biochar C-Sink Standard and Principles of Global C-Sink Standards.

2.1 Project location and georeferenced boundaries

Project location is given in Project Design Document Chapter 1.1. To be eligible for CRCF the Biochar C-Sink Project must be located in the EU. This encompasses production and application of biochar.

Georeferenced boundaries of the activity must be given, including, if applicable, codes from the national integrated administration and control system (IACS) and land parcel identification system (LPIS) pursuant to Regulation (EU) 2021/2116 of the European Parliament and of the Council(1).

2.2 Maximum application rates of biochar to soils

Total application of biochar to the matrices S-01 “Agricultural soils”, and S-05 “Forest” shall be limited to no more than 50 tonnes per hectare cumulatively over time [t/ha] including any forms of biochar application whether or not they are certified and including applications that were made prior to the adoption of this methodology.
Respective documentation must be provided when requesting C-Sink verification.
“Diffuse C-sinks are restricted to matrices in which the final C-sinks are highly spatially distributed.” (Chapter 11.2 of Global Biochar C-Sink Standard 3.3): It is therefore within the nature of a diffuse C-Sink that the limits will not be reached.

2.3 Public Funding

Chapter 1.2 Description of Baseline Scenario of the PDD shall be amended by a statement that covers the following aspect. Where the activity is financed through a combination of public and private funding, in order to document that there is no overcompensation of costs, indicate any form of public financing received or applied for with regard to the activity.

Confidential details may be submitted as confidential annex to the PDD. VVB will reference to the information in the validation statement (in CRCF terms: certificate of compliance).

2.4 Eligible Matrices and Monitoring Period after Application

Applications in soil matrices require monitoring for a minimum period of one year following the application.

Furthermore, the eligible biological matrices as defined in "Positive list of permissible matrices for the establishment of biochar C-sinks" are limited to: B-06 Biochar Based Fertilizer, B-07 Animal feed, B-09 Potting soil/growing media/substrates for horticulture, B-10 Potting soil/growing media/substrates for horticulture for ornamental plants.

Soil applications (S-01 Agricultural Soil, S-02 Urban Soil) as diffuse carbon sinks are not permitted under the CRCF; instead, monitoring must be conducted up to the point of soil application, extended by an additional one-year period thereafter.

2.5 Voluntary compensation of biomass used by carbon removal activities

For voluntary compensation of used biomass by carbon removal activities to support the regeneration of natural carbon stocks used for the generation of permanent carbon removals, operators of carbon removal activities that are based on consumption of biomass feedstock may purchase carbon farming sequestration units. The quantity of carbon farming sequestration units purchased by the operator shall be reported in the certificate of compliance. Carbon Standards International recommends to purchase Tree-related C-Sinks which are verified under the Global Tree C-Sink Standard.

The quantity of carbon farming sequestration units purchased by the operator shall be reported in the certificate of compliance.

2.6 Additional emission sources for Biochar C-Sinks

Additional to the emission sources mentioned in the GBCS guidelines, projects under CRCF must consider GHG emissions from following sources:

- Any energy generation equipment that is geographically contiguous with the facility
- Production and transport of additives used in the pyrolysis plant. Permissible additives are listed in the EBC positive list of permissible biomasses. The amount of all additives used must be monitored and the emissions must be considered for the Biochar C-Sink:

  $[Emissions_{additives}\ (tCO2e)] = [additives\ (t\ DM)] * [factor_{additives}\ (tCO2e/km)]$

Conservative default emission factors for the additives based on official sources will be provided by CSI.

It is assumed that emissions from the application of biochar to materials defined in the GBCS Matrix List (e.g. soil or construction materials) are comparable to the emissions from mixing and preparation of the respective soil or construction material in a scenario without biochar. As no emissions exceeding the baseline scenario occur, application emissions are considered negligible.

2.7 Calculation of biochar transportation emissions

Emissions from fuel and electricity consumption for biochar transport must be determined by the biochar tracking tool, which will be provided by an endorsed dMRV provider (see also GBCS, Ch. 10.1). The emissions of each trip must be determined based on transport distances. Factor 1.5 is applied to cover also the empty return trips:

$[Emissions_{BC\ transport}\ (tCO2e)]$

$= [load_{BC}\ (t\ DM)] * [distance_{trip}\ (km)] * [factor_{vehicle\ loaded}\ (tCO2e/t*km)] * 1.5$

Following values shall be used as emission factor (Umweltbundesamt (D), 2024):

Truck	118	gCO2e/tkm
Freight railway	14	gCO2e/tkm
Inland watercraft	13	gCO2e/tkm

To calculate the biochar transport emission for each certification batch, the emissions of all trips in a certification period must be summed up.

2.8 Non-biogenic carbon in feedstock

For organic waste, up to 2% of plastic contamination can be accepted without the need for further measures to subtract the fossil fraction. The fossil carbon content in the biochar is then covered by the safety margin. If higher amounts are expected in the feedstock, the non-biogenic carbon fraction in biochar shall be identified by carbon 14 (14C) testing.

2.9 Non-biochar output for pro-rata approach

The output energy of non-biochar products from the pyrolysis facility (charcoal, hydrogen, pyrolysis oil, electricity and thermal energy) shall only be included in the pro-rata calculation, if the output product contains at least 10 % of the total energy in all the outputs of the process.

2.10 Methane emissions from pyrolysis

In addition to the specifications for determining methane emissions from the pyrolysis plant, which are defined in Ch. 7.3 of the GBCS and in the document 'Clarifications Methane Emissions', the following requirements apply to projects under EU-CRCF:

- At least two emissions tests must per pyrolysis unit must be completed. One can either measure CH4 directly, or infer the methane missions based on CxHy, TOC or CO measurements - based on the rules in document 'Clarifications Methane Emissions'.
- The two measurements must be conducted during the first certification batch, with an interval of a third of the batch runtime (usually: batch duration of one year, interval between measurements must be 4 months)
- If the measurements are consistent, the average of these measurements can be taken characteristic of the production unit. The measurements are considered consistent if:
    - The measurement shows that CH4 is only emitted at trace levels: For this, it must be demonstrated that CO2e of Methane translated with GWP100 make up less than 1% of the C-Sink potential multiplied with the GPC ratio per tonne of biochar - the expected permanent C-Sink.
    - The measured level is similar for the two measurements: The higher of the two measurements shall be not more than 40 % above the lower measurement.
- If the measurements are not consistent, additional measurements shall be taken until a reliable estimate of average CH4 emissions is established.
- In the case that CH4 emissions above the trace level (1% of total permanent C-Sink) are identified, the producer shall implement a CH4 reduction plan, and new measurements must be conducted in the subsequent production batch.
- If CH4 emissions are found to be emitted at only trace levels, such measured level may be taken as representative for that production unit for the following five years, after which CH4 emissions shall be measured again.

2.11 Electricity consumption at pyrolysis plant

a) Definition of net electricity consumption

For the determination of emissions from electricity consumption, net quantity of electricity consumed shall be considered.

If the system both takes in and generates electricity, the net electricity consumption shall be determined by the assessment of the overall change in demand: This is the quantity of electricity imported minus the electricity recovered from pyrolysis activity.

Net consumption shall exclude electricity both produced and consumed on-site, as well as electricity that is not generated from recovery process but produced specifically for export.

Where the net quantity of consumed electricity is less than the gross quantity, and the electricity originates from more than one source, the net consumption from each source shall be calculated proportionally.

b) Emission factors

Producers should request information on the up-to-date emission factor at the bidding zone level from their respective electricity providers. In the case of net electricity export, the emission factor shall be zero.

2.12 Consumption of external heat at pyrolysis plant

If useful heat, which does not originate in the pyrolysis plant itself, is consumed, the respective greenhouse gas emissions shall be calculated according to following equation:

$[Emissions_{external\ heat}\ (tCO2e)] =$

$[consumption_{external\ heat}\ (kWh)]^* [factor_{external\ heat}\ (tCO2e/kWh)]$

a) Definition of net heat consumption

For the determination of emissions from consumption of external heat, net quantity of heat consumed shall be considered.

If the system both takes in and generates heat, the net heat consumption shall be determined by the assessment of the overall change in demand: This is the quantity of heat imported minus the heat recovered from pyrolysis activity.

Net consumption shall exclude heat both produced and consumed on-site, as well as heat that is not generated from recovery process but produced specifically for export.

Where the net quantity of consumed heat is less than the gross quantity, and the heat originates from more than one source, the net consumption from each source shall be calculated proportionally.

b) Emission factor

The following emission factors shall be applied in the calculation of emissions associated with any net heat consumption generated externally. For heat that is recovered from pyrolysis itself, there are no additional emissions.

- For heat, that is generated externally from fossil fuels:

Lifecycle emission factors for fossil fuel supply and combustion set out in the latest version of the Joint Research Centre document Definition of input data to assess GHG default emissions from biofuels in EU legislation, divided by the thermal efficiency of the heat generation process.

- For heat, that is generated externally from biomass, biofuel, bioliquid or biomass fuel:

  Emission factors for the supply and combustion calculated in accordance with Annex VI to Directive (EU) 2018/2001 divided by the thermal efficiency of the heat generation process.

- For heat from non-biomass renewable sources or nuclear energy production, the emission factor is zero.

- For heat that is recovered from a process from which heat was not previously recovered until a maximum of three months prior to the project start: The emission factor is zero.

- For heat that is recovered from an external process from which heat was already recovered or from a new process, i.e. a process coming into operation less than 6 months prior to the start of the activity: The emission factor shall be set to the EU ETS benchmark emission factor for heat.

- For heat that is supplied from a heat network: The emission factor shall be set to the EU ETS benchmark emission factor for heat.

- In the case of net heat export the emission factor shall be zero.

2.13 Additional biomass consumption

If additional biomass is thermally recovered in order to produce heat or electricity for the pyrolysis process, following equations must be followed to quantify the additional biomass consumed.

a.) Biomass consumption for generation of electricity only

If additional biomass is consumed to solely generate electricity, and some of this own electricity is consumed to power the pyrolysis process, the additional biomass consumption shall be calculated from the net amount of own electricity and the electrical efficiency:

$[Consumption_{biomass}\ (t\ DM)]$

$= [net\ consumption_{elec}\ (kWh)] / [efficiency_{elec}\ (t\ DM/kWh)]$

b.) Biomass consumption for generation of heat only

If additional biomass is consumed to solely generate heat, and some of this own heat is consumed to power the pyrolysis process, the additional biomass consumption shall be calculated from the net amount of own heat and the heat efficiency:

[$Consumption_{biomass}$ (t DM)]

= [net $consumption_{heat}$ (kWh)] / [$efficiency_{heat}$ (t DM/kWh)]

c.) Biomass consumption for generation of mix of electricity and heat

If additional biomass is consumed to generate both electricity and heat, the additional biomass consumption shall be calculated as follows:

$$[Consumption_{biomass}\ (t\ DM)] = \frac{net\ consumption_{elec} + net\ consumption_{heat} * C_{heat}}{net\ consumption_{elec} * eff_{elec} + net\ consumption_{heat} * eff_{heat}}$$

Whereas the electrical and heat efficiencies refer to the respective efficiencies under typical operational conditions. C_{heat} refers to the Carnot efficiency, which is the fraction of exergy in the useful heat and is defined as follows:

$$C_{heat}(K) = \frac{Temp_{heat}\ (K) - 273.15\ K}{Temp_{heat}\ (K)}$$

$Temp_{heat}$ refers to the average temperature of the heat consumed.

2.14 Measurement standards and laboratories

When carrying out measurements, the specifications laid out in Implementing Regulation (EU) 2018/2066, Article 42 must be followed:

a.) Measurements

All measurements shall be carried out applying methods based on:

- EN 14181 (Stationary source emissions — Quality assurance of automated measuring systems);
- EN 15259 (Air quality — Measurement of stationary source emissions — Requirements for measurement sections and sites and for the measurement objective, plan and report);
- other relevant EN standards, in particular EN ISO 16911-2 (Stationary source emissions — Manual and automatic determination of velocity and volume flow rate in ducts).

Where such standards are not available, the methods shall be based on suitable ISO standards, standards published by the Commission or national standards. Where no applicable published standards exist, suitable draft standards, industry best practice

guidelines or other scientifically proven methodologies shall be used, limiting sampling and measurement bias.

The operator shall consider all relevant aspects of the continuous measurement system, including the location of the equipment, calibration, measurement, quality assurance and quality control.

b.) Laboratories

Laboratories carrying out measurements, calibrations and relevant equipment assessments for CEMS must be accredited in accordance with EN ISO/IEC 17025 for the relevant analytical methods or calibration activities.

Where the laboratory does not have such accreditation, the equivalent requirements of Article 34(2) and (3) of (EU) 2018/2066 must be met.

2.15 Criteria related to climate adaption

Operators shall conduct a climate risk and vulnerability assessment of the biochar C-Sink activity, proportionate to its scale and expected lifetime, identifying the physical climate risks material to the activity based on state-of-the-art climate projections covering, as a minimum, current climate conditions and future scenarios of 10 to 30 years. Based on this assessment, operators shall implement adaptation solutions, within a period of up to five years, that address the most significant identified physical climate risks, and shall document these measures in a written adaptation plan. For new biochar C-Sink activities and for existing activities using newly-built physical assets, the required adaptation solutions shall be integrated at the design and construction stage rather than retrofitted afterward.

2.16 Biomass compliance with RED II

- The certification body shall verify and apply, as part of its certification and audit procedure, the requirements referable to Article 29(2)–(7) of Directive (EU) 2018/2001 (RED II) to all biomass, biofuel, bioliquid or biomass fuel used as feedstock for biochar production or consumed to generate process energy for the BCR activity, regardless of whether that biomass is accounted for under Directive (EU) 2018/2001's renewable energy targets.

  This verification requirement does not apply to biomass, biofuel, bioliquid, or biomass fuel produced from wastes or residues other than agricultural, aquaculture, fisheries, and forestry residues, which are exempt from Article 29(2)–(7) verification pursuant to Article 29(1) RED II. For the purposes of this exemption, feedstock falling under Global Biochar C-Sink Standard, Ch. 5.3, classes (5) Wood processing waste and waste wood materials, (6) Organic residues from biomass processing, (7) Municipal waste and municipal waste digestate, (9) Biosolids and biosolid digestate, and (10) Other biogenic residues, is presumed exempt, unless

the specific waste or residue originates from agricultural, aquaculture, fisheries, or forestry activity, in which case the verification requirement continues to apply.

Compliance for non-exempt feedstock shall be evidenced by valid certification under a voluntary scheme recognised by the European Commission pursuant to Article 30(4) RED II (SURE), or by an equivalent verification accepted by Carbon Standards International. The certification body's audit protocol and technical pre-audit checklist shall explicitly record the feedstock class, exemption status, and – where applicable – verification outcome for each production batch as part of the annual inspection.

Where the operator provides valid certification under an Article 30(4) or 30(6) RED II-recognised scheme (SURE) or an equivalent scheme recognised by the competent national authority accepted by Carbon Standards International, the certification body shall treat that certification as sufficient evidence of compliance and shall not conduct independent re-verification, limiting its check to the certificate's validity, scope, and coverage of the specific feedstock batch.

- Where a BCR facility also produces heat, electricity, biofuel, bioliquid, or biogas alongside biochar, the certification body shall verify that the greenhouse gas emissions saving requirements of Article 29(10) of Directive (EU) 2018/2001 (RED II) are met with regard to that co-produced heat, electricity, biofuel, bioliquid, or biogas. This verification is not required where the facility produces biochar only, without any co-generated heat, electricity, biofuel, bioliquid, or biogas output. Where applicable, the operator shall provide the certification body with the GHG emissions calculation for the co-produced output, consistent with the facility's pro-rata energy allocation as documented under the Global Biochar C-Sink Standard, Ch. 4.6, and the certification body shall confirm this calculation meets the applicable RED II threshold as part of the annual audit.

- **Notification of non-conformity;** Periodic sustainability compliance assessments carried out by Member State competent authorities under Directive (EU) 2018/2001 shall not, by themselves, prevent the certification body from approving the issuance of carbon removal units. Where such an assessment results in a finding of non-conformity with Article 29 of that Directive, the certification body shall establish a documented process to receive such notifications and shall suspend issuance of further units for the affected feedstock or facility pending resolution.

- **Conservation and protected area sourcing;** Where biomass is sourced from areas designated by the competent national authority for conservation – including areas covered by a national restoration plan under Regulation (EU) 2024/1991 – or from protected habitats, the operator shall demonstrate that sourcing is consistent with the conservation and restoration objectives applicable to those areas. The operator shall provide documentation identifying the designation status of the sourcing area and confirming alignment with the relevant management or restoration plan, to be verified by the certification body as part of the annual audit.

2.17 Maximum production amount and biochar analysis frequency

In addition to European Biochar Certificate Standard 10.5E chapter 5 the maximum permitted size of a production batch is 3'000t dry matter.

2.18 Supplementary information for certification audit

In addition to the information required under the Project Design Document (PDD, Ch. 1–4) and the validation/re-validation process (Global C-Sink Standard, Ch. 6.2 and Validation & Re-validation of PDD, Ch. 1–2), the operator shall provide any further information reasonably requested by the certification body where necessary to conduct the certification audit in accordance with Article 9 of Regulation (EU) 2024/3012. This includes, but is not limited to, information needed to address findings from a prior audit, clarify site-specific circumstances not covered by the PDD template as annexes, or respond to newly applicable legal or regulatory requirements arising during the five-year validity period of the PDD. The certification body shall document any such request and the operator's response as part of the audit record.

2.19 Data sharing

To promote scientific advancement and facilitate collective progress in the field of biochar carbon removals, operators shall share relevant data and information that is not commercially sensitive upon request by certification schemes, competent national authorities or the European Commission, and without creating undue administrative burden for farmers.

On request Carbon Standards enables knowledge sharing between operators by providing platforms to allow the dissemination of data gathered in the course of any post-application monitoring activities undertaken by operators.

2.20 Permitted mineral additives for EBC Agro

In addition to European Biochar Certificate Standard 10.5E summary 4.2 and and 4.10 to produce EBC-Agro, no mineral additives are admitted.

2.21 Permitted applications for EBC Feed

Manure of livestock animals that have been fed the biochar certified against to the former application class EBC Feed may not be applied to agricultural or forest soils, the mixture since it doesn’t comply with the requirements of CMC 14.

2.22 Permitted persistence class

Only biochars assigned to the new upper persistence as per Global Biochar C-Sink Standard 3.3, Ch. 3.6 are permitted for usage compliant with EU-CRCF.

Biochars are assigned to the upper persistence class if they meet the following criteria:(i) a mean random reflectance of Ro ≥ 3.8%, while no more than 3% of all measured points present Ro < 2% and data from ≥500 measured points shows a Gaussian distribution with a heterogeneity score ≤ 8.

Option (ii) is not permitted within the scope of CRCF.

This corresponds to the permanence function based on random reflectance assessment according to section 2.2.7.1.1 of BCR methodology under EU-CRCF.

For biochars assigned to this upper persistence class, 90% of total biochar carbon are assigned to the GPC pool and 10% to the SPC pool.

Sources

Umweltbundesamt (D), 2024. Vergleich der durchschnittlichen Emissionen einzelner Verkehrsmittel im Personenverkehr in Deutschland 2024: Linien- und Individualverkehr, Link, retireved on 30.07.2026.

FOEN, 2025. Life cycle assessment of different biochar application scenarios in Swiss agriculture, Link, retrieved on 12.08.2026

A Annex

A.1 Exemplary calculation of capital emissions per net carbon sink

Following exemplary calculation is based on the study 'Life cycle assessment of different biochar application scenarios in Swiss agriculture', commissioned by the Swiss Federal Office for the Environment (FOEN). The data refers to biochar production in a PYREG plant (7500 working hours per year, 311 kg biomass input per hour), under consideration of 20 years lifespan. This demonstrates that for a commercial pyrolysis plant, the capital emissions (construction and deconstruction emissions) are expected to be around 0.3% of the net carbon sink.

Tab. 1: Exemplary calculation of capital emissions per net carbon sink

Parameter	Value	Unit	Source/Notes
End product: Biochar (moisturized) at farm	1	kg	FOEN (2025), Figure A4
Biochar to produce 1 kg end product	0.833	kg	FOEN (2025), Figure A4
Associated emissions	0.128	kg CO2e	FOEN (2025), Figure A4
Reactor emissions (incl. constrution and deconstruction)	0.005	kg CO2e	FOEN (2025), Figure A4
Carbon content in biochar	75%		Conservative assumption

Permanent fraction of biochar carbon	75%		Conservative assumption
Carbon storage in biochar	1.718	kg CO2e	Biochar amount * C content in biochar * Permanent C fraction * 44/12 tCO2e/tC
Net biochar carbon sink at factory gate	1.590	kg CO2e	Carbon storage in biochar - Associated emissions
Share of capital emission of C-sink_1000+	**0.3%**		