



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 ₂ e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
DOC	Degradable Organic Carbon
DOC _f	Fraction of Degradable Organic Carbon that Decomposes
EF	Emission Factor
FOD	First Order Decay
GHG	Greenhouse gas
GWP	Global Warming Potential
GWP ₁₀₀	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 ₂ O	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 ₂ e	Metric tonne of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VCC	Verified Carbon Credit

1 Introduction

The disposal of biodegradable waste in solid waste disposal sites (SWDS) is an important source of anthropogenic methane emissions. Under anaerobic conditions, degradable organic carbon contained in waste is progressively converted into methane, with emissions occurring over extended periods after disposal. The magnitude and timing of these emissions depend on waste composition, disposal conditions, climatic factors and the management characteristics of the disposal site.

Avoiding or reducing the continued disposal of biodegradable waste in SWDS can reduce these emissions where the waste is diverted before disposal or recovered after disposal and subjected to alternative treatment or recovery pathways that result in lower net greenhouse gas emissions. Such activities may include biological treatment, material recovery and processing, production of refuse-derived or solid recovered fuels, and other eligible treatment routes meeting the applicability conditions of this methodology.

BCR0018 provides the methodological framework for quantifying greenhouse gas emission reductions resulting from the diversion and alternative treatment of eligible biodegradable waste that would otherwise be disposed of or remain disposed of in a SWDS. The methodology establishes requirements for determining the baseline scenario, quantifying methane emissions that would have occurred in the absence of the project activity, accounting for project and leakage emissions, and monitoring the waste quantities, characteristics and treatment pathways relevant to the quantified mitigation outcome.

The methodology applies a mass-balance and traceability approach to ensure that emission reductions are attributed only to eligible waste quantities that are demonstrably diverted from the baseline disposal pathway or, where landfill mining is applied, excavated from an identifiable SWDS disposal area and subjected to an eligible treatment route. Where recovered materials, intermediate products or waste-derived fuels are subsequently used under another eligible mitigation activity, the applicable boundaries and accounting shall prevent overlap or double counting of the same greenhouse gas benefit.

BCR0018 shall be applied together with the applicable BioCarbon Standard and the BioCarbon tools and procedures identified in this methodology.

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 disposal in solid waste disposal sites (SWDS), or recover eligible biodegradable waste already disposed of in a SWDS through landfill mining, and subject such waste to eligible alternative waste management routes.

This methodology establishes the requirements and procedures to:

- (a) determine the eligibility of activities that divert biodegradable solid waste from disposal in SWDS or recover eligible biodegradable waste already disposed of in a SWDS;
- (b) quantify avoided methane emissions using the applicable FOD approach and account for material project and leakage emissions;
- (c) establish the data, monitoring, traceability, and QA/QC requirements necessary for conservative and independently verifiable quantification; and
- (d) prevent over-crediting and double counting, including where this methodology is applied together with another BioCarbon-approved methodology.

3 Scope

This methodology applies to GHG emission reduction project activities that:

- (a) divert eligible biodegradable solid waste from disposal in a SWDS; or
- (b) recover eligible biodegradable solid waste already disposed of in a SWDS through landfill mining, where the activity prevents future methane emissions from the remaining biodegradable fraction;

and subject such waste to eligible alternative treatment routes in accordance with this methodology.

Eligible waste streams may include 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 managed as solid waste, subject to the applicability conditions in Section 5.

For landfill mining activities, eligibility is limited to previously disposed non-hazardous waste containing a biodegradable fraction with remaining methane generation potential. Recovery of previously disposed material solely for the recovery of inert materials, metals, plastics, landfill space, soil or other non-methane mitigation purposes does not generate emission reductions under this methodology.

This methodology quantifies avoided methane emissions from eligible biodegradable waste that would otherwise have been disposed of or remained disposed of in a SWDS, together with applicable project emissions, leakage emissions and conservative adjustments. It does not quantify carbon dioxide removals, carbon storage, long-term sequestration, electricity or heat generation benefits, or emission reductions from downstream fossil fuel substitution.

Where another mitigation outcome results from the treatment or downstream use of diverted waste or project outputs, that outcome shall be quantified separately under an applicable BioCarbon-approved methodology.

The methodology is globally applicable subject to the BioCarbon Standard and applicable legal and regulatory requirements.

4 Version

This document constitutes Version 1.0 of the methodology Avoided Methane Emissions from the Diversion and Alternative Treatment of Biodegradable Solid Waste from Solid Waste Disposal Sites.

The applicable version of this methodology shall be determined in accordance with the BioCarbon Standard, the Standard Operating Procedures, and any applicable transition provisions 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 where all of the following conditions are met:

- (a) the project activity diverts eligible biodegradable solid waste from disposal in a SWDS or recovers eligible biodegradable solid waste already disposed of in a SWDS through landfill mining, and subjects it to an eligible treatment route within the scope of this methodology;
- (b) the waste is non-hazardous solid waste containing a biodegradable organic fraction capable of generating methane under baseline SWDS conditions;
- (c) emission reductions are claimed only for the eligible biodegradable fraction of the waste;
- (d) the project holder demonstrates that, in the absence of the project activity, the eligible biodegradable waste would have been disposed of or would have remained disposed of in a SWDS, with or without methane recovery, as applicable;
- (e) the baseline SWDS, or the relevant disposal area or waste mass in the case of landfill mining, is identified or conservatively characterized to the extent required for baseline quantification;
- (f) the project activity does not divert waste from recycling, reuse, material recovery, composting, anaerobic digestion, or another treatment route that would have occurred in the baseline scenario;
- (g) the diversion or treatment of the eligible waste is not required by an enforced legal, regulatory, judicial, administrative, permitting, or equivalent mandatory requirement; and
- (h) the project activity complies with applicable legal and regulatory requirements.

For project activities involving landfill mining, the following additional conditions shall apply:

- (a) the excavated waste shall originate from an identifiable SWDS, disposal area, cell, lift, or other defined waste mass, and the age of the waste relevant to baseline

- quantification shall be determined or conservatively estimated in accordance with the requirements of this methodology;
- (b) only the eligible biodegradable fraction with remaining methane generation potential may contribute to baseline emission reductions;
 - (c) emission reductions shall be calculated only for methane emissions that would have occurred after the waste is excavated under the project activity; methane generated or emitted before excavation shall not be credited;
 - (d) baseline methane recovery, destruction, utilization and oxidation that would have occurred in the absence of the project activity shall be accounted for;
 - (e) the project holder shall establish traceability and mass balance from excavation through separation, treatment, recovery, storage and final fate of the excavated material and resulting fractions; and
 - (f) the same waste mass and methane mitigation outcome shall not be credited under this methodology and any landfill gas recovery, destruction, aeration, remediation or other methane mitigation activity for the same period.

6 Methodology type and modular architecture

BCR0018 is a modular methodology for GHG emission reductions in the waste handling and disposal sector. Eligible treatment pathways may be applied independently or in combination, subject to the applicable eligibility, quantification and monitoring requirements of this methodology.

The methodology provides a common framework for baseline determination, avoided methane quantification, project emissions, leakage, uncertainty, monitoring, mass balance and chain of custody. Specific requirements apply according to the waste stream and treatment pathway implemented, including, where applicable, landfill mining of previously disposed biodegradable waste.

BCR0018 shall be applied together with the BioCarbon Standard and the applicable BioCarbon Tools. Sector-specific requirements contained in this methodology complement and do not replace applicable program-level requirements.

The following BioCarbon Tools shall be applied according to their scope and the characteristics and risks 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, where applicable;

(f) Avoiding Double Counting Tool;

(g) Sustainable Development Safeguards Tool; and

(h) Sustainable Development Goals Contribution Tool.

6.1 Application with other methodologies

BCR0018 may be applied together with another BioCarbon-approved methodology where each methodology quantifies a distinct mitigation outcome. Multi-methodology application, attribution of shared emission sources and prevention of double counting shall be addressed in accordance with Section 13.8 and the applicable BioCarbon requirements.

Downstream mitigation outcomes not quantified under BCR0018 shall be quantified only under the applicable separate methodology.

7 Normative references / Methodological basis

BCR0018 shall be applied within the BioCarbon normative framework identified in Section 6. The following external methodological sources provide the technical basis for the quantification and treatment-specific procedures incorporated into this methodology:

7.1 External methodological basis

This methodology draws on 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 AMS-III.A.F: Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (MSW), as methodological basis for activities involving excavation and treatment of previously disposed biodegradable waste;
- (f) CDM ACM0022: Alternative waste treatment processes;
- (g) CDM TOOL03: Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion;
- (h) CDM TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation;
- (i) CDM TOOL12: Project and leakage emissions from transportation of freight;
- (j) CDM TOOL13: Project and leakage emissions from composting;
- (k) CDM TOOL14: Project and leakage emissions from anaerobic digesters;
- (l) CDM TOOL06: Project emissions from flaring, where relevant to biogas or methane-containing gas flaring under the project activity; and

- (m)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.

External methodological sources do not override BioCarbon requirements. In the event of an inconsistency, the applicable BioCarbon normative framework and this methodology shall prevail.

8 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 or continued disposal in a SWDS 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.

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 the first auditable point of collection, aggregation or receipt, as applicable, 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.

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.

Landfill mining

The controlled excavation, recovery and separation of waste previously disposed of in a SWDS for subsequent eligible treatment, recovery or valorization. For the purpose of this methodology, landfill mining is eligible only where the activity results in quantifiable avoidance of future methane emissions from the remaining biodegradable fraction of the excavated waste.

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.

Previously disposed waste

Solid waste that was placed in a SWDS before implementation of the project activity and remains within the disposal site at the time of excavation or recovery.

Project activity

The activity implemented by the project holder to divert eligible biodegradable solid waste from disposal in a SWDS or, where applicable, recover eligible biodegradable waste already

disposed of in a SWDS through landfill mining, and subject such waste to an eligible alternative treatment route.

Project boundary

The physical and operational boundary within which the relevant baseline, project and leakage emission sources are identified and accounted for under this methodology.

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 determination of the composition and other properties of a waste stream or waste mass that are relevant to eligibility, quantification or monitoring under this methodology.

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.

9 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, excavated or transferred before treatment, as applicable.
Baseline SWDS	Yes	SWDS where eligible biodegradable solid waste would have been disposed of or would have remained disposed of in the baseline scenario. For landfill mining activities, this includes the relevant disposal area, cell, lift or defined waste mass from which waste is excavated.
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.

Component	Included in the project boundary	Explanation / Justification
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 temporal boundary shall cover each monitoring period for which emission reductions are quantified and the time-dependent methane generation relevant to the baseline waste. For landfill mining, only methane emissions that would have occurred after excavation of the relevant waste mass may be credited.

The GHG accounting boundary shall include baseline methane emissions, material project and leakage emissions attributable to the project activity, and any conservative adjustments required under this methodology and the applicable BioCarbon Tools.

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 or remaining disposed of in the baseline SWDS	CH ₄	Yes	Main baseline emission source. For landfill mining, only methane emissions that would have occurred after excavation of the relevant waste mass are eligible.
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,

Scenario	Source	GHG	Included?	Justification / treatment
				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.
Baseline	N ₂ O from SWDS	N ₂ O	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 from excavation and other project operations	CO ₂	Yes, where applicable	Included where attributable to project operations.
Project	Fossil fuel or auxiliary fuel consumption from excavation and other project operations	CO ₂	Yes, where applicable	Included where attributable to project operations.
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 attributable to project operations.
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 CH ₄ or N ₂ O emissions are material and attributable to the project activity.
Project	Composting, co-composting, digestate management, compost residues, residual organic material, wastewater, leachate, runoff, or liquid residue management	N ₂ O	Yes, where applicable	Included where CH ₄ or N ₂ O emissions are material and attributable to the project activity.
Project	Disposal of residual biodegradable waste, rejects, treatment residues,	CH ₄	Yes, where applicable	Included where residual biodegradable material generated by the project activity or resulting

Scenario	Source	GHG	Included?	Justification / treatment
	digestate, compost residues, sludge, or other residual organic material in a SWDS			from landfill mining 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 excluded only where immaterial or conservative and properly justified.
Project	Combustion, gasification, pyrolysis, oxidation, or thermal treatment within the project boundary	N ₂ O	Yes, where applicable	Included where N ₂ O emissions arise from combustion, gasification, pyrolysis, oxidation, or other thermal treatment within the project boundary. 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 ₂ O	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.

Scenario	Source	GHG	Included?	Justification / treatment
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 ₂ O	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 ₂ O	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 attributable to the project activity	CO ₂	Yes, where applicable	Included where additional or incremental transport outside the project boundary is caused by the 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 ₂ O	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 ₂ O	Yes, where applicable	Included where residual biodegradable material is disposed of in a SWDS or otherwise generates methane.
Leakage	Exported RDF, SRF, stabilized biomass, or comparable waste-derived outputs with documented or undocumented final fate	CO ₂ , CH ₄ , N ₂ O	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.

Emission sources may be excluded only where permitted by this methodology or the applicable BioCarbon Tools and where their exclusion is demonstrated to be immaterial or conservative.

10 Project activities

Project activities under this methodology consist of the diversion of eligible biodegradable solid waste from disposal in a SWDS or the recovery of eligible biodegradable waste already disposed of in a SWDS through landfill mining, followed by an eligible alternative treatment, processing, stabilization, recovery or valorization 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) landfill mining involving the controlled excavation, recovery and separation of previously disposed waste containing an eligible biodegradable fraction with remaining methane generation potential;
- (c) mechanical treatment, including shredding, screening, size reduction, separation of inerts, removal of recyclable materials, moisture control, or preparation of waste for subsequent treatment;
- (d) biological treatment of eligible biodegradable solid waste, including composting, aerobic stabilization, anaerobic digestion with appropriate methane capture and treatment, or mechanical-biological treatment;
- (e) drying, conditioning, densification, blending, or stabilization of eligible biodegradable solid waste or residual biodegradable fractions to prevent or materially reduce anaerobic decomposition;
- (f) production of refuse-derived fuel, solid recovered fuel, stabilized biomass, or comparable waste-derived products from waste containing eligible biodegradable fractions, provided that emission reductions under this methodology are limited to avoided methane emissions attributable to the eligible biodegradable fraction;
- (g) 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;
- (h) 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 emissions from eligible biodegradable solid waste that would otherwise have been disposed of or remained 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 or landfill remediation activities that do not involve eligible landfill mining and subsequent treatment in accordance with 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 recycling or reuse, manipulate waste composition or routing, or otherwise increase credited emission reductions artificially. Material changes affecting eligibility, additionality, baseline validity or quantification shall be documented and assessed.

11 Additionality

The project holder shall demonstrate additionality in accordance with the applicable BioCarbon Baseline and Additionality Tool (BAT), the BioCarbon Standard, and any other applicable BioCarbon requirements.

For activities under this methodology, additionality shall include demonstration that, in the absence of the project activity, the eligible biodegradable waste would have been disposed of or would have remained disposed of in a SWDS and would have generated methane emissions.

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.

For landfill mining activities, the project holder shall additionally demonstrate that excavation, recovery or treatment of the relevant previously disposed waste is not required under an enforceable landfill closure, remediation, rehabilitation, capacity-restoration or other applicable obligation.

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 applied, all material revenues and economic benefits attributable to the project activity, including tipping or gate fees and revenues from recovered materials, compost, biogas, biomethane, RDF, SRF or other project outputs, shall be included in accordance with the BAT.

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.

Where common practice is assessed, the geographic and sectoral scope shall be representative of the waste stream, baseline management practice and project activity. For waste transported across jurisdictions, the relevant scope shall be determined on the basis of the market and waste-management conditions that materially influence the baseline and project activity and shall not be defined solely by the location of the treatment facility.

Additionality shall be reassessed where required by the BAT and the applicable BioCarbon rules.

Where BCR0018 is applied together with another BioCarbon-approved methodology, additionality shall be addressed for each distinct mitigation outcome in accordance with the applicable BioCarbon requirements.

12 Baseline scenario

The baseline scenario shall be identified in accordance with the applicable BioCarbon Baseline and Additionality Tool, the BioCarbon Standard and this methodology.

For waste diverted before disposal, the baseline scenario shall represent the credible management of the eligible biodegradable waste in the absence of the project activity and, where SWDS disposal is selected, the disposal conditions relevant to methane generation.

For landfill mining, the baseline scenario shall be the continued presence and degradation of the relevant previously disposed waste in the SWDS in the absence of excavation, taking into account applicable methane recovery, destruction or utilization and oxidation. Only methane emissions that would have occurred after excavation under the project activity may form part of the baseline.

The selected baseline scenario shall be supported by verifiable evidence and shall not overestimate baseline methane emissions.

For waste transferred across national or jurisdictional boundaries, the baseline scenario shall reflect the credible fate of the relevant waste stream in the absence of the project activity and shall not be determined solely by the location of the project treatment facility. The Project Holder shall consider the applicable waste-management practices, legal requirements and disposal conditions governing the counterfactual management of the waste. Import/export records, contracts, manifests, customs documentation, historical routing records and other independently verifiable evidence may be used to substantiate the baseline fate.

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 SWDS disposal or continued disposal is the baseline, the relevant SWDS conditions shall be identified or conservatively characterized to the extent required for quantification, including, as applicable, site type and management conditions, methane recovery or destruction, oxidation conditions and other parameters required by the FOD approach.

Where site-specific information is unavailable or incomplete, representative national, regional or jurisdictional data, or applicable conservative IPCC or other approved default values, may be used in accordance with the BioCarbon Conservative Approach and Uncertainty Management Tool.

Baseline methane emissions shall be estimated only for the eligible biodegradable fraction of waste that would have been disposed of or remained disposed of in the SWDS. Non-biodegradable, inert and fossil-derived fractions shall not generate avoided methane emission reductions under this methodology.

The baseline scenario shall consider 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 where required by the BAT and the applicable BioCarbon rules.

13 Quantification of GHG emission reductions

13.1 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, in the absence of the project activity, would have been disposed of in a solid waste disposal site (SWDS) or would have remained disposed of and continued to generate methane in a 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 TOOLo4 “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 TOOLo3 “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”, CDM TOOLo5 “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 $GWPC_{CH_4}=27.0$. Nitrous oxide emissions shall use $GWP_{N_2O}=273$. Carbon dioxide shall use $GWPC_{CO_2}=1$. 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.

13.2 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
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Where:

ER_y	=	Net GHG emission reductions in year y (tCO ₂ e)
BE_y	=	Baseline emissions in year y (tCO ₂ e)
PE_y	=	Project emissions in year y (tCO ₂ e)
LE_y	=	Leakage emissions in year y (tCO ₂ e)
CA_y	=	Conservative adjustment in year y required to address uncertainty, data gaps, model uncertainty, or other conservative deductions (tCO ₂ e)

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

13.3 Baseline emissions

Baseline emissions under this methodology shall consist of methane emissions that would have occurred from eligible biodegradable solid waste that, in the absence of the project activity, would have been disposed of in a SWDS or would have remained disposed of in a SWDS and continued to generate methane.

For waste diverted before disposal, baseline emissions shall be determined in accordance with Sections 13.3.1 to 13.3.3. For previously disposed waste recovered through landfill mining, baseline emissions shall be determined in accordance with Section 13.3.4.

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.

13.3.1 Baseline emissions from waste diverted before disposal

For eligible biodegradable waste diverted before disposal in a SWDS, baseline emissions shall be calculated using the applicable annual or monthly FOD approach in Sections 13.3.2 and 13.3.3.

13.3.2 Annual FOD calculation

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

$BE_{CH_4,SWDS,y} = \phi_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_y) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_j \sum_{x=1}^y [W_{j,x} DOC_j e^{-k_j(y-x)} (1 - e^{-k_j})]$	Equation 2
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Where:

$BE_{CH_4,SWDS,y}$	=	Baseline methane emissions in year y from eligible biodegradable solid waste prevented from disposal in a SWDS (tCO ₂ e/year)
ϕ_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, GWPC _H ₄ =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 diverted from disposal in the baseline SWDS in year x; ton

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.

13.3.3 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:

$BE_{CH_4,SWDS,m} = \phi_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_Y) \times \frac{16}{12} \times F \times DOC_{f,m}$ $\times MCF_y \times \sum_j \sum_{i=1}^m \left[W_{j,i} DOC_j e^{-\frac{k_j}{12}(m-i)} \left(1 - e^{-\frac{k_j}{12}} \right) \right]$	Equation 3
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Where:

$BE_{CH_4,SWDS,m}$	=	Baseline methane emissions in month m from eligible biodegradable solid waste prevented from disposal in a SWDS; $\text{tCO}_2\text{e/month}$
ϕ_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, $GWP_{CH_4}=27.0$, 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 diverted from disposal in the baseline SWDS in month i; ton
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.

13.3.4 Baseline emissions from landfill mining

For landfill mining activities, baseline emissions shall represent the methane emissions that would have occurred after excavation from the eligible biodegradable fraction of previously disposed waste if that waste had remained in the baseline SWDS.

Methane generated or emitted before excavation shall not be included. The calculation shall account for the age of the excavated waste, the applicable SWDS conditions, baseline methane recovery or destruction, and oxidation.

Where the age or age distribution of the excavated waste can be determined or conservatively estimated, annual baseline methane emissions shall be calculated using the FOD approach as follows:

$BE_{CH_4,LM,y} = \phi_y(1 - f_y)GWP_{CH_4}(1 - OX)\frac{16}{12}FDOC_{f,j}MCF_y \sum_j \sum_{x=1}^y [W_{LM,j,x}DOC_j e^{-k_j(a_{j,x}+y-x)}(1 - e^{-k_j})]$	Equation 4
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Where:

$BE_{CH_4,LM,y}$	=	baseline methane emissions in year y attributable to eligible biodegradable waste excavated through landfill mining; tCO ₂ e/year
$W_{LM,j,x}$	=	amount of eligible biodegradable waste type j excavated and subjected to an eligible treatment route in year x ; ton
$a_{j,x}$	=	age of waste type j at the time of excavation in year x ; years

All other parameters are as defined in Section 13.3.2.

For Equation 4, $y \geq x$. The parameter $a_{j,x}$ represents the age of the relevant waste mass at the time of excavation in year x . The term $y - x$ represents the elapsed time after excavation for which counterfactual methane generation is estimated.

The age of excavated waste shall be determined using the best available verifiable evidence, which may include disposal records, cell or lift construction records, topographic or volumetric modelling, historical operating records, or other evidence capable of associating the excavated waste mass with its disposal period.

Where waste of different ages is mixed and a discrete age distribution cannot reasonably be established, a conservative weighted mean age may be used. Where yearly disposal quantities are available, the weighted mean age shall be determined from those quantities. Where such information is unavailable, another conservative estimate may be applied where justified and subject to the BioCarbon Conservative Approach and Uncertainty Management Tool.

Where a reliable age distribution of the excavated waste is available and materially improves the accuracy of baseline quantification, the calculation shall be performed by age cohort. Otherwise, a conservative weighted mean age may be used.

13.3.5 Determination of waste quantities by waste type

Where different waste types j are present in the eligible waste stream, the quantity of each eligible biodegradable waste type shall be determined using representative and verifiable information appropriate to the characteristics of the waste stream. Such information may include direct sorting or characterization, representative sampling, composition studies, laboratory results, mass balance, operational records, or conservative documented estimates, as applicable.

For landfill mining, characterization shall reflect the composition of the excavated waste relevant to the credited waste mass and shall distinguish, to the extent necessary for quantification, eligible biodegradable material from inert, non-biodegradable, fossil-derived, recyclable, and other ineligible fractions.

For landfill mining, the quantity of each eligible biodegradable waste type j excavated in year x shall be determined as follows:

$W_{LM,j,x} = W_{LM,x} \times p_{LM,j,x}$	Equation 5
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Where:

$W_{LM,j,x}$	=	Amount of eligible biodegradable waste type j excavated and subjected to an eligible treatment route in year $x(t)$
$W_{LM,x}$	=	Total waste mass excavated through landfill mining in year $x(t)$
$p_{LM,j,x}$	=	Representative fraction of eligible biodegradable waste type j in the excavated waste mass in year x (dimensionless)

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 6
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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 7
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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 $p_{j,x}$ and $p_{j,i}$ 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.

13.3.6 Determination of average waste fractions from samples

For waste diverted before disposal, where representative sampling is used to determine waste composition, the average fraction of each eligible biodegradable waste type j shall be calculated as follows:

$p_{j,x} = \frac{\sum_{n=1}^{Z_x} p_{n,j,x}}{Z_x}$	Equation 8
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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 9
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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

For landfill mining, representative composition may be determined for the relevant excavated waste mass, disposal area, cell, lift, age cohort or other representative sampling stratum. The averaging period or sampling unit shall correspond to the waste mass used in Equation 4.

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.

13.3.7 Determination of DOC for bulk waste

For waste diverted before disposal, where bulk waste is used and waste composition data are available, the degradable organic carbon content of the bulk waste shall be calculated as follows:

$DOC_x = \sum_j (DOC_j \times p_{j,x})$	Equation 10
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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
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For landfill mining, bulk-waste DOC shall be determined using the representative composition of the excavated waste mass or applicable age cohort and the corresponding DOC_j values.

For monthly calculations:

$DOC_i = \sum_j (DOC_j \times p_{j,i})$	Equation 11
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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.

13.3.8 Determination of DOC_f using BMP

Where the project holder elects to determine DOC_f using biochemical methane potential (BMP) measurements, DOC_f shall be determined consistently with CDM TOOLo4 and applicable IPCC-based assumptions.

For landfill mining, BMP measurements may be used, where appropriate, to characterize the remaining methane generation potential of the excavated biodegradable waste. BMP testing is not mandatory where the applicable FOD parameters can be determined conservatively using other methods permitted under this methodology.

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

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

$DOC_{f,y}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in year y
BMP_{MSW}	=	Biochemical methane potential of the relevant municipal solid waste or mixed waste (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 DOC_f 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 13
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Where:

$DOC_{f,m}$	=	Fraction of degradable organic carbon that decomposes under SWDS conditions in month m
BMP_{MSW}	=	Biochemical methane potential of relevant residual waste type j (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, DOC_f 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 14
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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 relevant residual waste type j (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

Where BMP measurements are used, testing shall be performed using recognized national or international standards, representative samples, and documented laboratory QA/QC procedures. Where DOC_f is not determined using BMP measurements, or where available BMP measurements are not sufficiently representative, DOC_f shall be determined using conservative values or other methods permitted under CDM TOOLo4 and applicable IPCC guidance, subject to the BioCarbon Conservative Approach and Uncertainty Management Tool.

13.3.9 Determination of methane correction factor

Where the baseline SWDS does not have a water table above the bottom of the SWDS, MCF_y shall be selected based on the type and management conditions of the SWDS, using conservative IPCC or CDM TOOLo4 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, MCF_y shall be calculated as follows:

$MCF_y = \max \left\{ 1 - \frac{2}{d_y}, \frac{h_{w,y}}{d_y} \right\}$	Equation 15
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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 MCF_y are unavailable, incomplete, or not verifiable, the project holder shall apply the most conservative applicable MCF value.

13.3.10 Determination of model correction factor

The model correction factor ϕ_y shall account for model and parameter uncertainty in the FOD model and shall be determined in accordance with CDM TOOLo4. For baseline emissions, the project holder may apply the applicable default value provided by TOOLo4 or determine a project-specific value as set out below. The BioCarbon Conservative Approach and Uncertainty Management Tool shall apply to uncertainty matters not specifically addressed by this procedure.

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 16
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Where:

V_y	=	Overall uncertainty of methane generation in year y
a	=	Effect of uncertainty in waste quantity
b	=	Effect of uncertainty in DOC_f

c	=	Effect of uncertainty in DOC_f
d	=	Effect of uncertainty in F
e	=	Effect of uncertainty in MCF _y
g	=	Effect of uncertainty in the exponential decay term

The values of a , b , c , d , e , and g shall be selected and justified in accordance with CDM TOOLo₄

The model correction factor shall then be calculated as follows:

$\phi_y = \frac{1}{1 + V_y}$	Equation 17
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Where:

ϕ_y	=	Model correction factor in year y
V_y	=	Overall uncertainty of methane generation in year y

Where a project-specific value is not determined in accordance with this section, the applicable default value for ϕ_y provided by CDM TOOLo₄ shall be used.

13.4 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.

13.4.1 General project emissions equation

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

$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{TR,y} + PE_{COMP,y} + PE_{AD,y} + PE_{COMB,y} + PE_{WW,y} + PE_{RW,y} + PE_{OTHER,y}$	Equation 18
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Where:

PE_y	=	Project emissions in year y (tCO ₂ e)
$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO ₂ e)
$PE_{FC,y}$	=	Project emissions from fossil fuel or auxiliary fuel consumption in year y (tCO ₂ e)
$PE_{TR,y}$	=	Project emissions from transportation in year y (tCO ₂ e)
$PE_{COMP,y}$	=	Project emissions from composting or co-composting in year y (tCO ₂ e)
$PE_{AD,y}$	=	Project emissions from anaerobic digestion in year y (tCO ₂ e)
$PE_{COMB,y}$	=	Project emissions from combustion or thermal treatment of fossil-derived waste fractions within the project boundary in year y (tCO ₂ e)
$PE_{WW,y}$	=	Project emissions from wastewater, leachate, runoff, or liquid residue management in year y (tCO ₂ e)
$PE_{RW,y}$	=	Project emissions from residual waste or treatment residues in year y (tCO ₂ e)
$PE_{OTHER,y}$		Other material project emissions in year y (tCO ₂ e)

Each project emission source shall be accounted for only once. Where electricity, fossil fuel, transport, wastewater or leachate, residual waste, thermal treatment, or another emission source is quantified under a dedicated subsection of Section 13.4, the same emissions shall not be included again within a treatment-specific project emission term. Shared emission sources shall be allocated consistently and without omission or double counting.

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.

13.4.2 Project emissions from electricity consumption

Project emissions from electricity consumption shall be calculated in accordance with applicable BioCarbon requirements and, where relevant, CDM TOOLo5.

$PE_{EC,y} = \sum_s (EC_{s,y} \times EF_{EL,s,y})$	Equation 19
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Where:

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO ₂ e)
$EC_{s,y}$	=	Electricity consumed from source s in year y (MWh)
$EF_{EL,s,y}$	=	Emission factor for electricity source s in year y (tCO ₂ e/MWh)
s	=	Electricity source

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

13.4.3 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 TOOLo3.

$PE_{FC,y} = \sum_i \sum_s (FC_{i,s,y} \times NCV_{i,y} \times EF_{CO_2,i,y})$	Equation 20
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Where:

$PE_{FC,y}$	=	Project emissions from fossil fuel or auxiliary fuel consumption in year y (tCO ₂ e)
$FC_{i,s,y}$	=	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

Fuel consumption shall include, as applicable, fuel used for excavation, material handling, sorting, processing, treatment, stabilization, pumping, on-site mobile equipment, and other project operations.

Where CH₄ or N₂O 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.

13.4.4 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:

$PE_{TR,y} = \sum_i \sum_f (FC_{i,f,y} \times NCV_{i,y} \times EF_{CO_2,i,y})$	Equation 21
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Where:

$PE_{TR,y}$	=	Project emissions from transportation in year y (tCO ₂ e)
$FC_{i,f,y}$	=	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:

$PE_{TR,y} = \sum_f (D_{f,y} \times FR_{f,y} \times EF_{CO_2,f} \times 10^{-6})$	Equation 22
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Where:

$PE_{TR,y}$	=	Project emissions from transportation in year y (tCO ₂ e)
$D_{f,y}$	=	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.

13.4.5 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 23
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Where:

$PE_{COMP,y}$	=	Project emissions from composting or co-composting in year y (tCO ₂ e)
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$PE_{CH_4,COMP,y}$	=	Methane emissions from composting or co-composting in year y (tCO ₂ e)
$PE_{N_2O,COMP,y}$	=	Nitrous oxide emissions from composting or co-composting in year y (tCO ₂ e)
$PE_{EC,COMP,y}$	=	Emissions from electricity consumption associated with composting or co-composting in year y (tCO ₂ e)
$PE_{FC,COMP,y}$	=	Emissions from fossil fuel consumption associated with composting or co-composting in year y (tCO ₂ e)
$PE_{WW,COMP,y}$	=	Emissions from wastewater, leachate, runoff, or liquid residue management associated with composting or co-composting in year y (tCO ₂ e)

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.

13.4.6 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 24
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Where:

$PE_{AD,y}$	=	Project emissions associated with anaerobic digestion in year y (tCO ₂ e)
$PE_{EC,AD,y}$	=	Project emissions from electricity consumption associated with anaerobic digestion in year y (tCO ₂ e)
$PE_{FC,AD,y}$	=	Project emissions from fossil fuel consumption associated with anaerobic digestion in year y (tCO ₂ e)

$PE_{CH_4,AD,y}$	=	Methane emissions from anaerobic digesters, biogas handling, or methane leakage in year y (tCO ₂ e)
$PE_{flare,y}$	=	Project emissions from flaring of biogas in year y (tCO ₂ e)
$PE_{DIG,res,y}$	=	Project emissions from storage, treatment, composting, transport, use, or disposal of digestate or other anaerobic digestion residues in year y (tCO ₂ e)

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 25
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Where:

$PE_{CH_4,AD,y}$	=	Methane emissions from anaerobic digestion leakage in year y (tCO ₂ e)
$Q_{CH_4,AD,y}$	=	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, GWPC _{H4} =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 26
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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.

13.4.7 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 from waste diverted before disposal or recovered through landfill mining, project emissions from such production shall be calculated as follows:

$PE_{RDFS RF,y} = PE_{EC,RDFS RF,y} + PE_{FC,RDFS RF,y} + PE_{TR,RDFS RF,y} + PE_{WW,RDFS RF,y} + PE_{res,RDFS RF,y} + PE_{FCARB,RDFS RF,y}$	Equation 27
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Where:

$PE_{RDFS RF,y}$	=	Project emissions associated with RDF, SRF, stabilized biomass, or comparable waste-derived fuel production in year y (tCO ₂ e)
$PE_{EC,RDFS RF,y}$	=	Electricity-related emissions from production, handling, drying, conditioning, processing, or storage in year y (tCO ₂ e)
$PE_{FC,RDFS RF,y}$	=	Fossil fuel or auxiliary fuel emissions from production, handling, drying, conditioning, processing, or storage in year y (tCO ₂ e)
$PE_{TR,RDFS RF,y}$	=	Transport emissions associated with RDF/SRF production and delivery within the project boundary in year y (tCO ₂ e)
$PE_{WW,RDFS RF,y}$	=	Wastewater, leachate, runoff, or liquid residue emissions associated with RDF/SRF production in year y (tCO ₂ e)

$PE_{res,RDFS\text{SRF},y}$	=	Emissions from residual waste or residues generated by RDF/SRF production in year y (tCO ₂ e)
$PE_{FCARB,RDFS\text{SRF},y}$	=	Fossil carbon emissions from combustion, thermal treatment, or oxidation of fossil-derived fractions within the project boundary in year y (tCO ₂ e)

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.

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

Where waste, including waste recovered through landfill mining, or waste-derived fuel is combusted, gasified, pyrolyzed, oxidized, or thermally treated within the project boundary, fossil carbon emissions shall be quantified. CO₂ 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 CO₂ 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 28
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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 CO₂ 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 29
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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 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 CO₂ 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 30
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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, CH₄ and N₂O 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 31
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Where:

$PE_{COMB,CH_4,N_2O,c,y}$	=	Project emissions of CH ₄ and N ₂ O from combustion or thermal treatment in combustor or treatment unit c in year y (tCO ₂ e)
$SG_{c,y}$	=	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 ₂ O in stack gas from combustor or treatment unit c in year y (t N ₂ O/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, GWPCH ₄ =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, $GWP_{N_2O}=273$, unless another value is required by the BioCarbon Standard or an applicable accounting framework
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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 32
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Where:

$PE_{COMB,CH_4,N_2O,c,y}$	=	Project emissions of CH ₄ and N ₂ O from combustion or thermal treatment in combustor or treatment unit c in year y (tCO ₂ e)
$Q_{waste,c,y}$	=	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 ₂ O associated with treatment option t (t N ₂ O/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, $GWP_{CH_4}=27.0$, 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, $GWP_{N_2O}=273$, unless another value is required by the BioCarbon Standard or an applicable accounting framework

t	=	Treatment option
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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.

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

Where wastewater, leachate, runoff, or liquid residues generated by the project activity, including from landfill mining where applicable, 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 33
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Where:

$PE_{WW,y}$	=	Project methane emissions from wastewater, leachate, runoff, or liquid residues in year y (tCO ₂ e)
$Q_{WW,y}$	=	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, GWPCH ₄ =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 34
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Where:

$PE_{WW,y}$	=	Project methane emissions from wastewater, leachate, runoff, or liquid residues in year y after methane destruction, where applicable (tCO ₂ e)
$Q_{WW,y}$	=	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, $GWP_{CH_4}=27.0$, 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 ₂ e)

If the result of Equation 34 is negative, $PE_{WW,y}$ shall be set equal to zero.

13.4.10 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

or resulting from landfill mining is disposed of in a SWDS, methane emissions shall be calculated using the FOD approach, consistent with IPCC guidance and CDM TOOLo4.

$PE_{RW,y} = PE_{CH_4,RW,SWDS,y}$	Equation 35
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Where:

$PE_{RW,y}$	=	Project emissions from residual waste disposed of in a SWDS in year y (tCO ₂ e)
$PE_{CH_4,RW,SWDS,y}$	=	Methane emissions from residual biodegradable waste disposed of in a SWDS in year y (tCO ₂ e)

For annual calculations:

$PE_{CH_4,RW,SWDS,y} = \phi_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_y) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_j \sum_{x=1}^y [RW_{j,x} \times DOC_j \times e^{-k_j(y-x)} \times (1 - e^{-k_j})]$	Equation 36
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Where:

$PE_{CH_4,RW,SWDS,y}$	=	Methane emissions from residual biodegradable waste disposed of in a SWDS in year y (tCO ₂ e/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:

$PE_{CH_4,RW,SW DS,m}$ $= \phi_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX_y) \times \frac{16}{12} \times F \times DOC_{f,m}$ $\times MCF_y \times \sum_j \sum_{i=1}^m \left[RW_{j,i} \times DOC_j \times e^{-\frac{k_j}{12}(m-i)} \times \left(1 - e^{-\frac{K_J}{12}} \right) \right]$	Equation 37
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Where:

$PE_{CH_4,RW,SW DS,m}$	=	Methane emissions from residual biodegradable waste disposed of in a SWDS in month m (tCO ₂ e/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.

For landfill mining activities, excavated biodegradable waste that is subsequently returned to, or disposed of in, a SWDS shall not be treated as permanently diverted for the period during which it remains subject to methane generation under SWDS conditions. The corresponding methane emissions shall be accounted for as project emissions under this section, consistently with the mass balance and without double counting the same waste mass in baseline and project calculations.

Where the residual waste consists of previously disposed waste recovered through landfill mining, the parameters used for residual-waste methane quantification shall reflect its condition, age and remaining degradable organic carbon or methane generation potential at the time of redisposal, using the applicable procedures of Sections 13.3.4, 13.3.7 and 13.3.8, as applicable.

13.5 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.

13.5.1 General leakage emissions equation

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

$LE_y = LE_{REC,y} + LE_{DISP,y} + LE_{TR,y} + LE_{RDFS\text{SRF},y} + LE_{SUB,y} + LE_{OTHER,y}$	Equation 38
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Where:

LE_y	=	Total leakage emissions in year y (tCO ₂ e)
$LE_{REC,y}$	=	Leakage from diversion of waste from recycling, reuse, material recovery, composting, anaerobic digestion, or other existing higher-priority uses in year y (tCO ₂ e)
$LE_{DISP,y}$	=	Leakage from displacement of existing waste management, treatment, recovery, or disposal activities in year y (tCO ₂ e)
$LE_{TR,y}$	=	Leakage from transport outside the project boundary in year y (tCO ₂ e)
$LE_{RDFS\text{SRF},y}$	=	Leakage associated with RDF, SRF, stabilized biomass, or comparable waste-derived outputs in year y (tCO ₂ e)
$LE_{SUB,y}$	=	Leakage from substitute materials, fuels, or processes required because waste or recovered material is diverted to the project activity in year y (tCO ₂ e)
$LE_{OTHER,y}$	=	Other material leakage emissions in year y (tCO ₂ e)

For landfill mining activities, the project holder shall assess whether excavation, recovery or subsequent management of previously disposed waste causes material increases in emissions outside the project boundary, including through displacement of waste-management or disposal activities, additional transport, or management of excavated materials or residues outside the project boundary. Any such emissions shall be quantified under the applicable leakage category in Equation 38.

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.

13.5.2 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 auditable 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:

$LE_{RDFS\text{RF},y} = LE_{EN\ DU\ SE,RDF\ SRF,y} + LE_{SW\ DS,W\ BP,y}$	Equation 39
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Where:

$LE_{RDFS\text{RF},y}$	=	Leakage associated with RDF, SRF, stabilized biomass, or comparable waste-derived outputs in year y (tCO ₂ e)
$LE_{EN\ DU\ SE,RDF\ SRF,y}$	=	Leakage emissions associated with the end use or undocumented fate of RDF/SRF exported outside the project boundary in year y (tCO ₂ e)
$LE_{SW\ DS,W\ BP,y}$	=	Leakage emissions from disposal of biodegradable waste by-products associated with RDF/SRF production in a SWDS in year y (tCO ₂ e)

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:

$LE_{EN\ DU\ SE,RDFS\text{RF},y} = Q_{RDFS\text{RF},COM,y} \times NCV_{RDFS\text{RF},y} \times EF_{CO_2,RDFS\text{RF},y}$	Equation 40
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Where:

$LE_{EN\ DU\ SE, RDFS\ Rf, y}$	=	Leakage emissions associated with combustion of exported RDF/SRF in year y (tCO ₂ e)
$Q_{RDFS\ Rf, COM, y}$	=	Quantity of RDF/SRF exported off-site and combusted in year y (t)
$NCV_{RDFS\ Rf, y}$	=	Net calorific value of RDF/SRF in year y (GJ/t)
$EF_{CO_2, RDFS\ Rf, y}$	=	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.

13.6 Conservative adjustment and uncertainty

The project holder shall assess and address uncertainty in accordance with the BioCarbon Conservative Approach and Uncertainty Management Tool. This requirement applies to all material data, parameters and assumptions used in the quantification of baseline emissions, project emissions and leakage emissions.

Any conservative adjustment required under the applicable BioCarbon Tools or this methodology shall be applied in the manner prescribed by the relevant requirement and shall only reduce, and never increase, credited emission reductions. Where more than one adjustment applies to the same source of uncertainty or data limitation, the project holder shall ensure that the same effect is not deducted more than once.

The basis and application of material conservative adjustments shall be documented in the project document or monitoring report, as applicable, and shall be subject to validation or verification by the CAB.

13.7 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
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Where:

ER_{MP}	=	Net GHG emission reductions for the monitoring period (tCO ₂ e)
ER_y	=	Net GHG emission reductions in year y (tCO ₂ e)
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
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Where:

ER_{MP}	=	Net GHG emission reductions for the monitoring period (tCO ₂ e)
ER_m	=	Net GHG emission reductions in month m (tCO ₂ e)
m	=	Each month included in the monitoring period

13.8 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 before disposal or recovered through landfill mining 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 attributable to the eligible biodegradable fraction. 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.

Where landfill mining is implemented at a SWDS with an existing or concurrent landfill gas recovery, destruction or utilization activity, baseline methane emissions under BCR0018 shall

account for the methane that would have been captured, destroyed or utilized in the absence of the landfill mining activity. The same methane generation potential shall not be credited under both activities.

Allocation of shared emission sources, data separation, chain of custody and prevention of double counting or claiming shall be addressed in accordance with the BioCarbon Avoiding Double Counting Tool and the applicable BioCarbon requirements.

14 Data and parameters

14.1 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.

Data sources shall be selected according to their relevance to the parameter being determined, representativeness, reliability and auditability. Project-specific measurements, representative laboratory analysis or sampling, official data, auditable operational or historical records, and conservative IPCC, CDM or other approved default values may be used as applicable. Where alternative data sources are available, the source providing the most representative and reliable basis for quantification shall be selected. Where default values are used because project-specific or representative data are unavailable, the project holder shall justify their selection and demonstrate that they are conservative for the project context.

14.2 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 ₂ e/tCH ₄	IPCC AR6, unless another value is required by the BioCarbon Standard or applicable accounting framework	Conversion of CH ₄ emissions to tCO ₂ e
GWP_{N_2O}	100-year Global Warming Potential of nitrous oxide	tCO ₂ e/tN ₂ O	IPCC AR6, unless another value is required by the BioCarbon Standard or applicable accounting framework	Conversion of N ₂ O emissions to tCO ₂ e
GWP_{CO_2}	Global Warming Potential of carbon dioxide	tCO ₂ e/tCO ₂	IPCC AR6	Conversion of CO ₂ emissions to tCO ₂ e
F	Fraction of methane in landfill gas	Dimensionless	Site-specific data, IPCC default, or CDM TOOLo ₄	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 TOOLo ₄	Baseline and residual waste FOD calculation
k_j	Decay rate for waste type (j)	yr ⁻¹	Site-specific data, IPCC default, or CDM TOOLo ₄	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 TOOLo ₄	Baseline and residual waste FOD calculation
MCF_y	Methane correction factor	Dimensionless	Site-specific data, IPCC default, or CDM TOOLo ₄	Baseline and residual waste FOD calculation
OX_y	Oxidation factor	Dimensionless	Site-specific data, IPCC default, or CDM TOOLo ₄	Deduction for methane oxidation
ϕ_y	Model correction factor	Dimensionless	CDM TOOLo ₄ , using the applicable default value or the project-specific determination procedure provided therein	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 ₂ e/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 TOOLo ₃	Fossil fuel emissions

Parameter	Description	Unit	Source / determination	Use
$NCV_{i,y}$	Net calorific value of fossil fuel type (i)	GJ/unit	IPCC, national source, supplier data, or CDM TOOLo3	Fossil fuel emissions
$EF_{CO_2,f}$	Default freight emission factor	gCO ₂ /t-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
$EF_{N_2O,t}$	N ₂ O emission factor for treatment option (t)	tN ₂ O/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.

14.3 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	Representative sampling and composition analysis

Parameter	Description	Unit	Monitoring frequency	Source / method
			waste composition varies materially	
$W_{LM,x}$	Total amount of waste excavated through landfill mining in year	t	Per excavation unit or monitoring batch; aggregated annually	Weighbridge, calibrated scales, documented volumetric measurement and conversion, mass balance, or other auditable measurement method
$p_{LM,j,x}$	Representative fraction of eligible biodegradable waste type j in the excavated waste mass in year	Dimensionless	Periodic characterization sufficient to remain representative of the relevant excavated waste mass	Representative waste characterization, sampling, composition studies, operational records, mass balance, or conservative documented estimates, as applicable
$W_{LM,j,x}$	Amount of eligible biodegradable waste type j excavated through landfill mining and subjected to an eligible treatment route in year	t	Per excavation unit or monitoring batch; aggregated annually	Weighbridge, calibrated scales, documented volumetric measurement and conversion, mass balance, or other auditable measurement method
$a_{j,x}$	Age of waste type j at the time of excavation in year	years	For each relevant disposal area, cell, lift, age cohort or representative excavated waste mass	Disposal records, cell or lift construction records, historical operating records, topographic or volumetric modelling, or other verifiable evidence permitted under Section 13.3.4
$p_{j,i}$	Average fraction of eligible biodegradable waste type j in month i	Dimensionless	Monthly, where monthly calculation is used	Representative sampling and composition analysis

Parameter	Description	Unit	Monitoring frequency	Source / method
$p_{n,j,x}$	Fraction of eligible biodegradable waste type j in sample n during year x	Dimensionless	Per sample	Sampling and waste sorting records
$p_{n,j,i}$	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 TOOL4 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,	tCO ₂ e	Continuous or periodic	Flow, methane concentration,

Parameter	Description	Unit	Monitoring frequency	Source / method
	or liquid residue management in year y			destruction efficiency
$RW_{j,x}$	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
$Q_{RDFS\text{SRF},COM,y}$	Quantity of RDF/SRF exported off-site and combusted in year y	t	Per batch; aggregated annually	Delivery records, end-use declarations, contracts
$NCV_{RDFS\text{SRF},y}$	Net calorific value of RDF/SRF in year y	GJ/t	Per representative sample or batch	Laboratory analysis
$EF_{CO_2,RDFS\text{SRF},y}$	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 ₂ O concentration in stack gas from combustor or treatment unit c in year y	tN ₂ O/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 ₂ e	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.

15 Monitoring requirements

15.1 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 identify the data, parameters, measurement and sampling approaches, material flows, treatment pathways, project emission sources and leakage sources required for quantification under this methodology.

Material changes in waste sources, waste composition, treatment routes, project boundaries or quantification approaches that affect the application of this methodology shall be documented and addressed in accordance with the applicable BioCarbon requirements.

15.2 Waste quantity monitoring

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

Waste quantities shall be determined using calibrated weighbridges or scales, documented volumetric measurement and conversion methods, mass balance, or other auditable measurement methods permitted under Section 14. Where volumetric measurements are used, conversion factors shall be documented, representative and conservative.

Monitoring records shall be sufficient to establish, as applicable, the origin or source of the waste, quantity, eligibility, relevant composition, treatment route and final fate, and to reconcile the quantities used in the emission reduction calculation. The level of aggregation shall be appropriate to the waste stream, measurement system and quantification approach.

For landfill mining, monitored quantities shall be associated with the relevant SWDS disposal area, cell, lift, age cohort or other representative excavated waste mass, as applicable, and shall be consistent with the mass and composition parameters used in Equations 4 and 5.

15.3 Waste characterization and sampling

Waste characterization shall be performed to the extent necessary to determine eligibility and the parameters required by the applicable quantification approach. Characterization may include biodegradable and other relevant waste fractions, waste types, *DOC*, *DOC_f*, BMP, moisture content, fossil-derived fractions, or other characteristics, as applicable.

Where sampling is used, the sampling design, frequency and sample size shall be sufficient to provide representative data for the relevant waste stream or waste mass and shall be documented in accordance with the Monitoring, Reporting and Verification Tool.

Sampling shall reflect material variability in waste composition. Stratification or increased sampling frequency shall be applied where necessary to maintain representativeness.

For landfill mining, characterization and sampling shall be representative of the excavated waste mass used for quantification and, where relevant, the disposal area, cell, lift or age cohort. Characterization frequency shall be reassessed where the excavated waste mass changes materially in composition or disposal history.

Missing, non-representative or otherwise unreliable characterization data shall be addressed conservatively in accordance with Section 13.6 and the applicable BioCarbon Tools.

15.4 Chain of custody and mass balance

The project holder shall maintain auditable chain of custody and mass balance for waste and material flows relevant to eligibility, quantification, project emissions, leakage or final fate under this methodology.

The chain of custody shall allow relevant material flows to be traced from the first auditable point to the treatment, use, storage, transfer, export or disposal relevant to quantification. The mass balance shall reconcile, as applicable, input waste, eligible and ineligible fractions, recovered materials, intermediate and final outputs, residual waste, and material changes or losses necessary to account for the credited waste mass.

For landfill mining, the mass balance shall reconcile the excavated waste mass with the eligible biodegradable fraction, recovered or separated materials, waste subjected to eligible treatment, residual waste, material returned to or disposed of in a SWDS, and other material flows relevant to quantification.

Outputs transferred outside the project boundary shall additionally meet the applicable traceability requirements of Section 13.5.2.

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

15.5 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 accordance with the applicable treatment pathway and quantification requirements of this methodology.

The parameters and operating conditions monitored shall be those necessary to quantify material project emissions and demonstrate performance of the applicable treatment pathway, including any parameters required by the relevant CDM tool or procedure referenced in Section 13.4.

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.

15.6 Monitoring of project emissions

The project holder shall monitor the activity data and parameters required to quantify all material project emission sources identified under Section 13.4 and Table 4, as applicable to the project activity.

Project emissions shall be quantified using the applicable procedures, monitored data and permitted emission factors or defaults specified in Section 13.4 and the relevant methodological tools.

15.7 Monitoring of leakage

The project holder shall monitor and document the data and evidence necessary to assess material leakage sources identified under Section 13.5, in accordance with the BioCarbon Leakage Management Tool.

Where the project activity involves landfill mining, monitoring shall include any material displacement, additional transport or management of excavated materials or residues outside the project boundary identified under Section 13.5.1.

Where RDF, SRF, stabilized biomass or comparable outputs are transferred outside the project boundary, the applicable final-fate and traceability requirements of Section 13.5.2 shall apply.

Where leakage cannot be reliably quantified, conservative treatment shall be applied in accordance with the applicable BioCarbon Tools.

15.8 Digital MRV

Digital monitoring, reporting and verification systems may be used to support data capture, traceability, mass balance, monitoring and auditability under this methodology, in accordance with the BioCarbon Monitoring, Reporting and Verification Tool.

Where digital MRV is used, the system and level of traceability shall be appropriate to the monitored waste or material flow and shall preserve access to the underlying data and evidence required for verification. Digital MRV shall not replace measurement, sampling, laboratory analysis or documentary evidence where these are required under the applicable quantification or monitoring procedure.

15.9 QA/QC and data retention

QA/QC and data retention shall be implemented in accordance with the BioCarbon Monitoring, Reporting and Verification Tool and the applicable requirements of this methodology. QA/QC procedures shall be sufficient to ensure the reliability, consistency, completeness and auditability of material data used for quantification.

Records supporting waste quantities, characterization, material flows, treatment, project emissions, leakage, final fate and emission reduction calculations shall be retained in accordance with the applicable BioCarbon requirements.

15.10 Operational incidents, monitoring gaps, and conservative treatment

Operational incidents, monitoring gaps, missing or unreliable data, treatment interruptions, material mass-balance discrepancies, and other events that may affect quantification shall be

documented and addressed in accordance with the BioCarbon Monitoring, Reporting and Verification Tool and the Conservative Approach and Uncertainty Management Tool.

Where an event affects waste eligibility, quantity, composition, treatment, final fate, project emissions or leakage, its effect on quantified emission reductions shall be assessed and conservatively addressed. Emission reductions shall not be claimed for affected quantities or periods where sufficient auditable evidence for conservative quantification is unavailable.

Material incidents and the corresponding treatment, assumptions or deductions shall be reported in the applicable monitoring report.

16 Permanence and reversal risk management

This methodology quantifies GHG emission reductions from avoided methane emissions associated with eligible biodegradable waste that would otherwise have been disposed of or remained disposed of in a SWDS. It does not quantify carbon dioxide removals or the maintenance of a stored carbon stock.

Accordingly, permanence and reversal requirements applicable to stored carbon stocks do not apply solely by virtue of the avoided-methane mitigation outcome quantified under this methodology. The BioCarbon Permanence and Risk Management Tool shall be applied to the extent relevant to the risks associated with the project activity and the mitigation outcome quantified under this methodology. Risks affecting the validity or quantity of emission reductions shall also be addressed through the applicable monitoring, uncertainty, leakage and double-counting requirements of this methodology and the applicable BioCarbon Tools.

Where the final fate of waste, residual material or project outputs affects quantified emission reductions, project emissions or leakage, such final fate shall be monitored and accounted for in accordance with Sections 13 and 15.

No permanence crediting period, long-term carbon-stock monitoring or reversal compensation mechanism applies to emission reductions quantified under this methodology solely on the basis of avoided methane emissions. Where another mitigation outcome is quantified together with BCR0018 and is subject to permanence or reversal requirements, those requirements shall apply to that separate mitigation outcome in accordance with the applicable BioCarbon methodology and Tools.

17 Document status

This document constitutes Version 1.0 of BCR0018, a methodological document under the BioCarbon Standard. It shall be applied together with the BioCarbon Standard, the applicable BioCarbon Tools and procedures, and the methodological requirements referenced herein.

18 Bibliographic References

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

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United Nations Framework Convention on Climate Change (UNFCCC). Clean Development Mechanism. AMS-III.AF: Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (MSW). Version 1.0.

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. Version 17.0.

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.
Version 1.0	September 21, 2026	First approved version. Incorporates revisions following public consultation, including methodological clarifications, streamlined monitoring and risk-management requirements, and provisions for landfill mining of previously disposed biodegradable waste.