# ClimatePal EU 303

## BIOCHAR CARBON REMOVAL (BCR)

Version 1.0

ClimatePal
by ISCC



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## Table of Abbreviations

| Abbreviation | Name |
|---|---|
| BCR | biochar carbon removal |
| BioCCS | biogenic emissions capture with carbon storage |
| $CO_2$ | carbon dioxide |
| DACCS | direct air capture with carbon storage |
| EU | European Union |
| EU ETS | EU Emissions Trading System |
| GHG | greenhouse gas |
| GWP | global warming potential |
| IPCC | Intergovernmental Panel on Climate Change |
| LHV | lower heating value |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PCDD/F | polychlorinated dibenzo-p-dioxins and dibenzofurans |
| JEC | Joint Research Centre–EUCAR–Concawe collaboration |
| $CH_4$ | methane |
| IEA | International Energy Agency |
| ISO | International Organization for Standardization |
| JRC | Joint Research Centre |
| $N_2O$ | nitrous oxide |
| QA/QC | quality assurance and quality control |

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# Introduction

*BCR concept and regulatory basis*

Biochar carbon removal (BCR) converts carbon contained in biomass or biomass fuels into biochar through thermal treatment and permanently stores a quantified stable fraction of that carbon by applying the biochar to eligible soils or incorporating it into eligible products. Regulation (EU) 2024/3012 establishes the Union certification framework for permanent carbon removals, while Delegated Regulation (EU) 2026/285 establishes the applicable certification methodology for BCR.

*Methodology coverage*

This document operationalises those requirements within the ClimatePal EU. It provides BCR-specific requirements for activity eligibility, planning and monitoring, quantification of carbon removals and associated greenhouse gas emissions, biochar production and transport, permanence and application or incorporation, long-term storage and chain of custody, and sustainability.

*Implementation*

The methodology is intended to support consistent implementation by operators and independent assessment by certification bodies. Scheme-wide certification and governance requirements are established separately in the applicable ClimatePal EU scheme documents.

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# 1. Scope

*Methodology applicability*

This document specifies the ClimatePal EU methodology for certification of permanent carbon removals generated by biochar carbon removal (BCR) activities following the Article 1(2) and (3), Article 4 and Sections 1.1.2 and 2.2 of the Annex to Delegated Regulation (EU) 2026/285.

*Eligible BCR activities*

It applies to activities that produce biochar by thermal treatment of biomass or biomass fuels and permanently store the stable carbon fraction by application to eligible soils or incorporation into eligible products.

*Scope of requirements*

It covers activity eligibility and periods, planning and reporting, quantification of total carbon removal and associated GHG emissions, biochar production and transport, permanence and use-stage emissions, long-term storage and chain of custody, and sustainability.

*Excluded activity types*

It does not apply to direct air capture with carbon storage (DACCS) or biogenic emissions capture with carbon storage (BioCCS) activities.

# 2. Normative References

*Normative-reference rules*

The following documents are referred to in this methodology in such a way that all or part of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated legal references, the version in force applies.

## 2.1 EU legislation

a. Regulation (EU) 2024/3012 establishing a European Union certification framework for permanent carbon removals, carbon farming and carbon storage in products

b. Commission Delegated Regulation (EU) 2026/285 establishing certification methodologies for permanent carbon removal activities

c. Commission Implementing Regulation (EU) 2018/2066 on monitoring and reporting of greenhouse gas emissions

d. Commission Delegated Regulation (EU) 2020/1044, Annex I, for 100-year global warming potentials

e. Commission Delegated Regulation (EU) 2021/2139, Appendix A to Annex I, for climate-adaptation criteria

f. Commission Delegated Regulation (EU) 2023/1185, Part A of the Annex, where referenced for electricity emission factors

g. Directive (EU) 2018/2001, including Article 29 and Article 2(23) and (43), where biomass, biofuel, bioliquid or biomass fuel is used by the activity

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h. Regulation (EU) 2019/1009 on EU fertilising products, where biochar is applied to agricultural, forest or greenhouse soils or incorporated into a soil-amendment matrix

i. Regulation (EC) No 183/2005 on feed hygiene, where biochar is used as a livestock feed additive before application to soil in manure

j. Directive 2010/75/EU where a facility falls within its scope

k. Regulation (EU) 2020/852, Article 17(1)(d), for circular-economy significant-harm considerations

l. Regulation (EU) 2024/1991 where biodiversity, ecosystem or restoration-plan obligations are relevant

### 2.2 International standards and guidance

a. EN ISO 14064-2:2019, Greenhouse gases - Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements

b. IPCC, Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, Chapter 6, Section 3, as referenced by Delegated Regulation (EU) 2026/285 for combining uncertainties

### 2.3 ClimatePal EU normative documents

a. ClimatePal EU 101 Governance

b. ClimatePal EU 110 Glossary

c. ClimatePal EU 201 Certification Programme

d. ClimatePal EU 202 Certification Body Requirements

e. ClimatePal EU 331 Activity Plan Template

f. ClimatePal EU 332 Monitoring Report Template

## 3. Terms and Definitions

*Applicable definitions*

For the purposes of this document, the following terms and definitions apply. Additionally, all definitions which are relevant for ClimatePal EU and this document can be found in the ClimatePal EU 110 Glossary.

### 3.1 Terms Established by Delegated Regulation (EU) 2026/285

*BCR-specific definitions*

Specific terms for the Biochar methodology used in this document are in accordance with article 1(2), (3) and (5), and definitions (1), (2), (5), (9) and (12) of the Annex to Delegated Regulation (EU) 2026/285:

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**associated GHG emissions:** increase in direct and indirect greenhouse gas emissions over the entire lifecycle of the activity attributable to its implementation;

**BCR activity:** activity resulting in the production and permanent storage of biochar by its application to soils or by its incorporation into materials;

**biochar:** carbonaceous material produced by thermal treatment of biomass or biomass fuels;

**biogenic $CO_2$:** $CO_2$ produced from a source of biomass, biofuel, bioliquid or biomass fuel by a chemical or biological process acting on the carbon atoms therein, including combustion, oxidation, anaerobic digestion and fermentation;

**capital emissions:** emissions associated with the construction of facilities and equipment associated with an activity;

**certification period:** period between a re-certification audit of an activity and the most recent preceding certification audit or re-certification audit;

**fossil $CO_2$:** $CO_2$ generated from fossil carbon, which is inorganic and organic carbon that is not zero-rated carbon under Implementing Regulation (EU) 2018/2066

**useful heat:** heat generated to satisfy an economically justifiable demand for heating or cooling.

# 4. Activity Description and Eligibility

## 4.1 Eligible BCR Activity and Location

*BCR activity eligibility*

A BCR activity shall consist of biochar production at one or more biochar production facilities that are owned by the same legal entity and apply the same biochar production technology in accordance with Section 1.1.2 of the Annex to Delegated Regulation (EU) 2026/285.

*Site-specific batching*

Biochar produced at different locations shall not be assigned to the same production batch, even where feedstock and production conditions are similar. Biochar from one activity may be applied to soils or incorporated into products at several sites.

*EU facility and storage locations*

The operator shall ensure that each biochar production facility included in the activity and each location at which the biochar is permanently stored through eligible application or incorporation are located in the EU (in accordance with Article 4(2) of Delegated Regulation (EU) 2026/285).

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*EU location confirmation*

The operator shall ensure that each biochar production facility and the location at which the biochar is permanently stored by eligible application or incorporation are located in the EU.

*Operator responsibility and data access*

The operator shall demonstrate legal or operational responsibility for the activity and shall have arrangements that provide access to the data and evidence required from feedstock suppliers, transport entities and application or incorporation sites.

## 4.2 Eligible Biochar Production and Uses

*Eligible criteria for biochar production*

The biochar production process shall heat biomass or biomass fuel to a temperature of at least 350 °C and shall be designed with the intention of fully capturing or destroying any methane produced with the biochar.

*Heat-utilisation requirements*

Co-produced heat shall be used for biomass drying or to satisfy another economically justifiable demand for heat, for heating or cooling purposes. A mobile biochar facility may operate without utilisation of the produced heat where heat utilisation would be impractical in its specific context. ClimatePal EU may establish more detailed minimum heat-utilisation-efficiency requirements.

*Application to soils*

Where biochar is applied to soils, the operator shall ensure that there is no significant risk that the net climate benefit of the BCR activity is offset by heat absorption resulting from albedo decreases.

*Eligible soil-application routes*

Biochar may be applied to agricultural soils, forest soils or soil in greenhouses directly, after intermixing with a matrix consisting of soil or one or more additional soil-amendment products compliant with Article 5 of Regulation (EU) 2019/1009, or after feeding to animals and recovery as manure.

*Cumulative application limit*

Total application of biochar to agricultural and forest soils shall not exceed 50 tonnes per hectare (t/ha) cumulatively over time. This cumulative amount shall include certified and non-certified applications and applications made before adoption of the methodology. The operator shall maintain geographically specific application records sufficient to monitor cumulative application.

*Other eligible uses*

Biochar may also be used in landscaping, as daily cover at landfill sites, for filling holes including disused mines and oil wells, and in urban soils including growing media used in flowerbeds, urban tree planting, public parks and public or private gardens.

*Intermixing and combustion safety*

Biochar used for landscaping, landfill cover or hole filling shall be intermixed with at least one other material before application, and the resulting intermixture shall not be capable of self-sustaining combustion.

*Incorporation in products*

Only incorporation of biochar in cement, concrete or asphalt shall be eligible for certification as BCR.

## 4.3 Activity Boundary and Value Chain

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The operator shall describe the activity technologies and infrastructure, identify all entities in the carbon removal value chain and identify the relevant GHG emission sources and sinks in the activity plan (in accordance with Sections 1.3.1(a) to (d), 2.2.1, 2.2.5, 2.2.6 and 2.2.7 of the Annex to Delegated Regulation (EU) 2026/285).

*BCR value-chain boundary*

The operator shall define one auditable activity boundary covering all biochar production facilities included in the activity, feedstock supply, transport of produced biochar, and each application or incorporation site used to generate permanent carbon removal units.

*Auditable activity boundary*

The minimum value-chain information is summarized in Table 1.

*BCR value-chain description*

*Table 1: BCR value-chain description*

| Value-chain element | Minimum information | Reference |
|---|---|---|
| Biochar production facilities | Facility location and ownership; production technology; feedstock handling and storage; thermal-treatment equipment; processing, preparation and packaging; associated energy generation; wastes and by-products; relevant energy, input and capital-emission sources. | Article 4(2) and Annex 1.1.2, 2.2.1, and 2.2.5 of Delegated Regulation (EU) 2026/285 |
| Feedstock supply | Feedstock types and mixes; supplier or collection source; production or collection pathway; storage conditions; transport to the biochar production facility; biomass-sustainability evidence. | Annex 2.2.1, 2.3.4.3, 2.2.5.4.1, and 4.2 of Delegated Regulation (EU) 2026/285 |
| Biochar transport | Transport modes and routes from the biochar production facility to the point of application or incorporation; actual fuel or distance data and applicable emission factors. | Annex 2.2.6 of Delegated Regulation (EU) 2026/285 |
| Application or incorporation sites | Site identification and location; eligible end use; quantity applied or incorporated; geographically specific application records where applicable; biochar-containing matrix where applicable; application/incorporation energy use; evidence of permanent storage. | Article 4(2) and Annex 1.1.2.2, 2.2.7, and 3.2 of Delegated Regulation (EU) 2026/285 |
| Interfaces and data access | Responsible entity, data-transfer point and arrangements for obtaining monitoring evidence across the value chain. | Annex 1.3.1 to 1.3.3, and 3.2 of Delegated Regulation (EU) 2026/285 |

## 4.4 Activity, Monitoring and Certification Periods

The applicable periods are summarized in Table 2 (in accordance with Sections 1.2.2.1 to 1.2.2.3 of the Annex to Delegated Regulation (EU) 2026/285).

*BCR time periods*

*Table 2: Activity, monitoring and certification periods*

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| Period | Requirement | Reference |
|---|---|---|
| Activity period | Maximum 5 years. A new activity period may start after the end of an activity period by submission of a new activity plan. | Annex 1.2.2.1 of Delegated Regulation (EU) 2026/285 |
| Monitoring period - soil application | Where soil application is directly overseen by the certification body, until application. Otherwise, until one year after the end of the certification period during which the biochar is reported to have been applied. | Annex 1.2.2.2(a) of Delegated Regulation (EU) 2026/285 |
| Monitoring period - product incorporation | Until it is demonstrated that the biochar has been incorporated into the eligible product. | Annex 1.2.2.2(b) of Delegated Regulation (EU) 2026/285 |
| Certification period | Maximum 1 year. Carbon removals and associated emissions shall be recorded in the certification period in which the $CO_2$ is permanently stored by application of biochar to soils or incorporation into eligible products. | Annex 1.2.2.3 of Delegated Regulation (EU) 2026/285 |

The activity plan shall identify the activity-period start date and planned end date.

*Activity period dates*

# 5. Planning, Monitoring and Reporting

## 5.1 Activity Plan and Changes

*See 6.2 in EN ISO 14064-2:2019.*

Before the certification audit, the operator shall submit an activity plan containing the information necessary to assess compliance with this methodology in accordance with Section 1.3.1 of the Annex to Delegated Regulation (EU) 2026/285. General requirements applicable to the activity plan are specified in ClimatePal EU 201 Certification Programme. Table 3 lists the required content.

*Activity-plan content*

The activity plan shall be prepared using the current controlled version of ClimatePal EU 331 Activity Plan Template.

*Mandatory activity-plan template*

*Table 3: Activity-plan content*

| Activity-plan component | Required content |
|---|---|
| Activity | Project title, purpose and objectives; BCR project type; location and organizational, geographic and physical extent; relevant conditions prior to activity initiation; general description of the activity, technologies and infrastructure to be used; and expected level of activity. |
| Value chain | Details of all entities involved in delivery of the activity. |

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| Activity-plan component | Required content |
|---|---|
| Roles and responsibilities | Roles and responsibilities of the operator and other project participants relevant to implementation, monitoring and reporting, including relevant contact information. |
| Risks | Identification of risks that could substantially affect the activity's carbon removals or associated GHG emissions and, where applicable, measures to manage those risks. |
| Activity schedule | Planned activity-period start and end dates and applicable monitoring, reporting and certification frequencies. |
| Regulatory compliance | Identification and demonstration of compliance with relevant local, regional and national laws, statutes and regulatory frameworks. |
| GHG sources and sinks | List of the GHG sources and sinks relevant to the activity in accordance with 6.1. |
| Expected quantification | Estimates of total carbon removals and associated GHG emissions for the activity period in accordance with 6.3 and 6.4. |
| Materiality | Description of any materiality assessment undertaken in accordance with 6.8. |
| Uncertainty | Description of the uncertainty assessment undertaken in accordance with 6.12. |
| Sustainability | Proof of compliance with the minimum sustainability requirements in 9.1. |
| Funding | Funding sources received or applied for with regard to the activity, in accordance with Clause 7. |
| Other audit information | Any other information necessary for the certification body to conduct the certification audit under Article 9 of Regulation (EU) 2024/3012. |
| Traceability arrangements | Identification of the principal records, interfaces and data providers used to trace each production batch through transport and application or incorporation. |

*Change control and recalculation*

Where the operator wishes to change the activity plan during the activity period, the rationale shall be submitted to the certification body without delay together with the necessary adjustments, including recalculation of expected GHG emissions and removals and reassessment of sustainability impacts where affected.

*Change-date traceability*

The operator shall identify the effective date of material changes and preserve traceability of data, calculations and allocation before and after the change

## 5.2 Monitoring Plan and Parameter Controls

*See 6.9 and 6.10 in EN ISO 14064-2:2019.*

*Monitoring roles, methods and frequency*

Before the certification audit, the operator shall submit a monitoring plan. The plan and each monitored parameter shall contain the information summarized in Table 4 in accordance with Section 1.3.2 and Sections 2.2.5.3, 2.2.5.6 and 2.2.6.2 and 2.2.7.3 of the Annex to Delegated Regulation (EU) 2026/285.The plan and each monitored parameter shall contain the information summarized in Table 4 in

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accordance with Section 1.3.2 and Sections 2.2.5.3, 2.2.5.6 and 2.2.6.2 and 2.2.7.3 of the Annex to Delegated Regulation (EU) 2026/285.

The monitoring plan shall be prepared using the current controlled version of ClimatePal EU 331 Activity Plan Template which contains the monitoring plan.

*Mandatory monitoring-plan template*

*Table 4: Monitoring-plan content*

| Element | Required content |
|---|---|
| **General monitoring-plan requirements** | |
| Activity | Description of the activity to be monitored. |
| Purpose of monitoring | Purpose and intended use of the monitored data. |
| Responsibilities and competence | Procedure for assigning monitoring and reporting responsibilities and managing the competence of responsible personnel. |
| Default factors | Applicable default calculation factors and the source from which each factor is obtained or periodically retrieved. |
| Laboratories | List of laboratories engaged in relevant analytical procedures. |
| Measurement methods | Description of applicable measurement, estimation, modelling or calculation methods and all written procedures relevant to monitoring, including applicable uncertainty considerations. |
| Biochar sampling | Sampling protocol for all production batches in accordance with 6.5.2, including representative sampling and retention-sample arrangements. |
| Application/incorporation evidence | Method for identifying application or incorporation sites and demonstrating the quantity and eligible use of each production batch or fraction thereof. For agricultural and forest soils, geographically specific records shall enable verification of cumulative application against the 50 t/ha limit, in accordance with 4.2. |
| Analysis frequency | Applicable minimum analysis frequencies in Annex VII to Implementing Regulation (EU) 2018/2066 where relevant, together with the BCR-specific frequencies in this methodology. |
| Quality assurance | Quality-assurance requirements in Article 60 of Implementing Regulation (EU) 2018/2066. |
| Record keeping | Record-retention requirements consistent with Article 67(1) of Implementing Regulation (EU) 2018/2066. |
| Data-change control | Procedures for authorizing, approving and documenting changes to recorded data. |
| Internal data checks and corrective action | Procedures for checking data inputs, transformations and outputs and for implementing corrective actions where errors are identified. |
| Data management | Procedures for storage, retention and transfer of data between information systems, calculation files and other records. |
| **Information for each monitored parameter** | |
| Responsibility | Entity responsible for collection and archiving. |

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| Element | Required content |
|---|---|
| Data source | Source of the monitored or calculated data. |
| Measurement system | Equipment, measurement method and procedure, including accuracy and calibration. |
| Frequency | Monitoring frequency. |
| QA/QC | Quality-assessment and quality-control procedures. |

*Calibration and aggregation*

Measurements shall be performed using calibrated equipment consistently with Article 42 of Implementing Regulation (EU) 2018/2066. Where measurement data require aggregation, Article 44 of that Implementing Regulation shall be applied.

*Monitoring coverage*

Where the monitoring plan cannot be fully detailed at application, it shall be submitted as completely as possible, the non-final elements shall be identified and justified, and the final monitoring plan shall be presented before the first re-certification audit.

*Required BCR parameters*

The monitored and calculated parameters shall include all parameters applicable to BCR under this methodology. Parameters identified as “To be monitored” in 6.5.4, 6.6.2 and 6.7.3 shall be included in the monitoring plan, as applicable. Table 5 summarizes the BCR monitoring coverage.

*Table 5: BCR monitoring coverage*

| Coverage area | Minimum data coverage |
|---|---|
| Biochar production | Production-batch identity; feedstock mix and production conditions; biochar quantity and properties; biomass, storage, fuel, electricity, heat and input data; methane-release measurements; allocation and capital-emission variables. |
| Biochar transport | Transport modes, routes and trips; actual fuel consumption or distance; loaded and unloaded vehicle emission factors. |
| Application or incorporation | Site and eligible use; quantity applied or incorporated; for agricultural and forest soils, geographically specific application area and cumulative application in t/ha; permanence parameters; composition of any biochar-containing matrix; application/incorporation energy use and related GHG terms. |
| Cross-cutting | Materiality assumptions; net energy consumption; emission factors; capital emissions; measurement uncertainty; biomass sustainability; pollution-risk laboratory results and chain-of-custody evidence. |

*Dataset metadata and provenance*

For each monitored dataset or calculation, the operator shall retain the data source, version or date, applicable temporal and facility scope, units, measurement equipment and calibration status, preprocessing or transformation steps, calculation factors and responsible entity.

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## 5.3 Monitoring Report

*See 6.13 in EN ISO 14064-2:2019.*

*Re-certification reporting*

Before each re-certification audit, the operator shall submit a monitoring report containing the net carbon removal benefit, total carbon removal, associated GHG emissions and the information necessary to demonstrate compliance with quantification, long-term storage, chain-of-custody and sustainability requirements. Table 6 summarizes the BCR-specific content in accordance with Section 1.3.3 of the Annex to Delegated Regulation (EU) 2026/285.

*Table 6: Monitoring-report content for BCR*

| Monitoring-report element | Required content |
|---|---|
| Reporting period | Date of the monitoring report and the certification period covered. |
| Quantification parameters | All applicable measured and calculated parameters specified in 6.5.4, 6.6.2 and 6.7.3 for the certification period being audited. |
| GHG basis | All removals and $CO_2$ emissions and all other GHG emissions assessed over the certification period; non-$CO_2$ GHGs converted to $tCO_2e$ using the applicable 100-year global warming potentials, as specified in Clause 6. |
| Uncertainty | Summary of the uncertainty assessment for the certification period and how uncertainty has been addressed in determining the net carbon removal benefit, in accordance with 6.12. |
| Material changes | Description of material changes to the activity, monitoring plan, measurement systems or calculation procedures during the certification period and their effect on quantification. |
| Biomass feedstock | Biomass feedstock or feedstock mix consumed, where required by 9.2. |
| Voluntary biomass compensation | Quantity of carbon farming sequestration units purchased in accordance with 9.3, where applicable. |
| Financing | Financing received or applied for with regard to the activity, as specified in Clause 7. |
| Long-term storage and chain of custody | Evidence necessary to demonstrate application or incorporation, segregation and production-batch traceability in accordance with 8, including evidence of cumulative application in accordance with 4.2, where applicable. |
| Pollution-risk laboratory results | Results of laboratory analyses required in 9.4. |
| Sustainability | Evidence and information necessary to demonstrate compliance with the applicable sustainability requirements in 9.1 to 9.4. |

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### 5.4 Records and Traceability

*See 6.10 and 6.11 in EN ISO 14064-2:2019.*

*Traceability and records*

Records shall enable traceability from each biochar production batch through transport and any permitted mixing to the quantity applied to soil or incorporated into an eligible product (in accordance with Sections 1.3.1 to 1.3.3 of the Annex to Delegated Regulation (EU) 2026/285).

*Evidence quality and attribution*

Evidence shall be relevant to the requirement, traceable to its source, attributable to the relevant production facility, production batch, transport consignment, application or incorporation site, value-chain entity and certification period where applicable, and sufficiently complete to permit independent review.

*Conflicting evidence*

Where evidence from different value-chain entities conflicts materially, the operator shall investigate and document the conflict. The selected treatment shall be justified and conservative with respect to the certified net carbon removal benefit.

*Calculation traceability*

Calculations shall be reproducible from retained source data and calculation files. Manual adjustments, exclusions, substitutions and overrides shall be identifiable, justified and traceable.

## 6. Quantification

*See 4.2 to 4.7 in EN ISO 14064-2:2019.*

*Certification period quantification*

For each certification period, the operator shall quantify total carbon removal ($CR_{total}$) and associated GHG emissions ($GHG_{associated}$) in accordance with this clause. The resulting net carbon removal benefit shall be determined in accordance with Regulation (EU) 2024/3012 and Sections 2.2 and 2.3 of the Annex to Delegated Regulation (EU) 2026/285.

*GHG timeframe and GWP*

All removals and emissions of $CO_2$ and emissions of other greenhouse gases shall be assessed over the certification period. Greenhouse gases other than $CO_2$ shall be converted to tonnes of $CO_2$ equivalent using the applicable 100-year global warming potentials set out in Annex I to Commission Delegated Regulation (EU) 2020/1044.

*Quantification principles*

Quantification, monitoring and reporting under this methodology shall be based on the principles of relevance, completeness, consistency, accuracy, transparency and conservativeness.

### 6.1 GHG Sources and Sinks

*BCR quantification boundary*

The BCR activity shall include the greenhouse gas sources and sinks listed in Table 7 in accordance with Section 2.2.1 and Table 1 of the Annex to Delegated Regulation (EU) 2026/285. The same sources and sinks shall be used consistently in the activity plan, monitoring plan, monitoring report and quantification.

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*Table 7: GHG sources and sinks for BCR*

| Activity stage | Emission source or sink | Gas |
|---|---|---|
| Biochar production | Equipment used to produce biochar. | GHGs |
| Biochar production | Biochar processing equipment used before shipping for application or incorporation. | GHGs |
| Biochar production | Associated energy-generation equipment geographically contiguous with the facility. | GHGs |
| Biochar production | Treatment equipment for wastes or by-products of the biochar production process. | GHGs |
| Biochar production | Production, collection and transportation of biomass and biomass fuel used by the biochar production facility. | GHGs |
| Biochar production | Production and supply of inputs used by the biochar production facility. | GHGs |
| Biochar production | Processing and treatment of any wastes generated by the biochar production facility, including wastewater and exhaust gases. | GHGs |
| Biochar production | Emissions associated with the construction and installation of the biochar production facility. | GHGs |
| Biochar transport | Fuel combustion and electricity consumption for land, rail, maritime and other transport modes. | GHGs |
| Application to soils or incorporation in products | Quantity of $CO_2$ permanently stored in the form of biochar. | $CO_2$ |
| Application to soils or incorporation in products | Energy consumption and/or generation associated with the process of application or incorporation. | GHGs |

*Additional material sources*

All sources listed in Table 7 shall be assessed unless this methodology expressly permits a materiality treatment. Any additional material source identified by the operator or certification body shall also be included in $GHG_{associated}$.

## 6.2 Standardised Baseline

*Zero baseline*

A standardised baseline of 0 tonnes of $CO_2$ per year ($tCO_2$/year) shall apply to BCR activities.

## 6.3 Quantification of Total Carbon Removal

*Gross carbon removal*

Total carbon removal, $CR_{total}$, shall be calculated using equation (1):

$$CR_{total} = -3.664 \times F_{perm} \times C_{org} \times Q_{biochar} \quad (1)$$

where

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| | |
|---|---|
| $F_{perm}$ | is the permanence fraction of the biochar production batch, determined in accordance with 6.7.1; |
| $C_{org}$ | is the organic carbon content of the biochar, established by laboratory analysis as the ratio of the mass of organic carbon to the total mass of biochar; |
| $Q_{biochar}$ | is the mass of biochar applied or incorporated during the certification period, expressed in tonnes on a dry-matter basis; |
| 3.664 | is the mass ratio of a $CO_2$ molecule to a carbon atom, in accordance with equation (44) of the Annex to Delegated Regulation (EU) 2026/285. |

*Biogenic carbon fraction*

The mass $Q_{biochar}$ shall exclude any fraction attributable to non-biogenic material that was also processed in the biochar production process. Where the biochar feedstock may be expected to contain non-biogenic carbon exceeding 2 % of the total carbon feedstock by mass, the biogenic carbon fraction in the biochar product shall be identified by carbon-14 testing.

*Inorganic-carbon defaults*

ClimatePal EU may identify specific cases in which the operator may treat the inorganic carbon content of the biochar as zero without direct assessment.

## 6.4 Associated GHG Emissions

*Associated GHG emissions calculation*

Associated GHG emissions shall be calculated using equation (2):

$$GHG_{associated} = GHG_{biochar} + GHG_{transport} + GHG_{use} \quad (2)$$

where

| | |
|---|---|
| $GHG_{biochar}$ | is GHG emissions associated with production of biochar, determined in 6.5.3; |
| $GHG_{transport}$ | is GHG emissions associated with transport of biochar from the production facility to the point of application or incorporation, determined in 6.6.1; |
| $GHG_{use}$ | is GHG emissions associated with application or incorporation of biochar, determined in 6.7.2. |

## 6.5 Biochar Production and Associated GHG Emissions

### 6.5.1 Production Batches

*Batch definition*

The amount of biochar produced shall be measured and assigned to production batches that share a common feedstock mix and common processing conditions. Common processing conditions require use of the same underlying process and consistent target production temperature, biochar residence time and techniques used to manage oxygen concentration. A common feedstock mix requires the shares of feedstock types to be similar across the batch.

*Batch continuity across consignments*

A production batch shall not include biochar produced in more than one certification period. A production batch may be interrupted and restarted. Biochar

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produced from the same feedstock under the same conditions and divided into multiple consignments for different end uses may remain one production batch for quantification.

*Units issuance*

At re-certification, units may be issued in relation to production batches applied or incorporated during the relevant certification period. Where only part of a production batch has been applied or incorporated, units shall be issued for that part. Units for the remaining portion may be issued at a later re-certification once that portion has been applied or incorporated.

*Additional batch limits*

ClimatePal EU may establish additional requirements limiting variation within a production batch and may set a maximum production-batch size.

### 6.5.2 Biochar Properties and Sampling

*Batch characterization*

The operator shall undertake laboratory testing on each production batch of biochar. At a minimum, the laboratory characterization shall include:

a. organic carbon content, Corg, as required in equation (1);

b. molar H/Corg ratio, as required in 8 and where the decay function is used to determine the permanence fraction in 6.7.1;

c. energy density of the biochar on a lower-heating-value basis;

d. where the random-reflectance method is used to determine the permanence fraction in 6.7.1, the fraction of biochar having a Ro reflectance value of 2% or greater and associated measurements; and

e. compliance with the applicable maximum thresholds for limited substances in 9.4.

*Sampling requirements*

All production batches shall be sampled in accordance with Table 8.

*Table 8: Biochar sampling requirements*

| Requirement | Specification |
|---|---|
| Representativeness | All production batches shall be sampled. Samples shall be representative of the average properties of the production batch. |
| Sampling protocol | The monitoring plan shall describe the sampling protocol. The protocol shall be reviewed by the certification body at the certification audit and followed during the activity period. |
| Sampling standard | Sampling protocols shall be consistent with Article 33 of Implementing Regulation (EU) 2018/2066, except for the last sentence of paragraph 1. |
| Sample collection | The biochar to be sampled shall be well mixed and an adequate number of samples shall be taken to ensure representative batch data. |

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| Requirement | Specification |
|---|---|
| Batches produced over time | Sampling shall be undertaken either after mixing biochar produced over the full production period or on subsets of the batch using sufficient samples to robustly establish average properties across the full production batch. |
| Retention samples | One-litre retention samples shall be taken for each production batch on every day on which biochar is produced. Samples may be aggregated across the calendar month for storage, provided samples from each production batch remain separate. |
| Retention period and access | Retention samples shall be stored for at least two years and made available on request to the certification body, ClimatePal EU or relevant competent national authorities. |

*Sampling protocol adjustments*

The sampling protocol may be amended during the activity period where the operator demonstrates that the resulting sample data remain at least equally representative. The certification body or ClimatePal EU may require analysis of retention samples where necessary to establish representative characterization or confirm that measurements are representative. Sampling frequency may be reduced over time where it is demonstrated that the process reliably produces biochar with consistent characteristics from a given feedstock. ClimatePal EU may provide additional guidance on allowable sampling protocols, including differentiated sampling requirements for different production contexts and types of biochar where technically justified.

### 6.5.3 Biochar Production GHG Emissions

*Production emissions*

GHG emissions associated with biochar production shall be calculated using equation (3):

$$GHG_{biochar} = F_{alloc} \times \left( GHG_{facility} + GHG_{inputs} \right) \quad (3)$$

where

$F_{alloc}$ is the allocation fraction for biochar, determined using equation (4);

$GHG_{facility}$ is total GHG emissions from operation and construction of the biochar production facility, determined using equation (5);

$GHG_{inputs}$ is total GHG emissions associated with inputs to the biochar production facility, determined using equation (11).

*Residue allocation threshold*

The biochar shall be treated as a residue of another process where the chemical energy in the produced biochar on a lower-heating-value (LHV) basis is less than 10 % of the total energy of the produced co-products. In that case $F_{alloc}$ shall be zero, $F_{alloc}=0$, and $GHG_{facility}$ and $GHG_{inputs}$ need not be calculated.

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*Allocation fraction*

$F_{alloc}$ shall be calculated using equation (4):

$$F_{alloc} = \begin{cases} 0 \text{ if the biochar is treated as a residue} \\ \frac{E_{biochar}}{\left(E_{biochar} + \sum_{co-products} E_{co-products}\right)}, \text{otherwise} \end{cases} \quad (4)$$

where

$E_{biochar}$ is the chemical energy in the produced biochar, expressed in MJ/kg biochar produced and assessed by laboratory testing on a lower-heating-value basis;

co-products is an index of energy-containing co-products of the biochar production process;

$E_{co\text{-}products}$ is the energy attributed to each eligible co-product, expressed on the applicable basis specified below.

*Co-products*

Outputs exported from the facility for use elsewhere and containing at least 10 % of the total energy in all process outputs shall be treated as co-products. Exported electricity, useful heat and materials containing chemical energy shall be treated as co-products where this threshold is met. Electricity or heat used by the activity, including for biomass drying, shall not be treated as exported. Co-products subject to further processing before export shall be included using their energy content before that processing. Outputs with no heating value, such as ash, and outputs sent for disposal shall not be included in the allocation.

*Co-product energy basis*

For material co-products, $E_{co\text{-}products}$ shall be the chemical energy in the co-product per kilogram of biochar produced, assessed by laboratory testing on a lower-heating-value basis. For electricity or useful heat co-products, $E_{co\text{-}products}$ shall be the amount supplied to a grid, network or user outside the activity.

*GHG emissions from production facility*

$GHG_{facility}$, including emissions associated with biochar preparation and packaging, shall be calculated using equation (5):

$$GHG_{facility} = GHG_{bio} + GHG_{bio\text{-}storage} + GHG_{combustion} + CH_{4release} + GHG_{elec} + GHG_{heat} + GHG_{capital} + GHG_{disposal} \quad (5)$$

where

$GHG_{bio}$ is GHG emissions associated with production and supply of biomass and biomass fuel used at the biochar production facility, determined using equation (6);

$GHG_{bio\text{-}storage}$ is $CH_4$ emissions due to biomass storage before processing, determined in accordance with equation (7);

$GHG_{combustion}$ is emissions due to fuel consumption at the biochar production facility, determined using equation (8);

$CH_{4release}$ is methane emitted to the atmosphere by the biochar production process;

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$GHG_{elec}$ is emissions due to net electricity consumption, determined using equation (9);

$GHG_{heat}$ is emissions due to net useful-heat consumption, determined using equation (10);

$GHG_{capital}$ is applicable capital emissions determined in 6.11;

$GHG_{disposal}$ is emissions from treatment or disposal of wastes generated by the biochar production facility.

$GHG_{bio}$ shall be calculated using equation (6):

*Biomass production and supply emissions*

$$GHG_{bio} = \sum_{fuels} (Q_{biomass} \times EF_{biomass}) \quad (6)$$

where

$Q_{biomass}$ is the quantity of biomass or biomass fuel consumed by the biochar production facility during the certification period, excluding non-biomass contamination, expressed in an appropriate unit, excluding any non-biomass contamination (e.g. soil, rocks);

$EF_{biomass}$ is the emission factor for the biomass or biomass fuel, expressed in $tCO_2e$/unit and determined in accordance with 6.10.3.

*Biomass-storage scope*

$GHG_{bio\text{-}storage}$ refers to $CH_4$ emissions due to biomass storage prior to processing at the biochar production facility. It shall be calculated for each quantity of feedstock of a given type that is harvested or collected at the same time and stored in the same way.

*$CH_4$ emissions from biomass storage*

$GHG_{bio\text{-}storage}$ shall be set to zero for a quantity of feedstock where at least one of the following conditions is met for all biomass concerned: coarse woody biomass naturally remains well aerated; biomass that does not necessarily remain naturally aerated is stored for no more than four weeks prior to processing or with a maximum of 30 % residual moisture; biomass is pelleted for storage; or the operator otherwise demonstrates that the biomass is stored in a way that avoids significant methane emissions from anaerobic decomposition, given the nature of the feedstock and the local conditions.

Otherwise, $GHG_{bio\text{-}storage}$ shall be calculated using equation (7):

*Biomass-storage calculation*

$$GHG_{bio\text{-}storage} = \sum_{feedstock} [1.335 \times 0.0013 \times Q_{feedstock} \times C_{feedstock} \times (T_{storage} - 1)] \times GWP_{CH4} \quad (7)$$

where

$Q_{feedstock}$ is the quantity of feedstock stored for more than four weeks in potentially anaerobic conditions;

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| | |
|---|---|
| $C_{feedstock}$ | is the carbon content of the feedstock, expressed as a mass percentage (%); |
| $T_{storage}$ | is the period in months for which the feedstock is stored in potentially anaerobic conditions; |
| Feedstock | is an index of the feedstocks consumed; |
| $GWP_{CH4}$ | is the 100-year global warming potential of methane, in accordance with equation (50) of the Annex to Delegated Regulation (EU) 2026/285; |
| 0.0013 | is the assumed monthly fractional loss of biomass carbon from storage, in accordance with equation (50) of the Annex to Delegated Regulation (EU) 2026/285; |
| 1.335 | is the mass ratio of a methane molecule to a carbon atom, in accordance with equation (50) of the Annex to Delegated Regulation (EU) 2026/285. |

*Fuel combustion emissions*

$GHG_{combustion}$ shall be calculated using equation (8):

$$GHG_{combustion} = \sum_{fuels} (Q_{fuel} \times EF_{fuel}) + CO_{2stored;fossil} \quad (8)$$

where

| | |
|---|---|
| $Q_{fuel}$ | is the quantity of fuel consumed in the certification period, including any fossil-carbon-based material in mixed biogenic and non-biogenic feedstocks that is combusted to $CO_2$, expressed in an appropriate unit; |
| $EF_{fuel}$ | is the emission factor for the fuel consumed, expressed in $tCO_2e$/unit and selected in accordance with 6.10.4; |
| $CO_{2stored,fossil}$ | is minus the quantity of fossil $CO_2$ from fuel combustion at the biochar production facility that is captured and permanently stored at a geological storage site permitted under Directive 2009/31/EC; |
| fuels | is an index of the fuels consumed. |

*$CH_4$ emissions from biochar production*

$CH_4$ emissions shall be measured at least twice per production unit during the first certification period, with an interval of at least one third of the certification period and expressed in grams of methane per kilogram of biochar produced. ClimatePal EU may further specify methane-sampling requirements and may provide guidance on conservatively inferring methane emissions from related measurements such as hydrocarbons or CO.

*$CH_4$ consistency criteria*

Where these measurements are consistent, their average may be taken as characteristic of the production unit. $CH_4$ emission measurements shall be considered consistent where either:

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a. both measurements demonstrate only trace emissions, defined as a level that would represent less than 1 % of $CR_{total}$ if continued for the entire certification period and expressed in $tCO_2e$ on a 100-year GWP basis; or

b. the higher measured value is not more than 40 % above the lower measured value.

*$CH_4$ consistency and follow-up*

Where the measurements are not consistent, additional measurements shall be taken until a reliable estimate of average $CH_4$ emissions is established. Where $CH_4$ emissions above trace level are identified, the operator shall prepare and implement a $CH_4$ reduction plan to eliminate those emissions, and $CH_4$ emissions shall be measured again in the subsequent certification period. Where only trace emissions are identified, the measured level may be taken as representative of that production unit for the following five years, after which $CH_4$ emissions shall be measured again.

*GHG emissions from electricity consumption*

GHG emissions due to net electricity consumption at the biochar production facility shall be calculated using equation (9):

$$GHG_{elec} = \sum_{electricity\ source} (Q_{elec} \times EF_{elec}) \quad (9)$$

where

$Q_{elec}$ is the net quantity of electricity consumed in the certification period, determined in accordance with 6.9 and expressed in an appropriate unit;

$EF_{elec}$ is the emission factor for the consumed electricity, selected in accordance with 6.10.1;

electricity source is an index of electricity sources.

*GHG emissions from heat*

GHG emissions due to net useful-heat consumption at the biochar production facility shall be calculated using equation (10):

$$GHG_{heat} = \sum_{heat\ source} (Q_{heat} \times EF_{heat}) \quad (10)$$

where

$Q_{heat}$ is the net quantity of useful heat consumed in the certification period for biochar production, determined in accordance with 6.9 and expressed in an appropriate unit;

$EF_{heat}$ is the emission factor for the consumed useful heat, selected in accordance with 6.10.2;

heat source is an index of external heat sources used.

*Emissions from treatment or disposal of wastes*

$GHG_{disposal}$ shall include emissions associated with the supply of energy and inputs consumed during the treatment or disposal of wastes generated by the biochar production facility and any other GHG emissions associated with the disposal

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process, including $N_2O$ and $CH_4$ emissions from aerobic or anaerobic degradation of biogenic wastes. ClimatePal EU may provide guidance allowing operators to estimate disposal emissions where direct measurement would be unduly burdensome, and the operator may use default values for disposal emissions where these are provided by ClimatePal EU for the applicable activity type.

*GHG emissions from inputs*

Emissions associated with inputs, including chemicals but excluding capital-emission items and fuels already included in $GHG_{combustion}$, shall be calculated using equation (11):

$$GHG_{inputs} = \sum_{inputs} \left( Q_{input} \times EF_{input} \right) \quad (11)$$

where

| | |
|---|---|
| $Q_{input}$ | is the quantity of the input consumed in the certification period, expressed in an appropriate unit; |
| $EF_{input}$ | is the emission factor for the input consumed, expressed in $tCO_2e$/unit and selected in accordance with 6.10.4. |

*Non-material input grouping*

The operator may group inputs whose collective emissions are considered non-material on the basis of a materiality assessment. The high-end estimate of the expected collective emissions shall satisfy equation (12):

$$\sum_{inputs} Q_{input} \times EF_{input} < 2\% \times CR_{total} \quad (12)$$

where

| | |
|---|---|
| $Q_{input}$ | is the quantity of each input included in the group; |
| $EF_{input}$ | is the applicable emission factor for each input; |
| $CR_{total}$ | is the total carbon removal for the activity. |

*Grouped-input substitution*

Where equation (12) is satisfied, the operator may substitute the calculated emissions of the grouped inputs with an emission term equal to 2 % × $CR_{total}$.

*Biogenic $CO_2$ capture at the production facility*

Where biogenic $CO_2$ is captured at the biochar production facility, this shall not be counted as a negative emission in $GHG_{associated}$ but may be eligible for certification as a BioCCS carbon removal activity.

### 6.5.4 Monitoring and Reporting Parameters for Biochar Production

*Production parameters reported*

In accordance with 5.3, the operator shall include in the monitoring report before each re-certification audit the measured or calculated parameters listed in Table 9. Where a parameter is identified as “To be monitored” in the “Notes” column, it shall be included in the monitoring plan in accordance with 5.2.

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*Deferred-application accounting*

Where biochar is produced during one certification period but applied or incorporated in a later certification period, the emissions and removals associated with that quantity shall be recorded in the later certification period.

*Table 9: Parameters for inclusion in the monitoring report – biochar production*

| Equation | Parameter | Unit | Definition | Notes |
|---|---|---|---|---|
| (2), (3) | $GHG_{biochar}$ | $tCO_2e$ | GHG emissions associated with biochar production | Calculated using equation (3) |
| (3), (4) | $F_{alloc}$ | % | Allocation fraction of biochar | Calculated using equation (4) |
| (3), (5) | $GHG_{facility}$ | $tCO_2e$ | Total GHG emissions from operation and construction of the biochar production facility | Calculated using equation (5) |
| (3), (11) | $GHG_{inputs}$ | $tCO_2e$ | Total GHG emissions associated with inputs to the biochar production facility | Calculated using equation (11) |
| (4) | $E_{biochar}$ | MJ/kg biochar produced | Chemical energy in the biochar | To be monitored |
| (4) | $E_{co\text{-}products}$ | MJ/kg biochar produced | Chemical energy or applicable energy output of each co-product | To be monitored |
| (5), (6) | $GHG_{bio}$ | $tCO_2e$ | GHG emissions associated with production and supply of biomass and biomass fuels used at the biochar production facility | Calculated using equation (6) |
| (5), (7) | $GHG_{bio\text{-}storage}$ | $tCO_2e$ | $CH_4$ emissions due to biomass storage prior to processing | Calculated using equation (7) |
| (5), (8) | $GHG_{combustion}$ | $tCO_2e$ | Emissions due to fuel consumption at the biochar production facility, including $CH_4$ and $N_2O$ emissions from biomass and biomass fuel combustion for energy | Calculated using equation (8) |
| (5) | $CH_{4release}$ | $tCO_2e$ | Methane emitted from the biochar production process | To be monitored |
| (5), (9) | $GHG_{elec}$ | $tCO_2e$ | Emissions due to net electricity consumption at the biochar production facility | Calculated using equation (9) |
| (5), (10) | $GHG_{heat}$ | $tCO_2e$ | Emissions due to net useful-heat consumption at the biochar production facility | Calculated using equation (10) |

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| Equation | Parameter | Unit | Definition | Notes |
|---|---|---|---|---|
| (5), (27) | $GHG_{capital}$ | $tCO_2e$ | Capital emissions | Calculated using equation (27) |
| (5) | $GHG_{disposal}$ | $tCO_2e$ | Emissions from treatment or disposal of wastes generated by the biochar production facility | To be monitored where relevant |
| (6) | $Q_{biomass}$ | appropriate unit | Quantity of biomass and/or biomass fuel consumed for biochar production | To be monitored |
| (6) | $EF_{biomass}$ | $tCO_2e$/unit | Emission factor for biomass and/or biomass fuel | |
| (7) | $Q_{feedstock}$ | appropriate unit | Quantity of feedstock stored for more than four weeks in potentially anaerobic conditions | To be monitored where relevant |
| (7) | $C_{feedstock}$ | % | Carbon content of the feedstock | To be monitored where relevant |
| (7) | $T_{storage}$ | months | Period for which feedstock is stored in potentially anaerobic conditions | To be monitored where relevant |
| (8) | $Q_{fuel}$ | appropriate unit | Quantity of fuel consumed in the certification period | To be monitored |
| (8) | $EF_{fuel}$ | $tCO_2e$/unit | Emission factor for consumed fuel | |
| (8) | $CO_{2stored,fossil}$ | $tCO_2$ | Quantity of fossil $CO_2$ from fuel combustion at the biochar production facility captured and permanently stored | To be monitored |
| (9) | $Q_{elec}$ | appropriate unit | Net quantity of electricity consumed in the certification period | To be monitored |
| (9) | $EF_{elec}$ | $tCO_2e$/unit | Emission factor for consumed electricity | |
| (10) | $Q_{heat}$ | appropriate unit | Net quantity of useful heat consumed in the certification period | To be monitored |
| (10) | $EF_{heat}$ | $tCO_2e$/unit | Emission factor for consumed heat | |
| (11) | $Q_{input}$ | appropriate unit | Quantity of input consumed in the certification period | To be monitored |
| (11) | $EF_{input}$ | $tCO_2e$/unit | Emission factor for input consumed | |
| (27), (28) | $GHG_{materials}$ | $tCO_2e$ | Emissions from materials utilised in construction of the facility | Calculated using equation (28) |

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| Equation | Parameter | Unit | Definition | Notes |
|---|---|---|---|---|
| (28) | $Q_{materials}$ | t | Quantity of materials utilised in construction of the facility | To be monitored |
| (28) | $EF_{materials}$ | $tCO_2e$/tonne material | Emission factor for utilised materials | |

## 6.6 Transport of Biochar

*Biochar transport boundary*

This subclause specifies the quantification of GHG emissions associated with transport of biochar from the biochar production facility to the point of application or incorporation. Emissions associated with transport of biomass or biomass fuel from the point of harvest or collection to the biochar production facility shall instead be included in $GHG_{bio}$ in accordance with 6.5.3.

### 6.6.1 Transport Associated GHG Emissions

*Biochar transport emissions*

$GHG_{transport}$ shall be calculated either from actual fuel consumption using equation (13) or from vehicle emission factors and actual distance using equation (14). The operator may use different approaches for different transport modes and shall sum the emissions calculated using each approach.

$$GHG_{transport} = \sum_{trips} (Q_{fuel} \times EF_{fuel}) \quad (13)$$

where

$Q_{fuel}$ is the quantity of fuel consumed for each trip, including empty return trips, expressed in an appropriate unit;

$EF_{fuel}$ is the emission factor for the consumed fuel, expressed in $tCO_2e$/unit and selected in accordance with 6.10.4;

trips is an index of trips taken.

$$GHG_{transport} = \left(\sum_{L=1}^{O} \left(K_L \times EF_{vehicle,loaded}\right) + \sum_{L=1}^{R} \left(K_L \times EF_{vehicle,unloaded}\right)\right) \quad (14)$$

where

$K_L$ is the distance of each trip, expressed in kilometres;

$EF_{vehicle,loaded}$ is the $CO_2$ emission per kilometre of the loaded transport vehicle, expressed in $tCO_2e$/km travelled. An appropriate conservative default emission factor provided by ClimatePal EU may be used;

$EF_{vehicle,unloaded}$ is the $CO_2$ emission per kilometre of the unloaded transport vehicle, expressed in $gCO_2e$/km travelled. An appropriate conservative default emission factor provided by ClimatePal EU may be used. Where no measured or default value is available for $EF_{vehicle,unloaded}$, but a value is available for $EF_{vehicle,loaded}$, the

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operator may set $EF_{vehicle,unloaded} = EF_{vehicle,loaded}$, with the values expressed in consistent units before calculation;

O is the total number of outbound trips;

R is the total number of empty return trips;

L is an index of the trips

### 6.6.2 Monitoring and Reporting Parameters for Biochar Transport

*Transport parameters reported*

In accordance with 5.3, the operator shall include in the monitoring report before each re-certification audit the parameters listed in Table 10. Parameters identified as "To be monitored" shall be included in the monitoring plan.

*Table 10: Parameters for inclusion in the monitoring report – biochar transport*

| Equation | Parameter | Unit | Definition | Notes |
|---|---|---|---|---|
| (13), (14) | $GHG_{transport}$ | $tCO_2e$ | GHG emissions due to energy use for biochar transportation | Calculated using equation (13) or (14) |
| (13) | $Q_{fuel}$ | appropriate unit | Quantity of fuel consumed in the certification period | To be monitored |
| (13) | $EF_{fuel}$ | $tCO_2e$/unit | Emission factor for consumed fuel | |
| (14) | $K_L$ | km | Distance of each trip | To be monitored |
| (14) | $EF_{vehicle,loaded}$ | $tCO_2e$/km | GHG emissions per kilometre of loaded transport vehicle | |
| (14) | $EF_{vehicle,unloaded}$ | $tCO_2e$/km | GHG emissions per kilometre of unloaded transport vehicle; convert to a unit consistent with equation (14) before calculation | |

## 6.7 Biochar Application or Incorporation and Permanence

### 6.7.1 Permanence Fraction

*Biochar permanence*

For each production batch, the operator may calculate the permanence fraction $F_{perm}$ using either the random-reflectance assessment in 6.7.1.1 or the decay-function approach in 6.7.1.2. Elements of the two approaches shall not be combined for a single production batch.

#### *6.7.1.1 Random Reflectance Assessment*

*Reactive-carbon testing*

The operator shall submit at least three random samples from each production batch to a qualified laboratory. Part of each sample shall be thermochemically analysed to identify the reactive organic-carbon fraction, $F_{reactive}$. This analysis shall involve heating the sample to identify the fraction of the material that is subject to

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thermal decomposition when heated to high temperature. The laboratory shall use a methodology consistent with best practice. ClimatePal EU may establish additional laboratory requirements.

*Random-reflectance microsropy*

Part of each sample shall be analysed by incident-light microscopy to measure the random reflectance of the non-reactive solid fraction and identify the fraction having a $R_o$ value of at least 2 %. ClimatePal EU may require a specific laboratory method consistent with current science and best practice. Where ClimatePal EU does not specify a method, the procedure below shall be used.

*Reflectance sampling procedure*

Each sample shall be prepared by embedding crushed particles from the sample in a resin, grinding and polishing one face of the resulting pellet, and taking 500 random-reflectance point measurements evenly distributed across the polished surface. A distribution shall be fitted to these point measurements using kernel density estimation with a univariate Gaussian kernel, using equation (15):

$$\hat{f}(x)=\frac{1}{500h}\times\sum_{i=1}^{500}K\left(\frac{x-x_i}{h}\right) \quad (15)$$

where

$\hat{f}(x)$ is the estimated probability-density function at point x;

h is the bandwidth, calculated as:

$$h=0.9\times\min\left(\sigma_{Ro},\frac{IQR}{1.34}\right)\times500^{-0.2},$$

where $\sigma_{Ro}$ is the standard deviation of $R_o$ values and IQR is their interquartile range;

K(u) is the Gaussian kernel function: $K(u)=\frac{1}{\sqrt{2\pi}}e^{-\frac{u^2}{2}}$, where $u=\frac{x-x_i}{h}$;

Xi is the ith measured $R_o$ value.

*Reflectance fraction calculation*

The fraction of the non-reactive material having a $R_o$ value greater than 2 %, $FR_o$>2%, shall be calculated by numerical integration of the fitted function using the composite Simpson 1/3 rule and equation (16):

$$F_{Ro>2\%}=\int_{2\%}^{\infty}\hat{f}(x)dx \quad (16)$$

*Sample permanence calculation*

The permanence fraction for each submitted sample i shall be calculated using equation (17):

$$F_{perm,i}=\left(1-F_{reactive,i}\right)\times F_{Ro>2\%,i} \quad (17)$$

where

$F_{reactive,I}$ is the reactive organic-carbon fraction measured for sample i;

$F_{Ro>2\%,I}$ is the fraction of non-reactive material in sample i having a $R_o$ value greater than 2 %.

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*Batch permanence averaging*

For n tested samples, the estimated permanence fraction of the production batch shall be calculated as the arithmetic mean of the permanence fractions determined for the individual samples using equation (18):

$$F_{perm} = \frac{\sum_{i=1}^{n} F_{perm,i}}{n} \quad (18)$$

*Reflectance uncertainty*

For the uncertainty assessment in 6.12, the uncertainty associated with $F_{perm}$ under the random-reflectance method shall be calculated using equation (19):

$$\text{Uncertainty}_{F_{perm}} = 1.65 \times \frac{\bar{\sigma}_{Ro}}{\bar{\psi}_{Ro} \times \sqrt{n}} + 2.5\% \quad (19)$$

where

| | |
|---|---|
| $\bar{\sigma}_{Ro}$ | is the standard deviation of the mean $R_o$ value for each of the n samples; |
| $\bar{\psi}_{Ro}$ | s the arithmetic mean of the mean $R_o$ value for each of the n samples; |
| n | is the number of tested samples; |
| 2.5 % | is the conservatism factor, in accordance with equation (62) of the Annex to Delegated Regulation (EU) 2026/285. |

#### *6.7.1.2 Decay Function*

*$H/C_{org}$ and temperature inputs*

The decay-function approach shall use the $H/C_{org}$ ratio of the biochar production batch and the expected annual average temperature at the location of application or incorporation. $H/C_{org}$ shall not exceed 0.7. Soil temperature shall be used for application to soils and air temperature for incorporation into products. ClimatePal EU may provide additional guidance or location-specific default values for assessing temperature.

*200-years permanence estimate*

The operator shall use the $H/C_{org}$ ratio and the expected average temperature at the location of application or incorporation to calculate $F_{perm}$. The expected average temperature shall be rounded up to the next 5 °C interval. This calculation estimates the remaining carbon after 200 years using the decay data documented by Woolf et al. (2021)[1]. $F_{perm}$ shall then be calculated using equation (20), using the applicable values of m and c from Table 11:

$$F_{perm} = m \times H/C_{org} + c \quad (20)$$

where

| | |
|---|---|
| $H/C_{org}$ | is the ratio of hydrogen to organic carbon in the biochar production batch; |

[1] Woolf, D., Lehmann, J., Ogle, S., Kishimoto-Mo, A. W., McConkey, B., and Baldock, J., 'Greenhouse gas inventory model for biochar additions to soil', Environmental Science & Technology, 55(21), 2021, pp. 14795–14805, https://doi.org/10.1021/acs.est.1c02425.

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m — is the parameter for the linear part of the modelled relationship between the $H/C_{org}$ ratio and permanence;

c — is the parameter for the constant part of the modelled relationship between the $H/C_{org}$ ratio and permanence.

*Table 11: Parameters for calculating Fperm using the decay function*

| Temperature (°C) | m | c |
|---|---|---|
| 5 | −0.500 | 1.108 |
| 10 | −0.650 | 1.001 |
| 15 | −0.653 | 0.896 |
| 20 | −0.636 | 0.829 |
| 25 | −0.621 | 0.789 |

*Decay-method uncertainty*

For the uncertainty assessment in 6.12, $F_{perm}$ determined using the decay-function method shall be treated as having zero associated uncertainty because the decay function is already considered a conservative basis for estimation.

### 6.7.2 GHG Emissions Associated with Application or Incorporation

*Use-stage emission boundary*

Only emissions directly related to the use of biochar shall be included in $GHG_{use}$. Where biochar is intermixed with another material before application or incorporation, emissions associated with producing and handling the other material shall not be included, and emissions from application or incorporation shall be allocated on a mass basis. ClimatePal EU may provide more detailed guidance on the assessment of associated GHG emissions for particular activity types.

*Site-level use emissions*

$GHG_{use}$ across one or more application or incorporation sites shall be calculated using equation (21):

$$GHG_{use} = \sum_{S} \left( F_S \times GHG_{biochar\ site,S} \right) \quad (21)$$

where

$F_S$ — is the mass fraction of biochar from the activity in the total mass of soil amendment applied or material incorporated at site S. The total mass includes biochar from the activity, biochar sourced from other activities for use at the same site and any other materials intermixed with the biochar;

$GHG_{biochar\ site,S}$ — is the GHG emissions associated with application or incorporation at site S, determined using equation (22);

S — is an index of application or incorporation sites.

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*Biochar application or incorporation emissions*

GHG emissions associated with application or incorporation at each site shall be calculated using equation (22):

$$GHG_{biochar\ site} = GHG_{combustion} + GHG_{elec} + GHG_{heat} \quad (22)$$

where

$GHG_{combustion}$ is the GHG emissions due to fuel consumption at the application or incorporation site, including vehicles and mobile equipment, determined using equation (23);

$GHG_{elec}$ is the GHG emissions due to electricity consumption at the application or incorporation site, determined using equation (24);

$GHG_{heat}$ is the GHG emissions due to useful-heat consumption at the application or incorporation site, determined using equation (25).

$$GHG_{combustion} = \sum_{fuels} (Q_{fuel} \times EF_{fuel}) \quad (23)$$

$$GHG_{elec} = \sum_{electricity\ source} (Q_{elec} \times EF_{elec}) \quad (24)$$

$$GHG_{heat} = \sum_{heat\ source} (Q_{heat} \times EF_{heat}) \quad (25)$$

where

$Q_{fuel}$ is the quantity of fuel consumed in the certification period, expressed in an appropriate unit;

$EF_{fuel}$ is the emission factor for the fuel consumed, expressed in $tCO_2e$/unit and selected in accordance with 6.10.4;

$Q_{elec}$ is the net quantity of electricity consumed in the certification period, expressed in an appropriate unit and determined in accordance with 6.9;

$EF_{elec}$ is the emission factor for the consumed electricity, expressed in $tCO_2e$/unit and selected in accordance with 6.10.1;

$Q_{heat}$ is the net quantity of useful heat consumed in the certification period, expressed in an appropriate unit and determined in accordance with 6.9;

$EF_{heat}$ is the emission factor for the consumed heat, expressed in $tCO_2e$/unit and selected in accordance with 6.10.2.

*Use-stage default values*

The operator may use default values per tonne of material applied or incorporated for $Q_{fuel}$, $Q_{elec}$ and $Q_{heat}$ for specified application or incorporation methods where such default values are provided by ClimatePal EU.

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### 6.7.3 Monitoring and Reporting Parameters for Application or Incorporation

*Use-stage parameters reported*

In accordance with 5.3, the operator shall include in the monitoring report before each re-certification audit the measured or calculated parameters listed in Table 12. Where a parameter is identified as "To be monitored" in the "Notes" column, it shall be included in the monitoring plan in accordance with 5.2.

*Table 12: Parameters for inclusion in the monitoring report*

| Equation | Parameter | Unit | Definition | Notes |
|---|---|---|---|---|
| (1) | $Q_{biochar}$ | tonne | Quantity of biochar in the production batch applied or incorporated in the certification period | To be monitored |
| (1) | $C_{org}$ | % | Fractional content of organic carbon in the biochar production batch | To be monitored |
| (1), (18), (20) | $F_{perm}$ | % | Permanence fraction of each production batch determined using either the random-reflectance assessment or the decay-function approach | Calculated using equation(18) or (20) |
| (16) | $FR_o$>2% | % | Fraction of non-reactive biochar in a sample having random reflectance greater than 2 % | To be monitored |
| (20) | $H/C_{org}$ | dimensionless | Ratio of hydrogen to organic carbon in the biochar production batch. $H/C_{org}$ shall be measured for every production batch | To be monitored |
| (21) | $GHG_{use}$ | $tCO_2e$ | GHG emissions associated with application or incorporation of biochar across one or more sites | To be monitored |
| (21) | $F_S$ | % | Mass fraction of biochar from the activity in the total mass of soil amendment applied or material incorporated at each site | To be monitored |

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| Equation | Parameter | Unit | Definition | Notes |
|---|---|---|---|---|
| (21), (22) | $GHG_{biochar\ site,S}$ | $tCO_2e$ | GHG emissions associated with energy use and operation to apply or incorporate biochar or a biochar-containing matrix | Calculated using equation (22) |
| (22), (23) | $GHG_{combustion}$ | $tCO_2e$ | GHG emissions due to fuel consumption at the application or incorporation site | Calculated using equation (23) |
| (22), (24) | $GHG_{elec}$ | $tCO_2e$ | GHG emissions due to electricity consumption at the application or incorporation site | Calculated using equation (24) |
| (22), (25) | $GHG_{heat}$ | $tCO_2e$ | GHG emissions due to useful-heat consumption at the application or incorporation site | Calculated using equation (25) |
| (23) | $Qf_{uel}$ | appropriate unit | Quantity of fuel consumed in the certification period | To be monitored |
| (23) | $EF_{fuel}$ | $tCO_2e$/unit | Emission factor for fuel consumed | |
| (24) | $Q_{elec}$ | appropriate unit | Net quantity of electricity consumed in the certification period | To be monitored |
| (24) | $EF_{elec}$ | $tCO_2e$/unit | Emission factor for the consumed electricity | |
| (25) | $Q_{heat}$ | appropriate unit | Net quantity of useful heat consumed in the certification period | To be monitored |
| (25) | $EF_{heat}$ | $tCO_2e$/unit | Emission factor for the consumed heat | |

## 6.8 Completeness and Materiality

*See 4.2, 4.3 and 4.7 in EN ISO 14064-2:2019.*

*Reassessment deviations*

The quantification of associated GHG emissions shall be complete and shall cover all process and combustion emissions from all material emission sources and source streams belonging to the activity, and all other relevant emissions (in accordance with Section 2.3.1 of the Annex to Delegated Regulation (EU) 2026/285.

*Unspecified material sources*

Where the operator or certification body identifies emissions from a source or group of sources associated with the activity that are material but are not covered by this methodology, the operator shall include those emissions in the calculation of $GHG_{associated}$.

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*Materiality assessment*

A materiality assessment may be applied only in the following cases:

a. capital emissions, in accordance with 6.11;

b. input emissions where a materiality treatment is expressly permitted under 6.5.3; or

c. emissions from a source or group of sources associated with the activity that is not explicitly identified in this methodology, where a materiality assessment is required to determine whether those emissions shall be directly assessed.

*Emission-range estimate*

Where a materiality assessment is required for a specified emission source or group of emission sources, the operator shall present to the certification body an estimate of the potential range of emissions associated with that source or group of sources over the activity period.

*2% materiality threshold*

Where the emissions at the high end of that range are equal to or greater than 2 % of the gross carbon removals delivered, or expected to be delivered, over the activity period, the emissions shall be considered potentially material and shall be directly assessed.

*Initial materiality assessment*

At the certification audit, the operator shall carry out the materiality assessment using the expected emissions and removals over the activity period. The basis for concluding that any emissions are immaterial shall be described in the activity plan.

*Materiality reassessment*

At each re-certification audit, the certification body shall assess whether there has been a significant deviation from the operational conditions declared at the certification audit. Where such a deviation is identified, the operator shall repeat the relevant materiality assessment.

## 6.9 Net Consumption of Electricity and Useful Heat

*Net energy consumption*

Energy recovery resulting from process configurations may reduce the additional net consumption of a specified type of energy or shift net demand from one energy type to another. For the calculation of net electricity or net useful heat consumption, the operator shall assess the overall change in demand after such energy-recovery processes have been implemented.

*On-site energy exclusion*

The calculation of net consumption shall exclude electricity or heat that is both produced and consumed on site at the relevant facility or site. Emissions associated with electricity or heat generated on site shall be accounted for separately through the fuel consumed.

*Imported and recovered energy*

The overall change in demand shall be determined as the quantity of electricity or heat imported from outside the relevant facility or site for direct use by the activity, minus the quantity of electricity or heat exported for other uses that was recovered from processes directly required for the activity. Electricity or heat produced

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specifically for export, rather than recovered from a process required for the activity, shall not be included as recovered energy.

*Source-proportional net energy*

Where the net quantity of electricity or useful heat consumed is lower than the gross quantity and the electricity or heat originates from more than one source, the net consumption from each source shall be calculated proportionally using equation (26):

$$Q_{heat/elec,net,source} = Q_{heat/elec,gross,source} \times \frac{\sum_{sources} Q_{heat/elec,net,source}}{\sum_{sources} Q_{heat/elec,gross,source}} \quad (26)$$

where

$Q_{heat/elec,net,source}$ is the net quantity of electricity or useful heat allocated to a given source;

$Q_{heat/elec,gross,source}$ is the gross quantity of electricity or useful heat from that source consumed during the certification period;

Sources is an index of the electricity or useful-heat sources.

*Negative net energy*

Where energy recovery results in a net increase in the availability of a type of energy, $Q_{heat}$ or $Q_{elec}$ may be reported as a negative value. The operator shall ensure that any negative quantity is substantiated by correct process assumptions.

*No negative energy emissions*

Where $Q_{heat}$ or $Q_{elec}$ calculated for a process element is negative, the corresponding $EF_{heat}$ or $EF_{elec}$ shall be set to zero. $GHG_{heat}$ and $GHG_{elec}$ shall therefore not take negative values.

## 6.10 Emission Factors

### 6.10.1 Electricity

*Electricity emission factors*

$EF_{elec}$ shall be calculated in accordance with paragraphs 5 and 6 of Part A of the Annex to Delegated Regulation (EU) 2023/1185, subject to the adaptations specified in Delegated Regulation (EU) 2026/285 for permanent carbon removals.

*Electricity calculation period*

The calculation period may be shorter than a calendar year and may span parts of two calendar years. If a certification period falls entirely within one calendar year, $EF_{elec}$ shall be calculated either based on data for the exact certification period or on data for the full calendar year. If the certification period spans two calendar years, a separate $EF_{elec}$ shall be calculated for electricity consumed in each calendar year, either based on data for the part of the certification period falling within that year or on data for the full calendar year.

*Renewable energy transition*

For a new biochar production facility for which the final investment decision is made and construction has started no later than 31 December 2029, where a zero electricity emission factor is claimed because the consumed electricity is fully renewable and temporal correlation is required, temporal correlation may be

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assessed annually rather than hourly until 31 December 2044 or the end of the first activity period, whichever occurs first.

*Source-specific electricity attribution*

The operator may choose the approach used to attribute GHG-emission values to electricity independently for each source of consumed electricity and is not required to use the same approach for electricity consumed at different locations.

*Bidding-zone intensity values*

ClimatePal EU may provide lists of up-to-date electricity-emission-intensity values at bidding-zone level.

*Net electricity export*

For net electricity export, where $Q_{elec}$ is negative, $EF_{elec}$ shall be zero.

### 6.10.2 Useful Heat

*Useful-heat factors*

The applicable emission factor for net useful-heat consumption shall be selected in accordance with Table 13.

*Table 13: Useful-heat emission factor treatment*

| Heat source | Emission-factor treatment |
|---|---|
| Heat recovered from a process that forms part of the activity | No additional emissions. |
| Heat generated by combustion of fossil fuels | Lifecycle emission factor for fossil-fuel supply and combustion set out in the latest version of the referenced JRC document, divided by the thermal efficiency of the heat-generation process. |
| Heat generated from biomass, biofuel, bioliquid or biomass fuel | Emission factor for supply and combustion, excluding $CO_2$ from combustion, calculated in accordance with Annex VI to Directive (EU) 2018/2001 and divided by the thermal efficiency of the heat-generation process. |
| Heat generated from non-biomass renewable sources | $EF_{heat} = 0$. |
| Heat from nuclear energy production | $EF_{heat} = 0$. |
| Heat recovered from a process from which heat was not previously recovered until no more than three months before the start of the activity | $EF_{heat} = 0$. |
| Heat recovered from a process from which heat was already recovered, or from a new process that came into operation less than six months before the start, where that process is not directly related to the activity | $EF_{heat}$ shall be set to the EU ETS benchmark emission factor for heat. |
| Heat supplied from a heat network | $EF_{heat}$ shall be set to the EU ETS benchmark emission factor for heat. |

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For net heat export, where $Q_{heat}$ is negative, $EF_{heat}$ shall be zero.

*Net heat export*

### 6.10.3 Biomass, Biofuel, Bioliquid and Biomass Fuel

*Biomass emission factors*

Where biomass, biofuel, bioliquid or biomass fuel is consumed by the activity, including biomass used as feedstock for biochar production and biomass or biomass fuel consumed by the biochar production facility, the emissions associated with that consumption shall be determined in accordance with this clause (in accordance with Section 2.3.4.3 of the Annex to Delegated Regulation (EU) 2026/285 and Directive (EU) 2018/2001).

*Biogenic combustion accounting*

Where biomass, biofuel, bioliquid or biomass fuel meeting the applicable sustainability requirements in Article 29 of Directive (EU) 2018/2001 is consumed by the activity, $CO_2$ produced by chemical processes from the biogenic carbon contained therein shall be accounted for using a $CO_2$ emission factor of zero. Supply-chain emissions associated with the provision of the biomass, biofuel, bioliquid or biomass fuel and non-$CO_2$ emissions associated with its combustion, primarily $CH_4$ and $N_2O$, shall be accounted for.

*Supply-chain emission factors*

The emission factor for supply-chain emissions shall be calculated in accordance with the applicable rules for biomass, biofuel, bioliquid or biomass-fuel supply in Annexes V and VI to Directive (EU) 2018/2001. The calculation shall include emissions up to the point of consumption associated with the terms eec, el and ep defined in those Annexes, together with transport emissions determined in accordance with this subclause. Where necessary, emission factors shall be converted from emissions per unit of energy produced by a bioenergy facility to emissions per unit of feedstock consumed.

*Waste and residue treatment*

Wastes and residues shall be considered to have zero lifecycle GHG emissions up to the process of collection in accordance with Directive (EU) 2018/2001. For municipal waste, post-consumer wood waste and sewage sludge, the process of collection shall be considered to start when the material is deposited at the biochar production facility.

*Biomass transport emissions*

Emissions from the transport of biomass, biofuel, bioliquid or biomass fuel to the biochar production facility shall be calculated using the actual distance travelled and mode of transport. The disaggregated default emission factors specified for the etd term in Annexes V and VI to Directive (EU) 2018/2001 shall not be used for this transport calculation.

*Zero ILUC treatment*

For biomass consumption falling within the scope of the zero indirect-land-use-change treatment specified in Section 2.3.4.3 of the Annex to Delegated Regulation (EU) 2026/285, indirect land-use-change emissions shall be set to zero.

*Missing-feedstock factor guidance*

ClimatePal EU may provide guidance for calculating emission factors for feedstocks for which disaggregated default values are not available in Annexes V and VI to Directive (EU) 2018/2001.

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### 6.10.4 Inputs and Fuels

*Input and fuel factors*

Where the quantification rules require the calculation of emissions associated with the use of inputs, including fossil fuels and materials used in the construction of capital equipment, lifecycle emission factors shall be taken either from lists of default emission factors provided by ClimatePal EU or from the hierarchical sources in Table 14.

*First available factor source*

Where the hierarchy in Table 14 is used, the emission factor shall be obtained from the first source in the hierarchy from which it is available, using the most recent version where available.

*Table 14: Hierarchy for lifecycle emission factors for inputs and fuels*

| Priority | Source |
|---|---|
| 1 | Part B of the Annex to Delegated Regulation (EU) 2023/1185. |
| 2 | Most recent Environmental Footprint datasets or EF-compliant datasets. |
| 3 | Joint Research Centre, Definition of input data to assess GHG default emissions from biofuels in EU legislation. |
| 4 | JEC Well-to-Wheels report[2] |
| 5 | Ecoinvent database, version 3.5 or a more recent version, or another comparable commercial database. |
| 6 | Official sources, including IPCC, IEA or government sources. |
| 7 | Other reviewed sources or peer-reviewed publications. |

*Database-access fallback*

Where access to a database under priority 5 is not possible, the operator may rely on a source under priority 6 or 7.

*Point-of-use lifecycle scope*

Lifecycle emission factors shall reflect emissions associated with supplying the input up to the point of use by the activity.

*Emission-factor hierarchy*

Where necessary, an emission factor obtained from one of these sources shall be adjusted to exclude carbon contained within the input material itself. Where such carbon is oxidised and emitted as a result of processes associated with the activity, the resulting emissions shall be counted directly as an emission source.

*Embedded-carbon adjustment*

The use of emission factors from different sources may result in minor differences in the lifecycle scope applied to different inputs. The operator shall not be required

[2] Prussi, M., Yugo, M., De Prada, L., Padella, M., and Edwards, R., JEC Well-To-Wheels report V5, Publications Office of the European Union, Luxembourg, 2020, https://data.europa.eu/doi/10.2760/100379.

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to recalculate emission factors obtained from these sources solely to achieve full consistency in lifecycle scope across the utilised input data.

*Lifecycle-scope consistency*

ClimatePal EU may provide lists of conservative default emission factors, including emission factors available from the sources listed in Table 14. Where there is uncertainty in the best estimate of a default emission factor or variability in the value can be expected, the default emission factor shall be set conservatively such that its use is likely to result in a marginal underestimation of the delivered net carbon removals.

*Conservative default factors*

Where a standard deviation is reported, the default emission factor shall be set to the mean plus one standard deviation. Where a 95 % confidence interval is reported, the default emission factor shall be set halfway between the mean and the applicable 95 % confidence limit. These adjustments shall always be made in the direction that reduces the estimated net carbon removal benefit.

*Default-factor uncertainty*

Default emission factors established in accordance with this subclause shall be treated as having no associated uncertainty for the calculation in 6.12.

### 6.10.5 Transport

*Transport emission factors*

Transport emissions, whether from biochar or other bulk-material transport associated with the activity, may be calculated either from the fuel consumption and associated emissions of the specific vehicles and routes used or using conservative default emission factors provided by ClimatePal EU.

*Distance-based transport estimate*

Where default values are not used, the operator may estimate emissions either from the actual fuel consumption of the vehicles and other infrastructure used or from the product of the average GHG emissions associated with operating the specific vehicle or infrastructure, expressed in $gCO_2e/km$, and the actual distance travelled. Fuel emission factors shall be lifecycle emission factors selected in accordance with 6.10.4.

*Return-trip allocation*

Return-trip emissions shall be included assuming that the vehicle returns empty, unless the operator demonstrates that the return trip provides another transport service. In that case, the return-trip emissions allocated to the activity may be set to zero.

## 6.11 Capital Emissions

*Capital-emission applicability*

Capital emissions associated with the construction and installation of the biochar production facility shall be considered where the facility first came into operation, was expanded or refitted within 15 years before the certification date of the activity or will be expanded or refitted during the activity period. For any other biochar production facility, capital emissions shall be considered to be zero. The DA identifies BCR capital emissions specifically with construction and installation of the biochar production facility.

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*Capital-emission materiality*

A materiality assessment shall be undertaken for the sum of capital emissions in accordance with 6.8. Where the certification body concludes on the basis of that assessment that capital emissions may be material, the capital emissions shall be assessed.

*Capital-emission exclusions*

Capital emissions associated with non-biomass renewable-energy generating equipment shall be excluded from the calculation. Capital emissions shall only be assessed for the parts of the biochar production facility or equipment directly required for performance of the BCR activity.

*Construction inventory*

Where capital emissions are assessed, the operator shall take an inventory of the construction materials used and the fuel and energy consumed during construction and shall sum the associated emissions. Emission factors used to assess capital emissions shall account for the full lifecycle of the materials and energy used.

*Annual capital amortisation*

The calculated capital emissions shall be amortised over either 15 or 20 years. Where the biochar production facility or relevant capital equipment is not used exclusively by the certified activity, a pro-rata fraction of the capital emissions shall be allocated to the activity.

*Annual amortised capital emissions*

The annual amortised capital emissions allocated to the activity shall be calculated using equation (27):

$$GHG_{capital} = \frac{Q_{activity}}{Q_{total}} \times \frac{GHG_{combustion} + GHG_{elec} + GHG_{heat} + GHG_{materials}}{T} \quad (27)$$

where

$Q_{activity}$ is the utilisation of the capital equipment by the activity, expressed in a relevant unit;

$Q_{total}$ is the expected annual average total utilisation of the capital equipment over its operational lifetime, expressed in the same unit. Where the equipment is used only by the activity, $Q_{activity} / Q_{total} = 1$;

$GHG_{combustion}$ is the lifecycle GHG emissions associated with fuel consumed during construction, calculated on the same basis as equation (8), using the quantity of fuel consumed during construction and the applicable emission factor selected in accordance with 6.10.4;

$GHG_{elec}$ is the GHG emissions associated with electricity consumed during construction, calculated on the same basis as equation (9), using the electricity emission factor determined in accordance with 6.10.1;

$GHG_{heat}$ is the GHG emissions associated with useful heat consumed during construction, calculated on the same basis as equation (10), using the useful-heat emission factor determined in accordance with 6.10.2;

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$GHG_{materials}$ is the GHG emissions associated with construction materials, determined using equation (28);

T is the amortisation period of either 15 or 20 years.

*GHG emissions from construction materials*

GHG emissions from construction materials shall be calculated using equation (28):

$$GHG_{materials} = \sum_{materials} (Q_{materials} \times EF_{materials}) \quad (28)$$

where

$Q_{materials}$ is the quantity of materials used in construction, expressed in tonnes;

$EF_{materials}$ is the lifecycle emission factor for the material, expressed in $tCO_2e/t$ of material and selected in accordance with 6.10.4.

*Comparable-facility proxy*

Where the biochar production facility has equal or lower material requirements for construction than a previously constructed facility of the same type, the operator may use the capital emissions of that previous facility as an estimate of the capital emissions of the new facility.

*Conservative capital defaults*

ClimatePal EU may provide conservative capital-emission factors for specific activity types, activity stages or facility sizes as an alternative to undertaking an activity-specific materiality assessment or full calculation. Such values shall be set so that they can reasonably be expected to exceed the actual capital emissions for the relevant facility in at least 95 % of cases. ClimatePal EU shall document the basis for treating the provided values as conservative.

*Capital-emission inclusion period*

The annual amortised capital emissions shall be included in the associated GHG emissions of the activity for each year until the fifteenth or twentieth year, according to the selected amortisation period, following the year in which the biochar production facility came into operation, was expanded or was refitted, as applicable.

## 6.12 Measured Data, Uncertainty and Conservatism

*See 4.5, 4.7 and 6.9 in EN ISO 14064-2:2019.*

*Measurement uncertainty*

The operator shall establish and apply data-quality management procedures covering data collection, processing, calculation, storage, quality control and uncertainty assessment for information used to quantify the net carbon removal benefit (in accordance with Sections 2.2.7.1 and 2.3.6 of the Annex to Delegated Regulation (EU) 2026/285.

*Measurement requirements*

Measurements shall be undertaken in a way consistent with the requirements of Article 42 of Implementing Regulation (EU) 2018/2066. ClimatePal EU may provide additional guidelines for specific types of measurement.

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*Uncertainty aggregation*

Where measured, estimated or default data are used as the basis for calculations of sources or sinks, the operator shall assess the uncertainty introduced into the calculation of net carbon removals. Uncertainties shall be combined in accordance with the principles set out in Section 3 of Chapter 6, "Quantifying Uncertainties in Practice", of the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*[3]. Uncertainty shall be assessed based on the 95 % confidence interval.

*Permanence uncertainty treatment*

For $F_{perm}$, the random-reflectance method shall use the uncertainty determined in accordance with equation (19). The decay-function method shall be treated as having zero associated uncertainty because the decay function is already considered a conservative basis for estimation. The applicable conservatism treatment is specified in Table 15.

*Table 15: Uncertainty and conservatism*

| Total resulting uncertainty estimate | Conservatism factor | Consequence |
|---|---|---|
| Lower than ±2.5 % | FC = 1 | No uncertainty adjustment. |
| At least ±2.5 % and not greater than ±20 % | FC = 100 % minus the total uncertainty estimate | Apply the applicable conservatism treatment. |
| Greater than ±20 % | Not applicable | No units shall be issued for the certification period. |

*BCR uncertainty guidance*

ClimatePal EU may provide more detailed instructions on the calculation of uncertainty for BCR activity types.

## 7. Additionality and Financing

*Additionality and financing*

The standardised baseline specified in 6.2 is 0 $tCO_2$/year. Where a standardised baseline is used, the additionality requirements in Article 5(1) of Regulation (EU) 2024/3012 shall be considered to be complied with.

*Public financing disclosure*

Where the activity is financed through a combination of public and private funding when the activity plan is submitted to ClimatePal EU, the operator shall indicate any form of public financing received or applied for with regard to the activity. This information shall be included in the certificate of compliance.

[3] Penman, J., Kruger, D., Galbally, I., Hiraishi, T., Nyenzi, B., Emmanuel, S., Buendia, L., Hoppaus, R., Martinsen, T., Meijer, J., Miwa, K., and Tanabe, K. (Eds.), Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, IPCC National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, 2000, https://www.ipcc-nggip.iges.or.jp/ public/gp/english/

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*Financing update reporting*

Financing received or applied for with regard to the activity shall be included in the monitoring report before each re-certification audit.

## 8. Long Term Storage, Chain of Custody and Monitoring

*Chain of custody and storage*

The $H/C_{org}$ ratio of each production batch shall be measured. No permanent carbon removal units shall be issued for a production batch with $H/C_{org}$ greater than 0.7.

*Use verification before issuance*

Use of produced biochar shall be monitored up to application to soil or incorporation into an eligible product. Units shall be issued only in relation to the quantity of biochar demonstrated to have been applied or incorporated.

*Monitoring-period endpoints*

The monitoring period shall continue:

a. for biochar applied to soil, until application where the application is directly overseen by the certification body;

*Overseen soil application*

b. for biochar applied to soil where the application is not directly overseen by the certification body, until one year after the end of the certification period during which the biochar is reported to have been applied; and

*Unsupervised soil application*

c. for biochar incorporated into products, until it is demonstrated that the biochar has been incorporated.

*Product incorporation*

*Certified biochar segregation*

Biochar from certified activities shall be segregated in the supply chain from biochar produced by non-certified activities until the point of application or incorporation. Certified and non-certified biochar may be mixed at that point before application or incorporation.

*Mixed-batch mass balance*

Where biochar from multiple production batches of certified activities is mixed before application or incorporation, the material shall be well mixed and treated as containing fractions of the original batches in proportion to the quantities mixed. Segregated supply for each production batch is mandatory unless the batches are demonstrated to be well mixed.

*Use suitability*

The chain of custody shall ensure that biochar is used only in ways appropriate to its production and characteristics.

*Post-application site access*

Where biochar is applied to soil and the application is not directly overseen by a representative of the certification body, the operator shall grant access to the application location on request during the monitoring period to ClimatePal EU, the certification body or the relevant competent national authority to allow testing of the soil to confirm that the biochar was applied. Once application is confirmed in this way, the application shall be treated as demonstrated.

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*End of monitoring*

No further monitoring is required after the applicable monitoring period has ended because reversal risk is characterized through the permanence fraction and direct identification of reversals after application or incorporation is not practically possible.

# 9. Sustainability

## 9.1 Minimum Sustainability Requirements

*Minimum sustainability requirements*

The operator shall comply with the minimum sustainability requirements summarized in Table 16 and shall maintain evidence sufficient to demonstrate compliance.

*Table 16: Minimum sustainability requirements*

| Environmental objective | Requirement for BCR | Reference |
|---|---|---|
| Climate change mitigation | Maintain compliance with the eligibility requirements in 4.1 and 4.2, which prevent certification of activities that significantly harm the climate-change-mitigation objective. | Annex 4.1.1 of Delegated Regulation (EU) 2026/285 |
| Climate change adaptation | Comply with the climate-adaptation criteria in Appendix A to Annex I to Delegated Regulation (EU) 2021/2139. | Annex 4.1.2 of Delegated Regulation (EU) 2026/285 |
| Water and marine resources | Evaluate and address potential risks due to the activity to the good status or good ecological potential of bodies of water, including surface water and groundwater, or to the good environmental status of marine waters. Where pollutants scrubbed from flue gases to reduce air pollution may be released to a body of water, consider the air-pollution benefit and the availability of alternative discharge strategies when evaluating the impact on water quality. | Annex 4.1.3 of Delegated Regulation (EU) 2026/285 |
| Circular economy | Evaluate and address potential risks to circular-economy objectives, considering the types of potential significant harm set out in Article 17(1)(d) of Regulation (EU) 2020/852. Comply with 9.2 and 9.3. | Annex 4.1.4 of Delegated Regulation (EU) 2026/285 |
| Pollution prevention and control | Evaluate and address potential risks of a significant increase in emissions of pollutants to air, water or land. Facilities within the scope of Directive 2010/75/EU shall comply with all requirements arising from that Directive. | Annex 4.1.5 and 4.1.5.1 of Delegated Regulation (EU) 2026/285 |

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| Environmental objective | Requirement for BCR | Reference |
|---|---|---|
| Biodiversity, ecosystems and land degradation | Evaluate and address potential risks from the activity to the good condition or resilience of ecosystems, the conservation status of habitats and species, including those of Union interest, or the achievement of targets or obligations set out in national restoration plans under Regulation (EU) 2024/1991. | Annex 4.1.6 of Delegated Regulation (EU) 2026/285 |

*Soil-use product compliance*

For biochar applied to agricultural, forest or urban soils, the operator shall demonstrate that the biochar complies with the limit values specified in 9.4.1 and meets all requirements relating to pyrolysis and gasification materials in Regulation (EU) 2019/1009, including the limitations on permissible input materials.

*Local soil and biomass impacts*

For biochar applied to agricultural and forest soils, the operator shall demonstrate that the local context has been considered and that it is reasonable to expect no overall negative effect on biomass production, site condition or soil health and no significant reduction in the storage of other soil organic carbon through positive priming effects from the application of biochar.

*Adverse-impact exclusion*

Where the certification body considers significant loss of other soil organic carbon or deleterious impacts on agricultural productivity, biodiversity, ecosystems receiving the biochar or ecosystems located downstream in the watershed, soil health or any other environmental aspects to be likely, no units shall be issued in relation to the affected applied quantity. ClimatePal EU may provide additional best-practice guidance or soil-health-monitoring guidance on biochar application to soils.

*Sustainability data sharing*

The operator shall share relevant data and information that are not commercially sensitive, upon request, with ClimatePal EU, competent national authorities or the European Commission, without creating undue administrative burden for farmers. ClimatePal EU shall enable knowledge sharing between operators through platforms allowing dissemination of data gathered in the course of post-application monitoring activities.

## 9.2 Biomass Sustainability

*Biomass sustainability*

All biomass, biofuel, bioliquid or biomass fuel used as feedstock for biochar production, and any additional biomass, biofuel, bioliquid or biomass fuel consumed to produce energy for the activity, shall comply with the applicable requirements in this subclause.

*RED sustainability application*

Where Article 29 of Directive (EU) 2018/2001 sets requirements for biomass, biofuel, bioliquid or biomass fuel to be taken into account for the purposes specified in Article 29(1)(a), (b) or (c), the certification body shall apply those requirements also to material consumed in relation to the BCR activity, even where the activity does not generate renewable energy taken into account under that Directive.

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*Feedstock disclosure*

The operator shall disclose the biomass feedstock or feedstock mix consumed by the activity and the feedstock or feedstock mix used to produce consumed biofuels, bioliquids or biomass fuels, disaggregated to the level required by Directive (EU) 2018/2001 reporting, national guidance and relevant industrial standards.

*Bioenergy outpu*

Where biochar production takes place at a facility producing heat or electricity or a biofuel, bioliquid or biogas, the certification body shall verify the requirements in Article 29(10) of Directive (EU) 2018/2001 only with regard to the heat, electricity, biofuel, bioliquid or biogas produced.

*Waste and residue exemption*

Biomass, biofuel, bioliquid or biomass fuel produced from wastes or residues other than agricultural, aquaculture, fisheries and forestry residues is not subject to the requirements in Article 29(2) to (7) of Directive (EU) 2018/2001.

*Recognised sustainability schemes*

Voluntary schemes approved by the Commission in accordance with Article 30(4) of Directive (EU) 2018/2001 and national schemes recognised by the Commission in accordance with Article 30(6) of that Directive shall be treated as providing accurate data for demonstrating compliance with the applicable biomass sustainability requirements. Other schemes recognised by the competent national authority in the Member State where the biochar production facility is located shall likewise be treated as providing accurate data for this purpose.

*Competent-authority assessments*

For facilities regulated under Directive (EU) 2018/2001, periodic assessments of compliance with sustainability requirements by Member State competent authorities shall not prevent the certification body from approving the issuance of units. Where such an assessment subsequently results in a non-conformity with Article 29 of that Directive, the non-conformity shall be notified to the certification body.

*Conservation area sourcing*

Where biomass is sourced from areas designated by the national competent authority for conservation, including areas covered by a national restoration plan pursuant to Regulation (EU) 2024/1991, or from protected habitats, the sourcing shall be in accordance with the conservation and restoration objectives for those areas.

### 9.3 Avoidance of Unsustainable Biomass Demand and Voluntary Compensation

*High-biochar-output feedstock rule*

Where the produced biochar in a production batch is expected to account for 50 % or more of the total energy outputs in the co-products of the biochar production facility, determined consistently with equation (4), that production batch shall use only waste or residual feedstocks, or biofuel, bioliquid or biomass fuel produced from waste or residual feedstocks, as defined in Article 2(23) and (43) of Directive (EU) 2018/2001.

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*Voluntary biomass compensation*

The operator may purchase carbon farming sequestration units to support the regeneration of natural carbon stocks used for the generation of permanent carbon removals. The quantity purchased shall be reported in the certificate of compliance and in the monitoring report.

## 9.4 Biochar Pollution Risk Requirements

*Biochar pollution controls*

Sampling and testing for compliance with this subclause shall be conducted in accordance with 6.5.2. ClimatePal EU shall apply a risk-based approach to sampling and testing against the threshold values in this subclause.

*Batch testing frequency*

For biochar applied to agricultural and forest soils, sampling shall at minimum be consistent with Regulation (EU) 2019/1009. Laboratory testing against the applicable threshold values shall be required for each production batch unless a reduced testing regime is justified by the properties of the feedstock and process or by the distribution of historical results for comparable production batches.

*Non-biogenic char exclusion*

Where non-biogenic material is co-processed during biochar production, the resulting char shall not be applied to agricultural or forest soils.

### 9.4.1 Agricultural, Forest and Urban Soils

*Soil contaminant limits*

Biochar applied to agricultural, forest or urban soils shall comply with the maximum concentrations in Table 17 and with any applicable national or local requirements.

*Urban-soil requirements*

Where biochar is applied to urban soils, the requirements in 9.4.3 shall also apply.

*Table 17: Limit values for biochar applied to agricultural and forest soils*

| Substance | Maximum concentration | Unit |
|---|---|---|
| Lead | 120 | g/t dm |
| Cadmium | 1.5 | g/t dm |
| Copper | 100 | g/t dm |
| Nickel | 50 | g/t dm |
| Mercury | 1 | g/t dm |
| Zinc | 400 | g/t dm |
| Chromium | 90 | g/t dm |
| Arsenic | 13 | g/t dm |
| Benzo[e]pyrene | 1 | g/t dm |
| Benzo[j]fluoranthene | 1 | g/t dm |
| PCB | 0.2 | g/t dm |
| PCDD/F | 0.000020 | g TE/t dm (WHO-TEQ 2005) |

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| Substance | Maximum concentration | Unit |
|---|---|---|
| PAH16[4] | 6 | g/t dm |
| PAH8 | 1 | g/t dm |

### 9.4.2 Biochar Incorporated into a Matrix or Used as a Feed Additive

*Permitted matrix routes*

Biochar may be applied to soil directly without being intermixed with another material, after incorporation into a mixture, intermixed with digestate from anaerobic digestion following use of biochar as an additive to the digestion process, or in manure from livestock that have been fed biochar as a feed additive.

*Matrix component requirements*

A mixture shall consist of biochar and other component materials that comply with the relevant component-material-category requirements under Regulation (EU) 2019/1009. Such component materials may include manure, compost, liquid fertiliser, anaerobic digestate and other substrates. The mixture shall be identified in a Product Function Category and shall comply with the requirements for that Product Function Category.

*Permanence unaffected by additives*

$F_{perm}$ may be treated as unaffected by the use of biochar as an additive to anaerobic digestion or as a feed additive.

*Feed-additive requirements*

Where biochar is applied to soils in manure after use as a livestock feed additive, the additional requirements in Table 18 shall apply.

*Table 18: Additional requirements for biochar used as a livestock feed additive*

| Requirement | Limit or condition | Reference |
|---|---|---|
| Feedstock | Only pure plant biomass or biomass fuel produced from pure plant biomass. | Annex 4.4.2(a) of Delegated Regulation (EU) 2026/285 |
| Feed hygiene | Comply with Regulation (EC) No 183/2005. | Annex 4.4.2(b) of Delegated Regulation (EU) 2026/285 |
| H/Corg | ≤ 0.4 | Annex 4.4.2(c) of Delegated Regulation (EU) 2026/285 |
| Lead | 10 g/t 88 % dm | Annex 4.4.2(d)(i) of Delegated Regulation (EU) 2026/285 |
| Cadmium | 0.8 g/t 88 % dm | Annex 4.4.2(d)(ii) of Delegated Regulation (EU) 2026/285 |

[4] PAH16 is the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene and benzo[ghi]perylene. PAH8 is the subset comprising benzo[a]pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene and benzo[ghi]perylene.

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| Requirement | Limit or condition | Reference |
|---|---|---|
| Mercury | 0.1 g/t 88 % dm | Annex 4.4.2(d)(iii) of Delegated Regulation (EU) 2026/285 |
| Arsenic | 2 g/t 88 % dm | Annex 4.4.2(d)(iv) of Delegated Regulation (EU) 2026/285 |
| PCDD/F | 0.00000075 g TE/t 88 % dm (WHO-TEQ 2005) | Annex 4.4.2(d)(v) of Delegated Regulation (EU) 2026/285 |
| PCDD/F + dl-PCB | 0.00000125 g TE/t 88 % dm (WHO-TEQ 2005) | Annex 4.4.2(d)(vi) of Delegated Regulation (EU) 2026/285 |
| Sum of 6 DIN PCB[5] | 0.00001 g/t 88 % dm | Annex 4.4.2(d)(vii) of Delegated Regulation (EU) 2026/285 |
| Fluorine | 150 g/t 88 % dm | Annex 4.4.2(d)(viii) of Delegated Regulation (EU) 2026/285 |

*Manure application requirement*

The operator shall ensure that all manure produced by animals receiving the biochar-amended feed is either naturally applied to soils by the animals in situ or collected and applied to soil. $F_{perm}$ may be treated as unaffected by use of the biochar in livestock feed.

### 9.4.3 Products and Soils Other Than Agricultural and Forest Soils

*Product and other-soil limits*

For incorporation into products, only cement, concrete and asphalt are eligible. Biochar incorporated into those products or applied to soils other than agricultural and forest soils shall comply with the maximum concentrations in Table 19 and with any applicable national or local requirements.

*Table 19: Limit values for biochar incorporated in products or applied to other soils*

| Substance | Maximum concentration | Unit |
|---|---|---|
| PAH8 | 4 | g/t dm |
| Benzo[e]pyrene | 1 | g/t dm |
| Benzo[j]fluoranthene | 1 | g/t dm |
| PCB | 0.2 | g/t dm |
| PCDD/F | 0.000020 | g/t dm (WHO-TEQ 2005) |

[5] The six DIN PCB are PCB-28, PCB-52, PCB-101, PCB-138, PCB-153 and PCB-180.

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