



METHODOLOGICAL DOCUMENT REDD+ PROJECTS

BCR0002

Emission Reductions from Avoided
Unplanned Deforestation and Forest
Degradation

BIOCARBON CERT®

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BIOCARBON CERT

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Acronyms and abbreviations

AFOLU	Agriculture, Forestry and Other Land Uses
AB	Aboveground biomass
A/R (AR)	Afforestation and reforestation
AE	Annual emission
BB	Belowground biomass
BT	Total biomass
BCC	Biomass carbon content
CDM	Clean Development Mechanism
CF	Carbon fraction of the dry matter
CH ₄	Methane
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
CT	Total carbon dioxide equivalent; tCO _{2e} ha ⁻¹
FAO	Food and Agriculture Organization of the United Nations
FSC	Change in the surface covered by forest
GHG	Greenhouse Gases
GIS	Geographic Information System
IPCC	Intergovernmental Panel on Climate Change
N ₂ O	Nitrous oxide
REDD+	Reducing Emissions from deforestation, forest degradation and forest conservation, sustainable management or enhancement of forest carbon stocks.
SOC	Soil organic carbon
QA/QC	Quality Control/Assurance Control
UNFCCC	United Nations Framework Convention on Climate Change
VCC	Verified Carbon Credits

1 Introduction

This methodology establishes the requirements and procedures for quantifying and monitoring greenhouse gas (GHG) emission reductions attributable to activities that avoid unplanned deforestation and forest degradation in eligible natural forests under the BioCarbon Standard.

The methodology is globally applicable, subject to the applicable national forest definition and the eligibility conditions established herein. Eligible areas include forested wetlands, forested peatlands, and forests on organic soils. Eligibility requires continuous forest cover for at least ten years before the project start date, together with compliance with the other requirements in Section 5. Conservation and hydrological management measures may form part of the activities implemented to avoid unplanned deforestation and forest degradation in these forests.

The methodology provides procedures for defining project boundaries, assessing the drivers and agents of deforestation and forest degradation, demonstrating additionality, establishing the baseline scenario, and quantifying emissions under the baseline and project scenarios. It also establishes requirements for selecting and accounting for carbon pools and GHG sources, addressing uncertainty and leakage, managing non-permanence risks, monitoring project outcomes, and applying REDD+ safeguards.

For ex post quantification, the methodology uses a dynamic baseline approach based on contemporaneous observations from a comparable reference region. Emission reductions are determined by comparing baseline emissions with emissions under the observed project scenario, applying the accounting procedures and adjustments required by this methodology. Historical information supports the assessment of deforestation and degradation patterns and the development and evaluation of the baseline approach.

Project holders shall apply this methodology together with the BioCarbon Standard and the applicable BioCarbon tools and procedures, in accordance with their respective scopes, effective dates, and version and transition provisions.

2 Objectives

The objectives of this methodological document (from now on referred to as this methodology) are:

- (a) Provide requirements for quantification of GHG Emission Reductions from REDD+ projects;

- (b) Present the methodological requirements for the baseline identification for REDD+ projects;
- (c) Endow the methodological requests to demonstrate additionality of REDD+ projects;
- (d) Describe the requirements for the monitoring and follow-up of REDD+ projects;
- (e) Establish requirements related to permanence and leakages;
- (f) Facilitate the articulation of the Project accounting with national accounting, if applicable;

3 Scope

This Methodology establishes the principles, requirements, and procedures to quantify net anthropogenic greenhouse gas (GHG) emission reductions resulting from activities that avoid unplanned deforestation and forest degradation within natural forest that meet the national definition of forest applicable in the host country.

It applies to mitigation activities implemented at the project level that meet the eligibility and applicability conditions defined in this document, and that aim to reduce emissions by preventing land-use change from forest to non-forest land, as well as by avoiding the loss of carbon stocks in standing forests due to degradation.

This methodology is applicable to:

- (a) Emission reductions from unplanned deforestation, defined as the direct human-induced conversion of forest to non-forest land use, occurring without pre-established planning or legal authorization (e.g., spontaneous agricultural expansion, informal extraction activities).
- (b) Emission reductions from forest degradation, defined as the long-term reduction of carbon stocks within land that remains classified as forest. Relevant processes include selective logging, fuelwood extraction, fire, and drainage or other human-induced hydrological changes affecting soil carbon. Associated GHG emissions shall be assessed under Section 7 and quantified using the applicable procedures in Section 11.

This methodology applies to avoided unplanned deforestation and forest degradation in eligible natural forests, including forested wetlands, forested peatlands, and forests on organic soils. Conservation and hydrological management measures may form part of the REDD+ activities implemented in these forests.

This methodology does not apply to avoided planned deforestation, afforestation/reforestation, or activities outside the two REDD+ activity types described above.

4 Version and validity

This document is a draft of Version 6.0 prepared for public consultation. Its status and the provisions governing its approval, effective date, and transition are set out in Section 17.

5 Applicability conditions

This Methodology is applicable to project activities that aim to reduce anthropogenic GHG emissions through the avoidance of unplanned deforestation and/or forest degradation within areas that meet the national definition of natural forest. The applicability conditions are described below and shall be fully met at the time of validation.

5.1 Forest condition and land eligibility

- (a) The project area shall qualify as “forest” according to the national forest definition adopted under the UNFCCC and shall have maintained continuous forest cover for at least 10 years prior to the project start date;
- (b) Forested wetlands, forested peatlands, and forests on organic soils are eligible where they meet the forest definition, forest-history requirements, and other applicability conditions of this methodology. Their extent, soil characteristics, hydrological conditions, and relevant changes shall be identified and addressed in stratification, baseline estimation, quantification, and monitoring. Soil-carbon changes and associated GHG emissions shall be quantified under Sections 11.4.4.2 and 11.4.6, according to their respective applicability;
- (c) Lands under active forest concessions or legally sanctioned planned deforestation are not eligible under this methodology.

5.2 Deforestation and degradation dynamics

- (a) The direct and underlying causes of unplanned deforestation and/or degradation shall be demonstrably present within or near the project area, and shall be shown to exert historical or current pressure on forest cover within the project boundaries;
- (a) No reduction in deforestation or degradation would reasonably occur in the absence of the project, as determined using the Additionality Tool;

- (b) The forest carbon stock in litter, deadwood, or soil organic carbon may be excluded only if such exclusion is conservative and justified and does not lead to overestimation of mitigation results.

5.3 Project boundaries and permanence

- (a) The project area shall be clearly demarcated using georeferenced boundaries in a GIS platform and shall not overlap with any other registered GHG mitigation project;
- (b) The project shall implement measures to mitigate risk of non-permanence and shall apply the BioCarbon Permanence and Risk Management Tool;
- (c) The project holder shall have demonstrable control or legal right to manage the land and to claim GHG mitigation outcomes (carbon rights), supported by appropriate documentation.

5.4 Additional safeguards and legal compliance

- (a) The project shall not involve any displacement of deforestation to other areas under the same control unless such leakage is monitored and compensated as per this Methodology;
- (b) The project shall comply with all applicable national and local laws, including environmental, land tenure, and communities and/or indigenous rights regulations;
- (c) Where applicable, the project holder shall demonstrate that Free, Prior and Informed Consent (FPIC) has been obtained from affected Indigenous Peoples or local communities in accordance with applicable law and BioCarbon safeguards.

Neither completion of a state-led consultation procedure nor a determination that such consultation is not required shall, by itself, demonstrate compliance with applicable FPIC requirements.

Where FPIC applies, the evidence shall identify the decision reached through the rights holders' own collective decision-making process and the authority of their freely chosen representatives, including where an Indigenous People or local community is the project holder. A signature by a commercial participant, consultant, or contractor shall not, by itself, substitute for evidence of that collective decision.

The project holder shall disclose any prior or current participation in other GHG programs and demonstrate compliance with Sections 25 and 26 of the BioCarbon Standard and the applicable Avoidance of Double Counting (ADC) Tool.

The project holder shall assess and document the project's compatibility with a transition to net zero GHG emissions, referring to the host country's net zero objectives and relevant long-

term climate strategies. This assessment shall be included in the Project Document and evaluated during validation.

6 Normative references

The documents referenced in this section form part of the normative framework for applying this methodology. Project holders shall use the applicable versions in accordance with the BioCarbon Standard, Section 17 of this methodology, and the version, effective-date, and transition provisions of the relevant instruments.

6.1 Applicable Standards and Guidelines

The following external and internal references shall be used for the implementation of this methodology:

- (a) The BCR Standard;
- (b) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use, together with the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands and the 2019 Refinement, according to their respective applicability;
- (c) Applicable national GHG legislation and land-use regulations;
- (d) Relevant decisions from the UNFCCC, ICAO-CORSIA (ICAO, n.d.), and the Paris Agreement Article 6 mechanisms (UNFCCC, 2015);
- (e) ISO 14064-2 and ISO 14064-3, for project-level GHG quantification and verification.

6.2 Modular architecture and application of BioCarbon Tools

This methodology forms part of the modular methodological architecture of the BioCarbon Standard. It establishes the REDD+ applicability conditions, boundaries, baseline procedures, quantification methods, and monitoring requirements. The applicable BioCarbon tools provide the corresponding cross-cutting program requirements. Project holders shall apply this methodology and those tools together, according to their respective scopes and applicability. The tools listed below form part of this normative framework:

Tool	Applicability
Baseline and Additionality Tool	Mandatory for establishing the baseline scenario and demonstrating additionality.
Permanence and Risk Management Tool	Required for risk classification, buffer determination, and reversals compensation.

Monitoring, Reporting and Verification (MRV) Tool	Provides mandatory requirements for MRV procedures, monitoring intervals, and QA/QC.
Leakage Management Tool	Mandatory for leakage identification, materiality assessment, risk classification, quantification, conservative adjustments, monitoring, and reassessment.
Uncertainty Assessment Tool	Mandatory for evaluating uncertainty in emission reductions and applying conservative adjustments.
Avoidance of Double Counting (ADC) Tool	Required to ensure uniqueness, traceability, and exclusivity of claimed emission reductions.
Sustainable Development Goals Tool (SDGs)	Used to identify, monitor, and report the project's SDG contributions, including applicable targets, indicators, and supporting evidence.
Sustainable Development Safeguards Tool (SDSs)	Provides mandatory safeguards compliance indicators, monitoring plans, and documentation formats.

BioCarbon may issue additional tools, technical guidance, or procedures. Their mandatory application, where established by BioCarbon, shall follow the specified scope, effective dates, and applicable version and transition provisions. These documents shall be published on the official BioCarbon website and communicated to project holders.

7 Carbon pools and sources of emissions

This section describes the carbon pools and GHG emission sources that shall be considered for quantifying emission reductions under this Methodology. The selection of carbon pools shall follow IPCC principles and be justified based on conservativeness and project-specific conditions.

7.1 Carbon pools

The selection of carbon pools shall be consistent between scenarios. Any pool excluded from the baseline shall also be excluded from the project scenario, unless justified by risk of overestimation. The selection of carbon pools to quantify changes in carbon stocks at the project boundaries are shown in *Table 1*.

Table 1. Carbon pools selected for the accounting of carbon stock changes

Carbon pool	Baseline Scenario	Project Scenario	Justification/Explanation
Aboveground biomass	Included	Included	The change in carbon content in this pool is significant according to the IPCC. Mandatory in both scenarios.
Belowground biomass	Included	Included	The change in carbon content in this pool is significant according to the IPCC.
Deadwood and litter	Optional	Optional	Being conservative with the baseline scenario, if the carbon content in this pool is expected to decrease, it may be excluded if conservatively justified. Being conservative with the baseline scenario, if the carbon content in this pool is expected to decrease, it may be excluded.
Soil Organic Carbon (SOC)	Included unless exclusion is justified	Included unless exclusion is justified	This pool includes carbon in mineral and organic soils. Any exclusion shall be demonstrated not to overestimate net emission reductions and shall be applied consistently between scenarios. Significant soil emissions shall not be assigned zero solely because site-specific measurements are unavailable. Wetland and organic-soil processes shall be assessed under Section 11.4.6.

7.2 Source of emissions

Emissions from forest carbon-stock changes and the associated sources identified in Table 2 shall be consistently accounted for in the baseline and project scenarios. This source selection shall not exclude material leakage sources identified under the Leakage Management Tool. Such sources shall be quantified and accounted for under Section 12.

The emission sources and associated GHGs selected for accounting are shown in Table 2.

Table 2. Emission sources and GHGs selected for accounting

Source	GHG	Whether selected (Yes/No)	Justification/Explanation
Biomass burning (if fire is present) ¹	CO ₂	No	CO ₂ emissions from biomass combustion shall be accounted for through carbon-stock changes and shall not be counted again as a separate combustion term.

¹ The quantification of CH₄ and N₂O emissions caused by burning woody biomass is estimated based on the guidelines presented in the IPCC (2006) that excludes CO₂ emissions.

Source	GHG	Whether selected (Yes/No)	Justification/Explanation
			This treatment does not exclude emissions from the combustion of peat or other organic soil material.
	CH ₄	Yes	CH ₄ emission should be included if the presence of fires was identified in the monitoring period.
	N ₂ O	Yes	N ₂ O emission should be included if the presence of fires was identified in the monitoring period.
Decomposition and oxidation of soil organic matter following drainage or other relevant land-use or management changes	CO ₂	Yes, where applicable	Quantified using the applicable procedures under Sections 11.4.4.2 and 11.4.6 and reconciled with soil carbon-stock changes to avoid double counting.
Wetland soil and hydrological processes, including drainage ditches, inundation, and rewetting	CH ₄ N ₂ O	Yes, where applicable	Relevant emissions shall be assessed in both scenarios, including increases associated with project activities.
Combustion of peat or other organic soil material	CO ₂ CH ₄ N ₂ O	Yes, where applicable	Quantified using applicable fire methods and distinguished from biomass combustion.
Oxidation of dissolved organic carbon exported from affected soils	CO ₂	Yes, where applicable	Included where required by the applicable soil-emission method and counted only once.

GHG emissions from each source shall be quantified using the applicable IPCC methods referenced in Section 6.1, the procedures established in this methodology, and the BioCarbon MRV Tool. The most accurate available data shall be used, applying Tier 2 or Tier 3 methods when feasible, or applying conservative default values with proper justification when higher-tier data are not available.

Emission sources shall be included symmetrically in both the baseline and project scenarios. Any exclusion shall be conservative and justified in the Project Document.

8 Spatial and temporal limits

This section defines the spatial and temporal boundaries within which GHG emission reductions shall be quantified under this Methodology. The boundaries shall be clearly documented and justified in the Project Document, following the definitions provided in Annex A.

8.1 Project area

The project area is the geographic space under the control of the project holder where REDD+ activities are implemented. The project area shall be clearly defined and included only forest category (as outlined by the national forest definition), which is defined as forest for minimum ten years before the project start date (defined as a stable forest)².

The boundaries of each validated project area shall remain fixed, subject to the area-addition provisions of Section 8.1.1. Forest losses within those boundaries shall be classified in accordance with Annex A and reflected in the applicable emissions calculations and carbon-stock histories. Confirmed disturbances and any resulting reversals shall be addressed under Section 13, including the applicable mitigation, reporting, and compensation requirements.

It's necessary to demonstrate that the project areas are under control of the project holder, presenting all the details of the landholder and related user rights to proof the land propriety and, consequently, the carbon rights.

8.1.1 Adding areas after validation

REDD+ project holders may add areas to the Project under the following conditions:

- a) the project holder shall identify the project expansion area during the validation process and define the criteria for adding new areas;
- b) the default criteria that a new area shall meet to be added to the REDD+ Project are:
 - i) Comply with the applicable version of the BioCarbon Standard;
 - ii) Comply with the applicable version of this methodology, subject to the relevant transition provisions;
 - iii) Include emission reduction only for validated REDD+ project activities³.

² The determination of this stable forest condition, along with the detailed methodological process for generating information on forest area changes, shall be based on credible cartographic inputs and data sources.

³ An activity excluded in the validation cannot be contemplated in a new area. This does not refer to REDD+ activities (described in section 9 of this document) but to activities proposed by the project to avoid deforestation/degradation.

- iv) Implement the activities to avoid deforestation and forest degradation, described in the validated project document;
- v) The causes and agents of deforestation/degradation, the baseline scenario and the additionality conditions of new areas should be consistent with the characteristics of the initial areas validated;
- vi) have a start date later than the start date of the areas included in the validation.

Given that the leakage belt may overlap with the validated expansion area in some cases, the project holder should update the leakage belt to include potential deforestation displacements due to the implementation of REDD+ project activities.

8.2 Reference region for baseline estimation

The reference region shall provide the historical and contemporaneous observations used to establish and update the baseline activity data applicable to the project area. It shall represent the biophysical conditions, accessibility, land-use pressures, drivers, and agents relevant to the conditions that would occur in the absence of the project. Its delineation and use shall comply with the criteria in Sections 8.2.1 through 8.2.8.

The reference region, any internal strata or comparison units, the aggregation rules, observation windows, and missing-data rules shall be specified under the procedures and controls established by BioCarbon before the observations used to evaluate project performance become available. Updates shall follow the approved procedure. Reference areas, comparison units, or aggregation rules shall not be selected or replaced on the basis of the emission reductions they would generate.

Activity data shall be allocated to each project in accordance with the procedure specified in this methodology. A designated technical provider shall prepare the allocation, which shall undergo independent technical review before approval and release by BioCarbon. The project holder shall use the approved allocation, together with the applicable emission factors, to calculate project baseline emissions. The CAB shall evaluate the application of the assigned data, the emission factors, and the resulting calculations. Provision of activity data shall not constitute validation, verification, or authorization for credit issuance.

8.2.1 General criteria for selection

The reference region shall be:

- (a) Geographically distinct from the project area, but subject to similar biophysical, socio-economic, legal, and accessibility conditions as the project area;

- (b) Delimited using objective, credible and verifiable spatial data (e.g., land cover, infrastructure, administrative boundaries) that supports its representativeness and integrity;
- (c) Composed primarily of forested land, excluding areas that are systematically unrepresentative of the drivers affecting the project area;
- (d) Larger than the project area, and no more than 10 times its size;
- (e) The reference region shall be located in reasonable geographic proximity to the project area, within the same deforestation frontier, administrative unit, or socio-ecological landscape⁴.

The selection and continued use of the reference region shall ensure that the observations used for baseline estimation reflect land-use dynamics unaffected by the project intervention or by other interventions that compromise their representativeness. Continued suitability shall be assessed when activity data are updated and at baseline reassessment. Any loss of comparability shall be documented and addressed through the applicable predefined procedure.

8.2.2 Spatial and landscape similarity criteria

The reference region shall comply with the following minimum similarity requirements:

- (a) Forest types: at least 80% of the forest classes present in the project area shall also occur in the reference region. This percentage shall be calculated by dividing the number of forest classes present in both areas by the total number of forest classes present in the project area and multiplying the result by 100. The comparison shall use a common classification legend and reference date;
- (b) Soil types and slopes: at least 50% similarity in dominant soil categories and slope classes;
- (c) Access conditions: road density and navigable river density (measured in m/km², with a 2 km buffer) shall not differ by more than 30% from those in the project area at the start of the reference period.

The similarity assessment shall identify the data sources, reference dates, classification rules, geographic domains, formulas, denominators, and treatment of missing or zero values used for each indicator. Soil and slope similarity shall be assessed separately.

⁴ The selection of distant regions with the sole purpose of increasing baseline deforestation rates (known as “cherry-picking”) is strictly prohibited.

Road density and navigable river density shall also be assessed separately, with the application of the 2 km buffer and the corresponding length and area calculations explicitly documented.

The indicators and calculation procedures shall be established before their application and shall be applied consistently to the project area and the reference region.

For forested wetlands, peatlands, and forests on organic soils, the similarity assessment shall also address soil characteristics, hydrological regime, drainage networks, and, where relevant, peat depth, inundation, salinity, and tidal influence. Differences that materially affect land-use pressure or soil emissions shall be addressed through stratification or a documented adjustment supported by representative evidence. Reference observations used to estimate hydrological changes shall be unaffected by the project intervention or its leakage.

8.2.3 Socioeconomic and legal similarity criteria

- (a) Socio-economic, cultural and land use conditions, as well applicable laws and policies related to land status, land use, land tenure, shall be comparable between the reference region and the project area;
- (b) Any differences in land tenure or legal status between the reference region and the project area shall have no material impact on forest-loss dynamics, and shall not affect the underlying drivers, responsible agents, or temporal patterns of deforestation and forest degradation.

8.2.4 Functional representativeness of drivers and agents

The same direct and underlying drivers of deforestation or degradation identified in the project area (as per Section 10), and their associated agents, shall be present and active in the reference region. This includes evidence of:

- (a) The historical presence of those drivers in the region;
- (b) Spatial overlap or proximity between agent areas of influence and the reference region;
- (c) Documented accessibility of the agents to both regions, supported by field data or remote sensing.

8.2.5 Fragmented or multi-unit reference regions

The reference region may consist of multiple non-contiguous polygons, provided that each polygon independently meets all applicable criteria of representativeness, including similarity in deforestation drivers, agent access, land use dynamics, and biophysical conditions.

Project holders shall demonstrate that:

- (a) The selected polygons are exposed to comparable deforestation pressures and agent behavior;
- (b) There are no material differences between the disjoint areas that would undermine the integrity of the baseline estimation;
- (c) The aggregated reference region maintains statistical coherence and supports consistent baseline estimation using historical and contemporaneous observations under the applicable procedure.

The use of multi-unit reference regions shall be technically justified, reproducible, and subject to independent validation. The selection of polygons and the aggregation rules shall follow the procedures and controls established by BioCarbon and shall not be used to manipulate baseline activity data. The justification shall demonstrate the coherence of the selected polygons through appropriate spatial and statistical evidence.

A comparison unit shall not be removed or replaced solely because forest loss has occurred within it or because its observed outcome would change the emission reductions calculated for the project. Missing observations, exhaustion of forest exposure, or loss of comparability shall be addressed through the predefined rules applicable to the estimator.

8.2.6 Exclusion Criteria

The reference region shall not include:

- (a) Areas formally designated for conversion or legal harvest, unless their inclusion is justified as representative of the drivers and land-use dynamics affecting the project area;
- (b) Areas where access by the agents and drivers of deforestation and degradation is physically or legally restricted, such that deforestation pressure cannot be reasonably expected to occur;
- (c) Areas under permanent legal protection or special management unless demonstrably subject to the same deforestation pressures;
- (d) Land under the jurisdiction or within the geographic boundaries of other GHG mitigation projects, including projects registered or seeking registration under voluntary or compliance carbon standards.

8.2.7 Exceptions for land tenure and legal status differences

The reference region may include areas with different land tenure regimes or management arrangements, such as collectively managed lands⁵, only if the project holder provides transparent and verifiable evidence that such differences do not materially affect land-use change dynamics in the region.

To justify such inclusion, the project holder shall use GIS and remote sensing tools to demonstrate that:

- (a) The same agents and drivers of deforestation and degradation are active across the different land types;
- (b) The expected deforestation patterns during the reference period are comparable, including:
 - i. Deforestation rates per land tenure category;
 - ii. Total forest loss (ha) per category;
 - iii. A spatial or statistical similarity index of at least 0.75 across land tenure types.

The similarity index shall be technically justified for the land tenure comparison and shall have a defined interpretation that supports application of the minimum value of 0.75. Its formula, variables, normalization, weighting, data sources, reference dates, and treatment of missing values shall be documented. The index and its calculation procedure shall be specified before the comparison is performed and shall not be selected or modified to obtain a passing result. Meeting the numerical threshold shall not replace the evidence required to demonstrate that differences in land tenure or legal status do not materially affect land-use change dynamics.

8.2.8 Justification and documentation

The criteria, assumptions, and selection process used to define the reference region shall be clearly described and substantiated in the Project Document, including all supporting data layers, maps, and sources. The project holder shall provide sufficient technical evidence to demonstrate that the selected region is representative of the forest-loss dynamics, drivers, and pressures affecting the project area.

⁵ The term collectively managed lands refer to spatial units where land and natural-resource rights are held jointly by a defined group, rather than by individuals. The group enjoys secure and exclusive authority to own, manage and/or use the area under either customary or statutory tenure systems. Typical examples include Indigenous reserves, Afro-descendant collective territories, campesino community lands, ejidos, and community forest concessions.

At a minimum, the following elements shall be included:

- (a) An explanation of the spatial and functional relationship between the project area and the reference region;
- (b) A description of the geographic extent and delineation process, including rationale for boundary selection;
- (c) A summary of the similarity analysis, including forest types, land use, tenure, accessibility, and socio-economic context;
- (d) Maps and geospatial data layers used to support the selection (e.g., land cover, roads, rivers, administrative limits);
- (e) A list of data sources, methodologies, software tools, and assumptions applied;
- (f) Results of any quantitative analysis (e.g., statistical similarity indices, deforestation rates per land category, spatial overlays);
- (g) If applicable, justification for the inclusion of areas with different legal or tenure characteristics, as described in Section 8.2.7.

All documentation shall be sufficient to allow replication of the analysis by third parties. The complete justification shall be subject to independent validation and may be rejected if it is not transparent, reproducible, or technically robust.

The documentation shall identify the reference-region delineation, internal strata or comparison units, aggregation rules, observation windows, and applicable data-processing rules associated with each assigned activity-data product. The project holder shall retain the assigned data and the supporting information necessary to trace their use in the baseline calculations. Updates shall remain traceable to the preceding data version and shall identify any changes and their justification under the applicable BioCarbon procedure.

8.3 Leakage area

The leakage area under this section is the spatial domain used to assess activity-shifting leakage. Its delineation shall reflect the mobility of agents and the destinations of displaced pressures. The similarity requirements in Section 8.3.2 apply to this area. Market and infrastructure estimation domains shall be delineated under Sections 12.5.2 and 12.5.3 and may extend beyond it.

8.3.1 General criteria for selection

The project holder shall identify and justify the leakage area based on the following criteria:

- (a) The area shall be defined according to the expected or demonstrated mobility of deforestation and degradation agents identified in the baseline scenario;
- (b) It shall be spatially distinct from the project area but located within the broader socio-ecological context where the agents operate;
- (c) The area shall not overlap with the project area or other emission reduction interventions, unless those interventions are accounted for separately and transparently;
- (d) The extent of the leakage area shall be determined based on the scale of the project, the behavior of the agents, and the local landscape dynamics. While no fixed size is required, the project holder shall demonstrate that the area is sufficiently representative to capture potential leakage effects.

8.3.2 Landscape and accessibility similarity requirements

To ensure comparability with the project area, the leakage area shall meet the following minimum conditions:

- (a) Forest type similarity: at least 80% of the forest classes present in the project area shall also exist in the leakage area;
- (b) Soil and topographic conditions: at least 50% similarity in dominant soil types and slope categories;
- (c) Accessibility indicators: access road density and navigable river density (including a 2 km buffer) shall each be at least 50% similar to those observed in the project area at the start of the reference period.

The project holder may justify deviations from these thresholds if supported by documented evidence showing that the same drivers and agents are active under comparable pressures.

8.3.3 Clarification on leakage area in cases of multi-unit reference regions

When the reference region is composed of multiple non-contiguous polygons, the project holder shall ensure that the leakage area is spatially and functionally distinct from all reference region units. Any area located between the reference region polygons, and the project area shall be evaluated for potential displacement risk.

8.3.4 Exclusions

Any exclusion shall be justified by evidence that the identified displacement pathway cannot materially affect the area, considering the actual effectiveness of protection or access

restrictions. Legal designation or inclusion in another mitigation project shall not, by itself, justify exclusion. Overlapping mitigation interventions shall be accounted for separately and transparently under Section 8.3.1.

8.3.5 Monitoring and emission accounting

Emissions from deforestation and degradation occurring within the leakage area shall be monitored and quantified in accordance with the procedures defined in Section 11. The same data sources, classification criteria, and methodological standards applied to the project area shall also apply to the leakage area. If project activities include interventions intended to mitigate leakage, these shall be described and monitored separately.

8.4 Temporal boundaries

The Project Document shall identify the project start date in accordance with Annex A and separately specify the project duration and the start and end dates of the quantification and monitoring periods. The start of the initial quantification period shall be supported in accordance with Section 11.4.2 of the BioCarbon Standard. Monitoring periods and calculation intervals shall follow Section 15.3.

The historical baseline analysis shall cover the ten years preceding the project start date. The baseline shall be reassessed and revalidated at least once every five years in accordance with Section 8.4.1.1. Baseline reassessment shall not, by itself, renew or extend a quantification period.

Each REDD+ quantification period shall not exceed ten years. The project shall provide for at least three renewals and a total project duration of at least forty years and no more than sixty years, in accordance with Section 11.5 of the BioCarbon Standard. Renewal shall remain subject to the applicable baseline review, validation, and program requirements.

8.4.1 Historical analysis of deforestation and degradation

The historical rate of deforestation shall be assessed for both the reference region and the leakage area at a minimum of two points in time: the project start date and ten years prior to the start date.

The project holder shall demonstrate that historical deforestation trends in the reference region and the project area are comparable, using the supporting evidence associated with the assigned activity data and appropriate statistical analyses. The assessment shall identify the observation dates, comparable geographic coverage, variables, statistical methods, uncertainty, and limitations. Two forest-cover observations may support an estimate of

average change over an interval, but shall not, by themselves, demonstrate similarity of temporal trends. The evidence shall be sufficient for the trend comparison claimed.

For forest degradation, the historical rate shall be analyzed using at least three points in time: ten years before the project start date, an intermediate year, and the start date. This applies to both the reference region and the leakage area.

Ex ante projections of deforestation and degradation for the reference and leakage areas shall cover at least the first five years from the project start date. They shall remain distinct from the contemporaneous observations and calculations required for ex post quantification.

At each verification, the project holder shall demonstrate that the baseline activity data and calculations have been updated and applied in accordance with the validated procedure and the applicable BioCarbon requirements. The documentation shall distinguish updates using new observations from changes to the reference region, estimator, or methodological assumptions. An update of observations under the approved procedure shall not, by itself, constitute a baseline reassessment or restart the five-year reassessment interval.

8.4.1.1 Baseline reassessment

Baseline projections for deforestation, forest degradation, or land-use change extending beyond a ten-year period are likely to become unreliable due to the dynamic nature of land-use drivers and the inherent uncertainty in long-term predictions.

To maintain environmental integrity and methodological robustness, the project holder shall re-evaluate the baseline scenario at least once every five (5) years during the quantification period. The revised baseline shall be submitted for validation and applied in the subsequent verification.

The baseline reassessment shall adhere to the following conditions:

- (a) It shall consider updated information on the drivers and agents of land-use change, including any changes in their behaviour, geographic distribution, or intensity, as well as updated values for all parameters used in the original baseline scenario;
- (b) The revised analysis shall be used to generate updated projections of land-use change rates, spatial distribution patterns, and expected baseline emissions;
- (c) The continued applicability of the methodology and its version shall be reassessed in accordance with the applicable BCR Standard and Baseline and Additionality Tool. Any resulting change in the applicable methodology version shall follow Section 17.2 and the applicable program procedures;

- (d) The Project Document shall be updated to reflect the revised baseline scenario and shall conform to the current version of the BioCarbon Standard and applicable program requirements.

At each verification, the continued suitability of the reference region and baseline estimator shall be assessed using suitable observations and a predefined diagnostic procedure. The procedure shall identify the geographic domain, observation window, comparison statistic, uncertainty, treatment of zero or missing values, and criteria requiring reassessment. The difference between baseline emissions and observed project emissions shall not, by itself, be treated as baseline prediction error.

A triggered review shall document whether reassessment is required and the consequences for the affected calculation intervals. Any revised baseline shall be independently validated before use and shall preserve the continuity of the project's counterfactual forest accounting. Corrections affecting previous results shall follow the applicable program procedures.

9 REDD+ activities

REDD+ activities shall be designed based on the results of the analysis of the direct and underlying causes of deforestation and forest degradation, as well as the identification of the relevant agents of change.

The project holder shall describe each project activity (including the technologies) and the expected outputs, outcomes and impacts of the activities identifying the causal relationships, using the TOC approach, explain how the activities will contribute for the project and generate, consequently, the benefits to the climate, community and biodiversity benefits. It's necessary to describe the implementation timeline of project activity or activities.

The project activities shall also reflect the priorities and decisions of local stakeholders. In Indigenous territories, alignment with community life plans is required; in Afro-descendant communities, ethno-development plans shall be considered. For other rural communities, REDD+ activities shall be defined through participatory processes that reflect local priorities and cultural contexts.

Each REDD+ activity shall include, at a minimum, the following elements:

- (a) Activity identification (name and description);
- (b) Clear linkage between the activity and the specific direct or underlying cause it addresses;
- (c) Demonstrated alignment with community life plans, ethno-development plans, or priorities identified by rural communities;

- (d) Description of the consultation process used to define the objectives and structure of the activity;
- (e) Roles and responsibilities of the actors involved in the implementation of the activity;
- (f) Implementation timeline and milestones;
- (g) Monitoring indicators to track progress, including the indicator name, type, target value, unit of measurement, and entity responsible for data collection.

Monitoring indicators shall be directly linked to the project's objectives and REDD+ activities. All indicators shall be specific, measurable, achievable, relevant, and time-bound – SMART (European Commission, 2021).

Finally, the methodology requires from the project holder the use of the BCR SDG tool to verify the impacts of the project activities implementation in the sustainability agenda, specifically in the SDGs goals and Sustainable Development Safeguards.

10 Analysis of causes, agents and drivers of deforestation and forest degradation

The project holder shall identify, describe and analyze the causes, drivers and agents of deforestation and forest degradation in the reference region and in the project area as input for:

- (a) Design measures and actions to avoid deforestation and forest degradation (REDD+ activities) in the project area and in the leakage area; and,
- (b) Support the delimitation of the reference region.

The following is a description of the key elements to develop a characterization of deforestation's causes and agents and drivers, as suggested by UN-REDD Program⁶.

10.1 Context

After the baseline scenario has been established, the project holder shall conduct a detailed description and analysis of the agents, direct causes, and underlying drivers of deforestation and forest degradation within the project area and surrounding landscape.

A thorough understanding of the behavior, motivations, and mobility of deforestation agents is essential for minimizing the risk of activity-shifting leakage resulting from the

⁶ The present methodology accepts the use of the Minimum Characterization Scenario (MCS).

implementation of project activities. This analysis also supports the design of targeted actions to mitigate leakage and improve the overall effectiveness of REDD+ interventions.

The identification of deforestation and forest degradation agents, causes, and underlying drivers should begin with an initial diagnostic approach. Some key aspects that may be analyzed include:

- (a) The *territorial context* refers to the biophysical environment and how the agents use the land and are involved in the land change. It includes elements such as occupation, land use, social interaction, and legal and regulatory aspects that govern these dynamics;
- (b) The sociocultural context refers to the relationships among different groups of agents and how they interact, organize, and establish norms to inhabit the landscape, use natural resources, and develop productive activities within the reference region, municipalities, and communities;
- (c) The economic context refers to how the means of production are used to generate and exchange goods and services, and how these activities contribute to the local or regional gross domestic product (GDP) and the broader economic structure of the landscape;
- (d) The historical context influences the other types of contexts described above, as it reflects the evolution of deforestation agents over time and across geographic space. Of particular importance are the historical processes of territorial occupation and land-use consolidation by different groups of agents, which define how patterns of production and landscape transformation have developed.

10.2 Key actors, interests, motivations and impact

Deforestation and forest degradation processes involve multiple agents. Some of these agents contribute directly to land-use change (e.g., through agricultural expansion or timber extraction), while others exert indirect influence by enabling or facilitating the conditions that drive forest loss (e.g., through policy decisions, infrastructure development, or market demand).

It is essential to characterize the interests, motivations, and decision-making dynamics of the agents involved in deforestation and forest degradation, as well as their relationships with other key stakeholders.

In this context, the analysis shall include the underlying causes of deforestation and degradation identified for the project area, highlighting their role and relative importance

among the set of factors that influence agents to undertake deforestation and/or degradation activities.

Each key actor involved in the dynamics of deforestation and forest degradation holds a specific degree of responsibility, influence, and territorial presence. These elements shall be characterized and explicitly linked to the patterns and processes of deforestation and/or degradation observed within the project area and its surrounding landscape.

Each identified cause, agent, and driver of deforestation or forest degradation has a differentiated impact on forest dynamics. These impacts may be assessed either quantitatively or qualitatively, depending on data availability and methodological approach.

A quantitative assessment may be conducted through spatial analysis, identifying correlations between the location or intensity of a given cause and observed deforestation or degradation rates. A qualitative assessment may be conducted using participatory approaches, such as Participatory Rapid Appraisal (PRA), to gather insights from local stakeholders on perceived drivers and actor behavior in the landscape.

The project holder shall characterize deforestation and degradation agents in the reference region, project area, and leakage area, including, at a minimum, the name and historical, cultural, economic, and territorial profile of each agent or group, an analysis of its estimated population size or presence within the relevant landscape unit, and the historical deforestation or degradation attributable to it, based on available data or participatory evidence.

10.3 Economic activities and their importance (deforestation drivers)

Activities that directly cause deforestation and/or degradation should be characterized in terms of the spatial patterns associated with their presence, but also in terms of their economic and socio-cultural importance for the agents of deforestation or degradation and other key stakeholders involved. It is clear that activities with a high level of socio-cultural practices require different measures and actions than that where economic benefit prevails over other interests.

For the deforestation and degradation agents some factors affected their decisions and mainly two different types of variables drivers can be identified:

- (a) Related to the deforestation quantity: prices and costs of the products, population density and wages.
- (b) Related with the deforestation location: access to the forests; slope; proximity of markets, proximity to settlements/cities, landscape factors (agricultural suitability) and land management (conservation units, indigenous lands, etc.).

List all the deforestation drivers identified, briefly describing how each decision of the agent or agent group is affected by the driver's variables. Also, describe the likely future of the driver variable and the project activities that will be implemented to reduce the driver deforestation risk.

10.4 Confirm the causes of the deforestation and forest degradation dynamic

The analysis of causes and dynamics seeks to identify the relationships between major groups of agents and causes to try to explain the sequence of events that usually leads to the loss of forest and forest degradation in a particular area. The agents' characteristics and decisions are themselves determined by broader forces.

The project holder shall identify and establish clear linkages between the underlying causes of deforestation and/or forest degradation and the corresponding drivers and agents previously identified whether their involvement is direct or indirect.

For each underlying cause identified, the project holder shall describe the specific REDD+ activities that will be implemented to mitigate the associated risk, ensuring that the interventions are appropriately aligned with the nature and influence of the cause and agent in question

A useful tool for identifying, measuring and monitoring project drivers, causes, agents and activities is the Theory of Change (TOC). By using this theory as the guiding framework for project development, a logical and coherent structure is established to clearly identify the steps required to achieve deforestation and degradation reduction targets.

The TOC approach can be summarized by 1. define the problem; 2. identify the desired outcomes; 3. map the causal pathways; 4. transparently shows the assumptions made; 5. develop a visual representation and 6. validate and refine.

In a logical sequence, this framework represents the conditions and factors necessary to achieve impact and mitigation outcomes. Impacts and outcomes can be quantified in the short-term using variables that adequately describe the links between project activities and emission reductions.

A guide such as Conservation International's 'Constructing theories of change for ecosystem-based adaptation projects (Conservation International, 2013) can be used to guide the GHG project holder. This guide provides a step-by-step approach to setting goals and objectives and understanding the relationships between different elements on the basis of a theory of change.

11 Quantification of GHG emission reduction from REDD+ activities

The project's emission reductions shall be quantified over the quantification period, which is the timeframe during which the project holder estimates GHG emission reductions or removals, measured against the validated baseline scenario, for the purpose of requesting the issuance of Verified Carbon Credits (VCCs) under the BioCarbon Standard.

Each verification is based on a defined monitoring period, which represents the specific interval within the quantification period for which data are collected, analyzed, and reported for third-party verification.

11.1 Identification of the baseline scenario

The project holder shall determine the most plausible baseline scenario by applying the procedures and criteria established in this Methodology. This includes the identification of historical deforestation patterns, the characterization of agents and drivers, and the application of geographic and socio-ecological comparability requirements between the project area and the reference region. The baseline scenario shall reflect the expected forest loss in the absence of project implementation, based on verifiable historical evidence and conservative assumptions.

The project holder shall comply with legally binding national or subnational requirements applicable to the project. Where a legally binding and applicable regulatory baseline exists, the more conservative of that baseline and the baseline calculated under this methodology shall be used. Comparability of geographic scope, period, carbon pools, gases, and units shall be documented.

For baseline assessment and reassessment, applicable government policies and legal requirements shall be treated as enforced in countries classified as high income by the World Bank at the time of the assessment.

Any national or subnational adjustment used in the calculation shall be expressly authorized by this methodology or an applicable legally binding provision. The project holder shall document the authorization, affected parameter and scenario, period, source, geographic applicability, and calculation rule. An adjustment authorized for projections shall not be applied to historical observations or observed ex post activity data. The existence of a national forest reference level shall not, by itself, authorize an adjustment or impose a project baseline constraint.

Any recalculation of previously reported results following a regulatory change shall be subject to an explicit decision under the applicable program procedures.

11.1.1 Baseline scenario for deforestation

The baseline scenario for deforestation shall be established and updated using a representative reference region that meets the requirements of Section 8.2. Historical observations covering the ten-year period preceding the project start date shall support the assessment of comparability, the characterization of deforestation dynamics, and the development and evaluation of the baseline estimator. The cartographic inputs shall be suitable for the forest definition, spatial scale, and changes being assessed.

For ex post quantification, baseline deforestation shall be estimated for each calculation interval using contemporaneous observations from the reference region and the corresponding counterfactual forest area within the project boundary. The calculation shall follow Sections 11.1.1.1 through 11.1.1.2 and use the activity data assigned under the procedures and controls established by BioCarbon.

Historical averages and projections may support ex ante estimates and the evaluation of the baseline model. They shall not replace the contemporaneous observations required for ex post quantification. The project holder shall use the assigned activity data with the applicable emission factors to calculate baseline emissions and shall document their application for independent validation and verification.

The baseline estimator shall be evaluated for its intended geographic domain and conditions of use. The evaluation shall address reference-region comparability, model assumptions, transfer of observed reference-region change to the project area, potential bias, and uncertainty. For fitted or calibrated components, the evaluation shall address independence from the fitting data and justify any spatial or temporal separation. The evaluation and its limitations shall be documented before assigned activity data are used for crediting. Uncertainty shall be addressed under Section 14.

11.1.1.1 Historical and contemporaneous deforestation observations

Deforestation observations shall identify gross forest conversion to non-forest in accordance with the applicable forest and deforestation definitions. Gross deforestation, forest gains, and net forest-area change shall be distinguished. The difference between total forest areas at two dates shall not be used as a substitute for gross deforestation where forest gains or other changes affect that difference.

Each calculation interval shall have explicit start and end dates. The reference-region observations and the corresponding project calculations shall cover the same interval. Within

each reference unit, the initial forest area and the observed deforestation shall refer to the same geographic domain and use comparable classification and observation methods.

Missing or unreliable observations shall be identified separately and shall not be treated as zero deforestation. Forest loss first detected after an observation gap shall be assigned to a calculation interval only where the temporal evidence supports that assignment under the predefined data-processing procedure. It shall not be automatically attributed entirely to the interval in which it was first detected.

Historical and contemporaneous observations shall remain traceable to their source data, observation dates, processing methods, geographic coverage, and quality assessments.

11.1.1.1.1 Deforestation proportion in the reference region

The initial forest cohort within the reference region and the corresponding baseline-risk strata shall be defined before the observations used to evaluate project performance become available. Each stratum shall represent the biophysical conditions, accessibility, drivers, agents, and deforestation pressures applicable to the corresponding project forest. Comparability shall be demonstrated for each stratum using the requirements of Section 8.2 and the available historical evidence.

The reference-unit boundaries, stratum membership, and calculation procedure shall remain fixed until a prospective reassessment is approved. Reference units shall form non-overlapping subdivisions of the forest cohort within each stratum. Previously deforested areas shall remain traceable and shall not re-enter that cohort through subsequent forest gains.

For each stratum and calculation interval, the deforestation proportion shall be calculated by dividing total gross deforestation within the reference cohort by the forest area remaining within that cohort at the beginning of the interval:

$$q_{RR,h,t} = \frac{\sum_{s \in S_h} D_{h,s,t}^{RR}}{\sum_{s \in S_h} F_{h,s,t,start}^{RR}} \quad \text{Equation 1}$$

Subject to:

$$\sum_{s \in S_h} F_{h,s,t,start}^{RR} > 0$$

$$0 \leq D_{h,s,t}^{RR} \leq F_{h,s,t,start}^{RR} \quad \forall s \in S_h$$

Where:

$q_{RR,h,t}$	Deforestation proportion for reference-region stratum (h) during interval (t); dimensionless
h	Baseline-risk stratum with corresponding forest areas in the reference region and the project area
S_h	Fixed set of reference units belonging to stratum (h)
$F_{h,s,t,start}^{RR}$	Forest area remaining within that cohort at the beginning of interval (t); ha
$D_{h,s,t}^{RR}$	Gross deforestation within the remaining initial forest cohort of reference unit (s), stratum (h), during interval (t); ha
t	Calculation interval identified by its start and end dates

Numerator and denominator shall refer to the same forest cohort and geographic domain. The proportion shall represent deforestation during the specified interval. It shall not be interpreted as an annual rate unless the interval is exactly one year.

A fully deforested reference unit shall remain in the accounting with zero subsequent forest exposure and zero subsequent deforestation. It shall not be replaced because of that outcome. The calculation shall continue using the aggregate remaining forest exposure of the stratum.

Where the aggregate reference forest exposure is zero, no deforestation proportion shall be calculated. Subsequent baseline deforestation shall be zero where the corresponding project baseline forest area has also been exhausted. Where project baseline forest remains, the estimate shall be classified as non-estimable pending reassessment.

Missing observations shall not be assigned zero values or addressed by restricting the denominator to the observable portion of a stratum. They shall be resolved using traceable alternative observations or a predefined and validated estimation procedure covering the affected domain. Until resolved, the affected estimate shall remain non-estimable and shall not support credit issuance.

A loss of comparability shall be supported by evidence identifying the affected stratum, the cause, and the intervals concerned. Differences in observed deforestation or in calculated emission reductions shall not, by themselves, justify removing or replacing reference units. Any reassessment shall preserve the continuity of the project's counterfactual forest accounting. A non-estimable component shall not be silently omitted or assigned zero when calculating net emission reductions.

11.1.1.1.2 Dynamic baseline deforestation in the project area

The project forest shall be divided into baseline-risk strata corresponding to those established in the reference region. Their intersection with carbon strata shall define non-overlapping accounting units covering the eligible project forest. Each baseline-risk stratum shall have a comparable reference counterpart under Section 8.2. Where characteristics associated with a carbon stratum materially affect deforestation risk, the baseline-risk stratification shall be refined before applying a common deforestation proportion.

Baseline deforestation shall be calculated for each accounting unit by applying the corresponding reference-region deforestation proportion to the forest area remaining under the baseline scenario at the beginning of the interval:

$$D_{BL,P,h,k,t} = q_{RR,h,t} \times F_{BL,P,h,k,t,start} \quad \text{Equation 2}$$

$$D_{BL,P,t} = \sum_h \sum_k D_{BL,P,h,k,t} \quad \text{Equation 3}$$

$$F_{BL,P,h,t,end} = F_{BL,P,h,t,start} - \sum_k D_{BL,P,h,k,t} \quad \text{Equation 4}$$

$$F_{BL,P,h,t+1,start} = F_{BL,P,h,t,end} \quad \text{Equation 5}$$

$$F_{BL,P,h,t,start} = \sum_k F_{BL,P,h,k,t,start} \quad \text{Equation 6}$$

Where:

$D_{BL,P,h,k,t}$	Baseline deforestation in accounting unit (h, k) of the project area during interval (t), in hectares
$D_{BL,P,t}$	Total baseline deforestation in the project area during interval (t), in hectares
$q_{RR,h,t}$	Dimensionless deforestation proportion for baseline-risk stratum (h) in the reference region during interval (t), calculated under Section 11.1.1.1.1

$F_{BL,P,h,k,t,start}$	Forest area remaining under the baseline scenario in accounting unit (h, k) at the beginning of interval (t), in hectares
$F_{BL,P,h,t,start}$	Total forest area remaining under the baseline scenario in baseline-risk stratum (h) at the beginning of interval (t), in hectares
$F_{BL,P,h,t,end}$	Total forest area remaining under the baseline scenario in baseline-risk stratum (h) at the end of interval (t), in hectares
h	Baseline-risk stratum
k	Carbon stratum identifying the applicable emission factors. Carbon strata within each baseline-risk stratum form a non-overlapping partition of its forest area
P	Project area
t	Calculation interval with defined start and end dates

For a project applying this approach from its start date, the initial baseline forest area shall correspond to the eligible forest area within the project boundary at that date. Its geographic extent, reference date, and supporting evidence shall be documented. Application to an existing project shall follow the applicable transition provisions and shall preserve the continuity of the baseline forest accounting.

The baseline forest area is a counterfactual accounting quantity and shall be maintained separately from observed forest cover in the project area. A baseline reassessment or an update of observations shall not automatically reset it to the forest area observed under the project scenario.

Baseline deforestation calculated for an interval shall not exceed the baseline forest area available at the beginning of that interval. Areas already accounted for as deforested under the baseline scenario shall not be made available again for subsequent baseline deforestation.

The value of $D_{BL,P,t}$ represents hectares deforested over the complete calculation interval. It shall not be multiplied by the duration of that interval a second time. Where an equation requires an average annual activity value, that value shall be obtained by dividing the interval total by the interval duration expressed in years.

Activity data and emission factors shall be matched by accounting unit and calculation interval. Any redistribution of baseline deforestation among carbon strata shall follow the predefined allocation procedure and shall not be determined by its effect on credited emission reductions.

Changes in forest condition associated with degradation under Section 11.2 shall be reconciled with the carbon strata and the forest-area balance. Such changes shall not restore forest area already accounted for as deforested. Emission factors shall reflect carbon-stock conditions immediately before the modeled conversion, considering degradation losses already quantified, so that the same carbon-stock loss is not counted again upon deforestation.

Soil carbon emissions, where included, shall retain their applicable temporal treatment and shall not be incorporated into a biomass emission factor as an annual flow.

11.1.1.2 Annual historical deforestation in the leakage area

Average annual historical deforestation in the leakage area shall be calculated from observed gross forest conversion to non-forest during the historical interval, using the observation requirements in Section 11.1.1.1:

$$AD_{LK,yr} = \frac{D_{LK}^{hist}}{t_2 - t_1} \quad \text{Equation 7}$$

Where:

$AD_{LK,yr}$	Average annual historical deforestation in the leakage area; ha/year
D_{LK}^{hist}	Observed gross deforestation during the historical interval; ha
$t_2 - t_1$	The interval duration; years

Forest gains shall not offset gross deforestation. This historical average supports characterization and ex ante assessment; it shall not replace the counterfactual and attribution procedures required for ex post leakage estimation under Section 12.

11.2 Baseline scenario for forest degradation

11.2.1 Conceptual Basis

Forest degradation implies a loss of forest carbon stocks without a full conversion to non-forest. It can occur even when forest cover and height remain above the thresholds of forest definition. In the absence of historical biomass data and limited remote sensing capacity for degradation monitoring, this methodology adopts a spatial proxy approach using landscape fragmentation classes as indicators of carbon loss.

Fragmentation classes provide indicators for the biomass-carbon losses addressed by the fragmentation approach. Soil-carbon losses and associated GHG emissions caused by drainage or other hydrological changes shall be assessed separately under Section 11.4.6. The absence

of a fragmentation-class transition shall not establish the absence of forest degradation or justify assigning zero to these emissions.

11.2.2 Use of fragmentation analysis

The project holder shall apply a consistent and validated method to detect forest degradation based on transitions between fragmentation classes. The following assumptions apply:

- (a) Primary degradation: Transition from core to patch forest;
- (b) Secondary degradation: Transition from perforated to patch forest.

The relationship between fragmentation transitions and carbon loss shall be demonstrated using field plots or regionally appropriate studies, in accordance with Section 11.2.5. The evidence shall support the fragmentation transitions used in the calculation.

11.2.3 Spatial inputs and processing steps

The spatial inputs shall include forest-cover observations for the historical assessment dates and the start and end of each calculation interval used for ex post quantification. The forest layer used to associate fragmentation classes with biomass estimates shall have a documented temporal relationship to those estimates. Reference-region and project observations shall cover corresponding intervals and meet the comparability and observation-gap requirements of Sections 11.1.1.1 and 15.2.

Forest fragmentation shall be classified into Core, Edge, Perforated, and Patch following the morphological method of Vogt et al. (2007), using the LFT v2.0 procedure documented by UConn CLEAR as the reference implementation. Alternative software may be used if it demonstrably reproduces this classification for the same input data and configuration. All Core size subclasses shall be combined into Core. The area of each class shall be reported for each assessment date in Table 3.

The analysis shall use an edge width of 100 m. The project holder shall document the software and version, geometric implementation of the edge width, spatial resolution, connectivity rules, boundary treatment, and handling of missing observations. The same configuration shall be applied across comparable observation dates and geographic domains, using spatial inputs consistent with Section 15.2. The edge width is a classification parameter, distinct from input pixel size. The relationship between the resulting fragmentation transitions and carbon loss shall be supported by the evidence required under Section 11.2.5.

Table 3. Area by fragmentation class and year

Fragmentation Class	Area (ha)			
	Biomass Year	Year 1	Year 2	Year 3
Core				
Perforated				
Edge				
Patch				

11.2.4 Transition matrices and activity data

Spatial intersections of the initial and final maps shall identify mapped transitions from Core to Patch and from Perforated to Patch. The corresponding activity-area estimates shall incorporate the accuracy assessment and area-estimation requirements of Section 15.2. Mapped transitions and estimated activity areas shall remain distinguishable and shall reconcile with the applicable forest-cohort balances.

Where an average annual value is required, the transition area shall be divided by the elapsed time expressed in years:

$$PFD_{z,t}^{obs} = \frac{A_{z,core \rightarrow patch,t}^{obs}}{\Delta t_t} \quad \text{Equation 8}$$

$$SFD_{z,t}^{obs} = \frac{A_{z,perforated \rightarrow patch,t}^{obs}}{\Delta t_t} \quad \text{Equation 9}$$

Where:

$PFD_{z,t}^{obs}$	Average annual area of observed primary degradation in geographic domain (z) during interval (t); ha/year
$SFD_{z,t}^{obs}$	Average annual area of observed secondary degradation in geographic domain (z) during interval (t); ha/year
$A_{z,core \rightarrow patch,t}^{obs}$	Estimated area transitioning from Core to Patch in domain (z) during interval (t), determined under Section 15.2; ha
$A_{z,perforated \rightarrow patch,t}^{obs}$	Estimated area transitioning from Perforated to Patch in domain (z) during interval (t), determined under Section 15.2; ha
z	Geographic domain: reference region, project area, or leakage area
t	Observation interval identified by its start and end dates
Δt_t	Duration of interval (t), expressed in years; greater than zero
obs	Observed transition data

The transition areas are totals for the observation interval. Annualized values shall be used only where the applicable equation requires activity data in hectares per year.

Geographic domain and accounting scenario shall be distinguished. Equations 8 and 9 describe observed transitions. Baseline degradation activity data for the project area shall be calculated under Section 11.2.6 and retained separately from observed project transitions.

For each geographic domain and interval, the transition matrix shall reconcile all mapped classes, including stable classes and transitions to non-forest, over the common observable domain. Areas without valid observations at either date shall be reported separately and shall not be treated as zero change. Transitions meeting the definition of deforestation shall be accounted for as deforestation; the same carbon-stock loss shall not be counted again as degradation.

Table 4. Observed transition areas between mapped classes (ha)

Initial class / Final class	Core	Perforated	Edge	Patch	Non-forest	Initial total
Core						
Perforated						
Edge						
Patch						
Non-forest						
Final total						

Each cell shall report the area of intersection between the corresponding initial and final classes. Any additional class produced by the documented classification procedure shall be included as a separate row and column. Row and column totals shall reconcile with the classified areas at the respective dates within the common observable domain.

11.2.5 Uncertainty and validation

The relationship between fragmentation transitions and actual carbon loss shall be validated using field plots or regionally appropriate studies. A precision analysis is recommended to reduce uncertainty and to confirm the reliability of fragmentation-based assumptions.

11.2.6 Dynamic baseline degradation in the project area

For ex post quantification, baseline degradation shall be estimated for each calculation interval using contemporaneous reference-region transitions and the forest remaining under the project baseline. This procedure estimates transition areas; it does not generate a spatially explicit counterfactual fragmentation map.

Within each accounting unit, the initial baseline forest shall be partitioned by fragmentation class. The initial classification shall correspond to the baseline forest initialization under Section 11.1.1.1.2. Subsequent class areas shall follow the preceding interval's baseline results and shall not be reset to observed project conditions.

For this subsection, $F_{h,k,c,t}^{BL}$ denotes the baseline forest area in the project area at the start of interval (t), within baseline-risk stratum (h), carbon stratum (k), and fragmentation class (c). The set C shall include all forest classes produced by the documented classification procedure. Class areas shall be non-negative and shall reconcile with the corresponding baseline accounting unit:

$$\sum_{c \in C} F_{h,k,c,t}^{BL} = F_{BL,P,h,k,t,start} \quad \text{Equation 10}$$

Baseline deforestation shall be distributed among these classes using the deforestation proportion already determined under Section 11.1.1.1.1:

$$D_{h,k,c,t}^{BL} = q_{RR,h,t} F_{h,k,c,t}^{BL} \quad \text{Equation 11}$$

Here, $D_{h,k,c,t}^{BL}$ is the baseline deforestation area allocated to class (c), in hectares. Its sum across forest classes shall equal the baseline deforestation of accounting unit (h, k) calculated under Section 11.1.1.1.2.

For each origin class, the reference-region distribution of destinations among areas remaining forest shall be calculated as follows:

$$p_{RR,h,c \rightarrow d,t} = \frac{\sum_{s \in S_h} A_{h,s,c \rightarrow d,t}^{RR}}{\sum_{s \in S_h} \sum_{u \in C} A_{h,s,c \rightarrow u,t}^{RR}} \quad \text{Equation 12}$$

$A_{h,s,c \rightarrow d,t}^{RR}$ is the reference-cohort area transitioning from forest class (c) to forest class (d) during the interval, in hectares. The denominator includes all forest destinations, including persistence in the origin class, and excludes deforestation. Reference transitions shall remain within the initial forest cohort defined under Section 11.1.1.1.1, without re-entry of previously deforested areas. For each origin class, the reference matrix shall reconcile initial forest area with forest-to-forest transitions and deforestation.

Where the denominator is positive, the proportions shall be non-negative and sum to one across forest destinations. They shall be applied to the corresponding project baseline area remaining after deforestation:

$$T_{h,k,c \rightarrow d,t}^{BL} = (F_{h,k,c,t}^{BL} - D_{h,k,c,t}^{BL})p_{RR,h,c \rightarrow d,t} \quad \text{Equation 13}$$

$T_{h,k,c \rightarrow d,t}^{BL}$ is the baseline transition area, in hectares. The subtraction of deforestation separates the interval's accounting outcomes and does not assert that every deforestation event chronologically precedes degradation.

The forest area available in each class at the start of the next interval shall be:

$$F_{h,k,d,t+1}^{BL} = \sum_{c \in C} T_{h,k,c \rightarrow d,t}^{BL} \quad \text{Equation 14}$$

The update shall conserve the forest-area balance under Section 11.1.1.1.2. Any justified change in carbon stratification shall reconcile the areas transferred and retain their carbon histories. Previously deforested areas shall not become available again.

Primary and secondary baseline degradation areas entering Section 11.6 shall be:

$$A_{BL,P,k,t}^{prim} = \sum_h T_{h,k,Core \rightarrow Patch,t}^{BL} \quad \text{Equation 15}$$

$$A_{BL,P,k,t}^{sec} = \sum_h T_{h,k,Perforated \rightarrow Patch,t}^{BL}$$

These areas are interval totals in hectares and shall not be multiplied by interval duration again. All forest-class transitions shall remain in the area balance, including those that do not enter the primary or secondary degradation terms.

Application shall be supported by the evaluation required under Section 11.1.1. The evaluation shall address the common deforestation proportion across fragmentation classes within each risk stratum, transfer of conditional transitions to the corresponding project forest, and class-area evolution over successive intervals. Where material differences invalidate these assumptions, the stratification or procedure shall be reassessed before the affected estimates

are used. Changes shall follow the prospective reassessment and continuity requirements of Sections 8.4.1.1 and 11.1.1.1.1.

Where an origin class has no remaining project baseline forest after deforestation, its forest-to-forest transitions shall be zero and Equation 12 need not be evaluated for that class. Where such forest remains but the corresponding reference denominator is zero, the affected estimate shall be non-estimable. Missing observations and loss of comparability shall follow Section 11.1.1.1.1; the reference denominator shall not be restricted to observable areas to bypass unresolved gaps. A non-estimable component shall not be omitted or assigned zero in net emission reductions.

Subcohorts with different carbon histories shall remain distinguishable within each accounting unit. Their emission factors and remaining biomass-carbon stocks shall be determined under Section 11.4.5. Uncertainty and dependencies among deforestation proportions, transition proportions, areas, and emission factors shall be addressed under Section 14.

11.3 Project scenario

Ex ante estimates may use justified expected reduction factors. Ex post project activity data shall be based on observations for the relevant calculation interval. Ex post leakage shall be determined in accordance with Section 12. Each input shall identify its scenario, geographic domain, observation or modeling status, unit, and time basis. Expected reductions shall not substitute for monitored project results.

11.3.1 Observed deforestation in the project scenario

Deforestation in the project scenario shall be the gross area of forest converted to non-forest within the project boundary during the calculation interval, determined from empirical observations in accordance with the applicable forest and deforestation definitions. Forest gains shall be reported separately and shall not offset gross deforestation. Observed losses shall remain traceable to their location, calculation interval, and applicable carbon stratum.

Where an average annual activity value is required, it shall be calculated as follows:

$$AD_{P,t} = \frac{D_{PRJ,P,t}}{\Delta t_t} \quad \text{Equation 16}$$

Where:

$AD_{P,t}$	Average annual gross deforestation observed in the project area during interval (t); ha/year
$D_{PRJ,P,t}$	Gross deforestation observed in the project area under the project scenario during interval (t); ha
Δt_t	Duration of interval (t), expressed in years; greater than zero
P	Project area
t	Calculation interval identified by its start and end dates

Observation gaps and the attribution of losses to calculation intervals shall be treated in accordance with Sections 11.1.1.1 and 15.2. The gross deforestation area is an interval total and shall not be multiplied by the interval duration again.

The estimation of the reduction in deforestation resulting from the implementation of REDD+ activities should indeed be based on a comprehensive analysis of the project's effectiveness. This includes a detailed description of how the activities and implementation of the project contribute to the reduction in deforestation over time.

11.3.2 Ex-ante deforestation projections in the leakage area

The leakage factor (LF) represents the expected proportional increase in deforestation in the leakage area attributable to project implementation. Its value shall be supported by evidence concerning the relevant agents, displacement opportunities, geographic domain, and projection period. It shall be used for ex ante projections and shall not be interpreted as a percentage deduction from emission reductions.

For ex ante estimates, annual deforestation in the leakage area under the project scenario is projected as follows:

$$AD_{lk,proj,yr} = AD_{lk,hist,yr} \times (1 + LF) \quad \text{Equation 17}$$

Where:

$AD_{lk,proj,yr}$	Projected annual deforestation in the leakage area during the project scenario; ha/year
$AD_{lk,hist,yr}$	Historical annual deforestation in the leakage area; ha/year
LF	Expected proportional increase in deforestation in the leakage area attributable to project implementation, used for ex ante estimates; dimensionless

The project holder shall document the derivation, data sources, assumptions, and applicability conditions of LF in the Project Document for validation. Ex post leakage shall be determined under Section 12.

11.3.3 Ex ante projections of forest degradation

(a) In the project area

For ex ante estimates, annual forest degradation in the project area under the project scenario may be projected by applying justified expected reduction factors to the corresponding baseline degradation estimates, as follows:

$$PFD_{prj,yr} = PFD_{bl,yr} \times (1 - r_{PFD}) \quad \text{Equation 18}$$

$$SFD_{prj,yr} = SFD_{bl,yr} \times (1 - r_{SFD}) \quad \text{Equation 19}$$

Where:

$PFD_{prj,yr}, SFD_{prj,yr}$	Projected annual primary and secondary degradation in the project area under the project scenario, used for ex ante estimates; ha/year.
$PFD_{bl,yr}, SFD_{bl,yr}$	Annual primary and secondary degradation in the project area under the baseline scenario, used for ex ante estimates; ha/year.
r_{PFD}, r_{SFD}	Proportional reduction expected due to REDD+ activities (e.g., 0,25 for 25%)

The values of r_{PFD} and r_{SFD} shall be justified in the Project Document based on the type, coverage, and expected effectiveness of REDD+ activities, and shall be validated by an independent third party.

For ex post quantification, degradation in the project area shall be determined from observed transitions and the applicable emission factors in accordance with Sections 11.2.4, 11.2.5, and 11.4.5. Proportional reductions expected from REDD+ activities shall be used only for ex ante estimates and shall not replace those observations.

(b) In the leakage area

For ex ante estimates, forest degradation in the leakage area under the project scenario shall be projected as an expected increase over the corresponding baseline degradation estimate for that area:

$$PFD_{lk,yr} = PFD_{bl,lk,yr} \times (1 + LF_{deg}) \quad \text{Equation 20}$$

$$SFD_{lk,yr} = SFD_{bl,lk,yr} \times (1 + LF_{deg}) \quad \text{Equation 21}$$

Where:

$PFD_{lk,yr}, SFD_{lk,yr}$	Projected annual primary and secondary degradation in the leakage area under the project scenario, used for ex ante estimates; ha/year
$PFD_{bl,lk,yr}, SFD_{bl,lk,yr}$	Annual primary and secondary degradation in the leakage area under the baseline scenario, used for ex ante estimates; ha/year
LF_{deg}	Expected proportional increase in forest degradation in the leakage area attributable to project implementation, used for ex ante estimates; dimensionless

The value of LF_{deg} shall be supported by evidence applicable to the degradation processes, affected area, and projection period. Its derivation and assumptions shall be documented in the Project Document for validation. Ex post leakage shall be determined under Section 12.

11.4 Emission factors

The project holder may determine emission factors using data applicable to the relevant carbon pool or emission source, obtained through field measurements or representative national or international sources. The selected data and methods shall be scientifically supported, applicable to the conditions assessed, and conservative for the comparison between scenarios.

Each biomass or carbon input shall identify its physical quantity, unit, included pools, and prior conversions. The carbon fraction shall be applied once to dry biomass and shall not be applied to inputs already expressed as carbon. The factor 44/12 shall be applied only when converting carbon to CO₂. Belowground biomass shall not be added to an input that already includes it. Components with different carbon fractions shall be calculated separately.

11.4.1 Field-Based estimation of emission factors

When emission factors are derived from sampling plots, the project holder shall follow the sampling requirements described by the Intergovernmental Panel on Climate Change (IPCC, 2006) Guidelines and subsequent refinements), including:

- (a) Sampling principles (e.g., random, stratified, or systematic sampling);
- (b) Sampling design (e.g., plot size, shape, number, and distribution);
- (c) Sampling methods for area estimation;
- (d) Sampling methods for estimating emissions and removals of greenhouse gases;
- (e) Quantification and management of uncertainties in sample-based surveys.

Field data shall be collected in a manner that is statistically representative, independently verifiable, and spatially consistent with the strata or land classes used in the emission reduction estimates.

To ensure the accuracy and reliability of the estimated emission factors, the sampling precision shall meet the following minimum requirement:

- ▲ A relative precision of $\pm 10\%$ at a 95% confidence level, calculated across the full population or stratum.

If this level of precision is not achievable due to practical limitations (e.g., access, cost, terrain), the project holder shall apply conservative emission factors and transparently document the reasons and implications.

Allometric equations shall be appropriate to the forest type, species or functional groups, ecological and disturbance conditions, tree-size range, and measured predictors. The project holder shall document their sources, calibration domains, input units, transformations, and correction factors, together with measurement procedures and the treatment of missing observations and damaged or atypical trees. Selection shall be based on demonstrated suitability and predictive performance. Extrapolation shall require documented justification and conservative treatment of the additional uncertainty under Section 14.

11.4.2 Use of published or default values

Where direct sampling is not feasible or data gaps exist, the project holder may use:

- (a) National emission factors published by the host country (e.g., in GHG inventories, NDCs, REDD+ FRELs), if consistent with IPCC Tiers 2 or 3;

- (b) Regionally relevant peer-reviewed literature or forest inventory databases;
- (c) IPCC default values (Tier 1) only if justified as conservative and no higher-tier data are available.

The selected emission factors shall:

- (a) Be consistent with the forest, soil, land-use, and hydrological conditions represented by the applicable strata;
- (b) Represent the relevant carbon pools, emission sources, and gases, identifying the processes included in each factor;
- (c) Retain clearly identified units appropriate to the calculation, distinguishing stock changes per hectare, annual emission rates per hectare, and event-based factors. Conversions to gas mass and CO₂-equivalent shall be applied once. Biomass conversion factors and root-to-shoot ratios shall be used only where applicable to the quantity being estimated.

National or subnational emission factors shall be supported by evidence of applicability to the project's forest types, geographic and temporal scope, carbon pools, units, and uncertainty. Included pools and prior conversions shall be reconciled with the project calculations to prevent double counting. Their use shall not replace the delineated reference region or, by itself, establish an allocation of a jurisdictional baseline.

11.4.3 Documentation and validation

All emission factor sources, methodologies, assumptions, and calculations shall be:

- (a) Clearly described in the Project Document,
- (b) Supported by traceable datasets (field forms, calibration methods, equations, etc.), and
- (c) Subject to validation by an independent third party.

The uncertainty associated with emission factors shall be incorporated into the overall project uncertainty assessment as required under Section 14.

Remotely sensed or modeled biomass products shall identify their target quantity, included pools, reference dates, and domain of applicability. Relevant published independent validation may demonstrate suitability; additional evaluation shall address material limitations not resolved by that evidence, including temporal transferability and change-detection performance where relevant. Project-specific calibration shall be evaluated

independently of its fitting data. Where differences between maps estimate carbon loss, the uncertainty assessment shall account for relevant correlated errors.

11.4.4 Deforestation

Emission factors vary depending on the carbon pool being quantified. This Methodology provides default or recommended values for aboveground biomass, belowground biomass, and soil carbon pools.

If the REDD+ project holder intends to include additional carbon pools (e.g., deadwood or litter), they shall provide a detailed description of the estimation methods applied, in accordance with the latest IPCC guidelines. The inclusion of such pools shall be transparently justified and demonstrate that their use does not result in an overestimation of baseline emissions or mitigation outcomes. All data sources, assumptions, and methods shall be documented in the Project Document and subject to validation.

11.4.4.1 Biomass emission factor

The biomass emission factor shall account for living biomass retained immediately after conversion, the timing of carbon release, and subsequent changes in vegetation. Calculations shall distinguish the initial loss from living biomass from its release to the atmosphere, following the applicable IPCC methods for land-use conversion (IPCC, 2006; 2019).

For each deforestation cohort, the initial living-biomass carbon loss and the net biomass emission factor for calculation interval (t) shall be:

$$\Delta C_{\sigma,z,k,\tau}^{conv} = C_{\sigma,z,k,\tau}^{pre} - C_{\sigma,z,k,\tau}^{post,0}$$

Equation 22

$$EF_{\sigma,z,k,\tau,t}^{bio} = (\Delta C_{\sigma,z,k,\tau}^{conv} f_{\sigma,z,k,\tau,t} - G_{\sigma,z,k,\tau,t}^{post}) \frac{44}{12}$$

Where:

σ, z, k, t	Accounting scenario, geographic domain, carbon stratum, and calculation interval, respectively, as defined in Section 11.5
τ	Deforestation cohort sharing conversion timing, carbon history, post-conversion land use and management, and applicable emission and uptake trajectories
$C_{\sigma,z,k,\tau}^{pre}$	Aboveground and belowground living-biomass carbon immediately before conversion, reflecting degradation losses already accounted for; tC/ha

$C_{\sigma,z,k,\tau}^{post,0}$	Carbon in living biomass surviving immediately after conversion, before subsequent vegetation growth; tC/ha
$\Delta C_{\sigma,z,k,\tau}^{conv}$	Initial carbon loss from living biomass due to conversion; tC/ha
$f_{\sigma,z,k,\tau,t}$	Fraction of the initial conversion loss assigned to CO ₂ emissions during interval (t); dimensionless
$G_{\sigma,z,k,\tau,t}^{post}$	Net atmospheric CO ₂ -carbon uptake associated with surviving and subsequently established vegetation during interval (t), excluding the initial conversion loss. Positive values represent net uptake, and negative values represent net release; tC/ha
$EF_{\sigma,z,k,\tau,t}^{bio}$	Net biomass-related CO ₂ emissions during interval (t), per hectare converted in cohort τ ; tCO ₂ e/ha
44/12	Molecular weight ratio of CO ₂ to carbon

Stocks and post-conversion trajectories shall be supported under Sections 11.4.1–11.4.3 and shall identify the represented vegetation, biomass components, land use, management, and time since conversion. Baseline estimates shall reflect the supported counterfactual destination; project estimates shall reflect observed post-conversion conditions. Missing data shall not justify assigning zero to retained biomass or subsequent uptake.

Allocation fractions shall be nonnegative and shall not sum to more than one across calculation intervals. Their derivation shall account for carbon retained in dead biomass or other pools and its subsequent release. Where aboveground and belowground components have different release profiles, the combined fraction shall be weighted by the carbon lost from each component. Immediate recognition may be used only where the conversion conditions and temporal assumptions are supported and the simplification does not overestimate net emission reductions for the reported period. Applying the same assumption in both scenarios shall not, by itself, establish conservativeness.

Post-conversion uptake shall be estimated using applicable IPCC gain-loss or stock-difference methods, accounting consistently for transfers between pools and carbon remaining stored. Growth and subsequent losses of surviving and newly established vegetation shall be included where material. Future growth shall not be deducted as though it had already occurred during the calculation interval.

Carbon represented by the initial conversion loss shall enter the calculation through its allocation fraction only; its subsequent decomposition shall not be counted again in post-conversion uptake, soil emissions, or additional emissions. Other transfers and releases shall likewise be assigned once. Signed interval factors shall be retained, and uncertainty in stocks,

trajectories, and temporal allocation shall be addressed under Section 14. Post-conversion uptake shall serve the calculation of net deforestation emissions and shall not constitute a separate credited removal activity.

11.4.4.2 Soil organic carbon change following deforestation

For mineral soils, emissions shall be based on the difference between soil organic carbon stocks immediately before conversion and those at the end of the transition to the subsequent land use and management. Stocks shall be estimated on a comparable soil-depth or equivalent-soil-mass basis using applicable IPCC stock-change factors or representative empirical data. The project holder shall document the soil type, comparison basis, post-conversion conditions, data sources, and transition duration for each scenario and relevant carbon stratum.

Soil emissions for each calculation interval shall include all relevant deforestation cohorts whose soil-carbon transitions overlap that interval:

$$E_{\sigma,z,t}^{SOC,min} = \frac{44}{12} \sum_k \sum_{\tau} D_{\sigma,z,k,\tau} \Delta SOC_{\sigma,z,k,\tau} \omega_{\sigma,z,k,\tau,t} \quad \text{Equation 23}$$

Where:

σ, z, k, t	Scenario, geographic domain, carbon stratum, and calculation interval, respectively, as defined in Section 11.5
τ	Deforestation cohort sharing conversion timing, post-conversion conditions, and a soil-carbon transition. Materially different conditions shall be calculated separately
$D_{\sigma,z,k,\tau}$	Deforestation area assigned to the cohort, reconciled with the activity areas under Section 11.5; ha
$\Delta SOC_{\sigma,z,k,\tau}$	Soil carbon stock immediately before conversion minus the stock at the end of the transition; tC/ha. Positive values represent losses and negative values represent gains
$\omega_{\sigma,z,k,\tau,t}$	Fraction of the cohort's soil-carbon change allocated to the calculation interval; dimensionless
$E_{\sigma,z,t}^{SOC,min}$	Mineral-soil CO ₂ emissions during the interval from the cohorts quantified under this subsection, with negative values representing removals; tCO ₂ e.

For a linear transition, the fraction allocated to each calculation interval shall be calculated as follows:

$$\omega_{\sigma,z,k,\tau,t} = \frac{\Delta t_{\sigma,z,k,\tau,t}^{overlap}}{T_{\sigma,z,k,\tau}} \quad \text{Equation 24}$$

Where:

$\Delta t_{\sigma,z,k,\tau,t}^{overlap}$ Duration of the overlap between calculation interval (t) and the cohort's soil-carbon transition, beginning at conversion; years. Zero where there is no overlap

$T_{\sigma,z,k,\tau}$ Duration of the complete soil-carbon transition; years, greater than zero

The linear allocation and its duration shall be justified for the soil, conversion, and management conditions assessed. A 20-year duration may be used where consistent with the applicable IPCC stock-change factors and their assumptions. Transition and overlap durations shall use the same time convention under Section 11.7. Allocation fractions shall be nonnegative and sum to one over the complete transition, including any portions outside the current monitoring period.

Conversion timing shall be supported by observations or a documented temporal allocation appropriate to the scenario. Where timing is uncertain, the allocation rule and its effect on emissions shall be addressed under Section 14. Earlier cohorts shall remain in the calculation while their transitions continue. Signed stock changes shall be retained, and no portion shall be counted more than once.

Equations 23 and 24 apply to mineral-soil carbon-stock changes where their assumptions are applicable. Organic-soil emissions and wetland processes not represented by those equations shall be quantified under Section 11.4.6. The mineral-soil transition duration shall not be applied as a default duration for organic-soil emissions.

11.4.4.3 Application in deforestation emission calculations

Biomass emission factors and soil emission totals shall enter their separate terms in Section 11.5. Both components shall include the applicable contributions from current and earlier deforestation cohorts. Annual rates shall be converted to interval quantities before aggregation and shall not be added directly to stock-based factors per hectare. Cohort areas, conversion timing, and carbon histories shall remain reconcilable across components without duplicate accounting.

11.4.5 Forest degradation

Emission factors for forest degradation are derived from the estimated differences in total biomass between fragmentation classes. These reflect the expected carbon stock loss due to transitions such as:

- ▲ Core → Patch (Primary degradation)
- ▲ Perforated → Patch (Secondary degradation)

For each carbon stratum and transition, biomass loss shall be calculated from comparable origin and destination stocks supported under Section 11.2.5. Class-average origin stocks shall be used only where they represent the carbon condition of the affected area, including its previous degradation history. Where previous losses have been quantified, the remaining-stock calculation below shall govern. Equations 25–27 apply to differences expressed as dry biomass, subject to their stated conversion conditions.

Table 5. Aboveground biomass per fragmentation class

Fragmentation class	Average aboveground dry biomass per class (t dry matter/ha)
Core	
Perforated	
Patch	

Where the same root-to-shoot ratio applies to the origin and destination classes, total dry biomass loss shall be calculated as follows:

$$DTB_i = DAB_i \times (1 + R) \quad \text{Equation 25}$$

Where the same carbon fraction applies to both classes and biomass components, total biomass loss shall be converted to carbon as follows:

$$DTCB_i = DTB_i \times CF \quad \text{Equation 26}$$

Convert to CO₂e using the molecular weight ratio:

$$EF_i = DTCB_i \times \frac{44}{12} \quad \text{Equation 27}$$

Where:

DTB_i	Total aboveground and belowground dry biomass loss for degradation type (i); t dry matter/ha
DAB_i	Aboveground dry biomass loss for degradation type (i), calculated as the stock of the origin class minus that of the destination class; t dry matter/ha
R	Root-to-shoot dry biomass ratio applicable to both classes; dimensionless
$DTCB_i$	Total biomass carbon loss for degradation type (i); tC/ha
CF	Applicable carbon fraction; tC/t dry matter. The default value of 0.47 may be used where justified under Section 11.4.2
EF_i	Emission factor for degradation type (i); tCO ₂ e/ha
44/12	Molecular weight ratio of CO ₂ to carbon
i	Degradation type: 1 = primary degradation (Core → Patch); 2 = secondary degradation (Perforated → Patch)

Where root-to-shoot ratios or carbon fractions differ between classes or biomass components, the project holder shall estimate aboveground and belowground carbon stocks separately for each class before calculating their difference. Carbon inputs shall not receive another carbon-fraction conversion. A root-to-shoot ratio may be applied directly to aboveground carbon inputs only where the same ratio applies to both classes and aboveground and belowground carbon fractions are equal. Inputs already expressed as total biomass carbon loss shall enter Equation 27 directly; factors already expressed in tCO₂e/ha shall not be converted again.

Where carbon histories differ within a stratum, losses shall be calculated separately for each accounting subcohort before aggregation. For a subcohort with previously quantified degradation, the additional biomass-carbon loss, emission factor, and remaining stock after an applicable degradation transition shall be:

$$L_{j,i,t}^C = \max(0, C_{j,t,start}^{rem} - C_{j,i,t}^{dest})$$

$$EF_{j,i,t} = \frac{44}{12} L_{j,i,t}^C$$

Equation 28

$$C_{j,i,t,end}^{rem} = C_{j,t,start}^{rem} - L_{j,i,t}^C$$

Here, (j) identifies an accounting subcohort with a common carbon history, and (i) identifies primary or secondary degradation. $C_{j,t,start}^{rem}$ is its remaining living-biomass carbon stock before the transition; $C_{j,i,t}^{dest}$ is the applicable validated destination stock; and $L_{j,i,t}^C$ is the

additional loss. These quantities are expressed in tC/ha, while $EF_{j,i,t}$ is expressed in tCO₂e/ha. The calculation shall be performed separately for each accounting scenario and geographic domain.

Reclassification to a fragmentation class with a higher mean biomass shall not, by itself, replenish the recorded carbon stock. Any supported stock recovery shall be documented and reconciled with the applicable carbon accounting before changing an emission factor. Subsequent deforestation shall use the remaining biomass stock of the affected subcohort.

A zero-degradation factor shall be supported by the applicable stock estimates and the validated transition-carbon relationship. Missing stock data or unresolved applicability shall not be converted to zero through Equation 28. Affected estimates shall remain non-estimable until resolved.

Table 6 summarizes the aboveground biomass losses for the fragmentation transitions defined in this section. Values shall be determined separately where carbon strata require different emission factors. Where Tables 5 and 6 report carbon inputs, their units shall be labeled in tC/ha and the carbon-fraction conversion shall be omitted.

Table 6. Difference in aboveground biomass by transition

Transition ID	Fragmentation classes transition	DAB_i (t dry matter/ha)
1	Core → patch	
2	Perforated → patch	

The emission factors for degradation types 1 and 2 shall provide the primary and secondary degradation emission factors, respectively, in Section 11.6 for the corresponding scenario, geographic domain, carbon stratum, and interval.

11.4.6 Forested wetlands, peatlands, and organic soils

For organic soils and wetland processes not represented by Section 11.4.4.2, the project holder shall apply the relevant procedures in the 2013 IPCC Wetlands Supplement: Chapter 2 for drained inland organic soils, Chapter 3 for rewetted organic soils, Chapter 4 for coastal wetlands, and Chapter 5 for inland wetland mineral soils, together with applicable provisions of the 2006 IPCC Guidelines and the 2019 Refinement. The Project Document shall identify the selected equations, parameters, applicability conditions, and supporting evidence.

Calculations shall distinguish the accounting scenario, geographic domain, soil and hydrological stratum, affected cohort, and calculation interval. The areas and periods subject to each relevant condition shall be identified, including drainage, inundation, rewetting, and

organic-soil fire. Stratification shall reflect the land use, climate, soil properties, vegetation, nutrient status, and hydrological characteristics required by the selected method.

Baseline hydrological changes shall be supported by evidence of the relevant agents, drivers, and land-use or management pathway. Projected deforestation or fragmentation transitions shall not, by themselves, establish the occurrence, extent, or timing of drainage or other hydrological changes. Baseline trajectories shall use comparable reference observations or a model supported by representative evidence. Selection rules, temporal allocation, and missing-data treatment shall be specified before the results being assessed become available and evaluated during validation. Observed project hydrology shall not automatically replace baseline conditions.

Where annual area-based emission factors are used, interval emissions shall equal the sum of affected area multiplied by the applicable emission factor and the duration of the corresponding condition within the interval. Changes in area, condition, or factor shall be represented through appropriate subdivisions or integration. Event-based emissions shall use the applicable event method and shall not be multiplied again by interval duration. Unit conversions shall be applied once, and CH₄ and N₂O emissions shall be converted to CO₂-equivalent using the global warming potentials applicable under the BioCarbon Standard.

Applicable IPCC default factors may be used where their conditions are met and their use is conservative for the comparison between scenarios, subject to Section 11.4.2. Representative published factors, direct measurements, or evaluated models may be used where appropriate. Lack of local measurements shall not automatically exclude an eligible area or justify a zero emission factor. The applicability and uncertainty of the selected inputs shall be documented.

Relevant CO₂, CH₄, and N₂O emissions shall be assessed in both scenarios, including emissions associated with drainage ditches, inundation, rewetting, organic-soil combustion, and exported dissolved organic carbon where applicable. Background emissions shall receive consistent treatment. Increases in project emissions, including methane emissions associated with wetter conditions, shall remain in the calculation. Any exclusion shall meet the conservativeness requirements of Section 7.

Continuing emissions from earlier affected cohorts shall remain in the calculation while the emitting conditions and relevant carbon substrate persist. Organic-soil emissions shall not cease automatically after 20 years. Cumulative soil-carbon losses shall be reconciled with supported carbon availability and previously quantified losses. Changes in hydrology, land use, or baseline assumptions shall preserve cohort continuity and shall not recreate the initial carbon stock.

The calculation files shall reconcile affected areas with the deforestation and degradation accounts and identify the destination of each emission component under Sections 11.5 and 11.6. The same effect shall not be counted both through a stock-change estimate and a flux estimate, or under both deforestation and degradation. Quantified benefits shall be attributable to the activities within the scope of this methodology.

11.5 GHG emissions from deforestation

Emissions shall be calculated separately for each scenario and geographic domain and expressed as totals for the calculation interval, in tCO₂e. Activity data and emission factors shall correspond to the same carbon stratum, forest condition, and interval. Where emission factors vary within a stratum or interval, the corresponding subdivisions shall be calculated separately and summed.

Deforestation emissions shall include the net biomass contributions of all relevant conversion cohorts, soil carbon emissions occurring during the interval, and emissions from other included pools and sources, without double counting:

$$E_{\sigma,z,DEF,t} = \sum_k \sum_{\tau} (D_{\sigma,z,k,\tau} EF_{\sigma,z,k,\tau,t}^{bio}) + E_{\sigma,z,t}^{SOC} + E_{\sigma,z,DEF,t}^{add} \quad \text{Equation 29}$$

Where:

σ	Accounting scenario: BL for baseline or PRJ for the project scenario
z	Geographic domain: P for the project area or LK for the leakage estimation domain
k	Carbon stratum identifying the applicable emission factors
τ	Deforestation cohort defined under Section 11.4.4.1. The summation includes current and earlier cohorts contributing emissions or uptake during interval (t).
t	Calculation interval with defined start and end dates
M	Monitoring period comprising the calculation intervals being reported
$E_{\sigma,z,DEF,t}$	Total deforestation emissions for the specified scenario, domain, and interval; tCO ₂ e
$D_{\sigma,z,k,t}$	Gross deforestation area in carbon stratum (k) during the interval; ha
$D_{\sigma,z,k,\tau}$	Gross deforestation area assigned to cohort τ within carbon stratum (k); ha.
$EF_{\sigma,z,k,t}^{bio}$	Net biomass emission factor for cohort τ during interval (t), determined under Section 11.4.4.1; tCO ₂ e/ha.
$E_{\sigma,z,t}^{SOC}$	Total soil CO ₂ emissions occurring during the calculation interval from all relevant deforestation cohorts, comprising the mineral-soil contribution quantified under Section 11.4.4.2 and additional soil CO ₂ emissions quantified under Section 11.4.6. The two contributions shall not overlap; tCO ₂ e

$E_{\sigma,z,DEF,t}^{add}$ Emissions from other pools and GHG sources included under Section 7 and not already represented in the biomass or soil CO₂ terms, including CH₄ and N₂O emissions associated with deforestation cohorts under Section 11.4.6, converted to CO₂-equivalent; tCO₂e

Cohort areas assigned to each conversion interval shall sum to the corresponding gross deforestation area for that interval. Each area shall be counted once as deforestation and retained in subsequent calculations while its cohort contributes emissions or uptake. Cohort subdivisions shall conserve the original area and carbon history.

Biomass factors shall represent interval quantities per hectare, including the applicable temporal allocation under Section 11.4.4.1; they shall not be multiplied again by interval duration. Soil emissions shall include relevant earlier cohorts. An annual soil emission rate shall not be added directly to a biomass factor per hectare. Emission totals calculated under Section 11.4.6 shall enter the corresponding term once, without further multiplication by area or duration. Included pools and sources shall receive consistent treatment across scenarios, and exclusions shall satisfy Section 7.

11.5.1 Baseline scenario

Baseline deforestation in the project area shall be obtained from Section 11.1.1.1.2 and aggregated across baseline-risk strata within each carbon stratum:

$$D_{BL,P,k,t} = \sum_h D_{BL,P,h,k,t} \quad \text{Equation 30}$$

Baseline emissions in a leakage estimation domain shall use the corresponding counterfactual activity data under Section 12. Reference-region observations support baseline estimation; emissions occurring in the reference region shall not be added to project emission reductions.

11.5.2 Project scenario

For ex post quantification, project-area deforestation shall be the observed gross loss determined under Section 11.3.1 and assigned to the applicable carbon strata. The sum of those areas shall equal the observed interval total:

$$\sum_k D_{PRJ,P,k,t} = D_{PRJ,P,t} \quad \text{Equation 31}$$

Project-scenario emissions in leakage estimation domains shall be determined under Section 12. Ex ante projections shall remain separately identified and shall not replace the observations required for ex post quantification.

11.6 Emissions from forest degradation

Forest degradation emissions shall include biomass losses associated with the primary and secondary degradation transitions and emissions from other included pools and sources. Soil-carbon losses and associated GHG emissions under Section 11.4.6 shall enter the additional-emissions term where they are not already represented in the biomass emission factors. These emissions may occur without a fragmentation-class transition. Calculations shall distinguish baseline and project scenarios in the project area and each applicable leakage estimation domain:

$$E_{\sigma,z,DEG,t} = \sum_k (A_{\sigma,z,k,t}^{prim} EF_{\sigma,z,k,t}^{prim} + A_{\sigma,z,k,t}^{sec} EF_{\sigma,z,k,t}^{sec}) + E_{\sigma,z,DEG,t}^{add} \quad \text{Equation 32}$$

Where:

$E_{\sigma,z,DEG,t}$	Total forest degradation emissions for the specified scenario, domain, and interval; tCO ₂ e
$A_{\sigma,z,k,t}^{prim}$	Area undergoing primary degradation, core to patch, during the interval in carbon stratum (k); ha
$A_{\sigma,z,k,t}^{sec}$	Area undergoing secondary degradation, perforated to patch, during the interval in carbon stratum (k); ha
$EF_{\sigma,z,k,t}^{prim}, EF_{\sigma,z,k,t}^{sec}$	Applicable emission factors for primary and secondary degradation, determined under Section 11.4.5; tCO ₂ e/ha
$E_{\sigma,z,DEG,t}^{add}$	Emissions from included pools, emission sources, and carbon-stock losses not already represented in the degradation emission factors, including soil CO ₂ and associated CH ₄ and N ₂ O emissions under Section 11.4.6 and applicable leakage effects under Section 12; tCO ₂ e

For ex post project-area estimates, degradation areas shall be obtained from the observed interval transitions under Sections 11.2.4 and 11.2.5. Project-area baseline transition areas shall be calculated under Section 11.2.6. Areas shall be assigned to the applicable carbon strata and matched with their carbon histories under Section 11.4.5. Where histories or emission factors differ within a stratum, the corresponding area-factor products shall be calculated separately and summed. Any aggregated emission factor shall be weighted by the areas undergoing the corresponding transition during that interval. Where the transition area is zero, its emission

term shall be zero, and an aggregated factor need not be calculated. Leakage estimates shall follow Section 12.

Where annual PFD or SFD estimates are used, they shall be converted once to interval areas using the duration represented by those estimates. Areas already expressed as interval totals shall be used directly. Emission factors shall reflect the relevant forest conditions, and degradation losses shall be reconciled with subsequent deforestation to prevent counting the same carbon loss twice.

Soil and hydrological emission histories shall be reconciled with any subsequent deforestation of the same area. Changes in accounting classification shall preserve previously quantified losses and continuing emissions without omission or duplication.

11.7 GHG emissions reduction in the project scenario

Calculation intervals shall be contiguous, non-overlapping, and together cover the monitoring period. Reported monitoring-period start and end dates shall be inclusive. For calculation, the period shall begin on the reported start date and end immediately before the day following the reported end date. Where conversion between annual values and interval totals is required, elapsed time shall be calculated within each calendar year using the included days divided by 365 or 366, as applicable.

Annual values shall represent the intervals to which they are applied. Where rates vary between intervals, the corresponding interval totals shall be calculated separately and summed. Quantities already expressed as interval totals shall not be multiplied by elapsed time again.

11.7.1 Emissions reduction from avoided deforestation

Emission reductions from avoided deforestation shall equal the difference between baseline and project emissions in the project area over the monitoring period, less the applicable leakage deduction:

$$ER_{DEF,M} = \sum_{t \in M} (E_{BL,P,DEF,t} - E_{PRJ,P,DEF,t}) - L_{DEF,M} \quad \text{Equation 33}$$

Where:

$ER_{DEF,M}$ Emission reductions from avoided deforestation during monitoring period (M), after leakage and before subsequent program adjustments; tCO₂e

$L_{DEF,M}$ Leakage deduction assigned to deforestation for the monitoring period under Sections 11.7.3 and 12; tCO₂e

11.7.2 Emission reduction from avoided forest degradation

Emission reductions from avoided forest degradation shall equal the difference between baseline and project emissions in the project area over the monitoring period, less the applicable leakage deduction:

$$ER_{DEG,M} = \sum_{t \in M} (E_{BL,P,DEG,t} - E_{PRJ,P,DEG,t}) - L_{DEG,M} \quad \text{Equation 34}$$

Where:

$ER_{DEG,M}$ Emission reductions from avoided forest degradation during monitoring period (M), after leakage and before subsequent program adjustments; tCO₂e

$L_{DEG,M}$ Leakage deduction assigned to forest degradation for the monitoring period under Sections 11.7.3 and 12; tCO₂e

11.7.3 Leakage deductions and accounting consistency

Leakage deductions shall represent emissions attributable to project implementation under Section 12. Each estimation component shall have a defined method, geographic domain, and monitoring period established before its results are evaluated. Components shall be reconciled to avoid overlap in the emission effects being deducted.

Use of an incremental method shall be supported by evidence linking the affected activities and geographic domain to project implementation and by a comparable counterfactual. Baseline and project estimates shall cover the same period, carbon pools, emission sources, and units. A positive difference alone shall not establish attribution.

For each component using the incremental method, the emission difference and leakage deduction shall be calculated as follows:

$$\Delta L_{a,m,M} = \sum_{t \in M} (E_{PRJ,LK,a,m,t} - E_{BL,LK,a,m,t}) \quad \text{Equation 35}$$

$$L_{a,m,M} = \max(0, \Delta L_{a,m,M}) \quad \text{Equation 36}$$

$$L_{a,M} = \sum_m L_{a,m,M} \quad \text{Equation 37}$$

Where:

a	Activity to which the leakage deduction is assigned: DEF for deforestation or DEG for forest degradation
m	Leakage estimation component with a defined method and geographic scope
$E_{\sigma,LK,a,m,t}$	Interval emissions corresponding to component (m), calculated for the specified scenario using Sections 11.5–11.6 and the applicable procedure under Section 12; tCO ₂ e
$\Delta L_{a,m,M}$	Signed emission difference for the component over the monitoring period; tCO ₂ e
$L_{a,m,M}$	Leakage deduction for the component over the monitoring period; tCO ₂ e
$L_{a,M}$	Sum of the applicable component deductions assigned to activity (a); tCO ₂ e

The zero lower bound shall be applied after aggregating the intervals and strata within each defined component for the monitoring period. Negative differences shall remain visible as diagnostic results. They shall not offset deductions for other components or increase emission reductions unless expressly authorized by the BioCarbon Standard.

Where a direct deduction or conservative adjustment is permitted under Section 12, it shall replace the incremental calculation for the same effect, scope, and period. The resulting component deduction shall enter the sum above once. Reconciliation across leakage mechanisms and between deforestation and degradation shall follow Section 12.9.

11.8 Total Emission Reductions

Total emission reductions for the monitoring period shall equal the sum of the deforestation and forest degradation results after leakage deductions:

$$ER_{total,M} = ER_{DEF,M} + ER_{DEG,M} \quad \text{Equation 38}$$

Where:

$ER_{total,M}$	Total emission reductions during the monitoring period (tCO ₂ e)
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$ER_{DEF,M}$	Emission reductions from avoided deforestation (tCO ₂ e), as defined in Section 11.7.1
$ER_{DEG,M}$	Emission reductions from avoided forest degradation (tCO ₂ e), as defined in Section 11.7.2

The total and its components shall be expressed in tCO₂e for the monitoring period. Negative activity-level results shall be retained when calculating the total.

This result precedes the applicable uncertainty adjustments, reserve contributions, and other requirements governing issuance under the BioCarbon Standard. Leakage already included under Section 11.7 shall not be deducted again.

12 Leakage management

The project holder shall apply the BioCarbon Leakage Management Tool, subject to the applicable version and transition provisions. This section establishes the complementary REDD+ procedures for delineating leakage estimation domains and calculating deductions.

12.1 Definition and scope

Leakage comprises increases in emissions outside the project boundary attributable to project implementation. The mechanisms described below do not limit the sources to be assessed under the Tool.

12.2 Types of leakage

Activity-shifting leakage arises when affected agents relocate deforestation, degradation, or associated production. Market leakage arises when changes in the supply of forest, agricultural, or livestock products induce production changes elsewhere. Indirect infrastructure leakage arises when project-induced roads, access changes, or development incentives increase emissions outside the project boundary.

Leakage assessment shall also consider project-induced hydrological changes outside the project boundary, including effects transmitted through connected drainage networks, surface water, or groundwater. Where attributable increases in emissions occur, the affected domain and sources shall be assessed under this section, including effects on non-forest land where relevant. These effects shall be reconciled with other leakage components and with off-site emissions already included under Section 11.4.6.

12.3 Ex ante leakage risk assessment

The assessment shall characterize affected activities and agents, their mobility, displaced production, likely receiving areas or markets, legal and tenure conditions, and planned

mitigation. Its findings shall determine the estimation domains and applicable procedures under Section 12.5.

12.4 Leakage monitoring area

The activity-shifting leakage area shall be delineated under Section 8.3 using evidence of agents' mobility and access to receiving areas. Its boundaries and supporting evidence shall be included in the Project Document. Market and infrastructure domains shall follow Sections 12.5.2 and 12.5.3 and may extend beyond that area, including across national boundaries where supported by the identified pathways.

12.5 Quantification and deduction of leakage

Where quantification is required under the Tool, baseline deforestation and degradation for spatial estimates of activity-shifting and infrastructure leakage shall follow Sections 11.1.1.1 through 11.1.1.2 and 11.2.6, replacing the project area with the affected external domain. Reference observations shall be unaffected by the project or its leakage and comparable in pre-exposure forest conditions, forest-change patterns, accessibility, drivers, and tenure. Applicability and data controls shall follow Sections 11.1.1 and 8.2.

Both scenarios shall use the same initial forest cohort and carbon conditions, established before first exposure to the project-induced effect. Previously deforested areas shall not re-enter that cohort through subsequent forest gains. Counterfactual balances shall be carried forward separately from observed conditions. Project-scenario activity data shall represent observed changes in the same domain and intervals. Both scenarios shall be converted to emissions under Sections 11.5 and 11.6, including applicable soil-emission cohorts. Attribution shall address other causes of observed change; a positive emission difference alone shall not establish leakage.

For material leakage sources not represented by forest carbon-stock changes, scenario activity totals shall be combined with source-specific emission factors using applicable BioCarbon methodologies or IPCC inventory methods. Factors, units, temporal coverage, and conversions to tCO₂e shall be documented. Resulting interval emissions shall enter the appropriate additional emissions term under Section 11.5 or 11.6.

12.5.1 Conservative adjustments and use of default or proxy values

The applicable treatment shall follow Sections 10.2 and 11.1–11.3 of the Leakage Management Tool. Any default, proxy, or adjustment shall identify its applicability, calculation base, and evidence of conservativeness. This methodology establishes no universal leakage deduction percentage. A flat deduction shall not replace the full quantification required for Level 4.

12.5.2 Market leakage

For each affected product and calculation interval, the project holder shall calculate the change in supply as baseline supply minus project supply, in consistent physical units. Baseline supply shall follow the adopted activity data and supported product yields; agricultural and livestock output shall account for the establishment dates and productive lives of relevant conversion cohorts.

Using the estimated supply changes, outside production shall be estimated for both scenarios using documented supply-chain evidence with a supported counterfactual or an empirical market model evaluated for the affected market. The calculation shall distinguish products or substitutes, destination locations, and production systems; use consistent assumptions for factors unrelated to the project; and reconcile production, consumption, trade, inventories, substitution, and response timing. The selected model, parameters, and applicability shall be documented and validated before use. Observed production or price changes alone shall not establish attribution.

Scenario production shall be converted into forest conversion, harvesting, degradation, and other applicable emission-producing activities using documented destination yields, land origins, production systems, and carbon stocks. Production on existing land shall be distinguished from additional conversion. Previously established productive capacity shall be carried forward; recurring output shall not be counted as new forest conversion in each interval.

Associated emissions shall follow Sections 11.4–11.6, including continuing soil emissions from earlier conversion cohorts. Biomass losses from harvesting not represented by fragmentation-transition terms shall be quantified from documented harvest activity and associated carbon-stock losses and included in the additional emissions term under Section 11.6. Scenario emission differences shall enter Section 11.7.3. Where an estimate cannot be supported, Section 12.5.1 shall apply.

12.5.3 Indirect infrastructure leakage

The calculation shall identify the project-induced infrastructure, access, or development change, its timing, and the external forest exposed to the resulting pressure. Attribution shall be supported by intervention records and evidence of the causal pathway. The domain shall reflect actual access and displacement pathways. Infrastructure and development expected without the project shall remain in the counterfactual. Scenario activity data and emissions shall follow Section 12.5; where the counterfactual cannot be supported, Section 12.5.1 shall apply.

12.6 Leakage minimization measures

The project holder shall implement measures addressing the identified displacement mechanisms and describe their expected effects in the Project Document. Claimed reductions in leakage shall be supported by evidence of effectiveness and reflected in the applicable calculation assumptions.

12.7 Exclusions and justified exceptions

Materiality shall follow Section 9.5 of the Leakage Management Tool, using baseline emissions minus project emissions for the same monitoring period before leakage deductions. Sources shall be assessed individually and collectively without artificial subdivision. A percentage comparison shall not justify exclusion where this base is zero or negative. Protection, access restrictions, mitigation measures, or absence of detected local forest loss shall not automatically establish immateriality.

12.8 Monitoring and verification of leakage

Monitoring and reassessment shall follow Sections 10.2, 11.4, and 13 of the Leakage Management Tool. The Monitoring Report shall retain the interval activity data, estimation assumptions, and emissions supporting the deduction for the monitoring period, including changes affecting the applicability of the selected procedure. Uncertainty shall be addressed under Section 14.

12.9 Treatment of leakage in net emission reductions

Leakage deductions shall enter Section 11.7.3 once, before uncertainty and non-permanence adjustments. Overlapping mechanisms, domains, products, processing stages, and deforestation or degradation components shall be reconciled by emission effect and period. Each effect shall be assigned once to the deforestation or degradation deduction associated with the project activity causing it; any allocation between those activities shall preserve the total deduction and be documented. Quantified emissions and conservative adjustments shall not both deduct the same effect. Signed interval results and monitoring-period aggregation shall follow Section 11.7.3.

13 Permanence and reversal risk management

Ensuring the long-term permanence of GHG emission reductions is critical in REDD+ projects, where forest carbon stocks remain vulnerable to reversal due to human and natural risks. Project holders shall identify and assess all potential reversal risks, including deforestation, degradation, land-use change, fire, pests, land tenure insecurity, and institutional instability, throughout the quantification period and beyond.

13.1 Definition and scope of reversal

A reversal is a loss of previously credited mitigation outcomes arising from a reduction in forest carbon stocks, as determined under the BioCarbon Standard and Permanence and Risk Management Tool. Natural or anthropogenic disturbances may cause reversals. Changes in policy, governance, or other risk factors shall not, by themselves, establish that a quantified reversal has occurred.

Monitoring shall distinguish alerts, confirmed disturbances, and reversals affecting previously credited outcomes. Supporting records shall identify the location, timing, sources, confirmation evidence, and basis for quantification. An alert alone shall not establish a reversal quantity or authorize a compensatory reserve cancellation.

13.2 Measures to enhance permanence

Project design and implementation shall include measures to strengthen permanence, such as legal land protection through conservation easements, customary tenure recognition, or community agreements; integration into jurisdictional or long-term forest governance frameworks; participatory forest monitoring and adaptive management; transparent benefit-sharing and full engagement of local and Indigenous communities; and fire prevention and landscape-level risk mitigation. These measures shall be documented in the Project Document and assessed during validation and verification.

13.3 Permanence and risk management tool

The project holder shall apply the BioCarbon Permanence and Risk Management Tool to determine the risk-based Project Reserve contribution. The separate General Reserve contribution and the allocation of both components shall follow Section 14.1.1 of the BioCarbon Standard.

Both contributions shall be deducted from the quantity eligible for issuance and reported separately, identifying the applicable calculation base, percentage, and amount for each reserve. Uncertainty adjustments under Section 14 and reserve contributions shall remain separately identifiable; reserve contributions shall not substitute for uncertainty adjustments.

13.4 Risk assessment and monitoring requirements

The project holder shall complete and justify the risk assessment under Annex 1 of the BioCarbon Permanence and Risk Management Tool, updating it at each verification and whenever events or changes materially affect the risk profile. For projects applying this methodology, reversal monitoring, reporting, verification, and compensation obligations shall continue until the later of forty (40) years after the start of the first quantification period and

the end of the final quantification period, including renewals. Any longer applicable obligation shall also be met.

The project holder shall classify reversals as avoidable or unavoidable, subject to CAB assessment, in accordance with Section 4.1 of the Tool. Notification shall comply with Section 14.1.2 of the BioCarbon Standard. The Loss Event Report, compensation, corrective actions, reserve use, and additional obligations shall follow the applicable program procedures and Sections 4.3–4.6 of the Tool. Routine monitoring and verification schedules shall not delay required notification or response.

For compensation purposes, cessation of required monitoring and verification shall be treated as an avoidable reversal. No further VCCs shall be issued for the project until all avoidable reversals have been fully compensated under the applicable program procedures.

For forested wetlands, peatlands, and forests on organic soils, the risk assessment shall address drainage, drought, organic-soil fire, changes in external water management, and failure of hydrological management measures, where relevant. Monitoring shall identify resulting carbon losses and distinguish their effects on current-period emissions from reversals of previously credited outcomes.

14 Uncertainty assessment and conservative adjustment

The project holder shall apply the BioCarbon Tool: Conservative Approach and Uncertainty Management, subject to the applicable version and transition provisions. The following requirements specify its application to REDD+ calculations.

14.1 Required confidence level and adjustment rule

Combined uncertainty shall be assessed for $ER_{total,M}$ under Section 11.8, after leakage deductions and before uncertainty adjustments and reserve contributions. Confidence intervals, statistical adjustments, exemptions, and rounding shall follow Section 11 of the Tool.

The assessment shall propagate uncertainty through the calculations in Sections 11.1–11.8, covering reference-region forest exposure and observed loss, transfer of reference observations to the project baseline, mapped areas and class transitions, carbon stocks and emission factors, degradation histories, biomass and soil cohorts, post-conversion vegetation trajectories, temporal allocation, and leakage estimates. The propagation approach shall follow Sections 9, 10, and 12 of the Tool and preserve relevant dependencies between numerators and denominators, shared inputs across scenarios, and spatial and temporal correlations. Derived proportions and subsequent forest-area and carbon-stock balances shall

be calculated consistently from the underlying uncertain inputs. Treating an input as fixed shall be justified.

For soil carbon and associated wetland emissions, uncertainty assessment shall cover the applicable pre-conversion and post-transition stocks, emission factors, affected areas, hydrological conditions, baseline trajectories, conversion and event timing, transition durations, and temporal allocation under Sections 11.4.4.2 and 11.4.6. Shared inputs and relevant dependencies shall remain linked across scenarios, cohorts, gases, and intervals. Uncertainty in the transfer of reference evidence to baseline hydrological conditions shall be included. Annex C of the Tool shall be used only within its stated scope and shall not substitute for the uncertainty assessment required for these components.

Where the net result is zero or negative, absolute uncertainty shall be reported. Relative uncertainty shall not be calculated with a zero denominator, and the uncertainty treatment shall not generate a positive quantity for issuance from a non-positive net result.

14.2 Data quality and discount factors

Data-quality discounts shall follow Annex D.1–D.2 of the Tool. The applicable category, calculation base, and evidence supporting any waiver shall be identified. A zero data-quality discount shall not imply zero statistical uncertainty. Project-specific or national data shall not create exemptions beyond the Tool's conditions.

The highest-discount rule in Annex D.2 shall not be interpreted as an automatic choice between a statistical adjustment and a data-quality discount. A waiver under Annex D.2 shall identify the uncertainty already quantified and adjusted and provide the required justification. No soil-carbon discount rate shall be inferred from a biomass category.

14.3 Documentation and transparency requirements

Documentation and any expert judgment shall follow Section 14 and Annex G of the Tool. The existing uncertainty table and calculation files shall link source data, uncertainty estimates, shared inputs, assumptions, and propagation procedures to $ER_{total,M}$.

The calculation files shall identify the respective bases and amounts of statistical adjustments, data-quality discounts, and any waivers. They shall show the reconciliation between the net emission reductions, these adjustments, the separate reserve contributions, and the quantity proposed for issuance. These records shall permit independent replication without applying leakage deductions again.

15 Monitoring requirements

The purpose of the monitoring plan is to define the procedures, data sources, responsibilities, and quality assurance measures required to track the implementation of REDD+ activities, verify GHG emission reductions, and ensure compliance with safeguards and permanence requirements throughout the quantification period and, for permanence obligations, throughout the period specified in Section 13.4.

15.1 Parameters to be monitored

The project holder shall monitor the following elements, as applicable:

Changes in forest cover (deforestation and degradation) in the project area;

- (a) Forest cover changes in the leakage area;
- (b) Contemporaneous forest-cover and deforestation observations from the reference region, including the initial forest areas, observed losses, observation gaps, and data versions supporting the assigned baseline activity data for each calculation interval;
- (c) GHG emissions from deforestation and degradation;
- (d) Implementation progress of REDD+ activities;
- (e) Compliance with environmental and social safeguards;
- (f) Risks to permanence and effectiveness of mitigation results.

For reference-region observations provided through the assigned activity data, the project holder shall retain and report the corresponding data products and supporting records, including their geographic scope, calculation intervals, versions, and application in the project calculations.

For baseline degradation, the supporting records shall also identify the initial and updated forest areas by class, reference transition proportions, assigned baseline transition areas, and the carbon-history subdivisions required under Sections 11.2.6 and 11.4.5. These records shall reconcile with the activity data and emission factors used in the reported calculations.

The parameters to be monitored and reported shall be consistent with the requirements of the BioCarbon MRV Tool and other applicable normative instruments.

Documentation of material inputs shall distinguish fixed, measured, and modeled values and identify their units, source and version, geographic domain, temporal basis, quality checks, missing-data treatment, and conditions requiring an update. This shall cover activity data, carbon-stock and emission factors, model inputs, uncertainty parameters, and defaults or substitutions used in baseline, project, and leakage calculations, within the existing Project Document, Monitoring Report, and calculation files.

For areas subject to Section 11.4.6, monitoring shall cover the extent and condition of wetland and organic soils, relevant hydrological changes, and the parameters required by the selected quantification methods. Supporting observations shall distinguish project conditions from the reference evidence used to estimate baseline conditions. Measurement frequency shall capture material seasonal variation and relevant disturbance events. Results shall be retained within the existing monitoring and calculation records.

15.2 Data sources and monitoring methods

The project holder shall identify the data sources and methods for each parameter. Cartographic suitability shall address the forest definition, geographic domain, observation dates, native and processing resolutions, positional and thematic accuracy, minimum mapping unit, and ability to detect the changes assessed. Resampling alone shall not be presented as an increase in native resolution.

Observations shall use comparable definitions, classifications, processing methods, spatial alignment, and coverage within each accounting domain. Each product shall retain its source legend and version and its correspondence to methodological classes. Changes in data or methods shall require demonstrated comparability and, where necessary, consistent reprocessing.

Classification and change accuracy shall be assessed using reference evidence independent of map production, covering the classes and transitions used in accounting. Existing assessments may be used where demonstrably representative of the relevant domains, dates, classes, and changes. The sampling design, reference data, error matrix, area estimator, and confidence intervals shall be documented. The estimator shall be consistent with the sampling design. Error matrices shall be distinguished from fragmentation-transition matrices.

Mapped areas shall be reported separately from activity-area estimates, which shall account for classification error. Forest and transition areas shall be estimated consistently to reconcile totals, subset relationships, and cohort balances. Related numerator and denominator estimates shall use consistent underlying evidence. Uncertainty shall follow Section 14.

Observation gaps and the temporal assignment of detected changes shall follow Section 11.1.1.1. Missing observations shall not be treated as zero loss or addressed by restricting denominators to observable areas.

15.3 Monitoring frequency and reporting

The project holder shall define the frequency at which each parameter will be monitored and reported, in accordance with the requirements of this Methodology and the applicable BioCarbon tools. The monitoring frequency shall be appropriate to the nature of the parameter and the level of risk or variability associated with it. At a minimum, the following requirements shall be met:

- (a) Forest-cover change and the observations supporting baseline and project activity data shall be monitored for each calculation interval defined in the validated procedure. Corresponding reference-region and project calculations shall use the same interval boundaries. A monitoring period may include several calculation intervals; the Monitoring Report shall retain their separate activity data and emission results. The interval length and treatment of partial intervals shall be specified before the observations used to assess project performance become available;
- (b) REDD+ activities and safeguards indicators shall be monitored annually or biennially, based on their nature and implementation timeline;
- (c) Risk and permanence indicators shall be reviewed at least once per monitoring period and immediately following reversals, disturbances, or other changes that may materially affect the risk profile, in accordance with Sections 13.4 and 15.7.

All monitoring results shall be documented and made available for verification in accordance with the BioCarbon Validation and Verification Manual.

15.4 Monitoring of REDD+ activities and safeguards

The project holder shall establish and implement a monitoring plan to assess the execution and effectiveness of REDD+ activities and ensure continuous compliance with environmental and social safeguards. Safeguard monitoring shall reflect the participatory processes established in project design and follow the applicable version of the BioCarbon Sustainable Development Safeguards Tool (SDS Tool), including its mandatory indicators, monitoring methods, documentation, stakeholder engagement processes, reporting structure, and verification requirements. Safeguard monitoring results shall be included in each Monitoring Report and independently verified. Monitoring results shall also be included in the Verification Report and made available to affected stakeholders upon request.

For each REDD+ activity, the monitoring plan shall specify the activity's identifier and description, one or more identified indicators to track implementation and outcomes, target values, measurement units, expected results, monitoring methods and tools, data collection frequency, the responsible entity, and documentation supporting the reported results.

This information shall be presented using a standardized format, as illustrated in the following table:

Table 7. Monitoring of the REDD+ activities implementation

Activity ID	
Indicator ID	
Indicator name	

Type ⁷	
Goal ⁸	
Measurement unit	
Monitoring methodology	
Monitoring frequency	
Responsible for measurement	
Result indicator in the reporting period	
Documents to support the information	
Observations	

15.5 Monitoring of REDD+ Safeguards

The project holder shall monitor the implementation and compliance of REDD+ safeguards throughout the duration of the project. These safeguards include, at a minimum, the elements established in relevant UNFCCC decisions, such as:

- (a) Full and effective participation of stakeholders, including Indigenous Peoples and local communities;
- (b) Respect for land tenure and customary rights;
- (c) Conservation of natural forests and biodiversity;
- (d) Enhancement of social and environmental benefits;
- (e) Transparent governance and grievance mechanisms.

⁷ Result, product or impact.

⁸ Expected value and time for compliance.

For each safeguard, the project holder shall define specific indicators, monitoring methods, and documentation procedures. The monitoring plan shall be developed using the standardized structure shown in the following table:

Table 8. Monitoring of the REDD+ Safeguards

Safeguard ID	
Indicator ID	
Indicator name	
Type	
Measurement unit	
Monitoring methodology	
Monitoring frequency	
Responsible for measurement	
Result indicator in the reporting period	
Documents to support the information	
Observations	

15.6 Data quality and management

All monitored data shall be:

- (a) Complete and representative of the project area;
- (b) Supported by documentation (e.g., photos, field forms, remote sensing outputs);
- (c) Validated through internal QA/QC procedures;
- (d) Retained in accordance with Section 15.9.1.

Where sampling is used, it shall be based on statistically robust approaches (e.g., stratified random sampling, IPCC-compliant biomass plots).

If digital monitoring technologies (e.g., drones, LiDAR, remote sensing platforms) are used, methods shall be validated and reproducible.

15.7 Monitoring of reversal risk and permanence conditions

Project holders shall monitor and report changes that may affect the permanence of credited outcomes, including signs of illegal activity, degradation, or encroachment; natural disturbances such as fires, storms, or pests; changes in legal status, governance, or stakeholder agreements; and the effectiveness of risk mitigation measures such as patrols, firebreaks, and community involvement.

Records concerning the same disturbance shall be linked in the existing monitoring documentation to prevent duplicate estimates of affected area or carbon loss. The project holder shall reconcile confirmed disturbances with the applicable activity data, emissions, and remaining carbon-stock histories under Section 11, separately identifying their effects on current-period results and any compensation for previously credited outcomes under Section 13.4. Each applicable obligation shall be addressed without duplicate accounting or omission.

Unresolved evidence shall remain identified and shall be addressed under the applicable program procedures. Where a disturbance invalidates baseline comparability or estimator applicability, the reassessment and non-estimability provisions of Sections 11.1.1.1.1 and 11.2.6 shall apply.

15.8 Monitoring frequency and data sources

Table 9 summarizes monitoring and calculation frequencies and supporting data sources. Frequencies required under Section 15.3 and the applicable BioCarbon tools shall apply. Other frequencies shown in the table are indicative and shall be justified in the monitoring plan according to the parameter, its variability, and the project conditions.

Table 9. Monitoring frequency and data sources for REDD+ projects

Parameter	Monitoring or calculation frequency	Data Sources / Methods
Forest cover and canopy integrity	Each calculation interval under Section 15.3	Satellite imagery (e.g., Landsat, Sentinel, Planet), aerial photos, GIS-based change detection

Parameter	Monitoring or calculation frequency	Data Sources / Methods
Forest degradation indicators	Each calculation interval under Section 15.3	Forest fragmentation analysis, spectral indices (e.g., NDVI, NBR), biomass loss models
Reference-region forest exposure, deforestation, and degradation transitions	Each calculation interval under Section 15.3	Assigned activity-data products and supporting observations under Sections 8.2 and 11.1.1, and 11.2.6, including observation gaps and data versions
Project baseline forest balances and carbon histories	Updated for each calculation interval	Forest-area balances by baseline-risk stratum, carbon stratum, and fragmentation class, with carbon-history subdivisions under Sections 11.1.1.1.2, 11.2.6, and 11.4.5
Biomass emissions and uptake following deforestation	Calculated for each interval, including contributions from earlier cohorts; supporting observations updated at frequencies appropriate to the selected method and material changes	Cohort areas and conversion timing; pre-conversion and retained biomass; observed or supported counterfactual post-conversion land use and management; representative stock trajectories and release profiles under Section 11.4.4.1
Soil-carbon changes following deforestation, where included	Calculated for each interval, including continuing emissions from earlier cohorts	Cohort areas, conversion timing, soil and hydrological conditions, stock changes, applicable emission factors, and temporal allocation under Sections 11.4.4.2 and 11.4.6
Wetland and organic-soil conditions and associated GHG emissions	Emissions calculated for each interval; supporting observations at frequencies appropriate to seasonal variability, disturbances, and the selected method	Soil and hydrological mapping; field observations; water-table or inundation data; drainage and rewetting records; salinity where relevant; fire observations; representative emission factors or models; and baseline reference evidence under Section 11.4.6
Aboveground biomass	Every 5 years or per verification period	Field plots, national forest inventory data, LiDAR, allometric equations
Belowground biomass	Every 5 years or when aboveground is updated	Root-to-shoot ratio models, IPCC defaults, literature-based coefficients
Leakage activity data and emissions	Calculated for each interval and reported for each monitoring period; supporting observations	Spatial observations, production and market data, infrastructure and access

Parameter	Monitoring or calculation frequency	Data Sources / Methods
	as required under Section 12	records, and counterfactual estimates applicable to the identified mechanisms
Forest disturbances and potential reversals	Ongoing detection and event-based assessment under Sections 13.4 and 15.7	Satellite alerts and imagery, field or community observations, incident reports, and confirmation evidence
REDD+ activity implementation	Annually or according to implementation plan	Field observation, implementation reports, geo-tagged photos, community verification
Safeguard compliance	Annually or per verification period	FPIC records, safeguard checklist, participatory reports, grievance redress logs
Permanence risk indicators	Every verification period or when triggered	BioCarbon Permanence Tool, stakeholder consultations, land-use change records
Community/stakeholder engagement	Every verification period or more frequently	Meeting minutes, surveys, consultation forms, benefit-sharing reports

Wherever possible, project holders are encouraged to use open-access and traceable data sources (such as publicly available satellite imagery and IPCC-compatible methodologies) to ensure consistency, transparency, and replicability. Participatory monitoring approaches are strongly encouraged, particularly for safeguard compliance and permanence risk assessment, as they strengthen both the technical robustness and social legitimacy of the monitoring system.

15.9 Data and record keeping

Project holders shall establish and maintain a data and record-keeping system that ensures the transparency, traceability, and accessibility of all information used in the design, implementation, monitoring, and verification of REDD+ activities.

This system shall support the independent verification of GHG emission reductions, the assessment and management of permanence risk, the monitoring of safeguards, and full compliance with all applicable requirements of the BioCarbon Standard. It shall be designed to enable efficient review by third parties, facilitate version control of key documents, and ensure the secure storage of spatial, quantitative, and qualitative project data throughout the crediting period.

15.9.1 Minimum requirements

The project holder shall retain all relevant records and supporting documentation in accordance with Sections 17 and 22 of the BioCarbon MRV Tool and any longer applicable legal or program requirement. Records needed to meet outstanding monitoring, permanence, or compensation obligations shall remain available for as long as those obligations continue.

Records shall be accurate, complete, consistent with the Project Document and monitoring plan, securely archived in a retrievable format, and available to the CAB and BioCarbon or its designated representatives upon request. Changes in data service providers shall not interrupt custody or access.

15.9.2 Types of records to be maintained

Project holders shall retain, at a minimum, the following:

- (a) GIS files and maps delineating project boundaries, leakage belts, stratification, and monitoring plots;
- (b) Forest inventories, biomass measurements, soil sampling data, and any raw field data collected;
- (c) Satellite imagery, aerial photos, or drone outputs used for land cover assessment or monitoring;
- (d) Legal documentation: land titles, project authorization, community agreements;
- (e) Monitoring and verification reports, field inspection records, and data analysis files;
- (f) Evidence of stakeholder consultations, grievance redress logs, and benefit-sharing documentation;
- (g) Financial or operational records relevant to baseline and project scenario implementation;
- (h) Risk assessment scores and justifications from the Permanence and Risk Management Tool;
- (i) Documentation related to reversals, loss events, or leakage incidents, including mitigation actions and corrective measures.

Records for each assigned activity-data product shall identify its version, geographic scope, observation intervals, source data, processing methods, assumptions, uncertainty, quality-control results, technical review, and BioCarbon approval or release. The retained records shall link the product and its supporting spatial data to the activity data and calculations in

which it was used. Public replication information shall follow Sections 28.1 and 28.1.1 of the BioCarbon Standard.

15.9.3 Data integrity and version control

The project holder shall maintain version-controlled datasets and calculations, timestamped backups, and traceable links to source records. Corrections and updates shall identify the affected geographic areas and calculation intervals, the reason for the change, the applicable review and approval, and the effect on reported results. Superseded products and supporting calculations shall remain retrievable. Material changes to baseline assumptions, monitoring methods, or risk assessments shall be documented and justified. Corrections affecting previously reported results shall follow the applicable BioCarbon correction and reassessment procedures.

16 Quality Assurance and Quality Control (QA/QC)

Project holders shall implement QA/QC procedures for ex ante and ex post quantification and monitoring, ensuring the accuracy, consistency, transparency, and traceability of data and calculations. Procedures shall be documented in the Project Document and Monitoring Reports.

Quality assurance shall include, as applicable, independent review of stratification and sampling design, validation of field crew training and calibration of measurement instruments, cross-checks of input data, sources, and emission/removal factors, peer review of calculations before submission, and documentation of data sources, assumptions, and justifications.

Quality control shall include spot-checks or remeasurement of a subset of sample plots, verification of field forms, GPS coordinates, and data entries, and consistency checks across datasets and versions. Detected errors, inconsistencies, and deviations shall be corrected and documented. Calculation data shall remain traceable to original records, and changes to data or assumptions shall be justified and recorded through version control and audit trails. Results shall be reproducible by an independent third party using documented methods and tools.

QA/QC actions and monitored data shall be documented and archived digitally. Records shall include, at a minimum, raw monitoring data and processing scripts or spreadsheets, version-controlled calculations, field survey protocols and original field notes, external reports, assessments and reviews, and records of revisions to the methodology application. All information shall be retained in accordance with Section 15.9.1 and made available to BioCarbon or the CAB upon request.

Project holders are encouraged to periodically review and update the QA/QC system, considering lessons from monitoring and audits, technological advancements, feedback from

stakeholders, verifiers, and host country authorities, and updates to the BioCarbon Program, IPCC guidance, and international best practices.

17 Document status and publication format

17.1 Status

This document is a draft of Version 6.0 of this methodology prepared for public consultation. It has not been approved for use under the BioCarbon Standard and shall not be used as the applicable methodology for validation, verification, or credit issuance.

17.2 Effective date, transition period and applicable version

The effective date of Version 6.0 shall be specified in the approved final version. The ninety (90) calendar-day transition period shall begin on the official publication date of that version. Publication of this consultation draft shall not initiate the transition period or change the methodology version applicable to ongoing validation or verification processes or registered projects.

The applicable methodology version shall be determined in accordance with the BCR Standard and the applicable validation and verification procedures. Any specific requirements for existing projects to adopt Version 6.0 shall be established in the transition provisions accompanying the approved final version.

17.3 Publication Format

This consultation draft shall be published in digital format on the official BioCarbon website for review and comment. It shall be clearly identified as a draft and shall be distinguished from the methodology version currently in force. The approved final version, when published, shall identify its publication date, effective date, and applicable transition arrangements. Printed copies and other reproductions shall be checked against the corresponding official digital document.

18 References

BioCarbon Cert. (2025). Biocarbon Tool. Permanence and Risk Management. https://biocarbonstandard.com/wp-content/uploads/BCR_risk-and-permanence.pdf

Conservation International. (2013). Constructing theories of change models for Ecosystem-based Adaptation projects: a guidance document. Conservation International. https://www.conservation.org/docs/default-source/publication-pdfs/constructing-theories-of-change-for-ecosystem-based-adaptation.pdf?Status=Master&sfvrsn=1fd83348_3

European Commission. (2021). Directorate-General for Research and Innovation, Evaluating the impact of nature-based solutions – A handbook for practitioners. Publications Office of the European Union. <https://data.europa.eu/doi/10.2777/244577>

ICAO. (n.d.). Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). ICAO. <https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx>

IPCC. (2003). Intergovernmental Panel on Climate Change Good Practice Guidance for Land Use, Land-Use Change and Forestry IPCC National Greenhouse Gas Inventories Programme. Institute for Global Environmental Strategies. https://www.ipcc.ch/site/assets/uploads/2018/03/GPG_LULUCF_FULLEN.pdf

IPCC. (2014). 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. and Troxler, T.G. (eds). Published: IPCC, Switzerland. https://www.ipcc.ch/site/assets/uploads/2018/03/Wetlands_Supplement_Entire_Report.pdf

IPCC. (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 4: Agriculture, Forestry and Other Land Use. Institute for Global Environmental Strategies. <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>

IPCC. (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 4: Agriculture, Forestry and Other Land Use. IPCC. <https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol4.html>

Ramsar. (1987). Convention on Wetlands of International Importance especially as Waterfowl Habitat (p. 1). https://www.ramsar.org/sites/default/files/documents/library/current_convention_text_e.pdf

UNFCCC. (2015). The Paris Agreement. United Nations Climate Change; United Nations. <https://unfccc.int/process-and-meetings/the-paris-agreement>

United Nations. (2001). REPORT OF THE CONFERENCE OF THE PARTIES ON ITS SEVENTH SESSION, HELD AT MARRAKESH FROM 29 OCTOBER TO 10 NOVEMBER 2001. <https://unfccc.int/sites/default/files/resource/docs/cop7/13a01.pdf>

University of Connecticut, Center for Land Use Education and Research (UConn CLEAR). (n.d.). Landscape Fragmentation Tool v2.0: Method. <https://media.clear.uconn.edu/tools/lft/lft2/method.htm>

United Nations. (2011). Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010. In <https://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf>.

Vogt, P., Riitters, K. H., Estreguil, C., Kozak, J., Wade, T. G., & Wickham, J. D. (2007). Mapping spatial patterns with morphological image processing. *Landscape Ecology*, 22, 171–177. <https://doi.org/10.1007/s10980-006-9013-2>

Draft for public consultation

Annex A. Terms and definitions

The following terms are used throughout this Methodology. Unless otherwise specified, definitions are aligned with the BioCarbon Standard, the IPCC Guidelines for National Greenhouse Gas Inventories (2006, 2019), and ISO 14064-2 and 14064-3. In case of conflict, definitions provided in the BioCarbon Standard and its associated tools shall prevail.

Activity data

Data representing the extent of human activities that cause GHG emissions or removals. In REDD+ projects, this refers to spatial changes in forest cover or forest condition, derived from satellite imagery, field plots, or other verifiable sources.

Source: IPCC, BioCarbon MRV Tool.

Additionality

The characteristic of a GHG mitigation activity by which it generates emission reductions or removals that would not have occurred in the absence of the project. Additionality shall be demonstrated in accordance with the BioCarbon Baseline and Additionality Tool.

Source: Adapted from ISO 14064-2 and CDM Glossary.

Agriculture, Forestry and Other Land Use (AFOLU)

The sector comprises either greenhouse gas emissions or removals attributable to project activities in agriculture, forestry, and other land uses.

Baseline scenario

A counterfactual scenario that reasonably represents the changes in carbon stocks (emissions or removals) within the project area in the absence of the project activity.

The baseline shall be established using the BioCarbon Baseline and Additionality Tool and reflect historical evidence, agents of change, and plausible land-use trajectories.

Source: IPCC 2006, BioCarbon Baseline and Additionality Tool.

Carbon fraction

Tons of carbon per ton of dry biomass, in the case of AFOLU projects.

Carbon pools

The components of a terrestrial ecosystem where carbon is stored. Relevant pools in this Methodology include aboveground biomass, belowground biomass, deadwood, litter, and soil

organic carbon (SOC), as defined by the IPCC Guidelines. Pools may be excluded only if justified and if their exclusion leads to a more conservative estimate.

Source: IPCC Guidelines for National Greenhouse Gas Inventories (2006, Vol. 4).

Core area

Forest pixels located beyond the edge zone established by the morphological classification procedure in Section 11.2.3. This class includes all Core size subclasses.

Deforestation

Deforestation is defined as the direct or induced conversion of forest cover to another type of land cover in a given period. Once the parameters applicable to the forest definition have been defined, the forest boundaries can be identified at any time. Only areas within these boundaries can be subject to deforestation activities. Consequently, "forested areas" that do not meet the minimum conditions for the country-specific definition of forest cannot be deforested (IPCC, 2003).

Units of land can only be classified as deforested if they have been subject to direct human-induced conversion from forest to non-forest land. Areas in which forest cover was lost as a result of natural disturbances are therefore not considered deforested, even if changed physical conditions delay or prevent regeneration, provided that these changes in physical conditions are not the result of direct human-induced actions. If, however, the natural disturbance is followed by a non-forest land use, then this will prevent the regeneration of forest, and the deforestation shall be considered direct human induced.

Deforestation agents

Individuals, social groups, or institutions (public or private) that, influenced or motivated by a series of factors or underlying causes, decide to convert natural forests to other land cover and land uses, and whose actions are manifested in the territory through one or more direct causes.

Direct causes of deforestation

Direct causes of deforestation⁹ are related to human activities that directly affect forests. They include factors that operate at the local scale, different from the initial structural or systemic conditions, which originate in land use and affect forest cover by harvesting the arboreal resource or eliminating it to give way to other uses.

⁹ For the purposes of this document, and in accordance with international literature on the subject, the term "direct cause" is used synonymously with the concept of a "driver" of deforestation.

Edge

Forest pixels along external boundaries or around large internal non-forest openings within forest components containing Core, as identified by the morphological classification procedure in Section 11.2.3.

Eligible areas

Areas that meet the condition of forest presence on the reference dates established by the BCR Standard. The areas in the geographical limits of the Project that correspond to the category of natural forest (as outlined by the national forest definition for the Clean Development Mechanism), at the beginning of the project activities, and minimum ten years before the starting date of the Project.

Emission factor

A coefficient that quantifies GHG emissions or removals per unit of activity data, typically expressed in tCO₂e per hectare. Emission factors shall be derived from credible sources such as peer-reviewed literature, national GHG inventories, or direct field measurements, and selected conservatively.

Source: IPCC, ISO 14064-2.

Forest

“Forest” is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest.¹⁰

For the application of this methodology, forest means natural forest meeting the national forest definition adopted by the host country under the UNFCCC. Eligibility shall also satisfy the forest-history and other requirements in Section 5. Forest plantations, oil-palm plantations, and other agricultural tree crops shall not be classified as eligible natural forest.

Forest degradation

A direct, human-induced, long-term reduction of carbon stocks in forests that remain classified as forest. It includes measurable losses of above- and below-ground biomass due to activities such as selective logging, fuelwood collection, fire, and unsustainable land use,

¹⁰ Source: United Nations (2001), FCCC/CP/2001/13/Add.1, p. 58, annex, paragraph 1(a).

without resulting in a change to non-forest classification. The process shall persist over time and not meet the national threshold for deforestation.

Source: IPCC (2003, 2006)¹¹

Geographic proximity

Refers to the spatial closeness between the project area and the reference region, such that both areas are located within the same deforestation frontier, administrative jurisdiction, or socio-ecological landscape.

The intent of this criterion is to ensure that the reference region is subject to the same regional pressures, policy environment, accessibility conditions, and land-use dynamics as the project area.

Geographic proximity does not imply a fixed distance threshold but requires functional and contextual representativeness and may be assessed using spatial data layers such as infrastructure networks, land tenure, administrative boundaries, and forest loss patterns.

GHG Project (Greenhouse gas project)

activity or activities that alter the conditions of a GHG baseline and which cause GHG emission reductions or GHG removal enhancements.

[SOURCE: ISO 14064-3:2019(en), 3.4.1.]

GHG emission reductions

The quantified decrease in anthropogenic greenhouse gas emissions attributable to the implementation of project activities, measured against a conservative and credible baseline scenario. Emission reductions shall be real, additional, measurable, permanent, and verified in accordance with the BioCarbon Standard.

Leakages

A measurable and attributable increase in GHG emissions that occurs outside the project boundary as a result of the implementation of project activities. Leakage may occur when

¹¹ Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types. See Intergovernmental Panel on Climate Change (IPCC), Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003); and 2006 IPCC Guidelines for National Greenhouse Gas Inventories, vol. 4 (2006).

deforestation or degradation is displaced to other areas due to restrictions or changes within the project area.

Source: Adapted from IPCC, UNFCCC.

Monitoring period

The time interval during which data are collected, and emissions reductions are monitored, verified, and reported. A monitoring period shall be clearly defined in the Project Document and shall comply with the rules established by the BioCarbon Standard and the MRV Tool.

Non-forest

Land that has never had a forest cover and cannot support trees or was previously an arboreal cover but changed to a different cover. It includes commercial forest plantations, palm crops, and trees planted for agricultural production.

Organic soils

Organic soils are soils meeting the diagnostic criteria in Annex 3A.5, Chapter 3, Volume 4 of the 2006 IPCC Guidelines, as addressed in Section 1.2 of the 2013 IPCC Wetlands Supplement. Classification shall consider organic-horizon thickness, organic-carbon content, clay content, and water-saturation conditions. Organic-carbon content shall be distinguished from organic-matter content.

Organic soils are identified based on criteria 1 and 2, or 1 and 3 listed below:

1. Organic horizon thickness is greater than or equal to 10 cm. A horizon of less than 20 cm has 12 percent or more organic carbon when mixed to a depth of 20 cm.
2. Soils that are never saturated with water for more than a few days shall contain more than 20 percent organic carbon by weight (i.e., about 35 percent organic matter).
3. Soils are subject to water saturation episodes and have either:
 - a) At least 12 percent organic carbon by weight (i.e., about 20 percent organic matter) if the soils have no clay;
 - b) At least 18 percent organic carbon by weight (i.e., about 30 percent organic matter) if the soils have 60% or more clay; or
 - c) An intermediate proportional amount of organic carbon for intermediate amounts of clay.

Patch

Forest pixels belonging to a connected forest component that contains no Core pixels under the classification procedure in Section 11.2.3. Classification depends on geometry and connectivity rather than a fixed fragment-area threshold.

Perforated

Forest pixels bordering small internal non-forest openings within forest components containing Core, as identified by the morphological classification procedure in Section 11.2.3.

Permanence

The durability of the GHG emission reductions achieved by the project, maintained through the protection of the associated forest carbon stocks and the management and compensation of reversals in accordance with the BioCarbon Standard and the applicable Permanence and Risk Management Tool.

Project area

The geographic area under the legal authority or control of the project holder, within which REDD+ activities are implemented and GHG emission reductions or removals are quantified and monitored.

Project boundary

The spatial extent of land under the control of the project holder where REDD+ activities are implemented and GHG mitigation outcomes are accounted. The project boundary shall be georeferenced and delineated in a GIS platform and shall not overlap with other registered mitigation initiatives.

Project holder

The legal entity or individual with operational control over the project area and the right to claim, register, and transfer GHG mitigation outcomes. The project holder shall demonstrate compliance with all applicable legal, technical, and programmatic requirements under the BioCarbon Standard.

Project start date

The project start date shall be the date on which implementation of REDD+ activities intended to reduce deforestation, or forest degradation first begins in the project area. This may be the effective date of an agreement with local communities or Indigenous Peoples, adopted through their legitimate collective decision-making processes, where the agreement

puts specific forest conservation or management measures into effect. The signature date may be used where those measures take effect upon signature.

The Project Document shall identify the measures, their geographic scope, and the basis for the selected date, supported by the agreement or other relevant records demonstrating their commencement. An agreement limited to an intention to undertake future activities shall not, by itself, establish the project start date.

Quantification period

The defined period during which GHG emission reductions are quantified for credit issuance. A quantification period may include several monitoring periods. Its start and end dates shall be specified separately from the project start date, total project duration, and baseline reassessment schedule, in accordance with Section 8.4.

REDD+

It is an international mitigation mechanism framed in the decisions of the CMNUCC, whose objective is to reduce emissions and remove GHGs through the implementation of activities to reduce emissions from deforestation, forest degradation, and other forestry activities.

REDD+ Project

These are GHG projects that implement activities aimed at reducing emissions due to deforestation and forest degradation, as well as promoting conservation, sustainable forest management and increasing forest carbon stocks.

REDD+ safeguards

Measures aimed at preventing the affectation of fundamental social, economic, or environmental rights and negative impacts due to the design and implementation of REDD+ activities. Likewise, it includes measures to improve the obtainment and distribution of benefits generated by REDD+ activities (United Nations, 2011).

Reference region

A geographically delineated area, spatially distinct from the project area and the leakage area, used to establish and update the baseline scenario through historical and contemporaneous observations of deforestation and forest degradation. The reference region shall meet the representativeness, similarity, and exclusion criteria in Section 8.2. Observations used for baseline estimation shall not be affected by the project intervention or by other GHG mitigation interventions that compromise their suitability for estimating the conditions that would occur in the absence of the project.

Safeguards

A set of social, environmental, and governance measures aimed at preventing adverse impacts and ensuring that project activities respect human rights, biodiversity, cultural values, and the fair distribution of benefits. Projects shall implement and monitor safeguards in accordance with the Sustainable Development Safeguards (SDSs) of the BioCarbon Program.

Source, sink, or carbon pool-related

Source sink or reservoir of GHG with flows of energy or materials to the interior, the exterior, or within the Project.

Uncertainty

The degree of imprecision associated with the quantification of GHG emissions or removals, due to limitations in data, models, sampling methods, or measurement techniques. Uncertainty shall be assessed following IPCC principles and the BioCarbon Uncertainty Assessment Tool and shall be conservatively accounted for in the final calculation of emission reductions.

Underlying causes of deforestation

Underlying causes are factors that reinforce the direct causes of deforestation. They include social, political, economic, technological, and cultural variables, which constitute the initial conditions in the existing structural relationships between human and natural systems. These factors influence the decisions made by agents and help explain why deforestation occurs.

Unplanned deforestation

The direct, human-induced conversion of natural forest to non-forest land use, occurring without pre-established planning or legal authorization. It typically results from spontaneous, opportunistic, or migratory land-use expansion, such as small-scale agriculture, informal extraction, or unsanctioned development, outside the scope of permitted forest management frameworks.

Source: Adapted from IPCC (2006).

Verified Carbon Credit (VCC)

A serialized unit representing one metric tonne of CO₂-equivalent emission reductions or removals that has been verified and issued under the BioCarbon Standard. Each VCC is unique, traceable, and subject to registry rules ensuring environmental integrity and avoidance of double counting.

Wetlands

According to the Article 1 of the Ramsar Convention on Wetlands (1987) "wetlands are *areas of marsh, fen, peat, and or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters.*"

IPCC (2006) defines wetlands as: "Wetlands include any land that is covered or saturated by water for all or part of the year, and that does not fall into the Forest Land, Cropland, or Grassland categories. Managed wetlands are restricted to wetlands where the water table is artificially changed (e.g., drained or raised) or those created through human activity".

For this methodology, wetland characteristics may occur on land classified as Forest Land. The distinction between IPCC land-use categories shall not exclude forested wetlands, forested peatlands, or forests on organic soils that meet Section 5. Their eligibility shall be determined by the forest and other applicability requirements, and their emissions shall be quantified using the procedures applicable to their soil and hydrological conditions.

Document history

Type of document. Methodological Document for REDD+ projects

Version	Date	Description
1.0	February 3, 2020	Initial version – Document submitted for public consultation
2.0	April 13, 2020	Updated version – After consultation
2.1	June 5, 2020	Adjusted version Reference region Leakage area Activity data Some terms and definitions
2.2	February 5, 2021	Adjusted version Editorial changes Notation in some equations
3.0	February 16, 2022	Actualized version Normative references Definitions REDD+ safeguards Minor Editorial Changes Copyright BioCarbon Registry
3.1	September 15, 2022	Actualized version GHG Sources. Soil Organic Carbon, optional Minor Editorial Changes
4.0	May 27, 2024	Actualized version Scope Conditions of applicability Version and validity Terms and definitions Uncertainty management Emission reduction quantification Copyright BioCarbon Cert
5.0	July 23, 2025	Comprehensive methodological update to align with the integrity principles. Updated terminology and definitions consistent with the BCR Standard v4.0 and programmatic tools. Full restructuring and expansion of applicability conditions, normative references, and spatial/temporal boundaries. Refined and expanded criteria for the definition of the project area, reference region, and leakage area. Strengthened requirements for baseline and additionality, including clarified procedures and equations for deforestation and degradation. Inclusion of updated and field-applicable procedures for forest degradation assessment using fragmentation classes.

		Detailed and standardized equations for quantification of emissions, emission factors, and reductions, including new structure for deforestation and degradation (baseline, project, and leakage). Revised permanence section aligned with BioCarbon Permanence Tool and reversal classification. Fully restructured uncertainty and conservativeness section with tiered approach. Updated and expanded monitoring section, including monitoring frequency, data sources, QA/QC, record keeping, and safeguard compliance aligned with the SDS Tool. Editorial and formatting improvements to enhance clarity, transparency, and usability.
Public consultation version 6.0	October 2, 2026	Comprehensive methodological update to strengthen REDD+ requirements for avoided unplanned deforestation and forest degradation. Includes updated applicability conditions, including forested wetlands, forested peatlands and forests on organic soils; dynamic baseline procedures; revised reference-region and leakage-area requirements; strengthened forest degradation, emission-factor, leakage, permanence, uncertainty, monitoring, QA/QC, record-keeping and safeguards provisions; and clarified document status, transition and public consultation provisions.