BioCarbon Standard

METHODOLOGICAL DOCUMENT
Waste Sector

BCR0020
MATERIAL RECOVERY AND RECYCLING FROM SOLID WASTE STREAMS

BioCarbon Cert®

Draft for Public Consultation | September 7, 2026

BIOCARBON CERT. 2026. BCR0020. Material Recovery and Recycling from Solid Waste Streams. Draft for Public Consultation. September 7, 2026. 99 p.

Table of contents

1 Introduction 8

2 Sources 8

3 Purpose of the methodology 9

4 Version and validity 10

5 Scope 10

6 Applicability conditions 11

6.1 General applicability conditions 11

6.2 Material-specific recycling requirements 12

7 Methodology type and modular architecture 13

7.1 Applicable BioCarbon documents and tools 13

8 Material-specific quantification pathways 14

9 Relationship with other BioCarbon methodologies 15

10 Normative references and methodological basis 16

10.1 Applicability of references 16

10.2 Normative and methodological framework 16

11 Terms and definitions 17

12 Project activities 19

12.1 Eligible project activities 19

12.2 Project implementation configurations 20

12.2.1 Collection and sorting with downstream recycling 20

12.2.2 Integrated recovery and recycling 20

12.2.3 Distributed recycling network 21

12.2.4 Recovery of constituent materials from composite or multilayer waste 21

12.3 Formal and informal waste-sector participation 22

12.3.1 Informal waste-sector participation 22

12.3.2 Formal waste-sector participation 22

12.4 New and existing project activities 22

12.5 Activities that do not independently generate emission reductions 23

13 Eligible waste streams and materials 24

13.1 General eligibility requirements 24

13.2 Eligible source streams 24

13.3 Materials covered by the quantification pathways 25

13.3.1 Plastics 25
13.3.2 Paper and cardboard 26
13.3.3 Container glass 26
13.3.4 Metals 26

13.4 Additional materials 27

13.5 Composite and multilayer materials 27

13.6 Pre-consumer materials and production residues 28

13.7 Excluded waste streams and materials 28

14 Baseline scenario 29

14.1 General requirements 29

14.2 Identification of alternative scenarios 29

14.3 Baseline recycling quantity 30

14.3.1 Existing activities 30
14.3.2 New facilities and systems 31

14.4 Baseline pathways by material 32

14.4.1 Plastics, container glass and metals 32
14.4.2 Paper and cardboard 32
14.4.3 Composite and multilayer materials 33

14.5 Data and evidence 33

14.6 Baseline reassessment 34

15 Additionality 35

15.1 General requirements 35

15.2 Regulatory surplus and prior consideration 36

15.3 Recycling-specific additionality considerations 37

15.4 Investment and barrier analysis 38

15.5 Common practice 38

15.6 Documentation, validation and reassessment 39

16 Project boundary 39

16.1 General requirements 39

16.2 Physical and geographical boundary 40

16.3 Greenhouse gas accounting boundary 41

16.4 Boundary by material-specific quantification pathway 42

16.4.1 Plastics 42
16.4.2 Paper and cardboard 42
16.4.3 Container glass 42
16.4.4 Metals 43
16.4.5 Composite and multilayer materials 43

16.5 Temporal boundary 43

17 Quantification of GHG emission reductions 44

17.1 General quantification approach 44

17.2 Baseline emissions 45

17.2.1 Total baseline emissions 45
17.2.2 Baseline emissions associated with plastics 47
17.2.3 Baseline emissions associated with paper and cardboard 51
17.2.3.1 Avoided methane emissions from baseline disposal 52
17.2.3.2 Avoided emissions from displacement of virgin-fiber production 54
17.2.4 Baseline emissions associated with container glass 57
17.2.5 Baseline emissions associated with metals 61
17.2.6 Composite and multilayer materials 66

17.3 Project emissions 67

17.3.1 Energy consumption 68
17.3.2 Transportation 70
17.3.3 Other material project emissions and shared sources 71

17.4 Leakage 72

17.5 Net GHG emission reductions 75

17.6 Uncertainty and conservative adjustment 75

18 Mass balance, chain of custody and attribution 77

18.1 Mass balance 77

18.2 Chain-of-custody and demonstration of effective recycling 78

18.3 Attribution and prevention of double claiming 79

18.4 Distributed networks and unresolved discrepancies 80

19 Monitoring requirements 80

19.1 Data and parameters available at validation 81

19.2 Data and parameters monitored 87

20 Bibliographic references 98

List of tables

Table 1. Data and parameters available at validation 82

Table 2. Data and parameters monitored 88

Acronyms and abbreviations

ABS	Acrylonitrile butadiene styrene
ADC	Avoiding Double Counting
BAT	Baseline and Additionality Tool
BAU	Business as Usual
BE	Baseline Emissions
CAB	Conformity Assessment Body
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
dMRV	Digital Monitoring, Reporting and Verification
EF	Emission Factor
EPS	Expanded polystyrene
GHG	Greenhouse gas
GWP	Global Warming Potential
HDPE	High-density polyethylene
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LDPE	Low-density polyethylene
LE	Leakage Emissions
MRV	Monitoring, Reporting and Verification
N_2O	Nitrous oxide
NCV	Net Calorific Value
PC	Polycarbonate
PE	Project Emissions
PET	Polyethylene terephthalate
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl chloride
QA/QC	Quality Assurance and Quality Control
SDSs	Sustainable Development Safeguards
SDGs	Sustainable Development Goals
SF	Substitution factor
SWDS	Solid waste disposal site
t	Metric tonne
tC	Metric tonne of carbon
tCO_2	Metric tonne of carbon dioxide
tCO_2e	Metric tonne of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VCC	Verified Carbon Credit

1 Introduction

Material recovery and recycling can reduce greenhouse gas emissions by displacing the production of virgin materials. For eligible paper and cardboard, recycling may also avoid methane emissions where the applicable without-project scenario is disposal under conditions that would generate methane. The magnitude of these benefits depends on the material recovered, its without-project fate, the recycling process, the quality and use of the recycled output, and the emissions associated with the project activity.

Waste management systems have evolved considerably in recent years. Recyclable materials may originate from municipal, commercial, institutional, retail, distribution and other solid waste streams and may pass through several collection, sorting, conditioning and processing stages before becoming usable secondary materials. These systems require accounting approaches that distinguish material collection from effective recycling and that establish a verifiable relationship between recovered waste, recycled output and the greenhouse gas benefit claimed.

This methodology establishes requirements and procedures for quantifying net greenhouse gas emission reductions resulting from the recovery and recycling of eligible materials from solid waste streams. Its principal accounting pathway is the displacement of virgin-material production by usable secondary or recycled material. Where applicable, the methodology also accounts for avoided methane emissions when eligible paper and cardboard are demonstrably diverted from a baseline disposal pathway that would generate methane.

The methodology applies a material- and pathway-specific approach. It does not assume that the quantity of waste collected is equivalent to the quantity recycled, or that one unit of recycled material necessarily displaces an equal quantity of virgin material. Quantification is based on the eligible recycled output and the demonstrated greenhouse gas consequences of the project relative to the applicable baseline scenario.

The methodology is intended for application within the BioCarbon Standard and shall be used together with the applicable BioCarbon rules and tools.

2 Sources

The technical design of this methodology was primarily informed by the following sources:

United Nations Framework Convention on Climate Change. AMS-III.AJ.: Recovery and recycling of materials from solid wastes, Version 9.0, including relevant approved clarifications and methodological decisions.

United Nations Framework Convention on Climate Change. TOOL04: Emissions from solid waste disposal sites, Version 8.1.

Intergovernmental Panel on Climate Change. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5: Waste, and the 2019 Refinement to the 2006 IPCC Guidelines, as applicable.

AMS-III.AJ served as the principal methodological benchmark for material recovery and recycling. TOOL04 informed the treatment of avoided methane emissions from eligible paper and cardboard where the applicable baseline is disposal under methane-generating conditions. The IPCC Guidelines provide the underlying scientific basis for waste characterization and the estimation of emissions from waste treatment and disposal.

Other methodological tools, scientific publications and sector-specific sources used for particular calculations, parameters or material-specific quantification pathways are cited in the relevant sections and included in Section 20. Such sources are not incorporated by reference unless expressly stated in this methodology.

The applicable BioCarbon Tools are identified in Section 7.1, and the broader BioCarbon normative framework is identified in Section 10.2.

3 Purpose of the methodology

The purpose of this methodology is to establish requirements and procedures for quantifying, monitoring, reporting and verifying net greenhouse gas emission reductions attributable to the recovery and recycling of eligible materials from solid waste streams, relative to the most plausible and conservative without-project scenario.

Specifically, this methodology provides procedures to:

a) determine the eligibility of solid waste streams, materials, project activities, recycling processes and recycled outputs;

b) identify the applicable baseline scenario and determine the incremental quantity of material eligible for quantification, consistent with the applicable additionality requirements;

c) quantify avoided greenhouse gas emissions resulting from the demonstrated displacement of virgin-material production and, where applicable, from the diversion of eligible paper and cardboard from disposal pathways that would generate methane;

d) account for project emissions, leakage and uncertainty and determine net greenhouse gas emission reductions;

e) establish mass-balance, chain-of-custody, downstream processing or use, and attribution requirements necessary to demonstrate effective recycling and prevent double counting; and

f) define the material-specific monitoring and data-quality requirements applicable to each quantification pathway.

4 Version and validity

The status and publication date of this draft methodology are indicated on the cover page. The version number and date of entry into force of the approved methodology shall be indicated in the final publication.

This methodology remains valid until it is revised or withdrawn by BioCarbon Cert. It may be updated to reflect methodological or scientific developments, changes in the applicable BioCarbon framework, or experience gained through its implementation.

Project holders shall apply the version required under the BioCarbon Standard and any applicable transition provisions. Before applying this methodology, users shall verify that they are using the current applicable version published by BioCarbon Cert.

5 Scope

This methodology is globally applicable to project activities that increase the recovery and effective recycling of eligible materials from traceable solid waste streams and, as a result, reduce greenhouse gas emissions relative to the most plausible and conservative without-project scenario.

The methodology may be applied to new facilities, expansions or retrofits of existing facilities, and distributed systems comprising collection points, sorting centers, processing facilities and downstream users. For existing activities, only the incremental and attributable quantity above the applicable baseline is eligible.

Eligible solid waste streams may originate from municipal, commercial, institutional, retail, distribution, reverse-logistics and other non-hazardous post-consumer sources. Separately collected recyclable materials and traceable non-hazardous industrial or commercial waste streams may also be eligible. Pre-consumer manufacturing scrap, production residues and materials circulating within closed-loop industrial recycling systems are not eligible under this version of BCR0020 unless expressly permitted by a material-specific provision and covered by a complete quantification procedure established in this methodology.

The material categories covered by this methodology include:

(a) eligible plastic polymers;
(b) paper and cardboard;
(c) container glass;
(d) aluminum, steel and copper; and
(e) composite and multilayer materials containing one or more eligible constituent materials.

Mixed waste streams may be included only where the eligible fractions, contaminants, rejects,

processing losses and recycled outputs can be separately determined through a verifiable mass balance.

This methodology quantifies the following greenhouse gas outcomes:

(a) avoided emissions from virgin-material production demonstrably displaced by usable recycled output; and
(b) where applicable, avoided methane emissions from the diversion of eligible paper and cardboard from a disposal pathway that would generate methane.

Where both outcomes are claimed for the same material, they shall relate to distinct emission sources, be quantified separately and not overlap. This methodology quantifies emission reductions only; it does not quantify carbon dioxide removals.

Collection, aggregation, sorting, conditioning or transfer of waste does not by itself generate emission reductions. Quantification requires evidence that the eligible material was effectively recycled, produced a usable recycled output and resulted in the credited downstream greenhouse gas outcome.

Energy recovery, incineration, pyrolysis, gasification, the production of refuse-derived fuel or solid recovered fuel, and improvements to final disposal are outside the scope of this methodology.

6 Applicability conditions

A project activity may apply one or more material-specific quantification pathways under this methodology. Where more than one pathway is applied, eligible quantities and baseline outcomes shall be determined separately for each applicable pathway, while shared project emissions and leakage shall be assigned or allocated without duplication and all material flows shall be reconciled through a common mass balance.

6.1 General applicability conditions

This methodology is applicable where all the following conditions are met:

(a) the materials originate from identifiable and traceable non-hazardous solid waste streams and have been discarded, or are intended to be discarded, before entering the project activity;
(b) the project activity does not intentionally increase waste generation or divert products or materials from reuse, repair, refurbishment or remanufacturing in order to generate emission reductions;
(c) the project activity results in an increase in effective recycling relative to the applicable baseline scenario. Historical recycling, existing capacity or quantities that would have been recycled without the project activity shall not be credited;

(d) existing formal and informal recovery and recycling activities are considered in the baseline. The project activity shall not claim materials diverted from another recycler unless a net and attributable increase in recycling is demonstrated;
(e) any quantity required by an enforced legal or regulatory obligation is excluded, unless the project activity demonstrably exceeds the required level in accordance with the applicable BioCarbon requirements;
(f) the source, material category, quantity, moisture content where relevant, contaminants, rejects, processing losses and recycled output can be determined through measurement, sampling or another verifiable method appropriate to the material;
(g) all facilities, intermediaries and transfer points included in the project activity are identifiable, and the movement of eligible materials can be reconciled through a documented chain of custody and mass balance;
(h) evidence of effective recycling extends at least to the facility that converts the recovered material into a usable recycled output. Where the claimed displacement occurs at a later manufacturing or use stage, the evidence shall extend to that stage;
(i) sufficient data are available to establish the applicable baseline, quantify the relevant greenhouse gas outcome and determine all material project and leakage emissions;
(j) the project activity complies with applicable laws, permits, technical requirements and the applicable BioCarbon Standard documents and tools; and
(k) the right to claim the greenhouse gas outcome is clearly assigned, and the same material or emission reduction is not credited or claimed by more than one participant, facility, project activity or environmental crediting program.

6.2 Material-specific recycling requirements

For plastics, paper and cardboard, container glass, metals, and composite and multilayer materials, the following additional conditions apply:

(a) the material or constituent material is identified with sufficient accuracy to select the applicable recycling pathway, substitution factor and virgin-material production emission factor;
(b) the recycling process produces a measurable recycled output that meets the technical specifications required for its demonstrated downstream use;
(c) the relationship between the recycled output and the material or product displaced is demonstrated. A one-to-one substitution ratio shall not be assumed unless supported by material-specific evidence;
(d) where the recycled output is used in a product with a different function or lower technical performance, the project shall identify the material or product actually displaced and apply an appropriate substitution factor;

(e) for composite or multilayer materials, quantification is based on the constituent materials effectively recovered and recycled. The total incoming mass of the composite material shall not be treated as recycled output;
(f) contaminants, non-recoverable fractions, rejects and materials subsequently disposed of, combusted or used as fuel are excluded from the eligible recycled quantity; and
(g) pre-consumer materials and production residues are eligible only where expressly permitted under Section 13.6 and covered by the applicable material-specific quantification procedure in Section 17.

7 Methodology type and modular architecture

BCR0020 is a modular project-level baseline and monitoring methodology for the quantification of greenhouse gas emission reductions from the recovery and effective recycling of eligible materials from solid waste streams. It does not quantify carbon dioxide removals or carbon stored in products or reservoirs.

The modular architecture of BCR0020 consists of this methodology and the applicable BioCarbon Tools, which together establish the requirements for project eligibility, baseline determination, additionality, quantification, monitoring, leakage, uncertainty, avoidance of double counting, sustainable development safeguards and other applicable program requirements.

Project activities applying BCR0020 shall apply the BioCarbon Tools identified in Section 7.1 in conjunction with the material-specific requirements established in this methodology.

The material-specific quantification pathways established in Section 8 form part of BCR0020 and do not constitute independent methodological modules.

7.1 Applicable BioCarbon documents and tools

This methodology shall be applied together with the following BioCarbon documents and tools:

a) BCR Standard, Version 4.1, or any subsequent version that amends or supersedes it;

b) Baseline and Additionality Tool, Version 2.0, or any subsequent version that amends or supersedes it;

c) Monitoring, Reporting and Verification Tool, Version 2.0, or any subsequent version that amends or supersedes it;

d) Leakage Management Tool, Version 1.0, or any subsequent version that amends or supersedes it;

e) Conservative Approach and Uncertainty Management Tool, Version 1.0, or any subsequent

version that amends or supersedes it;

f) Avoiding Double Counting Tool, Version 3.1, or any subsequent version that amends or supersedes it;

g) Sustainable Development Safeguards Tool, Version 2.1.1, or any subsequent version that amends or supersedes it;

h) Sustainable Development Goals Contribution Tool, Version 2.0, or any subsequent version that amends or supersedes it;

i) Permanence and Risk Management Tool, Version 2.2, or any subsequent version that amends or supersedes it, where applicable;

j) BioCarbon Multi-Methodology Framework, as amended or superseded, where applicable;

k) any other BioCarbon document expressly required by the BCR Standard or by the scope and characteristics of the project activity.

Each applicable Tool shall be applied in full within its respective scope. The requirements established in BCR0020 supplement the applicable BioCarbon Tools and do not replace or reduce their requirements.

8 Material-specific quantification pathways

BCR0020 applies material-specific quantification pathways according to the physical greenhouse gas mitigation mechanism associated with each eligible material. These pathways are components of a single methodology and do not constitute independent methodologies or methodological modules.

The following pathways are established:

a) Plastics pathway, applicable to eligible HDPE, LDPE, PET, PVC, PP, PS, EPS, polycarbonate (PC) and acrylonitrile butadiene styrene (ABS), and based on the demonstrated displacement of virgin-material production;

b) Paper and cardboard pathway, comprising:

i. avoided emissions from the demonstrated displacement of virgin pulp, paper or cardboard production; and

ii. avoided methane emissions where eligible paper and cardboard would otherwise have been disposed of under methane-generating conditions;

c) Container glass pathway, based on the displacement of the virgin-material production stages expressly covered by this methodology;

d) Metals pathway, applicable to eligible aluminum, steel and copper and based on the demonstrated displacement of production from virgin raw materials; and

e) Composite and multilayer materials pathway, establishing the requirements for identifying, separating, measuring and assigning eligible constituent materials to the corresponding material-specific quantification pathway.

The composite and multilayer materials pathway does not generate an independent greenhouse gas benefit.

A project activity may apply one or more material-specific quantification pathways. Eligible recycled quantities and baseline emissions shall be determined separately for each applicable pathway. Shared project emissions and leakage shall be directly assigned or conservatively allocated without duplication, and all material flows shall be reconciled through the project mass balance.

Where both accounting mechanisms under the paper and cardboard pathway are applied to the same eligible quantity, the quantified benefits shall correspond to distinct physical emission sources, be calculated independently and not overlap.

A material or recycling process not covered by a complete and applicable quantification pathway under BCR0020 shall not generate emission reductions. Materials shall not be quantified by analogy with another material.

9 Relationship with other BioCarbon methodologies

BCR0020 applies only to the recovery and effective recycling of eligible materials and to the greenhouse gas outcomes expressly quantified under its material-specific quantification pathways.

Biological treatment of organic waste, including anaerobic digestion and biogas activities; production or use of waste-derived fuels; thermal treatment or energy recovery; biochar production or use; landfill-gas management; and improvements to solid waste disposal sites shall not be quantified under BCR0020 and may be addressed, where eligible, under another approved BioCarbon methodology. Biochar activities shall be addressed under BCR0011 or any methodology that supersedes it.

The avoided-methane accounting mechanism for eligible paper and cardboard is an exception to the general exclusion of waste-treatment outcomes. The same avoided methane emissions shall not be quantified under another methodology.

BCR0020 may be applied together with another approved BioCarbon methodology within the same facility, waste-management system or supply chain, provided that:

a) the activities, waste fractions, physical processes, emission sources and mitigation outcomes attributed to each methodology are clearly distinguished;

b) each methodology retains its own baseline, project boundary, quantification and monitoring requirements, and verified mitigation outcome;

c) shared material flows and project emissions are reconciled and allocated using a documented and conservative approach; and

d) no waste quantity, recycled output, emission source or mitigation outcome is counted more than once, in accordance with the BCR Standard, the Avoiding Double Counting Tool and the BioCarbon Multi-Methodology Framework.

Rejects, by-products or non-eligible fractions may enter an activity covered by another methodology, provided that the transfer point, quantity, material characteristics and subsequent destination are documented. BCR0020 shall not quantify any greenhouse gas benefit attributable to their subsequent treatment or use.

10 Normative references and methodological basis

10.1 Applicability of references

The version numbers identified in this methodology correspond to the editions in force on the date of issuance of BCR0020 and are provided for traceability.

References to BioCarbon documents shall include any subsequent version that amends or supersedes the identified edition, subject to the applicable transition provisions of the BCR Standard.

For external dated references, only the cited edition applies unless this methodology expressly provides otherwise. For external undated references, the latest applicable edition shall apply.

A revision or replacement of an external methodology, methodological tool or technical source does not automatically amend BCR0020. Any substantive change affecting eligibility, equations, parameters, default values or monitoring requirements shall be incorporated through the applicable BioCarbon methodology-revision procedure.

10.2 Normative and methodological framework

The BioCarbon documents identified in Section 7.1 form part of the normative framework applicable to BCR0020. Other BioCarbon documents shall apply where required by the BCR Standard or by the scope and characteristics of the project activity. In the event of inconsistency, the applicable BioCarbon normative hierarchy shall prevail.

The external sources underpinning BCR0020 are identified in Section 2. AMS-III.AJ is the principal methodological benchmark; only provisions expressly retained or adapted in

BCR0020 apply. Its small-scale limitation, Annex I and non-Annex I provisions, program-specific procedures, closed material list and default values do not apply unless expressly stated in this methodology.

The inclusion of PS, EPS, polycarbonate, ABS and copper in BCR0020 constitutes a BioCarbon-specific extension beyond the material scope expressly covered by AMS-III.AJ, Version 9.0. Their eligibility and quantification are governed exclusively by the complete material-specific provisions of BCR0020 and shall not be represented as having been adopted or approved under AMS-III.AJ.

TOOL04 shall be applied where avoided methane emissions from eligible paper and cardboard are quantified or where BCR0020 expressly requires its use to determine project emissions from the disposal of residual streams containing degradable organic carbon.

Except for TOOL04 in the circumstances expressly identified in BCR0020, no external methodological tool is incorporated by reference. Equations 9 to 12 and their associated monitoring requirements establish the applicable BCR0020 framework for the quantification of project emissions. External technical sources may be used to determine parameter values or source-specific emission factors only as permitted by this methodology and the applicable BioCarbon Tools.

Other scientific, sectoral or technical sources used to establish specific emission factors, substitution factors, recycling yields or monitoring parameters shall be cited where used and included in Section 20. Such sources constitute normative requirements only where BCR0020 expressly assigns them that status.

11 Terms and definitions

The definitions contained in the BCR Standard and the applicable BioCarbon Tools shall apply. For the purposes of this methodology, the following definitions also apply.

Effective recycling

The demonstrated conversion of an eligible waste material into a measurable recycled output that is used in an identifiable processing, manufacturing or production pathway. Collection, aggregation, sorting, conditioning, sale or transfer of a material does not, by itself, constitute effective recycling.

Formal waste sector

Waste-management activities planned, financed, carried out, regulated or formally recognized by public authorities or their authorized agents, including activities conducted under contracts, licenses, permits or concessions.

Informal waste sector

Individuals or groups involved in waste collection, sorting, recovery or recycling activities who are not formally responsible for providing waste-management services. Cooperatives or other organizations established by these individuals may be considered part of the informal waste sector for the purpose of this methodology.

Material-specific quantification pathway

Set of eligibility, baseline, quantification, monitoring and data requirements established by BCR0020 for a specified material or material category.

Materially different

A difference in material type, grade, composition, source stream, legal or market conditions, baseline fate, processing technology, recycled-output quality, downstream use, displaced material or product, production origin or another relevant condition that results in, or could reasonably result in, a different eligibility conclusion, baseline scenario, parameter value, emission factor, substitution factor, monitoring method or quantified greenhouse gas outcome. The basis for grouping or separating materials or conditions shall be documented in the Project Document, and grouping shall not reduce accuracy or conservativeness.

Mechanical recycling

Physical or mechanical processes through which recyclable materials are separated, cleaned, classified, washed, dried, compacted, shredded, ground, pelletized or otherwise prepared or processed to produce intermediate or finished products that substitute virgin materials.

Recycling facility

A facility or set of facilities where recyclable fractions of solid waste are sorted, classified and prepared into marketable materials for further processing or manufacturing. A recycling facility may include processing operations where these are integrated at the same site.

Processing or manufacturing facility

An identifiable facility where materials obtained from a recycling facility are processed or transformed into recycled intermediate or finished products.

Recycled output

A measurable material or product resulting from the applicable recycling pathway, determined at the stage specified by this methodology and meeting the technical requirements for its demonstrated downstream use.

Post-consumer waste

Material discarded after completion of its intended use by a household, commercial,

institutional or other end user. Post-consumer waste does not include manufacturing scrap, process residues or materials discarded before completion of the production process.

Substitution factor

Ratio representing the quantity of virgin material or product whose production is demonstrably displaced by one unit of eligible recycled output, after accounting, as applicable, for differences in material quality, technical performance, processing yield and downstream use.

12 Project activities

12.1 Eligible project activities

A project activity under this methodology shall comprise one or more coordinated measures that increase the recovery and effective recycling of eligible materials relative to the applicable baseline scenario and produce a measurable recycled output.

Eligible project activities may include:

a) establishing, expanding or retrofitting systems for the collection or reception of eligible post-consumer materials, including source-separated collection, collection points, take-back systems and reverse-logistics arrangements;

b) recovering and separating eligible materials from mixed or separately collected non-hazardous solid waste streams through manual, magnetic, optical or other physical or mechanical separation methods;

c) sorting, classifying and segregating recovered materials by material type, grade, composition or other characteristics relevant to the applicable recycling pathway;

d) removing contaminants and non-eligible fractions from recovered materials;

e) conditioning or preparing recovered materials through operations such as washing, drying, compacting, baling, shredding, grinding, flaking, granulating or pelletizing;

f) physically or mechanically recycling eligible materials to produce usable secondary materials or intermediate or finished recycled products;

g) separating and recovering eligible constituent materials from composite or multilayer materials;

h) processing or manufacturing recovered materials at an identifiable facility where they are converted into recycled intermediate or finished products and demonstrably substitute virgin materials; and

i) effectively recycling eligible paper and cardboard where the activity diverts the material

from a baseline disposal pathway that would generate methane.

Collection, transport, aggregation, sorting, conditioning, sale or transfer of materials may form part of the project activity but shall not, by themselves, generate emission reductions. Emission reductions may be quantified only for materials demonstrated to have been effectively recycled and to have generated an eligible greenhouse gas outcome under the applicable material-specific quantification pathway.

12.2 Project implementation configurations

A project activity may be implemented under one or more of the following configurations.

12.2.1 Collection and sorting with downstream recycling

The project activity collects, receives, sorts or conditions eligible materials and transfers them to one or more third-party processing or manufacturing facilities.

Under this configuration, the quantity collected, sorted or transferred shall not constitute the eligible recycled quantity. Effective recycling shall be demonstrated at the applicable downstream processing or manufacturing facility.

The project holder shall maintain evidence of:

a) the quantity and type of material leaving the collection or sorting facility;

b) the quantity and type of material received by the downstream facility;

c) processing losses, rejects and non-eligible fractions;

d) the recycled output produced; and

e) the downstream use required under the applicable material-specific quantification pathway.

12.2.2 Integrated recovery and recycling

The same facility or organizational system carries out the recovery, sorting, conditioning and recycling of eligible materials.

The eligible recycled quantity shall be determined at the output point specified by the applicable material-specific quantification pathway. Inputs, intermediate transfers, rejects, processing losses and recycled outputs shall be reconciled through the project mass balance.

Where the facility also produces non-eligible products or processes materials outside the project activity, energy consumption, material flows and other relevant parameters shall be separately measured or conservatively allocated.

12.2.3 Distributed recycling network

The project activity comprises multiple collection points, establishments, intermediaries, sorting centers, recycling facilities or downstream processing or manufacturing facilities operating under a common project arrangement.

The Project Document shall identify:

a) every participating entity and facility;

b) its function within the recycling chain;

c) the eligible materials handled;

d) the applicable transfer and measurement points;

e) the procedures for consolidating and reconciling data; and

f) the contractual or other arrangements governing chain of custody, attribution and the right to claim the greenhouse gas outcome.

All material flows shall be measured or determined through verifiable procedures and reconciled through a common mass balance. Transfers among participants shall not create additional eligible quantities.

12.2.4 Recovery of constituent materials from composite or multilayer waste

The project activity separates or otherwise recovers eligible constituent materials from composite or multilayer waste through a technically defined physical or mechanical recycling process.

The incoming mass of the composite or multilayer material shall not be treated in full as eligible recycled output. Each constituent material shall be measured or determined separately and quantified under the corresponding material-specific quantification pathway.

The project mass balance shall identify, at a minimum:

a) each constituent material recovered;

b) moisture, where relevant;

c) contaminants;

d) separation and processing losses;

e) rejects; and

f) fractions sent to disposal, incineration, energy recovery or use as fuel.

12.3 Formal and informal waste-sector participation

Project activities may involve the formal waste sector, the informal waste sector, or material flows between both sectors.

12.3.1 Informal waste-sector participation

Under this arrangement, one or more recovery, sorting or recycling activities are carried out by individuals, associations, cooperatives or other organizations belonging to the informal waste sector.

The project activity may receive or process materials originating from formal collection systems. Materials that were already recovered or effectively recycled in the baseline by formal or informal operators shall be excluded from the eligible incremental quantity.

Where intermediaries participate in the chain, the project holder shall demonstrate that the materials are transferred to identifiable processing or manufacturing facilities and are not used as fuel, sent to energy recovery or disposed of.

12.3.2 Formal waste-sector participation

Under this arrangement, one or more collection, recovery or recycling facilities are owned, operated, regulated or formally recognized by a public authority, private company or other formal waste-management entity.

The project activity may receive materials collected or supplied by individuals, associations, cooperatives or other participants from the informal waste sector. Their roles, material flows, contractual arrangements and rights related to the claimed greenhouse gas outcome shall be documented.

The participation of the informal waste sector as a supplier or service provider does not, by itself, transfer or extinguish any right relating to the claimed mitigation outcome. Attribution and ownership shall be established in accordance with the applicable BioCarbon requirements.

12.4 New and existing project activities

Any of the configurations described above may comprise:

a) a newly established recycling facility or system;

b) a new collection, recovery or recycling network supplying an identifiable processing or manufacturing facility;

c) a capacity addition or retrofit to an existing facility;

d) the installation of new sorting, conditioning or recycling equipment;

e) an operational or technological improvement that demonstrably increases effective recycling; or

f) an existing facility or system that implements identifiable measures resulting in additional effective recycling above the applicable baseline recycling level.

For an existing activity, only the incremental and attributable quantity effectively recycled above the applicable baseline recycling level shall be eligible.

For a newly established facility or system, the construction of the facility, acquisition of equipment or expansion of service coverage shall not, by itself, demonstrate that all material processed is additional. The project holder shall demonstrate that the eligible material would not have been effectively recycled in the absence of the project activity and has not been diverted from another existing formal or informal recycling activity.

A project activity may comprise the complete recycling chain or one or more stages of that chain. Where the project holder does not control all stages, the complete material flow from the applicable collection or reception point to the facility where effective recycling and the credited greenhouse gas outcome are demonstrated shall remain within the project monitoring, mass-balance and chain-of-custody system.

12.5 Activities that do not independently generate emission reductions

The following activities do not independently generate emission reductions under this methodology:

a) collection, transport, aggregation, trading, sorting, conditioning or transfer of materials without demonstrated effective recycling;

b) brokerage or commercial intermediation without control or verifiable traceability of the material to the applicable downstream facility;

c) reuse, repair, refurbishment, remanufacturing or waste-prevention activities;

d) production of fuels or materials intended for combustion or energy recovery;

e) disposal, incineration or destruction of recovered materials;

f) recovery or processing of materials that would have been effectively recycled in the baseline; and

g) recycling processes or materials for which this methodology does not establish a complete and applicable quantification pathway.

Materials collected or processed under the project activity that are subsequently used as fuel, sent to energy recovery, incinerated or disposed of shall not be treated as eligible recycled output.

13 Eligible waste streams and materials

13.1 General eligibility requirements

A material is eligible under this methodology where all the following conditions are met:

a) it originates from an identifiable and traceable non-hazardous solid waste stream;

b) it has been discarded, or is intended to be discarded, before entering the project activity, except where a material-specific provision expressly permits a pre-consumer source;

c) its material type and, where relevant, composition can be identified with sufficient accuracy to apply the corresponding material-specific quantification pathway;

d) its quantity can be determined separately from non-eligible materials, contaminants, moisture, rejects and processing losses;

e) it is processed through a recycling pathway expressly covered by this methodology;

f) it produces a measurable recycled output; and

g) its effective recycling and required downstream processing or use can be demonstrated.

Materials from unknown, undocumented or unverifiable sources are not eligible.

Where eligible materials are recovered from a mixed waste stream, the composition of the incoming waste and the quantities of the eligible fractions shall be determined through direct measurement or representative sampling. The results shall be reconciled through the project mass balance.

The eligibility of a material does not establish that its full collected or processed quantity is creditable. The eligible recycled quantity shall be determined at the measurement point established by the applicable material-specific quantification pathway and shall exclude the applicable baseline recycling quantity.

13.2 Eligible source streams

Eligible materials may originate from:

a) household and municipal solid waste streams;

b) commercial and institutional post-consumer waste streams;

c) retail, distribution and warehousing activities;

d) take-back, deposit-return and reverse-logistics systems;

e) separately collected post-consumer materials generated at industrial or commercial premises; and

f) other traceable non-hazardous post-consumer waste streams consistent with the scope and applicability conditions of this methodology.

Materials may be collected separately or recovered from mixed solid waste, provided that the requirements for identification, measurement, mass balance and effective recycling are met.

The geographic or organizational source of a material shall not, by itself, establish eligibility. The project holder shall demonstrate the without-project fate, baseline recycling level and additionality of each material or materially different group of materials.

13.3 Materials covered by the quantification pathways

13.3.1 Plastics

The plastics pathway covers the following post-consumer polymers:

a) high-density polyethylene (HDPE);

b) low-density polyethylene (LDPE);

c) polyethylene terephthalate (PET);

d) polyvinyl chloride (PVC);

e) polypropylene (PP);

f) polystyrene (PS);

g) expanded polystyrene (EPS);

h) polycarbonate (PC); and

i) acrylonitrile butadiene styrene (ABS).

PVC is eligible only where it is mechanically recycled.

Each polymer shall be quantified using the material-specific parameters established in Section 17.2.2. Parameters applicable to one polymer shall not be applied to another polymer by analogy.

Plastic films and flexible plastics may be eligible where their polymer composition is identified and they are processed into a measurable recycled output. Flexible packaging composed of inseparable combinations of materials shall be assessed under the composite and multilayer materials pathway.

The project holder shall demonstrate that the recycled output meets the technical and quality requirements of the downstream use and that the material or product whose production is claimed to be displaced has been correctly identified.

13.3.2 Paper and cardboard

The paper and cardboard pathway covers identifiable post-consumer:

a) paper;

b) cardboard; and

c) corrugated cardboard.

Beverage cartons and other fiber-based composite packaging shall be assessed under the composite and multilayer materials pathway.

Eligible paper and cardboard may generate:

a) emission reductions from the displacement of virgin pulp, paper or cardboard production, determined in accordance with Section 17.2.3.2; and

b) avoided methane emissions where the applicable baseline is disposal under conditions that would generate methane.

Where both outcomes are quantified, they shall correspond to separate physical emission sources, be calculated independently and not overlap.

Other fiber-based materials are not eligible unless expressly incorporated through a complete material-specific quantification pathway.

13.3.3 Container glass

The container glass pathway covers post-consumer container-glass cullet that:

a) is separated from ceramics, stones, metals and other contaminants to the degree required by the receiving manufacturing facility;

b) is directly measured; and

c) is demonstrably used in container-glass production.

Flat, laminated, tempered, chemically treated or other specialty glass is not covered by the base pathway.

Container glass used as aggregate, fill or another product shall not be treated as displacing virgin inputs used in container-glass production unless the actual displaced material and substitution relationship are demonstrated under an applicable quantification pathway.

13.3.4 Metals

The metals pathway covers the following post-consumer metals:

a) aluminum;

b) steel; and

c) copper.

The eligible material shall be recovered from end-of-life post-consumer waste, separated from non-metallic components and delivered to an identifiable processing or manufacturing facility.

Scrap generated during primary or secondary aluminum, steel or copper production, the manufacture of finished metal products, or the processing of those products is not eligible under the metals pathway.

Other metals and alloys are not eligible unless expressly incorporated through a complete material-specific quantification pathway.

13.4 Additional materials

Polymers, glass types, metals, alloys, fiber-based materials or other solid materials not expressly covered by Sections 13.3.1 to 13.3.4 shall not be quantified by analogy with an eligible material.

Such materials may generate emission reductions only after a complete applicable quantification pathway has been incorporated through an approved revision, amendment or normative annex to BCR0020.

A project-specific study, supplier declaration or CAB determination does not, by itself, extend the material scope of this methodology.

13.5 Composite and multilayer materials

The composite and multilayer materials pathway does not generate an independent greenhouse gas benefit. Each constituent material shall be quantified under the applicable material-specific quantification pathway.

The total incoming mass of a composite or multilayer material shall not be treated as recycled output. Quantification shall be based only on constituent-material outputs that:

a) are separately measured or determined through representative sampling and a verified recovery yield;

b) are processed into usable secondary materials;

c) are delivered to identifiable downstream processing or manufacturing facilities; and

d) are covered by an applicable material-specific quantification pathway.

The mass balance shall separately identify:

a) each recovered constituent material;

b) moisture, where relevant;

c) contaminants;

d) separation and processing losses;

e) rejects; and

f) fractions sent to disposal, incineration, energy recovery or use as fuel.

Fractions used as fuel, sent to energy recovery, incinerated or disposed of are not eligible recycled outputs.

Where the recycling process produces a combined output that cannot be separated by constituent material, the project holder shall demonstrate its composition, technical use and actual material displacement. In the absence of sufficient evidence or an applicable quantification pathway, no emission reductions shall be quantified for that output.

13.6 Pre-consumer materials and production residues

Pre-consumer manufacturing scrap, process residues and materials circulating within established closed-loop industrial recycling systems are not eligible under this version of BCR0020 unless expressly identified as eligible under both the applicable material-specific provisions of Section 13 and a complete corresponding quantification procedure in Section 17.

Production scrap from aluminum, steel and copper operations is excluded under the metals pathway.

13.7 Excluded waste streams and materials

The following are not eligible under BCR0020:

a) hazardous waste;

b) infectious, pharmaceutical or radioactive waste;

c) electrical and electronic waste, batteries, end-of-life vehicles and refrigerant-containing equipment, unless expressly covered by an applicable material-specific quantification pathway under BCR0020;

d) food waste, garden waste, other biodegradable organic waste, sludge and similar materials intended for composting, anaerobic digestion or other biological treatment;

e) materials intended for incineration, gasification, pyrolysis, combustion or energy recovery;

f) refuse-derived fuel, solid recovered fuel and equivalent waste-derived fuels;

g) materials for which the source, composition, quantity or downstream destination cannot be verified;

h) materials that would have been effectively recycled in the baseline; and

i) materials for which this methodology does not establish a complete and applicable quantification pathway.

14 Baseline scenario

14.1 General requirements

The baseline scenario shall be determined in accordance with the applicable Baseline and Additionality Tool and the specific requirements of this methodology.

For each eligible material or materially different group of materials, the baseline determination shall address separately:

a) the without-project fate of the waste material; and

b) the production pathway of the material or product displaced by the recycled output.

These two elements may represent distinct baseline emission sources. Their separate identification does not, by itself, establish that both may be credited.

The baseline scenario shall represent the most plausible and conservative situation that would occur in the absence of the project activity. It shall reflect applicable laws, regulatory obligations, contractual arrangements, existing recycling practices, market conditions, available infrastructure and expected technological development.

The baseline shall not assume that:

a) all material collected or processed by the project activity would otherwise have been disposed of;

b) no recovery or recycling would have occurred without the project activity;

c) all recycled output displaces virgin material;

d) one unit of recycled output displaces one unit of virgin material; or

e) the construction of a new facility makes all material processed by that facility additional.

Where more than one without-project pathway applies to a material, the project holder shall determine the proportion attributable to each pathway. The sum of all pathway proportions for that material shall equal one.

14.2 Identification of alternative scenarios

In addition to the alternatives required by the Baseline and Additionality Tool, the project holder shall consider, where technically feasible and legally allowable:

a) implementation of the project activity without registration under a greenhouse gas crediting program;

b) continuation of existing collection, recovery, sorting, recycling and disposal practices;

c) recovery or recycling of the material by other formal or informal waste-sector participants;

d) transfer, sale or export of the material for recycling through an existing market;

e) reuse, repair, refurbishment or remanufacturing of the material or product;

f) disposal in a solid waste disposal site;

g) incineration, energy recovery or another existing waste-treatment pathway; and

h) any other realistic alternative capable of providing the same waste-management function or material output.

Alternatives shall be assessed separately where different materials, source streams or downstream uses are subject to materially different conditions.

A scenario shall not be excluded solely because it is not implemented by the project holder. Alternatives implemented by other market participants shall be considered where they would reasonably affect the without-project fate of the eligible material or the supply of the displaced material.

14.3 Baseline recycling quantity

14.3.1 Existing activities

For an existing collection system, recycling facility, distributed recycling network or other existing activity, the quantity that would have been effectively recycled in the absence of the project activity shall be determined separately for each eligible material.

The baseline recycling quantity shall be based on the average annual dry mass effectively recycled during the three complete years preceding the project start date.

Where the activity has operated for less than three years, all available complete years shall be used, subject to a minimum of one complete year.

Historical data shall demonstrate effective recycling and shall not be based solely on:

a) quantities collected;

b) quantities received;

c) installed processing capacity;

d) quantities sorted or transferred; or

e) sales records that do not identify the downstream recycling destination.

Historical quantities shall be supported by direct weighing records, production records, delivery receipts, invoices, inventory records, downstream processing records or other independently verifiable evidence.

Where the historical average is not representative because of material changes in waste generation, service coverage, number or size of participating facilities, sales activity or another relevant underlying activity, the baseline shall be adjusted using a documented and verifiable activity indicator or another conservative method.

An increase resulting solely from ordinary business growth, increased waste generation or expansion of the underlying commercial activity shall not be treated as additional recycling.

Temporary shutdowns, exceptional disruptions or other abnormal events shall not be used to reduce the baseline recycling quantity unless the project holder demonstrates that those conditions would reasonably continue in the without-project scenario.

The baseline recycling quantity shall not be lower than:

a) the quantity required by an enforced legal or regulatory obligation;

b) the quantity required by a binding contractual commitment; or

c) the quantity reasonably expected to be recycled under the without-project scenario.

Only the quantity effectively recycled above the applicable baseline recycling quantity may be included in the quantification of emission reductions.

14.3.2 New facilities and systems

For a newly established facility or recycling system, the project holder shall determine the quantity of eligible material that would have been effectively recycled in the absence of the project activity.

A baseline recycling quantity of zero may be applied only where the project holder demonstrates that:

a) the material would not have been effectively recycled in the without-project scenario;

b) the material has not been diverted from another formal or informal recycling activity;

c) effective recycling of the material is not common practice in the applicable geographic and sectoral context;

d) recycling is not required by an enforced legal, regulatory or contractual obligation; and

e) no other realistic market participant would have recycled the material in the absence of the project activity.

Where any part of the material would have been recycled without the project activity, that

quantity shall be included in the baseline recycling quantity.

For a capacity addition, retrofit or operational improvement at an existing facility, the baseline shall include:

a) the quantity that would have been recycled using the pre-project capacity and operating conditions; and

b) any increase in recycling reasonably expected to occur in the absence of the project activity.

The acquisition of equipment, construction of a facility or expansion of collection coverage does not, by itself, establish a zero baseline.

14.4 Baseline pathways by material

14.4.1 Plastics, container glass and metals

For plastics, container glass and metals, the principal baseline emission source is the production of the virgin material or product demonstrably displaced by the eligible recycled output.

The project holder shall identify:

a) the recycled output;

b) its technical and functional characteristics;

c) the material or product actually displaced;

d) the applicable production pathway for the displaced material; and

e) the applicable substitution relationship.

Where the recycled output displaces another recycled material rather than virgin material, avoided virgin-material production shall not be assumed.

Where the recycled output has a different function, quality or performance from the original material, the baseline shall reflect the material or product actually displaced.

The without-project fate of the waste material shall also be documented, even where disposal-related emissions are not quantified under the applicable material-specific quantification pathway.

14.4.2 Paper and cardboard

For eligible paper and cardboard, the baseline may include two distinct emission sources:

a) production of virgin pulp, paper or cardboard demonstrably displaced by the recycled output under the virgin-fiber displacement accounting mechanism established in this methodology; and

b) methane emissions from disposal, where the without-project scenario is disposal under conditions that would generate methane.

Avoided methane emissions shall be quantified only for the proportion of paper and cardboard that would have been disposed of under the applicable methane-generating conditions.

No avoided methane emissions shall be quantified for the proportion that would otherwise have been:

a) recycled;

b) reused;

c) incinerated;

d) treated aerobically; or

e) disposed of under conditions that would not generate material methane emissions.

Where both virgin-material displacement and avoided methane emissions are quantified, they shall correspond to separate physical emission sources and shall be calculated independently.

14.4.3 Composite and multilayer materials

Composite and multilayer materials do not have an independent baseline pathway.

Each eligible constituent material shall be assessed under the corresponding material-specific quantification pathway.

The incoming mass of the composite or multilayer material shall not be used as the baseline recycling quantity. Only the quantity of each constituent material effectively recovered and recycled may be considered.

A constituent material for which no complete quantification pathway exists shall not generate baseline emissions.

14.5 Data and evidence

The baseline determination shall use the most representative and reliable data available.

Relevant sources may include:

a) project and facility records;

b) weighing and production records;

c) records from downstream processors or manufacturers;

d) municipal or public waste-management data;

e) official statistics;

f) sectoral and market studies;

g) regulatory and contractual documentation;

h) records of extended producer responsibility or take-back systems;

i) documented information from formal and informal waste-sector participants; and

j) surveys or studies conducted by an independent and competent third party.

Data shall be representative of the applicable:

a) material;

b) source stream;

c) geographic area;

d) market;

e) technology; and

f) time period.

Where data sources conflict, the project holder shall explain the difference and apply the source or assumption that results in the more conservative baseline.

All assumptions, data sources, calculations and judgments used to establish the baseline shall be transparently documented in the Project Document.

14.6 Baseline reassessment

The baseline scenario shall be reassessed and validated in accordance with the BCR Standard.

For project activities in the waste sector, reassessment shall occur:

a) at least every seven years;

b) at each renewal of the quantification period; and

c) whenever a material change may affect the validity or conservativeness of the baseline.

Material changes may include:

a) new or amended recycling obligations;

b) extended producer responsibility requirements;

c) mandatory collection or recycling targets;

d) deposit-return systems;

e) restrictions or prohibitions on disposal;

f) new recycling or waste-treatment infrastructure;

g) material changes in market practice or recycling rates;

h) widespread adoption of improved recycling technology;

i) changes in the destination of the eligible material;

j) changes in the production pathway of the displaced material; or

k) other regulatory, technological or market developments affecting the without-project scenario.

The reassessment shall determine whether:

a) the original baseline remains realistic and conservative;

b) the baseline recycling quantity requires adjustment;

c) the without-project material pathways remain valid;

d) the applied emission factors and substitution assumptions remain representative;

e) the methodology remains applicable; and

f) regulatory surplus and additionality continue to be demonstrated.

Any revised baseline shall be independently validated, documented in the updated Project Document and applied in accordance with the transition and prospective application rules established by the BCR Standard.

15 Additionality

15.1 General requirements

Project holders shall demonstrate the additionality of the project activity in accordance with the applicable BioCarbon Baseline and Additionality Tool.

The Baseline and Additionality Tool shall be applied in full. The requirements in this section supplement, and do not replace, the procedures established in that Tool. Procedures contained in AMS-III.AJ, TOOL21 or any other external methodology or tool shall not substitute the applicable BioCarbon requirements.

The determination of the baseline recycling quantity under Section 14 does not, by itself, demonstrate additionality. The project holder shall demonstrate that the identifiable measures resulting in the eligible incremental recovery and effective recycling of materials would not occur under the selected without-project scenario.

This methodology does not establish automatic additionality or a positive list based solely on:

a) the construction of a new facility;

b) an increase in installed capacity;

c) the scale of the project activity;

d) the type or quantity of material recycled;

e) participation of the informal waste sector; or

f) a baseline recycling quantity equal to zero.

Any simplified additionality procedure may be applied only where expressly permitted by the applicable Baseline and Additionality Tool.

Where materials, source streams or material-specific quantification pathways are subject to materially different legal requirements, market conditions, technologies or investment circumstances, additionality shall be assessed separately for each material or group of materials, unless the project holder demonstrates that a common assessment is appropriate.

15.2 Regulatory surplus and prior consideration

The project activity shall exceed all enforced legal, regulatory and binding contractual requirements applicable to the collection, recovery or recycling of the eligible materials.

The assessment shall consider, as applicable:

a) extended producer responsibility obligations;

b) mandatory collection, recovery or recycling targets;

c) deposit-return or mandatory take-back systems;

d) restrictions or prohibitions on disposal;

e) municipal or public-service waste-management obligations;

f) concession, supply or service agreements; and

g) any other binding requirement affecting the eligible material or project activity.

The quantity required by an enforced obligation shall not be considered additional. Where the project activity exceeds the applicable requirement, only the quantity demonstrably exceeding that requirement may be eligible.

The project holder shall comply with the prior-consideration and timing requirements established in the BCR Standard. The project holder shall also provide dated and verifiable evidence demonstrating that the expected revenue from carbon credits was considered before the decision to implement the additional project measures or make the corresponding

investment.

Evidence may include:

a) board or management approvals;

b) feasibility studies and investment memoranda;

c) financing applications or conditional financing agreements;

d) procurement or equipment-acquisition decisions;

e) forward purchase agreements or expressions of interest for carbon credits; and

f) other contemporaneous records demonstrating the role of carbon-credit revenues in the implementation decision.

15.3 Recycling-specific additionality considerations

When applying the Baseline and Additionality Tool, the project holder shall consider the following:

a) for an existing facility, collection system or recycling network, additionality shall be assessed for the identifiable investment, equipment, operational improvement, collection system or other measure that causes the increase above the applicable baseline recycling quantity, and not for the pre-existing activity as a whole;

b) for a new facility or system, the project holder shall demonstrate that the eligible materials would not otherwise have been effectively recycled and have not been diverted from an existing formal or informal recycling activity;

c) a change in the collector, intermediary, contractual arrangement, processing facility or destination of material does not demonstrate additionality where the material would have been effectively recycled in the absence of the project activity;

d) an increase resulting solely from higher waste generation, greater sales, ordinary business growth, expansion of the underlying commercial activity or transfer of materials from another recycling activity is not additional;

e) the existence of a market for the recovered or recycled material does not automatically prevent additionality, but all material market revenues and commercial benefits shall be considered in the applicable analysis; and

f) the participation or formalization of waste pickers, cooperatives or other informal-sector participants does not, by itself, demonstrate additionality. Existing informal recovery and recycling shall be reflected in the baseline and additionality assessment.

15.4 Investment and barrier analysis

Where investment analysis is applied, it shall include all material project costs, revenues, financial support and cost savings, including, as applicable:

a) capital and operating costs;

b) revenue from the sale of recovered materials, recycled outputs or by-products;

c) collection, reception, processing or waste-management fees;

d) payments under extended producer responsibility, take-back or deposit-return systems;

e) grants, subsidies, concessional finance, public funding or tax benefits;

f) avoided disposal, transportation, procurement or raw-material costs; and

g) any other material financial or commercial benefit associated with the project activity.

The analysis shall demonstrate that the expected carbon-credit revenues materially affect the financial attractiveness or implementation of the additional project measure, in accordance with the applicable Baseline and Additionality Tool.

Where barrier analysis is applied, the project holder shall:

a) identify the specific barriers preventing implementation of the project activity;

b) provide verifiable evidence of the existence and material effect of each barrier;

c) demonstrate that at least one realistic alternative scenario is not prevented by the same barriers; and

d) demonstrate that carbon-credit revenues materially enable the project activity to overcome the identified barriers.

Barriers arising solely from internal management preferences, voluntarily adopted commercial policies or lack of action by the project holder shall not demonstrate additionality.

15.5 Common practice

Common practice shall be assessed in accordance with the Baseline and Additionality Tool using a geographic, sectoral and market boundary appropriate to the material and recycling pathway.

The assessment shall consider, as applicable:

a) the type and source of material;

b) the recycling technology and processing route;

c) the type and quality of recycled output;

d) the project configuration;

e) the formal or informal nature of existing recycling activities;

f) the geographic and market area from which the material is sourced; and

g) recent and representative recovery and effective-recycling rates.

Common practice shall be assessed on the basis of effective recycling or the applicable magnitude of comparable activities. Quantities merely collected, sorted, traded or transferred, and installed capacity not resulting in effective recycling, shall not be treated as comparable implementation.

Where similar activities are identified, any essential distinction relied upon to demonstrate additionality shall be clearly identified and supported by verifiable evidence.

15.6 Documentation, validation and reassessment

The complete additionality assessment, supporting evidence, assumptions, calculations and conclusions shall be documented in the Project Document and in any public disclosure required by the BCR Standard or the Baseline and Additionality Tool.

The Conformity Assessment Body shall assess all material elements of the additionality demonstration during validation, including:

a) regulatory surplus;

b) prior consideration;

c) the selected additionality pathway;

d) the treatment of all material non-carbon revenues and benefits;

e) barrier or investment analysis, as applicable;

f) common practice; and

g) the consistency of the additionality assessment with the selected baseline scenario.

Additionality shall be reassessed at renewal of the quantification period and whenever required by the BCR Standard or the Baseline and Additionality Tool due to material regulatory, technological, financial or market changes.

16 Project boundary

16.1 General requirements

The project boundary shall include the physical locations, material flows, processes and

greenhouse gas emission sources required to quantify the baseline emissions, project emissions and leakage attributable to the project activity.

The project holder shall define and document:

a) the physical and geographical boundary;

b) the greenhouse gas accounting boundary;

c) the temporal boundary;

d) the facilities, entities and transfer points included in the project activity;

e) the material flows entering and leaving each facility; and

f) the baseline and project emission sources associated with each material-specific quantification pathway.

The project boundary shall be consistent with the project configuration, baseline scenario, additionality assessment, mass balance and chain-of-custody system.

Where a project activity applies more than one material-specific quantification pathway, the boundary applicable to each pathway shall be identified separately. Shared facilities, processes and emissions shall be identified and allocated in accordance with a documented and conservative procedure.

16.2 Physical and geographical boundary

The physical and geographical boundary shall include, as applicable:

a) the collection, take-back or reception sites from which eligible materials enter the project activity;

b) collection centers, transfer stations, warehouses and other intermediate facilities through which eligible materials pass;

c) the recycling facility or facilities where eligible materials are sorted, classified, separated, cleaned, conditioned or otherwise prepared;

d) the processing or manufacturing facility or facilities where recovered materials are transformed into recycled intermediate or finished products;

e) the transport routes between the identified sites, to the extent required to determine project or leakage emissions;

f) the virgin-material production system displaced by the eligible recycled output;

g) the solid waste disposal site or treatment facility corresponding to the applicable baseline scenario for paper and cardboard, where avoided methane emissions are quantified; and

h) the facilities receiving rejects, contaminants or non-eligible fractions, where their treatment or disposal is relevant to project emissions or leakage.

The production of virgin material shall be included in the project boundary even where a specific production facility cannot be identified. In such cases, the boundary shall correspond to the production stages and geographic scope represented by the applicable baseline emission factor.

Where the project activity comprises a distributed recycling network, every participating entity and facility shall be identified in the Project Document. The project holder shall document the function of each participant, the materials handled and the applicable measurement and transfer points.

A facility does not need to be owned or operated by the project holder to be included in the project boundary. Where a third-party facility is included, the project holder shall demonstrate sufficient contractual arrangements, access to data and chain-of-custody controls to support monitoring and verification.

16.3 Greenhouse gas accounting boundary

The greenhouse gas accounting boundary shall include all material emission sources that are attributable to the project activity or that are used to determine the applicable baseline benefit.

The accounting boundary begins at the first collection or reception point included in the project activity and extends to the point at which:

a) the eligible recycled output is produced;

b) the downstream processing or use required by the applicable material-specific quantification pathway is demonstrated; and

c) the displacement of the applicable virgin material or product can be substantiated.

For projects that quantify avoided methane emissions from paper and cardboard, the accounting boundary shall also include the applicable baseline disposal pathway and the parameters required to determine methane generation and baseline methane capture.

The accounting boundary shall include, where material:

a) electricity consumed in collection, sorting, conditioning, recycling and downstream processing;

b) fossil fuels consumed by facilities and equipment;

c) transportation of eligible materials, recycled outputs, rejects and non-eligible fractions;

d) direct process emissions;

e) emissions from wastewater generated by washing or other recycling processes;

f) emissions from the treatment or disposal of contaminants, rejects and processing residues; and

g) any other material emission source caused by the project activity.

An emission source may be excluded only where:

a) its exclusion results in a more conservative estimate of net emission reductions; or

b) it is demonstrated to be immaterial in accordance with the applicable BioCarbon requirements.

Any exclusion shall be justified and documented in the Project Document.

Emission sources included in the calculation of a baseline emission factor shall not be included again as project emissions or under another baseline term.

16.4 Boundary by material-specific quantification pathway

16.4.1 Plastics

The boundary shall extend from the applicable collection or reception point to the facility where the eligible polymer is converted into a recycled output and, where necessary, to the downstream manufacturing stage at which displacement of virgin polymer or another material is demonstrated.

Where recycled plastic is used in a product with a different function or technical performance, the boundary shall extend to the stage necessary to identify the product or material actually displaced.

16.4.2 Paper and cardboard

The boundary shall include the facilities where paper and cardboard are collected, sorted, prepared and recycled.

Where virgin-fiber displacement is quantified, the boundary shall include the production stages represented by the applicable virgin pulp, paper or cardboard emission factor.

Where avoided methane emissions are quantified, the boundary shall also include the applicable baseline solid waste disposal site and the baseline methane capture or destruction system, if any.

16.4.3 Container glass

The boundary shall extend from collection or reception of eligible container glass to the facility where the cullet is prepared and demonstrably used in container-glass production.

The baseline boundary shall include only the virgin-material production stages displaced by the eligible cullet and represented by the applicable baseline equation or emission factor.

16.4.4 Metals

The boundary shall extend from collection or reception of eligible post-consumer metal to the processing or manufacturing facility where the recycled metal is demonstrably used.

The baseline boundary shall include the production stages of the corresponding virgin metal represented by the applicable emission factor.

16.4.5 Composite and multilayer materials

The boundary shall include the facility where the composite or multilayer material is separated or processed and all subsequent facilities necessary to demonstrate effective recycling of each eligible constituent material.

Each recovered constituent material shall be assigned to the applicable material-specific quantification pathway. Fractions sent to disposal, incineration, energy recovery or use as fuel shall remain identifiable within the mass balance and shall not generate emission reductions under BCR0020.

16.5 Temporal boundary

The temporal boundary shall be consistent with the project start date, quantification period and monitoring periods established under the BCR Standard.

The temporal boundary shall include:

a) the historical period used to determine the baseline recycling quantity under Section 14;

b) the period during which eligible materials are collected, processed and effectively recycled;

c) the monitoring period for which emission reductions are quantified and reported; and

d) any subsequent period required by the applicable quantification procedure to determine the greenhouse gas outcome attributable to materials recycled during the project activity.

Baseline emissions, project emissions, leakage and eligible recycled quantities shall be assigned to non-overlapping monitoring periods.

For avoided methane emissions from paper and cardboard, the temporal treatment of waste disposal and methane generation shall follow the applicable provisions of TOOL04 and the quantification procedures established in this methodology.

Changes to facilities, material sources, processing routes or downstream destinations that may affect the project boundary shall be documented and addressed in accordance with the applicable BioCarbon procedures for changes after project registration.

17 Quantification of GHG emission reductions

17.1 General quantification approach

Greenhouse gas emission reductions shall be quantified ex post for each monitoring period.

The calculation shall comprise:

a) baseline emissions determined separately for each applicable material-specific quantification pathway in accordance with Section 17.2;

b) project emissions determined in accordance with Section 17.3;

c) leakage emissions determined in accordance with Section 17.4; and

d) the uncertainty assessment and conservative adjustment determined in accordance with Section 17.6 and the applicable Conservative Approach and Uncertainty Management Tool.

The equations in Section 17 retain, where applicable, the accounting structure of AMS-III.AJ. Equation numbering is specific to BCR0020.

For the purposes of this section, $Q_{i,y}$ and the corresponding pathway-specific quantity parameters represent the eligible quantity effectively recycled in year y, expressed on the mass basis specified for the applicable material-specific quantification pathway.

For an existing project activity, the applicable eligible quantity shall include only the quantity effectively recycled in year y that exceeds the applicable baseline recycling quantity determined under Section 14. Where the effectively recycled quantity is equal to or lower than the applicable baseline recycling quantity, $Q_{i,y}$ shall be zero.

For a new facility or recycling system, the full quantity effectively recycled may be included as the applicable eligible quantity only where the baseline recycling quantity is zero in accordance with Section 14.3.2. Where a non-zero baseline recycling quantity applies, $Q_{i,y}$ shall equal the quantity effectively recycled in year y minus the applicable baseline recycling quantity, subject to a minimum value of zero.

The eligible quantity shall exclude:

a) moisture;

b) contaminants;

c) non-eligible materials;

d) rejects;

e) material losses occurring before the applicable measurement point;

f) materials sent to disposal, incineration, energy recovery or use as fuel;

g) materials that would have been effectively recycled under the baseline scenario; and

h) materials for which the required downstream processing or use has not been demonstrated.

Where material quantities are measured at more than one point in the recycling chain, the measurements shall be reconciled through the project mass balance. Where a discrepancy cannot be satisfactorily explained and supported, the lowest reconciled quantity shall be used.

Collection, reception, sorting, conditioning, sale or transfer records shall not, by themselves, establish the eligible quantity.

The correction factor $B_i$contained in AMS-III.AJ shall not apply. Domestic and imported production shall instead be represented using their actual or conservatively determined market shares and corresponding production emission factors. Baseline emissions associated with production outside the host country may be included only where their attribution, authorization and treatment are permitted under the applicable requirements of the BCR Standard and the Avoiding Double Counting Tool. Where these requirements are not met, the corresponding imported-production term shall be set to zero.

All non-CO_2 greenhouse gases quantified under BCR0020 shall be converted to CO_2e using the 100-year global warming potential values required by the applicable BCR Standard. The same GWP set shall be applied consistently to baseline emissions, project emissions and leakage within each monitoring period. Where TOOL04 refers to a commitment-period-specific GWP value, the value required by the applicable BCR Standard shall prevail for the application of BCR0020. This requirement applies to greenhouse gases quantified separately by mass; emission factors expressly established by BCR0020 in CO_2e units shall be applied as specified without an additional GWP conversion.

The calculation model shall be dimensionally consistent, transparent and reproducible. Eligible quantities, baseline emissions, project emissions, leakage and conservative adjustments shall be reconciled without duplication with the project mass balance. The model shall be maintained in an editable format and shall permit the CAB to trace each reported result to its source data, parameters, assumptions and equations. Where an unresolved inconsistency or unsupported parameter cannot be treated conservatively, the affected quantity shall be excluded.

17.2 Baseline emissions

17.2.1 Total baseline emissions

Baseline emissions in year *y* shall be calculated as:

$$BE_y = BE_{plastic,y} + BE_{paper,y} + BE_{glass,y} + BE_{metal,y} \quad \text{Equation 1}$$

Where:

BE_y	Baseline emissions in year y; tCO_2e
$BE_{plastic,y}$	Baseline emissions associated with the recycling of eligible plastics in year y; tCO_2e
$BE_{paper,y}$	Baseline emissions associated with the effective recycling of eligible paper and cardboard in year y, including virgin-fiber displacement and, where applicable, avoided methane emissions; tCO_2e
$BE_{glass,y}$	Baseline emissions associated with the recycling of eligible container glass in year y; tCO_2e
$BE_{metal,y}$	Baseline emissions associated with the recycling of eligible metals in year y; tCO_2e

Where a quantification pathway is not applicable, the corresponding term shall be zero.

Composite and multilayer materials shall not generate a separate baseline-emission term. Each eligible constituent material recovered from a composite or multilayer material shall be included under the applicable term in Equation 1.

The degree of geographic and production-route disaggregation differs among the material-specific quantification pathways because the applicable baseline equations represent different displaced production stages and use different parameter structures. For plastics, specific baseline emissions are reconstructed from production-energy inputs and therefore distinguish domestic and imported supply. For paper and cardboard, production origin and route are reflected through the selection or weighting of $SE_{VF,g,y}$. For container glass, Equation 6 quantifies only the electricity associated with preparation and mixing of virgin raw materials at the receiving manufacturing facility and therefore uses the applicable facility electricity emission factor. For metals, BCR0020 applies conservative material-specific default emission factors and, where the displaced production origin can be reliably identified, requires application of the lower of the corresponding origin-weighted factor and the applicable default. This differentiated treatment shall not reduce the requirements for representativeness, equivalence of production stages or conservative data selection.

Unless BCR0020 expressly establishes a default substitution factor, the applicable substitution factor shall be determined using evidence that meets the data hierarchy of the relevant material-specific quantification pathway. Where sufficient evidence is not available, the

substitution factor shall be set equal to zero and the affected recycled output shall not generate baseline emissions under that pathway.

17.2.2 Baseline emissions associated with plastics

Baseline emissions associated with the recycling of eligible plastics shall be determined separately for each polymer type and, where applicable, for each materially different recycled-output grade or downstream use.

Baseline emissions shall be calculated as:

$$BE_{plastic,y} = \sum_{i} Q_{i,y} \times SF_{i,y} \times \left(w_{i,in-country,y} \times SE_{i,in-country,y} + w_{i,imported,y} \times SE_{i,imported,y}\right)$$

Equation 2

Where:

$BE_{plastic,y}$	Baseline emissions associated with the recycling of eligible plastics in year y; tCO_2e
i	Virgin polymer category demonstrably displaced by an eligible recycled output: HDPE, LDPE, PET, PVC, PP, PS, EPS, PC or ABS
$Q_{i,y}$	Eligible quantity of recycled output in year $y$demonstrably assigned to the displacement of virgin polymer category i, determined in accordance with Section 17.1; tonnes of dry material
$SF_{i,y}$	Substitution factor representing the quantity of virgin polymer category $i$demonstrably displaced by one unit of eligible recycled output assigned to that category; dimensionless
$w_{i,in-country,y}$	Fraction of the virgin polymer type i consumed in the host country in year y that is produced in the host country; dimensionless
$SE_{i,in-country,y}$	Specific baseline emissions associated with production of virgin polymer type i in the host country in year y; tCO_2e/t
$w_{i,imported,y}$	Fraction of the virgin polymer type i consumed in the host country in year y that is imported; dimensionless
$SE_{i,imported,y}$	Specific baseline emissions associated with production of imported virgin polymer type i in year y; tCO_2e/t

For each polymer type:

$$w_{i,in-country,y} + w_{i,imported,y} = 1$$

The specific baseline emissions associated with production of virgin polymer type i in production origin s shall be calculated as:

$$SE_{i,s,y} = SEC_{BL,i,s} \times EF_{el,s,y} + SFC_{BL,i,s} \times EF_{FF,s,y} \quad \text{Equation 3}$$

Where:

s	Production origin, corresponding to the host country or an identified country or region of origin of imported virgin polymer
$SEC_{BL,i,s}$	Specific electricity consumption associated with production of virgin polymer type i in production origin s; MWh/t
$EF_{el,s,y}$	Emission factor for electricity used in virgin polymer production in production origin s, in year y; tCO2e/MWh
$SFC_{BL,i,s}$	Specific fossil-fuel consumption associated with production of virgin polymer type $i$in production origin s; GJ/t
$EF_{FF,s,y}$	CO_2 emission factor of the fossil fuel used in virgin polymer production in production origin $s$in year y; tCO2e/GJ

Where more than one fossil fuel is used, $EF_{\mathrm{FF},s,y}$ shall be the consumption-weighted emission factor of the relevant fuels. Where the fuel mix cannot be identified, natural gas may be assumed only where this results in a conservative estimate and is consistent with the applicable data hierarchy.

Specific baseline emissions for imported virgin polymer type $i$shall be determined as:

$$SE_{i,imported,y} = \sum_{r} w_{i,r,y} \times SE_{i,r,y} \quad \text{Equation 4}$$

Where:

r	Identified country or region of origin of imported virgin polymer type i
$w_{i,r,y}$	Share of imported virgin polymer type i originating from country or region r in year y; dimensionless
$SE_{i,r,y}$	Specific baseline emissions associated with production of virgin polymer

type $i$in country or region r, calculated using Equation 3; tCO_2e/t

For each imported polymer type:

$$\sum_r w_{i,r,y} = 1$$

The shares of in-country and imported production and, where applicable, the distribution of imported production by country or region of origin shall be determined using the most representative and reliable information available, including official production statistics, customs and trade data, sectoral reports or independently verified market data.

Where annual information is not available, the most recent representative multi-year average may be used. The period selected shall be justified and shall not include information that is demonstrably unrepresentative of the applicable market.

Where the project holder cannot reliably determine the share produced in the host country, the project holder shall conservatively assign a value of zero to $w_{i,\text{in-country},y}$and a value of one to $w_{i,\text{imported},y}$.

Where the origin of imported virgin polymer cannot be reliably identified, the project holder shall use:

a) a representative import mix derived from official or independently verifiable trade data; or

b) where such information is unavailable, the plausible production origin or combination of origins resulting in the lowest specific baseline emissions.

Determination of the substitution factor

The substitution factor $SF_{i,y}$shall be determined separately for each polymer and each materially different recycled-output grade or downstream application.

The factor shall reflect:

a) the technical and functional equivalence of the recycled output and the virgin polymer displaced;

b) differences in quality, purity, grade, intrinsic viscosity, mechanical performance or other relevant properties;

c) the quantity of recycled output actually incorporated into the downstream product;

d) manufacturing yields and losses occurring after the measurement point for $Q_{i,y}$;

e) the proportion of virgin polymer demonstrably displaced; and

f) the actual downstream use of the recycled output.

The substitution factor shall be determined using the following hierarchy:

a) direct and verifiable evidence from the downstream processing or manufacturing facility, including production formulations, input-output records, technical specifications, procurement records or controlled production trials;

b) representative material-specific technical studies, peer-reviewed publications, recognized industry datasets or standards applicable to the same polymer grade and downstream use; or

c) a conservative default value expressly established in this methodology.

Where more than one source at the same level of the hierarchy is equally representative, the value resulting in the lower baseline emissions shall be applied.

The substitution factor shall satisfy:

$$0 \leq SF_{i,y} \leq 1$$

A value of one shall be applied only where one-to-one displacement of virgin polymer is demonstrated.

Where the recycled output displaces another recycled material, does not result in an attributable reduction in virgin-polymer production or is used in an application for which the displaced material cannot be identified, $SF_{i,y}$ shall be zero.

Where a recycled output of one polymer demonstrably displaces a different virgin polymer, the calculation shall use the specific baseline emissions of the virgin polymer actually displaced. The relationship between the recycled output and the displaced polymer shall be supported by technical and downstream-use evidence.

The classification of the incoming waste shall not, by itself, determine the virgin polymer displaced. In particular, where recycled EPS is processed into a PS output that displaces virgin PS, the applicable specific baseline emissions shall correspond to virgin PS production.

Where a recycled plastic output displaces a non-plastic material, no baseline emissions shall be quantified under the plastics pathway unless BCR0020 expressly establishes a complete quantification procedure for the displaced material.

Baseline production boundary and data selection

The baseline production boundary shall include the energy consumed in the production of the relevant virgin monomers and virgin polymer resin or pellets up to the applicable production output represented by $SEC_{\mathrm{BL},i,s}$ and $SFC_{\mathrm{BL},i,s}$.

Downstream product-conversion stages that occur under both the baseline and project

scenarios shall not be included.

Avoided emissions associated with extraction or acquisition of primary feedstocks, non-energy process emissions or downstream product manufacture shall not be quantified under Equations 2–4 unless expressly incorporated into BCR0020 through a revision, amendment or normative annex.

The values of $SEC_{\mathrm{BL},i,s}$ and $SFC_{\mathrm{BL},i,s}$ shall be selected using the following hierarchy:

a) independently verified data representative of the virgin-polymer production route demonstrably displaced by the project activity;

b) current national or regional sector-specific data representative of the applicable polymer and production technology;

c) recognized industry or life-cycle inventory data from which the relevant electricity and fossil-fuel consumption can be transparently determined; or

d) conservative default values expressly established in this methodology.

The selected data shall be consistent with the production boundary defined above. Values established for one polymer shall not be applied to another polymer by analogy.

The selected parameters, sources, system boundaries, production routes, geographic representativeness and conservative choices shall be documented in the Project Document and assessed during validation. They shall be reassessed at renewal of the quantification period and whenever a material change affects their representativeness.

17.2.3 Baseline emissions associated with paper and cardboard

Baseline emissions associated with the effective recycling of eligible paper and cardboard may comprise:

a) avoided methane emissions from the baseline disposal of paper and cardboard under methane-generating conditions; and

b) avoided emissions from the demonstrated displacement of virgin pulp, paper or cardboard production.

Baseline emissions shall be calculated as:

$$BE_{paper,y} = BE_{CH_4,SWDS,y} + \sum_{g} Q_{paper,g,y} \times SF_{paper,g,y} \times SE_{VF,g,y} \qquad \text{Equation 5}$$

Where:

$BE_{paper,y}$	Baseline emissions associated with the effective recycling of eligible paper

	and cardboard in year y; tCO_2e
$BE_{CH_4,SWDS,y}$	Baseline methane emissions avoided in year $y$as a result of preventing eligible paper and cardboard from disposal at a solid waste disposal site; tCO_2e
g	Grade or materially distinct category of recycled fiber output and corresponding virgin pulp, paper or cardboard product displaced
$Q_{paper,g,y}$	Eligible quantity of recycled paper, cardboard or fiber output of grade g in year y, determined on a dry-mass basis in accordance with Section 17.1; tonnes
$SF_{paper,g,y}$	Substitution factor representing the quantity of virgin pulp, paper or cardboard production demonstrably displaced by one unit of eligible recycled output of grade g; dimensionless
$SE_{VF,g,y}$	Specific baseline emissions associated with production of the virgin pulp, paper or cardboard product displaced by recycled output of grade g in year y; tCO2e/t

Where one of the two accounting mechanisms is not applicable, the corresponding term shall be zero.

Application of both accounting mechanisms to the same eligible physical quantity is permitted only where the project holder demonstrates that:

a) the avoided methane emissions and avoided virgin-production emissions arise from distinct physical emission sources;

b) each baseline emission source is independently established and quantified;

c) the same emission source is not included in both terms; and

d) the claimed outcomes are not quantified under another project activity, methodology or environmental crediting program.

17.2.3.1 Avoided methane emissions from baseline disposal

Avoided methane emissions from eligible paper and cardboard shall be determined using Application B of TOOL04.

The project holder shall demonstrate the proportion of eligible paper and cardboard that would, in the absence of the project activity, have been disposed of at a solid waste disposal site under conditions that would generate methane.

Only this demonstrated proportion shall be included in the determination of $BE_{\mathrm{CH_4,SWDS},y}$.

No avoided methane emissions shall be quantified for any proportion of paper or cardboard that would otherwise have been:

a) effectively recycled;

b) reused;

c) incinerated or used for energy recovery;

d) treated under aerobic conditions;

e) exported or transferred for recycling; or

f) disposed of under conditions that would not result in material methane generation.

For purposes of TOOL04, $W_{\text{paper},x}$ shall represent the quantity of eligible paper and cardboard prevented from disposal in year x.

Where the eligible quantity is determined on a dry-mass basis and the applicable TOOL04 parameters require wet or as-received mass, the quantity shall be converted as follows:

$$W_{paper,x} = \frac{Q_{paper,CH_4,x}}{1 - MC_{paper,x}}$$

Where:

$W_{\text{paper},x}$	Wet or as-received mass of eligible paper and cardboard prevented from disposal in year x, for application of TOOL04; tonnes
$Q_{\text{paper},\text{CH}_4,x}$	Eligible dry mass of paper and cardboard in year x demonstrated to have followed a methane-generating disposal pathway in the baseline; tonnes
$MC_{\text{paper},x}$	Moisture content of the eligible paper and cardboard in year x, expressed as a fraction of wet mass; dimensionless

Where paper and cardboard streams have materially different moisture contents, the conversion shall be performed separately for each stream.

The amount $Q_{\text{paper},\text{CH}_4,x}$ shall:

a) include only the eligible incremental quantity determined under Section 17.1;

b) reflect the demonstrated proportion attributable to the methane-generating disposal pathway;

c) exclude moisture, contaminants, non-eligible materials and rejects before conversion to wet mass; and

d) be reconciled with the project mass balance.

The baseline solid waste disposal site or representative group of disposal sites shall be identified using verifiable evidence. The project holder shall document, as applicable:

a) the location and type of solid waste disposal site;

b) the waste-placement and management conditions;

c) the applicable methane correction factor;

d) the presence and operation of methane capture, flaring or utilization systems;

e) the fraction of methane captured;

f) climatic conditions;

g) disposal practices and restrictions; and

h) the proportion of eligible paper and cardboard attributable to each disposal site.

Where more than one solid waste disposal site is applicable, the calculation shall use:

a) the documented proportion of material attributable to each site; or

b) where the proportions cannot be reliably determined, the plausible disposal-site configuration resulting in the lowest baseline methane emissions.

Only methane emissions occurring during the applicable quantification period and attributable to eligible paper and cardboard diverted after the project start date shall be quantified.

All parameters, default values, monitoring requirements, uncertainty adjustments and conservative provisions established in TOOL04 shall apply unless BCR0020 expressly establishes a more specific requirement.

17.2.3.2 Avoided emissions from displacement of virgin-fiber production

Avoided emissions from displacement of virgin-fiber production shall be quantified only where the recycled output demonstrably substitutes virgin pulp, paper, cardboard or another expressly eligible virgin fiber-based input.

The project holder shall identify for each grade g:

a) the incoming paper or cardboard material;

b) the recycled output produced;

c) the grade, quality and technical specifications of the recycled output;

d) the downstream manufacturing process and use;

e) the virgin pulp, paper or cardboard product actually displaced;

f) the applicable production boundary;

g) the substitution factor $SF_{\text{paper},g,y}$; and

h) the specific baseline emissions $SE_{\text{VF},g,y}$.

The recycled output and the displaced virgin product shall be compared at an equivalent processing and functional stage.

For example:

a) recycled pulp shall be compared with the virgin pulp demonstrably displaced;

b) recycled paper shall be compared with the virgin paper grade demonstrably displaced; and

c) recycled cardboard shall be compared with the virgin cardboard or fiber input demonstrably displaced.

A recovered-paper bale or other intermediate material shall not be assumed to displace an equivalent quantity of virgin pulp or finished paper unless the downstream conversion, yield and actual substitution relationship are demonstrated.

Determination of the substitution factor

The substitution factor $SF_{\text{paper},g,y}$ shall account for, as applicable:

a) recovered-fiber grade and composition;

b) fiber length and strength;

c) contamination and non-fiber content;

d) losses during pulping, screening, cleaning and deinking;

e) manufacturing yield;

f) the proportion of recycled fiber incorporated into the downstream product;

g) differences in technical performance or product lifetime; and

h) the quantity of virgin fiber actually displaced.

The substitution factor shall be determined using the following hierarchy:

a) direct and verifiable data from the downstream pulp, paper or cardboard manufacturing facility, including production formulations, input-output records, fiber furnish data, technical specifications and procurement records;

b) independently verified supplier- or facility-specific technical data;

c) representative industry studies, technical standards, peer-reviewed publications or recognized sectoral datasets applicable to the same recovered-fiber grade and downstream product; or

d) a conservative default value expressly established in this methodology.

The substitution factor shall satisfy:

$$0 \leq SF_{paper,g,y} \leq 1$$

A value of one shall be applied only where one-to-one displacement of the corresponding virgin pulp, paper or cardboard product is demonstrated.

Where the recycled output:

a) displaces another recycled fiber input;

b) is used in an application for which the displaced material cannot be identified;

c) is used as fuel or for energy recovery;

d) is disposed of; or

e) does not result in an attributable reduction in virgin-fiber production,

$SF_{\text{paper},g,y}$ shall be zero.

Determination of specific baseline emissions

The parameter $SE_{\text{VF},g,y}$ shall represent only the greenhouse gas emissions from production stages demonstrably displaced by the eligible recycled output.

The applicable system boundary shall be consistent with the processing stage and function of the recycled output and may include, as applicable:

a) preparation of virgin fiber raw material;

b) virgin pulping;

c) bleaching, where applicable;

d) stock preparation;

e) paper or cardboard manufacturing; and

f) other production stages necessary to produce the equivalent virgin output.

Production stages that occur under both the baseline and project scenarios shall not be included as avoided baseline emissions.

The following shall not be included under the virgin-fiber displacement accounting mechanism:

a) carbon dioxide removals or changes in forest carbon stocks;

b) carbon stored in paper or cardboard products;

c) avoided land-use change;

d) biogenic carbon benefits that are not part of the applicable greenhouse gas inventory

boundary; or

e) downstream conversion, distribution or use stages that occur in both scenarios.

The parameter $SE_{VF,g,y}$ shall be selected using the following hierarchy:

a) independently verified data representative of the virgin production facility or production route demonstrably displaced;

b) current national or regional industry data representative of the applicable virgin pulp, paper or cardboard product;

c) recognized sectoral or life-cycle inventory data with transparent system boundaries, energy inputs and greenhouse gas calculations;

d) peer-reviewed technical data representative of the product and geographic context; or

e) a conservative default value expressly established in this methodology.

Where the displaced virgin product is supplied from more than one country, region or production route, the specific baseline emissions shall be determined using the documented market shares and corresponding emission factors.

Where the production origin or product grade cannot be reliably determined, the project holder shall apply the plausible factor resulting in the lowest baseline emissions.

The selected data source shall be:

a) technologically representative;

b) geographically representative;

c) sufficiently current;

d) consistent with the applicable production boundary;

e) transparent regarding allocation and system-boundary assumptions; and

f) independently verifiable.

The substitution factor, specific baseline emissions, production route and downstream use shall be reassessed whenever a material change occurs and at renewal of the quantification period.

17.2.4 Baseline emissions associated with container glass

Baseline emissions associated with the effective recycling of eligible container glass shall be quantified only for post-consumer container-glass cullet that is demonstrably used in container-glass production and displaces the preparation and mixing of virgin raw materials.

Baseline emissions shall be calculated as:

$$BE_{glass,y} = Q_{glass,y} \times SF_{glass,y} \times SEC_{BL,glass} \times EF_{el,glass,y} \quad \text{Equation 6}$$

Where:

$BE_{glass,y}$	Baseline emissions associated with the effective recycling of eligible container glass in year y; tCO_2e
$Q_{glass,y}$	Eligible quantity of clean container-glass cullet effectively recycled and demonstrably used in container-glass production in year y, determined in accordance with Section 17.1; tonnes
$SF_{glass,y}$	Substitution factor representing the quantity of virgin container-glass raw materials whose preparation and mixing are displaced by one unit of eligible container-glass cullet in year y; dimensionless
$SEC_{BL,glass}$	Specific electricity consumption associated with preparation and mixing of virgin raw materials displaced by the use of container-glass cullet; MWh/t
$EF_{el,glass,y}$	Emission factor of the electricity supplied to the container-glass manufacturing facility at which the eligible cullet is used in year y; tCO2e/MWh

Where eligible cullet is used at more than one container-glass manufacturing facility, Equation 6 shall be applied separately to the quantity used at each facility and the resulting baseline emissions shall be aggregated.

Where materially different grades, colors or downstream uses of container-glass cullet result in different substitution factors, the calculation shall be performed separately for each materially different category.

Eligible quantity of container-glass cullet

The quantity $Q_{glass,y}$ shall be measured at the point at which the clean cullet is received, accepted and used by the identified container-glass manufacturing facility.

The quantity shall:

a) include only eligible incremental container-glass cullet determined in accordance with Sections 14 and 17.1;

b) be net of ceramics, stones, metals, non-glass materials, contaminants, moisture, rejects and processing losses occurring before the applicable measurement point;

c) exclude cullet that is rejected by the receiving manufacturing facility;

d) exclude glass sent to disposal, incineration, energy recovery or use as aggregate, fill or another non-container-glass application; and

e) be reconciled with the project mass balance, delivery records, receiving-facility records and production records.

Cullet transferred to a container-glass manufacturing facility shall not be included in $Q_{\text{glass},y}$ unless its actual use in container-glass production is demonstrated.

Determination of the substitution factor

The default value shall be:

$$SF_{glass,y} = 0.88$$

This value accounts conservatively for differences in material quality and losses associated with the use of recycled cullet in container-glass production.

A project-specific substitution factor may be applied where direct and verifiable information from the receiving container-glass manufacturing facility demonstrates the actual substitution relationship.

Project-specific evidence may include:

a) raw-material batch formulations;

b) quantities of cullet and virgin raw materials introduced into production;

c) input-output and production records;

d) cullet acceptance and quality specifications;

e) contaminant and reject rates;

f) manufacturing yield; and

g) technical evidence identifying the virgin raw materials displaced.

The substitution factor shall satisfy:

$$0 \leq SF_{\text{glass},y} \leq 1$$

Where the available evidence supports a range of values, the lower value shall be applied.

A value greater than 0.88 shall be applied only where direct and independently verifiable downstream production data demonstrate the higher substitution relationship.

Where the eligible cullet displaces another recycled-glass input rather than virgin raw materials, no displacement of virgin-material preparation shall be assumed unless the attributable reduction in virgin-material use is demonstrated.

Where no attributable displacement of virgin raw materials is demonstrated:

$$SF_{\text{glass},y} = 0$$

Specific electricity consumption

The value of $SEC_{\text{BL,glass}}$ shall be:

$$SEC_{BL,glass} = 0.026\ MWh/t$$

This value represents the electricity consumed in the preparation and mixing of virgin raw materials displaced by the use of container-glass cullet.

The value shall be applied to the quantity of virgin raw-material preparation displaced after application of $SF_{\text{glass},y}$.

The default value shall remain applicable until revised through an approved revision, amendment or normative annex to BCR0020.

Electricity emission factor

The parameter $EF_{\text{el,glass},y}$shall represent the electricity supplied to the container-glass manufacturing facility where the eligible cullet is demonstrably used.

Where electricity is supplied from more than one source, the emission factor shall reflect the applicable consumption-weighted combination of:

a) grid electricity;

b) captive electricity generation; and

c) other identifiable electricity sources supplying the facility.

Where the electricity supply mix cannot be determined directly, the most representative official or independently verifiable electricity-emission factor applicable to the facility location shall be used.

Where more than one electricity source or emission factor is plausible and the applicable source cannot be reliably identified, the value resulting in the lowest baseline emissions shall be applied.

The selected factor, data source, geographic boundary, applicable year and treatment of grid and captive electricity shall be documented in the Project Document.

Baseline production boundary

The following conservative assumptions shall apply:

a) eligible container-glass cullet displaces only the preparation and mixing of virgin raw materials before the melting stage;

b) electricity is the only baseline energy source included for preparation and mixing of the displaced virgin raw materials;

c) fossil-fuel consumption associated with melting or other glass-manufacturing stages is not included in baseline emissions;

d) melting, forming, annealing, finishing and post-forming stages are not credited because these stages continue to occur when container-glass cullet is used;

e) avoided process emissions associated with decomposition of carbonated raw materials are not included;

f) emissions associated with extraction, mining, transport or acquisition of virgin raw materials are not included; and

g) no benefit shall be quantified for carbon storage or other effects outside the greenhouse gas accounting boundary established by this methodology.

The use of container-glass cullet shall not be assumed to avoid the entire production of container glass from virgin raw materials.

Container glass used as aggregate, fill, abrasive material, construction material or another non-container-glass product shall not be quantified under Equation 6.

The project holder shall reassess $SF_{\text{glass},y}$, $EF_{\text{el,glass},y}$, the receiving manufacturing facility and the downstream use whenever a material change occurs and at renewal of the quantification period.

17.2.5 Baseline emissions associated with metals

Baseline emissions associated with the effective recycling of eligible aluminum, steel and copper shall be determined separately for each metal type and, where relevant, for each materially different grade or downstream use.

Baseline emissions shall be calculated as:

$$BE_{metal,y} = \sum_{i} Q_{i,y} \times SF_{i,y} \times SE_{i,y} \qquad \text{Equation 7}$$

Where:

$BE_{metal,y}$	Baseline emissions associated with the effective recycling of eligible metals in year y tCO_2e
i	Eligible metal type: aluminum, steel or copper
$Q_{i,y}$	Eligible quantity of recycled output of metal type $i$in year y, determined in accordance with Section 17.1; tonnes of metal
$SF_{i,y}$	Substitution factor representing the quantity of production of the corresponding virgin metal demonstrably displaced by one unit of eligible recycled output of metal type i; dimensionless
$SE_{i,y}$	Specific baseline emission factor applicable to production of the corresponding displaced metal in year y; tCO2e/t

The eligible metal quantity, substitution factor and specific baseline emission factor shall be determined consistently at an equivalent material and processing stage.

Eligible quantity of recycled metal

The quantity $Q_{i,y}$shall represent the net quantity of eligible metal effectively recycled and accepted for use at an identifiable processing or manufacturing facility.

The quantity shall:

a) include only the eligible incremental quantity determined in accordance with Sections 14 and 17.1;

b) be determined separately for aluminum, steel and copper;

c) be net of moisture, coatings, insulation, plastics, glass, non-metallic components, contaminants, rejects and processing losses occurring before the applicable measurement point;

d) represent the actual metal content of the recycled output;

e) exclude material rejected by the receiving processing or manufacturing facility;

f) exclude material subsequently disposed of, incinerated, used as fuel or sent to energy recovery; and

g) be reconciled with the project mass balance, delivery records, receiving-facility records and downstream production records.

Where an eligible metal is recovered from cables, coated products, composite products or other materials containing non-metallic components, $Q_{i,y}$shall be based only on the measured or conservatively determined mass of the eligible metal.

Where a material contains more than one eligible metal, each metal shall be determined

separately.

Copper alloys, including brass and bronze, shall not be quantified as copper unless expressly incorporated into BCR0020 through a complete material-specific quantification pathway.

The transfer or sale of metal scrap shall not, by itself, establish $Q_{i,y}$. Its acceptance and effective use in an identifiable processing or manufacturing pathway shall be demonstrated.

Determination of the substitution factor

The substitution factor $SF_{i,y}$shall be determined separately for each metal type and, where relevant, for each materially different grade, composition or downstream application.

The factor shall reflect:

a) the grade, purity and composition of the recycled output;

b) the technical and functional equivalence of the recycled output and the virgin metal displaced;

c) the quantity of recycled output actually incorporated into the downstream product;

d) processing and manufacturing yields after the measurement point for $Q_{i,y}$;

e) losses arising from remelting, refining, casting or other downstream processing;

f) differences in alloy composition or product specifications; and

g) the quantity of virgin metal whose production is demonstrably displaced.

The substitution factor shall be determined using the following hierarchy:

a) direct and verifiable information from the downstream processing or manufacturing facility, including material formulations, charge records, input-output records, procurement records, production records and technical specifications;

b) independently verified facility- or supplier-specific technical information applicable to the same metal grade and downstream use;

c) recognized technical standards, representative industry studies, peer-reviewed publications or sectoral datasets applicable to the same metal and use; or

d) a conservative default value expressly established in this methodology.

The substitution factor shall satisfy:

$$0 \leq SF_{i,y} \leq 1$$

A value of one shall be applied only where one unit of eligible recycled metal demonstrably

displaces one unit of the corresponding virgin metal at an equivalent material and processing stage.

For copper, a substitution factor of one may be applied where the recycled output meets the applicable purity and technical specifications and direct downstream evidence demonstrates that it substitutes refined copper cathode or an equivalent virgin copper input.

Where the recycled metal:

a) displaces another secondary or recycled metal input;

b) is used in an application for which the displaced material cannot be identified;

c) has a materially different function or technical performance and the actual displaced material cannot be demonstrated; or

d) does not result in an attributable reduction in virgin-metal production,

$SF_{i,y}$ shall be zero.

Where the recycled output displaces a different metal or a non-metallic material, no baseline emissions shall be quantified under the metals pathway unless BCR0020 expressly establishes a complete quantification procedure for the displaced material.

Specific baseline emission factors

The following default specific baseline emission factors shall apply:

Metal	Default specific baseline emission factor $SE_{i,\text{default}}$	Unit
Aluminum	8.40	tCO_2e/t aluminum
Steel	1.27	tCO_2e/t steel
Copper	3.965	tCO_2e/t refined copper

The default factors for aluminum and steel are retained from AMS-III.AJ, Version 9.0.

The default factor for copper represents the cradle-to-gate climate-change result for one metric tonne of copper cathode reported in the International Copper Association global dataset, which includes both primary and secondary copper-cathode production routes. It is therefore not a primary-production-only factor. Under BCR0020, the factor shall be used as a conservative default only where the recycled output demonstrably displaces refined copper cathode or an equivalent virgin copper input.

Where reliable and independently verifiable information demonstrates that the specific emission factor of the production route actually displaced is lower than the applicable default value, the lower factor shall be applied.

A project-specific factor greater than the applicable default value shall not be applied unless it has been incorporated through an approved revision, amendment or normative annex to BCR0020.

Where the production origin of the displaced metal can be reliably identified, the project holder shall determine a consumption-weighted emission factor based on the documented production origins and shall apply the lower of:

a) the resulting consumption-weighted emission factor; and

b) the applicable default factor established above.

Where the origin cannot be reliably determined, the applicable default factor shall be used.

Consistency of production stages

The recycled output and the displaced virgin metal shall be compared at equivalent material and processing stages.

For example:

a) recycled aluminum ingot or another equivalent aluminum input shall be compared with the corresponding primary aluminum product displaced;

b) recycled steel shall be compared with the corresponding virgin-steel grade or input displaced; and

c) recycled copper output shall be compared with refined copper cathode or another equivalent copper input only where the relationship is demonstrated.

The specific baseline emission factor shall include only the production stages represented by the applicable factor.

No additional baseline benefit shall be added separately for:

a) mineral extraction;

b) ore beneficiation;

c) transport of primary raw materials;

d) intermediate metal-production stages;

e) avoided production residues or by-products; or

f) downstream manufacturing stages,

where those stages are already included in the applicable specific baseline emission factor or occur in both the baseline and project scenarios.

Emissions associated with collection, sorting, preparation, remelting, refining, casting and

other processing of the recycled metal shall be accounted for as project emissions under Section 17.3.

The project holder shall reassess $SF_{i,y}$, $SE_{i,y}$, the displaced metal, the receiving facility and the downstream use whenever a material change occurs and at renewal of the quantification period.

17.2.6 Composite and multilayer materials

Composite and multilayer materials shall not generate a separate baseline-emission term. No $BE_{\text{composite},y}$ shall be calculated.

Each eligible constituent material recovered and effectively recycled from a composite or multilayer material shall be included once under the corresponding term in Equation 1, as follows:

a) eligible polymers under $BE_{\text{plastic},y}$;

b) eligible paper, cardboard or recovered-fiber outputs under $BE_{\text{paper},y}$;

c) eligible container-glass cullet under $BE_{\text{glass},y}$; and

d) eligible aluminum, steel or copper under $BE_{\text{metal},y}$.

The quantity of each constituent material shall be determined at the measurement point established for the applicable material-specific quantification pathway.

For each constituent material, the eligible quantity shall:

a) be separately measured or conservatively determined through representative sampling and a verified recovery yield;

b) represent only the dry mass of the eligible constituent material;

c) exclude moisture, contaminants, adhesives, coatings, non-eligible materials, rejects and processing losses, unless any such component is separately eligible under another applicable pathway;

d) be demonstrated to have undergone effective recycling;

e) be linked to an identifiable recycled output and downstream use;

f) comply with the substitution and baseline-emission requirements of the applicable material-specific quantification pathway; and

g) be reconciled with the project mass balance.

The total quantity of constituent materials attributed to a composite or multilayer input shall not exceed the eligible dry mass of that input after accounting for contaminants, non-eligible

components and processing losses.

The total incoming mass of the composite or multilayer material shall not be entered directly as $Q_{i,y}$, $Q_{\text{paper},g,y}$ or $Q_{\text{glass},y}$.

No substitution factor or specific baseline emission factor shall be assigned to the composite or multilayer material as a whole.

Where the recycling process produces an inseparable combined output, baseline emissions may be quantified only where:

a) the composition of the output is determined through direct measurement or representative sampling;

b) each eligible constituent fraction is identified;

c) the actual downstream use and displaced material are demonstrated;

d) an applicable quantification pathway exists for each constituent fraction claimed; and

e) the same constituent material is not counted under more than one pathway.

Where these conditions are not met, no baseline emissions shall be quantified for the combined output.

Constituent materials that are disposed of, incinerated, used as fuel, sent to energy recovery or otherwise not effectively recycled shall not generate baseline emissions.

Project emissions associated with separation, conditioning and processing of composite or multilayer materials shall be included under Section 17.3 and shall be directly assigned or conservatively allocated to the recovered constituent materials.

17.3 Project emissions

Project emissions shall be quantified ex post for each monitoring period and for every material-specific quantification pathway applied by the project activity.

Project emissions shall extend from the first collection or reception point included in the project activity to the processing or manufacturing stage necessary to produce the eligible recycled output and establish a technically equivalent comparison with the displaced virgin material or product.

Project emissions shall be calculated as:

$$PE_y = PE_{energy,y} + PE_{transport,y} + PE_{other,y} \qquad \text{Equation 8}$$

Where:

PE_y	Total project emissions in year y; tCO_2e
$PE_{energy,y}$	Project emissions from electricity, externally supplied heat or steam, and fossil-fuel consumption in year y; tCO_2e
$PE_{transport,y}$	Project emissions from transportation attributable to the eligible project activity in year y tCO_2e
$PE_{other,y}$	Other material project emissions, including direct process emissions and emissions from wastewater, rejects and residual streams, in year y tCO_2e

Each term in Equation 8 shall be equal to or greater than zero.

Project emissions shall be quantified for all applicable material-specific quantification pathways, including paper and cardboard. A project-emission source may be assigned a value of zero only where the source does not occur, its exclusion is conservative, or its exclusion is permitted under the applicable BioCarbon requirements.

Internal recovery or reuse of energy may reduce the monitored consumption of purchased energy but shall not result in negative project emissions.

Defaults, exclusions and zero-emission assumptions contained in AMS-III.AJ shall apply only where expressly retained in BCR0020.

17.3.1 Energy consumption

Project emissions from energy consumption shall include electricity, externally supplied heat or steam, and fossil fuels consumed in collection, sorting, conditioning, recycling and any downstream processing required to reach the material or functional stage represented by the applicable baseline-emission calculation.

Project emissions from energy consumption shall be calculated as:

$$PE_{energy,y} = \sum_{j,s}\left(EC_{j,s,y} \times EF_{el,j,s,y}\right) + \sum_{j,h}\left(HC_{j,h,y} \times EF_{heat,j,h,y}\right) + \sum_{j,f}\left(FC_{f,j,y} \times NCV_{f,y} \times EF_{fuel,f,y}\right) \quad \text{Equation 9}$$

Where:

j	Facility or process stage included in the project-emission boundary

s	Electricity supply source
h	Source of externally supplied heat or steam
f	Fuel type
$EC_{j,s,y}$	Electricity from source $s$consumed at facility or process stage j in year y and attributable to the eligible project activity; MWh
$EF_{el,j,s,y}$	Emission factor applicable to electricity source $s$supplying facility or process stage j in year y; tCO2e/MWh
$HC_{j,h,y}$	Externally supplied heat or steam from source h consumed at facility or process stage j in year $y$and attributable to the eligible project activity; GJ
$EF_{heat,j,h,y}$	Emission factor applicable to the externally supplied heat or steam; tCO2e/GJ
$FC_{f,j,y}$	Quantity of fuel type f consumed at facility or process stage j in year $y$and attributable to the eligible project activity; mass or volume unit
$NCV_{f,y}$	Net calorific value of fuel type f in year y; GJper mass or volume unit
$EF_{fuel,f,y}$	Greenhouse gas emission factor for combustion of fuel type f in year y tCO2e/GJ

Where electricity, heat or fuel is supplied from more than one source, consumption and emissions shall be determined separately for each source.

The processing stage included in project emissions shall be consistent with the stage represented by the corresponding baseline-emission factor. In particular:

a) recycled plastic resin or pellets shall be compared with virgin resin or pellets at an equivalent stage;

b) recycled pulp, paper or cardboard shall be compared with the corresponding displaced virgin output at an equivalent stage;

c) for container glass, project emissions shall include preparation of eligible cullet, while stages occurring equivalently in both scenarios and not represented in the baseline benefit may be excluded; and

d) recycled metal shall be compared with the virgin-metal stage represented by the applicable baseline-emission factor.

A downstream process shall not be assigned a value of zero solely because it is performed by a third party.

Where direct energy-consumption data are unavailable, a representative and independently verifiable specific consumption factor may be used. The factor shall correspond to the same material, processing technology, output stage and applicable geographic or technological context.

The default specific electricity-consumption value of 0.83 MWh/t contained in AMS-III.AJ shall not apply automatically under BCR0020.

17.3.2 Transportation

Project emissions from transportation shall include the movement of eligible materials, recycled outputs, rejects and residual streams along the routes included in the project boundary.

Transportation emissions shall preferably be determined using actual fuel-consumption data:

$$PE_{transport,y} = \sum_{r,f} \left(FC_{TR,r,f,y} \times NCV_{f,y} \times EF_{fuel,f,y} \right) \quad \text{Equation 10}$$

Where:

r	Transport route included in the project boundary
$FC_{TR,r,f,y}$	Quantity of fuel type f consumed for transport route r in year y and attributable to the eligible project activity; mass or volume unit
$NCV_{f,y}$	Net calorific value of fuel type f; GJ per mass or volume unit
$EF_{fuel,f,y}$	Greenhouse gas emission factor for fuel type f; tCO2e/GJ

Where actual fuel-consumption data are unavailable, transportation emissions may be determined using a mass-distance approach:

$$PE_{transport,y} = \sum_{r,v} \left(M_{r,v,y} \times D_{r,v,y} \times EF_{tkm,v,y} \right) \quad \text{Equation 11}$$

Where:

v	Vehicle or transportation mode
$M_{r,v,y}$	Mass transported on route r using vehicle or transportation mode v in year y; tonnes
$D_{r,v,y}$	Transport distance attributable to route r and vehicle or mode v in year y; km
$EF_{tkm,v,y}$	Emission factor for vehicle or transportation mode v; tCO2e/(t.km)

Only one calculation option shall be applied to a given transport activity.

The calculation shall reflect actual or conservatively determined distances, loads, vehicle types, fuels and return trips. Where the selected emission factor already includes empty return trips, they shall not be added separately.

For volume-constrained materials, including EPS and other low-density materials, actual vehicle loads and the number of trips shall be used. Rated maximum mass capacity shall not be used where it cannot be achieved because of the volume of the material.

Transportation may be excluded only where equivalent transportation demonstrably occurs in the baseline and project scenarios and the exclusion does not increase the quantified emission reductions.

17.3.3 Other material project emissions and shared sources

Other material project emissions shall be calculated as:

$$PE_{other,y} = \sum_{o} (AD_{o,y} \times EF_{o,y}) \qquad \text{Equation 12}$$

Where:

o	Other material project-emission source
$AD_{o,y}$	Activity data applicable to project-emission source o in year y
$EF_{o,y}$	Greenhouse gas emission factor applicable to source o; expressed consistently with the activity data
$PE_{other,y}$	Other material project emissions in year y; tCO2e

Other material project-emission sources may include, as applicable:

a) direct methane or nitrous oxide emissions from wastewater treatment;

b) emissions from treatment or disposal of rejects, sludge and residual streams;

c) direct process emissions;

d) fugitive refrigerant or process-gas emissions; and

e) emissions associated with material process chemicals or additives.

Where a residual stream containing degradable organic carbon is disposed of at a solid waste disposal site, the applicable provisions of TOOL04 shall be used. Where wastewater treatment, incineration or another treatment route is material, the associated greenhouse gas emissions shall be determined using the applicable procedures of the 2006 IPCC Guidelines

for National Greenhouse Gas Inventories, as refined by the 2019 Refinement.

Only gross positive emissions shall be included under $PE_{\text{other},y}$. Avoided disposal, energy recovery, recycling, material substitution or another environmental benefit shall not be netted against project emissions.

Where a facility, process, vehicle or utility system serves eligible and non-eligible activities, shared emissions shall be directly measured or allocated using a documented physical and causal parameter, such as energy consumption, operating time, throughput or transport activity.

Allocation based solely on sales value, revenue, profitability or market price shall not be used. Where no reliable allocation can be established, all shared emissions shall be assigned to the eligible project activity.

Project-emission data shall be monitored or conservatively determined in accordance with the Monitoring, Reporting and Verification Tool and the Conservative Approach and Uncertainty Management Tool.

Where a material project-emission source cannot be measured or conservatively estimated with sufficient reliability, the affected material quantity shall not generate emission reductions.

17.4 Leakage

Leakage shall be identified, assessed, minimized, quantified, monitored and conservatively managed in accordance with the applicable Leakage Management Tool and the requirements established in this section.

For purposes of BCR0020, leakage comprises any increase in greenhouse gas emissions occurring outside the project boundary that is attributable to implementation of the project activity and that is not already accounted for through:

a) the baseline recycling quantity;

b) the material-specific substitution factor;

c) project emissions under Section 17.3;

d) exclusion of a non-eligible material quantity; or

e) another applicable component of the greenhouse gas accounting model.

Emissions from collection, transportation, downstream processing, wastewater treatment, management of rejects or other activities included in the project boundary shall be treated as project emissions and shall not be reclassified as leakage.

The leakage assessment shall consider, as applicable:

a) diversion of materials from existing formal or informal recovery or recycling activities;

b) diversion of materials from reuse, repair, refurbishment, remanufacturing or another existing productive use;

c) replacement, outside the project boundary, of a displaced material, energy output or other service by an alternative resulting in higher greenhouse gas emissions;

d) continued operation, transfer or relocation of equipment or activities displaced by the project activity;

e) material market or supply-chain effects attributable to the project activity; and

f) any other material increase in emissions occurring outside the project boundary and attributable to implementation of the project activity.

Materials that would have been effectively recycled in the absence of the project activity shall be included in the baseline recycling quantity or excluded from the eligible recycled quantity, as applicable.

Failure to demonstrate that a recycled output displaces virgin material shall be reflected through the applicable substitution factor and shall not be treated as a separate leakage deduction. However, any distinct and demonstrable increase in emissions outside the project boundary caused by diversion or replacement effects shall be treated as leakage.

The same effect shall not be accounted for more than once through the baseline recycling quantity, substitution factor, project emissions, leakage, uncertainty adjustment or exclusion of an eligible quantity.

Total leakage emissions shall be calculated as:

$$LE_y = \sum_k LE_{k,y} + LE_{adj,y} \qquad \text{Equation 13}$$

Where:

LE_y	Total leakage emissions and conservative leakage adjustments applicable in year y tCO2e
k	Identified measurable leakage source
$LE_{k,y}$	Quantified leakage emissions from source $k$in year y tCO2e
$LE_{adj,y}$	Conservative adjustment, expressed in tCO_2e, applied in accordance with

the Leakage Management Tool for material leakage that cannot be directly quantified; tCO2e

For each measurable leakage source, the incremental emissions attributable to the project activity shall be determined as:

$$LE_{k,y} = max\left(0, E^{PJ}_{out,k,y} - E^{BL}_{out,k,y}\right) \quad \text{Equation 14}$$

Where:

$E^{PJ}_{out,k,y}$	Emissions occurring outside the project boundary from source *k*under the situation caused by implementation of the project activity in year y tCO2e
$E^{BL}_{out,k,y}$	Emissions that would have occurred outside the project boundary from source *k*under the without-project scenario in year y tCO2e

Equation 14 shall be applied using consistent boundaries, activity data, emission factors and time periods.

Where a material leakage risk cannot be directly quantified with sufficient reliability, the project holder shall apply the conservative treatment required by the Leakage Management Tool and include the resulting adjustment as $LE_{\text{adj},y}$.

A value of zero may be assigned to LE_yonly where all identified leakage sources are demonstrated to be negligible, immaterial or structurally prevented by the eligibility, baseline, substitution and traceability requirements of BCR0020.

Positive environmental effects occurring outside the project boundary shall not be used to offset leakage emissions.

Where a material leakage risk cannot be adequately avoided, mitigated, quantified or conservatively adjusted, the affected material quantity or material-specific quantification pathway shall not generate emission reductions.

Leakage shall be reassessed for each monitoring period and whenever a material change occurs in the project activity, material sources, downstream uses, market conditions or without-project scenario. The assessment, assumptions, calculations, mitigation measures and supporting evidence shall be documented in the Project Document and Monitoring Report.

17.5 Net GHG emission reductions

Net greenhouse gas emission reductions before application of the uncertainty and conservative adjustment shall be calculated as:

$$ER_y = BE_y - PE_y - LE_y \qquad \text{Equation 15}$$

Where:

ER_y	Net greenhouse gas emission reductions before uncertainty and conservative adjustment in year y; tCO2e
BE_y	Total baseline emissions in year y, determined in accordance with Section 17.2 and Equation 1; tCO2e
PE_y	Total project emissions in year y, determined in accordance with Section 17.3 and Equation 8; tCO2e
LE_y	Total leakage emissions and conservative leakage adjustments in year y, determined in accordance with Section 17.4 and Equation 13; tCO2e

Equation 15 shall be applied ex post using monitored or otherwise eligible data for the applicable monitoring period.

Where a monitoring period covers more than one calendar year, Equation 15 shall be applied separately to each year and the annual results shall be aggregated. Negative annual or pathway-specific results shall remain in the aggregation and shall not be omitted solely to increase the quantified emission reductions.

Where $ER_y \leq 0$, no greenhouse gas emission reductions shall be generated for year y. The result shall nevertheless be reported and retained in the calculation records.

The result of Equation 15 is subject to the uncertainty assessment and any conservative adjustment required under Section 17.6 before determining the final verified quantity eligible for issuance.

Calculations shall retain sufficient decimal precision to avoid material rounding effects. Rounding shall be applied only after the applicable uncertainty and conservative adjustment.

17.6 Uncertainty and conservative adjustment

The project holder shall identify, quantify and conservatively manage uncertainty in accordance with the applicable Conservative Approach and Uncertainty Management Tool.

The uncertainty assessment shall cover the complete calculation of net greenhouse gas emission reductions and shall include, as applicable, uncertainty associated with:

a) measurement and sampling of material quantities;

b) moisture, contamination, composition and non-eligible fractions;

c) processing and recovery yields;

d) baseline recycling quantities;

e) substitution factors;

f) baseline and project emission factors;

g) allocation of shared material flows and emissions;

h) parameters applied under TOOL04; and

i) monitored or estimated project-emission and leakage data.

Structural or scenario uncertainty that cannot be represented reliably through statistical analysis shall be addressed through conservative baseline selection, conservative parameter selection or exclusion of unsupported material quantities.

BCR0020 does not establish a separate uncertainty threshold or deduction schedule. The applicable confidence level, calculation method and conservative adjustment shall be determined in accordance with the Conservative Approach and Uncertainty Management Tool.

The same source of uncertainty or overestimation risk shall not be treated more than once. In particular, uncertainty already addressed through TOOL04, a substitution factor, a conservative default value, a leakage adjustment or exclusion of a material quantity shall not be deducted again for the same effect.

An uncertainty adjustment shall not be used to remedy failure to meet an applicability condition, lack of additionality, an unsupported baseline, failure to demonstrate effective recycling, an unresolved chain-of-custody gap, double counting or absence of the right to claim the mitigation outcome.

The final conservatively adjusted greenhouse gas emission reductions determined under the applicable Tool shall be reported as $ER_{\text{adj},y}$ and shall constitute the quantity submitted for verification before application of any program-level issuance or reserve provisions.

The uncertainty assessment, input data, assumptions, calculation method and resulting adjustment shall be documented in an editable and reproducible format and shall be reassessed for each monitoring period and whenever a material change affects the calculation.

18 Mass balance, chain of custody and attribution

18.1 Mass balance

The project holder shall establish and maintain a documented mass-balance system for all eligible materials included in the project activity.

The system shall link material inputs, inventories, intermediate transfers, eligible and non-eligible outputs, rejects, losses and downstream recycling at both facility and project levels.

A separate mass balance shall be maintained for each eligible material type, materially different grade or composition, facility or operational node, and material-specific quantification pathway.

For each material m, facility or node j, and reconciliation period p, the reconciliation difference shall be determined as:

$$RD_{m,j,p} = \left(M_{in,m,j,p} + I_{open,m,j,p}\right) - \left(M_{elig,out,m,j,p} + M_{nonelig,out,m,j,p} + M_{reject,m,j,p} + M_{loss,m,j,p} + I_{close,m,j,p}\right) \quad \text{Equation 16}$$

Where:

$RD_{m,j,p}$	Mass-balance reconciliation difference for material m, facility or node j, and reconciliation period p; tonnes
$M_{in,m,j,p}$	Quantity of material $m$entering facility or node $j$during reconciliation period p; tonnes
$I_{open,m,j,p}$	Opening inventory of material $m$at facility or node $j$at the beginning of reconciliation period p; tonnes
$M_{elig,out,m,j,p}$	Quantity of output from material $m$provisionally assigned to an eligible material flow during reconciliation period p; tonnes
$M_{nonelig,out,m,j,p}$	Quantity of output from material $m$assigned to non-eligible uses, products or activities during reconciliation period p; tonnes
$M_{reject,m,j,p}$	Quantity of rejects, contaminants and non-recoverable fractions associated with material $m$during reconciliation period p; tonnes
$M_{loss,m,j,p}$	Measured or conservatively determined processing losses associated with material $m$during reconciliation period p; tonnes
$I_{close,m,j,p}$	Closing inventory of material $m$at facility or node $j$at the end of reconciliation period p; tonnes

The mass balance shall be prepared at intervals sufficient to identify and resolve discrepancies

and shall be consolidated for each monitoring period.

Equation 16 shall be applied using a consistent mass basis. Eligible quantities shall normally be determined on a dry-mass basis, except where this methodology or TOOL04 expressly requires a wet-mass or as-received basis.

Virgin material, additives, coatings, fillers, alloying materials and other non-eligible inputs shall be separately identified and shall not increase the eligible recycled quantity.

The term $M_{\text{elig,out},m,j,p}$ does not, by itself, establish eligibility for crediting. The quantity remains subject to the applicable baseline, effective-recycling, downstream-use, substitution and attribution requirements.

Where accounted outputs exceed supported inputs, the eligible output shall be limited to the lower quantity supported by verifiable evidence. Where inputs exceed accounted outputs and the difference cannot be resolved, the unexplained quantity shall be treated as a non-eligible loss or reject.

Negative inventories shall not be permitted.

18.2 Chain-of-custody and demonstration of effective recycling

The project holder shall maintain a verifiable physical link between:

a) the material source;

b) each collection, reception, aggregation, transfer, storage and processing point;

c) the applicable measurement point;

d) the recycled output;

e) the downstream processing or use required by the applicable pathway; and

f) the greenhouse gas outcome attributed to the material quantity.

Each transfer shall be supported by a unique transaction, batch, consignment or equivalent identifier and shall be recorded at both the dispatching and receiving points.

Chain-of-custody records shall identify, as applicable, the entities and facilities involved, dates, material type and grade, quantity and mass basis, quantities accepted or rejected, processing performed, recycled output and downstream destination.

The project activity may use identity preservation, physical segregation or a controlled mass-balance model.

A controlled mass-balance model may be used only where:

a) eligible and non-eligible inputs are separately measured or conservatively determined;

b) the physical movement of the material through the identified facility or network is demonstrated;

c) the eligible output does not exceed the eligible input adjusted for verified inventories, yields and losses;

d) no eligible quantity is borrowed from future inputs; and

e) the calculation remains reproducible and available for verification.

A book-and-claim model or another model that does not maintain a physical link between the eligible material and the recycling chain shall not be used.

The transfer, sale or delivery of a material to a recycler shall not, by itself, demonstrate effective recycling. Evidence shall extend to the point at which the recycled output and the downstream outcome required by the applicable material-specific quantification pathway are demonstrated.

Where downstream evidence is insufficient to demonstrate effective recycling, the affected material quantity shall be excluded.

18.3 Attribution and prevention of double claiming

The project holder shall demonstrate the exclusive right to claim the greenhouse gas outcome associated with each material quantity included in the calculation.

Legal title to the physical material and the right to claim the greenhouse gas outcome may be held by different entities. The purchase, sale or transfer of a material shall not, by itself, transfer the right to claim that outcome.

The right to claim shall be established through applicable law, contract, authorization, assignment or another enforceable arrangement before the corresponding quantity is included in a Monitoring Report.

The applicable arrangement shall identify the parties, materials, quantities, period, facilities and activities covered, the party authorized to claim the greenhouse gas outcome, and the prohibition of conflicting claims.

Any other certificate, environmental attribute, regulatory claim or credit associated with the same material shall be disclosed. Such instruments may coexist only where they represent distinct outcomes and the same greenhouse gas mitigation outcome is not claimed more than once.

The applicable requirements of the Avoiding Double Counting Tool shall apply.

Where attribution is unclear, disputed, overlapping or unsupported, the affected material quantity shall not generate emission reductions.

18.4 Distributed networks and unresolved discrepancies

A project activity involving multiple participants or facilities shall maintain a controlled register identifying each participant, facility, role, eligible material, applicable measurement point and effective participation period.

Mass balances shall be prepared at both:

a) the individual facility or operational-node level; and

b) the consolidated project level.

Transfers among project participants shall cancel upon consolidation and shall not create additional eligible quantities.

Where third-party facilities are included, contractual or equivalent arrangements shall provide the project holder and the CAB with access to the records necessary to demonstrate effective recycling, mass balance, downstream use and attribution.

Each material reconciliation difference shall be reviewed. Where a difference exceeds the expected measurement, sampling or inventory uncertainty, the project holder shall investigate and document the cause and any correction.

An unresolved mass-balance, chain-of-custody or attribution gap shall not be remedied through an uncertainty deduction, substitution-factor adjustment, leakage adjustment or unsupported attestation.

Where a material discrepancy or documentation gap cannot be resolved conservatively, the affected quantity shall be excluded.

Records shall be retained for the period required by the BCR Standard and the applicable Monitoring, Reporting and Verification Tool.

19 Monitoring requirements

Project activities shall be monitored in accordance with the applicable Monitoring, Reporting and Verification Tool.

This section establishes only the parameters and material-specific monitoring requirements necessary to apply BCR0020.

The Monitoring Plan shall identify, for each applicable parameter:

a) the data source;

b) the measurement, sampling or determination method;

c) the monitoring frequency;

d) the responsible entity;

e) the applicable QA/QC procedure;

f) the treatment of missing or invalid data; and

g) the records required for validation and verification.

Unless BCR0020 establishes a more specific requirement, the provisions of the Monitoring, Reporting and Verification Tool shall apply.

All data and parameters necessary to apply Sections 14 to 18 shall be included, as applicable, in one of the following categories.

19.1 Data and parameters available at validation

The data and parameters identified in Table 1 shall be determined, selected or confirmed before validation and documented in the Project Document.

For each applicable parameter, the project holder shall document the value applied, unit, source, publication or version date, system boundary, geographic and technological representativeness, uncertainty and any conservative assumption used.

Unless BCR0020 establishes a fixed default value, project-specific or external values shall be selected in accordance with the data hierarchy and representativeness requirements established in the applicable quantification section.

A data value or parameter validated for a quantification period may continue to be applied only while the conditions underlying its selection remain representative. It shall be reassessed at renewal of the quantification period and whenever a material change affects the baseline pathway, material grade, recycled output, downstream use, displaced virgin product, production origin or production route.

Where a parameter listed in Table 1 includes the index y, the table refers to the value initially validated for application in year y. Any update required during a monitoring period shall be recorded in accordance with Section 19.2.

Data and parameters required by TOOL04 and classified by that Tool as fixed or determined ex ante shall be established in accordance with TOOL04 and shall not be duplicated individually in BCR0020.

Table 1. Data and parameters available at validation

Data or parameter	Unit	Description	Source and value applied	Use and reassessment
Baseline recycling quantity, by eligible material and materially different source stream	tonnes of dry material/year	Quantity that would have been effectively recycled in the absence of the project activity.	Determined in accordance with Section 14.3 using historical effective-recycling data and the applicable legal, contractual and without-project requirements. A value of zero may be applied only where the conditions in Section 14.3.2 are met.	Used to determine the eligible incremental quantity under Section 17.1. Reassessed in accordance with Section 14.6.
Proportion assigned to each without-project pathway	fraction or %	Proportion of each eligible material assigned to each applicable recycling, reuse, disposal, incineration, energy-recovery or other without-project pathway. The proportions for each material shall sum to one.	Determined from the baseline evidence required under Sections 14.1, 14.2, 14.4 and 14.5. Where reliable proportions cannot be established, the conservative pathway configuration shall be applied.	Used to determine the applicable baseline recycling quantity and, for paper and cardboard, the quantity attributable to methane-generating disposal. Reassessed with the baseline scenario.
$SEC_{\mathrm{BL},i,s}$	$MWh/t$of virgin polymer	Specific electricity consumption associated with production of virgin polymer category $i$in	Selected in accordance with the data hierarchy in Section 17.2.2. The value shall be specific to the applicable polymer,	Used in Equation 3 and, through Equation 4, for imported virgin-polymer production. Reassessed at renewal and

Data or parameter	Unit	Description	Source and value applied	Use and reassessment
		production origin s.	production route and origin. Values shall not be transferred between polymers by analogy.	whenever the displaced production route or origin changes materially.
$SFC_{\mathrm{BL},i,s}$	$GJ/t$of virgin polymer	Specific fossil-fuel consumption associated with production of virgin polymer category $i$in production origin s.	Selected in accordance with the data hierarchy in Section 17.2.2. The value shall be representative of the applicable polymer and production route.	Used in Equation 3 and, through Equation 4, for imported virgin-polymer production. Reassessed at renewal and whenever the displaced production route or fuel configuration changes materially.
$SF_{i,y}$— plastics	dimensionless	Substitution factor representing the quantity of virgin polymer category $i$displaced by one unit of eligible recycled-plastic output.	Determined separately for each polymer, recycled-output grade and materially different downstream use in accordance with Section 17.2.2. The factor shall satisfy $0 \leq SF_{i,y} \leq 1$. A value of one requires demonstrated one-to-one displacement. No default value is established for plastics unless expressly specified in BCR0020.	Used in Equation 2. Reassessed whenever the recycled-output grade, quality, downstream use or displaced virgin polymer changes materially, and at renewal of the quantification period.

Data or parameter	Unit	Description	Source and value applied	Use and reassessment
$SF_{\text{paper},g,y}$	dimensionless	Substitution factor representing the quantity of virgin pulp, paper or cardboard displaced by one unit of eligible recycled output of grade g.	Determined in accordance with Section 17.2.3.2 using downstream production data or another source permitted by the applicable data hierarchy. The factor shall satisfy $0 \leq SF_{\text{paper},g,y} \leq 1$. No default value is established unless expressly specified in BCR0020.	Used in Equation 5. Reassessed whenever the recovered-fiber grade, manufacturing yield, downstream product or displaced virgin-fiber input changes materially, and at renewal.
$SE_{\text{VF},g,y}$	$tCO_2e/t$of displaced virgin output	Specific baseline emissions associated with production of the virgin pulp, paper or cardboard product displaced by recycled output of grade g.	Selected in accordance with the data hierarchy and system-boundary requirements in Section 17.2.3.2. Where the production origin or product grade cannot be reliably identified, the plausible factor resulting in the lowest baseline emissions shall be applied.	Used in Equation 5. Reassessed whenever the displaced product, production route, origin or applicable system boundary changes materially, and at renewal.
$SF_{\text{glass},y}$	dimensionless	Substitution factor for eligible container-glass cullet.	Default value: 0.88. A project-specific value may be used where supported by direct and verifiable information from	Used in Equation 6. Reassessed whenever the cullet grade, receiving facility, raw-material formulation or

Data or parameter	Unit	Description	Source and value applied	Use and reassessment
			the receiving container-glass manufacturing facility. A value greater than 0.88requires direct and independently verifiable downstream production data.	downstream use changes materially, and at renewal.
$SEC_{\mathrm{BL,glass}}$	$MWh/t$of displaced virgin raw-material preparation	Specific electricity consumption associated with preparation and mixing of virgin raw materials displaced by eligible container-glass cullet.	Fixed value: 0.026 MWh/t, retained from AMS-III.AJ, Version 9.0.	Used in Equation 6. The value remains fixed unless revised through an approved amendment, revision or normative annex to BCR0020.
$SF_{i,y}$— metals	dimensionless	Substitution factor representing the quantity of the corresponding virgin metal displaced by one unit of eligible recycled-metal output.	Determined separately for aluminum, steel and copper and, where relevant, by grade, composition and downstream use, in accordance with Section 17.2.5. The factor shall satisfy $0 \leq SF_{i,y} \leq 1$. A value of one requires demonstrated equivalence and one-to-one displacement.	Used in Equation 7. Reassessed whenever the recycled-metal grade, downstream use or displaced virgin-metal input changes materially, and at renewal.

Data or parameter	Unit	Description	Source and value applied	Use and reassessment
$SE_{i,y}$— metals	tCO_2e/t of displaced metal	Specific baseline emission factor applicable to production of the corresponding displaced virgin metal.	Default values: aluminum, 8.40 tCO2e/t; steel, 1.27 tCO2e/t; and refined copper, 3.965 tCO2e/t. Where reliable information demonstrates that the production route actually displaced has a lower factor, the lower value shall be applied. A value above the applicable default is not permitted unless incorporated through an approved revision, amendment or normative annex.	Used in Equation 7. The selected factor shall be reassessed whenever the displaced product, production origin or production route changes materially, and at renewal.
Fixed or ex ante parameters required by TOOL04	As specified in TOOL04	Parameters required to quantify avoided methane emissions from eligible paper and cardboard under Application B of TOOL04, including the applicable waste- and disposal-site-specific parameters.	Determined using TOOL04, Version 8.1, and the baseline evidence required under Sections 14.4.2 and 17.2.3.1.	Used to determine $BE_{CH_4,SWDS,y}$ under Equation 5. Reassessed as required by TOOL04 and whenever the baseline disposal site or its management conditions change materially.

Global warming potentials shall be applied in accordance with Section 17.1. Other program-

level constants shall be taken from the applicable BCR Standard or BioCarbon Tool and are not repeated in Table 1.

A value established for one material, grade, production route or downstream use shall not be applied to another by analogy. Where a required parameter has no approved default value and cannot be supported by representative and independently verifiable data, the affected material quantity shall be excluded from the quantification of greenhouse gas emission reductions.

19.2 Data and parameters monitored

The data and parameters identified in Table 2 shall be monitored, calculated or updated, as applicable, during each monitoring period.

Monitoring records shall be maintained at the level of disaggregation necessary to identify the applicable material, source stream, facility, batch or transaction, measurement point, calendar year and material-specific quantification pathway.

Unless a more specific frequency is established in Table 2, data shall be collected at a frequency sufficient to capture operational and material variability and shall be consolidated separately for each calendar year and monitoring period.

Data obtained from third-party facilities, processors, manufacturers, transport operators or other participants shall be supported by traceable records and shall be accessible to the project holder and the CAB.

Parameters initially validated under Section 19.1 need not be redetermined during each monitoring period where the project holder demonstrates that the conditions supporting their selection remain valid. Any required update shall follow the applicable data hierarchy and conservative provisions of this methodology.

Where monitored data are missing, invalid or inconsistent, the project holder shall apply the missing-data procedure established in the validated Monitoring Plan and the applicable Monitoring, Reporting and Verification Tool. Where the affected parameter cannot be reconstructed conservatively with sufficient reliability, the corresponding material quantity shall be excluded or the higher project-emission or leakage value shall be applied, as relevant.

The same monitored value shall be used consistently wherever it applies to more than one equation or accounting component.

Table 2. Data and parameters monitored

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
Eligible recycled-output quantities: $Q_{i,y}$ for plastics and metals; $Q_{\text{paper},g,y}$; $Q_{\text{glass},y}$; and corresponding pathway-specific constituent quantities	tonnes of dry eligible material, unless otherwise specified	Direct weighing at the measurement point established for the applicable pathway, supported by production records, receiving-facility acceptance records and evidence of downstream use. Quantities shall be net of moisture, contaminants, non-eligible fractions, rejects and losses occurring before the applicable measurement point. For metals, the quantity shall represent actual eligible metal content.	Each batch, transaction, consignment or production lot, as applicable; aggregated separately by material, facility, year and monitoring period	Measuring equipment shall be controlled in accordance with the Monitoring, Reporting and Verification Tool. Quantities shall be cross-checked against dispatch, receipt, inventory, production and downstream records and reconciled through the mass balance. Where discrepancies cannot be resolved, the lowest verifiable quantity shall be used or the affected quantity shall be excluded. Used in Equations 2, 5, 6 and 7.
$Q_{\text{paper},\text{CH}_4,x}$, $MC_{\text{paper},x}$ and	tonnes of dry material;	$Q_{\text{paper},\text{CH}_4,x}$ shall be determined	For each materially different paper or	Sampling shall be representative of

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
$W_{paper,x}$	fraction of wet mass; tonnes of wet or as-received material	from the eligible dry mass attributable to a methane-generating baseline disposal pathway. Moisture content shall be directly measured or determined through representative sampling. $W_{paper,x}$ shall be calculated using the conversion established in Section 17.2.3.1.	cardboard stream. Moisture shall be determined for each batch where directly measured or at the frequency established in the validated sampling plan, including whenever source or material conditions change materially.	the applicable material and period. The dry and wet-mass quantities shall reconcile with the project mass balance and TOOL04 inputs. Where moisture or baseline-disposal attribution cannot be determined conservatively, the affected quantity shall not generate avoided methane emissions.
Composition, eligible constituent fractions and recovery yields for composite and multilayer materials	tonnes and dimensionless fractions	Direct measurement of separated outputs or representative sampling of incoming and recovered materials, supported by processing-yield and quality-control records.	Each batch or production lot where practicable; otherwise according to the validated sampling plan and whenever material composition or processing conditions change materially	The sum of eligible constituent materials, non-eligible fractions, rejects and losses shall not exceed the supported dry input quantity. A constituent fraction shall be quantified only under its applicable material-specific pathway. Unsupported or

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
				unreconciled fractions shall be excluded.
$w_{i,\text{in-country},y}$, $w_{i,\text{imported},y}$ and $\omega_{i,r,y}$	dimensionless	Determined from official production, customs and trade data, recognized sectoral information or independently verifiable market data applicable to virgin polymer category i.	For each calendar year y. Where annual information is unavailable, the most recent representative multi-year average permitted under Section 17.2.2 may be used.	$w_{i,\text{in-country},y} + w_{i,\text{imported},y} = 1$, and the applicable import-origin shares shall sum to one. Where the domestic share cannot be determined, $w_{i,\text{in-country},y} = 0$ and $w_{i,\text{imported},y} = 1$. Where import origin cannot be established, the plausible origin mix resulting in the lowest baseline emissions shall be used. Applied in Equations 2 and 4.
$EF_{\text{el},s,y}$, $EF_{\text{FF},s,y}$ and $EF_{\text{el,glass},y}$	tCO_2e/MWh; tCO_2e/GJ; tCO_2e/MWh	Obtained from official, recognized or independently verifiable sources representative of the electricity system, fossil-fuel mix or	For each calendar year and whenever the electricity source, fuel mix, production origin or receiving facility changes materially	The source, version, geographic boundary, applicable year and calculation procedure shall be documented. Where more than one factor is plausible and the

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
		container-glass manufacturing facility applicable in year y. Where more than one source applies, the factor shall be consumption-weighted.		applicable factor cannot be reliably identified, the value producing the lowest baseline emissions shall be applied. Used in Equations 3 and 6.
Continued representativeness and any required update of parameters validated under Section 19.1, including $SF_{i,y}$, $SF_{\text{paper},g,y}$, $SF_{\text{glass},y}$, $SE_{\text{VF},g,y}$, $SE_{i,y}$, $SEC_{\text{BL},i,s}$ and $SFC_{\text{BL},i,s}$	As specified in Section 19.1	Confirmed using current information on recycled-output quality, production formulations, processing yields, downstream use, displaced virgin material, production origin and production route. Where an update is required, the applicable hierarchy in Section 17 shall be used.	Continued validity shall be confirmed for each monitoring period. The parameter shall be updated whenever a material change affects its representativeness and at renewal of the quantification period, as applicable.	The value used shall remain within the limits established by BCR0020. Where continued representativeness cannot be demonstrated, the project holder shall apply a lower conservative value, set the substitution factor to zero where appropriate, or exclude the affected quantity.
Changes affecting the baseline	Not applicable;	Review of applicable laws,	For each monitoring period	The review shall determine whether

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
scenario, baseline recycling quantity or regulatory surplus	tonnes where a revised baseline quantity is required	extended producer responsibility requirements, mandatory targets, contracts, recycling practices, market conditions, waste-treatment infrastructure, material destinations and displaced-production pathways.	and whenever a potentially material legal, regulatory, technological or market change is identified	reassessment under Section 14.6 is triggered. Quantities required by an enforced obligation or no longer additional shall be excluded prospectively in accordance with the BCR Standard and applicable transition requirements.
Monitored parameters required by TOOL04, including the inputs needed to determine $BE_{CH_4,SWDS,y}$	As specified in TOOL04; tCO_2e for $BE_{CH_4,SWDS,y}$	Monitored or determined in accordance with Application B of TOOL04, including the applicable waste quantities, disposal-site conditions, methane correction, oxidation, methane capture and other required parameters.	As required by TOOL04 and for each monitoring period in which avoided methane emissions are claimed	TOOL04 monitoring, default-value, uncertainty and conservative provisions shall apply. Parameters already determined under BCR0020 shall not be duplicated or counted on an inconsistent mass basis. $BE_{CH_4,SWDS,y}$ is included in Equation 5.

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
$EC_{j,s,y}$, $HC_{j,h,y}$, $FC_{f,j,y}$, $NCV_{f,y}$, $EF_{\text{el},j,s,y}$, $EF_{\text{heat},j,h,y}$ and $EF_{\text{fuel},f,y}$	MWh; GJ; mass or volume unit; GJ per mass or volume unit; tCO_2e/MWh; tCO_2e/GJ	Direct meters, utility bills, fuel-purchase and inventory records, equipment or production records, and applicable official or independently verifiable emission factors. Consumption shall be attributed to the eligible project activity or conservatively allocated where systems are shared.	Continuously where metered; otherwise for each billing, fuel-delivery or operating period; consolidated by facility, source, year and monitoring period	Energy balances and invoices shall be cross-checked against meter readings, fuel stocks, operating hours and production throughput. Where missing data cannot be reconstructed using a documented and conservative procedure consistent with the applicable BioCarbon requirements, the higher plausible project-emission value shall be used or the affected quantity shall be excluded. Applied in Equation 9.
$FC_{\text{TR},r,f,y}$, or $M_{r,v,y}$, $D_{r,v,y}$ and $EF_{\text{tkm},v,y}$	mass or volume unit; tonnes; km; $tCO_2e/(t \cdot km)$	Actual fuel records, vehicle logs, trip records, GPS or route information, weighbridge records and	Each trip or transport transaction where practicable; otherwise by vehicle and operating period; consolidated by	Distances, loads, fuel type, vehicle type and return trips shall be cross-checked. For EPS and other volume-constrained materials, actual

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
		applicable transport emission factors. Only one calculation approach shall be used for the same transport activity.	route, year and monitoring period	loads and trip numbers shall be used. Where data are unavailable, a conservative method producing higher project emissions shall be applied; otherwise the associated quantity shall be excluded. Used in Equations 10 and 11.
$AD_{o,y}$ and $EF_{o,y}$	Unit applicable to source o; emission factor expressed consistently with the activity data	Monitored for each material direct-emission source not included in energy or transport, including wastewater treatment, treatment or disposal of rejects and residual streams, process emissions, refrigerants and material process chemicals.	For each occurrence, batch, treatment period or operating period, as applicable; consolidated annually and for the monitoring period	Activity data and emission factors shall be determined using the applicable provisions of TOOL04 or the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, as refined by the 2019 Refinement, according to the relevant emission source and treatment route. Only gross positive project emissions shall be included. Where reliable

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
				quantification is not possible, a conservative higher-emission estimate shall be applied or the affected material quantity shall be excluded. Used in Equation 12.
$E^{PJ}_{out,k,y}$, $E^{BL}_{out,k,y}$, $LE_{k,y}$ and $LE_{adj,y}$	tCO_2e	Determined for each identified material leakage source using monitored activity data, affected-party or market information and representative emission factors. Non-quantifiable material leakage shall be treated through the applicable Leakage Management Tool.	Assessed for each monitoring period and whenever material sources, project scale, downstream uses, market conditions, displaced services or equipment destinations change materially	Project-boundary emissions shall not be reclassified as leakage. The same effect shall not be deducted through more than one accounting component. Where material leakage cannot be avoided, quantified or conservatively adjusted, the affected quantity or pathway shall be excluded. Used in Equations 13 and 14.
$M_{in,m,j,p}$, $I_{open,m,j,p}$, $M_{elig,out,m,j,p}$, $M_{nonelig,out,m,j,p}$, $M_{reject,m,j,p}$,	tonnes	Direct weighing, inventory records, processing and	Each transaction, batch or inventory movement, as applicable.	Opening and closing inventories shall be physically supported. Internal

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
$M_{\text{loss},m,j,p}$, $I_{\text{close},m,j,p}$ and $RD_{m,j,p}$		production records, transfer records and verified loss or reject measurements, maintained separately by material, grade, facility or node and reconciliation period. $RD_{m,j,p}$ shall be calculated using Equation 16.	Reconciled at the frequency established in the Monitoring Plan and consolidated for each monitoring period.	transfers shall cancel on project consolidation. Accounted outputs shall not exceed supported inputs. Unresolved differences shall be treated as non-eligible losses or rejects, and negative inventories shall not be permitted.
Chain-of-custody, effective-recycling, downstream-use and attribution records	tonnes and non-quantitative records	Unique transaction or batch identifiers; dispatch and receipt records; material type, grade and mass basis; receiving-facility acceptance; production and yield records; recycled-output specifications; downstream use; displaced material; participant register; and	For every material transfer, batch or transaction and before inclusion of the corresponding quantity in a Monitoring Report	Records shall maintain a physical link from the material source to the required downstream outcome. Book-and-claim is not permitted. Unresolved chain-of-custody, effective-recycling or attribution gaps shall result in exclusion of the affected quantity and shall not be remedied through an uncertainty or

Data or parameter	Unit	Monitoring or determination method	Frequency	QA/QC, treatment of missing data and methodological use
		enforceable evidence of the exclusive right to claim the greenhouse gas outcome.		leakage adjustment.
Uncertainty inputs and calculated greenhouse gas results, including BE_y, PE_y, LE_y, $ER_y$and $ER_{adj,y}$	tCO_2e; parameter-specific uncertainty units	Calculated from the applicable monitored and validated data using the equations in Section 17 and the Conservative Approach and Uncertainty Management Tool. Parameter uncertainty, sampling uncertainty, allocation uncertainty and applicable correlations shall be documented.	For each calendar year and monitoring period	The calculation model shall be editable, reproducible and traceable to source records. Results shall be cross-checked against material balances and pathway-level calculations. The same uncertainty or conservative adjustment shall not be applied more than once. $ER_{adj,y}$is the result submitted for verification before program-level issuance or reserve provisions.

Parameters calculated from monitored data, including BE_y, PE_y, LE_y, ER_y, $ER_{adj,y}$and $RD_{m,j,p}$, are not directly measured but shall be reported and fully traceable to the underlying monitored and validated parameters.

Where the project activity does not apply a particular material-specific quantification pathway, emission source, transport option, leakage source or TOOL04 accounting

mechanism, the corresponding monitored parameter is not applicable and shall be identified as such in the Monitoring Plan.

Project-specific parameters not expressly listed in Table 2 shall be included in the Monitoring Plan where they are necessary to apply an applicable calculation procedure, demonstrate effective recycling or quantify a material emission source. Their monitoring shall comply with the applicable BioCarbon Tools and the requirements of this methodology.

20 Bibliographic references

International Copper Association (ICA). 2023. Copper Environmental Profile: Global 2023. International Copper Association.

Intergovernmental Panel on Climate Change (IPCC). 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 5: Waste. Prepared by the National Greenhouse Gas Inventories Programme, Eggleston, H.S., Buendia, L., Miwa, K., Ngara, T., and Tanabe, K. (eds.). IGES, Japan.

Intergovernmental Panel on Climate Change (IPCC). 2019. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 5: Waste. Calvo Buendia, E., Tanabe, K., Kranjc, A., Baasansuren, J., Fukuda, M., Ngarize, S., Osako, A., Pyrozhenko, Y., Shermanau, P., and Federici, S. (eds.). IPCC, Switzerland.

United Nations Framework Convention on Climate Change (UNFCCC). 2022. AMS-III.AJ: Recovery and recycling of materials from solid wastes. Version 9.0. Clean Development Mechanism.

United Nations Framework Convention on Climate Change (UNFCCC). 2023. TOOL04: Emissions from solid waste disposal sites. Version 8.1. Clean Development Mechanism.

Document history

Type of document. Methodological Document. Material Recovery and Recycling from Solid Waste Streams

Version	Date	Description
Draft for Public Consultation	September 7, 2026	Draft version – Document submitted for public consultation