Publication Date:
31/03/2026

Methodology:
M002

Version:
v1.0.2

Contact:
Equitable Earth
info@eq-earth.com

Core Document

Methodology for Terrestrial Forest Conservation

Summary

This methodology sets out the criteria, requirements, and procedures for certifying terrestrial forest conservation projects that avoid unplanned deforestation and degradation. It includes the principles and methods for establishing centrally determined, jurisdictionally nested baselines derived from Jurisdictional Reference Levels (JRLs) using a model to forecast biomass stock changes and allocate project-level baselines proportionally to predicted losses; demonstrating additionality; quantifying net greenhouse gas (GHG) emission reductions; and meeting monitoring and reporting requirements.

Acknowledgements

This methodology was developed by Equitable Earth with significant contributions from the Equitable Earth Coalition, including James G.C. Ball, PhD, Simon Bird, Emily Dangremond, PhD, Jeremy Freund, Will Gochberg, PhD, Vincent Haller, Lawson Henderson, Mike Korchinsky, and Maren Pauly, PhD.

The first versions of this methodology and its supporting programme were guided by and co-designed with governments, scientists, technical experts, and Indigenous Peoples and Local Community leaders.

Table of Contents

1 Introduction **3**
1.1 Normative References 3
1.2 Reading Notes 3
2 Eligibility Criteria **4**
2.1 Scope 4
2.2 Nesting 4
2.3 Land Status 4
2.4 Geographic Boundaries 6
2.5 Temporal Boundaries 6
3 Livelihoods **7**
4 Ecological Condition **8**
4.1 Principles 8
4.2 Methods 10
5 Carbon **14**
5.1 Baseline Scenario 14
5.2 Additionality 14
5.3 Leakage 19
5.4 Permanence 20
6 Project Boundary **22**
6.1 Emission Sinks & Sources 22
6.2 Carbon Pools 23
7 Monte Carlo Simulation **25**
8 Carbon Stock and Baseline Estimation **27**
8.1 AUDD Project Baseline 27
8.2 Project Emissions 28
9 Carbon Quantification **30**
9.1 Quantifying Carbon Stocks 30
9.2 Quantifying AUDD Project Baseline Emissions 31
9.3 Quantifying Project Emissions 32
9.4 Quantifying Emissions from Activity-Shifting Leakage 40
9.5 Quantifying Uncertainty Deduction 41
9.6 Quantifying Gross Emission Reductions (GERs) 42
9.7 Quantifying Net Emission Reductions (NERs) 42
10 Monitoring, Reporting, and Verification (MRV) **44**
10.1 Monitoring 44
10.2 Reporting 45
Appendix A: Documentation History **46**
Appendix B: Default AGB/BGB Ratios **47**
Appendix C: Livestock Grazing Emissions **49**
Appendix D: GHG Parameters **52**

1 Introduction

1.1 Normative References

This document must be read in conjunction with the latest versions of the following documents, available on the Equitable Earth website:

- Equitable Earth Standard
- Programme Manual
- Validation and Verification Procedure
- Registry Procedures
- Standard Setting and Methodology Development Procedure
- Terms & Definitions
- Baseline Setting Module
- Future Improvements & Limitations

1.2 Reading Notes

Several sections in this document are divided into Principles and Methods as follows:

- Principles set out the requirements applying to each of the three pillars.
- Methods elaborate on how developers and Equitable Earth must apply these requirements.

See the *Reading Notes* section in the Programme Manual for additional information.

2 Eligibility Criteria

Projects are eligible to apply this methodology if they meet the criteria set out in this section.

2.1 Scope

This methodology includes requirements and procedures for Avoided Unplanned Deforestation and Degradation (AUDD) activities. It includes carbon crediting estimation and quantification methods for these activities.

2.1.1 Developers must implement targeted activities to address the root causes of deforestation[1] and degradation,[2] including but not limited to:

1) **Exclusion of deforestation and degrading practices:** prohibition of activities such as harvesting and logging of timber within the project area, and, where feasible, implementation of controls to reduce access

2) **Community-based sustainable practices:** collaboration with communities to encourage sustainable resource use and alternative livelihoods

2.2 Nesting

2.2.1 Projects must use an AUDD baseline, allocated via a risk map from a Jurisdictional Reference Level (JRL) provided by Equitable Earth. Standalone (non-nested) AUDD baselines cannot be applied under this version of M002.

2.2.2 The JRL must be validated by an independent expert panel in accordance with the Jurisdictional Baseline Validation Methodology (forthcoming).

2.3 Land Status

2.3.1 To be eligible for Equitable Carbon Unit (ECU) crediting, at least 90% of the project crediting area must have met the Equitable Earth definition of forest[3]

[1] *Deforestation* is defined in the Terms & Definitions document.

[2] Under this methodology, Equitable Earth uses a forest degradation definition adapted from the IPCC, under which forest degradation is interpreted as a long-term loss of forest carbon stocks on land that remains forest (forest remaining forest). Adapted from IPCC, 2003, "Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types".

[3] Under this methodology, Equitable Earth uses a forest definition adapted from FAO, which defines forest as land spanning more than 0.5 hectares with a canopy cover of more than 10 percent. Adapted from Global Forest Resources Assessment 2020, Terms and Definitions, Working Paper, Rome: FAO, 2018. Developers may submit requests to use the

at the project start date and for the 10 years prior. Equitable Earth determines this by applying a forest mask within the project area and comparing the Above-Ground Biomass (AGB) value per pixel over the 10 years preceding the project start date against the reference values established by the AGB provider.[4]

2.3.2 Projects must be located within at least one clearly defined jurisdiction for which Equitable Earth has developed a risk map.

2.3.3 Projects may be developed on public, private, communal, or mixed lands and territories, including those owned and/or managed by Indigenous Peoples (IPs) and Local Communities (LCs).

Public lands that are contested by IPs and/or LCs, have rights-of-way, or hold cultural significance for IPs and LCs are subject to the Free, Prior, and Informed Consent (FPIC) requirements set out in the Equitable Earth Standard.

2.3.4 Projects may be developed within or outside protected areas, provided additionality requirements are met, considering the following:

1) **Within protected areas:** includes areas designated under any management category (Ia–VI) and governed under any recognised governance type (e.g., government, shared, private), as established by the International Union for Conservation of Nature (IUCN).[5]

2) **Outside protected areas:** includes non-protected lands or territories under any governance type.

2.3.5 Projects located in any of the terrestrial transitional realms, including mangroves, as classified by the IUCN Global Ecosystem Typology, are not eligible under this version of the methodology.

2.3.6 Avoided emissions from the rewetting of peat soils and from the conservation of peat from unplanned conversion are not eligible under this version of the methodology.

2.3.7 Monoculture and/or intensively managed forest plantations are not eligible for crediting under this methodology, even if classified as forest.[6]

---

relevant national definition of forest, which will be considered and applied on a case-by-case basis. Note that certification times may be longer for projects using alternative forest definitions.

[4] Equitable Earth conducted a comprehensive benchmarking exercise to compare multiple external AGB providers. The objective of this assessment was to select the provider best suited to deliver rigorous, conservative, and accurate AGB data for calculating GHG reductions and removals. More information is available on the Equitable Earth website.

[5] Dudley, N. (Ed.) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN.

[6] Equitable Earth's approach to forest plantation eligibility is informed by the concept of plantation forest reflected in the Regulation (EU) 2023/1115.

2.4 Geographic Boundaries

2.4.1 Developers must clearly define the geographic boundaries of the project. Refer to the *Geography and Project Boundaries* section in the Equitable Earth Standard for more details.

2.4.2 The project area for AUDD activities may be a combination of forest, non-forest, or converted native ecosystems.

2.4.3 Any forest areas within the geographic boundaries of the project area may not be excluded. However, plantation forests intensively managed for timber products, food, or fibre must be excluded from the project crediting area, but may be included within the project area.

2.4.4 The size of the project area may be expanded in conformance with the requirements and procedures established by Equitable Earth. Refer to the *Project Expansion* section in the Programme Manual for more details.

2.4.5 Projects of any size are eligible to apply this methodology. No minimum or maximum land area or net GHG reduction estimate is required under this version.

2.5 Temporal Boundaries

2.5.1 Developers must clearly define the temporal boundaries for the project area, specifying the period during which deforestation and degradation impacts are mitigated by project activities and eligible carbon stocks are monitored for reversals.

Refer to the *Key Project Dates and Crediting Period* section in the Equitable Earth Standard for more details on core requirements related to the project start date, project registration date, submission deadline, and crediting period. Specific requirements for monitoring periods and their frequency are set out in the *Monitoring* section of this methodology.

3 Livelihoods

3.1.1 Developers applying this methodology must demonstrate that their project meets all requirements under the Livelihoods Pillar in the Equitable Earth Standard. This includes requirements related to livelihoods baseline assessment, stakeholder engagement, social safeguards, and engagement with IPs and LCs (e.g., FPIC, social additionality).

4 Ecological Condition

4.1 Principles

Project Activities

4.1.1 Developers must plan and implement project activities to achieve positive ecological outcomes, minimise risks, and mitigate negative socio-environmental impacts in line with the requirements in the Equitable Earth Standard and this methodology.

4.1.2 Developers must develop project activities that conserve areas identified as high risk of deforestation and/or degradation and those identified as high conservation values (HCVs) within the project area.

4.1.3 Developers must promote local ownership by involving IPs and LCs identified as core and direct project stakeholders in the design and monitoring of ecological condition and project activities, and in data collection processes.

Ecosystem Extent and Connectivity

4.1.4 Developers must demonstrate concrete actions to maintain and increase ecosystem extent and connectivity and mitigate human-made barriers that fragment or hinder connectivity. Actions may include, but are not limited to:

1) Maintaining minimum corridor widths
2) Establishing new corridors (e.g., installation of wildlife crossings, overpasses, underpasses)
3) Establishing or maintaining buffer zones
4) Demonstrating no net habitat loss
5) Removing barriers (e.g., roads, fences)

4.1.5 Developers must assess the impact of and justify the need for project activities that create new barriers.

4.1.6 Developers must strive to limit and mitigate the impacts of infrastructure (e.g., roads, hydroelectric dams) development or land-use changes that reduce connectivity within the project area.

Ecosystem Services

4.1.7 Where IPs and LCs depend on ecosystem services for their livelihoods, developers must ensure access is maintained.

4.1.8 Developers must ensure that access to Non-Timber Forest Products (NTFPs) and their derived benefits is fair, transparent, and non-discriminatory. Particular attention should be paid to vulnerable project stakeholders and IPs and LCs who depend on these resources for their livelihoods.

4.1.9 If NTFPs are generated within the project area, developers must identify any ongoing unsustainable practices. Where such practices are identified, developers must work with project stakeholders to encourage sustainable management of forest products, including through capacity development and training for core and direct stakeholders, as needed.

Ecosystem Threats

4.1.10 Developers must leverage historical data, local expertise, and active engagement with relevant stakeholders, particularly IPs and LCs, to ensure a context-specific understanding of threats and drivers.

4.1.11 Developers must locate where each identified threat poses risks to the project area.

Anthropogenic Threats

4.1.12 Developers must identify and analyse past and/or current drivers of anthropogenic deforestation and degradation (e.g., anthropogenic fires, logging, agricultural expansion), and the stakeholders involved (e.g., local farmers, logging operators).

4.1.13 Developers must strive to reduce deforestation and degradation drivers affecting the project area, such as land conversion for agriculture and ranching, infrastructure development, browsing, overgrazing, illegal or unsustainable harvesting, hunting practices, nutrients and chemical runoffs, and proliferation of invasive species.

Natural and Climatic Threats

4.1.14 Developers must identify and strive to manage emergent and recurring natural threats to ecosystem conditions in the project area. This may include, but is

not limited to, invasive species, grazing, uncontrolled fire, soil erosion, flooding, pests, disease, drought, and smothering.

4.1.15 If developers or project stakeholders identify invasive species in the project area, developers must implement control measures and prevent further spread.

4.1.16 If invasive species are to be removed, developers must detail plans for the proper disposal, focusing on minimising carbon emissions linked to their disposal.

4.2 Methods

Baseline Assessment

4.2.1 Developers must conduct a comprehensive baseline assessment to inform the design of project activities, as outlined in the Equitable Earth Standard. This includes:

1) Field assessment (refer to the *Field Assessment* section for more details)
2) Desktop research and assessments, as needed
3) Engagement with relevant stakeholders, including IPs and LCs identified as core and direct project stakeholders, to integrate their insights and priorities

4.2.2 Developers must establish an ecological condition baseline for the project area using each of the categories below (Table 1). Developers are encouraged to monitor multiple indicators and metrics.

Table 1: Ecological condition baseline requirements.

Category	Requirement	
Ecosystem extent	Developers must provide	Extent of core forest area
	Developers must provide	Map of roads, settlements, infrastructure and other barriers
	Developers must measure and monitor at least one metric	Example metrics may include, but are not limited to, canopy cover, crown visibility, relative distance between crowns, and canopy height

Category	Requirement	
Ecosystem function	Developers must document	Vegetation strata
	Developers must document	Disturbance type, if observed
	Developers must document	Regeneration, if observed
	Developers must document	Identification and abundance of invasive species
	Developers must measure and monitor at least one metric	Indicator species. Example metrics may include, but are not limited to, population and occupancy.
	Developers must provide	HCVs in the project area
	Developers must measure and monitor at least one metric	Hydrology and water quality. Example metrics may include, but are not limited to, turbidity, suspended sediment, nutrients, and contaminants.
	Developers must measure and monitor at least one metric	Soil health. Example metrics may include, but are not limited to, bulk density, soil texture, soil moisture, contaminants, microbial activity, and fauna.
Ecosystem threats	Developers must	Provide information on the existing and historic prevalence and scope of identified ecosystem threats (e.g., incidence and severity of fires, invasive species)
	Developers must	Identify and comment on the effectiveness of past and/or ongoing efforts to mitigate or reduce identified threats
Ecosystem services	Developers must	Determine the main ecosystem services derived by core and direct project stakeholders, and describe how they contribute to their land use

4.2.3 Developers must justify the selection of each metric and state why it is representative.

Field Assessment

4.2.4 Developers must design and conduct a field assessment to gather data for the baseline assessment and to monitor performance against project targets, outcomes, and objectives in the project area. Developers must complete the field assessment using the Equitable Earth Certification Platform.

4.2.5 Equitable Earth provides developers with a stratification of the project area, with groups based on:

1) Risk of AGB loss as outlined in the *Carbon Stock and Baseline Estimation* section
2) Biome
3) Distance to forest edge

4.2.6 Developers must identify field assessment sites and justify their selection. Field assessment sites must be selected within the areas set out below:

1) Each group in the stratification provided by Equitable Earth
2) Areas identified by the developer as being at high risk of deforestation and/or degradation
3) Sites that are indicative of performance against project targets, outcomes, or objectives

The developer must demonstrate whether any identified field assessment area(s) are inaccessible. Equitable Earth will review and determine whether these areas can be excluded from the field assessment.

4.2.7 Developers must repeat the field assessment in the same sites used in the baseline assessment during each adaptive management phase. Developers must also conduct field assessments in additional sites in new areas categorised as high risk and proximal to areas of deforestation.

Intervention Plan

4.2.8 Developers must design interventions in line with the *Theory of Change* section of the Equitable Earth Standard.

4.2.9 The interventions must be based on the ecological condition of the project area. This plan must adhere to the specific requirements set out in the *Intervention Plan* section of the Equitable Earth Standard.

4.2.10 Each indicator should be monitored at least annually and must be monitored and reported on at each verification. Monitoring approaches may include remote satellite imagery, field inventories, community-based monitoring, and sensors for continuous monitoring.

4.2.11 Developers must provide details of the monitoring and methods used, such as remote sensing, field assessment, and surveys, in addition to the number, distribution, and location of samples.

4.2.12 The monitoring plan should strive to control for seasonality.

Measurement and Reporting

For more details, refer to the *Monitoring, Reporting, and Verification (MRV)* section of the methodology, and the *Monitoring, Reporting, and Verification (MRV)* and *Theory of Change* sections of the Equitable Earth Standard.

5 Carbon

5.1 Baseline Scenario

Principles

5.1.1 Developers must establish the baseline scenario representing the most plausible land-use trajectory in the absence of the project, consistent with historical trends, applicable legal and policy frameworks, and jurisdictional REDD+ strategies.

5.1.2 Developers must re-evaluate the baseline scenario at the end of the baseline validity period (BVP) to reflect updated deforestation dynamics, changes in relevant government policies, and advances in available data. Refer to the *Baseline Validity and Re-Evaluation* section for more details. Validation of the baseline scenario re-evaluation occurs at the subsequent verification.

Methods

5.1.3 Developers must establish the baseline scenario by identifying and analysing alternative land use scenarios to the proposed project activities in a qualitative assessment.[7]

5.1.4 Developers must re-evaluate the original baseline scenario by assessing the impact of any potential changes to policies or regulations. If no changes affecting the baseline scenario occurred, and the original baseline scenario remains valid, developers must demonstrate this.

5.2 Additionality

Principles

5.2.1 Developers must demonstrate additionality following a three-step process:

1) **Regulatory surplus.** Developers must demonstrate that there is no enforced legal obligation to implement forest conservation activities.

[7] This methodology requires developers establish a qualitative baseline scenario, while Equitable Earth sets the quantitative project baseline. Refer to the *AUDD Project Baseline* and *Carbon Quantification* sections for more details on project baseline setting and calculation of baseline emissions, respectively.

2) **Barrier analysis.** Developers must identify existing barriers that would prevent the implementation of project activities in the absence of revenues from ECUs. Developers must, at a minimum, include a financial barrier in the analysis, and may also include other relevant barriers from, but not limited to, the list below:

    a) **Financial barriers:** challenges related to, for example, insufficient funding, high upfront costs, and difficulty accessing finance. This includes existing policies and requirements other than legal obligations to lower GHG emissions (e.g., non-mandatory policy incentives and enablers).

    b) **Technical barriers:** challenges related to the application of technology, methodologies, and technical expertise. Barriers may include difficulties in applying established methodologies, managing complex technical tasks, and ensuring accurate measurement and monitoring of key indicators and outcomes, such as carbon sequestration.

    c) **Capacity barriers:** challenges related to education, technical training, and human resources. Barriers may include a lack of skilled personnel or insufficient training in conservation techniques, monitoring protocols, and carbon accounting.

    d) **Logistical barriers:** challenges related to the infrastructure, operational aspects of a project, and labour shortages. Barriers can include poor accessibility to key sites, limited transportation options, inadequate facilities, and the unavailability of necessary materials.

    e) **Cultural and social barriers:** challenges in the collective movement of communities towards implementing, maintaining and monitoring conservation projects due to, for example, lack of information, threats to the safety of community members, and existing social structures and norms.

    f) **Regulatory and institutional barriers:** limitations within the regulatory framework and its relevant institutions, such as limited staff capacity, lack of necessary skills, local regulations, complex permitting processes, ineffective bureaucratic processes, or challenges in meeting specific compliance standards.

3) **Common practice assessment:** Developers must demonstrate that activities similar to the project activities are not common practice in the project's jurisdiction, following the steps set out in the *Methods* section below.

Methods

5.2.2 Both Equitable Earth and the Validation and Verification Body (VVB) must assess the demonstration of additionality and all supporting evidence provided.

Regulatory Surplus

5.2.3 Developers must identify all applicable local, regional, or national legislation, policies, or agreements in force in the project's jurisdiction.

5.2.3.1 For high-income countries, all legal requirements should be deemed enforceable.[8]

5.2.3.2 For countries other than high-income countries, legal requirements should only be deemed non-enforceable based on legal and documented sources relevant to the project activity.

5.2.3.3 Where a legal obligation to undertake conservation activities applies to the project crediting area, developers must indicate and prove exactly where and in what context it applies.

5.2.3.4 Where a legal obligation to implement conservation measures applies to the project crediting area but cannot be fulfilled without the project's funds or technology, developers must prove that barriers exist to establish additionality.

Barrier Analysis

5.2.4 Developers must demonstrate the presence of existing barriers to the implementation of project activities and provide supporting evidence for assessment by Equitable Earth and the VVB. Evidence may include, but is not limited to, the examples outlined below:

1) **Financial barriers:** statements of account, notice of refusal of subsidies, and evidence that alternative land uses are more profitable without carbon credits.

2) **Technical barriers:** lack of tools, records of failed pilot trials.

3) **Capacity barriers:** list of staff, job descriptions, expertise and relevant knowledge, access to training and capacity-building resources, training records (or lack thereof).

[8] Refer to the Terms & Definitions document for a full list of high-income countries.

4) **Logistical barriers:** maps showing remoteness or poor access, transport cost estimates or invoices, and photos of terrain and access routes.

5) **Cultural and social barriers:** stakeholder engagement reports, evidence of past opposition or failed conservation attempts, and records of traditional land use patterns.

6) **Regulatory and institutional barriers:** unclear or restrictive legal frameworks for land use or carbon rights, evidence of policy gaps or lack of institutional support, land tenure records or land registry status, legal reviews of land or forestry laws, and correspondence with authorities showing regulatory delays.

Common Practice Assessment

5.2.5 Developers must demonstrate that the project would not be common practice using the following steps:

1) Define the project activity type(s) in accordance with the *Scope* section of this methodology.[9]

2) Define the geographic region for the assessment. The geographic region should have a similar policy environment as the project area, and should, at most, align with the national jurisdiction. Where there are sub-national (e.g., regional, local) programmes providing incentives for conservation activities, then the geographic region for assessment should align with them.

3) Identify any comparable activities to the project activity type that are currently active or underway at the time of the assessment, or that were active at any time during the ten years prior to the project start date, in the defined geographic region, excluding any projects that are under certification or registered with a voluntary carbon crediting programme.

4) Compare the project activity typeto the identified activities by selecting and justifying comparable attributes relevant to the assessment (e.g., land tenure, funding or access to resources, economic or socioeconomic conditions), and assess whether the activities are similar or present any distinctions.

[9] For the common practice assessment under this methodology, 'project activity type' is an adaptation of the programme-level definition of 'project activity' set out in the Terms & Definitions, and refers to the REDD+ activity type(s) defined under the UNFCCC and permitted under the *Scope* section of this methodology, rather than the individual project activities implemented by the project. Under this version of the methodology, there is a single project activity type: avoided emissions from deforestation and degradation. REDD+ activity types are defined under Decision 1/CP.16 (The Cancun Agreements), paragraph 70 (UNFCCC, 2011).

a) Similar activities are those that share comparable conditions or circumstances that affect the implementation of the project activity type.

b) A distinction must represent a verifiable difference in circumstances that affects whether the project activity type would be implemented under business-as-usual conditions (e.g., land tenure structures, access to non-carbon funding or subsidies, economic or socioeconomic conditions, or site-specific biophysical constraints). Minor operational differences that do not fundamentally affect the implementation of the project activity type under business-as-usual conditions do not constitute distinctions.

5) For each of the project types, calculate the adoption rate (%) of any similar activities identified using the following equation (E.1):

$$A_i = [1 - (\frac{Ndist,i}{Nsim,i})] \times 100 \quad \textbf{(E.1)}$$

Where:

- A_i = Adoption rate for each project activity type *i*; percentage (%)
- $N_{sim,i}$ = number of activities identified in the defined geographic region similar to project activity type *i*
- $N_{dist,i}$ = number of similar activities with distinctions from the project activity type *i*; $N_{dist,i}$ must not exceed $N_{sim,i}$

6) Using the calculation results, determine whether or not each of the project activity types is common practice, based on the following:

a) Where the adoption rate A_i is below 20%, the project activity type is not common practice and is therefore additional.[10]

b) Where the adoption rate A_i is equal to or above 20%, the project activity type is common practice and is not additional.

[10] Equitable Earth established a 20% adoption rate threshold in alignment with the CDM tool to assess common practice.

c) Where no similar activities exist in the defined geographic region (i.e., $N_{sim,i}$ = 0) for project activity type *i*, the adoption rate A_i must be set to 0%, and the project activity type is deemed not common practice.

d) Project activity types determined to be common practice are not additional and are not eligible for crediting.

5.3 Leakage

Principles

5.3.1 Equitable Earth accounts for activity-shifting leakage resulting from deforestation and degradation activities displaced by the implementation of project activities.[11]

5.3.2 Developers must identify and mitigate leakage risks through targeted strategies and activities, designed and implemented throughout the project crediting period.

5.3.3 Equitable Earth may apply additional adjustments in cases where leakage risks are deemed material or not adequately mitigated.

Methods

5.3.4 Equitable Earth pre-defines potential activity-shifting leakage risks to support developers in identifying and mitigating risks.

5.3.5 Developers must evaluate the activity-shifting leakage risks pre-defined by Equitable Earth, document any gaps, develop a mitigation plan for each risk identified, and report on risk mitigation during each monitoring period.

5.3.6 Equitable Earth applies a fixed leakage deduction of 10% to avoided forest-loss emissions to account for activity-shifting leakage.[12] Refer to the *Quantifying Emissions from Activity-Shifting Leakage* section for more details.

[11] Market leakage is captured in the national JRL and is not quantified separately due to the local nature of displacement; this is consistent with the methodological assumption that leakage due to activity shifting is primarily local.

[12] The 10% factor is a conservative default supported by Equitable Earth's global analysis of REDD+ projects (76 projects; 532 monitoring-years, 2003–2023), which found typical activity-shifting leakage well below 10% across regions and methodologies.

5.4 Permanence

Principles

Safeguards

5.4.1 Developers must ensure the permanence of emission reductions by contributing to a shared buffer pool managed by Equitable Earth.

5.4.2 Developers must notify Equitable Earth of any loss events within the project crediting area. Refer to the Terms & Definitions and the Equitable Earth Standard for additional details on loss events.

5.4.3 Developers must mitigate the risk of unintended fires by preparing a fire prevention and management strategy for the project crediting area, following the requirements set out in the Equitable Earth Standard.

5.4.4 If prescribed fires are included in project activities, developers must mitigate the risk of biomass burning beyond the area designated for the prescribed fire by preparing a fire management strategy for the project crediting area. This strategy must indicate the location of the expected burnt area, the reason for burning, and its frequency.

Reversals

5.4.5 All reversal risks must be assessed, monitored, and mitigated. Refer to the *Compensation of Reversals* section in the Programme Manual for more details.

Methods

Risk Assessment & Buffer Pool

5.4.6 Equitable Earth identifies delivery and reversal risks and assesses their likelihood and the severity of their consequences. Refer to the *Risk Assessment* section of the Programme Manual for more details.

5.4.7 Equitable Earth allocates 20% of the verified GHG reductions achieved by each project to the buffer pool at the time of ECU issuance. Refer to the *Buffer Pool* section of the Programme Manual for more details about how buffer pool contributions are managed. Additional details on project-level deductions are in the *Quantifying Net Emission Reductions (NERs)* section of this methodology.

Loss Events

5.4.8 Loss events must be monitored, reported, quantified, and accounted for.

5.4.8.1 Developers must monitor and report on loss events during the project lifetime. Refer to the *Permanence* section of the Equitable Earth Standard for more details.

5.4.8.2 **Quantification:** In case of a loss event, Equitable Earth quantifies the net GHG impact associated with the area that experienced the loss event using the following equation (E.2):

$$GHG_{loss-event} = GHG_{post-event} - GHG_{pre-event} \quad \textbf{(E.2)}$$

Where:

- $GHG_{loss-event}$ = Net GHG impact attributable to the loss event; tCO_2e
- $GHG_{post-event}$ = Total GHG equivalent attributable to the affected area after the loss event; tCO_2e
- $GHG_{pre-event}$ = Total GHG equivalent attributable to the affected area before the loss event; tCO_2e

Reversals

5.4.9 If reversals occur during the project lifetime, ECUs must be compensated through the buffer pool mechanism. Refer to the *Compensation of Reversals* section in the Programme Manual for more details.

6 Project Boundary

The project boundary delimits all carbon pools, emission sinks, and emission sources considered in this methodology.

6.1 Emission Sinks & Sources

6.1.1 Projects are monitored for CO_2 (carbon dioxide) and must include additional GHGs, unless they are shown to be *de minimis*. Equitable Earth may only account for the GHG gases specified below (Table 2).

Table 2: GHGs and potential emission sources.

Gas	Potential Sources
CO_2 (carbon dioxide)	• Flux in carbon pools
CH_4 (methane)	• Burning of biomass • Livestock
N_2O (nitrous oxide)	• Burning of biomass • Livestock • Synthetic fertiliser

6.2 Carbon Pools

6.2.1 Relevant carbon pools included in this methodology are listed below (Table 3).

Table 3: Carbon pools included and excluded in this version of the methodology.

Carbon Pool	Type	Inclusion	Justification
Woody biomass	**Above-Ground Biomass (AGB)**	Yes	• Significant carbon pool in REDD+ projects • The primary source of emissions from deforestation and degradation • Estimated with high accuracy using remote sensing
	Below-Ground Biomass (BGB)	Yes	• Significant carbon pool directly related to AGB • Can be robustly estimated using established root-to-shoot ratios • Inclusion ensures a more complete accounting of tree biomass emissions
Non-woody biomass	**AGB**	No	• Generally, a minor carbon pool in forest ecosystems relative to woody biomass • High temporal variability and limited impact on overall emission estimates • Project baselines are derived from observed, aggregated biomass changes, in contrast to approaches that rely on a modelled land-use transition counterfactual. Therefore, this

Carbon Pool	Type	Inclusion	Justification
			pool is excluded.
	BGB	No	• Typically, a small and variable carbon pool • Limited data availability and high measurement uncertainty • Excluded for simplicity in this version
Soil organic carbon (SOC)		No	• Material in some ecosystems, but high measurement uncertainty and monitoring complexity • Excluded for simplicity in this version • Conservation is assumed to be correlated with tree biomass conservation
Dead wood		No	• Can be significant after disturbance events, but variable over time • Monitoring requires additional field data • Excluded for simplicity in this version
Litter		No	• Minor pool in most tropical and subtropical forests • High turnover rate and low overall carbon stock • Excluded for simplicity in this version

7 Monte Carlo Simulation

Principles

Equitable Earth applies a Monte Carlo simulation to propagate pixel-level uncertainty to project- or jurisdiction-level estimations of carbon stock. This method propagates uncertainties from each component and reflects their interactions accurately, providing a robust and comprehensive probabilistic representation of both jurisdictional baselines and emission reduction estimates, along with their corresponding uncertainties.

The Monte Carlo approach used by Equitable Earth involves sampling values at the pixel level from the best-fitting probability density function for the parameter of interest. These sampled values are then aggregated to calculate the overall values for the area of interest.

Methods

Through iterative sampling, the method constructs a comprehensive probability density function, capturing site-level uncertainty with precision. The key steps are outlined in this section.

For each pixel, the value is adjusted based on its associated uncertainty, following the procedure below.

7.1.1 When spatial correlation is required, it is incorporated through a perturbation field across a given area of interest (e.g., jurisdiction, project crediting area) defined by equation (E.3):

$$\mathbf{Z}_{total,\,i} = \mathbf{Z}_{global,\,i} \times \sqrt{\varrho} + \mathbf{Z}_{noise,\,i} \times \sqrt{1 - \varrho} \qquad \textbf{(E.3)}$$

Where:

- $\mathbf{Z}_{total,\,i}$ = Perturbation field across the area of interest at iteration *i*; dimensionless

- $\mathbf{Z}_{global,\,i}$ = Global shock across the area of interest at iteration *i*, identical for all pixels and randomly drawn from a normal distribution with a mean of 0 and a variance of 1; dimensionless
- $\mathbf{Z}_{noise,\,i}$ = Pixel-level independent noise at iteration *i*, independently drawn for each pixel from a normal distribution with a mean of 0 and a variance of 1; dimensionless
- ϱ = Correlation factor between the pixels; dimensionless

7.1.2 The perturbation field created is used to compute the pixel-level value at iteration *i* for a given area of interest, using equation (E.4):

$$\mathbf{V}_{mc,\,i} = \mu + \sigma \times \mathbf{Z}_{total,\,i} \quad \textbf{(E.4)}$$

Where:

- $\mathbf{V}_{mc,\,i}$ = Perturbed value across the area of interest at iteration *i*; tDM
- μ = Mean of the best-fitting distribution; dimensionless
- σ = Standard deviation of the best-fitting distribution; dimensionless
- $\mathbf{Z}_{total,\,i}$ = Optional perturbation field across the area of interest at iteration *i*; dimensionless

7.1.3 The determined pixel-level values obtained are aggregated to estimate the total value in the specific iteration.

7.1.4 These steps are iterated to build a comprehensive probability distribution of values at the project level. During the iterations, the value stabilises as the simulation progresses. The number of iterations is determined dynamically by monitoring the convergence of both the mean and standard deviation; simulations continue until both statistics stabilise within predefined tolerances.

7.1.5 The resulting distribution represents the range of potential values in the area. The 5th percentile is selected from this distribution, ensuring a conservative estimate with a 95% probability that the actual emission values are equal to or higher than the calculated values. The Monte Carlo simulation is used at multiple stages of this methodology, including:

1) Estimation of carbon stock in the project area
2) Estimation of carbon stock for JRL
3) Quantification of carbon stock losses for reversal assessment

8 Carbon Stock and Baseline Estimation

8.1 AUDD Project Baseline

8.1.1 Projects must use a centrally defined and risk-adjusted baseline for AUDD activities, assigned by Equitable Earth.[13]

Equitable Earth calculates AUDD baselines through a three-step process:

1) Establishment of a JRL
2) Development of a risk map using a risk model that predicts biomass loss
3) Allocation of the JRL to project areas based on relative risk. Developers are not permitted to submit baseline emissions data or propose alternative baselines

Baseline Validity and Re-Evaluation

8.1.2 Equitable Earth must assign, at the feasibility phase, the initial baseline estimation derived from the JRL. The JRL's underlying data is based on a historical reference period (HRP) of 10 years that ends on the last day of the year before the project start date.

8.1.3 Equitable Earth establishes new AUDD baselines every five years at the end of the BVP to reflect updated deforestation dynamics, model uncertainty, baseline stability, and overall procedural efficiency. The BVP begins on the project start date.

When a new baseline is established, the HRP is extended to incorporate the most recent historical period.

8.1.4 Equitable Earth may develop revised risk maps to allocate baselines based on newly available data, identified errors, and model performance improvements.

[13] To ensure conservativeness and avoid perverse incentives, baselines are centrally determined by Equitable Earth using a standardised model, and quality-controlled data. The baseline allocation process applies consistent rules across all projects. Refer to the Baseline Setting Module for more details on the procedures established.

8.2 Project Emissions

Project emissions represent GHG emissions that occur within the project boundary as a result of forest biomass loss and project activities.

8.2.1 Project emissions are quantified by Equitable Earth, with some input from developers, and are deducted from the project's gross emission reductions (GERs) in accordance with the requirements outlined in this section. Monitoring and reporting procedures are detailed in the *Monitoring, Reporting, and Verification (MRV)* section.

This methodology distinguishes between:

1) **Emissions from Forest Biomass Loss**: emissions from carbon stock changes attributed to deforestation and forest degradation within the project crediting area, including forest fires, grass fires, anthropogenic clearing, logging, or natural events. These emissions are centrally quantified by Equitable Earth using remote sensing methods and are included in the AUDD baseline and project carbon stock change estimates. Calculations do not require additional input from developers.

2) **Emissions from Project Activities**: emissions from project activities related to project implementation that are not captured through forest biomass changes.[14] These include, but are not limited to:

    a) Biomass burning (e.g., prescribed fires)
    b) Livestock grazing
    c) Use of synthetic fertilisers

Emissions from project activities are assessed and quantified by Equitable Earth with inputs from developers based on the materiality assessment defined in this methodology below. For additional details on data inputs, refer to the *Quantifying Emissions from Project Activities* and *Monitoring, Reporting, and Verification (MRV)* sections.

Materiality Assessment

8.2.2 Equitable Earth must conduct a materiality assessment for each of the project activity emission sources.

[14] It is assumed by default that emissions resulting from project operations, including fossil fuel combustion, staff and use of construction materials in infrastructure development are *de minimis* and are not required. These emissions must be accounted for and reported if they are material.

8.2.3 Equitable Earth applies a materiality threshold of 1% of the estimated total gross emission reductions for the BVP and establishes the following requirements based on the materiality of emissions:

1) **Material emissions**: if any of the project activity emission sources equal or exceed the materiality threshold, developers must report data inputs annually in the Annual Report and periodically in the Monitoring Report, and Equitable Earth makes the corresponding deductions from the project's GERs. Refer to the *Carbon Quantification* and *Monitoring, Reporting, and Verification (MRV)* sections for additional details on deductions, data and reporting requirements.

2) **Non-material emissions**: if any of the project activity emission sources fall below the materiality threshold, such emissions are considered *de minimis* and are excluded from ongoing quantification and reporting.

8.2.4 Equitable Earth assesses the materiality of project activity emission sources using the Clean Development Mechanism (CDM) A/R methodological *Tool for testing the significance of GHG emissions in A/R CDM project activities*.[15]

8.2.5 Equitable Earth conducts the materiality assessment during the feasibility and design stages and reassesses it every five years from the project start date, aligning with the BVP and adaptive management frequency requirements.

8.2.6 During the materiality reassessment, developers must disclose any changes to project activities that occurred during the previous BVP or are expected for the next BVP and that impact emissions. Refer to the section *Reporting by Developers* in this methodology for additional details.

8.2.7 If developers deviate from planned project activities during the BVP in a manner that impacts emissions (e.g., increase the number of prescribed fires), developers must notify Equitable Earth following the procedures for design deviations set out in the Programme Manual. In such cases, Equitable Earth may reassess materiality and/or require developers to monitor and report on emissions throughout the remainder of the BVP.

[15] UNFCCC/CCNUCC (2007) 'Tool for testing significance of GHG emissions in A/R CDM project activities.' Version 01, EB 31, CDM – Executive Board. Available at: URL (Accessed 25/03/2026).

9 Carbon Quantification

This section guides the quantification of GHG emission reductions for projects using this methodology. Emission reductions are based on the monitored reduction of emissions from deforestation and degradation from the project AUDD baseline during the crediting period.

9.1 Quantifying Carbon Stocks

9.1.1 Equitable Earth estimates AGB changes based on annual stock data from the AGB provider.

9.1.2 Equitable Earth estimates corresponding BGB at the pixel level using AGB and the IPCC default root-to-shoot ratios (RS) (*Appendix B*). The relationship between BGB and AGB is represented by equation E.5:

$$BGB = AGB \times RS \quad \textbf{(E.5)}$$

Where:

- **BGB** = Below-ground biomass in the project crediting area; tDM
- **AGB** = Above-ground biomass in the project crediting area; tDM
- **RS** = Root-to-shoot ratio of biomass; dimensionless

9.1.3 Equitable Earth estimates total biomass by aggregating AGB and BGB (E.6) and converts to tCO_2e by applying multiple default factors (E.7).

$$B = AGB + BGB \quad \textbf{(E.6)}$$

Where:

- **B** = Total biomass in the project crediting area; tDM
- **AGB** = Above-ground biomass in the project crediting area; tDM
- **BGB** = Below-ground biomass in the project crediting area; tDM

$$\mathbf{C} = \mathbf{B} \times \mathbf{CF} \times \frac{44}{12} \quad \textbf{(E.7)}$$

Where:

- **C** = Carbon stock in the project crediting area; tCO_2e
- **B** = Total biomass in the project crediting area; tDM
- **CF** = Carbon fraction of tree biomass; tC/tDM
- $\frac{44}{12}$ = Molecular weight ratio of CO_2 to carbon; dimensionless

9.2 Quantifying AUDD Project Baseline Emissions

9.2.1 Equitable Earth quantifies AUDD project baseline emissions for the relevant carbon pools ($E^{[m]}_{B\ AUDD}$), and for each monitoring period using jurisdictional AGB loss data and model-based projections of deforestation risk.[16]

9.2.2 Equitable Earth quantifies AGB stock loss associated with deforestation and attributes forest degradation emissions to the remaining AGB loss that occurs in areas that continue to meet the forest definition for the entire period over which the loss is observed.

[16] Equitable Earth uses a risk model to calculate project baselines based on forecasted biomass stock changes. The model is trained on historical data, and the earliest data available for training results in some limitations for projects with a start date on or before December 31, 2024. Projects with start dates on or before December 31, 2024 are eligible, but will be reviewed by Equitable Earth on a case-by-case basis. Note that certification times may be longer for projects with earlier start dates. Refer to the Future Improvements and Limitations document for more details.

9.3 Quantifying Project Emissions

9.3.1 Equitable Earth quantifies project emissions for a given monitoring period ($E_{PE}^{[m]}$) following equation (E.8). Refer to the section *Monitoring, Reporting, and Verification (MRV)* in this methodology for project monitoring requirements.

Total project emissions for the current monitoring period can be greater than the project AUDD baseline if a major disturbance event occurs. Refer to the *Permanence* section in this methodology for additional details on reversals.

$$E_{PE}^{[m]} = E_{P\,for}^{[m]} + E_{P\,act}^{[m]} \quad \textbf{(E.8)}$$

Where:

- $E_{PE}^{[m]}$ = Total project emissions for the monitoring period $[m]$; tCO_2e
- $E_{P\,for}^{[m]}$ = Total emissions from forest biomass loss for the monitoring period $[m]$; tCO_2e
- $E_{P\,act}^{[m]}$ = Total emissions from project activities for the monitoring period $[m]$. Sum of emissions from biomass burning, livestock grazing, and synthetic fertiliser use; tCO_2e

Quantifying Emissions from Forest Biomass Loss

9.3.2 Equitable Earth quantifies emissions from forest biomass loss by comparing carbon stock values between successive observation periods.

If a reduction is identified, the associated forest biomass loss emissions for a given monitoring period ($E_{P\,for}^{[m]}$) are used as an input in equation (E.8).

Quantifying Emissions from Project Activities

9.3.3 Equitable Earth, with some data inputs from developers, quantifies emissions from project activities within the project area and project crediting area when determined to be material. The total emissions for each monitoring period are

calculated as the sum of all relevant emission sources, as specified in equation (E.9).

$$E_{P\,act}^{[m]} = E_{P\,act\,B}^{[m]} + E_{P\,act\,LS}^{[m]} + E_{P\,act\,SF}^{[m]} \quad \textbf{(E.9)}$$

Where:

- $E_{P\,act}^{[m]}$ = Total emissions from project activities for the monitoring period $[m]$. Sum of emissions from biomass burning, livestock grazing, and synthetic fertiliser use; tCO_2e
- $E_{P\,act\,B}^{[m]}$ = Total emissions from AGB burning in project activities during the monitoring period $[m]$; tCO_2e
- $E_{P\,act\,LS}^{[m]}$ = Total emissions from livestock grazing in project activities during the monitoring period $[m]$; tCO_2e
- $E_{P\,act\,SF}^{[m]}$ = Total emissions from synthetic N fertiliser application in project activities during the monitoring period $[m]$; tCO_2e

Quantifying Emissions from Biomass Burning

9.3.4 Equitable Earth quantifies emissions from biomass burning (e.g., prescribed fires, sustainable charcoal production) within the project area and project crediting area, if included in the project activities and emissions are material.

9.3.5 Equitable Earth quantifies biomass burning emissions as the sum of all burning events based on the following method, and using data inputs from developers:

1) **Quantification method**: Equitable Earth detects fires using remote sensing and quantifies total CO_2 and non-CO_2 emissions from AGB burning for a given monitoring period ($E_{P\,act\,B}^{[m]}$) based on stock changes between fire events and data inputs from developers (E.10-E.13).

2) **Data inputs from developers**: developers must provide, annually, for all fire events occurring within the monitoring period, the following inputs for each fire event within the project area and project crediting area:

a) Unique identifier
b) Burnt area
c) Start and end dates

$$AGB_{burn,\,i} = A_{burn,\,i} \times \Delta AGB_{i} \quad \textbf{(E.10)}$$

Where:

- $AGB_{burn,\,i}$ = AGB burnt for fire event *i*; tDM[17]
- $A_{burn,\,i}$ = Burnt area for fire event *i*; ha
- ΔAGB_{i} = Mean AGB loss due to fire event *i*; tDM/ha

$$E^{[m]}_{P\ act\ B} = E^{[m]}_{burn} + E^{[m]'}_{burn} \quad \textbf{(E.11)}$$

Where:

- $E^{[m]}_{P\ act\ B}$ = Total emissions from AGB burning in project activities during monitoring period $[m]$; tCO_2e
- $E^{[m]}_{burn}$ = Total CO_2 emissions from AGB burning in project activities during monitoring period $[m]$; tCO_2
- $E^{[m]'}_{burn}$ = Total non-CO_2 emissions from AGB burning in project activities during monitoring period $[m]$; tCO_2e

[17] Equitable Earth applies the IPCC Tier 1 method to estimate emissions from prescribed fires. BGB is not assumed to be combusted and is therefore excluded from this calculation.

$$E_{burn}^{[m]} = \sum_{i=1}^{n[m]} AGB_{burn,i} \times \mathbf{CF} \times \left(\frac{44}{12}\right) \quad \textbf{(E.12)}$$

Where:

- $E_{burn}^{[m]}$ = Total CO_2 emissions from AGB burning in project activities during monitoring period $[m]$; tCO_2
- $n[m]$= Total number of fire events that occurred in the monitoring period $[m]$; dimensionless
- $AGB_{burn,i}$ = AGB burnt for fire event *i*; tDM
- **CF** = Carbon fraction of tree biomass; tC/tDM
- $\frac{44}{12}$ = Molecular weight ratio of CO_2 to carbon; dimensionless

$$E_{burn}^{[m]'} = \sum_{i=1}^{n[m]} \sum_{g \in \{CH_4, N_2O\}} AGB_{burn,i} \times \mathbf{G}_{ef,g} \times \mathbf{GWP}_g \quad \textbf{(E.13)}$$

Where:

- $E_{burn}^{[m]'}$= Total non-CO_2 emissions from AGB burning in project activities during monitoring period $[m]$; tCO_2e
- $n[m]$= Total number of fire events that occurred in the monitoring period $[m]$; dimensionless
- $AGB_{burn,i}$ = AGB burnt for fire event *i*; tDM
- $\mathbf{G}_{ef,g}$ = Emission factor of dry matter burnt per GHG g; tGHG/tDM
- $\mathbf{GWP}_g$ = Global warming potential per GHG g; dimensionless

Quantifying Emissions from Livestock Grazing

9.3.6 Equitable Earth quantifies emissions from livestock grazing within the project area and project crediting area, if included in the project activities and emissions are material.

9.3.7 Equitable Earth quantifies livestock grazing emissions based on the following method, using data inputs from developers:

1) **Quantification method**: Equitable Earth quantifies total emissions from livestock for a given monitoring period ($E^{[m]}_{P\ act\ LS}$) (E.14) using default factors by livestock species/category and country development status (*Appendix C*).

2) **Data inputs from developers**: developers must quantify, within the project area and project crediting area, the annual average number of head of livestock species/category ($n_{LS,i}$), and report the parameter yearly for each year within the monitoring period (E.14).

$$E^{[m]}_{P\ act\ LS} = \sum_i \left(\frac{f_{LS,i} \times \sum_{y \in [m]} n_{LS,i,y}}{10^3} \right) \times 27 \qquad \textbf{(E.14)}$$

Where:

- $E^{[m]}_{P\ act\ LS}$ = Total emissions from livestock grazing in project activities during the monitoring period $[m]$; tCO_2e
- $f_{LS,i}$ = Emission factor for livestock species/category i; kg CH_4 $head^{-1}$ yr^{-1} (*Appendix C*)
- $n_{LS,i,y}$ = Annual average number of head of livestock species/category i for each year y within the monitoring period $[m]$; dimensionless
- 27 = CH_4 Global Warming Potential (GWP_{CH4}); dimensionless

Quantifying Emissions from the Application of Synthetic Fertilisers

9.3.8 Equitable Earth quantifies emissions from synthetic nitrogen fertiliser application within the project area and project crediting area, if included in the project activities, and emissions are material.

9.3.9 Equitable Earth quantifies emissions from synthetic nitrogen fertiliser use based on the following method, using data inputs from developers:

1) **Quantification method**: Equitable Earth quantifies total emissions from the use of synthetic nitrogen fertilisers for a given monitoring period ($E^{[m]}_{P\ act\ SF}$) (E.15), and distinguishes between direct (E.16, E.17) and indirect (E.18-E.20) emission sources.

2) **Data inputs from developers**: developers must provide, either as mass or liquid volume, the quantity of synthetic nitrogen fertiliser applied within the project area and project crediting area per year ($\mathbf{SF}_y$), along with its nitrogen content ($\mathbf{C}_{SF,y}$) (E.16, E.17).

$$E^{[m]}_{P\ act\ SF} = E^{[m]}_{Ndirect} + E^{[m]}_{Nindirect} \quad \textbf{(E.15)}$$

Where:

- $E^{[m]}_{P\ act\ SF}$ = Total emissions from synthetic N fertiliser application in project activities during monitoring period $[m]$; tCO_2e
- $E^{[m]}_{Ndirect}$= Total direct emissions from synthetic N fertiliser application during monitoring period $[m]$; tCO_2e
- $E^{[m]}_{Nindirect}$= Total indirect emissions from synthetic N fertiliser application during monitoring period $[m]$; tCO_2e

$$E_{Ndirect}^{[m]} = \sum_{y \in [m]} (\mathbf{SF}_y \times \mathbf{EF}_{Ndirect} \times \frac{44}{28} \times \mathbf{GWP}_{N_2O}) \quad \textbf{(E.16)}$$

Where:

- $E_{Ndirect}^{[m]}$= Total direct emissions from synthetic N fertiliser application during monitoring period $[m]$; tCO_2e
- $\mathbf{SF}_y$ = Amount of nitrogen applied as synthetic fertiliser in the project area and project crediting area for each year y in the monitoring period $[m]$; tN
- $\mathbf{EF}_{Ndirect}$ = Emission factor for direct N_2O emissions from synthetic N fertiliser application; tN_2O-N/tN applied
- $\frac{44}{28}$ = Conversion from N_2O–N to N_2O; dimensionless
- $\mathbf{GWP}_{N_2O}$ = N_2O Global Warming Potential (GWP_{N_2O}); dimensionless

$$\mathbf{SF}_y = \mathbf{M}_{SF,y} \times \mathbf{C}_{SF,y} \quad \textbf{(E.17)}$$

Where:

- $\mathbf{SF}_y$ = Amount of nitrogen applied as synthetic fertiliser in the project area and project crediting area for each year y in the monitoring period $[m]$; tN
- $\mathbf{M}_{SF,y}$ = Mass of N-containing synthetic fertiliser applied in the project area and project crediting area for each year y in the monitoring period $[m]$; t fertiliser[18]
- $\mathbf{C}_{SF,y}$ = N content of synthetic fertiliser applied in the project area and project crediting area for each year y in the monitoring period $[m]$; tN/t fertiliser

[18] Where $\mathbf{M}_{SF,y}$ is provided as liquid volume, Equitable Earth converts the reported volume to mass using standardised conversion factors.

$$E_{Nindirect}^{[m]} = \sum_{y \in [m]} (\mathbf{V}_{N,y} + \mathbf{L}_{N,y}) \quad \textbf{(E.18)}$$

Where:

- $E_{Nindirect}^{[m]}$ = Total indirect emissions from synthetic N fertiliser application during monitoring period $[m]$; tCO_2e
- $\mathbf{V}_{N,y}$ = Emissions from atmospheric deposition of N volatilised due to nitrogen fertiliser application in the project area and project crediting area for each year y in the monitoring period $[m]$; tCO_2e
- $\mathbf{L}_{N,y}$ = Emissions from leaching and runoff of N due to nitrogen fertiliser application in the project area and project crediting area for each year y in the monitoring period $[m]$; tCO_2e

$$\mathbf{V}_{N,y} = \mathbf{SF}_{y} \times \mathbf{F}_{SFvol} \times \mathbf{EF}_{Nv} \times \frac{44}{28} \times \mathbf{GWP}_{N_2O} \quad \textbf{(E.19)}$$

Where:

- $\mathbf{V}_{N,y}$ = Emissions from atmospheric deposition of N volatilised due to nitrogen fertiliser application in the project area and project crediting area for each year y in the monitoring period $[m]$; tCO_2e
- $\mathbf{SF}_{y}$ = Amount of nitrogen applied as synthetic fertiliser in the project area and project crediting area for each year y in the monitoring period $[m]$; tN
- $\mathbf{F}_{SFvol}$ = Fraction of all synthetic nitrogen added to soils, volatilising as NH_3 and NO_x; (kg NH_3–N + NO_x–N)/(kgN applied)
- $\mathbf{EF}_{Nv}$ = Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces; kg N_2O–N/(kg NH_3–N + NO_x–N volatilised)
- $\frac{44}{28}$ = Conversion from N_2O–N to N_2O; dimensionless
- $\mathbf{GWP}_{N_2O}$ = N_2O Global Warming Potential (GWP_{N_2O}); dimensionless

$$L_{N,y} = SF_y \times F_{Fleach} \times EF_{Nl} \times \frac{44}{28} \times GWP_{N_2O} \quad \textbf{(E.20)}$$

Where:

- $L_{N,y}$ = Emissions from leaching and runoff of N due to nitrogen fertiliser application in the project area and project crediting area for each year y in the monitoring period $[m]$; tCO_2e
- SF_y = Amount of nitrogen applied as synthetic fertiliser in the project area and project crediting area for each year y in the monitoring period $[m]$; tN
- F_{Fleach} = Fraction of synthetic nitrogen added to soil lost through leaching and/or runoff; kgN/(kg of N additions)
- EF_{Nl} = Emission factor for N_2O emissions from N leaching and/or runoff; kg N_2O–N/(kg N leaching/runoff)
- $\frac{44}{28}$ = Conversion from N_2O–N to N_2O; dimensionless
- GWP_{N_2O} = N_2O Global Warming Potential (GWP_{N_2O}); dimensionless

9.4 Quantifying Emissions from Activity-Shifting Leakage

9.4.1 Equitable Earth quantifies total emissions from activity-shifting leakage for the current monitoring period ($E_{L\,AS}^{[m]}$) by multiplying the avoided forest-loss emissions by a default 10% activity-shifting leakage value (E.21).

Once estimated for a given monitoring period, these cumulative emissions from leakage are fixed for subsequent monitoring periods.

$$E_{L\,AS}^{[m]} = (E_{B\,AUDD}^{[m]} - E_{P\,for}^{[m]}) \times LF \quad \textbf{(E.21)}$$

Where:

- $E_{L\,AS}^{[m]}$ = Total emissions from activity-shifting leakage for the monitoring period $[m]$; tCO_2e
- $E_{B\,AUDD}^{[m]}$ = Project AUDD baseline emissions for the monitoring period $[m]$; tCO_2e
- $E_{P\,for}^{[m]}$ = Total emissions from forest biomass loss for the monitoring period $[m]$; tCO_2e
- LF = Activity-shifting leakage default factor applied to total avoided forest-loss emissions; dimensionless

9.5 Quantifying Uncertainty Deduction

9.5.1 Equitable Earth quantifies an uncertainty deduction for a given monitoring period to account for uncertainty associated with baseline emissions, project emissions from forest biomass loss and project activities, and activity-shifting leakage emissions (E.22). The uncertainty deduction is derived from the Monte Carlo simulation.

$$E_{D}^{[m]} = U_{0.05}\,(E_{B\,AUDD}^{[m]} - E_{PE}^{[m]} - E_{L\,AS}^{[m]}) \qquad \textbf{(E.22)}$$

Where:

- $E_{D}^{[m]}$ = Uncertainty deduction for the monitoring period $[m]$; tCO_2e
- $U_{0.05}$ = Uncertainty deduction factor expressed as the difference between the mean of variable X and the 5th percentile value of the Monte Carlo distribution; dimensionless
- $E_{B\,AUDD}^{[m]}$ = Project AUDD baseline emissions for the monitoring period $[m]$; tCO_2e
- $E_{PE}^{[m]}$ = Total project emissions for the monitoring period $[m]$; tCO_2e
- $E_{L\,AS}^{[m]}$ = Total emissions from activity-shifting leakage for the monitoring period $[m]$; tCO_2e

9.6 Quantifying Gross Emission Reductions (GERs)

9.6.1 Equitable Earth quantifies gross emission reductions (GERs) for a given monitoring period using equation (E.23).

Quantified GERs must be rounded down to the nearest whole number as a conservative measure.

$$E_{GER\,ER}^{[m]} = E_{B\,AUDD}^{[m]} - E_{PE}^{[m]} - E_{L\,AS}^{[m]} - E_{D}^{[m]} \quad \textbf{(E.23)}$$

Where:

- $E_{GER\,ER}^{[m]}$ = Total gross emission reductions for the monitoring period $[m]$; tCO_2e
- $E_{B\,AUDD}^{[m]}$ = Project AUDD baseline emissions for the monitoring period $[m]$; tCO_2e
- $E_{PE}^{[m]}$ = Total project emissions for the monitoring period $[m]$; tCO_2e
- $E_{L\,AS}^{[m]}$ = Total emissions from activity-shifting leakage for the monitoring period $[m]$; tCO_2e
- $E_{D}^{[m]}$ = Uncertainty deduction for the monitoring period $[m]$; tCO_2e

9.7 Quantifying Net Emission Reductions (NERs)

9.7.1 Equitable Earth quantifies total net emission reductions (NERs) from AUDD activities for a given monitoring period by subtracting the buffer pool contribution from the GERs, in accordance with equation (E.24).

$$E_{NER\,ER}^{[m]} = E_{GER\,ER}^{[m]} - E_{BA\,ER}^{[m]} \quad \textbf{(E.24)}$$

Where:

- $E^{[m]}_{NER\,ER}$ = Total net emission reductions for the monitoring period $[m]$; tCO_2e
- $E^{[m]}_{GER\,ER}$ = Total gross emission reductions for the monitoring period $[m]$; tCO_2e
- $E^{[m]}_{BA\,ER}$ = Buffer pool contribution; tCO_2e

9.7.1.1 In the context of this methodology, ECUs represent NERs from AUDD activities after all deductions.

10 Monitoring, Reporting, and Verification (MRV)

10.1 Monitoring

Monitoring by Equitable Earth

10.1.1 Equitable Earth monitors and periodically re-evaluates the AUDD project baseline for each project in accordance with the BVP.

10.1.2 Equitable Earth monitors biomass carbon stock losses within the project crediting area for each monitoring period using remote sensing. These calculations account for emissions from deforestation and degradation.

10.1.3 Equitable Earth monitors project activity emissions within the project area and project crediting area, if emissions are material.

Monitoring by Developers

10.1.4 Developers must establish a monitoring plan and are responsible for monitoring all the parameters defined in *Appendix D* of this methodology and in conformance to requirements established in the Equitable Earth Standard and the Programme Manual.

10.1.5 In addition, developers must annually and/or periodically monitor all relevant metrics, parameters, and indicators related to:

1) Material project activity emissions, as specified in the sections *Materiality Assessment* and *Quantifying Emissions from Project Activities* in this methodology.

2) Project activities and interventions, as set out in the sections *Ecological Condition* and *Livelihoods* of this methodology, and adhering to the *Theory of Change* requirements defined in the Equitable Earth Standard.

10.2 Reporting

Reporting by Equitable Earth

10.2.1 Equitable Earth uses the parameters in *Appendix D* to compile a GHG Monitoring Report that consolidates the results of the net GHG reductions achieved during the verification period. Refer to the *Monitoring, Reporting, and Verification (MRV) Requirements* section in the Equitable Earth Standard for more details.

Reporting by Developers

10.2.2 Developers must complete the Annual Report, reporting on all relevant metrics, parameters, and indicators and consolidating the activities undertaken over the last 12 months.

10.2.3 Developers must report required data inputs for planned project activities during the feasibility and/or design phases in order for Equitable Earth to determine the materiality of emissions. Refer to the *Materiality Assessment* section in this methodology for more details.

10.2.4 If emissions from project activities are material, developers must report the required data inputs in the Annual Report and Monitoring Report. Refer to the *Materiality Assessment* section in this methodology for more details.

10.2.5 Developers must complete the Monitoring Report, reporting on all relevant metrics, parameters, and indicators and the implementation status of project interventions and activities, before each verification. Refer to the Equitable Earth Standard and the Programme Manual for more details.

Adaptive Management

10.2.6 Developers must update the Project Design Document every five years after the registration date. More information about adaptive management can be found in the Programme Manual.

Appendix A: Documentation History

Table A: Methodology version history.

Version	Date	Description
v0.1	21/08/2025	Version for public consultation
v1.0	13/11/2025	Public release of version 1.0 of M002 - Methodology for Terrestrial Forest Conservation
v1.0.1	18/12/2025	Minor corrections and revisions to align with the Baseline Setting Module published on 18/12/2025
v1.0.2	31/03/2026	Minor corrections and revisions to Eligibility, Additionality and Quantification of Project Activity Emissions sections

Appendix B: Default AGB/BGB Ratios

This appendix provides a summary table of the default AGB/BGB ratios from Table 4.4 of the 2019 IPCC Guidelines for National GHG Inventories is provided below (Table B). For domains, ecological zones, or continents not shown here, refer to the IPCC document for the complete table of values.[19]

Table B: Summary of default AGB/BGB ratios.

Domain	**Ecological zone**	**Continent**	**Origin** (Natural/ Plantation)	**Above-ground biomass** (tonnes ha^{-1})	**R** [tonne root d.m. (tonne shoot d.m.)$^{-1}$]
Tropical	Tropical Rainforest	Africa	Natural	≤ 125	0.825
			Natural	>125	0.532
		North and South America	Natural	≤ 125	0.221
			Planted	≤ 125	0.170
			Natural	>125	0.221
			Planted	>125	0.170
		Asia	Natural	≤ 125	0.207
			Planted	≤ 125	0.325
			Natural	>125	0.212
	Tropical Moist	Africa	Natural	>125	0.232
			Natural	≤ 125	0.232
		North and South America	Natural	>125	0.2845
			Natural	≤ 125	0.284
		Asia	Natural	>125	0.323
			Natural	≤ 125	0.246
	Tropical Dry	Africa	Natural	>125	0.332
			Natural	≤ 125	0.379

[19] Domke, G., Brandon, A., Diaz-Lasco, R., Federici, S., Garcia-Apaza, E., Grassi, G., Gschwantner, T., Herold, M., Hirata, Y., Kasimir, Å., Kinyanjui, M. J., Krisnawati, H., Lehtonen, A., Malimbwi, R. E., Niinistö, S., Ogle, S. M., Paul, T., Ravindranath, N. H., Rock, J., Sanquetta, C. R., Sanz Sanchez, M. J., Vitullo, M., Wakelin, S. J., and Zhu, J. (2019) '2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.' Volume 4: Agriculture, Forestry and Other Land Use, Chapter 4: Forest Land, Table 4.4, pp. 4.18–4.21. Available at: URL (Accessed 12/11/2025).

Domain	**Ecological zone**	**Continent**	**Origin** (Natural/ Plantation)	**Above-ground biomass** (tonnes ha^{-1})	**R** [tonne root d.m. (tonne shoot d.m.)$^{-1}$]
		North and South America	Natural	>125	0.334
			Natural	≤ 125	0.379
		Asia	Natural	>125	0.440
			Natural	≤ 125	0.379
	Tropical Mountain	North and South America	Natural	≤ 125	0.348
			Planted	≤ 125	0.205
			Natural	>125	0.283
		Asia	Natural	≤ 125	0.322
			Natural	>125	0.345

Appendix C: Livestock Grazing Emissions

This appendix describes methods for collecting and using data required for quantifying emissions from livestock grazing.

Emissions from livestock grazing are calculated by:

1) Determining the livestock population present; and
2) Applying the relevant default emission factors from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Livestock Sampling

To determine the average number of livestock heads being grazed, developers must:

1) Conduct a direct headcount of each livestock species, where possible
2) Ensure that population numbers reflect any changes over 12 months, including births and deaths
3) Where direct counting is not feasible, developers may use sampling methods that can be reliably extrapolated to the entire population.

Once livestock numbers are established, Equitable Earth applies the relevant emission factors provided in the following tables to estimate annual CH_4 emissions.

Livestock Emission Factors

Emission factors used to quantify emissions from livestock grazing are presented below (Tables C1–C2).

Table C1: IPCC default emission factors for livestock by country development status (kg CH_4 $head^{-1}$ yr^{-1}).[20]

Livestock	Developed countries	Developing countries
Buffalo	55	55
Sheep	8	5
Goats	5	5
Camels	46	46
Horses	18	18
Mules and Donkeys	10	10
Deer	20	20
Alpacas	8	8
Swine	1.5	1

[20] Eggleston, H. S., Buendia, L., Miwa, K., Ngara, T., and Tanabe, K. (2006) 'IPCC Guidelines for National Greenhouse Gas Inventories.' Volume 4: Agriculture, Forestry and Other Land Use, Chapter 10: Emissions from Livestock and Manure Management, Table 10.10, p. 10.28. Available at: URL (Accessed 17/12/2025).

Table C2: IPCC default emission factors for cattle by region and category (kg CH_4 $head^{-1}$ yr^{-1}).[21]

Region	Cattle Category	Emission factor
North America	Dairy	128
	Other cattle	53
Western Europe	Dairy	117
	Other cattle	57
Eastern Europe	Dairy	99
	Other cattle	58
Oceania	Dairy	100
	Other cattle	60
Latin America	Dairy	72
	Other cattle	56
Asia	Dairy	68
	Other cattle	47
Africa and the Middle East	Dairy	46
	Other cattle	31
Indian subcontinent	Dairy	58
	Other cattle	27

[21] Eggleston, H. S., Buendia, L., Miwa, K., Ngara, T., and Tanabe, K. (2006) 'IPCC Guidelines for National Greenhouse Gas Inventories.' Volume 4: Agriculture, Forestry and Other Land Use, Chapter 10: Emissions from Livestock and Manure Management, Table 10.11, p. 10.29. Available at: URL (Accessed 17/12/2025).

Appendix D: GHG Parameters

Parameters Available at Validation

Table D1: GHG parameters available at validation for Equitable Earth and developers.

Data/Parameter	**AGB**
Unit	tDM/ha
Description	Annual AGB stock. Earth-observation-based AGB stock data per pixel, provided as an annual time series. Primary input for JRL calculation and risk model
Equation(s)	E.5, E.6, E.10
Source of data	AGB provider
Value(s) applied	Project-specific
QA/QC	Equitable Earth conducted a comprehensive benchmark exercise to select the highest-performing AGB provider. Data performance tests are continuously conducted by both Equitable Earth and the provider to ensure high data accuracy. Equitable Earth continues to evaluate alternative providers fit for purpose. In addition, Equitable Earth performs different site-level quality controls: • A series of automated tests within the pipeline that detect anomalies (e.g., impossible values) • A visual review of possible artefacts, such as climatic or Bidirectional Reflectance Distribution Function (BRDF) effects and, if required, verifying data with high-resolution imagery

Data/Parameter	$\mathbf{SE}_{pixel}$
Unit	tDM
Description	Standard error from the AGB provider for each pixel. Used in the propagation of input uncertainty through the risk model
Equation(s)	N/A
Source of data	AGB provider
Value(s) applied	Project-specific
QA/QC	Refer to *QA/QC* for parameter **AGB**

Data/Parameter	ϱ
Unit	Dimensionless
Description	Spatial correlation factor between pixels in the Monte Carlo perturbation field. Controls the balance between global and local noise in uncertainty simulation
Equation(s)	E.3
Source of data	AGB provider
Value(s) applied	0.01
QA/QC	Value provided as part of the AGB provider's model and access via a secure API. Equitable Earth retains documentation of the AGB provider's methodological specifications, including the correlation factor, and conducts regular reviews to verify whether updates or methodological improvements have occurred

Data/Parameter	**RS**
Unit	Dimensionless
Description	IPCC default root-to-shoot ratios used to estimate below-ground biomass (BGB) from AGB, by domain, ecological zone, continent, origin, and biomass class
Equation(s)	E.5
Source of data	IPCC 2019 Guidelines for National GHG Inventories
Value(s) applied	Region-specific and AGB-dependent (Appendix B)
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	**CF**
Unit	tC/tDM
Description	Carbon fraction default value used to convert dry biomass into carbon mass
Equation(s)	E.7, E.12
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories

Value(s) applied	0.47
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	**CO_2 conversion factor**
Unit	Dimensionless
Description	Default value. Ratio of the molecular mass of CO_2 (44) to the atomic mass of carbon (12). Converts carbon mass to CO_2 mass
Equation(s)	E.7, E.12
Source of data	IPCC 2021 AR6 WGIII Annex II (Definitions, Units and Conventions)
Value(s) applied	$\frac{44}{12}$
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$AGB_{burn,\,i}$
Unit	tDM
Description	Mass of AGB burnt for fire event *i* as part of project activities
Equation(s)	E.10, E.12, E.13
Source of data	Equitable Earth
Value(s) applied	Refer to *Value(s) applied* for parameter **AGB**
QA/QC	Equitable Earth attributes the mass of AGB burnt to project activities by matching the developer's prescribed fire events (as per their fire management strategy) with both the burnt area boundaries provided by developers and the remotely-sensed AGB data provided by the AGB provider.

Data/Parameter	$A_{burn,\,i}$
Unit	ha
Description	Estimated burnt area for the fire event *i* as part of project activities in

	the baseline validity period. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities and assess their materiality
Equation(s)	E.10
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Equitable Earth visually validates the burnt area(s) using GIS tools and satellite data.

Data/Parameter	$n[m]$
Unit	Dimensionless
Description	Estimated number of fire events occurring in the baseline validity period. Equitable Earth uses the inputs reported by the developer (i.e., start and end dates for each expected fire event) to quantify emissions from project activities and assess their materiality
Equation(s)	E.12, E.13
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Equitable Earth validates the reported number of prescribed fire events against the fire management strategy.

Data/Parameter	$\mathbf{G}_{ef,g}$
Unit	gGHG/kgDM
Description	Emission factor of dry matter burnt per gas g
Equation(s)	E.13
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2, Table 2.5
Value(s) applied	GHG dependent
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$f_{LS,i}$
Unit	kg CH_4 $head^{-1}$ yr^{-1}
Description	Methane emission factor for livestock species/category *i*
Equation(s)	E.14
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	Dependent on livestock category, country development status, and region (for cattle)
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$n_{LS,i,y}$
Unit	Dimensionless
Description	Estimated annual average number of head of livestock species/category *i* for each year y in the baseline validity period. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities and assess their materiality
Equation(s)	E.14
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Equitable Earth applies evidence and plausibility screens by validating reported headcounts against annual records provided by the developer and requiring additional supporting documentation for large year-to-year changes.

Data/Parameter	**GWP_g**
Unit	Dimensionless
Description	Global warming potential per GHG *g* for a 100-year time horizon
Equation(s)	E.13, E.14, E.16, E.19, E.20
Source of data	IPCC's Sixth Assessment Report (AR6)
Value(s) applied	GHG dependent. Default values applied by Equitable Earth are defined under the *Principles* section of the Equitable Earth Standard
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are

	regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{EF}_{Ndirect}$
Unit	tN_2O-N/tN applied
Description	Default emission factor for direct N_2O emissions from N inputs, applied under this methodology to synthetic N fertiliser N inputs only
Equation(s)	E.16
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.1
Value(s) applied	0.03 The IPCC applies a default value of 0.01 with an uncertainty range of 0.003 - 0.03. Due to a lack of scalable field data on a per-project basis in this version of the methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	**N_2O conversion factor (N_2O–N to N_2O)**
Unit	Dimensionless
Description	Default value. Ratio of the molecular mass of N_2O (44) to the mass of nitrogen in N_2O (28). Converts N_2O–N to N_2O.
Equation(s)	E.16, E.19, E.20
Source of data	2019 IPCC Refinement to the 2006 Guidelines, Volume 4, Chapter 11
Value(s) applied	$\frac{44}{28}$
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{M}_{SF,y}$

Unit	t fertiliser
Description	Estimated mass of N-containing synthetic fertiliser to be applied in the project area and project crediting area for each year *y* in the baseline validity period. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities and assess their materiality
Equation(s)	E.17
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	The developer confirms the veracity of all information stated in the PDD and provides documentation (invoices, application details) for the purchase and planned application of fertilisers.

Data/Parameter	$C_{SF,y}$
Unit	tN/t fertiliser
Description	The estimated N content of synthetic fertiliser to be applied in the project area and project crediting area for each year *y* in the baseline validity period. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities and assess their materiality
Equation(s)	E.17
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Developer monitors for any manufacturer updates regarding the N-containing synthetic fertiliser applied

Data/Parameter	F_{SFvol}
Unit	(kg NH_3–N + NO_x–N)/(kgN applied)
Description	Fraction of all synthetic nitrogen added to soils, volatilising as NH_3 and NO_x
Equation(s)	E.19

Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.3 The IPCC applies a default value of 0.10 with an uncertainty range of 0.03 - 0.3. Due to a lack of scalable field data on a per-project basis in this version of the Quantification Methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{EF}_{Nv}$
Unit	kg N_2O–N/(kg NH_3–N + NO_x–N volatilised)
Description	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces
Equation(s)	E.19
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.05 The IPCC applies a default value of 0.010 with an uncertainty range of 0.002 - 0.05. Due to a lack of scalable field data on a per-project basis in this version of the quantification methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{F}_{Fleach}$
Unit	kgN/(kg of N additions)
Description	Fraction of synthetic nitrogen added to soil lost through leaching and/or runoff

Equation(s)	E.20
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.8 The IPCC applies a default value of 0.30 with an uncertainty range of 0.1 - 0.8. Due to a lack of scalable field data on a per-project basis in this version of the methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{EF}_{Nl}$
Unit	kg N_2O–N/(kg N leaching/runoff)
Description	Emission factor for N_2O emissions from N leaching and/or runoff
Equation(s)	E.20
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.025 The IPCC applies a default value of 0.0075 with an uncertainty range of 0.0005 - 0.025. Due to a lack of scalable field data on a per-project basis in this version of the methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	LF
Unit	Dimensionless
Description	Activity-shifting leakage default factor. It is applied as a fixed proportion of the estimated avoided forest-loss emissions to be generated during the baseline validity period
Equation(s)	E.21

Source of data	Equitable Earth
Value(s) applied	0.1
QA/QC	The value applied is a conservative default supported by Equitable Earth's global analysis of REDD+ projects (76 projects; 532 monitoring-years, 2003–2023), which found typical activity-shifting leakage well below 10% across regions and methodologies

Monitored Parameters

Table D2: Monitored GHG parameters for Equitable Earth and developers.

Data/Parameter	**AGB**
Unit	tDM/ha
Description	Annual AGB stock. Earth-observation-based AGB stock data per pixel, provided as an annual time series. Primary input for JRL calculation and risk model
Equation(s)	E.5, E.6, E.10
Source of data	AGB provider
Value(s) applied	Considering the AGB provider publishes yearly data for AGB density around mid-year for the previous year, Equitable Earth uses: • The *y*-2 data as the baseline for projects undergoing certification from January 1st to June 30th (included) of year *y*. • The *y*-1 data as the baseline for projects undergoing certification (or expected to start) from July 1st to December 31st (included) of year *y*. • The *y*-1 data is the baseline for projects having a start date in year *y* when pre-submission activities have been declared
QA/QC	Equitable Earth conducted a comprehensive benchmark exercise to select the highest-performing AGB provider. Data performance tests are continuously conducted by both Equitable Earth and the provider to ensure high data accuracy. Equitable Earth continues to evaluate alternative providers fit for purpose. In addition, Equitable Earth performs different site-level quality controls: • A series of automated tests within the pipeline that detect anomalies (e.g., impossible values). • A visual review of possible artefacts, such as climatic or Bidirectional Reflectance Distribution Function (BRDF) effects, and, if required, verifying data with high-resolution imagery

Data/Parameter	SE_{pixel}
Unit	tDM
Description	Standard error from the AGB provider for each pixel. Used in the propagation of input uncertainty through the risk model.
Equation(s)	N/A
Source of data	AGB provider
Value(s) applied	Project-specific

QA/QC	Refer to QA/QC of **AGB**

Data/Parameter	**RS**
Unit	Dimensionless
Description	IPCC default root-to-shoot ratios used to estimate below-ground biomass (BGB) from AGB, by domain, ecological zone, continent, origin, and biomass class
Equation(s)	E.5
Source of data	IPCC 2019 Guidelines for National GHG Inventories
Value(s) applied	Region-specific and AGB-dependent (Appendix B)
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	**CF**
Unit	tC/tDM
Description	Carbon fraction default value used to convert dry biomass into carbon mass
Equation(s)	E.7, E.12
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.47
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	**CO_2 conversion factor**
Unit	Dimensionless
Description	Default value. Ratio of the molecular mass of CO_2 (44) to the atomic mass of carbon (12). Converts carbon mass to CO_2 mass
Equation(s)	E.7, E.12
Source of data	IPCC 2021 AR6 WGIII Annex II (Definitions, Units and Conventions)

Value(s) applied	$\frac{44}{12}$
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$AGB_{burn,\,i}$
Unit	tDM
Description	Mass of AGB burnt for fire event *i* as part of project activities that occurred in the monitoring period $[m]$
Equation(s)	E.10, E.12, E.13
Source of data	Equitable Earth
Value(s) applied	Refer to *Value(s) applied* for parameter **AGB**
QA/QC	Equitable Earth attributes the mass of AGB burnt to project activities by matching the developer's prescribed fire events (as per their fire management strategy) with both the burnt area boundaries provided by developers and the remotely-sensed AGB data provided by the AGB provider.

Data/Parameter	$A_{burn,\,i}$
Unit	ha
Description	Burnt area for fire event *i* as part of project activities that occurred in the monitoring period $[m]$. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities. This parameter is only reported where project activity emissions are material
Equation(s)	E.10
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Equitable Earth visually validates the burnt area(s) using GIS tools and satellite data.

Data/Parameter	ΔAGB_{i}

Unit	tDM/ha
Description	Mean AGB loss due to a prescribed fire event as part of project activities. Calculated as the difference between biomass stocks before and after the fire event within the burnt area delineated by the developer and bounded by the event start and end dates. AGB data is sourced from the AGB provider
Equation(s)	E.10
Source of data	Equitable Earth
Value(s) applied	Refer to *Value(s) applied* for parameter **AGB**
QA/QC	Equitable Earth attributes the amount of AGB burnt to project activities by matching the developer's prescribed fire events (as per their fire management strategy) with both the burnt area boundaries provided by developers and the remotely-sensed AGB data provided by the AGB provider.

Data/Parameter	$n[m]$
Unit	Dimensionless
Description	Total number of fire events that occurred in the monitoring period $[m]$. Equitable Earth uses the inputs reported by the developer (i.e., start and end dates for each fire event) to quantify emissions from project activities. This parameter is only reported where project activity emissions are material
Equation(s)	E.12, E.13
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Equitable Earth validates the reported number of prescribed fire events against the fire management strategy.

Data/Parameter	$\mathbf{G}_{ef,g}$
Unit	gGHG/kgDM
Description	Emission factor of dry matter burnt per gas g
Equation(s)	E.13
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2, Table 2.5

Value(s) applied	GHG dependent
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$f_{LS,i}$
Unit	kg CH_4 $head^{-1}$ yr^{-1}
Description	Methane emission factor for livestock species/category *i*
Equation(s)	E.14
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	Dependent on livestock category, country development status, and region (for cattle)
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$n_{LS,i,y}$
Unit	Dimensionless
Description	Annual average number of head of livestock species/category *i* for each year y in the monitoring period $[m]$. . Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities. This parameter is only reported where project activity emissions are material
Equation(s)	E.14
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Equitable Earth applies evidence and plausibility screens by validating reported headcounts against annual records provided by the developer and requiring additional supporting documentation for large year-to-year changes.

Data/Parameter	**GWP_g**
Unit	Dimensionless

Description	Global warming potential per GHG *g* for a 100-year time horizon
Equation(s)	E.13, E.14, E.16, E.19, E.20
Source of data	IPCC's Sixth Assessment Report (AR6)
Value(s) applied	GHG dependent. Default values applied by Equitable Earth are defined under the *Principles* section of the Equitable Earth Standard
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{EF}_{Ndirect}$
Unit	tN_2O-N/tN applied
Description	Default emission factor for direct N_2O emissions from N inputs, applied under this methodology to synthetic N fertiliser N inputs only
Equation(s)	E.16
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.1
Value(s) applied	0.03 The IPCC applies a default value of 0.01 with an uncertainty range of 0.003 - 0.03. Due to a lack of scalable field data on a per-project basis in this version of the methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	**N_2O conversion factor (N_2O–N to N_2O)**
Unit	Dimensionless
Description	Default value. Ratio of the molecular mass of N_2O (44) to the mass of nitrogen in N_2O (28). Converts N_2O–N to N_2O.
Equation(s)	E.16, E.19, E.20
Source of data	2019 IPCC Refinement to the 2006 Guidelines, Volume 4, Chapter 11
Value(s) applied	$\frac{44}{28}$

QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$M_{SF,y}$
Unit	t fertiliser
Description	Mass of N-containing synthetic fertiliser applied in the project area and project crediting area for each year *y* within the monitoring period $[m]$. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities. This parameter is only reported where project activity emissions are material
Equation(s)	E.17
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	The developer confirms the veracity of all information stated in the PDD and provides documentation (invoices, application details) for the purchase and planned application of fertilisers.

Data/Parameter	$C_{SF,y}$
Unit	tN/t fertiliser
Description	The content of synthetic fertiliser applied in the project area and project crediting area for each year *y* within the monitoring period $[m]$. Equitable Earth uses the inputs reported by the developer to quantify emissions from project activities. This parameter is only reported where project activity emissions are material
Equation(s)	E.17
Source of data	Developer
Value(s) applied	Project-specific
QA/QC	Developer monitors for any manufacturer updates regarding the N-containing synthetic fertiliser applied

Data/Parameter	F_{SFvol}

Unit	(kg NH_3–N + NO_x–N)/(kgN applied)
Description	Fraction of all synthetic nitrogen added to soils, volatilising as NH_3 and NO_x
Equation(s)	E.19
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.3 The IPCC applies a default value of 0.10 with an uncertainty range of 0.03 - 0.3. Due to a lack of scalable field data on a per-project basis in this version of the Quantification Methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	$\mathbf{EF}_{Nv}$
Unit	kg N_2O–N/(kg NH_3–N + NO_x–N volatilised)
Description	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces
Equation(s)	E.19
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.05 The IPCC applies a default value of 0.010 with an uncertainty range of 0.002 - 0.05. Due to a lack of scalable field data on a per-project basis in this version of the quantification methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	F_{Fleach}
Unit	kgN/(kg of N additions)
Description	Fraction of synthetic nitrogen added to soil lost through leaching and/or runoff
Equation(s)	E.20
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.8 The IPCC applies a default value of 0.30 with an uncertainty range of 0.1 - 0.8. Due to a lack of scalable field data on a per-project basis in this version of the methodology, Equitable Earth, applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	EF_{Nl}
Unit	kg N_2O–N/(kg N leaching/runoff)
Description	Emission factor for N_2O emissions from N leaching and/or runoff
Equation(s)	E.20
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11, Table 11.3
Value(s) applied	0.025 The IPCC applies a default value of 0.0075 with an uncertainty range of 0.0005 - 0.025. Due to a lack of scalable field data on a per-project basis in this version of the methodology, Equitable Earth applies the most conservative value
QA/QC	Reputable source approved by Equitable Earth. IPCC updates are regularly checked, and applicable changes are integrated in new versions of the Equitable Earth Programme and/or relevant methodologies

Data/Parameter	LF
Unit	Dimensionless
Description	Activity-shifting leakage default factor. It is applied to all projects as a fixed proportion of the total avoided forest-loss emissions generated during the monitoring period $[m]$
Equation(s)	E.21
Source of data	Equitable Earth
Value(s) applied	0.1
QA/QC	The value applied is a conservative default supported by Equitable Earth's global analysis of REDD+ projects (76 projects; 532 monitoring-years, 2003–2023), which found typical activity-shifting leakage well below 10% across regions and methodologies

Data/Parameter	$U_{0.05}$
Unit	Dimensionless
Description	Uncertainty deduction factor expressed as the difference between the mean of variable *X* and the 5th percentile value of the Monte Carlo distribution. Variable *X* includes, and it is applied to emissions from baseline, project emissions, and activity-shifting leakage
Equation(s)	E.22
Source of data	Equitable Earth
Value(s) applied	Project-specific
QA/QC	Equitable Earth implements QA/QC by quantifying uncertainty from the Monte Carlo simulation, ensuring that the number of ECUs issued meets a 95% confidence level


Equitable
Earth