ClimatePal EU 302

BIOGENIC EMISSIONS CAPTURE WITH CARBON STORAGE (BIOCCS)

Version 1.0

ClimatePal
by ISCC



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Table of Abbreviations

Abbreviation	Name
^{14}C	carbon-14
BCR	biochar carbon removal
BioCCS	biogenic emissions capture with carbon storage
CH_4	methane
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
IEA	International Energy Agency
ILUC	indirect land-use change
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
JEC	Joint Research Centre–EUCAR–Concawe collaboration
JRC	Joint Research Centre
N_2O	nitrous oxide
QA/QC	quality assurance and quality control

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Introduction

BioCCS concept and regulatory basis

Biogenic emissions capture with carbon storage (BioCCS) captures biogenic CO_2 generated as a by-product of production processes and stores it permanently in permitted geological formations. 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 BioCCS.

Operational requirements

This document operationalises those requirements within the ClimatePal EU scheme. It provides BioCCS-specific requirements for activity eligibility, planning and monitoring, quantification of carbon removals and associated GHG emissions, treatment of mixed biogenic and fossil CO_2 streams, additionality, permanent geological storage and liability, 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

Application

This document specifies the ClimatePal EU methodology for certification of permanent carbon removals generated by biogenic emissions capture with carbon storage (BioCCS) activities (in accordance with Article 1(4) and (5), Article 3 and Sections 1.1.1, 1.2.1 and 2.1 of the Annex to Delegated Regulation (EU) 2026/285). This methodology defines activity-specific technical requirements for BioCCS.

Scheme-wide requirements

Scheme-wide requirements governing application review, validation or verification, audit planning, sampling of audit evidence, competence, impartiality, non-conformity handling, certification decisions, certificate issuance and status, suspension or withdrawal, complaints and appeals, and document management are established, as applicable, in ClimatePal EU 101 Governance, ClimatePal EU 201 Certification Programme and ClimatePal EU 202 Certification Body Requirements.

Methodology coverage

The document applies where biogenic CO_2 is generated as a by-product of production processes of goods, energy or services, captured and conditioned at a capture facility, transported where applicable, and permanently stored by injection at a geological storage site permitted under Directive 2009/31/EC.

Methodology coverage

It covers activity eligibility and periods, planning and reporting, quantification of total carbon removal and associated GHG emissions, capture of biogenic CO_2 including partially biogenic streams, CO_2 transport and geological storage, additional biomass consumption where applicable, additionality, liability and sustainability.

Exclusions

It does not apply to direct air capture with carbon storage (DACCS) or biochar carbon removal (BCR) activities.

2. Normative References

Regulatory alignment

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

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

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

f. Directive 2009/31/EC on the geological storage of carbon dioxide

g. Regulation (EU) 2024/1735 where definitions of CO_2 transport infrastructure are referenced

h. Directive (EU) 2018/2001, including Articles 3, 29 and 30, where biomass, biofuel, bioliquid or biomass fuel is relevant to the activity

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

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

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

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3. Terms and Definitions

Terminology

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

Delegated Regulation terminology

Specific terms for the BioCCS methodology used in this document are in accordance with Article 1(4) and (5) and definitions (1) to (12) of the Annex to Delegated Regulation (EU) 2026/285:

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

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;

BioCCS activity: activity resulting in a process of capturing biogenic CO_2, followed by transport and permanent storage of that biogenic CO_2 by injection at a geological storage site for which a valid permit exists in accordance with Article 8 of Directive 2009/31/EC;

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

captured CO_2: CO_2 captured and concentrated from a point source of CO_2 or from the atmosphere;

capture facility: facility that captures CO_2 from the atmosphere or from a biogenic-CO_2-containing stream and conditions it to a form that is ready to be transported or stored, including in terms of CO_2 purity and pressure;

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

CO_2 fugitives: irregular or unintended CO_2 emissions from sources that are not localised, or are too diverse or not substantial enough to be monitored individually;

CO_2 venting: intentional release of CO_2 occurring for operational or safety reasons;

exit point: point at which CO_2 is transferred out of the capture facility for the purpose of either transport or storage, excluding any smokestack, flue or other outlet at the capture facility from which CO_2 is released into the atmosphere;

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;

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permanent geological storage: storage of CO_2 at a geological storage site permitted under Directive 2009/31/EC;

point source of CO_2: natural or anthropogenic source of gases that has a CO_2 concentration higher than that in the free atmosphere due to the generation of CO_2 by an oxidation process or other chemical process or the release of CO_2 from some form of storage or containment;

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

4. Activity Description and Eligibility

4.1 Eligible BioCCS Activity and Operator

Confirm eligibility before quantification

Only the capture facility may be the operator of a BioCCS activity. The capture facility shall be located in the EU (in accordance with Article 3 and Section 1.1.1 of the Annex to Delegated Regulation (EU) 2026/285).

Eligible CO_2 and permanent storage

Biogenic CO_2 counted as a permanent removal under this methodology shall be generated as a by-product of production processes of goods, energy or services and shall not be generated from biomass, biofuel, bioliquid or biomass fuel solely for the purpose of capture and storage. Biogenic CO_2 counted towards permanent carbon removal units shall be transferred for permanent storage and injected at an operational geological storage site permitted under Directive 2009/31/EC.

Confirmation of biogenic origin

The requirements for confirmation of the biogenic origin of the captured CO_2 are specified in 6.14.

Value chain evidence

The operator shall demonstrate legal or operational responsibility for the capture facility and shall have arrangements that provide access to the data and evidence required from the facility generating the biogenic CO_2, transport entities and storage entities.

4.2 Activity Boundary and Value Chain

Map capture, transport and storage once

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), 2.1.1, 2.1.6, 2.1.7 and 2.1.8 of the Annex to Delegated Regulation (EU) 2026/285).

End-to-end activity boundary

The operator shall define one auditable activity boundary covering the capture process at the facility generating the biogenic CO_2, the capture facility and exit points, the transport pathway, intermediate storage or conditioning where applicable, and each geological storage site used by the activity. Normal operation of the underlying process generating biogenic CO_2 is outside the GHG capture boundary except where

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emissions are specifically attributable to operation of the capture process. The minimum value-chain information is summarized in Table 1.

Table 1: BioCCS value-chain description

Value-chain element	Minimum information	Reference
Biogenic CO_2 source and capture facility	Process generating the biogenic CO_2; capture technology; capture and conditioning equipment; any mixed biogenic/fossil stream; capture-specific on-site energy generation; treatment of capture wastes or by-products; relevant energy, input and capital-emission sources.	Sections 1.1.1, 2.1.6 and Table 1 of Annex to Delegated Regulation (EU) 2026/285
Exit points	Unique identification of every point at which captured CO_2 leaves the capture facility for transport or storage; measured quantity transferred at each applicable exit point.	Definition (8) and Sections 2.1.3.1 and 2.1.6.4 of Annex to Delegated Regulation (EU) 2026/285
Transport pathway	Mode or modes of transport; intermediate storage; transport infrastructure segments; merge and split points; allocation fractions where CO_2 from several sources uses shared infrastructure.	Section 2.1.7 of Annex to Delegated Regulation (EU) 2026/285
Storage sites	Storage-site operator; operational status; valid permit under Directive 2009/31/EC; entry and injection points; allocation where other CO_2 sources use the same site.	Sections 2.1.8 and 3.1 of Annex to Delegated Regulation (EU) 2026/285

Value-chain interfaces

The operator shall identify, for each relevant interface across the BioCCS value chain, the responsible entity, applicable metering or data-transfer point, and the arrangements for obtaining the monitoring evidence required under this methodology.

4.3 Activity, Monitoring and Certification Periods

Applicable periods

The applicable periods are summarized in Table 2 (in accordance with Sections 1.2.1.1 to 1.2.1.3 of the Annex to Delegated Regulation (EU) 2026/285). The activity plan shall identify the activity-period start date and planned end date.

Table 2: Activity, monitoring and certification periods

Period	Requirement	Reference
Activity period	Maximum 15 years. A new activity period may start after the end of an activity period by submission of a new activity plan.	Section 1.2.1.1 of the Annex to Delegated Regulation (EU) 2026/285

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Period	Requirement	Reference
Monitoring period	Continues until responsibility for every geological storage site used by the activity has been transferred to the relevant competent national authority in accordance with Article 18 of Directive 2009/31/EC.	Section 1.2.1.2 of the Annex to Delegated Regulation (EU) 2026/285
Certification period	Maximum 1 year. Where the exact time when captured CO_2 enters permanent storage cannot be identified, transport and storage emissions may be estimated from certification-period data using average associated emissions per tonne of CO_2 handled, without applying a temporal delay.	Section 1.2.1.3 of the Annex to Delegated Regulation (EU) 2026/285

5. Planning, Monitoring and Reporting

5.1 Activity Plan and Changes

See 6.2 in ISO 14064-2:2019

Activity plan requirements

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

Table 3: Activity-plan content

Activity-plan component	Required content
Activity	Project title, purpose and objectives; BioCCS project type; location and organizational, geographic and physical extent; relevant conditions prior to activity initiation; general description of the technologies and infrastructure to be used; and expected level of activity.
Value chain	Details of all entities involved in delivery of the activity.
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.
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 emission sources and sinks relevant to the activity in accordance with 6.1.

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Activity-plan component	Required content
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 6.13.
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 capture, transport and storage.

Activity-plan changes

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 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 ISO 14064-2:2019.

Monitoring plan requirements

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 2.1.6.4, 2.1.7.3 and 2.1.8.5 of the Annex to Delegated Regulation (EU) 2026/285.

Monitoring-plan template

The monitoring plan shall be prepared using the current controlled version of ClimatePal EU 331 Activity Plan Template, where the monitoring plan is contained.

Table 4: Monitoring plan content

	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.

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	Required content
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, where applicable.
Measurement methods	Description of applicable measurement, estimation, modelling or calculation methods and all written procedures relevant to monitoring, including applicable uncertainty considerations.
CO_2 transfer	Where CO_2 is transferred, description of the monitoring methodology, continuous measurement systems and procedures for preventing, detecting and quantifying leakage events from transport infrastructure.
Analysis frequency	Applicable minimum analysis frequencies in Annex VII to Implementing Regulation (EU) 2018/2066.
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.
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’

Measurement controls

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

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Incomplete monitoring plans

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 an indication shall be provided of how they are expected to be addressed. The activity may be certified on this basis only where the certification body accepts that the omissions are properly justified. The final monitoring plan shall be presented before the first re-certification audit.

Monitoring parameters

The monitored and calculated parameters shall include all parameters applicable to BioCCS in the Delegated Regulation. Table 5 groups those parameters by coverage area. Parameters identified as "To be monitored" in 6.5.2, 6.6.4 and 6.7.4 shall be included in the monitoring plan, as applicable.

Table 5: BioCCS monitoring coverage

Coverage area	Minimum data coverage
Capture facility	Captured CO_2 quantities and biogenic/fossil origin; mixed-stream biogenic fraction where applicable; exit-point quantities; F_{CRCF}-related variables; additional-biomass, fuel, electricity, heat and input quantities; capture-facility GHG terms; relevant capital-emission variables.
CO_2 transport	Transport-segment allocation fractions; CO_2 entering and leaving segments; fugitive, vented and leakage emissions; transport energy and infrastructure activity data; relevant emission factors.
Storage sites	Storage-site allocation; CO_2 entering and injected; fugitive and vented emissions before permanent storage; energy, input and capital-emission data for storage.
Cross-cutting	Materiality assumptions; net energy consumption; additional biomass where applicable; emission factors; capital emissions; measurement uncertainty; evidence confirming biogenic CO_2 origin.

Data and calculation records

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.

5.3 Monitoring Report

See 6.13 in ISO 14064-2:2019.

Monitoring report requirements

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, storage, liability and sustainability requirements. Table 6 summarizes the BioCCS-specific content in accordance with Section 1.3.3 of the Annex to Delegated Regulation (EU) 2026/285.

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Table 6: Monitoring report content for BioCCS

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 6.5.2, 6.6.4 and 6.7.4 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 6.13.
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 9.2, where applicable.
Financing	Financing received or applied for with regard to the activity, as specified in Clause 7.
Storage and liability	Evidence and information necessary to demonstrate compliance with the geological-storage, liability and monitoring-period requirements in Clause 8.
Sustainability	Evidence and information necessary to demonstrate compliance with the applicable sustainability requirements in 9.1 and 9.2.

5.4 Records and Traceability

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

Traceability and records

Records shall enable traceability from each capture-facility exit point through the relevant transport infrastructure segments to the quantity injected at each storage site (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 facility, infrastructure segment, storage 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.

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

Calculation traceability

6. Quantification

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

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 2.1 and 2.3 of the Annex to Delegated Regulation (EU) 2026/285.

General quantification guidelines

All quantities of CO_2 and 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.

GHG assessment basis

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

Quantification principles

6.1 GHG Sources and Sinks

The BioCCS activity shall include the greenhouse gas sources and sinks listed in Table 7 in accordance with Section 2.1.1 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.

GHG sources and sinks

Table 7: GHG sources and sinks for BioCCS

Activity stage	Emission source or sink	Gas
CO_2 capture	Capture operation for biogenic CO_2, including static and mobile machinery specifically required to enable capture.	GHGs
CO_2 capture	CO_2 conditioning before transfer to transport or storage.	GHGs
CO_2 capture	Energy-generation equipment supplying the capture process, to the extent specifically attributable to the capture activity.	GHGs
CO_2 capture	Treatment equipment for wastes or by-products of the capture process.	GHGs
CO_2 capture	Fuel combustion, electricity consumption and useful heat consumption.	GHGs
CO_2 capture	Additional biomass, biofuels, bioliquids or biomass fuels consumed to provide energy for the capture process, where applicable.	GHGs

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Activity stage	Emission source or sink	Gas
CO_2 capture	Production and supply of relevant inputs.	GHGs
CO_2 capture	Processing and treatment of wastes, including wastewater and exhaust gases.	GHGs
CO_2 capture	Applicable capital emissions from construction and installation of the capture facility.	GHGs
CO_2 transport	Fuel and electricity consumption for road, rail, maritime and other transport modes.	GHGs
CO_2 transport	Energy use in functionally connected transport infrastructure, including compressor stations, heaters, hubs and intermediate storage.	GHGs
CO_2 transport	Fugitive, vented and leakage emissions from the transport network.	CO_2
Geological storage	Removal by CO_2 injection.	CO_2
Geological storage	Fuel, electricity and useful heat consumption at the storage site.	GHGs
Geological storage	Fugitive and vented emissions during injection and before permanent geological storage.	CO_2
Geological storage	Production and supply of inputs used by the storage site.	GHGs
Geological storage	Processing and treatment of wastes generated by the storage site.	GHGs
Geological storage	Applicable capital emissions from construction and installation of the storage site.	GHGs

Emission-source completeness

All sources listed in Table 7 shall be assessed unless the Delegated Regulation (EU) 2026/285 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 BioCCS activities in accordance with Section 2.1.2 of the Annex to Delegated Regulation (EU) 2026/285.

6.3 Quantification of Total Carbon Removal

Captured CO_2 accounting

The operator shall select the calculation route according to whether the captured CO_2 remains fully segregated from CO_2 from other sources through transport and storage (in accordance with Sections 2.1.3 and 2.1.6.1 to 2.1.6.2 of the Annex to Delegated Regulation (EU) 2026/285). The segregated and non-segregated routes are specified in 6.3.3 and 6.3.4.

6.3.1 Captured CO_2 Streams and Quantities

Total captured CO_2

The total amount of CO_2 captured at the capture facility and transferred for transport or storage, $CO_{2captured,total}$, shall be calculated using equation (1) (in

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accordance with Sections 2.1.3.1 and 2.1.6.1 to 2.1.6.2 of the Annex to Delegated Regulation (EU) 2026/285):

$$CO_{2_{captured,total}} = \sum_{i} CO_{2_{OUT,activity,i}} \quad (1)$$

where

$CO_{2_{OUT,activity,i}}$ is minus the measured amount of CO_2 from the capture activity leaving the capture facility at exit point i, expressed in tCO_2;

i is an index of the applicable capture-facility exit points.

Capture-facility CO_2 losses

Any CO_2 loss between the point of capture and the point at which CO_2 leaves the capture facility is implicitly excluded from $CO_{2_{captured,total}}$.

Biogenic CO_2 quantity

The amount of biogenic CO_2 that is captured at the capture facility and transferred for transport or storage shall be designated $CO_{2_{captured,atmobio}}$ and shall be calculated using equation (2):

$$CO_{2_{captured,atmobio}} = CO_{2_{captured,total}} - CO_{2_{captured,fossil}} \quad (2)$$

where

$CO_{2_{captured,total}}$ is the total captured CO_2 determined using equation (1);

$CO_{2_{captured,fossil}}$ is the total captured fossil CO_2 determined using equation (3).

NOTE: The designation CO_2captured,atmobio is retained the Delegated Regulation (EU) 2026/285, in which the same parameter represents atmospheric CO_2 for DACCS and biogenic CO_2 for BioCCS. In this BioCCS methodology, the parameter represents biogenic CO_2 only.

Captured fossil CO_2

Fossil CO_2 may be captured alongside biogenic CO_2 either because it is emitted by processes specifically associated with the capture activity or because the BioCCS activity captures a mixed stream containing both biogenic and fossil CO_2. Capture-related fossil CO_2 may be captured separately or co-captured with biogenic CO_2. Where capture-related fossil CO_2 is permanently stored, it may be excluded from $GHG_{associated}$, but transport and storage emissions associated with that fossil CO_2 shall be included. Fossil CO_2 captured from the mixed source stream is not associated with the activity, and its transport and storage emissions shall not be included in $GHG_{associated}$.

Total captured fossil CO_2

The total amount of fossil CO_2 captured at the capture facility shall be calculated using equation (3):

$$CO_{2_{captured,fossil}} = CO_{2_{captured,fossil,assoc}} + CO_{2_{captured,fossil,mixed}} \quad (3)$$

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where

$CO_{2captured,fossil,assoc}$ is minus the amount of fossil CO_2 emitted as a result of the capture process that is captured, determined using equation (4);

$CO_{2captured,fossil,mixed}$ is minus the amount of fossil CO_2 captured from a mixed stream as part of the BioCCS activity, determined using equation (5).

Capture-related fossil CO_2

The amount of fossil CO_2 emitted as a result of the capture process and subsequently captured, $CO_{2captured;fossil;assoc}$, shall be calculated using equation (4):

$$CO_{2_{captured,fossil,assoc}} = CO_{2_{fossil,assoc,co-captured}} + \sum_{sources} CO_{2_{fossil,assoc,source}} \quad (4)$$

where

$CO_{2fossil;assoc;co-captured}$ is minus the amount of fossil CO_2 emitted as a result of the capture process that is co-captured with biogenic CO_2;

$CO_{2fossil;assoc;source}$ is minus the measured amount of fossil CO_2 from a source emitted as a result of the capture process that is captured separately from biogenic CO_2;

sources is an index of the point sources from which fossil CO_2 emitted by processes associated with the activity is captured separately.

Fossil CO_2 consistency check

The certification body shall confirm that $CO_{2fossil,assoc,co-captured}$ does not exceed the fossil CO_2 emissions at the capture facility reported in the calculation of $GHG_{associated}$.

Mixed-stream capture examples

Such activities include, among others, co-fired bioenergy facilities, waste-to-energy facilities processing partially biogenic waste, and energy-intensive industries, including but not restricted to cement, lime, metal and silicon producers using partially biogenic fuel or feedstock.

Mixed-stream fossil CO_2

Where biogenic CO_2 is captured from a mixed stream that also contains fossil CO_2, the amount of fossil CO_2 captured from that mixed stream shall be calculated using equation (5):

$$CO_{2_{captured,fossil,mixed}} = (1 - F_B) \times (CO_{2_{captured,total}} - CO_{2_{captured,fossil,assoc}}) \quad (5)$$

where

F_B is the fraction of captured CO_2 from the mixed stream that is of biogenic origin, determined in accordance with Article 39 of Implementing Regulation (EU) 2018/2066;

$CO_{2captured,total}$ is determined using equation (1);

$CO_{2captured,fossil,assoc}$ is determined using equation (4).

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Mixed-stream allocation

Only the biogenic part of a mixed captured stream may be counted towards CR_{total}. Capture-facility emissions shall be allocated proportionately between the biogenic fraction included in $CO_{2captured,atmobio}$ and the non-biogenic fraction excluded from quantification. After transfer from the capture facility, a segregated system or mass-balance accounting shall be used to identify a quantity of biogenic CO_2 entering permanent storage that is consistent with the amount of biogenic CO_2 captured, less any losses.

Transport and storage accounting

The amount of captured CO_2 for which transport or storage emissions shall be counted towards $GHG_{associated}$ shall be designated $CO_{2activity}$ and shall be calculated using equation (6):

$$CO_{2_{activity}} = F_{CRCF} \times (CO_{2_{captured,atombio}} + CO_{2_{captured,fossil,assoc}}) \quad (6)$$

where

F_{CRCF} is the fraction specified in 6.3.2;

$CO_{2captured,atmobio}$ is the biogenic CO_2 determined using equation (2);

$CO_{2captured,fossil,assoc}$ is the capture-related fossil CO_2 determined using equation (4).

6.3.2 Fraction Counted towards Total Carbon Removal

Eligible removal fraction

The operator shall designate F_{CRCF} as the fraction of captured biogenic CO_2 counted towards total carbon removal under Regulation (EU) 2024/3012. F_{CRCF} shall equal 1 where all captured biogenic CO_2 is transferred to eligible permanent storage and is intended to generate permanent carbon removal units (in accordance with Section 2.1.3.2 of the Annex to Delegated Regulation (EU) 2026/285).

Excluded removal fractions

Any fraction transferred for utilisation or permanently stored but recognised under another certification or accounting framework, shall be excluded from F_{CRCF} and shall not generate units under this methodology.

6.3.3 Segregated CO_2 Stream

Segregated-stream basis

Where all $CO_{2captured,total}$ sent for storage remains segregated from CO_2 from other sources throughout transport, storage and injection, total carbon removal shall be based on the quantity measured during injection at each storage site (in accordance with Section 2.1.3.3 of the Annex to Delegated Regulation (EU) 2026/285).

Segregated-stream calculation

For a segregated CO_2 stream, CR_{total} shall be calculated using equation (7):

$$CR_{total} = F_C \times F_{CRCF} \left(\frac{CO_{2_{captured,atmobio}}}{CO_{2_{captured,total}}} \times \sum_S (CO_{2_{injected,S}}) \right) \quad (7)$$

where

F_C is the conservatism factor determined in 6.13;

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F_{CRCF} is the fraction specified in 6.3.2;

$CO_{2captured,atmobio}$ is the biogenic CO_2 determined using equation (2);

$CO_{2captured,total}$ is the total captured CO_2 determined using equation (1);

$CO_{2injected,S}$ is minus the measured amount of CO_2 from the segregated stream injected at storage site S;

S is an index of storage sites at which the activity stream remains fully segregated through injection.

6.3.4 Non-Segregated CO_2 Stream

Non-segregated calculation

As an alternative to 6.3.3, the operator may or, where the CO_2 captured by the activity is not fully segregated from other CO_2 in the transport infrastructure or at the storage site, shall calculate CR_{total} using equation (8) (in accordance with Section 2.1.3.4 and, for losses, Sections 2.1.7.1 and 2.1.8.3 of the Annex to Delegated Regulation (EU) 2026/285):

$$CR_{total} = F_C \times \left(F_{CRCF} \times CO_{2_{captured,atmobio}} + CO_{2_{transport,losses}} + CO_{2_{storage,losses}}\right) \quad (8)$$

where

F_C is the conservatism factor determined in 6.13;

F_{CRCF} is the fraction specified in 6.3.2;

$CO_{2captured,atmobio}$ is the biogenic CO_2 determined using equation (2);

$CO_{2transport,losses}$ is the amount of biogenic CO_2 lost during transport from the capture facility to the storage sites, determined in 6.6.2;

$CO_{2storage,losses}$ is the amount of biogenic CO_2 lost at the storage sites prior to entering permanent geological storage, determined in 6.7.2.

6.4 Associated GHG Emissions

Associated GHG calculation

Associated GHG emissions shall be calculated using equation (9) (in accordance with Section 2.1.4 of the Annex to Delegated Regulation (EU) 2026/285):

$$GHG_{associated} = F_{CRCF} \times GHG_{capture} + GHG_{transport} + GHG_{storage} \quad (9)$$

where

F_{CRCF} is the fraction specified in 6.3.2;

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$GHG_{capture}$ is the GHG emissions associated with capture of biogenic CO_2, determined in 6.5;

$GHG_{transport}$ is the GHG emissions associated with CO_2 transport, determined in 6.6.3;

$GHG_{storage}$ is the GHG emissions associated with storage sites, determined in 6.7.3.

6.5 Biogenic CO_2 Capture Associated GHG Emissions

6.5.1 Capture-Facility and Input Emissions

Capture-specific emission boundary

Only emissions specifically associated with operating the capture process and transferring the captured CO_2 for transport or storage shall be included in GHGcapture. Emissions from static and mobile machinery used to enable capture shall be included. Emissions from normal operation of the facility generating the biogenic CO_2 that do not result from operation of the capture process shall be excluded. Where an emission source serves both the capture process and other processes at the facility, a pro-rata fraction shall be attributed to the capture process (in accordance with Sections 2.1.6.2, 2.1.6.3, 2.1.6.3.1 and 2.1.6.3.2 of the Annex to Delegated Regulation (EU) 2026/285).

BioCCS capture GHG calculation

GHGcapture shall be calculated using equation (10):

$$GHG_{capture} = \left(1 - \frac{CO_{2,captured,fossil,mixed}}{CO_{2,captured,total}}\right) \times \left(GHG_{facility} + GHG_{inputs}\right) \quad (10)$$

where

$CO_{2captured,fossil,mixed}$ is the fossil CO_2 captured from a mixed source stream, determined using equation (5);

$CO_{2captured,total}$ is the total captured CO_2 determined using equation (1);

$GHG_{facility}$ is the total GHG emissions from all relevant activities required for CO_2 capture at the capture facility, in tCO_2e, including emissions associated with conditioning CO_2 prior to transfer to transport infrastructure or a storage site;

GHG_{inputs} is the total emissions associated with inputs to the capture facility, in tCO_2e.

GHG emissions from capture facility

$GHG_{facility}$ shall be calculated using equation (11):

$$GHG_{facility} = GHG_{bio} + GHG_{bio\text{-}storage} + GHG_{on\text{-}site} + GHG_{elec} + GHG_{heat} + GHG_{capital} + GHG_{disposal} \quad (11)$$

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where

GHG_{bio} is the emissions associated with the production and supply of additional biomass used to generate energy consumed by the capture process, determined using equation (12);

$GHG_{bio\text{-}storage}$ is CH_4 emissions due to biomass storage prior to processing at the facility where CO_2 is captured, determined using equation (13) where required;

$GHG_{on\text{-}site}$ is fuel-combustion and other GHG emissions specifically associated with the capture activity, determined using equation (14);

GHG_{elec} is emissions due to net electricity consumption for the capture process, excluding own electricity consumption, determined using equation (15);

GHG_{heat} is emissions due to net useful heat consumption for the capture process, excluding own heat consumption, determined using equation (16);

$GHG_{capital}$ is applicable capital emissions determined in 6.12;

$GHG_{disposal}$ is emissions from treatment or disposal of wastes generated specifically due to the capture activity.

GHG emissions from additional biomass supply

GHG_{bio} shall be calculated using equation (12):

$$GHG_{bio} = \sum_{\text{biomass types}} (Q_{biomass} \times EF_{biomass}) \quad (12)$$

where

$Q_{biomass}$ is the quantity of additional biomass consumed in the certification period to supply on-site heat or electricity used specifically for the capture process and transfer of CO_2 for storage or transport, determined in accordance with 6.10 and expressed in an appropriate unit;

$EF_{biomass}$ is the emission factor for the additional biomass consumed, expressed in tCO_2e/unit and selected in accordance with 6.11.3.

Biomass-storage zero conditions

$GHG_{bio\text{-}storage}$ shall be set to zero for a quantity of feedstock if one or more of the following practices are followed for all biomass utilised:

a. coarse woody material naturally remains well aerated;

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b. material that does not necessarily remain naturally aerated is stored for no more than four weeks before processing or at a maximum of 30 % residual moisture;

c. biomass is pelleted for storage; or

d. the operator otherwise demonstrates that storage avoids significant CH_4 emissions from anaerobic decomposition given the feedstock and local conditions.

CH_4 emissions from biomass storage

Where none of these conditions applies, $GHG_{bio\text{-}storage}$ shall be calculated for each quantity of feedstock of a given type harvested or collected at the same time and stored in the same way using equation (13):

$$GHG_{bio\text{-}storage} = \frac{Q_{biomass}}{Q_{biomass,total}} \times \sum_{feedstock} \left[1.335 \times 0.0013 \times Q_{feedstock} \times C_{feedstock} \times \left(T_{storage} - 1\right)\right] \times GWP_{CH_4} \quad (13)$$

where

$Q_{biomass}$ is he quantity of additional biomass consumed in the certification period to supply on-site heat or electricity used specifically for the capture process and transfer of CO_2 for storage or transport, determined in accordance with 6.10 and expressed in an appropriate unit;

$Q_{biomass,total}$ is the total quantity of biomass consumed by the facility in the certification period for both the main process generating the captured CO_2 stream and the capture process, expressed in an appropriate unit;

$Q_{feedstock}$ is the quantity of the feedstock, expressed in an appropriate unit;

$C_{feedstock}$ is the carbon content of the feedstock, expressed as a mass percentage;

$T_{storage}$ is the time in months for which the feedstock is stored, rounded up;

Feedstock is an index of the feedstocks consumed;

GWP_{CH4} is the 100-year global warming potential of methane;

1.335 is the mass ratio of a methane molecule to a carbon atom, in accordance with equation (20) of the Annex to Delegated Regulation (EU) 2026/285;

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0.0013 is the assumed monthly fractional loss of biomass carbon from storage, in accordance with equation (20) of the Annex to Delegated Regulation (EU) 2026/285.

On-site fuel and biomass emissions

$GHG_{on\text{-}site}$ shall include fuel combustion and other GHG emissions at the capture facility that are specifically associated with the capture activity, including CH_4 and N_2O emissions from additional biomass combustion while applying a CO_2 emission factor of zero to biomass combustion where the sustainability requirements are met. Fossil fuel used to start the combustion cycle shall not be included where it is not specifically associated with the capture process. Where fuel is consumed for biomass handling or pre-treatment that serves both the underlying process and capture, the fraction $Q_{biomass}/Q_{biomass,total}$ shall be treated as associated with the capture process.

On-site GHG emissions

$GHG_{on\text{-}site}$ shall be calculated using equation (14):

$$\mathrm{GHG}_{\text{on-site}} = \sum_{\text{fuels}} (\mathrm{Q}_{\text{fuel}} \times \mathrm{EF}_{\text{fuel}}) + \mathrm{GHG}_{\text{other}} + \mathrm{CO}_{2,\text{stored,fossil}} \quad (14)$$

where

Q_{fuel} is the quantity of fuel consumed in the certification period and allocated to the capture process, expressed in an appropriate unit;

EF_{fuel} is the lifecycle emission factor for the fuel, expressed in tCO_2e/unit and selected in accordance with 6.11.4;

GHG_{other} is any other GHG emissions that are part of the capture process at the capture facility;

$CO_{2stored,fossil}$ is minus the quantity of fossil CO_2 from capture-related processes at the capture facility that is captured and permanently stored, in tCO_2. It shall be calculated as $CO_{2captured,fossil,assoc}$ determined using equation (4), plus any CO_2 losses occurring prior to storage, with losses calculated consistently with 6.6.2 and 6.7.2.

GHG emissions from electricity consumption

Emissions due to net electricity consumption for the capture process, excluding own electricity consumption, shall be calculated using equation (15):

$$\mathrm{GHG}_{\text{elec}} = \sum_{\text{electricity sources}} (\mathrm{Q}_{\text{elec}} \times \mathrm{EF}_{\text{elec}}) \quad (15)$$

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where

Q_{elec} is the net quantity of electricity from each source consumed in the certification period specifically for the capture process and transfer of CO_2 for storage or transport, determined in accordance with 6.9 and expressed in an appropriate unit;

EF_{elec} is the emission EF_{elec} is the emission factor for the consumed electricity, selected in accordance with 6.11.1.

GHG emissions from heat

Emissions due to net useful-heat consumption for the capture process, excluding own heat consumption, shall be calculated using equation (16):

$$GHG_{heat} = \sum_{heat\ source} (Q_{heat} \times EF_{heat}) \quad (16)$$

where

Q_{heat} is the net quantity of useful heat consumed in the certification period specifically for the capture process, 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 6.11.2.

Waste treatment and disposal emissions

$GHG_{disposal}$ shall include emissions associated with the supply of energy and inputs consumed in waste treatment or disposal and any other GHG emissions associated with disposal, including N_2O and/or CH_4 from aerobic or anaerobic degradation of the fraction of biogenic wastes associated with additional biomass use. ClimatePal EU may provide guidance for estimating $GHG_{disposal}$ where direct measurement would be unduly burdensome and may provide default values for specific activity types.

GHG emissions from inputs

Emissions associated with chemicals and other inputs consumed specifically for the capture process, GHG_{inputs}, shall be calculated using equation (17):

$$GHG_{inputs} = \sum_{inputs} (Q_{input} \times EF_{input}) \quad (17)$$

where

Q_{input} is the quantity of the input consumed in the certification period specifically for the capture process, 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 6.11.4.

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Grouped input materiality

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 of the grouped inputs shall satisfy equation (18):

$$\sum_{\text{inputs}} \left(Q_{\text{input}} \times EF_{\text{input}}\right) < 2\% \times CR_{\text{total}} \quad (18)$$

where

Q_{input} is the quantity of each input included in the group;

EF_{input} is the applicable emission factor for each input;

C_{Rtotal} is the total carbon removal for the activity.

2 % input substitution

Where the condition in equation (18) is met, the operator may substitute the calculated emissions of the grouped inputs with an emission term equal to 2 % × CR_{total}.

6.5.2 Monitoring and Reporting Parameters for Biogenic CO_2 Capture

Capture monitoring parameters

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 8. 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 (in accordance with Section 2.1.6.4 and Table 3 of the Annex to Delegated Regulation (EU) 2026/285).

Table 8: Parameters for inclusion in the monitoring report – biogenic CO_2 capture

Equation	Parameter	Unit	Definition	Notes
(1), (2), (7), (10)	$CO_{2captured,total}$	tCO_2	Total amount of CO_2 captured at the capture facility and transferred for transport or storage	Calculated using equation (1)
(1)	$CO_{2OUT,activity,i}$	tCO_2	Amount of CO_2 from the capture activity leaving the capture facility at each exit point i	To be monitored
(2), (6), (7), (8)	$CO_{2captured,atmobio}$	tCO_2	Amount of biogenic CO_2 captured at the capture facility and transferred for transport or storage	Calculated using equation (2)
(2), (3)	$CO_{2captured,fossil}$	tCO_2	Total amount of fossil CO_2 captured at the capture facility and transferred for transport or storage	Calculated using equation (3)
(3), (4), (5), (6)	$CO_{2captured,fossil,assoc}$	tCO_2	Amount of fossil CO_2 emitted as a result of the capture process that is captured	Calculated using equation (4)

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Equation	Parameter	Unit	Definition	Notes
(3), (5), (10)	$CO_{2captured,fossil,mixed}$	tCO_2	Amount of fossil CO_2 captured from a mixed stream as part of the BioCCS activity	Calculated using equation (5)
(4)	$CO_{2fossil,assoc,co-captured}$	tCO_2	Amount of capture-related fossil CO_2 co-captured with biogenic CO_2	To be monitored or calculated
(4)	$CO_{2fossil,assoc,source}$	tCO_2	Amount of capture-related fossil CO_2 captured separately from biogenic CO_2	To be monitored
(5)	F_B	%	Fraction of captured CO_2 from a mixed stream that is of biogenic origin	To be monitored
(6), (20), (21), (28)	$CO_{2activity}$	tCO_2	Amount of CO_2 for which transport and/or storage emissions are counted towards GHGassociated	Calculated using equation (6)
(6), (7), (8), (9)	F_{CRCF}	ratio	Fraction of captured biogenic CO_2 counted towards total carbon removal	To be monitored
(10)	$GHG_{capture}$	tCO_2e	Total GHG emissions associated with capture of biogenic CO_2	Calculated using equation (10)
(10), (11)	$GHG_{facility}$	tCO_2e	Total GHG emissions from activities required for CO_2 capture at the capture facility	Calculated using equation (11)
(10), (17)	GHG_{inputs}	tCO_2e	Total GHG emissions associated with inputs to the capture facility	Calculated using equation (17)
(11), (12)	GHG_{bio}	tCO_2e	Emissions associated with production and supply of additional biomass used for capture energy	Calculated using equation (12)
(11), (13)	$GHG_{bio-storage}$	tCO_2e	CH_4 emissions due to biomass storage prior to processing at the facility where CO_2 is captured	Calculated using equation (13), where relevant
(11), (14)	$GHG_{on-site}$	tCO_2e	Fuel-combustion and other GHG emissions specifically associated with the capture activity	Calculated using equation (14)
(11), (15)	GHG_{elec}	tCO_2e	Emissions due to net electricity consumption for the capture process	Calculated using equation (15)
(11), (16)	GHG_{heat}	tCO_2e	Emissions due to net useful-heat consumption for the capture process	Calculated using equation (16)
(11), (42)	$GHG_{capital}$	tCO_2e	Applicable capital emissions	Calculated using equation (42)
(11)	$GHG_{disposal}$	tCO_2e	Emissions from treatment or disposal of wastes generated specifically due to the capture activity	To be monitored where relevant

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Equation	Parameter	Unit	Definition	Notes
(12)	$Q_{biomass}$	appropriate unit	Additional biomass consumed to supply on-site heat and/or electricity for the capture process	To be monitored
(12)	$EF_{biomass}$	tCO_2e/unit	Emission factor for additional biomass consumed	Selected in accordance with 6.11.3
(13)	$Q_{biomass,total}$	appropriate unit	Total biomass consumed by the facility for the underlying process and capture process	To be monitored where relevant
(13)	$Q_{feedstock}$	appropriate unit	Quantity of feedstock	To be monitored where relevant
(13)	$C_{feedstock}$	%	Carbon content of the feedstock	To be monitored where relevant
(13)	$T_{storage}$	months	Time for which the feedstock is stored	To be monitored where relevant
(14)	Q_{fuel}	appropriate unit	Quantity of fuel allocated to the capture process in the certification period	To be monitored
(14)	EF_{fuel}	tCO_2e/unit	Emission factor for consumed fuel	Selected in accordance with 6.11.4
(14)	GHG_{other}	tCO_2e	Any other GHG emissions forming part of the capture process	To be monitored or calculated
(14)	$CO_{2stored,fossil}$	tCO_2	Fossil CO_2 from capture-related processes captured and permanently stored	To be monitored
(15)	Q_{elec}	appropriate unit	Net quantity of electricity consumed for the capture process	To be monitored
(15)	EF_{elec}	tCO_2e/unit	Emission factor for consumed electricity	Selected in accordance with 6.11.1
(16)	Q_{heat}	appropriate unit	Net quantity of useful heat consumed for the capture process	To be monitored
(16)	EF_{heat}	tCO_2e/unit	Emission factor for consumed heat	Selected in accordance with 6.11.2
(17)	Q_{input}	appropriate unit	Quantity of input consumed specifically for the capture process	To be monitored
(17)	EF_{input}	tCO_2e/unit	Emission factor for input consumed	Selected in accordance with 6.11.4
(42), (43)	$GHG_{materials}$	tCO_2e	Emissions from materials used in construction of the facility	Calculated using equation (43)
(43)	$Q_{materials}$	tonne	Quantity of materials used in construction of the facility	To be monitored

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Equation	Parameter	Unit	Definition	Notes
(43)	$EF_{materials}$	tCO_2e/t material	Emission factor for construction material	Selected in accordance with 6.11.4

6.6 CO_2 Transport

Transport scope

This clause specifies rules for the quantification of GHG emissions associated with CO_2 transport by pipeline, road, rail or water transportation, including emissions from supporting infrastructure and intermediate storage, and CO_2 losses occurring during transport, in accordance with Section 2.1.7 of the Annex to Commission Delegated Regulation (EU) 2026/285.

Transport pathway and infrastructure

These rules apply to captured CO_2 transported as a concentrated CO_2 stream from the capture facility to one or more storage sites using one or more modes of CO_2 transportation. The transport pathway from the capture facility to the storage sites shall consist of one or more transport infrastructure segments as defined in Article 3(29) of Regulation (EU) 2024/1735, which may form parts of one or more transport networks as defined in Article 3(22) of Directive 2009/31/EC, and may include intermediate storage and other supporting infrastructure.

Reported transport data

Where relevant data are available from reporting under Implementing Regulation (EU) 2018/2066, those data shall be considered reliable for the purpose of calculating transport emissions for the activity.

Infrastructure segmentation

Transport infrastructure segments shall be designated to allow the allocation of transport-related emissions where CO_2 from more than one source passes through parts of the same transport network. Where CO_2 from the activity is the only CO_2 passing through the relevant transport infrastructure, the whole transport pathway may be designated as a single transport infrastructure segment.

Infrastructure segmentation

Otherwise, the transport pathway shall be divided into a series of transport infrastructure segments. A new transport infrastructure segment shall be designated at least whenever two or more CO_2 streams are merged or two or more CO_2 streams are separated. Additional transport infrastructure segments may be designated by the operator or certification body for organisational reasons.

6.6.1 Transport-Segment Allocation

Segment allocation fraction

An allocation fraction F_S shall be specified for each transport infrastructure segment S as the fraction of the CO_2 passing through the segment during the certification period that comes from the activity and is being transferred for permanent storage. CO_2 from the activity that is transferred for utilisation shall not be included in this fraction (in accordance with Section 2.1.7 and equation [26] of the Annex to Delegated Regulation (EU) 2026/285):

$$F_S = \frac{CO_{2,activity,S}}{CO_{2,total,S}} \quad (19)$$

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where

$CO_{2activity,S}$	is the amount of $CO_{2activity}$, determined using equation (6), that is being transferred for permanent storage and passes through transport infrastructure segment S during the certification period, expressed in tCO_2. For the first transport infrastructure segment in the transport pathway, $CO_{2activity,S}$ is equal to the part of $CO_{2activity}$ measured as transferred from the capture facility to that segment. For each subsequent transport infrastructure segment, $CO_{2activity,S}$ is the quantity of activity CO_2 entering the preceding transport infrastructure segment minus any CO_2 losses occurring in that segment. Where the CO_2 stream is split at a node and transferred towards more than one storage site, the activity CO_2 shall be allocated across the transport infrastructure segments leaving that node;
$CO_{2total,S}$	is the total amount of CO_2 from all sources passing through transport infrastructure segment S during the certification period, expressed in tCO_2;
S	is an index of the transport infrastructure segments.

Verified allocation fractions

The operator may use independently verified F_S values provided by the transport network operator.

Loss composition

Where the CO_2 passing through a transport infrastructure segment consists of a mixture of biogenic CO_2 and fossil CO_2 emitted as a result of the capture process and subsequently captured, any CO_2 losses shall be considered to consist of the same pro-rata mixture of biogenic CO_2 and fossil CO_2.

6.6.2 Transport CO_2 Losses

Transport-loss method selection

Where CR_{total} is calculated using equation (8), intentional and accidental losses of transported CO_2 throughout the transport network shall be explicitly quantified. The operator shall quantify these losses using either Method A, based on the overall mass balance of input and output streams across a transport infrastructure segment or series of segments, or Method B, based on the monitoring of individual emission sources. The operator may select either method for each transport infrastructure segment or series of segments. The method that results in the lower uncertainty of the overall emissions shall be selected unless its use would incur disproportionate costs (in accordance with Section 2.1.7.1 of the Annex to Delegated Regulation (EU) 2026/285 and Implementing Regulation (EU) 2018/2066). The two methods for quantifying transport CO_2 losses are summarised in Table 9.

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Table 9: Transport-loss methods

Method	Basis	Application
Method A – mass balance	Overall mass balance of CO_2 input and output streams across a transport infrastructure segment or series of segments.	May be selected for each transport infrastructure segment or series of segments.
Method B – individual sources	Individual quantification of fugitive, vented and leakage emissions from the transport infrastructure segment or series of segments.	May be selected for each transport infrastructure segment or series of segments.

Method A: Mass balance

Under Method A, $CO_{2transport,losses}$ shall be calculated using equation (20):

$$CO_{2,transport,losses} = F_{CRCF} \times \frac{CO_{2,captured,atmobio}}{CO_{2,activity}} \times \sum_S \left[F_S \times \left(CO_{2,in,S} - CO_{2,out,S}\right)\right] \quad (20)$$

where

F_{CRCF} is the fraction specified in 6.3.2;

$CO_{2captured,atmobio}$ is the biogenic CO_2 determined using eequation (2);

$CO_{2activity}$ is the activity CO_2 determined using equation (6);

F_S is the segment allocation fraction determined using equation (19);

$CO_{2in,S}$ is amount of CO_2 entering transport segment S, determined in accordance with Articles 40 to 46 and Article 49 of Implementing Regulation (EU) 2018/2066, in tCO_2;

$CO_{2out,S}$ is amount of CO_2 leaving transport segment S, determined in accordance with Articles 40 to 46 and Article 49 of Implementing Regulation (EU) 2018/2066, in tCO_2.

S is an index of the transport infrastructure segments.

Method B: Individual emission sources

Under Method B, $CO_{2transport;losses}$ shall be calculated using equation (21):

$$CO_{2,transport,losses} = F_{CRCF} \times \frac{CO_{2,captured,atmobio}}{CO_{2,activity}} \times \sum_S \left[F_S \times \left(CO_{2,fugitive,S} + CO_{2,vented,S} + CO_{2,leakage,S}\right)\right] \quad (21)$$

where

$CO_{2fugitive,S}$ is the sum of fugitive emissions from CO_2 transported in the transportation infrastructure, such as from seals, valves,

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intermediate compressor stations in pipeline structures and intermediate storage sites, in tCO_2;

$CO_{2vented,S}$ is the sum of vented emissions from CO_2 transported in the transportation infrastructure, in tCO_2;

$CO_{2leakage,S}$ is the sum of CO_2 transported in the transportation infrastructure, which is emitted as the result of the failure of one or more components of the network, in tCO_2;

F_S is the segment allocation fraction determined using equation (19);

S is an index of transport infrastructure segments.

Fugitive emissions

Fugitive emissions during CO_2 transportation from seals, measurement devices, valves, intermediate compressor stations and intermediate storage sites shall be calculated using equation (22):

$$CO_{2,fugitive} = \sum_{S} \left[\sum_{c} \left(EF_{occur,c,S} \times N_{occur,c,S} \right) \right] \quad (22)$$

where

$EF_{occur,c,S}$ is the average emission factor for component type c in transport infrastructure segment S per time period, expressed in tCO_2/unit time. A separate emission factor shall be determined for each component type. The emission factors shall be reviewed at least every five years on the basis of newly available techniques and knowledge;

$N_{occur,c,S}$ is the number of components of type c in transport infrastructure segment S, multiplied by the number of applicable time periods;

c is the component type: seals, measurement devices, valves, intermediate compressor stations or intermediate storage sites;

S is an index of transport infrastructure segments.

Vented emissions

The activity operator shall calculate $CO_{2vented}$ for each transport infrastructure segment S as the expected venting identified for that segment by the transport network operator. Where the transport network operator does not provide venting emissions at the level of individual transport infrastructure segments, the venting emissions shall be allocated among the relevant segments on a reasonable basis agreed between the activity operator and the certification body. ClimatePal EU may provide guidance specifying the basis for estimating vented emissions.

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Transport leakage monitoring

In accordance with Implementing Regulation (EU) 2018/2066, the transport network operator shall monitor the transport network and calculate the amount of CO_2 leaked from the transport network using a suitable methodology documented in its monitoring plan and based on industry best-practice guidelines.

Leakage events

The activity operator shall calculate $CO_{2leakage}$ for each transport infrastructure segment S as the amount of leakage identified for that segment by the transport network operator during the certification period. Where the transport network operator does not report leakage emissions at the level of individual transport infrastructure segments, the leakage emissions shall be allocated among the relevant segments on a reasonable basis agreed between the activity operator and the certification body.

6.6.3 Transport-Associated GHG Emissions

Transport GHG calculation

GHG emissions associated with the transportation of CO_2, including emissions from transport vehicles and supporting infrastructure, shall be calculated using equation (23) (in accordance with Section 2.1.7.2 of the Annex to Delegated Regulation (EU) 2026/285):

$$\mathrm{GHG}_{\mathrm{transport}} = \sum_{\mathrm{S}} \left[\mathrm{F_S} \times \left(\sum_{\mathrm{T}} \mathrm{G\,HG_{T,S}} + \mathrm{GHG_{infra,S}} \right) \right] \qquad (23)$$

where

F_S is the allocation fraction for transport infrastructure segment S, determined using equation (19);

$GHG_{T,S}$ is GHG emissions due to energy use for CO_2 transportation in mode of transportation type T in infrastructure segment S, in tCO_2e;

$GHG_{infra,S}$ is the GHG emissions due to energy use at supporting infrastructure connected to the CO_2 transport network, including pipeline-operation infrastructure, expressed in tCO_2e;

T is the transport mode applicable to the infrastructure segment, such as road, rail or maritime transport;

S is an index of the transport infrastructure segments.

Non-pipeline transportation

For non-pipeline transport, $GHG_{T,S}$ for transport mode T in each transport infrastructure segment S shall be calculated either using actual fuel-consumption data in accordance with equation (24) or using vehicle emission factors and actual distance travelled in accordance with equation (25). The operator may use different calculation approaches for different transport modes and transport infrastructure segments.

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Actual fuel-consumption method

Where actual fuel-consumption data are used, $GHG_{T,S}$ shall be calculated using equation (24):

$$GHG_{T,S} = \sum_{trips} \left(Q_{fuel,S} \times EF_{fuel}\right) \quad (24)$$

where

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

EF_{fuel} is the emission factor for the consumed fuel, expressed in tCO_2e/unit, selected in accordance with 6.11.4;

trips is an index of the trips taken.

Actual distance travelled

Alternatively, where vehicle emission factors and actual distance travelled are used, $GHG_{T,S}$ shall be calculated using equation (25):

$$GHG_{T,S} = \left(\sum_{L=1}^{O}\left(K_{L,S} \times EF_{vehicle,loaded}\right) + \sum_{L=1}^{R}\left(K_{L,S} \times EF_{vehicle,unloaded}\right)\right) \quad (25)$$

where

$K_{L,S}$ is the distance of each trip L in transport infrastructure segment S, expressed in km;

$EF_{vehicle,loaded}$ is the CO_2 emission per kilometre of the loaded transport vehicle, expressed in tCO_2/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 tCO_2/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 operator may set $EF_{vehicle,unloaded} = EF_{vehicle,loaded}$;

O is the total number of outbound trips;

R is the total number of empty return trips;

L is an index of the trips

Transport infrastructure emissions

GHG emissions due to fuel and electricity consumption across all processes at installations required to operate the transport network shall be calculated using equation (26). The operator may use default values for emissions from transportation infrastructure where such default values are provided by ClimatePal EU.

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$$GHG_{infra} = \sum_S \left[F_S \times \sum_f \left(Q_{stat,f} \times EF_f + Q_{mob,f} \times EF_f\right) + Q_{elec} \times EF_{elec}\right] \quad (26)$$

where

$Q_{stat,f}$ is the quantity of fuel type f combusted in stationary sources at the installed transport infrastructure, expressed in GJ;

$Q_{mob,f}$ is the quantity of fuel type f combusted in mobile sources at the installed transport infrastructure, expressed in GJ;

EF_f is the emission factor due to combustion of fuel type f, expressed in tCO_2e/GJ, selected in accordance with 6.11.4;

Q_{elec} is the net amount of electricity imported from the grid and consumed at the installed transport infrastructure, determined in accordance with 6.9, expressed in MWh;

EF_{elec} is the emission factor for electricity generation, expressed in tCO_2e/MWh, selected in accordance with 6.11.1;

f is the fuel type, including fuels of fossil and biogenic origin.

6.6.4 Monitoring and Reporting Parameters for CO_2 Transport

Parameters for CO_2 transport

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 10. 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 (in accordance with Section 2.1.7.3 and Table 4 of the Annex to Delegated Regulation (EU) 2026/285).

Table 10: Parameters for inclusion in the monitoring report - CO_2 transport

Equation	Parameter	Unit	Definition	Notes
(19)	F_S	%	Allocation fraction defined for each transport segment S as the fraction of the CO_2 from the activity passing through the segment in a certification period and being sent for storage	Calculated using equation (19)
(19)	$CO_{2activity,S}$	tCO_2	Amount of CO_2 from the activity passing through the CO_2 infrastructure segment S in the certification period	To be monitored
(19)	$CO_{2total,S}$	tCO_2	Total amount of CO_2 from all sources passing through the CO_2 infrastructure segment S in the certification period	To be monitored
(8), (20), (21)	$CO_{2transport,losses}$	tCO_2	Amount of losses of biogenic CO_2 being sent for permanent storage to generate carbon removal units throughout the transport network	Calculated using equation (20) or equation (21)

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Equation	Parameter	Unit	Definition	Notes
(20)	$CO_{2in,S}$	tCO_2	Amount of CO_2 transferred to the transport infrastructure segment S, determined in accordance with Articles 40 to 46 and Article 49 of Implementing Regulation (EU) 2018/2066	To be monitored
(20)	$CO_{2out,S}$	tCO_2	Amount of CO_2 transferred out of the transport infrastructure segment, determined in accordance with Articles 40 to 46 and Article 49 of Implementing Regulation (EU) 2018/2066	To be monitored
(21), (22)	$CO_{2fugitive,S}$	tCO_2	Sum of fugitive emissions from CO_2 transported in the transportation infrastructure	Calculated using equation (22)
(21)	$CO_{2vented,S}$	tCO_2	Sum of vented emissions from CO_2 transported in the transportation infrastructure	To be informed by the operator of the transport network
(21)	$CO_{2leakage,S}$	tCO_2	Sum of CO_2 transported in the transportation infrastructure that is emitted as the result of the failure of one or more components of the network	To be informed by the operator of the transport network
(22)	$EF_{occur,c,S}$	tCO_2e/unit time	Average emission factors per type of component per occurrence	To be monitored
(22)	$N_{occur,c,S}$	number of time units/year	Number of components in the transportation system per type of component	To be monitored
(23)	$GHG_{transport}$	tCO_2e	Total amount of GHG emissions from the combustion of fuels during the transportation of CO_2	Calculated using equation (23)
(23), (24), (25)	$GHG_{T,S}$	tCO_2e	Emissions due to energy use for CO_2 transportation in mode of transportation type T in infrastructure segment S	Calculated using equation (24) or equation (25)
(23), (26)	$GHG_{infra,S}$	tCO_2e	Emissions due to energy use at the supporting infrastructure connected to the CO_2 transport network	Calculated using equation (26)
(24)	$Q_{fuel,S}$	appropriate unit	Quantity of the fuel consumed in the certification period	To be monitored
(24)	EF_{fuel}	tCO_2e	Emission factor for consumed fuel	
(25)	$K_{L,S}$	km	Distances of trips in infrastructure segments S	To be monitored
(25)	$EF_{vehicle,loaded}$	tCO_2e/km	CO_2 emission per kilometre of the loaded transport vehicles	
(25)	$EF_{vehicle,unloaded}$	tCO_2e/km	CO_2 emission per kilometre of the unloaded transport vehicles	

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Equation	Parameter	Unit	Definition	Notes
(26)	$Q_{stat,f}$	GJ	Quantity of fuel type f combusted in stationary sources at the installed infrastructure	To be monitored. Where relevant, the density and Net Calorific Value used shall be reported
(26)	$Q_{mob,f}$	GJ	Quantity of fuel type f combusted in mobile sources at the installed infrastructure	To be monitored
(26)	Q_{elec}	MWh	Amount of electricity imported from the grid and consumed at the installed infrastructure	To be monitored
(26)	EF_f	tCO_2e/GJ	Emission factor due to the combustion of fuel type f	
(26)	EF_{elec}	tCO_2e/MWh	Emission factor for the generation of electricity	

6.7 Injection and Geological Storage

Storage pathway

CO_2 from the activity may be transferred via a transport pathway to one or more storage sites for injection into geological storage.

Mass-balance reconciliation at storage site

Where CO_2 from sources other than the activity is stored at the same storage site, an allocation fraction shall be defined for each storage site S as the fraction of the CO_2 stored at that site during the certification period that comes from the activity (in accordance with Section 2.1.8 of the Annex to Delegated Regulation (EU) 2026/285).

6.7.1 Storage Allocation and Measured CO_2

Storage allocation fraction

For each storage site S that also receives CO_2 from sources other than the activity, the storage allocation fraction Fs shall be calculated using equation (27) (in accordance Sections 2.1.8, 2.1.8.1 and 2.1.8.2 of the Annex to Delegated Regulation (EU) 2026/285).

$$F_S = \frac{CO_{2,activity,injected,S}}{CO_{2,injected,S}} \quad (27)$$

where

$CO_{2activity,injected,S}$ is the part of $CO_{2activity}$, determined using equation (6), that is stored at storage site S. For a non-segregated CO_2 stream, this quantity shall be determined on a mass-balance basis;

$CO_{2injected,S}$ is the total amount of CO_2 from all sources stored at storage site S during the certification period, expressed in tCO_2;

S is an index of the storage sites.

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Storage-entry measurement

The amount of CO_2 entering each storage site shall be determined at the entry point or points using a measurement-based approach in accordance with Articles 40 to 45 and Article 49 of Implementing Regulation (EU) 2018/2066.

Application of mass-balance rules

Except where the CO_2 stream is fully segregated and CR_{total} is determined using the segregated-stream route in 6.3.3, a mass-balance system shall be used to trace CO_2 through the transport infrastructure from the capture facility to the storage site. The mass-balance system shall comply with the following principles:

a. *No double counting*

Each quantity of CO_2 entering the transport or storage system may be treated as having been stored or otherwise discharged from the system, including through losses or supply for a non-storage application, only once.

b. *Period mass-balance reconciliation*

For any transport infrastructure segment or storage site and for a given period, the sum of the quantities of CO_2 entering that segment or site, or released from intermediate storage, shall equal the sum of the quantities identified as leaving, being intermediately stored or being permanently stored during the same period. Discrepancies associated with CO_2 that remains in transit or is undergoing storage-related processes at the end of the period, and discrepancies associated with measurement uncertainty, may be taken into account.

c. *Allocation within mixed CO2 streams*

Where CO_2 from the activity is mixed with CO_2 from other sources and the resulting mixed stream is subsequently transferred to more than one transport infrastructure segment or storage site, the operator may agree with other interested parties which transferred quantities are to be treated as originating, or partially originating, from the activity.

d. *Network attribution without transit*

Where CO_2 from the activity is transferred into an interconnected transport network and mixed with CO_2 from other sources, the operator is not required to model the transit time of the activity CO_2 through the network. A corresponding quantity of CO_2 transferred out of the network after the activity CO_2 has entered the network may be treated as CO_2 from the activity. CO_2 shall not be assumed to have travelled against the flow direction of a transport infrastructure segment.

e. *Contractual attribution in shared infrastructure*

Subject to points a. to d., contractual arrangements may be used to identify a quantity of CO_2 injected at a storage site with an equivalent quantity of CO_2 from the capture facility that was transferred into shared infrastructure, accounting for transport losses in accordance with this methodology, even where the physical location of the CO_2 molecules captured by the activity is not known. No other quantity of CO_2 stored by or leaving the shared infrastructure system may be identified with that same quantity of CO_2 captured by the activity.

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f. The operator shall provide adequate evidence or shall arrange for the entities providing the transport or storage infrastructure services to provide adequate evidence, demonstrating compliance with these mass-balance requirements and any additional requirements imposed by ClimatePal EU.

Evidence for mass-balance compliance

6.7.2 Storage Losses before Permanent Storage

Storage-loss quantification

Where CR_{total} is calculated using equation (8), any intentional or accidental losses of CO_2 prior to entering permanent storage shall be explicitly quantified.

Storage fugitive and vented emissions

Fugitive and vented emissions during injection at a storage site shall be calculated in accordance with Section 23, Subsection B.1, of Annex IV to Implementing Regulation (EU) 2018/2066. For geological storage, data on fugitive and vented emissions shall be based on data recorded by the entity operating the storage site under Implementing Regulation (EU) 2018/2066.

Storage CO_2 loss calculation

The total loss of biogenic CO_2 from the activity during storage, $CO_{2storage,losses}$, shall be calculated using equation (28) (in accordance with Section 2.1.8.3 of the Annex to Delegated Regulation (EU) 2026/285 and Section 23, Subsection B.1, of Annex IV to Implementing Regulation (EU) 2018/2066):

$$CO_{2,storage,losses} = F_{CRCF} \times \frac{CO_{2,captured,atmobio}}{CO_{2,activity}} \times \sum_S \left[F_S \times \left(CO_{2,fugitive,S} + CO_{2,vented,S}\right)\right] \quad (28)$$

where

F_{CRCF} is the fraction specified in 6.3.2;

$CO_{2captured,atmobio}$ is the biogenic CO_2 determined using equation (2);

$CO_{2activity}$ is the activity CO_2 determined using equation (6);

F_S is the fraction of CO_2 stored at storage site S that originates from the activity, determined using equation (27);

$CO_{2fugitive,S}$ is the fugitive CO_2 emissions from storage site S, expressed in tCO_2;

$CO_{2vented,S}$ is the vented CO_2 emissions from storage site S, expressed in tCO_2.

Storage mass-balance check

At each storage site S, the sum of fugitive and vented emissions shall equal the difference between the measured amount of CO_2 entering the site and the measured amount of CO_2 injected into permanent geological storage, and shall be calculated using equation (29):

$$CO_{2,fugitive,S} + CO_{2,vented,S} = CO_{2,IN,S} - CO_{2,injected,S} \quad (29)$$

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where

$CO_{2IN,S}$ is the measured total amount of CO_2 entering storage site S, expressed in tCO_2;

$CO_{2injected,S}$ is the measured total amount of CO_2 injected for permanent storage at storage site S, expressed in tCO_2.

6.7.3 Storage-Associated GHG Emissions

Storage GHG calculation

GHG emissions associated with injection at storage sites shall be calculated using equation (30) (in accordance with Section 2.1.8.4 of the Annex to Delegated Regulation (EU) 2026/285):

$$GHG_{storage} = \sum_{S} \left[F_S \times \left(GHG_{storage\ site} + GHG_{inputs}\right)\right] \quad (30)$$

where

F_S is the storage-site allocation fraction determined using equation (27);

$GHG_{storage\ site}$ is the GHG emissions associated with energy use and operation at storage site S, expressed in tCO_2e;

GHG_{inputs} is the GHG emissions associated with the production and use of other inputs used at storage site S, expressed in tCO_2e.

Emissions from the storage site

GHG emissions at each storage site, $GHG_{storage\ site}$, shall be calculated using equation (31):

$$GHG_{storage\ site} = GHG_{combustion} + GHG_{elec} + GHG_{heat} + GHG_{capital} \quad (31)$$

where

$GHG_{combustion}$ is the GHG emissions due to fuel consumption at the storage site, expressed in tCO_2e, calculated using equation (32);

GHG_{elec} is the GHG emissions due to net electricity consumption at the storage site, expressed in tCO_2e, calculated using equation (33);

GHG_{heat} is the GHG emissions due to net useful heat consumption at the storage site, expressed in tCO_2e, calculated using equation (34);

$GHG_{capital}$ is the capital emissions from construction and installation of the storage site, expressed in tCO_2e, determined in accordance with 6.12.

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$GHG_{combustion}$ shall be calculated using equation (32):

Emissions from combustion

$$GHG_{combustion} = \sum_{fuels} (Q_{fuel} \times EF_{fuel}) + CO_{2,stored,fossil} \quad (32)$$

where

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

EF_{fuel} is the emission factor for the fuel consumed, expressed in tCO_2e/unit, selected in accordance with 6.11.4;

$CO_{2stored,fossil}$ is minus the quantity of fossil CO_2 from fuel combustion at the storage site that is captured and permanently stored, expressed in tCO_2.

$CO_{2stored,fossil}$ shall be calculated as minus the measured quantity of CO_2 captured from fossil sources at the storage site plus any CO_2 losses occurring prior to storage.

Stored fossil CO_2 at storage

GHG emissions due to net electricity consumption at the storage site shall be calculated using equation (33):

Emissions from electricity

$$GHG_{elec} = \sum_{electricity\ source} (Q_{elec} \times EF_{elec}) \quad (33)$$

where

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

EF_{elec} is the emission factor for the consumed electricity, expressed in tCO_2e/unit, selected in accordance with 6.11.1.

GHG emissions due to net useful heat consumption at the storage site shall be calculated using equation (34):

Emissions from heat

$$GHG_{heat} = \sum_{heat\ source} (Q_{heat} \times EF_{heat}) \quad (34)$$

where

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

EF_{heat} is the emission factor for the consumed heat, expressed in tCO_2e/unit, selected in accordance with 6.11.2.

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Emissions from inputs

Where inputs are consumed at the storage site, the GHG emissions associated with their consumption during the certification period shall be calculated using equation (35):

$$\mathrm{GHG}_{\mathrm{inputs}} = \sum_{\mathrm{inputs}} \left(\mathrm{Q}_{\mathrm{input}} \times \mathrm{EF}_{\mathrm{input}}\right) \quad (35)$$

where

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

EF_{input} is the emission factor for the input consumed, expressed in tCO_2e/unit, selected in accordance with 6.11.4.

Storage-input materiality

The operator may group any number of storage-site inputs whose collective emissions are considered non-material on the basis of a materiality assessment. The high-end estimate of the possible collective emissions of the grouped inputs shall satisfy equation (36):

$$\sum_{\mathrm{inputs}} \left(\mathrm{Q}_{\mathrm{input}} \times \mathrm{EF}_{\mathrm{input}}\right) < 2\% \times \mathrm{CR}_{\mathrm{total}} \quad (36)$$

where

Q_{input} is the quantity of each input included in the group;

EF_{input} is the applicable emission factor for each input;

C_{Rtotal} is the total carbon removal for the activity.

2 % storage-input substitution

Where the condition in equation (36) is met, the operator may substitute the calculated emissions of the grouped inputs with an emission term equal to 2 % × CR_{total}.

6.7.4 Monitoring and Reporting Parameters for Storage

Storage monitoring parameters

In accordance with 5.3, the operator shall include in the monitoring report before each re-certification audit the measured or calculated parameters for the certification period being audited listed in Table 11 (in accordance with Section 2.1.8.5 and Table 5 of the Annex to Delegated Regulation (EU) 2026/285). 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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Table 11: Parameters for inclusion in the monitoring report

Equation	Parameter	Unit	Definition	Notes
(27)	F_S	%	Allocation fraction of the CO_2 stored at site S that originates from the activity and shall be used to generate carbon removal units	
(27)	$CO_{2activity,injected,S}$	tCO_2	The part of CO_2activity stored at site S	To be identified following mass balance rules in the case of non-segregated CO_2 streams
(27), (29)	$CO_{2injected,S}$	tCO_2	Total amount of CO_2 injected for permanent storage at each relevant storage site	To be monitored
(8), (28)	$CO_{2storage,losses}$	tCO_2	Amount of losses of biogenic CO_2 being sent for permanent storage to generate carbon removal units during storage activity	Calculated using equation (28)
(28), (29)	$CO_{2vented,S}$	tCO_2	Amount of CO_2 vented at each relevant storage site	To be monitored
(28), (29)	$CO_{2fugitive,S}$	tCO_2	Amount of CO_2 fugitives at each relevant storage site	To be monitored or calculated using equation (29)
(29)	$CO_{2IN,S}$	tCO_2	Amount of CO_2 entering the storage site S	To be monitored
(30)	$GHG_{storage}$	tCO_2e	GHG emissions associated with the injection at a storage site	Calculated using equation (30)
(30), (31)	$GHG_{storage\ site}$	tCO_2e	GHG emissions associated with energy use and operation at the storage site	Calculated using equation (31)
(30), (35)	GHG_{inputs}	tCO_2e	GHG emissions associated with the production and use of other inputs used at the storage site	Calculated using equation (35)
(31), (32)	$GHG_{combustion}$	tCO_2e	GHG emissions due to fuel consumption at the storage site	Calculated using equation (32)
(31), (33)	GHG_{elec}	tCO_2e	GHG emissions due to net electricity consumption at the storage site	Calculated using equation (33)
(31), (34)	GHG_{heat}	tCO_2e	GHG emissions due to net useful heat consumption at the storage site	Calculated using equation (34)
(31), (42)	$GHG_{capital}$	tCO_2e	Capital emissions	To be informed by the operator. Calculated using equation (42)
(32)	Q_{fuel}	appropriate unit	Amount of fuels used for combustion at each storage site	To be monitored
(32)	EF_{fuel}	tCO_2e/unit	Emission factor for the fuel consumed	
(33)	Q_{elec}	MWh	Net amount of electricity consumed at each storage site	To be monitored

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Equation	Parameter	Unit	Definition	Notes
(33)	EF_{elec}	tCO_2e/unit	Emission factor for the consumed electricity	
(34)	Q_{heat}	MWh	Net amount of useful heat consumed at storage site, for all relevant storage sites	To be monitored
(34)	EF_{heat}	tCO_2e/unit	Emission factor for the consumed heat	
(35)	Q_{input}	appropriate unit	Amount of input consumed	To be monitored
(35)	EF_{input}	tCO_2e/unit	Emission factor for the input consumed	
(42), (43)	$GHG_{materials}$	tCO_2e	Emissions from the materials utilised in the construction of the storage site	Calculated using equation (43)
(43)	$Q_{materials}$	tonne	Quantity of materials utilised in the construction of the storage site	To be monitored
(43)	$EF_{materials}$	tCO_2e/tonne material	Emission factor for the utilised materials	

6.8 Completeness and Materiality

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

Emission-source completeness and materiality

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.

Additional 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 $GHG_{associated}$.

Emission-source assessment

Unless otherwise stated, all emission sources identified in this methodology shall be assessed and included in the calculation of $GHG_{associated}$, even where they do not reach the materiality threshold specified in this clause.

Materiality assessment

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

a. capital emissions, in accordance with 6.12;

b. input emissions where a materiality treatment is expressly permitted by this methodology; 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.

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Potential range of emissions

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.

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.

Materiality assessment evidence

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.

Reassessment after deviations

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 accounting

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 (in accordance with Section 2.3.2 of the Annex to Delegated Regulation (EU) 2026/285).

On-site energy exclusion

The calculation of net consumption shall exclude electricity or heat that is both produced and consumed on site at the capture facility or storage site, or for the transport infrastructure. 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 infrastructure 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, including downstream processes such as CO_2 liquefaction. Electricity or heat produced specifically for export, rather than recovered from a process required for the activity, shall not be included as recovered energy.

Net energy source allocation

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 (37):

$$Q_{heat/elec,net,source} = Q_{heat/elec,gross,source} \times \left[\frac{\sum_{sources} Q_{heat/elec,net,source}}{\sum_{sources} Q_{heat/elec,gross,source}} \right] \quad (37)$$

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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.

Net energy export

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.

Zero export emission factor

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 Additional Biomass Consumption

Additional biomass consumption

Additional biomass consumption is the biomass, biofuel, bioliquid or biomass fuel consumed specifically to provide energy for the carbon capture process.

Additional biomass boundary

Biomass, biofuel, bioliquid or biomass fuel consumed by the underlying process that generates the captured biogenic CO_2 stream shall not be treated as additional biomass consumption solely because the resulting CO_2 is captured. Only the quantity attributable to energy consumed specifically by the carbon capture process shall be treated as additional biomass consumption under this clause (in accordance with Section 2.3.3 of the Annex to Delegated Regulation (EU) 2026/285).

Recovered-heat treatment

Heat recovered from an existing biomass-based process whose primary purpose is not the production of heat or electricity and used by the capture facility shall not be treated as additional biomass consumption. Such heat shall instead be treated as consumed useful heat using the applicable emission factor in 6.11.2.

Bioenergy facility calculations

Where the BioCCS capture process is operated at a bioenergy facility and consumes electricity and/or useful heat generated by that facility for its own use, the quantity of additional biomass consumption attributable to the carbon capture process shall be determined using the applicable calculation below.

Facility generating only electricity

Where the bioenergy facility generates only electricity and part of its own electricity is consumed by the carbon capture process, additional biomass consumption shall be calculated using equation (38):

$$Q_{biomass} = \frac{Q_{elec}}{\eta_{elec}} \quad (38)$$

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where

Q_{elec} is the net consumption of own electricity by the carbon capture process;

η_{elec} is the electrical efficiency of the facility, calculated as the electricity produced during the certification period, including electricity consumed by the carbon capture process, divided by the fuel input during the certification period on an energy-content basis.

Facility generating only useful heat

Where the bioenergy facility generates only useful heat and part of its own heat is consumed by the carbon capture process, additional biomass consumption shall be calculated using equation (39):

$$Q_{biomass} = \frac{Q_{heat}}{\eta_{heat}} \quad (39)$$

where

Q_{heat} is the net consumption of own useful heat by the carbon capture process;

η_{heat} is the heat efficiency of the facility, calculated as the useful heat produced during the certification period, including useful heat consumed by the carbon capture process, divided by the fuel input during the certification period on an energy-content basis.

Facility generating electricity and useful heat

Where the bioenergy facility generates both electricity and useful heat, additional biomass consumption shall be calculated from the net quantities of own electricity and own useful heat consumed by the carbon capture process using equation (40). The resulting value of $Q_{biomass}$ shall be greater than zero.

$$Q_{biomass} = \frac{C_{elec} \times Q_{elec} + C_{heat} \times Q_{heat}}{C_{elec} \times \eta_{elec} + C_{heat} \times \eta_{heat}} \quad (40)$$

where

Q_{elec} is the net consumption of own electricity by the carbon capture process;

η_{elec} is the electrical efficiency of the facility under typical operating conditions. It may either be calculated as the electricity produced during the certification period, including electricity consumed by the carbon capture process, divided by the fuel input during the certification period on an energy-content basis, or be set for the whole activity period using technical documentation of the installation;

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Q_{heat} is the net consumption of own useful heat by the carbon capture process;

η_{heat} is the heat efficiency of the facility under typical operating conditions. It may either be calculated as the useful heat produced during the certification period, including useful heat consumed by the carbon capture process, divided by the fuel input during the certification period on an energy-content basis, or be set for the whole activity period using technical documentation of the installation;

C_{elec} is the fraction of exergy in electricity and shall be set to 1;

C_{heat} is the Carnot efficiency, representing the fraction of exergy in the consumed useful heat.

Carnot efficiency

C_{heat} shall be calculated using equation (41):

$$C_{heat} = \frac{T_{heat} - T_0}{T_{heat}} \quad (41)$$

where

T_{heat} is the average temperature of the consumed useful heat, expressed in kelvin;

T_0 is 273.15 K, in accordance with equation (72) of the Annex to Delegated Regulation (EU) 2026/285.

Efficiency-method consistency

The values of η_{elec} and η_{heat} shall be established consistently, either both by calculation or both using technical documentation.

Efficiency verification

Where technical documentation is used, the efficiency values shall be established on the same basis as if they were calculated, using the expected electricity or useful-heat output, respectively, divided by the expected fuel consumption under a representative operating mode. The certification body shall verify that the efficiency values used are consistently achievable under nominal operation of the facility and that the operating mode used to establish those values reasonably represents the actual operation of the installation.

Additional biomass result

The determined $Q_{biomass}$ under this clause shall be used as $Q_{biomass}$ in equations (12) and (13), as applicable, and represents the quantity of additional biomass, biofuel, bioliquid or biomass fuel attributable to the energy consumed by the carbon capture process. Emissions associated with that additional biomass consumption shall be accounted for in accordance with 6.11.3.

On-site energy treatment

Electricity or useful heat generated on site and consumed on site by the carbon capture process shall not be included in net Q_{elec} or Q_{heat}. Emissions associated with

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the on-site generation of that electricity or useful heat shall instead be accounted for through the fuel consumed, in accordance with 6.9.

6.11 Emission Factors

6.11.1 Electricity

Electricity emission-factor selection

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 the Delegated Regulation for permanent carbon removals in accordance with Section 2.3.4.1 of the Annex to Delegated Regulation (EU) 2026/285 and part A of the Annex to Delegated Regulation (EU) 2023/1185.

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 electricity transition

For a new capture 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 electricity is fully renewable and temporal correlation is required, temporal correlation may be assessed annually rather than hourly until 31 December 2044 or the end of the first activity period, whichever occurs first.

Source-specific electricity accounting

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. 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.

6.11.2 Useful Heat

Useful-heat emission factors

The applicable emission factor for net useful-heat consumption shall be selected in accordance with Table 12 (in accordance with Section 2.3.4.2 of the Annex to Delegated Regulation (EU) 2026/285).

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Table 12: 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 Edward et al. (2019)[1], divided by the thermal efficiency of the heat-generation process.
Heat generated from biomass, biofuel, bioliquid or biomass fuel, other than own useful heat consumed by a facility capturing CO_2 from biomass consumption for energy generation	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 of the activity, 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.

Own useful heat and net export

Own useful heat consumed by a BioCCS capture process at a facility capturing CO_2 from biomass consumption for energy generation shall be treated in accordance with 6.9 and 6.10. For net heat export, where Q_{heat} is negative, EF_{heat} shall be zero.

6.11.3 Biomass, Biofuel, Bioliquid and Biomass Fuel

Biomass emission accounting

Where additional biomass, biofuel, bioliquid or biomass fuel is consumed to provide energy for the BioCCS capture process, including additional biomass consumption determined in accordance with 6.10, 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, CO_2 produced by chemical processes from the biogenic carbon contained therein

[1] Edwards, R., O'Connell, A., Padella, M., Giuntoli, J., Koeble, R., Bulgheroni, C., Marelli, L., and Lonza, L., Definition of input data to assess GHG default emissions from biofuels in EU legislation, Version 1d – 2019, Publications Office of the European Union, Luxembourg, 2019, https://data.europa.eu/doi/10.2760/69179.

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shall use a CO_2 emission factor of zero. Supply-chain emissions and non-CO_2 combustion emissions, primarily CH_4 and N_2O, shall be accounted for.

Supply-chain and transport emissions

The supply-chain emission factor shall be calculated using the applicable rules in Annexes V and VI to Directive (EU) 2018/2001, considering emissions up to the point of consumption associated with the terms e_{ec}, e_l and e_p and emissions associated with transport. Where necessary, the emission factor 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. For municipal waste, post-consumer wood waste and sewage sludge, the process of collection for this purpose shall start when the material is deposited at the facility at which the CO_2 capture activity is implemented.

Biomass transport emissions

Emissions from transport of biomass, biofuel, bioliquid or biomass fuel to the capture facility shall be calculated using the actual distance travelled and mode of transport. Disaggregated default emission factors for the *etd* term shall not be used.

Indirect land-use change

Where biomass, biofuel, bioliquid or biomass fuel is accounted for under this subclause, indirect land-use-change (ILUC) emissions shall be set to zero in accordance with Section 2.3.4.3 of the Annex to Commission Delegated Regulation (EU) 2026/285. ClimatePal EU may provide guidance for feedstocks for which disaggregated default values are not available in Annexes V or VI to Directive (EU) 2018/2001.

6.11.4 Inputs and Fuels

Emission-factor hierarchy and defaults

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 13 (in accordance with Section 2.3.4.4 of the Annex to Delegated Regulation (EU) 2026/285).

Hierarchy application

Where the hierarchy in Table 13 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 13: 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.

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Priority	Source
4	JEC well-to-wheels report[2]
5	Ecoinvent database version 3.5 or later, or another comparable commercial database.
6	Official sources, including IPCC, IEA or government sources.
7	Other reviewed sources or peer-reviewed publications.

Fallback emission-factor sources

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

Lifecycle system boundary

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

Embedded-carbon adjustment

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.

Lifecycle-scope consistency

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

Conservative default factors

ClimatePal EU may provide lists of conservative default emission factors, including emission factors available from the sources listed in Table 13. 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.

Standard deviation

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 clause shall be treated as having no associated uncertainty for the calculation in 6.13.

6.11.5 Transport

Transport-factor calculation

Transport emissions, whether from CO_2 or bulk-material transport, 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

[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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ClimatePal EU (in accordance with Section 2.3.4.5 of the Annex to Delegated Regulation (EU) 2026/285).

Transport default factors

ClimatePal EU may provide additional conservative default emission factors for specific forms of CO_2 transport, provided that the basis for those values is clearly documented and the values are demonstrated to be conservative.

Fuel-emission factors

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 6.11.4.

CO_2 transport vehicle factors

Vehicle emission factors for CO_2 transport shall account for the mass of the CO_2 containment equipment and the energy required to compress or liquefy the CO_2 and maintain it in that state.

Return-trip emissions

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.

6.12 Capital Emissions

Capital-emission applicability

Capital emissions shall be considered where a relevant 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 facility, capital emissions shall be considered to be zero (in accordance with Section 2.3.5 of the Annex to Delegated Regulation (EU) 2026/285).

Capital-emission materiality

A materiality assessment shall be undertaken for the sum of capital emissions across all relevant facilities 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 scope

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 facilities or equipment directly required for performance of the 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.

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Capital allocation and amortisation

The calculated capital emissions for each facility shall be amortised over either 15 or 20 years. Where the facility 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 (42):

$$\mathrm{GHG_{capital}} = \frac{\mathrm{Q_{activity}}}{\mathrm{Q_{total}}} \times \left[\frac{\mathrm{GHG_{combustion}} + \mathrm{GHG_{elec}} + \mathrm{GHG_{heat}} + \mathrm{GHG_{materials}}}{\mathrm{T}}\right] \quad (42)$$

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 (32), using the quantity of fuel consumed during construction and the applicable emission factor selected in accordance with 6.11.4;

GHG_{elec} is the GHG emissions associated with electricity consumed during construction, calculated on the same basis as equation (15) or equation (33), as applicable, using the electricity emission factor determined in accordance with 6.11.1;

GHG_{heat} is the GHG emissions associated with useful heat consumed during construction, calculated on the same basis as equation (16) or equation (34), as applicable, using the useful-heat emission factor determined in accordance with 6.11.2;

$GHG_{materials}$ is the GHG emissions associated with construction materials, determined using equation (43);

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

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GHG emissions from construction material

GHG emissions from construction materials shall be calculated using equation (43):

$$GHG_{materials} = \sum_{materials} (Q_{materials} \times EF_{materials}) \quad (43)$$

where

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

$EF_{materials}$ is the lifecycle emission factor for the material, expressed in tCO_2/t of material and selected in accordance with 6.11.4.

Previous-facility proxy

Where a 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 clearly 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 facility came into operation, was expanded or was refitted, as applicable.

6.13 Measured Data, Uncertainty and Conservatism

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

Data-quality management

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 Section 2.3.6 of the Annex to Delegated Regulation (EU) 2026/285).

Measurement requirements

Measurements, including measurements of CO_2 flows, 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.

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

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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 Inventories3. Uncertainty shall be assessed based on the 95 % confidence interval. The applicable conservatism treatment is specified in Table 14.

Table 14: Uncertainty and conservatism factor

Total uncertainty	Conservatism factor	Consequence
Lower than ±2.5 %	$F_C = 1$	No uncertainty adjustment.
At least ±2.5 % and not greater than ±20 %	F_C = 100 % minus the total uncertainty estimate	Apply F_C in the CR_{total} calculation.
Greater than ±20 %	Not applicable	No units shall be issued for the certification period.

6.14 Confirmation of Biogenic CO_2 Origin

Biogenic CO_2 origin verification

Where the capture facility is not subject to monitoring under the EU ETS of the biogenic CO_2 amount, the operator shall provide immediate access on request to representatives of the certification body, ClimatePal EU or relevant national authority to allow unannounced random ^{14}C testing of the CO_2 stream before it leaves the capture facility and, where relevant, before it is mixed with any separately captured fossil CO_2 stream. The testing shall confirm the biogenic origin of the CO_2 stream (in accordance with Section 2.3.7 of the Annex to Delegated Regulation (EU) 2026/285).

Biogenic-origin verification failure

If the biogenic origin of the CO_2 cannot be confirmed, no units shall be issued for the corresponding certification period, and ClimatePal EU shall consider whether further action is required.

7. Additionality and Financing

Public financing disclosure

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 (in accordance with recital (4), Sections 2.1.2 and 1.3.3(d) of the Annex to Delegated Regulation (EU) 2026/285 and Article 5(1) and (2) of Regulation (EU) 2024/3012).

Financing declaration

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. Financing received or

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

8. Permanent Geological Storage and Liability

Eligible geological storage

CO_2 captured by the activity and counted towards permanent carbon removal units under this methodology shall be injected at an operational geological storage site permitted under Directive 2009/31/EC (in accordance with Sections 3.1 and 1.2.1.2 of the Annex to Delegated Regulation (EU) 2026/285 and articles 16 and 18 of Directive 2009/31/EC).

Storage-site liability

The operator of each geological storage site used by the activity is liable for any release of CO_2 from permanent geological storage under Article 16 of Directive 2009/31/EC.

Responsibility transfer

The monitoring period shall continue until responsibility for all geological storage sites used by the activity has been transferred to the relevant competent national authorities under Article 18 of Directive 2009/31/EC.

Storage traceability

The operator shall retain evidence linking the activity CO_2 to each geological storage site and identifying the storage-site operator, the applicable storage permit, and the date and legal basis for the transfer of responsibility for each site.

9. Sustainability

9.1 Minimum Sustainability Requirements

Minimum sustainability requirements

The operator shall comply with the minimum sustainability requirements summarized in Table 15 and shall maintain evidence sufficient to demonstrate compliance (in accordance with Sections 4.1.1 to 4.1.6 of the Annex to Delegated Regulation (EU) 2026/285).

Table 15: Minimum sustainability requirements

Environmental objective	Requirement for BioCCS	Reference
Climate change mitigation	Maintain compliance with the eligibility requirements in 4.1, which prevent certification of activities that significantly harm the climate-change-mitigation objective.	Section 4.1.1 of the Annex to Delegated Regulation (EU) 2026/285
Climate change adaptation	Comply with the climate-adaptation criteria in appendix A to Annex I to Commission Delegated Regulation (EU) 2021/2139.	Section 4.1.2 of the Annex to Delegated Regulation (EU) 2026/285

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Environmental objective	Requirement for BioCCS	Reference
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.	Section 4.1.3 of the Annex to 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. Where applicable, comply with the biomass-related requirements in 9.2.	Section 4.1.4 of the Annex to 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.	Section 4.1.5 of the Annex to Delegated Regulation (EU) 2026/285
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.	Section 4.1.6 of the Annex to Delegated Regulation (EU) 2026/285

9.2 Biomass-Related Requirements

Biomass sustainability

All biomass, biofuel, bioliquid or biomass fuel from which the biogenic CO_2 captured by the activity is generated, and any additional biomass, biofuel, bioliquid or biomass fuel consumed to produce energy for the capture activity, shall comply with the applicable sustainability requirements in Article 29 of Directive (EU) 2018/2001. The certification body shall apply those requirements even where the activity does not generate renewable energy that is taken into account under that Directive.

Feedstock disclosure

The operator shall disclose the biomass feedstock or feedstock mix consumed by the activity and the biomass 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.

Energy-production requirements

Where the BioCCS capture activity 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.

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Evidence of sustainability compliance

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 biomass sustainability requirements. Other schemes recognised by the competent national authority in the Member State where the capture 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.

National implementation and support schemes

Where the captured biogenic CO_2 is produced by a process that generates energy taken into account under Directive (EU) 2018/2001, the certification body shall verify that the national implementation of that Directive applies to the entity operating the process and that the entity complies with that implementation. Where the entity benefits from a relevant support scheme for energy production, the certification body shall also verify compliance with national measures implementing the biomass cascading priorities in Article 3(3), including applicable Member State derogations under Article 3(3a). The certification body shall verify that the entity does not receive direct Member State financial support for the use of saw logs, veneer logs, industrial-grade roundwood, stumps or roots to produce energy, in accordance with Article 3(3c).

High ILUC-risk feedstocks

Biomass, biofuel, bioliquid or biomass fuel from which the captured CO_2 is generated, or from which a biofuel, bioliquid or biomass fuel giving rise to the captured CO_2 is produced, shall not be identified as being or as being produced from a high indirect land-use-change-risk feedstock under Directive (EU) 2018/2001.

Conservation and restoration areas

Where biomass is sourced from areas designated by the national competent authority for conservation, including areas covered by a national restoration plan under Regulation (EU) 2024/1991, or from protected habitats, the sourcing shall be in accordance with the conservation and restoration objectives for those areas (in accordance with Section 4.2 (d) of the Annex to Delegated Regulation (EU) 2026/285).

Primary purpose of biomass use

Any biomass, biofuel, bioliquid or biomass fuel from which captured CO_2 is emitted shall be consumed with the primary purpose of generating a product other than CO_2 for capture. The underlying process shall not be adjusted in a way that increases the generation of CO_2 per unit of output where the adjustment is made solely to increase the quantity of CO_2 available for capture. This does not preclude adjustments made to increase the fraction of facility output that can be subject to CO_2 capture or to increase overall system efficiency.

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Heat/electricity facility conditions

For a facility where the primary purpose of biomass, biofuel, bioliquid or biomass fuel consumption is to produce heat or electricity, the additional requirements below shall apply unless an exception in the following paragraph applies.

Economic viability

Where the heat- or electricity-generating facility became operational not more than one year before the start of the activity period, or previously consumed fossil feedstock and was adjusted to increase the share of biomass, biofuel, bioliquid or biomass fuel not more than one year before the start of the activity period, the operator shall demonstrate that the facility would remain economically viable without the carbon removal activity. The net present value shall be positive for a version of the facility without the cost of carbon capture, revenue from carbon removal units or any other support predicated on delivery of carbon removals.

Capacity increase limitation

In all other cases where the primary purpose of biomass consumption is heat or electricity production, the operator shall demonstrate that the nameplate energy-generation capacity of the facility has not increased by more than the amount necessary to supply energy for the capture process, compared with the nameplate capacity on whichever is later of the date on which the facility became operational and the date three years before the start of the activity period.

Exempt facility categories

The preceding economic-viability and capacity requirements do not apply to waste-to-energy facilities combusting wastes or residues other than agricultural, aquaculture, fisheries and forestry residues; facilities using biomass, biofuel, bioliquid or biomass fuel for non-energy applications; energy applications where heat or electricity are not the primary outputs, such as biofuel or biogas production; or facilities where biomass, biofuel, bioliquid or biomass fuel is used as part of a chemical reaction in an industrial process aimed at producing a product other than heat or electricity, even where energy is also extracted.

Food and feed crop restriction

Where the feedstock processed at the installation from which CO_2 is captured includes food and feed crops or food- and feed-crop-based biofuels, bioliquids or biomass fuels, energy derived from that feedstock shall not be used to operate the capture process, except in the case of recovered heat (in accordance with Section 4.3.1 of the Annex to Delegated Regulation (EU) 2026/285; Directive (EU) 2018/2001)

Carbon farming sequestration units

Where the carbon removal activity is based on consumption of biomass feedstock, the operator may purchase carbon farming sequestration units to support regeneration of natural carbon stocks, in accordance with Section 4.3.3 of the Annex to Delegated Regulation (EU) 2026/285. The quantity purchased shall be reported in the certificate of compliance and in the monitoring report (in accordance with Section 4.3.3 and Section 1.3.3(c), respectively, of the Annex to Delegated Regulation (EU) 2026/285).

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