BioCarbon Standard

METHODOLOGICAL DOCUMENT
WASTE HANDLING AND DISPOSAL

BCR0018
Avoided Methane Emissions from the Diversion and Alternative Treatment of Biodegradable Solid Waste from Solid Waste Disposal Sites

BioCarbon Cert®

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Acronyms and abbreviations

AD	Anaerobic Digestion
ADC	Avoiding Double Counting
AR6	Sixth Assessment Report of the Intergovernmental Panel on Climate Change
BMP	Biochemical Methane Potential
BAT	Baseline and Additionality Tool
C	Carbon
CAB	Conformity Assessment Body
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
DOC	Degradable Organic Carbon
DOCf	Fraction of Degradable Organic Carbon that Decomposes
EF	Emission Factor
FOD	First Order Decay
GHG	Greenhouse gas
GWP	Global Warming Potential
GWP100	100-year Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LE	Leakage Emissions
MCF	Methane Correction Factor
MRV	Monitoring, Reporting and Verification
MSW	Municipal Solid Waste
N_2O	Nitrous Oxide
PE	Project Emissions
QA/QC	Quality Assurance and Quality Control
RDF	Refuse-Derived Fuel
SDGs	Sustainable Development Goals
SDSs	Sustainable Development Safeguards
SRF	Solid Recovered Fuel
SWDS	Solid Waste Disposal Site
tCO_2	Metric tonne of carbon dioxide
tCO_2e	Metric tonne of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VCC	Verified Carbon Credit

1 Introduction

The waste sector is a relevant source of anthropogenic greenhouse gas (GHG) emissions, particularly methane (CH_4) generated from the anaerobic decomposition of biodegradable organic waste in solid waste disposal sites (SWDS). Methane emissions from SWDS occur when degradable organic carbon contained in waste decomposes under anaerobic or partially anaerobic conditions over time. The generation and release of methane depends on the quantity and composition of the waste, the degradability of its organic carbon, climatic conditions, landfill management practices, methane recovery, and oxidation in cover materials. The IPCC Good Practice Guidance and the 2006 IPCC Guidelines, as refined in 2019, identify the First Order Decay (FOD) model as the appropriate methodological approach to reflect the time-dependent nature of methane generation from solid waste disposal.

This methodology establishes the requirements for quantifying, monitoring, reporting, and verifying GHG emission reductions achieved through the diversion and alternative treatment of biodegradable solid waste that, in the absence of the project activity, would have been disposed of in a SWDS and would have generated methane emissions. Eligible project activities may include waste separation, sorting, conditioning, mechanical treatment, biological treatment, thermal or mechanical-thermal treatment, stabilization, production of refuse-derived fuel or solid recovered fuel, or other alternative treatment routes, provided that the applicable conditions of this methodology and the BioCarbon Standard are met.

The methodology is designed as a modular methodology. It shall be applied together with the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification Manual, and all applicable BioCarbon Tools, including tools for baseline and additionality, monitoring, reporting and verification, leakage management, uncertainty, double counting, sustainable development safeguards, and Sustainable Development Goal contributions. Sector-specific procedures contained in this methodology complement, but do not replace, the mandatory application of those program-level requirements.

The core mitigation outcome under this methodology is GHG emission reduction, not carbon dioxide removal. The methodology does not quantify carbon storage, carbon dioxide removal, or long-term sequestration. It quantifies avoided methane emissions from the biodegradable fraction of waste that is demonstrably diverted from disposal under anaerobic conditions. Carbon dioxide emissions from the decomposition or combustion of biogenic waste are treated consistently with the applicable IPCC accounting principles, while fossil carbon emissions associated with plastics, synthetic materials, fossil-derived fractions, auxiliary fuels, electricity, transportation, or treatment processes shall be accounted for where required by this methodology and the applicable BioCarbon Tools. The IPCC 2019 Refinement distinguishes biogenic carbon from fossil carbon and provides updated guidance relevant to waste treatment, incineration, pyrolysis, gasification, and open burning of waste.

This methodology may be applied independently or in combination with another BioCarbon-approved methodology, provided that each methodology quantifies a distinct emission

source, baseline scenario, and causal mitigation mechanism. Where biodegradable waste diverted from a SWDS is processed into solid recovered fuel, refuse-derived fuel, or similar waste-derived fuel and subsequently used in an industrial thermal process, avoided methane emissions under this methodology shall be quantified separately from any emission reductions associated with downstream fossil fuel substitution. The same emission reduction shall not be credited more than once.

The methodology incorporates conservative baseline setting, robust waste characterization, chain-of-custody requirements, monitoring of project emissions, leakage assessment, uncertainty management, and safeguards to avoid double counting, double claiming, overestimation, and perverse incentives. In particular, emission reductions may only be claimed for waste fractions that are biodegradable, eligible, traceable, not subject to mandatory diversion or treatment requirements, and not diverted from recycling, reuse, or other higher-priority waste management options.

Digital monitoring, reporting, and verification systems may be used to support the implementation of this methodology. Digital MRV may include electronic weighbridge records, digital manifests, georeferenced evidence, batch-level traceability, laboratory data management systems, GPS tracking, electronic chain-of-custody records, digital mass-balance systems, and auditable databases. The use of digital systems shall be technology-neutral and shall not replace direct measurement, laboratory analysis, QA/QC procedures, documentary evidence, conservative uncertainty treatment, or independent validation and verification by an approved CAB.

2 Objectives

This methodology establishes the requirements and procedures for the quantification, monitoring, reporting and verification of greenhouse gas (GHG) emission reductions from project activities that divert eligible biodegradable solid waste from solid waste disposal sites (SWDS) and treat, process, stabilize, recover, or valorize such waste through alternative waste management routes.

The purpose of this methodology is to:

(a) define the eligible project activities, waste streams, treatment routes, and boundary conditions applicable to the diversion and alternative treatment of biodegradable solid waste;
(b) establish conservative criteria to determine the baseline scenario in which eligible biodegradable solid waste would have been disposed of in a SWDS and would have generated methane emissions under anaerobic or partially anaerobic conditions;
(c) provide methodological procedures to quantify avoided methane emissions from the diversion of eligible biodegradable solid waste from SWDS, using the First Order Decay (FOD) approach and applicable IPCC-based parameters, equations, and assumptions;

(d) establish requirements to identify, quantify, and deduct project emissions associated with waste collection, sorting, conditioning, treatment, processing, stabilization, storage, transportation, energy use, auxiliary fuel use, residual waste management, and any other material emission sources within the project boundary;
(e) establish requirements for the identification, assessment, and conservative treatment of leakage emissions associated with the project activity, including diversion of waste from other uses, displacement of existing waste management practices, transport-related emissions, and changes in residual waste handling;
(f) ensure that emission reductions are credited only for eligible biodegradable waste fractions that are measurable, traceable, verifiable, not diverted from recycling, reuse, or higher-priority waste management options, and not subject to mandatory legal diversion or treatment requirements;
(g) establish waste characterization, sampling, mass balance, chain-of-custody, and documentation requirements to support transparent and conservative quantification of emission reductions;
(h) define monitoring requirements for activity data, waste composition, treatment performance, residual waste, project emissions, leakage, uncertainty, and quality assurance/quality control;
(i) allow the use of digital monitoring, reporting, and verification systems to support traceability, data capture, chain-of-custody, mass balance, data storage, auditability, and verification, provided that such systems are technology-neutral, secure, exportable, auditable, and independently verifiable;
(j) establish rules to avoid double counting, double claiming, double issuance, and overestimation of emission reductions, particularly where multiple actors participate in the waste management chain;
(k) clarify the conditions under which this methodology may be applied together with another BioCarbon-approved methodology, including a methodology for downstream fossil fuel substitution, provided that each methodology quantifies a distinct emission source, baseline scenario, and causal mitigation mechanism;
(l) ensure consistency with the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification Manual, and all applicable BioCarbon Tools, including tools for baseline and additionality, monitoring, reporting and verification, leakage management, uncertainty, avoiding double counting, sustainable development safeguards, and SDG contribution;
(m) support the development of transparent, conservative, replicable, and independently verifiable GHG emission reduction projects in the waste handling and disposal sector.

This methodology does not quantify carbon dioxide removal, carbon storage, long-term sequestration, or downstream fossil fuel substitution. Any emission reductions from the use of solid recovered fuel, refuse-derived fuel, or similar waste-derived fuels to displace fossil fuels in industrial thermal processes shall be quantified under a separate BioCarbon-approved methodology, where applicable.

3 Scope

This methodology applies to greenhouse gas (GHG) emission reduction project activities in the waste handling and disposal sector that avoid methane (CH_4) emissions by diverting eligible biodegradable solid waste from solid waste disposal sites (SWDS) and subjecting such waste to alternative treatment, processing, stabilization, recovery, or valorization routes.

This methodology is applicable to project activities where eligible biodegradable solid waste, in the absence of the project activity, would have been disposed of in a SWDS under anaerobic or partially anaerobic conditions and would have generated methane emissions over time. The methodology covers the quantification of avoided methane emissions from such diversion, as well as the quantification and deduction of project emissions, leakage emissions, and uncertainty adjustments, as applicable.

The methodology may apply to municipal solid waste, source-separated organic waste, biodegradable fractions of commercial or institutional solid waste, biodegradable non-hazardous industrial solid waste, and dewatered sludge or similar residual materials only where such materials are managed as solid waste, are eligible under this methodology, and would have been disposed of in a SWDS in the baseline scenario.

Eligible alternative treatment or valorization routes may include, as applicable, source separation, sorting, mechanical treatment, biological treatment, composting, anaerobic digestion, aerobic stabilization, mechanical-biological treatment, drying, conditioning, controlled mechanical or thermal-mechanical treatment, production of refuse-derived fuel, solid recovered fuel, combustible solid recovered fuel, stabilized biomass, or other alternative waste treatment routes that prevent or reduce anaerobic degradation of eligible biodegradable waste in a SWDS.

This methodology quantifies only GHG emission reductions from avoided methane emissions associated with the diversion and alternative treatment of eligible biodegradable solid waste. It does not quantify carbon dioxide removal, carbon storage, long-term sequestration, avoided fossil fuel emissions from downstream energy use, electricity generation benefits, heat generation benefits, or emission reductions from the substitution of fossil fuels in industrial thermal processes.

Where a project activity produces refuse-derived fuel, solid recovered fuel, combustible solid recovered fuel, stabilized biomass, or a similar waste-derived fuel, this methodology may account for the avoided methane emissions from eligible biodegradable waste diverted from a SWDS. Any emission reductions associated with the downstream use of such fuel to substitute fossil fuels shall be quantified only under a separate BioCarbon-approved methodology, where applicable, and shall not be credited under this methodology.

The methodology is globally applicable, provided that the project activity complies with the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification

Manual, all applicable BioCarbon Tools, this methodology, and all applicable legal and regulatory requirements in the host country and relevant jurisdiction.

This methodology is a modular methodology. It shall be applied together with the applicable BioCarbon Tools, including, at a minimum and as applicable, the Baseline and Additionality Tool, the Monitoring, Reporting and Verification Tool, the Avoiding Double Counting Tool, the Leakage Management Tool, the Conservative Approach and Uncertainty Management Tool, the Sustainable Development Safeguards Tool, the SDGs Contribution Tool, and any other BioCarbon Tool required by the BioCarbon Standard or this methodology.

The methodology may be applied independently or together with another BioCarbon-approved methodology, provided that each methodology addresses a distinct emission source, baseline scenario, project boundary component, and causal mitigation mechanism. The same emission reduction shall not be credited under more than one methodology.

Digital monitoring, reporting and verification systems may be used to support the implementation of this methodology, including for waste traceability, activity data collection, mass balance, chain of custody, laboratory records, treatment performance, residual waste tracking, data storage, quality control and verification. The use of digital systems is optional, technology-neutral, and shall not replace direct measurement, sampling, laboratory analysis, documentary evidence, conservative uncertainty treatment, or independent validation and verification by an approved CAB.

4 Version

This document constitutes the draft for public consultation of the methodology Avoided Methane Emissions from the Diversion and Alternative Treatment of Biodegradable Solid Waste from Solid Waste Disposal Sites.

This version has been developed as a modular methodology under the BioCarbon Standard and shall be applied in conjunction with the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification Manual, and all applicable BioCarbon Tools.

This version establishes the initial methodological requirements for project activities that divert eligible biodegradable solid waste from solid waste disposal sites and subject such waste to alternative treatment, processing, stabilization, recovery, or valorization routes to avoid methane emissions.

This methodology may be updated periodically to incorporate scientific, technical, regulatory, methodological, or programmatic improvements, including updates to IPCC guidance, CDM methodological tools, BioCarbon Tools, or other applicable methodological sources formally adopted by BioCarbon.

Project holders, project developers, Conformity Assessment Bodies, and other intended users shall ensure that they apply the most recent version of this methodology and all applicable BioCarbon normative documents in force at the relevant stage of the project cycle.

Unless otherwise specified by BioCarbon, the applicable version of this methodology shall be determined in accordance with the BioCarbon Standard, the Standard Operating Procedures, and any applicable transition rules issued by BioCarbon.

Any revision of this methodology shall be documented through a version history, including the version number, date of publication, summary of changes, and status of the document.

5 Applicability conditions

This methodology is applicable under the following conditions:

(a) The project activity diverts eligible biodegradable solid waste from disposal at a solid waste disposal site (SWDS) and treats, processes, stabilizes, recovers, or valorizes such waste through an alternative waste management route;
(b) The waste shall be non-hazardous solid waste and shall contain a biodegradable organic fraction capable of generating methane under anaerobic or partially anaerobic conditions in a SWDS;
(c) Emission reductions may be claimed only for the eligible biodegradable fraction of the waste. Plastics, rubber, synthetic textiles, fossil-derived materials, metals, glass, ceramics, stones, construction and demolition inerts, and other non-biodegradable or inert materials shall not generate avoided methane emission reductions under this methodology;
(d) The project holder shall demonstrate that, in the absence of the project activity, the eligible waste would have been disposed of in a SWDS with or without partial landfill gas capture;
(e) The baseline SWDS shall be identified, or conservatively characterized, with respect to location, type, management conditions, methane recovery, oxidation, and any other parameter required to quantify baseline methane emissions;
(f) The project activity shall not reduce the amount or quality of waste that would have been recycled, reused, recovered as material, composted, anaerobically digested, incinerated, or otherwise treated in the baseline scenario;
(g) The project activity shall not be eligible where the diversion, treatment, processing, stabilization, recovery, or valorization of the eligible waste is required by enforced legal, regulatory, contractual, judicial, administrative, or permitting obligations;
(h) The project activity shall comply with all applicable laws, permits, licenses, environmental requirements, occupational health and safety requirements, waste management rules, transport requirements, and facility operating conditions;

(i) Eligible treatment routes may include sorting, mechanical treatment, biological treatment, aerobic stabilization, composting, anaerobic digestion, mechanical-biological treatment, drying, conditioning, mechanical or thermal-mechanical treatment, production of refuse-derived fuel, solid recovered fuel, stabilized biomass, or other alternative waste treatment routes, provided that all material project emissions and leakage emissions are accounted for;

(j) Organic waste, treated waste, intermediate products, by-products, residual waste, compost, digestate, stabilized biomass, refuse-derived fuel, solid recovered fuel, or comparable outputs shall not be stored under anaerobic conditions. Where anaerobic storage or disposal occurs, resulting emissions shall be quantified and deducted;

(k) Where the project activity produces refuse-derived fuel, solid recovered fuel, stabilized biomass, or any similar waste-derived fuel, this methodology shall quantify only avoided methane emissions from eligible biodegradable waste diverted from SWDS. Downstream fossil fuel substitution shall not be credited under this methodology;

(l) The project holder shall demonstrate clear legal and contractual rights to claim the emission reductions generated under this methodology and shall prevent double counting, double claiming, double issuance, and double use;

(m) The project activity shall apply the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification Manual, and all applicable BioCarbon Tools;

(n) The project holder shall establish a monitoring plan covering waste characterization, weighing, sampling, mass balance, chain of custody, treatment performance, residual waste, project emissions, leakage, uncertainty, QA/QC, data retention, and verification;

(o) Digital monitoring, reporting and verification systems may be used to support traceability, data capture, chain of custody, mass balance, laboratory records, transport tracking, evidence management, QA/QC, and auditability. Such systems shall be technology-neutral, secure, exportable, auditable, and independently verifiable.

6 Methodology type and modular architecture

This methodology is a modular BioCarbon methodology for greenhouse gas emission reductions in the waste handling and disposal sector.

This methodology shall be applied in conjunction with the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification Manual, and all applicable BioCarbon Tools. The requirements set out in this methodology are sector-specific requirements and shall complement, not replace, the applicable program-level requirements.

The most recent version in force of each of the following BioCarbon Tools shall be applied in full, according to the scope, risks, and characteristics of the project activity:

(a) Baseline and Additionality Tool;
(b) Monitoring, Reporting and Verification Tool;
(c) Leakage Management Tool;
(d) Conservative Approach and Uncertainty Management Tool;
(e) Permanence and Risk Management Tool;
(f) Avoiding Double Counting Tool;
(g) Sustainable Development Safeguards Tool; and
(h) Sustainable Development Goals Contribution Tool.

The Permanence and Risk Management Tool shall apply only to the extent relevant to risk management, conservative deductions, operational integrity, and applicable BioCarbon program requirements. This methodology does not quantify carbon stock permanence, carbon dioxide removal, or long-term carbon storage.

The modular architecture of this methodology is based on the separation of the following methodological components: baseline determination and additionality; eligibility and characterization of waste streams; quantification of avoided methane emissions from SWDS; quantification of project emissions; leakage assessment; uncertainty assessment; monitoring and QA/QC; safeguards; and prevention of double counting.

The core quantification module under this methodology is the estimation of methane emissions avoided by diverting eligible biodegradable solid waste from disposal in a SWDS. Project emissions, leakage emissions, uncertainty adjustments, and any ineligible or non-biogenic fractions shall be accounted for separately and deducted, where applicable.

When this methodology is applied together with another methodology, the project holder shall demonstrate methodological compatibility, separate quantification, separate monitoring data, traceable allocation of emissions and emission reductions, and absence of double counting, double claiming, double issuance, or double use.

Where there is any inconsistency between this methodology and the applicable BioCarbon Tools, the more specific, stringent, and conservative requirement shall apply, unless BioCarbon expressly determines otherwise.

7 Relationship with other BioCarbon methodologies

This methodology may be applied independently or in combination with another BioCarbon-approved methodology, provided that the project activity complies with the BioCarbon Standard, the Standard Operating Procedures, the Validation and Verification Manual, the Multi-Methodology Framework, and all applicable BioCarbon Tools.

Where this methodology is applied together with another BioCarbon-approved methodology, each methodology shall address a distinct emission source, baseline scenario, project boundary component, and causal mitigation mechanism. The project holder shall

demonstrate that the emission reductions quantified under each methodology are separately attributable, separately monitored, and not double counted.

This methodology quantifies only avoided methane emissions from the diversion and alternative treatment of eligible biodegradable solid waste that would otherwise have been disposed of in a solid waste disposal site. It shall not be used to quantify emission reductions from downstream fossil fuel substitution, electricity generation, heat generation, industrial energy use, or any other mitigation outcome covered by another methodology.

Where eligible biodegradable solid waste diverted under this methodology is processed into refuse-derived fuel, solid recovered fuel, stabilized biomass, or any similar waste-derived fuel, the avoided methane emissions may be quantified under this methodology. Any emission reductions associated with the subsequent use of such fuel to displace fossil fuels in industrial thermal processes shall be quantified only under a separate BioCarbon-approved methodology, where applicable.

The same waste stream, emission source, activity data, monitoring record, baseline emission, project emission, leakage emission, or mitigation outcome shall not be used to generate emission reductions under more than one methodology, unless the project holder demonstrates, and the CAB validates and verifies, that the relevant components are clearly separated and that no double counting, double claiming, double issuance, or double use occurs.

When this methodology is applied with another BioCarbon-approved methodology, the project holder shall include in the project document a methodological compatibility assessment describing the applicable methodologies, project boundary components, monitored data, allocation rules, emission sources, leakage sources, ownership of claims, and safeguards against double counting.

8 Normative references / Methodological basis

The following normative references and methodological sources are essential for the application of this methodology. Unless otherwise stated, the most recent version in force of each BioCarbon document shall apply.

8.1 BioCarbon normative references

(a) BioCarbon Standard;
(b) Standard Operating Procedures;
(c) Validation and Verification Manual;
(d) Baseline and Additionality Tool;
(e) Monitoring, Reporting and Verification Tool;
(f) Leakage Management Tool;
(g) Conservative Approach and Uncertainty Management Tool;
(h) Permanence and Risk Management Tool;

(i) Avoiding Double Counting Tool;
(j) Sustainable Development Safeguards Tool; and
(k) Sustainable Development Goals Contribution Tool.

8.2 External methodological basis

This methodology is based on, and shall be interpreted consistently with, the following methodological sources, as applicable:

(a) IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 5, Waste;
(b) 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Waste;
(c) IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, Chapter 5, Waste;
(d) CDM TOOL04: Emissions from solid waste disposal sites;
(e) CDM ACM0022: Alternative waste treatment processes;
(f) CDM TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion;
(g) CDM TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation;
(h) CDM TOOL12: Project and leakage emissions from transportation of freight;
(i) CDM TOOL13: Project and leakage emissions from composting;
(j) CDM TOOL14: Project and leakage emissions from anaerobic digesters;
(k) CDM TOOL06: Project emissions from flaring, where relevant to biogas or methane-containing gas flaring under the project activity; and
(l) AMS-III.E: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment, where relevant to the applicable treatment route.

The methodological basis of this methodology is the quantification of methane emissions avoided by preventing eligible biodegradable solid waste from being disposed of in a solid waste disposal site under anaerobic or partially anaerobic conditions. Baseline methane emissions shall be estimated using a First Order Decay (FOD) approach, unless this methodology expressly allows a more conservative alternative approach.

Where relevant methodological tools, standards, or technical requirements are formally adopted after the publication of this methodology, BioCarbon may revise this methodology or issue specific guidance to maintain consistency with applicable methodological, quantification, monitoring, and accounting requirements.

In the event of any inconsistency between external methodological sources and BioCarbon normative documents, the BioCarbon Standard, the applicable BioCarbon Tools, and this methodology shall prevail. Where more than one requirement may apply, the more specific, stringent, and conservative requirement shall be used, unless BioCarbon expressly determines otherwise.

9 Terms and definitions

For the purpose of this methodology, the following terms and definitions apply. Terms not defined in this section shall be interpreted in accordance with the BioCarbon Standard, the applicable BioCarbon Tools, and, where relevant, the IPCC Guidelines and CDM terminology.

Alternative waste treatment

Any eligible treatment, processing, stabilization, recovery, or valorization route that prevents or reduces the anaerobic decomposition of eligible biodegradable solid waste in a solid waste disposal site.

Anaerobic conditions

Conditions in which oxygen is not readily available and under which biodegradable organic matter may decompose and generate methane.

Baseline scenario

The scenario that reasonably represents the management and disposal of eligible biodegradable solid waste in the absence of the project activity, including disposal in a solid waste disposal site where methane would be generated.

Biodegradable solid waste

Non-hazardous solid waste containing degradable organic carbon capable of biological decomposition and methane generation under anaerobic or partially anaerobic conditions.

Biogenic carbon

Carbon derived from biomass or recently living organic material, excluding fossil carbon.

Bulk waste: A mixed solid waste stream for which individual waste types are not separately quantified, and for which average composition and default or measured parameters are applied conservatively.

Bulk waste

A mixed solid waste stream for which individual waste types are not separately quantified, and for which average composition and default or measured parameters are applied conservatively.

Chain of custody

The documented and traceable sequence through which waste, intermediate products, residual waste, and final outputs are identified, transferred, monitored, controlled, and recorded from origin to final treatment, use, or disposal.

Composting

The controlled aerobic biological decomposition of biodegradable organic waste into a stabilized material.

Degradable organic carbon (DOC)

The fraction of organic carbon in solid waste that is accessible to biochemical decomposition.

Digital monitoring, reporting and verification (digital MRV or dMRV): The use of digital systems to support data capture, traceability, chain of custody, mass balance, monitoring records, QA/QC, data retention, auditability, and verification.

Digital monitoring, reporting and verification (digital MRV or dMRV)

The use of digital systems to support data capture, traceability, chain of custody, mass balance, monitoring records, QA/QC, data retention, auditability, and verification.

Double claiming

A situation in which more than one entity claims the same emission reduction, mitigation outcome, environmental attribute, or related benefit.

Double counting

A situation in which the same emission reduction or mitigation outcome is counted more than once toward a target, claim, crediting system, compliance obligation, or other mitigation purpose.

Eligible biodegradable fraction

The portion of a solid waste stream that is eligible under this methodology and capable of generating methane under baseline SWDS conditions.

First Order Decay (FOD) model

A time-dependent model used to estimate methane generation from solid waste disposed of, or prevented from disposal, in a solid waste disposal site, based on the decay of degradable organic carbon over time.

Fossil carbon

Carbon derived from fossil sources, including plastics, synthetic rubber, synthetic textiles, fossil-derived materials, and other non-biogenic carbon-containing materials.

Leakage emissions

Net increases in GHG emissions outside the project boundary that are attributable to the project activity.

Mechanical-biological treatment

A combination of mechanical and biological treatment processes used to separate, recover, stabilize, dry, or otherwise treat solid waste.

Methane correction factor (MCF)

A factor that reflects the extent to which waste decomposes under anaerobic conditions in a solid waste disposal site, taking into account site type and management conditions.

Methane recovery

The capture and flaring, combustion, utilization, or other destruction of methane generated from a solid waste disposal site or treatment process.

Municipal solid waste (MSW)

A heterogeneous mixture of solid waste types usually collected by municipalities or other local authorities, including household waste, garden and park waste, and commercial or institutional waste.

Oxidation factor (OX)

A factor reflecting the fraction of methane generated in a solid waste disposal site that is oxidized in cover soil or other cover material before being emitted to the atmosphere.

Project activity

The activity implemented by the project holder to divert eligible biodegradable solid waste from a solid waste disposal site and subject it to an eligible alternative waste treatment route.

Project boundary

The physical and operational boundary including the relevant waste generation or collection points, transport routes, sorting and treatment facilities, storage areas, residual waste management sites, energy use, auxiliary fuel use, and other sources required to quantify baseline emissions, project emissions, leakage emissions, and net emission reductions.

Project emissions

GHG emissions occurring within the project boundary as a result of the project activity.

Refuse-derived fuel (RDF)

A fuel derived from the mechanical, thermal, or mechanical-biological treatment of solid waste and intended for use in combustion or co-combustion processes.

Residual waste

Solid waste remaining after sorting, treatment, processing, stabilization, recovery, or valorization, including rejects, residues, digestate, compost residues, or other by-products requiring further use, treatment, or disposal.

Solid recovered fuel (SRF)

A prepared solid fuel produced from non-hazardous waste, meeting defined quality specifications for energy recovery in industrial or other thermal processes.

Solid waste

Discarded, rejected, abandoned, unwanted, or residual material managed in solid or semi-solid form. Hazardous waste is excluded from this definition for the purpose of this methodology.

Solid waste disposal site (SWDS)

A designated area intended as the final storage place for solid waste. Stockpiles are considered SWDS where their physical conditions allow anaerobic decomposition.

Stabilized biomass

Biomass or biodegradable waste that has been treated under controlled conditions to prevent or materially reduce further anaerobic degradation, as demonstrated through monitored treatment conditions, mass balance, storage conditions, and, where applicable, BMP, moisture, stability, or other relevant indicators.

Stockpile

A pile of solid waste that is not buried below ground. A stockpile may be considered a solid waste disposal site if its volume-to-surface-area ratio is high enough and the material is exposed to anaerobic conditions.

Waste characterization

The process of determining the quantity, composition, biodegradability, moisture content, degradable organic carbon, fossil carbon content, inert fraction, and other relevant properties of a waste stream.

Waste-derived fuel

A fuel produced from waste through sorting, conditioning, drying, mechanical treatment, thermal-mechanical treatment, or other preparation processes, including RDF, SRF, or comparable fuels.

10 Project boundaries

The project boundary shall include all physical, operational, and GHG accounting components necessary to quantify baseline emissions, project emissions, leakage emissions, and net emission reductions under this methodology.

Table 1. Project boundary components

Component	Included in the project boundary	Explanation / Justification
Waste generation, collection or aggregation points	Yes, where applicable	Points where eligible biodegradable solid waste is generated, collected, received, aggregated or transferred before treatment.
Baseline SWDS	Yes	Solid waste disposal site where eligible biodegradable solid waste would have been disposed of in the baseline scenario. Included for baseline methane estimation and determination of relevant SWDS parameters.
Waste transport routes	Yes, where applicable	Transport routes for eligible waste, residual waste, intermediate products, by-products and final outputs attributable to the project activity.
Sorting and separation facilities	Yes, where applicable	Facilities where eligible biodegradable fractions, recyclable materials, inerts and residual materials are separated or classified.
Conditioning and preprocessing facilities	Yes, where applicable	Drying, shredding, mixing, size reduction, moisture control or other preprocessing activities before treatment or valorization.
Alternative treatment facilities	Yes	Facilities where eligible biodegradable solid waste is treated, processed, stabilized, recovered or valorized.
Storage areas	Yes, where applicable	Storage areas for incoming waste, treated waste, intermediate products, residual waste, compost, digestate, stabilized biomass, RDF, SRF or comparable outputs.
Wastewater, leachate or liquid residue management systems	Yes, where applicable	Systems managing wastewater, leachate, runoff or liquid residues generated by the project activity.
Residual waste management sites	Yes, where applicable	Sites where rejected material, residual waste, treatment residues or by-products are used, treated, stored or disposed of.
Energy and auxiliary fuel systems	Yes, where applicable	Electricity, fossil fuel or auxiliary fuel consumption attributable to sorting, treatment, processing, storage, transport or other project operations.
Downstream use of RDF, SRF or similar waste-derived fuels	No, except for traceability	Included only to confirm final fate and prevent double counting. Emission reductions from downstream fossil fuel substitution are not quantified under this methodology.

The spatial boundary shall include, as applicable: (a) the points where eligible biodegradable solid waste is generated, collected, received, or aggregated; (b) the transportation routes used

for eligible waste, intermediate products, residual waste, by-products, and final outputs; (c) the sorting, separation, conditioning, treatment, processing, stabilization, recovery, or valorization facilities; (d) storage areas for incoming waste, treated waste, intermediate products, residual waste, by-products, compost, digestate, stabilized biomass, refuse-derived fuel, solid recovered fuel, or comparable outputs; (e) wastewater, leachate, runoff, or liquid residue management systems associated with the project activity; (f) facilities or sites where residual waste or by-products are finally used, treated, stored, or disposed of; and (g) the solid waste disposal site where the eligible biodegradable waste would have been disposed of in the baseline scenario.

The temporal boundary shall cover each monitoring period for which emission reductions are quantified and shall include the time-dependent methane generation profile of eligible biodegradable waste that is diverted from disposal in a SWDS. Baseline methane emissions shall be calculated for the relevant years or months using the applicable FOD approach, according to this methodology.

The GHG accounting boundary shall include baseline methane emissions from the disposal of eligible biodegradable solid waste in a SWDS, project emissions from the implementation of the alternative treatment route, leakage emissions attributable to the project activity, and any conservative adjustments required under this methodology and the applicable BioCarbon Tools.

The following sources shall be included where material and applicable: methane emissions that would have occurred from eligible biodegradable waste disposed of in the baseline SWDS; CO_2 emissions from fossil fuel consumption; CO_2 emissions from electricity consumption; CH_4 emissions from treatment, storage, wastewater, leachate, digestate, compost, residual waste, or other organic material managed under anaerobic or partially anaerobic conditions; CO_2 emissions from transportation; and CO_2 emissions from combustion or treatment of fossil-derived fractions within the project boundary.

The GHG sources and gases included in or excluded from the project boundary are described in Table 2.

Table 2. Emission sources and GHGs included in the project boundary

Scenario	Source	GHG	Included?	Justification / treatment
Baseline	Methane emissions from eligible biodegradable solid waste disposed of in the baseline SWDS	CH_4	Yes	Main baseline emission source under this methodology. Quantified using the FOD approach, consistent with IPCC guidance and CDM TOOL04, considering eligible biodegradable waste quantity, waste composition, DOC, DOCf, decay rate, MCF, methane recovery, and oxidation.

Scenario	Source	GHG	Included?	Justification / treatment
Baseline	CO_2 from decomposition of biogenic waste in the baseline SWDS	CO_2	No	Excluded in accordance with applicable IPCC accounting principles for biogenic CO_2. No emission reductions are credited for avoided biogenic CO_2 emissions.
Baseline	Methane recovered, flared, combusted, or used at the baseline SWDS	CH_4	Yes	Included as a deduction or adjustment to baseline methane emissions. The fraction of methane that would have been captured, destroyed, combusted, or used in the baseline shall be accounted for conservatively.
Baseline	Methane oxidation in SWDS cover material	CH_4	Yes	Included through the applicable oxidation factor. Oxidation reduces baseline methane emissions and shall be applied conservatively.
Baseline	N_2O from SWDS	N_2O	No	Excluded unless required by BioCarbon or demonstrated to be material. Exclusion is conservative for this methodology because the credited baseline source is avoided methane from biodegradable waste disposal.
Project	Electricity consumption by project facilities	CO_2	Yes, where applicable	Included where electricity is consumed for collection, sorting, separation, shredding, drying, conditioning, treatment, stabilization, pumping, aeration, digesters, leachate treatment, monitoring systems, or other project operations. Calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL05.
Project	Fossil fuel or auxiliary fuel consumption by project facilities	CO_2	Yes, where applicable	Included where fossil fuels or auxiliary fuels are consumed by project equipment, vehicles, boilers, dryers, thermal units, backup systems, or other project operations. Calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL03.
Project	Transportation of eligible waste, residual waste, by-products, intermediate products, final outputs, samples, or other project-related materials	CO_2	Yes, where applicable	Included where transport is attributable to the project activity, including incremental transport relative to the baseline, transport to treatment facilities, transport of residual waste, and transport of RDF/SRF or comparable outputs where relevant. Calculated in

Scenario	Source	GHG	Included?	Justification / treatment
				accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL12.
Project	Treatment or storage of biodegradable waste under anaerobic or partially anaerobic conditions	CH_4	Yes, where applicable	Included where methane may be generated during storage, treatment, processing, stabilization, residual handling, or other project operations. Where anaerobic conditions occur, emissions shall be quantified and deducted.
Project	Composting, co-composting, digestate management, compost residues, residual organic material, wastewater, leachate, runoff, or liquid residue management	CH_4	Yes, where applicable	Included where methane may be generated from composting, anaerobic zones, digestate storage, liquid residues, leachate, runoff, wastewater, or residual organic material. Calculated using applicable procedures in this methodology and, where relevant, CDM TOOL13, CDM TOOL14, or IPCC-based wastewater methods.
Project	Composting, co-composting, digestate management, compost residues, residual organic material, wastewater, leachate, runoff, or liquid residue management	N_2O	Yes, where applicable	Included where N_2O emissions are material or required by the applicable treatment route, BioCarbon requirements, CDM TOOL13, CDM TOOL14, or other applicable procedures. Where excluded, the exclusion shall be justified as immaterial or conservative.
Project	Disposal of residual biodegradable waste, rejects, treatment residues, digestate, compost residues, sludge, or other residual organic material in a SWDS	CH_4	Yes, where applicable	Included where residual biodegradable material generated by the project activity is disposed of in a SWDS or stored under anaerobic conditions. Quantified using the FOD approach and deducted as project emissions.
Project	Combustion, gasification, pyrolysis, oxidation, or thermal treatment of fossil-derived waste fractions within the project boundary	CO_2	Yes, where applicable	Included where fossil-derived fractions, plastics, synthetic materials, RDF/SRF fossil carbon, or auxiliary fossil fuels are combusted, oxidized, gasified, pyrolyzed, or thermally treated within the project boundary. Fossil carbon emissions shall be quantified and deducted.
Project	Combustion, gasification, pyrolysis, oxidation, or thermal treatment within the project boundary	CH_4	Yes, where applicable	Included where CH_4 may be emitted due to incomplete combustion, gasification, pyrolysis, flaring, syngas handling, or other thermal treatment processes. May be

Scenario	Source	GHG	Included?	Justification / treatment
				excluded only where immaterial or conservative and properly justified.
Project	Combustion, gasification, pyrolysis, oxidation, or thermal treatment within the project boundary	N_2O	Yes, where applicable	Included where N_2O may be emitted from combustion, gasification, pyrolysis, RDF/SRF combustion, or other thermal treatment processes. May be excluded only where immaterial or conservative and properly justified.
Project	CO_2 from biological decomposition or combustion of biogenic carbon	CO_2	No	Excluded in accordance with applicable IPCC accounting principles for biogenic CO_2. The exclusion shall not be used to claim carbon dioxide removal, carbon storage, or downstream fossil fuel substitution benefits.
Project	Downstream fossil fuel substitution from RDF, SRF, stabilized biomass, or similar waste-derived fuels	CO_2	No	Excluded from this methodology. This methodology quantifies only avoided methane emissions from diversion of eligible biodegradable waste from SWDS. Any downstream fossil fuel substitution shall be quantified only under a separate BioCarbon-approved methodology, where applicable.
Project	Facility construction, equipment manufacturing, and capital goods	CO_2, CH_4, N_2O	No	Excluded unless required by BioCarbon or demonstrated to be material. These emissions are generally outside the operational accounting boundary and are not expected to be material for the credited mitigation outcome.
Leakage	Diversion of waste from existing recycling, reuse, material recovery, composting, anaerobic digestion, controlled treatment, or other higher-priority baseline uses	CO_2, CH_4, N_2O	Yes, where applicable	Included where the project activity diverts waste from an existing lawful use or treatment route, causing increased emissions or reduced mitigation elsewhere. Assessed and deducted in accordance with the BioCarbon Leakage Management Tool.
Leakage	Displacement of existing waste management, treatment, recovery, or disposal activities outside the project boundary	CO_2, CH_4, N_2O	Yes, where applicable	Included where the project activity causes displacement of waste, materials, treatment capacity, or disposal practices outside the project boundary. Quantified or conservatively deducted where attributable to the project activity.
Leakage	Increased transport outside the project boundary	CO_2	Yes, where applicable	Included where additional or incremental transport outside the project boundary is caused by the

Scenario	Source	GHG	Included?	Justification / treatment
	attributable to the project activity			project activity. Calculated using monitored fuel consumption or conservative transport emission factors, as applicable.
Leakage	Substitute materials, fuels, or processes required because waste or recovered material is diverted to the project activity	CO_2, CH_4, N_2O	Yes, where applicable	Included where project diversion causes another actor to use substitute materials, fuels, feedstocks, or processes that increase emissions. Quantified or conservatively deducted where material and attributable.
Leakage	Residual waste, by-products, digestate, compost residues, RDF/SRF residues, or other outputs managed outside the project boundary	CO_2, CH_4, N_2O	Yes, where applicable	Included where outputs or residues generated by the project are transferred, stored, treated, combusted, or disposed of outside the project boundary and may cause emissions. Final fate shall be documented; where final fate is not demonstrated, conservative assumptions shall apply.
Leakage	Exported RDF, SRF, stabilized biomass, or comparable waste-derived outputs with documented or undocumented final fate	CO_2, CH_4, N_2O	Yes, where applicable	Included for leakage and double-counting control. Downstream fossil fuel substitution is not credited under this methodology, but emissions from documented combustion, undocumented fate, anaerobic storage, uncontrolled dumping, or disposal in SWDS shall be assessed and deducted where attributable to the project activity.
Leakage	Double counting, double claiming, double issuance, or double use of emission reductions associated with the same waste stream or mitigation outcome	CO_2, CH_4, N_2O	Yes, as a control requirement	Not a physical emission source, but included as an accounting risk. The project holder shall demonstrate legal rights, chain of custody, allocation rules, registry controls, final fate evidence, and safeguards against double counting in accordance with the BioCarbon Avoiding Double Counting Tool.

CO_2 emissions from the biological decomposition or combustion of biogenic carbon shall be treated in accordance with applicable IPCC accounting principles and this methodology. Fossil carbon emissions from plastics, synthetic rubber, synthetic textiles, fossil-derived materials, auxiliary fuels, or other non-biogenic sources shall be accounted for where they are material and attributable to the project activity.

Where the project activity produces refuse-derived fuel, solid recovered fuel, stabilized biomass, or comparable waste-derived outputs, the project boundary shall include the

production, storage, handling, and transport of such outputs where these activities are attributable to the project activity. The downstream use of such outputs shall be tracked to confirm final fate and prevent double counting. Emission reductions from downstream fossil fuel substitution shall not be included under this methodology.

The baseline SWDS shall be included within the project boundary for the purpose of estimating avoided methane emissions, determining relevant SWDS parameters, identifying methane recovery or oxidation, and assessing the baseline fate of the eligible biodegradable waste.

Any residual waste, rejected material, by-product, compost, digestate, wastewater, leachate, or other material generated by the project activity and sent to storage, treatment, use, or disposal shall remain within the accounting boundary to the extent necessary to quantify project emissions or leakage emissions.

Emission sources may be excluded only where exclusion is permitted by this methodology or the applicable BioCarbon Tools and where the project holder demonstrates that the source is not material or that its exclusion is conservative. All exclusions shall be justified, documented, and validated or verified by the CAB, as applicable.

11 Project activities

Project activities under this methodology consist of the diversion of eligible biodegradable solid waste from disposal in a solid waste disposal site (SWDS) and its treatment, processing, stabilization, recovery, or valorization through an eligible alternative waste management route.

Eligible project activities may include one or more of the following activities:

(a) separation, sorting, classification, or recovery of eligible biodegradable solid waste before disposal in a SWDS;
(b) mechanical treatment, including shredding, screening, size reduction, separation of inerts, removal of recyclable materials, moisture control, or preparation of waste for subsequent treatment;
(c) biological treatment of eligible biodegradable solid waste, including composting, aerobic stabilization, anaerobic digestion with appropriate methane capture and treatment, or mechanical-biological treatment;
(d) drying, conditioning, densification, blending, or stabilization of eligible biodegradable solid waste or residual biodegradable fractions to prevent or materially reduce anaerobic decomposition;
(e) production of refuse-derived fuel, solid recovered fuel, stabilized biomass, or comparable waste-derived products from eligible biodegradable waste fractions, provided that this methodology quantifies only avoided methane emissions from diversion from SWDS;

(f) treatment or management of residual waste, by-products, digestate, compost residues, liquid residues, wastewater, leachate, or other outputs generated by the project activity, where such treatment or management is necessary to prevent emissions or to account for project emissions;
(g) supporting activities necessary for the implementation of the project activity, including collection, aggregation, transport, storage, weighing, sampling, waste characterization, chain of custody, monitoring, QA/QC, and data management.

The project activity shall result in the prevention or reduction of methane generation from eligible biodegradable solid waste that would otherwise have been disposed of under anaerobic or partially anaerobic conditions in a SWDS.

The project activity shall not credit emission reductions from downstream fossil fuel substitution, electricity generation, heat generation, or industrial energy use under this methodology. Such mitigation outcomes may be quantified only under a separate BioCarbon-approved methodology, where applicable.

The following activities are not eligible under this methodology:

(a) activities that only recover, flare, combust, or use landfill gas from waste already disposed of in a SWDS;
(b) landfill aeration, landfill remediation, landfill mining, or treatment of waste already disposed of in a SWDS, unless expressly allowed in a future version of this methodology;
(c) diversion of waste from recycling, reuse, material recovery, composting, anaerobic digestion, controlled incineration, or any other existing lawful treatment route in the baseline scenario;
(d) treatment, recovery, or valorization of hazardous waste, radioactive waste, infectious healthcare waste, or waste that cannot be lawfully managed under applicable regulation;
(e) activities that intentionally increase waste generation, reduce source separation, reduce recycling, or alter waste composition to increase credit generation;
(f) activities required by enforced legal, regulatory, contractual, judicial, administrative, or permitting obligations.

The project activity shall not create perverse incentives to increase waste generation, reduce source separation, reduce recycling or reuse, alter waste routing, reclassify waste streams, dilute or mix eligible and ineligible waste without traceability, or modify contractual or operational arrangements primarily to increase credited emission reductions. Any material change in waste source, waste composition, routing, contractual arrangements, or treatment practice shall be documented and assessed to confirm continued eligibility, additionality, baseline validity, and absence of over-crediting.

The project holder shall demonstrate that the project activity is compatible with the host country's applicable waste management, circular economy, methane mitigation, and net zero transition objectives, where such objectives are formally adopted or otherwise applicable. The project activity shall not create lock-in of carbon-intensive waste management practices, fossil fuel use, or long-term dependence on uncontrolled disposal of biodegradable waste.

12 Additionality

The project holder shall demonstrate additionality in accordance with the most recent version in force of the BioCarbon Baseline and Additionality Tool (BAT), the BioCarbon Standard, and any other applicable BioCarbon requirements. The Baseline and Additionality Tool shall be applied in full and shall not be replaced by simplified, project-specific, or sector-specific procedures contained in this methodology.

The project activity shall be additional only if the project holder demonstrates that, in the absence of carbon credit revenues and the project activity, the eligible biodegradable solid waste would have been disposed of in a solid waste disposal site (SWDS), or managed under another eligible baseline scenario, and methane emissions would have occurred.

The additionality assessment shall include, at minimum: (a) identification of the most plausible baseline scenario; (b) assessment of applicable legal and regulatory requirements; (c) assessment of investment, technological, institutional, market, operational or other relevant barriers; (d) common practice analysis; and (e) demonstration that carbon credit revenues were considered in the decision to implement the project activity.

The project activity shall not be additional where the diversion, treatment, stabilization, recovery or valorization of the eligible waste is required by enforced legal, regulatory, contractual, judicial, administrative or permitting obligations.

Where relevant legal or regulatory requirements exist but are not effectively enforced, the project holder shall provide authoritative, current and jurisdiction-specific evidence demonstrating non-enforcement. General statements, market opinions, or unsupported assertions shall not be sufficient.

The project holder shall identify and assess realistic and credible baseline alternatives, including, as applicable: (a) disposal of the eligible waste in a SWDS without methane recovery; (b) disposal of the eligible waste in a SWDS with partial methane recovery; (c) recycling, reuse or material recovery; (d) composting; (e) anaerobic digestion; (f) incineration or thermal treatment; (g) mechanical or mechanical-biological treatment; (h) production of waste-derived fuel without carbon crediting; and (i) continuation of current waste management practices.

The selected baseline scenario shall be conservative, legally permissible, technically feasible, economically credible, and consistent with observed waste management practices in the relevant jurisdiction.

Where investment analysis is used, the project holder shall transparently document all relevant capital costs, operating costs, revenues, subsidies, public support, avoided disposal costs, tipping fees, sales of recovered materials, sales of waste-derived products, energy revenues, and any other economic benefits associated with the project activity.

Where the project activity generates revenues from waste treatment fees, sale of recovered materials, sale of refuse-derived fuel, solid recovered fuel, compost, digestate, stabilized biomass, energy products, or other by-products, such revenues shall be included in the additionality assessment.

Carbon credit revenues shall not be described as merely optional or incidental where they are used to justify additionality. The project holder shall demonstrate the role of carbon credit revenues in overcoming barriers, improving financial viability, enabling implementation, scaling, or sustaining the project activity.

The common practice analysis shall be conducted in accordance with the BioCarbon Baseline and Additionality Tool. For the purposes of this methodology, the analysis shall define the applicable geographical boundary, technology or practice category, market segment, data sources, data vintage, and penetration indicator for comparable waste management and treatment activities. Data used for common practice shall be recent, representative, and independently verifiable. The geographical boundary shall not be selected in a manner that artificially supports additionality. Where the project holder proposes a subnational or non-national boundary, the selection shall be justified and validated by the CAB.

The additionality assessment shall be validated prior to registration and shall be reassessed at each renewal of the quantification period, or earlier where material changes occur in law, regulation, waste management practice, market conditions, project revenues, technology, or baseline conditions.

When this methodology is applied together with another BioCarbon-approved methodology, additionality shall be demonstrated for each distinct mitigation component, unless the applicable BioCarbon rules allow an integrated additionality assessment. In all cases, the project holder shall demonstrate that no component is credited for mitigation outcomes that would occur in the absence of carbon crediting.

13 Baseline scenario

The baseline scenario shall be identified in accordance with the most recent version in force of the BioCarbon Baseline and Additionality Tool, the BioCarbon Standard, this methodology, and all applicable BioCarbon requirements.

For project activities applying this methodology, the baseline scenario shall be the disposal of eligible biodegradable solid waste in a solid waste disposal site (SWDS), with or without partial methane recovery, unless the project holder demonstrates that another baseline

scenario is more plausible, conservative, legally permissible, and consistent with observed waste management practices in the relevant jurisdiction.

The project holder shall demonstrate that the eligible biodegradable solid waste would have been disposed of in a SWDS in the absence of the project activity. Such demonstration shall be based on verifiable evidence, including, as applicable, historical disposal records, contracts, manifests, weighbridge tickets, invoices, municipal or operator records, waste routing documentation, permits, or other auditable records.

The baseline scenario shall consider all realistic and credible alternatives available for the management of the eligible waste in the absence of the project activity, including, as applicable: disposal in a SWDS without methane recovery; disposal in a SWDS with partial methane recovery; continuation of existing waste management practices; recycling or material recovery; composting; anaerobic digestion; controlled incineration or thermal treatment; mechanical or mechanical-biological treatment; production of waste-derived fuel without carbon crediting; or any other legally permissible and technically feasible alternative.

The selected baseline scenario shall be conservative and shall not assume disposal in a SWDS where the evidence demonstrates that the eligible waste would have been recycled, reused, recovered as material, composted, anaerobically digested, incinerated, thermally treated, or otherwise managed through an alternative lawful treatment route in the absence of the project activity.

Where disposal in a SWDS is selected as the baseline scenario, the project holder shall identify or conservatively characterize the baseline SWDS, including, as applicable, its location, type, management conditions, depth or site classification, methane recovery, methane destruction or use, oxidation conditions, and any other parameter required to estimate baseline methane emissions.

Where data on methane recovery, methane destruction or use, oxidation, SWDS management conditions, methane correction factor, or other baseline SWDS parameters are uncertain, incomplete, outdated, or not independently verifiable, the project holder shall apply conservative assumptions that do not overestimate baseline emissions. For baseline methane recovery or destruction, the project holder shall use the highest plausible value supported by regulation, contracts, historical records, facility data, or other verifiable evidence. For oxidation, the project holder shall use only values that are justified by SWDS cover conditions and shall not apply oxidation factors that overestimate baseline emissions. For methane correction factor, the project holder shall use the value that is most conservative for the project context, taking into account SWDS type, depth, management conditions, water table, and available evidence.

Baseline methane emissions shall be estimated only for the eligible biodegradable fraction of the waste that would have been disposed of in the SWDS. Non-biodegradable, inert, and

fossil-derived fractions shall not generate avoided methane emission reductions under this methodology.

Baseline methane emissions shall be quantified using the First Order Decay (FOD) approach set out in this methodology, based on the amount and composition of eligible biodegradable waste, degradable organic carbon, decay rate, methane correction factor, methane recovery, oxidation factor, and other applicable parameters.

Where site-specific data are unavailable or incomplete, the project holder may use conservative national, regional, or IPCC default values, provided that the selected values are justified, documented, and consistent with the BioCarbon Conservative Approach and Uncertainty Management Tool.

The baseline scenario shall take into account applicable laws, regulations, permits, contracts, judicial or administrative orders, and enforced waste management obligations. A baseline scenario involving non-compliance with enforced legal requirements shall not be accepted.

The baseline scenario shall be reassessed at each renewal of the quantification period and whenever material changes occur in regulation, waste management practices, SWDS operation, methane recovery, market conditions, technology, or the project activity.

When this methodology is applied together with another BioCarbon-approved methodology, the baseline scenario under this methodology shall be defined only for the avoided methane emissions from eligible biodegradable waste diverted from SWDS. Any baseline related to downstream fossil fuel substitution, energy generation, heat generation, or industrial fuel use shall be defined separately under the applicable methodology.

14 Quantification of GHG emission reductions

14.1 General quantification approach and methodological basis

Emission reductions under this methodology shall be quantified as the difference between baseline methane emissions from eligible biodegradable solid waste that would have been disposed of in a solid waste disposal site (SWDS) and the sum of project emissions, leakage emissions, and conservative adjustments required under this methodology and the applicable BioCarbon Tools.

The quantification approach under this methodology is based on the First Order Decay (FOD) principles contained in the IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Waste, and the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Waste. For methane emissions from solid waste disposed of, or prevented from disposal, in a SWDS, this methodology applies the methodological principles and equations of CDM TOOL04 “Emissions from solid waste disposal sites”, as adapted to the BioCarbon Standard and this methodology.

Project emissions and leakage emissions shall be quantified using the procedures set out in this methodology and, where applicable, the relevant CDM tools, including CDM TOOL03 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", CDM TOOL05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", CDM TOOL12 "Project and leakage emissions from transportation of freight", CDM TOOL13 "Project and leakage emissions from composting", and CDM TOOL14 "Project and leakage emissions from anaerobic digesters".

Where this methodology includes equations derived from, adapted from, or consistent with IPCC or CDM methodological tools, such equations shall be interpreted in accordance with the BioCarbon Standard, the applicable BioCarbon Tools, and this methodology. In the event of inconsistency, the more specific, stringent, and conservative requirement shall apply.

Global Warming Potential values shall be based on the 100-year Global Warming Potential (GWP100) values from the IPCC Sixth Assessment Report (AR6), unless the BioCarbon Standard or an applicable host-country accounting requirement requires a different GWP basis. For the purposes of this methodology, methane emissions from biodegradable waste, composting, anaerobic digestion, wastewater, leachate, digestate, residual organic material, or other biogenic waste-related sources shall use GWPCH4=27.0. Nitrous oxide emissions shall use GWPN2O=273. Carbon dioxide shall use GWPCO2=1. Where a source-specific AR6 value distinguishes fossil methane from non-fossil methane, the project holder shall apply the value corresponding to the source and shall justify the selection in the project document and monitoring report.

14.2 General emission reduction equation

For each year y, net GHG emission reductions shall be calculated as follows:

$ER_y = BE_y - PE_y - LE_y - CA_y$	Equation 1

Where:

ER_y	=	Net GHG emission reductions in year y (tCO_2e)
BE_y	=	Baseline emissions in year y (tCO_2e)
PE_y	=	Project emissions in year y (tCO_2e)
LE_y	=	Leakage emissions in year y (tCO_2e)
CA_y	=	Conservative adjustment in year y required to address uncertainty, data gaps, model uncertainty, or other conservative deductions (tCO_2e)

If the result of Equation 1 is negative, ERy shall be set equal to zero.

14.3 Baseline emissions

Baseline emissions under this methodology shall consist of methane emissions that would have occurred from the disposal of eligible biodegradable solid waste in a SWDS under the baseline scenario.

Baseline emissions shall be calculated only for the eligible biodegradable fraction of the waste. Non-biodegradable, inert, fossil-derived, hazardous, or otherwise ineligible fractions shall not generate avoided methane emission reductions under this methodology.

14.3.1 Baseline emissions from avoided disposal in SWDS

For each year y, baseline emissions shall be calculated as follows:

$BE_y = BE_{CH4,SWDS,y}$	Equation 2

Where:

BE_y	=	Baseline emissions in year y (tCO_2e)
$BECH_4, SWDS_Y$	=	Baseline methane emissions from eligible biodegradable solid waste that would have been disposed of in a SWDS in year y (tCO_2e)

Baseline methane emissions shall be calculated using the FOD approach, consistent with IPCC 2006 Guidelines, Volume 5, Waste, the 2019 Refinement to the 2006 IPCC Guidelines, Volume 5, Waste, and CDM TOOL04.

14.3.2 Annual FOD calculation

Where annual activity data are used, baseline methane emissions shall be calculated as follows:

$$BE_{CH_4,SWDS,y} = \emptyset_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_Y) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_j \sum_{x=1}^{y} [W_{j,x} DOC_j e^{-k_j(y-x)} (1 - e^{-k_j})]$$	Equation 3

Where:

$BE_{CH_4,SWDS,y}$	=	Baseline methane emissions in year y from eligible biodegradable solid waste prevented from disposal in a SWDS (tCO_2e/year)
$\emptyset_y$	=	Model correction factor in year y
f_y	=	Fraction of methane that would have been captured, flared, combusted, or otherwise used at the baseline SWDS in year y
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework.
OX_y	=	Oxidation factor in year y
$16/12$	=	Molecular weight ratio of CH_4 to C
F	=	Fraction of methane in landfill gas
$DOC_{f,y}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in year y
MCF_y	=	Methane correction factor in year y
$W_{j,x}$	=	Amount of eligible biodegradable solid waste type j prevented from disposal in the SWDS in year x (t)
DOC_j	=	Fraction of degradable organic carbon in waste type j
k_j	=	Decay rate for waste type j (yr^{-1})
j	=	Eligible biodegradable waste type

x	=	Year in which the eligible waste would have been disposed of in the baseline SWDS
y	=	Year for which methane emissions are calculated

The annual FOD calculation shall be applied consistently for all years of the monitoring period. The project holder shall document the time period over which waste disposal is considered in the calculation and shall ensure that the same waste stream, waste fraction, or emission source is not counted more than once.

14.3.3 Monthly FOD calculation

Where activity data are monitored monthly and the project holder applies a monthly calculation approach, baseline methane emissions shall be calculated as follows:

$$BE_{CH_4,SWDS,m} = \emptyset_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_Y) \times \frac{16}{12} \times F \times DOC_{f,m} \times MCF_y \times \sum_j \sum_{i=1}^{m} \left[W_{j,i} DOC_j e^{-\frac{k_j}{12}(m-i)} \left(1 - e^{-\frac{k_j}{12}}\right)\right]$$

Equation 4

Where:

$BE_{CH_4,SWDS,m}$	=	Baseline methane emissions in month m from eligible biodegradable solid waste prevented from disposal in a SWDS (tCO_2e/month)
$\emptyset_y$	=	Model correction factor for the year y to which month m belongs
f_y	=	Fraction of methane that would have been captured, flared, combusted, or otherwise used at the baseline SWDS in year y
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework.
OX_y	=	Oxidation factor in year y

$\frac{16}{12}$	=	Molecular weight ratio of CH_4 to C
F	=	Fraction of methane in landfill gas
$DOC_{f,m}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in month m
MCF_y	=	Methane correction factor in year y
$W_{j,i}$	=	Amount of eligible biodegradable solid waste type j prevented from disposal in the SWDS in month i (t)
DOC_j	=	Fraction of degradable organic carbon in waste type j
j		Eligible biodegradable waste type
i		Month in which the eligible waste would have been disposed of in the baseline SWDS
m		Month for which methane emissions are calculated

The monthly FOD calculation shall be applied only where monthly activity data, waste composition data, and monitoring records are available and verifiable. The selected annual or monthly approach shall be stated in the project document and applied consistently during the monitoring period.

14.3.4 Determination of waste quantities by waste type

Where different waste types j are present in the eligible waste stream, the amount of each eligible biodegradable waste type j shall be determined through representative sampling, waste characterization, and mass balance, consistent with CDM TOOL04 and the monitoring requirements of this methodology.

For annual calculations, the amount of eligible biodegradable waste type j shall be calculated as follows:

$$W_{j,x} = W_x \times p_{j,x}$$	Equation 5

Where:

$W_{j,x}$	=	Amount of eligible biodegradable solid waste type j prevented from disposal in the SWDS in year x (t)
W_x	=	Total amount of eligible solid waste prevented from disposal in the SWDS in year x (t)
$p_{j,x}$	=	Average fraction of eligible biodegradable waste type j in the waste stream in year x
j	=	Eligible biodegradable waste type
x	=	Year in which the eligible waste would have been disposed of in the baseline SWDS

For monthly calculations, the amount of eligible biodegradable waste type j shall be calculated as follows:

$$W_{j,i} = W_i \times p_{j,i}$$	Equation 6

Where:

$W_{j,i}$	=	Amount of eligible biodegradable solid waste type j prevented from disposal in the SWDS in month i (t)
W_i	=	Total amount of eligible solid waste prevented from disposal in the SWDS in month i (t)
$p_{j,i}$	=	Average fraction of eligible biodegradable waste type j in the waste stream in month i
j	=	Eligible biodegradable waste type
i	=	Month in which the eligible waste would have been disposed of in the baseline SWDS

The fractions pj,x and pj,i shall be determined from representative samples, composition studies, laboratory results, mass balance, or conservative documented estimates accepted under this methodology. Where waste composition data are uncertain, incomplete, or not

representative, the project holder shall apply conservative values and uncertainty adjustments in accordance with the BioCarbon Conservative Approach and Uncertainty Management Tool.

14.3.5 Determination of average waste fractions from samples

For annual calculations, the average fraction of each eligible biodegradable waste type j shall be calculated as follows:

$$p_{j,x} = \frac{\sum_{n=1}^{Z_z} p_{n,j,x}}{Z_x}$$	Equation 7

Where:

$p_{j,x}$	=	Average fraction of eligible biodegradable waste type j in the waste stream in year x
$p_{n,j,x}$	=	Fraction of eligible biodegradable waste type j in sample n collected during year x
Z_x	=	Number of representative samples collected during year x
n	=	Sample collected during year x
j	=	Eligible biodegradable waste type
x		Year in which the eligible waste would have been disposed of in the baseline SWDS

For monthly calculations, the average fraction of each eligible biodegradable waste type *j*shall be calculated as follows:

$$p_{j,i} = \frac{\sum_{n=1}^{Z_i} p_{n,j,i}}{Z_i}$$	Equation 8

Where:

$p_{j,i}$	=	Average fraction of eligible biodegradable waste type j in the waste stream in month i
$p_{n,j,i}$	=	Fraction of eligible biodegradable waste type j in sample n collected during month i
Z_i	=	Number of representative samples collected during month i
n	=	Sample collected during month i
j	=	Eligible biodegradable waste type
i		Month in which the eligible waste would have been disposed of in the baseline SWDS

Sampling frequency, sample size, sampling technique, waste sorting categories, laboratory analysis, and QA/QC procedures shall be sufficient to ensure representativeness and shall be documented in the monitoring report.

14.3.6 Determination of DOC for bulk waste

Where bulk waste is used and waste composition data are available, the degradable organic carbon fraction for bulk eligible waste shall be calculated as a weighted average of DOC values by waste type, consistent with the IPCC Guidelines, the 2019 Refinement to the 2006 IPCC Guidelines, and CDM TOOL04.

For annual calculations:

$$DOC_x = \sum_j (DOC_j \times p_{j,x})$$	Equation 9

Where:

DOC_x	=	Fraction of degradable organic carbon in bulk eligible waste in year x
DOC_j	=	Fraction of degradable organic carbon in waste type j
$p_{j,x}$	=	Average fraction of eligible waste type j in the waste stream in year x
j	=	Eligible waste type

x	=	Year in which the eligible waste would have been disposed of in the baseline SWDS

For monthly calculations:

$$DOC_i = \sum_j \left(DOC_j \times p_{j,i}\right)$$	Equation 10

Where:

DOC_i	=	Fraction of degradable organic carbon in bulk eligible waste in month i
DOC_j	=	Fraction of degradable organic carbon in waste type j
$p_{j,i}$	=	Average fraction of eligible waste type j in the waste stream in month i
j	=	Eligible waste type
i	=	Month in which the eligible waste would have been disposed of in the baseline SWDS

Where waste-type-specific data are unavailable, conservative IPCC default DOC values may be used, provided that the selected values are justified and that inert, non-biodegradable, and fossil-derived fractions are appropriately excluded or assigned a DOC value of zero for the purpose of avoided methane quantification.

14.3.7 Determination of DOCf using BMP

Where the project holder elects to determine DOCf using biochemical methane potential measurements, DOCf shall be determined consistently with CDM TOOL04 and applicable IPCC-based assumptions.

For municipal solid waste or mixed waste, annual DOCf may be calculated as follows:

$$DOC_{f,y} = \frac{0.7 \times \frac{12}{16} \times BMP_{MSW}}{F \times \sum_j \left(p_{j,y} \times DOC_j\right)}$$	Equation 11

Where:

$DOC_{f,y}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in year y
BMP_{MSW}	=	Biochemical methane potential for the municipal solid waste or mixed waste prevented from disposal (t CH_4/t waste)
F	=	Fraction of methane in landfill gas
$p_{j,y}$	=	Average fraction of waste type j in the waste stream in year y
DOC_j	=	Fraction of degradable organic carbon in waste type j
j	=	Eligible waste type

For municipal solid waste or mixed waste, monthly DOCf may be calculated as follows:

$$DOC_{f,m} = \frac{0.7 \times \frac{12}{16} \times BMP_{MSW}}{F \times \sum_j (p_{j,m} \times DOC_j)}$$	Equation 12

Where:

$DOC_{f,m}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in month m
BMP_{MSW}	=	Biochemical methane potential for the municipal solid waste or mixed waste prevented from disposal (t CH_4/t waste)
F	=	Fraction of methane in landfill gas
$p_{j,m}$	=	Average fraction of waste type j in the waste stream in month m
DOC_j	=	Fraction of degradable organic carbon in waste type j
j	=	Eligible waste type

For residual waste type j, DOCf may be calculated as follows:

$DOC_{f,y} = DOC_{f,m} = \frac{0.7 \times \frac{12}{16} \times BMP_j}{F \times DOC_j}$	Equation 13

Where:

$DOC_{f,y}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in year y
$DOC_{f,m}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in month m
BMP_j	=	Biochemical methane potential for residual waste type j prevented from disposal (t CH_4/t waste)
F	=	Fraction of methane in landfill gas
DOC_j	=	Fraction of degradable organic carbon in waste type j
j	=	Residual waste type

BMP testing shall be performed using recognized national or international standards, representative samples, and documented laboratory QA/QC procedures. Where BMP measurements are not available or are not sufficiently representative, the project holder shall use conservative default DOCf values consistent with IPCC guidance, CDM TOOL04, and the BioCarbon Conservative Approach and Uncertainty Management Tool.

14.3.8 Determination of methane correction factor

Where the baseline SWDS does not have a water table above the bottom of the SWDS, MCFy shall be selected based on the type and management conditions of the SWDS, using conservative IPCC or CDM TOOL04 default values, unless site-specific values are justified, documented, and validated.

Where the baseline SWDS has a water table above the bottom of the SWDS, MCFy shall be calculated as follows:

$MCF_y = max\left\{1 - \frac{2}{d_y}, \frac{h_{w,y}}{d_y}\right\}$	Equation 14

Where:

MCF_y	=	Methane correction factor in year y
$h_{w,y}$	=	Height of the water table measured from the base of the SWDS in year y (m)
d_y	=	Depth of the SWDS in year y (m)

Where the required data to calculate MCFy are unavailable, incomplete, or not verifiable, the project holder shall apply the most conservative applicable MCF value.

14.3.9 Determination of model correction factor

The model correction factor ϕy shall account for model and parameter uncertainty in the FOD model. Where default values are used, ϕy shall be selected in accordance with CDM TOOL04 and the BioCarbon Conservative Approach and Uncertainty Management Tool.

Alternatively, where project-specific uncertainty is assessed, overall uncertainty of methane generation in year y shall be calculated as follows:

$$V_y = \sqrt{a^2 + b^2 + c^2 + d^2 + e^2 + g^2}$$	Equation 15

Where:

V_y	=	Overall uncertainty of methane generation in year y
a	=	Effect of uncertainty in waste quantity
b	=	Effect of uncertainty in DOCj
c	=	Effect of uncertainty in DOCf
d	=	Effect of uncertainty in F
e	=	Effect of uncertainty in MCFy
g	=	Effect of uncertainty in the exponential decay term

The model correction factor shall then be calculated as follows:

$$\emptyset_y = \frac{1}{1 + V_y}$$	Equation 16

Where:

$\emptyset_y$	=	Model correction factor in year y
V_y	=	Overall uncertainty of methane generation in year y

Where the project holder does not conduct a validated project-specific uncertainty assessment, conservative default values for ϕy shall be used.

14.4 Project emissions

Project emissions shall include all material GHG emissions attributable to the project activity. Project emissions shall include, as applicable, emissions from electricity consumption, fossil fuel or auxiliary fuel consumption, transport, composting, anaerobic digestion, wastewater or leachate management, residual waste disposal, thermal or mechanical-thermal treatment within the project boundary, and any other material emission source required by this methodology or the applicable BioCarbon Tools.

14.4.1 General project emissions equation

For each year y, project emissions shall be calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{TR,y} + PE_{COMP,y} + PE_{AD,y} + PE_{RDFSRF,y} + PE_{COMB,y} + PE_{WW,y} + PE_{RW,y} + PE_{OTHER,y}$$	Equation 17

Where:

PE_y	=	Project emissions in year y (tCO_2e)
$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO_2e)
$PE_{FC,y}$	=	Project emissions from fossil fuel or auxiliary fuel consumption in year y (tCO_2e)
$PE_{TR,y}$	=	Project emissions from transportation in year y (tCO_2e)

$PE_{COMP,y}$	=	Project emissions from composting or co-composting in year y (tCO_2e)
$PE_{AD,y}$	=	Project emissions from anaerobic digestion in year y (tCO_2e)
$PE_{RDFSRF,y}$	=	Project emissions from production of RDF, SRF, stabilized biomass, or comparable waste-derived fuel in year y (tCO_2e)
$PE_{COMB,y}$	=	Project emissions from combustion or thermal treatment of fossil-derived waste fractions within the project boundary in year y (tCO_2e)
$PE_{WW,y}$	=	Project emissions from wastewater, leachate, runoff, or liquid residue management in year y (tCO_2e)
$PE_{RW,y}$	=	Project emissions from residual waste or treatment residues in year y (tCO_2e)
$PE_{OTHER,y}$		Other material project emissions in year y (tCO_2e)

A project emission source may be excluded only where its exclusion is permitted under this methodology and the applicable BioCarbon Tools, and where the project holder demonstrates that the source is not material or that exclusion is conservative.

14.4.2 Project emissions from electricity consumption

Project emissions from electricity consumption shall be calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL05.

$$PE_{EC,y} = \sum_{s} \left(EC_{s,y} \times EF_{EL,s,y} \right)$$	Equation 18

Where:

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO_2e)
$EC_{s,y}$	=	Electricity consumed from source s in year y (MWh)
$EF_{EL,s,y}$	=	Emission factor for electricity source s in year y (tCO_2e/MWh)
s	=	Electricity source

Electricity consumption shall include, as applicable, electricity used for collection, sorting, separation, shredding, drying, conditioning, treatment, stabilization, pumping, aeration, digesters, leachate treatment, monitoring systems, and other project operations.

14.4.3 Project emissions from fossil fuel or auxiliary fuel consumption

Project emissions from fossil fuel or auxiliary fuel consumption shall be calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL03.

$$PE_{FC,y} = \sum_i \sum_s \left(FC_{i,s,y} \times NCV_{i,y} \times EF_{CO_2,i,y}\right)$$	Equation 19

Where:

$PE_{FC,y}$	=	Project emissions from fossil fuel or auxiliary fuel consumption in year y (tCO_2e)
$FC_{i,s,y}$	=	Quantity of fossil fuel type i consumed by source s in year y (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO_2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
i	=	Fossil fuel type
s		Fuel-consuming source

Where CH_4 or N_2O emissions from fossil fuel combustion are required by the applicable BioCarbon Tool or host-country accounting framework, they shall be calculated and included using applicable emission factors and GWPs.

14.4.4 Project emissions from transportation

Project emissions from transportation shall be calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL12. Transportation emissions shall include, as applicable, transport of eligible waste, residual waste, by-products, intermediate products, compost, digestate, RDF, SRF, stabilized biomass, laboratory samples, and other materials attributable to the project activity.

Where fuel consumption for freight transportation is monitored, transportation emissions shall be calculated as follows:

$$PE_{TR,y} = \sum_{i}\sum_{f}\left(FC_{i,f,y} \times NCV_{i,y} \times EF_{CO_2,i,y}\right)$$	Equation 20

Where:

$PE_{TR,y}$	=	Project emissions from transportation in year y (tCO_2e)
$FC_{i,f,y}$	=	Quantity of fuel type i consumed for freight transportation activity f in year y
$NCV_{i,y}$	=	Net calorific value of fuel type i in year y
$EF_{CO_2,i,y}$	=	CO_2 emission factor of fuel type i in year y
i	=	Fuel type
f		Freight transportation activity

Where monitored fuel consumption is not available and conservative default values are used, transportation emissions shall be calculated as follows:

$$PE_{TR,y} = \sum_{f}\left(D_{f,y} \times FR_{f,y} \times EF_{CO_2,f} \times 10^{-6}\right)$$	Equation 21

Where:

$PE_{TR,y}$	=	Project emissions from transportation in year y (tCO_2e)
$D_{f,y}$	=	Return-trip distance between origin and destination for freight transportation activity f in year y (km)
$FR_{f,y}$	=	Total mass of freight transported in freight transportation activity f in year y(t)
$EF_{CO_2,f}$	=	Default CO_2 emission factor for freight transportation activity f (g CO_2/t·km)
10^{-6}	=	Conversion factor from g CO_2 to t CO_2
f	=	Freight transportation activity

Distances, freight quantities, vehicle types, fuel types, empty return assumptions, route data, and allocation procedures shall be documented and verified.

14.4.5 Project emissions from composting

Where the project activity includes composting or co-composting, project emissions from composting shall be calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL13.

$PE_{COMP,y} = PE_{CH_4,COMP,y} + PE_{N_2O,COMP,y} + PE_{EC,COMP,y} + PE_{FC,COMP,y} + PE_{WW,COMP,y}$	Equation 22

Where:

$PE_{COMP,y}$	=	Project emissions from composting or co-composting in year y (tCO_2e)
$PE_{CH_4,COMP,y}$	=	Methane emissions from composting or co-composting in year y (tCO_2e)
$PE_{N_2O,COMP,y}$	=	Nitrous oxide emissions from composting or co-composting in year y (tCO_2e)
$PE_{EC,COMP,y}$	=	Emissions from electricity consumption associated with composting or co-composting in year y (tCO_2e)
$PE_{FC,COMP,y}$	=	Emissions from fossil fuel consumption associated with composting or co-composting in year y (tCO_2e)
$PE_{WW,COMP,y}$	=	Emissions from wastewater, leachate, runoff, or liquid residue management associated with composting or co-composting in year y (tCO_2e)

Methane and nitrous oxide emissions from composting shall be calculated using measured data, emission factors, or conservative default values allowed under CDM TOOL13 or the applicable BioCarbon requirements. Composting shall be managed under aerobic conditions. Where anaerobic zones, uncontrolled storage, leachate generation, or residual waste disposal occur, resulting emissions shall be quantified and deducted.

14.4.6 Project emissions from anaerobic digestion

Where the project activity includes anaerobic digestion, project emissions from anaerobic digestion shall be calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOL14 and the applicable CDM flaring tool.

$PE_{AD,y} = PE_{EC,AD,y} + PE_{FC,AD,y} + PE_{CH_4,AD,y} + PE_{flare,y} + PE_{DIG,res,y}$	Equation 23

Where:

$PE_{AD,y}$	=	Project emissions associated with anaerobic digestion in year y (tCO_2e)
$PE_{EC,AD,y}$	=	Project emissions from electricity consumption associated with anaerobic digestion in year y (tCO_2e)
$PE_{FC,AD,y}$	=	Project emissions from fossil fuel consumption associated with anaerobic digestion in year y (tCO_2e)
$PE_{CH_4,AD,y}$	=	Methane emissions from anaerobic digesters, biogas handling, or methane leakage in year y (tCO_2e)
$PE_{flare,y}$	=	Project emissions from flaring of biogas in year y (tCO_2e)
$PE_{DIG,res,y}$	=	Project emissions from storage, treatment, composting, transport, use, or disposal of digestate or other anaerobic digestion residues in year y (tCO_2e)

Methane emissions from anaerobic digestion leakage shall be calculated as follows:

$PE_{CH_4,AD,y} = Q_{CH_4,AD,y} \times LF_{AD,y} \times GWP_{CH_4}$	Equation 24

Where:

$PE_{CH_4,AD,y}$	=	Methane emissions from anaerobic digestion leakage in year y (tCO_2e)
$Q_{CH_4,AD,y}$	=	Quantity of methane produced in the anaerobic digester in year y (t CH_4)

$LF_{AD,y}$	=	Fraction of methane produced that leaks from the anaerobic digester, biogas handling system, or associated equipment in year y
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework.

Where measured methane production is unavailable and biogas production is measured, methane production may be calculated as follows:

$$Q_{CH_4,AD,y} = Q_{biogas,AD,y} \times f_{CH_4,biogas,y} \times \rho_{CH_4}$$	Equation 25

Where:

$Q_{CH_4,AD,y}$	=	Quantity of methane produced in the anaerobic digester in year y (t CH_4)
$Q_{biogas,AD,y}$	=	Quantity of biogas collected at the anaerobic digester outlet in year y (Nm^3)
$f_{CH_4,biogas,y}$	=	Methane fraction in the biogas in year y (Nm^3 CH_4/Nm^3 biogas)
ρ_{CH_4}	=	Density of methane at normal conditions (t CH_4/Nm^3 CH_4)

Where biogas is flared, combusted, or otherwise destroyed, methane destruction shall be supported by monitored biogas flow, methane concentration, operating hours, destruction efficiency, and flare or combustion device performance. Any methane slip, incomplete combustion, venting, or fugitive methane emissions shall be quantified and included.

14.4.7 Project emissions from RDF, SRF, stabilized biomass, or comparable waste-derived fuel production

Where the project activity includes the production of RDF, SRF, stabilized biomass, or a comparable waste-derived fuel, project emissions from such production shall be calculated as follows:

$$PE_{RDFSRF,y} = PE_{EC,RDFSRF,y} + PE_{FC,RDFSRF,y} + PE_{TR,RDFSRF,y} + PE_{WW,RDFSRF,y} + PE_{res,RDFSRF,y} + PE_{FCARB,RDFSRF,y}$$	Equation 26

Where:

$PE_{RDFSRF,y}$	=	Project emissions associated with RDF, SRF, stabilized biomass, or comparable waste-derived fuel production in year y (tCO_2e)
$PE_{EC,RDFSRF,y}$	=	Electricity-related emissions from production, handling, drying, conditioning, processing, or storage in year y (tCO_2e)
$PE_{FC,RDFSRF,y}$	=	Fossil fuel or auxiliary fuel emissions from production, handling, drying, conditioning, processing, or storage in year y (tCO_2e)
$PE_{TR,RDFSRF,y}$	=	Transport emissions associated with RDF/SRF production and delivery within the project boundary in year y (tCO_2e)
$PE_{WW,RDFSRF,y}$	=	Wastewater, leachate, runoff, or liquid residue emissions associated with RDF/SRF production in year y (tCO_2e)
$PE_{res,RDFSRF,y}$	=	Emissions from residual waste or residues generated by RDF/SRF production in year y (tCO_2e)
$PE_{FCARB,RDFSRF,y}$	=	Fossil carbon emissions from combustion, thermal treatment, or oxidation of fossil-derived fractions within the project boundary in year y (tCO_2e)

If RDF, SRF, stabilized biomass, or a comparable waste-derived fuel is produced and exported outside the project boundary, downstream fossil fuel substitution shall not be quantified under this methodology. The final fate of exported waste-derived fuel shall be documented for traceability and double-counting prevention.

14.4.8 Project emissions from combustion or thermal treatment of fossil-derived waste fractions within the project boundary

Where waste or waste-derived fuel is combusted, gasified, pyrolyzed, oxidized, or thermally treated within the project boundary, fossil carbon emissions shall be quantified. CO_2 emissions from biogenic carbon shall be treated in accordance with applicable IPCC

accounting principles and shall not be credited as emission reductions under this methodology.

Where waste is sorted by waste type, fossil CO_2 emissions from combustion or thermal treatment shall be calculated as follows:

$PE_{COMB,CO_2,c,y} = \sum_j \left(Q_{j,c,y} \times FCC_{j,y} \times FFC_{j,y} \times EFF_{COM,c,y} \times \frac{44}{12} \right)$	Equation 27

Where:

$PE_{COMB,CO_2,c,y}$	=	Project CO_2 emissions from combustion or thermal treatment in combustor or treatment unit c in year y (tCO_2)
$Q_{j,c,y}$	=	Quantity of waste type j fed into combustor or treatment unit c in year y (t)
$FCC_{j,y}$	=	Fraction of total carbon content in waste type j in year y (t C/t waste)
$FFC_{j,y}$	=	Fraction of fossil carbon in total carbon content of waste type j in year y
$EFF_{COM,c,y}$	=	Combustion or oxidation efficiency of combustor or treatment unit c in year y
$\frac{44}{12}$	=	Conversion factor from C to CO_2
j	=	Waste type
c	=	Combustor or thermal treatment unit

Where unsorted waste, RDF, SRF, or a comparable waste-derived fuel is used, fossil CO_2 emissions may be calculated as follows:

$PE_{COMB,CO_2,c,y} = \sum \left(Q_{waste,c,y} \times FFC_{waste,c,,y} \times EFF_{COM,c,y} \times \frac{44}{12} \right)$	Equation 28

Where:

$PE_{COMB,CO_2,c,y}$	=	Project CO_2 emissions from combustion or thermal treatment in combustor or treatment unit c in year y (tCO_2)
$Q_{waste,c,y}$	=	Quantity of fresh waste, RDF, SRF, or comparable waste-derived fuel fed into combustor or treatment unit c in year y (t)
$FFC_{waste,c,,y}$	=	Fossil-based carbon content in the waste or waste-derived fuel fed into combustor or treatment unit c in year y (t C/t waste)
$EFF_{COM,c,y}$	=	Combustion or oxidation efficiency of combustor or treatment unit c in year y
$\frac{44}{12}$	=	Conversion factor from C to CO_2

Where stack gas measurement is used, fossil CO_2 emissions may be calculated as follows:

$$PE_{COMB,CO_2,c,y} = SG_{c,y} \times C_{FC,stack,c,y} \times \frac{44}{12}$$	Equation 29

Where:

$PE_{COMB,CO_2,c,y}$	=	Project CO_2 emissions from combustion or thermal treatment in combustor or treatment unit c in year y (tCO_2)
$SG_{c,y}$	=	Volume of stack gas from combustor or treatment unit c in year y (Nm^3)
$C_{FC,stack,c,y}$	=	Concentration of fossil-based carbon in the stack gas of combustor or treatment unit c in year y (t C/Nm^3)
$\frac{44}{12}$	=	Conversion factor from C to CO_2

Where required, CH_4 and N_2O emissions from combustion or thermal treatment shall be calculated as follows:

$PE_{COMB,CH_4,N_2O,c,y} = SG_{c,y} \times [(C_{CH_4,SG,c,y} \times GWP_{CH_4}) + (C_{N_2O,SG,c,y} \times GWP_{N_2O})]$	Equation 30

Where:

$PE_{COMB,CH_4,N_2O,c,y}$	=	Project emissions of CH_4 and N_2O from combustion or thermal treatment in combustor or treatment unit c in year y (tCO_2e)
$SG_{c,y}$	=	Volume of stack gas from combustor or treatment unit c in year y (Nm^3)
$C_{CH_4,SG,c,y}$	=	Concentration of CH_4 in stack gas from combustor or treatment unit c in year y (t CH_4/Nm^3)
$C_{N_2O,SG,c,y}$	=	Concentration of N_2O in stack gas from combustor or treatment unit c in year y (t N_2O/Nm^3)
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework
GWP_{N_20}	=	100-year Global Warming Potential of nitrous oxide from IPCC AR6. For the purposes of this methodology, GWPN2O=273, unless another value is required by the BioCarbon Standard or an applicable accounting framework

Alternatively, where default emission factors are allowed:

$PE_{COMB,CH_4,N_2O,c,y} = Q_{waste,c,y} \times [(EF_{CH_4,t} \times GWP_{CH_4}) + (EF_{N_2O,t} \times GWP_{N_2O})]$	Equation 31

Where:

$PE_{COMB,CH_4,N_2O,c,y}$	=	Project emissions of CH_4 and N_2O from combustion or thermal treatment in combustor or treatment unit c in year y (tCO_2e)
$Q_{waste,c,y}$	=	Quantity of waste or waste-derived fuel treated in combustor or treatment unit c in year y (t)
$EF_{CH_4,t}$	=	Emission factor for CH_4 associated with treatment option t (t CH_4/t waste)
$EF_{N_2O,t}$	=	Emission factor for N_2O associated with treatment option t (t N_2O/t waste)
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework.
$GWP_{N_2O,}$	=	100-year Global Warming Potential of nitrous oxide from IPCC AR6. For the purposes of this methodology, GWPN2O=273, unless another value is required by the BioCarbon Standard or an applicable accounting framework
t	=	Treatment option

These equations apply only where combustion or thermal treatment occurs within the project boundary. They shall not be used to credit downstream substitution of fossil fuels outside this methodology.

14.4.9 Project emissions from wastewater, leachate, runoff, or liquid residues

Where wastewater, leachate, runoff, or liquid residues generated by the project activity are treated anaerobically, stored under anaerobic conditions, or released untreated, project methane emissions shall be calculated as follows:

$PE_{WW,y} = Q_{WW,y} \times COD_{WW,y} \times B_0 \times MCF_{WW,y} \times GWP_{CH_4}$	Equation 32

Where:

$PE_{WW,y}$	=	Project methane emissions from wastewater, leachate, runoff, or liquid residues in year y (tCO_2e)
$Q_{WW,y}$	=	Quantity of wastewater, leachate, runoff, or liquid residues generated and treated anaerobically, stored anaerobically, or released untreated in year y (m^3)
$COD_{WW,y}$	=	Chemical oxygen demand of wastewater, leachate, runoff, or liquid residues in year y (t COD/m^3)
B_0	=	Maximum methane producing capacity (t CH_4/t COD)
$MCF_{WW,y}$	=	Methane conversion factor for wastewater, leachate, runoff, or liquid residue treatment in year y
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework.

Where methane generated from wastewater, leachate, runoff, or liquid residues is captured and destroyed, project methane emissions shall be calculated as follows:

$PE_{WW,y} = max\{0, [Q_{WW,y} \times COD_{WW,y} \times B_0 \times MCF_{WW,y} \times GWP_{CH_4}] - MD_{WW,y}\}$	Equation 33

Where:

$PE_{WW,y}$	=	Project methane emissions from wastewater, leachate, runoff, or liquid residues in year y after methane destruction, where applicable (tCO_2e)

$Q_{WW,y}$	=	Quantity of wastewater, leachate, runoff, or liquid residues generated and treated anaerobically, stored anaerobically, or released untreated in year y (m^3)
$COD_{WW,y}$	=	Chemical oxygen demand of wastewater, leachate, runoff, or liquid residues in year y (t COD/m^3)
B_0	=	Maximum methane producing capacity (t CH_4/t COD)
$MCF_{WW,y}$	=	Methane conversion factor for wastewater, leachate, runoff, or liquid residue treatment in year y
GWP_{CH_4}	=	100-year Global Warming Potential of methane from IPCC AR6. For methane emissions from biodegradable waste and other biogenic waste-related sources under this methodology, GWPCH4=27.0, unless another value is required by the BioCarbon Standard or an applicable accounting framework
$MD_{WW,y}$	=	Methane destroyed from wastewater, leachate, runoff, or liquid residue management in year y (tCO_2e)

If the result of Equation 33 is negative, PEWW,y shall be set equal to zero.

14.4.10 Project emissions from residual waste disposed of in a SWDS

Where residual biodegradable waste, rejected material, treatment residues, digestate, compost residues, sludge, or other residual organic material generated by the project activity is disposed of in a SWDS, methane emissions shall be calculated using the FOD approach, consistent with IPCC guidance and CDM TOOL04.

$PE_{RW,y} = PE_{CH_4,RW,SWDS,y}$	Equation 34

Where:

$PE_{RW,y}$	=	Project emissions from residual waste disposed of in a SWDS in year y (tCO_2e)

$PE_{CH_4,RW,SW\ DS,y}$	=	Methane emissions from residual biodegradable waste disposed of in a SWDS in year y (tCO_2e)

For annual calculations:

$$PE_{CH_4,RW,SW\ DS,y} = \emptyset_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_y) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_j \sum_{x=1}^{y} \left[RW_{j,x} \times DOC_j \times e^{-k_j(y-x)} \times (1 - e^{-k_j})\right] \quad \text{Equation 35}$$

Where:

$PE_{CH_4,RW,SW\ DS,y}$	=	Methane emissions from residual biodegradable waste disposed of in a SWDS in year y (tCO_2e/year)
$RW_{j,x}$	=	Amount of residual biodegradable waste type j disposed of in a SWDS in year x (t)

All other parameters are as defined for baseline SWDS methane emissions.

For monthly calculations:

$$PE_{CH_4,RW,SW\ DS,m} = \emptyset_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_y) \times \frac{16}{12} \times F \times DOC_{f,m} \times MCF_y \times \sum_j \sum_{i=1}^{m} \left[RW_{j,i} \times DOC_j \times e^{-\frac{k_j}{12}(m-i)} \times \left(1 - e^{-\frac{K_J}{12}}\right)\right] \quad \text{Equation 36}$$

Where:

$PE_{CH_4,RW,SW\ DS,m}$	=	Methane emissions from residual biodegradable waste disposed of in a SWDS in month m (tCO_2e/month)
$RW_{j,i}$	=	Amount of residual biodegradable waste type j disposed of in a SWDS in month i (t)

All other parameters are as defined for baseline SWDS methane emissions.

14.5 Leakage emissions

Leakage emissions shall be identified, assessed, quantified, and deducted in accordance with the BioCarbon Leakage Management Tool and this methodology. Leakage shall include all material increases in GHG emissions outside the project boundary that are attributable to the project activity.

14.5.1 General leakage emissions equation

For each year y, leakage emissions shall be calculated as follows:

$LE_y = LE_{REC,y} + LE_{DISP,y} + LE_{TR,y} + LE_{RDFSRF,y} + LE_{SUB,y} + LE_{OTHER,y}$	Equation 37

Where:

LE_y	=	Total leakage emissions in year y (tCO_2e)
$LE_{REC,y}$	=	Leakage from diversion of waste from recycling, reuse, material recovery, composting, anaerobic digestion, or other existing higher-priority uses in year y (tCO_2e)
$LE_{DISP,y}$	=	Leakage from displacement of existing waste management, treatment, recovery, or disposal activities in year y (tCO_2e)
$LE_{TR,y}$	=	Leakage from transport outside the project boundary in year y (tCO_2e)
$LE_{RDFSRF,y}$	=	Leakage associated with RDF, SRF, stabilized biomass, or comparable waste-derived outputs in year y (tCO_2e)
$LE_{SUB,y}$	=	Leakage from substitute materials, fuels, or processes required because waste or recovered material is diverted to the project activity in year y (tCO_2e)

$LE_{OTHER,y}$	=	Other material leakage emissions in year y (tCO_2e)

Leakage sources may be excluded only where the project holder demonstrates that the source is not material or that exclusion is conservative, in accordance with the BioCarbon Leakage Management Tool and the Conservative Approach and Uncertainty Management Tool.

14.5.2 Leakage from exported RDF, SRF, stabilized biomass, or comparable outputs

Where RDF, SRF, stabilized biomass, or comparable waste-derived outputs are exported outside the project boundary, the project holder shall document their final fate and assess whether leakage emissions occur. Downstream fossil fuel substitution shall not be credited under this methodology.

Where RDF, SRF, stabilized biomass, or comparable waste-derived outputs are produced, transferred, exported, stored, used, treated, or disposed of outside the project boundary, the project holder shall maintain batch-level traceability from production to final fate. Such traceability shall include, as applicable, batch identification, quantity, composition or relevant quality characteristics, date of transfer, receiving entity, receiving facility, transport records, contractual documentation, evidence of receipt, and documented final fate. Where final fate cannot be demonstrated, the project holder shall apply the most conservative plausible treatment assumption, including combustion, anaerobic storage, uncontrolled dumping, or disposal in a SWDS, as applicable.

Leakage associated with exported RDF, SRF, stabilized biomass, or comparable outputs shall be calculated as follows:

$LE_{RDFSRF,y} = LE_{EN\ DU\ SE,RDF\ SRF,y} + LE_{SW\ DS,W\ BP,y}$	Equation 38

Where:

$LE_{RDFSRF,y}$	=	Leakage associated with RDF, SRF, stabilized biomass, or comparable waste-derived outputs in year y (tCO_2e)
$LE_{EN\ DU\ SE,RDF\ SRF,y}$	=	Leakage emissions associated with the end use or undocumented fate of RDF/SRF exported outside the project boundary in year y (tCO_2e)

$LE_{SW\ DS,W\ BP,y}$	=	Leakage emissions from disposal of biodegradable waste by-products associated with RDF/SRF production in a SWDS in year y (tCO_2e)

Where documented evidence confirms that exported RDF/SRF is combusted, fossil carbon emissions from such combustion shall be calculated as follows and deducted as leakage where attributable to the project activity:

$$LE_{EN\ DU\ SE,RDFSRF,y} = Q_{RDFSRF,COM,y} \times NCV_{RDFSRF,y} \times EF_{CO_2,RDFSRF,y}$$ Equation 39

Where:

$LE_{EN\ DU\ SE,RDFSRF,y}$	=	Leakage emissions associated with combustion of exported RDF/SRF in year y (tCO_2e)
$Q_{RDFSRF,COM,y}$	=	Quantity of RDF/SRF exported off-site and combusted in year y (t)
$NCV_{RDFSRF,y}$	=	Net calorific value of RDF/SRF in year y (GJ/t)
$EF_{CO_2,RDFSRF,y}$	=	CO_2 emission factor of RDF/SRF in year y (tCO_2/GJ)

Where the final fate of exported RDF/SRF is not documented, the project holder shall conservatively assume the fate that results in the highest emissions among plausible alternatives, including combustion, uncontrolled dumping, storage under anaerobic conditions, or disposal in a SWDS.

14.6 Conservative adjustment and uncertainty

The project holder shall assess uncertainty in accordance with the BioCarbon Conservative Approach and Uncertainty Management Tool. Uncertainty shall be assessed for all material parameters, including waste quantity, waste composition, eligible biodegradable fraction, DOC, DOCf, decay rate, methane correction factor, methane recovery, oxidation factor, electricity consumption, fuel consumption, transport activity, treatment emissions, residual waste emissions, wastewater or leachate emissions, and leakage emissions.

Conservative adjustments shall be calculated as follows:

$CA_y = UA_y + DQA_y + OA_y$	Equation 40

Where:

CA_y	=	Conservative adjustment in year y (tCO_2e)
UA_y	=	Uncertainty adjustment in year y (tCO_2e)
DQA_y	=	Data quality adjustment in year y (tCO_2e)
OA_y	=	Other conservative adjustment required by BioCarbon in year y (tCO_2e)

Conservative adjustments shall only reduce credited emission reductions and shall not increase Er_y.

Where uncertainty exceeds applicable thresholds, data are incomplete, or parameter values are not sufficiently representative, the project holder shall apply conservative adjustments. The basis, magnitude, and application of all conservative adjustments shall be documented in the project document and monitoring reports and shall be validated or verified by the CAB, as applicable.

14.7 Monitoring period emission reductions

Net GHG emission reductions for the monitoring period shall be calculated as the sum of annual net GHG emission reductions within the monitoring period.

$ER_{MP} = \sum_y ER_y$	Equation 41

Where:

ER_{MP}	=	Net GHG emission reductions for the monitoring period (tCO_2e)
ER_y	=	Net GHG emission reductions in year y (tCO_2e)
y	=	Each year included in the monitoring period

Where monthly calculations are used, net GHG emission reductions for the monitoring period shall be calculated as the sum of monthly net GHG emission reductions within the monitoring period.

$ER_{MP} = \sum_{m} ER_m$	Equation 42

Where:

ER_{MP}	=	Net GHG emission reductions for the monitoring period (tCO_2e)
ER_m	=	Net GHG emission reductions in month m (tCO_2e)
m	=	Each month included in the monitoring period

Emission reductions shall be issued only ex post, based on monitored data, verified project emissions, verified leakage emissions, applicable conservative adjustments, and successful validation or verification by an approved CAB.

14.8 Multi-methodology application and prevention of double counting

Where this methodology is applied together with another BioCarbon-approved methodology, emission reductions shall be calculated separately for each methodology. Each methodology shall address a distinct emission source, baseline scenario, project boundary component, and causal mitigation mechanism.

The same emission reduction, waste stream, emission source, activity data, monitoring record, baseline emission, project emission, leakage emission, or mitigation outcome shall not be credited more than once.

Where eligible biodegradable waste diverted from SWDS is processed into RDF, SRF, stabilized biomass, or a comparable waste-derived fuel and subsequently used in an industrial thermal process, this methodology shall quantify only the avoided methane emissions from the diversion of eligible biodegradable waste from SWDS. Any emission reductions from downstream fossil fuel substitution shall be quantified only under a separate BioCarbon-approved methodology, where applicable, and shall not be credited under this methodology.

The project holder shall document allocation rules, data separation, chain of custody, ownership of claims, monitoring records, and safeguards against double counting, double claiming, double issuance, and double use. These safeguards shall be validated and verified by the CAB.

15 Data and parameters

15.1 General requirements

The project holder shall identify, document, justify, monitor, and retain all data and parameters required to quantify baseline emissions, project emissions, leakage emissions, conservative adjustments, and net GHG emission reductions under this methodology.

Data and parameters shall be classified as follows:

(a) data and parameters available at validation, which are determined before registration and may remain fixed during the quantification period, unless reassessment is required; and
(b) data and parameters monitored during the project activity, which shall be measured, recorded, calculated, or updated during each monitoring period.

All data and parameters shall be consistent with this methodology, the BioCarbon Standard, the applicable BioCarbon Tools, the Monitoring, Reporting and Verification Tool, the Conservative Approach and Uncertainty Management Tool, and the applicable IPCC and CDM methodological basis.

Where project-specific data are available, they shall be used in preference to default values, provided that they are representative, verifiable, conservative, and supported by adequate QA/QC procedures. Where project-specific data are unavailable, incomplete, or not representative, conservative national, regional, IPCC, CDM, or other approved default values may be used, subject to justification and validation or verification by the CAB, as applicable.

For the purposes of this methodology, data shall be selected according to the following hierarchy: (a) direct measurements from calibrated equipment; (b) representative laboratory analysis or project-specific sampling; (c) official national or regional data; (d) auditable operator, supplier, or facility records; and (e) conservative IPCC, CDM, or other approved default values. Where default values are used because project-specific data are unavailable, incomplete, or not representative, the project holder shall justify the selection and demonstrate that the value is conservative for the project context.

15.2 Data and parameters available at validation

The following data and parameters shall be determined and documented at validation, where applicable.

Table 3. Data and parameters available at validation

Parameter	Description	Unit	Source / determination	Use
GWP_{CH_4}	100-year Global Warming Potential of methane	tCO_2e/tCH_4	IPCC AR6, unless another value is required by the BioCarbon Standard or applicable accounting framework	Conversion of CH_4 emissions to tCO_2e

Parameter	Description	Unit	Source / determination	Use
GWP_{N_2O}	100-year Global Warming Potential of nitrous oxide	tCO_2e/tN_2O	IPCC AR6, unless another value is required by the BioCarbon Standard or applicable accounting framework	Conversion of N_2O emissions to tCO_2e
GWP_{CO_2}	Global Warming Potential of carbon dioxide	tCO_2e/tCO_2	IPCC AR6	Conversion of CO_2 emissions to tCO_2e
F	Fraction of methane in landfill gas	Dimensionless	Site-specific data, IPCC default, or CDM TOOL04	Baseline and residual waste FOD calculation
DOC_j	Degradable organic carbon fraction of waste type (j)	tC/t waste	Site-specific data, laboratory analysis, IPCC default, or CDM TOOL04	Baseline and residual waste FOD calculation
k_j	Decay rate for waste type (j)	yr^{-1}	Site-specific data, IPCC default, or CDM TOOL04	Baseline and residual waste FOD calculation
DOC_f	Fraction of degradable organic carbon that decomposes under SWDS conditions	Dimensionless	Site-specific BMP, IPCC default, or CDM TOOL04	Baseline and residual waste FOD calculation
MCF_y	Methane correction factor	Dimensionless	Site-specific data, IPCC default, or CDM TOOL04	Baseline and residual waste FOD calculation
OX_y	Oxidation factor	Dimensionless	Site-specific data, IPCC default, or CDM TOOL04	Deduction for methane oxidation
$\emptyset_y$	Model correction factor	Dimensionless	CDM TOOL04 or project-specific uncertainty assessment	Conservative model adjustment
B_0	Maximum methane producing capacity for wastewater or liquid residues	$tCH_4/tCOD$	IPCC default, national value, or site-specific data	Wastewater/leachate emissions
$EF_{EL,s,y}$	Emission factor for electricity source (s)	tCO_2e/MWh	Grid emission factor, supplier-specific factor, national source, or approved tool	Electricity emissions
$EF_{CO_2,i,y}$	CO_2 emission factor for fossil fuel type (i)	tCO_2/GJ	IPCC, national source, supplier data, or CDM TOOL03	Fossil fuel emissions
$NCV_{i,y}$	Net calorific value of fossil fuel type (i)	GJ/unit	IPCC, national source, supplier data, or CDM TOOL03	Fossil fuel emissions
$EF_{CO_2,f}$	Default freight emission factor	$gCO_2/t{\cdot}km$	CDM TOOL12, national source, or conservative default	Transportation emissions
$EF_{CH_4,t}$	CH_4 emission factor for treatment option (t)	tCH_4/t waste	IPCC, CDM tool, or approved default	Combustion or treatment emissions

Parameter	Description	Unit	Source / determination	Use
$EF_{N_2O,,t}$	N_2O emission factor for treatment option (t)	tN_2O/t waste	IPCC, CDM tool, or approved default	Combustion or treatment emissions

The project holder shall justify the selected values, explain why they are appropriate for the project context, and demonstrate that they are conservative. Parameters available at validation shall be reassessed where required by this methodology, by the BioCarbon Standard, by the applicable BioCarbon Tools, or where material changes occur in waste composition, SWDS characteristics, legal requirements, technology, treatment route, or baseline conditions.

15.3 Data and parameters monitored

The following data and parameters shall be monitored during the project activity, where applicable.

Table 4. Data and parameters monitored

Parameter	Description	Unit	Monitoring frequency	Source / method
W_x	Total amount of eligible solid waste prevented from disposal in the SWDS in year x	t	Continuous or per batch; aggregated annually	Weighbridge, calibrated scales, digital manifests, mass balance
W_i	Total amount of eligible solid waste prevented from disposal in the SWDS in month i	t	Continuous or per batch; aggregated monthly	Weighbridge, calibrated scales, digital manifests, mass balance
$W_{j,x}$	Amount of eligible biodegradable waste type $j$prevented from disposal in year x	t	Annual	Waste characterization and mass balance
$W_{j,i}$	Amount of eligible biodegradable waste type j prevented from disposal in month i	t	Monthly, where monthly calculation is used	Waste characterization and mass balance
$p_{j,x}$	Average fraction of eligible biodegradable waste type j in year x	Dimensionless	At least annually, or more frequently where waste composition varies materially	Representative sampling and composition analysis
$p_{j,i}$	Average fraction of eligible biodegradable waste type j in month i	Dimensionless	Monthly, where monthly calculation is used	Representative sampling and composition analysis
$p_{n,j,x}$	Fraction of eligible biodegradable waste type j in sample n during year x	Dimensionless	Per sample	Sampling and waste sorting records

Parameter	Description	Unit	Monitoring frequency	Source / method
$p_{n,j,i}$	Fraction of eligible biodegradable waste type j in sample n during or applicable to month i	Dimensionless	Per sample	Sampling and waste sorting records
Z_x	Number of representative samples collected during year x	Number	Annual	Sampling records
Z_i	Number of representative samples used for month i	Number	Monthly, where monthly calculation is used	Sampling records
$EC_{s,y}$	Electricity consumed from source s in year y	MWh	Continuous, monthly, or per billing period	Meter readings, invoices, energy management system
$FC_{i,s,y}$	Fossil fuel type i consumed by source s in year y	Mass or volume	Per delivery, per use, or monthly	Fuel invoices, metering, logs
$FC_{i,f,y}$	Fuel type i consumed for freight transportation activity f in year y	Mass or volume	Per trip, monthly, or annually	Fuel logs, invoices, transport records
$D_{f,y}$	Return-trip distance for freight transportation activity f in year y	km	Per route or when route changes	GPS, route records, maps
$FR_{f,y}$	Total mass of freight transported in activity f in year y	t	Per trip or batch	Weighbridge, manifests, transport records
$Q_{biogas,AD,y}$	Quantity of biogas collected at anaerobic digester outlet in year y	Nm^3	Continuous or periodic metering	Flow meter
$f_{CH_4,biogas,y}$	Methane fraction in biogas in year y	Nm^3 CH_4/Nm^3 biogas	Continuous or periodic	Gas analyzer, laboratory analysis
$LF_{AD,y}$	Fraction of methane produced that leaks from anaerobic digestion systems in year y	Dimensionless	As required by TOOL14 or approved method	Measurement, default factor, leak detection records
$Q_{WW,y}$	Quantity of wastewater, leachate, runoff, or liquid residues in year y	m^3	Continuous, monthly, or per batch	Flow meter, tank records, operational records
$COD_{WW,y}$	Chemical oxygen demand of wastewater, leachate, runoff, or liquid residues in year y	$tCOD/m^3$	Per representative sample	Laboratory analysis
$MCF_{WW,y}$	Methane conversion factor for wastewater, leachate, runoff, or liquid residue treatment in year y	Dimensionless	Annual or when treatment conditions change	IPCC default, site-specific assessment
$MD_{WW,y}$	Methane destroyed from wastewater, leachate, runoff, or liquid residue management in year y	tCO_2e	Continuous or periodic	Flow, methane concentration, destruction efficiency

Parameter	Description	Unit	Monitoring frequency	Source / method
$RW_{j,x}$	Residual biodegradable waste type j disposed of in SWDS in year x	t	Per batch; aggregated annually	Weighbridge, disposal records, mass balance
$RW_{j,i}$	Residual biodegradable waste type j disposed of in SWDS in month i	t	Per batch; aggregated monthly	Weighbridge, disposal records, mass balance
$Q_{RDFSRF,COM,y}$	Quantity of RDF/SRF exported off-site and combusted in year y	t	Per batch; aggregated annually	Delivery records, end-use declarations, contracts
$NCV_{RDFSRF,y}$	Net calorific value of RDF/SRF in year y	GJ/t	Per representative sample or batch	Laboratory analysis
$EF_{CO_2,RDFSRF,y}$	CO_2 emission factor of RDF/SRF in year y	tCO_2/GJ	Per representative sample or batch	Laboratory analysis, carbon content analysis
$SG_{c,y}$	Volume of stack gas from combustor or treatment unit c in year y	Nm^3	Continuous or periodic, where applicable	Stack monitoring
$C_{CH_4,SG,c,,y}$	CH_4 concentration in stack gas from combustor or treatment unit c in year y	tCH_4/Nm^3	Continuous or periodic, where applicable	Stack monitoring
$C_{N_2O,SG,c,,y}$	N_2O concentration in stack gas from combustor or treatment unit c in year y	tN_2O/Nm^3	Continuous or periodic, where applicable	Stack monitoring
$C_{FC,stack,c,y}$	Fossil-based carbon concentration in stack gas from combustor or treatment unit c in year y	tC/Nm^3	Where applicable	Stack gas analysis
CA_y	Conservative adjustment in year y	tCO_2e	Each monitoring period	Uncertainty and data quality assessment

All monitored data shall be supported by auditable evidence. The project holder shall maintain records sufficient to allow the CAB to reproduce the emission reduction calculation, verify the chain of custody, confirm final fate of outputs and residuals, assess data quality, and determine whether conservative adjustments are required.

16 Monitoring requirements

16.1 General monitoring requirements

The project holder shall establish, implement, and maintain a monitoring plan in accordance with the BioCarbon Standard, the Monitoring, Reporting and Verification Tool, this methodology, and all applicable BioCarbon Tools.

The monitoring plan shall describe the procedures, responsibilities, data systems, measurement instruments, sampling methods, QA/QC controls, data retention arrangements, and evidence required to quantify baseline emissions, project emissions, leakage emissions, conservative adjustments, and net GHG emission reductions.

The monitoring plan shall identify the minimum auditable evidence required to support each material data point, assumption, parameter, waste flow, treatment route, final fate, project emission source, leakage source, conservative adjustment, and emission reduction calculation. Such evidence shall be sufficient to allow the CAB to reproduce the calculation, verify the eligibility and traceability of waste streams, confirm the final fate of outputs and residues, and assess whether conservative deductions are required.

The monitoring plan shall be validated by the CAB prior to registration and shall be implemented throughout each monitoring period. Any material change to the monitoring plan, monitoring equipment, data systems, treatment route, waste source, waste composition, project boundary, or quantification approach shall be documented and assessed in accordance with the BioCarbon Standard and the applicable BioCarbon Tools.

16.2 Waste quantity monitoring

The project holder shall monitor the quantity of eligible waste received, accepted, rejected, processed, treated, stabilized, recovered, valorized, exported, stored, or disposed of.

Waste quantities shall be measured using calibrated weighbridges, calibrated scales, documented volumetric conversion methods, or other validated measurement systems. Where volumetric measurements are used, conversion factors shall be conservative, documented, and periodically verified.

For each waste batch or aggregated monitoring unit, the project holder shall record, as applicable:

(a) origin of the waste;
(b) date and time of collection, receipt, transfer, treatment, or disposal;
(c) waste generator, collector, transporter, treatment facility, and receiving facility;
(d) gross weight, tare weight, and net weight;
(e) waste type and eligibility classification;
(f) rejected, residual, recyclable, inert, fossil-derived, and biodegradable fractions;
(g) treatment route and final fate; and
(h) supporting evidence, including tickets, manifests, invoices, contracts, permits, photographs, GPS records, digital logs, or other auditable documentation.

16.3 Waste characterization and sampling

The project holder shall characterize the eligible waste stream to determine the biodegradable fraction, waste types, inert fraction, fossil-derived fraction, moisture content, DOC, DOCf

where applicable, BMP where applicable, and any other parameter required by this methodology.

Sampling shall be representative of the waste stream, treatment route, source, seasonality, and operational variability. The sampling plan shall define, at minimum:

(a) sampling objective;
(b) sampling population and waste streams covered;
(c) sampling frequency;
(d) sample size and number of samples;
(e) sample collection and preservation procedures;
(f) sorting categories;
(g) laboratory methods, where applicable;
(h) QA/QC procedures; and
(i) procedures for conservative treatment of outliers, missing data, or non-representative samples.

The sampling design shall be proportionate to the variability of the waste stream and shall be sufficient to support conservative quantification. Where waste composition varies by source, season, collection route, generator type, treatment route, or operational condition, the project holder shall stratify sampling or increase sampling frequency to ensure representativeness. Sampling frequency and sample size shall be reassessed where material changes occur in waste sources, waste routing, operational conditions, treatment technology, market conditions, regulation, or observed waste composition.

Outliers, missing samples, or non-representative samples shall be identified, documented, and treated conservatively. The project holder shall not use sampling results that are biased toward increasing credited emission reductions. Where representative composition data are unavailable, the project holder shall apply conservative default values, conservative eligibility fractions, or conservative deductions in accordance with this methodology and the applicable BioCarbon Tools.

16.4 Chain of custody and mass balance

The project holder shall establish and maintain a chain-of-custody system covering eligible waste, intermediate products, residual waste, by-products, compost, digestate, stabilized biomass, RDF, SRF, liquid residues, wastewater, leachate, and any other material relevant to quantification.

The chain-of-custody system shall allow the CAB to trace material flows from origin to final treatment, use, storage, export, or disposal. The project holder shall maintain a mass balance reconciling, as applicable:

(a) waste received;

(b) waste accepted as eligible;
(c) waste rejected as ineligible;
(d) biodegradable fractions;
(e) non-biodegradable and inert fractions;
(f) fossil-derived fractions;
(g) recyclable or recovered materials;
(h) intermediate products;
(i) final outputs;
(j) residual waste;
(k) wastewater, leachate, or liquid residues; and
(l) losses, moisture changes, stock changes, or process residues.

Any material discrepancy in the mass balance shall be investigated, documented, corrected where possible, and treated conservatively where unresolved.

16.5 Monitoring of treatment performance

The project holder shall monitor treatment performance to demonstrate that eligible biodegradable waste is treated, processed, stabilized, recovered, or valorized in a manner consistent with this methodology and the validated project design.

Treatment performance monitoring shall include, where applicable:

(a) treatment technology and operating conditions;
(b) processing capacity and throughput;
(c) residence time or processing time;
(d) temperature, moisture, aeration, mixing, pH, or other relevant operating parameters;
(e) methane capture, destruction, leakage, or venting;
(f) composting, anaerobic digestion, drying, stabilization, or RDF/SRF production performance;
(g) residual waste generation and final fate;
(h) wastewater, leachate, runoff, or liquid residue management; and
(i) deviations, incidents, shutdowns, bypasses, or abnormal operating conditions.

Where waste or treated material is stored, the project holder shall monitor storage conditions to ensure that anaerobic decomposition is prevented or that resulting emissions are quantified and deducted.

16.6 Monitoring of project emissions

The project holder shall monitor all material project emission sources, including, where applicable:

(a) electricity consumption;
(b) fossil fuel and auxiliary fuel consumption;

(c) transport of eligible waste, residual waste, by-products, intermediate products, final outputs, samples, or other materials;
(d) composting emissions;
(e) anaerobic digestion emissions, methane leakage, biogas handling, and flaring;
(f) wastewater, leachate, runoff, or liquid residue emissions;
(g) residual waste disposal;
(h) combustion, gasification, pyrolysis, oxidation, or thermal treatment within the project boundary; and
(i) any other material project emission source identified under this methodology.

Project emissions shall be calculated using monitored activity data, project-specific emission factors, approved default values, or the applicable CDM tools referenced in this methodology.

16.7 Monitoring of leakage

The project holder shall monitor and document potential leakage sources in accordance with the BioCarbon Leakage Management Tool and this methodology.

Leakage monitoring shall include, where applicable:

(a) evidence that eligible waste is not diverted from recycling, reuse, material recovery, composting, anaerobic digestion, or other higher-priority baseline uses;
(b) changes in existing waste management, treatment, or recovery activities caused by the project activity;
(c) transportation outside the project boundary attributable to the project activity;
(d) substitute materials, fuels, or processes required because waste or recovered material is diverted to the project activity;
(e) residual waste or by-products managed outside the project boundary; and
(f) final fate of RDF, SRF, stabilized biomass, or comparable waste-derived outputs exported outside the project boundary.

Where leakage cannot be reliably monitored or quantified, the project holder shall apply conservative assumptions or deductions.

16.8 Digital MRV

Digital monitoring, reporting, and verification systems may be used to support implementation of this methodology. Digital MRV may include electronic weighbridge records, digital manifests, georeferenced evidence, batch-level traceability, laboratory data management systems, GPS tracking, electronic chain-of-custody records, digital mass-balance systems, remote sensors, automated meters, dashboards, and auditable databases.

Where digital MRV is used, the project holder shall demonstrate that the system is:

(a) technology-neutral and not dependent on a single proprietary provider for verification;
(b) secure and protected against unauthorized modification;

(c) capable of exporting raw data, metadata, calculation inputs, and audit trails;
(d) traceable at batch, facility, route, or monitoring-unit level, as applicable;
(e) capable of documenting data corrections, version control, and user access;
(f) auditable by the CAB and BioCarbon; and
(g) consistent with the monitoring plan, this methodology, and the applicable BioCarbon Tools.

Where digital MRV is used for batch-level traceability, the system shall record, as applicable, batch ID, waste source or origin, date and time of collection or receipt, transporter, vehicle ID, gross weight, tare weight, net weight, waste category, eligibility classification, sampling ID, treatment route, residual fraction, output generated, transfer records, receiving entity, final fate, supporting evidence, data corrections, user access records, timestamps, and audit trail. The absence of a digital record shall not automatically make a waste quantity ineligible where equivalent documentary evidence is available and verifiable; however, any missing, inconsistent, or non-auditable digital records shall be treated conservatively.

Digital MRV shall not replace direct measurement, representative sampling, laboratory analysis, documentary evidence, QA/QC procedures, conservative uncertainty treatment, or independent validation and verification by an approved CAB.

16.9 QA/QC and data retention

The project holder shall implement QA/QC procedures covering measurement equipment, calibration, data entry, data transfer, laboratory analysis, sampling, calculations, digital systems, documentation, and internal review.

QA/QC procedures shall include, as applicable:

(a) calibration and maintenance of measurement equipment;
(b) cross-checks between weighbridge records, manifests, invoices, transport records, and mass balance;
(c) verification of sampling representativeness;
(d) laboratory accreditation or documented laboratory QA/QC;
(e) review of calculation files and emission reduction results;
(f) controls to prevent double counting, double claiming, double issuance, and double use;
(g) review of missing data, outliers, corrections, and conservative adjustments; and
(h) internal approval of monitoring reports before submission to the CAB.

All monitoring records, source data, calculation files, laboratory reports, contracts, permits, chain-of-custody records, and supporting evidence shall be retained for the period required by the BioCarbon Standard and the applicable BioCarbon Tools, and in any case for a period sufficient to support validation, verification, registry review, audits, and dispute resolution.

16.10 Operational incidents, monitoring gaps, and conservative treatment

The project holder shall identify, document, assess, and report any operational incident, monitoring gap, data loss, abnormal operating condition, equipment failure, treatment interruption, storage deviation, uncontrolled anaerobic condition, mass-balance discrepancy, or final-fate uncertainty that may affect the quantification of emission reductions.

Where an operational incident or monitoring gap affects waste eligibility, waste quantity, waste composition, baseline emissions, project emissions, leakage emissions, final fate, chain of custody, or conservative adjustments, the project holder shall assess the affected waste quantities, time period, data points, parameters, and emission sources. The project holder shall quantify any resulting emissions or deductions and apply conservative assumptions where the effect cannot be reliably quantified.

Where temporary inaccessibility of the project site, treatment facility, waste source, transport route, receiving facility, laboratory, or other relevant monitoring location occurs due to circumstances beyond the reasonable control of the project holder, including conflict, public health restrictions, natural disasters, security restrictions, legal restrictions, or other force majeure events, the project holder may apply alternative monitoring approaches only where such approaches are documented, conservative, independently verifiable, and sufficient to demonstrate waste eligibility, quantity, composition, treatment, final fate, project emissions, leakage emissions, chain of custody, and conservative quantification.

Alternative monitoring approaches may include, as applicable, remote or virtual inspections, georeferenced photographs or videos, satellite or aerial imagery, electronic weighbridge records, digital manifests, GPS records, laboratory records, invoices, transport records, third-party facility declarations, receiving records, operational logs, or other auditable evidence. The use of alternative monitoring approaches shall not affect the applicability of this methodology, the validity of the baseline scenario, the demonstration of additionality, the project boundary, the chain of custody, or the conservative quantification of emission reductions.

Where temporary inaccessibility prevents the project holder from obtaining sufficient verifiable evidence for a waste quantity, batch, output, residue, parameter, emission source, leakage source, or monitoring period, emission reductions shall not be claimed for the affected component unless conservative alternative evidence is available and verified by the CAB. Any alternative monitoring approach, affected data, conservative assumptions, deductions, corrective actions, and justification shall be disclosed in the monitoring report and assessed by the CAB.

Emission reductions shall not be claimed for waste quantities, batches, outputs, residues, or monitoring periods for which the project holder cannot demonstrate eligibility, traceability, treatment, final fate, and conservative quantification. Where alternative evidence is used to replace missing primary monitoring data, such evidence shall be auditable, independently verifiable, and conservative.

Material incidents and monitoring gaps shall be disclosed in the monitoring report, together with the affected data, corrective actions, conservative deductions, and measures implemented to prevent recurrence. The CAB shall assess whether the treatment of the incident or monitoring gap is sufficient to prevent over-crediting.

17 Permanence and reversal risk management

This methodology quantifies greenhouse gas emission reductions from avoided methane emissions associated with the diversion and alternative treatment of eligible biodegradable solid waste that would otherwise have been disposed of in a solid waste disposal site. It does not quantify carbon dioxide removal, carbon storage, long-term sequestration, or the maintenance of a carbon stock.

For the purposes of this methodology, reversal risk shall not be understood as the physical reversal of a stored carbon stock. Instead, risk management shall focus on preventing over-crediting, ensuring continued operational integrity during each monitoring period, confirming the final fate of eligible waste and project outputs, and ensuring that residual biodegradable material does not generate unaccounted methane emissions after diversion from the baseline SWDS.

The project holder shall assess and manage all risks that could materially affect the validity, quantification, monitoring, reporting, or verification of emission reductions under this methodology, including, as applicable:

(a) failure to divert eligible biodegradable solid waste from the baseline SWDS;
(b) interruption, shutdown, or material underperformance of the treatment, processing, stabilization, recovery, or valorization route;
(c) storage of eligible biodegradable waste, treated waste, intermediate products, compost, digestate, stabilized biomass, RDF, SRF, residual waste, or comparable outputs under anaerobic or partially anaerobic conditions;
(d) disposal of residual biodegradable waste, treatment residues, digestate, compost residues, or by-products in a SWDS without quantification and deduction of resulting methane emissions;
(e) misclassification of ineligible, inert, non-biodegradable, hazardous, fossil-derived, or previously recycled/recovered waste as eligible biodegradable waste;
(f) loss of chain of custody, incomplete mass balance, missing records, undocumented final fate, or inability to verify waste origin, treatment, output, or disposal;
(g) diversion of waste from recycling, reuse, material recovery, composting, anaerobic digestion, or other higher-priority baseline uses;
(h) changes in regulation, enforcement, waste management obligations, permits, contracts, or baseline conditions that affect additionality or baseline determination;
(i) malfunction or failure of methane capture, flaring, combustion, anaerobic digestion, composting, wastewater, leachate, or treatment systems;

(j) data loss, manipulation, system failure, cybersecurity incidents, or loss of auditability in digital MRV systems; and
(k) any other material risk that could result in overestimation of emission reductions, unaccounted project emissions, unaccounted leakage, double counting, double claiming, double issuance, or double use.

The project holder shall prepare and maintain a risk management plan proportionate to the scale, complexity, technology, waste streams, treatment route, and monitoring system of the project activity. The risk management plan shall identify relevant risks, assign responsibilities, define preventive and corrective measures, establish monitoring indicators, and describe procedures for incident response, reporting, corrective action, and conservative adjustment.

Where a risk event occurs during a monitoring period, the project holder shall assess whether the event affects waste eligibility, baseline emissions, project emissions, leakage emissions, uncertainty, monitoring data, chain of custody, or net emission reductions. The project holder shall document the event, quantify any resulting emissions or deductions, apply conservative adjustments where necessary, and report the event in the monitoring report.

Where eligible biodegradable waste, residual waste, digestate, compost residues, stabilized biomass, RDF, SRF, or comparable outputs are stored, transferred, exported, used, treated, or disposed of after initial processing, the project holder shall monitor and document their final fate to the extent necessary to prevent unaccounted methane emissions and double counting. If final fate cannot be demonstrated, the project holder shall apply conservative assumptions, including quantification of methane emissions from anaerobic storage or disposal, or other conservative deductions required by this methodology and the applicable BioCarbon Tools.

Emission reductions shall not be issued for waste quantities, waste fractions, treatment outputs, or monitoring periods for which the project holder cannot demonstrate eligibility, traceability, final fate, and conservative quantification. Where uncertainty, missing data, operational incidents, or monitoring gaps affect the calculation, the project holder shall apply the BioCarbon Conservative Approach and Uncertainty Management Tool.

The project holder shall notify the CAB and BioCarbon of any material event that may affect the validity or quantification of emission reductions, including material operational failure, significant diversion of waste from the validated treatment route, loss of critical monitoring data, material discrepancy in mass balance, uncontrolled anaerobic storage, disposal of residual biodegradable waste, failure of methane capture or treatment systems, or evidence of double counting or double claiming.

The CAB shall assess the implementation of the risk management plan during validation and verification. The CAB shall confirm whether risk events have been identified, documented, quantified, deducted, and reported conservatively. Where unresolved risks or material data gaps remain, the CAB shall not verify emission reductions affected by such risks unless conservative deductions fully address the risk of over-crediting.

Because this methodology does not quantify removals or stored carbon stocks, no permanence crediting period, long-term carbon stock monitoring, or reversal compensation mechanism applies solely on the basis of carbon storage. However, BioCarbon may require additional risk controls, buffer contributions, conservative deductions, or other measures where required by the BioCarbon Standard, applicable BioCarbon Tools, host-country requirements, or specific project circumstances.

The project holder shall retain all risk management records, incident logs, corrective action records, mass balance reconciliations, final fate evidence, monitoring data, and supporting documentation for the period required by the BioCarbon Standard and the applicable BioCarbon Tools.

18 Document status

This document is a methodological document under the BioCarbon Standard.

This methodology establishes requirements for the quantification, monitoring, reporting, and verification of greenhouse gas emission reductions from avoided methane emissions resulting from the diversion and alternative treatment of eligible biodegradable solid waste that would otherwise have been disposed of in solid waste disposal sites.

This document is issued as a draft for public consultation. It is not yet an approved methodology and shall not be used for project registration, validation, verification, or issuance of Verified Carbon Credits unless and until it is formally approved and published by BioCarbon.

Comments received during the public consultation process may result in technical, methodological, editorial, structural, or normative changes to this document. BioCarbon may revise this methodology before approval to ensure consistency with the BioCarbon Standard, the applicable BioCarbon Tools, IPCC guidance, CDM methodological tools, and other applicable methodological or programmatic requirements.

The final approved version of this methodology shall indicate its effective date, version number, document status, and any applicable transition rules.

19 Bibliographic References

BioCarbon Cert. BioCarbon Standard. Latest version in force.

BioCarbon Cert. Standard Operating Procedures. Latest version in force.

BioCarbon Cert. Validation and Verification Manual. Latest version in force.

BioCarbon Cert. Baseline and Additionality Tool. Latest version in force.

BioCarbon Cert. Monitoring, Reporting and Verification Tool. Latest version in force.

BioCarbon Cert. Leakage Management Tool. Latest version in force.

BioCarbon Cert. Conservative Approach and Uncertainty Management Tool. Latest version in force.

BioCarbon Cert. Permanence and Risk Management Tool. Latest version in force.

BioCarbon Cert. Avoiding Double Counting Tool. Latest version in force.

BioCarbon Cert. Sustainable Development Safeguards Tool. Latest version in force.

BioCarbon Cert. Sustainable Development Goals Contribution Tool. Latest version in force.

Intergovernmental Panel on Climate Change (IPCC). 2000. Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. Chapter 5: Waste.

Intergovernmental Panel on Climate Change (IPCC). 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 1: General Guidance and Reporting.

Intergovernmental Panel on Climate Change (IPCC). 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 5: Waste.

Intergovernmental Panel on Climate Change (IPCC). 2019. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 5: Waste. The 2019 Refinement includes updated waste-sector guidance, including solid waste disposal, incineration/open burning and wastewater treatment chapters.

Intergovernmental Panel on Climate Change (IPCC). 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Annex VII: Glossary. IPCC AR6 recognizes the use of GWP100 values from AR5 or subsequent IPCC assessment reports under the Paris Rulebook context.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL04: Emissions from solid waste disposal sites. Version 08.1. TOOL04 covers emissions from solid waste disposed of, or prevented from disposal, in a SWDS.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion. Version 03. TOOL03 is the active CDM tool for fossil fuel combustion emissions.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation. Version 03.0.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL12: Project and leakage emissions from transportation of freight.

Version 01.1.0. TOOL12 provides options based on monitored fuel consumption or conservative default values for freight transport.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL13: Project and leakage emissions from composting. Version 02.0.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL14: Project and leakage emissions from anaerobic digesters. Version 03.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. CDM TOOL06: Project emissions from flaring. Version 04.0. This is relevant where biogas or methane-containing residual gas is flared under the project activity.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. ACM0022: Alternative waste treatment processes. Latest approved version.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. AM0025: Alternative waste treatment processes. Latest approved version, where relevant as methodological background.

United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. AMS-III.E: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment. Latest approved version.

Document history

Type of document. Methodological Document. Waste handling and disposal. Avoided Methane Emissions from the Diversion and Alternative Treatment of Biodegradable Solid Waste from Solid Waste Disposal Sites.

Version	Date	Description
Draft for Public Consultation	August 13, 2026	Initial draft version submitted for public consultation. This document establishes proposed methodological requirements for quantifying avoided methane emissions from eligible biodegradable solid waste diverted from solid waste disposal sites and treated through eligible alternative waste management routes.