REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION

Prepared by Tim Pearson (GreenCollar), Kevin Brown and Sarah Walker (Wildlife Conservation Society), Till Neeff, Simon Koenig (Climate Focus) and Verra

Title	Reducing Emissions from Deforestation and Forest Degradation
Version	0.7
Date of Issue	18 October 2023
Type	☒ New Methodology ☐ Methodology Revision
Sectoral Scope	14. Agriculture Forestry and Other Land Use (REDD)
Developer	Climate Focus on behalf of Verra
Contact Information	Salvador Sánchez-Colón, Manager, REDD+ Technical Innovation, scolon@verra.org

CONTENTS

1 SOURCES

This methodology is based on the VCS Jurisdictional and Nested REDD+ (JNR) Framework v4.0 and the following methodologies:

- *VM0006 Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects, v2.2*
- *VM0007 REDD+ Methodology Framework (REDD+MF), v1.6*
- *VM0009 Methodology for Avoided Ecosystem Conversion, v3.0*
- *VM0015 Methodology for Avoided Unplanned Deforestation, v1.1*
- *VM0037 Methodology for Implementation of REDD+ Activities in Landscapes Affected by Mosaic Deforestation and Degradation, v1.0*

This methodology uses the latest versions of the following modules and tools:

- Activity-type accounting modules:
  - *MD0055 Estimation of Emissions Reductions from Avoiding Unplanned Deforestation (AUDef)*
  - Other activity-type accounting modules covering planned deforestation and unplanned degradation or other REDD activities not covered in *AUDef* (e.g., Avoiding Planned Deforestation, APDef, and Avoiding Unplanned Forest Degradation, AUDef)
- Tools:
  - VCS *AFOLU Non-Permanence Risk Tool*
  - VCS *VT0001 Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities*
  - CDM *Methodological Tool: Estimation of Direct N_2O Emission from Nitrogen Fertilization (E-NA)*

This methodology uses the estimation procedures described in the following modules for estimating carbon stocks in relevant pools, leakage, direct emissions, and monitoring:[1][2]

- Carbon pool modules:
  - *VMD0001 Estimation of Carbon Stocks in the Above- and Belowground Biomass in Live Tree and Non-tree Pools (CP-AB)*
  - *VMD0002 Estimation of Carbon Stocks in the Dead-wood Pool (CP-D)*
  - *VMD0003 Estimation of Carbon Stocks in the Litter Pool (CP-L)*
  - *VMD0004 Estimation of Carbon Stocks in the Soil Organic Carbon Pool (CP-S)*
  - *VMD0005 Estimation of Carbon Stocks in the Long-term Wood Products Pool (CP-W)*
- Leakage module:
  - *VMD0011 Estimation of Emissions from Market-Effects (LK-ME)*
- Emissions modules (applicable to baseline, project scenario and leakage):
  - *VMD0013 Estimation of Greenhouse Gas Emissions from Biomass and Peat Burning (E–BPB)*
  - *VMD0014 Estimation of Emissions from Fossil Fuel Combustion (E-FFC)*
  - *VMD0016 Methods for Stratification of the Project Area (X-STR)*
- Monitoring module:
  - *VMD0015 Methods for Monitoring Greenhouse Gas Emissions and Removals (M-REDD)*

[1] These modules are currently associated with *VM0007 REDD+ Methodology Framework (REDD+MF)*. The modules used by this methodology (and others) will soon be updated to remove references to VM0007; until then, those references should be ignored by users of this methodology.

[2] Where these modules refer to external documents (e.g., IPCC guidelines), the most recent version of the document should be used.

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

Additionality and Crediting Method	
Additionality	Project Method
Crediting Baseline	Project Method

This methodology framework document, together with the modules and tools it calls upon, constitutes a complete REDD methodology. The project proponent must justify their choice of modules in the project description.

The modules and tools referenced in this document apply to project activities that reduce emissions from unplanned deforestation (UDef). In future iterations, additional modules will be added to address activities that reduce emissions from planned deforestation (PDef) and unplanned forest degradation (UDeg). For avoiding planned forest degradation, see the improved forest management category of methodologies.

The reference to this methodology and the modules used to construct the project-specific methodology must be given in the project description.

Table 1 lists the modules and tools, indicating where the use of modules/tools is mandatory, optional or not applicable. Appendix 1 of this methodology must be used to justify the omission of carbon pools and emission sources.

Table 1: Determination of where module/tool use is mandatory (M) or optional (O) for all project activities covered by this methodology

	Project activities		
Module/Tool	*UDef*	*PDef*	*UDeg*
AUDef	M	O	O
APDef	O	M	O
AUDeg	O	O	M
AFOLU Non-Permanence Risk Tool	M	TBD	TBD

	Project activities		
Module/Tool	*UDef*	*PDef*	*UDeg*
X-STR	M	TBD	TBD
LK-ME	(m)[1]	TBD	TBD
CP-AB	M	TBD	TBD
CP-D	(m)[2]	TBD	TBD
CP-L	O	TBD	TBD
CP-S	O	TBD	TBD
CP-W	(m)[1]	TBD	TBD
E-BPB	M	TBD	TBD
E-FFC	O	TBD	TBD
E-NA	(m)[3]	TBD	TBD

TABLE NOTES:

AUDef	*MD0OXX Estimation of Emissions from Avoiding Unplanned Deforestation*
APDef	*MD0OXX Estimation of Emissions from Avoiding Planned Deforestation (under development)*
AUDeg	*MD0OXX Estimation of Emissions from Avoiding Unplanned Forest Degradation (under development)*
M	Fully mandatory for the given project activity (i.e., the indicated modules and tools must be used)
O	Fully optional for the given project activity (i.e., the indicated pools and sources may be included or excluded as decided by the project, but where they are included in the baseline, they must also be included in the project scenario)
(m)[1]	Mandatory for the given project activity where the process of deforestation involves timber harvesting, fuel wood collection and/or charcoal production for commercial markets
(m)[2]	Mandatory for the given project activity where this carbon pool is greater in baseline (post-deforestation/degradation) than project scenario and significant; otherwise may be conservatively omitted
(m)[3]	Mandatory for the given project activity where leakage prevention activities include increases in the use of fertilizers

3 DEFINITIONS

3.1 Definitions

In addition to the definitions set out in the VCS Program document *Program Definitions* and additional definitions in specific modules, the following definitions apply to this methodology and any of the modules used with it.

Activity data (AD)
Data on the magnitude of a human activity resulting in emissions or removals taking place during a given period of time

Baseline validity period (BVP)
The period of time a baseline is considered valid, as set out in the *VCS Standard*

Forest (For)
In addition to the definition set out in the *VCS Program Definitions* and the requirements of the *VCS Methodology Requirements*, for this methodology "forest" must include woody vegetation with a canopy cover of between 10 and 30 percent, as used in the relevant country's international reporting to the UNFCCC, or as otherwise officially elected as an applicable definition for use by climate change mitigation projects and programs. Where a country's national forest definition excludes specific land use/land management types and/or vegetative classes, stratification should identify these areas to enable future inclusion/exclusion in nested accounting

Historical reference period (HRP)
A fixed period of time during which factors must be considered to make future projections of deforestation, as set out in the *VCS Methodology Requirements*

Mangrove forest
A subset of forests dominated by mangrove plant species (shrubs and trees that grow in coastal saline or brackish water)

Planned deforestation (PDef)
Deforestation on forest lands that are legally authorized and documented for conversion.

Unplanned deforestation (UDef)
Deforestation of degraded to mature forests not legally authorized and documented for conversion.

For definitions of VCS AFOLU project categories, refer to the *VCS Standard*.

3.2 Acronyms

AD Activity data

BVP Baseline validity period

CHC Change categories

DLF Displacement leakage factor

FSM Forest stratification map

HRP Historical reference period

LB Leakage belt

PA Project area

PAI Project activity instance

SF Stable forest

SNF Stable non-forest

SOC Soil organic carbon

SOP Standard operating procedures

UDef Unplanned deforestation

4 APPLICABILITY CONDITIONS

This methodology can only be used for eligible REDD projects and activities described in Sections A1.5-A1.9 of the *VCS Methodology Requirements*. The applicability conditions pertaining to each activity type are listed in the relevant accounting modules (listed in Table 1 above).

5 PROJECT BOUNDARY

Geographic boundaries related to project activities must be detailed in the project description. The project description should also set out the carbon pools that the project proponent will account for and the sources and associated types of greenhouse gas emissions that the project will affect.

5.1 Geographical Boundaries

The spatial boundaries of the project area must be clearly defined to facilitate accurate measuring, monitoring, accounting and verification of the project's emissions reductions and removals. The project activity may encompass more than one discrete area of land. When describing physical project boundaries, the following information must be provided for each discrete area:

1) Name of the project area (e.g., compartment number, allotment number, local name), giving a unique ID for each discrete parcel of land;

2) Map(s) of the area (in digital format);

3) Geographic coordinates of each polygon vertex along with the documentation of their accuracy (from a geo-referenced digital map – data must be provided in the format specified in the *VCS Standard*);

4) Total land area; and

5) Details of landholder and user rights.

The forested project area (within each discrete area of project activity) must be continuous without arbitrary exclusions of forests in the same geography (e.g., excluding forests next to villages around which deforestation is likely to occur).

The boundary of the REDD activity must be clearly delineated and defined and include only land qualifying as forest for a minimum of 10 years before the project start date.

Specific boundaries exist for specific activity types with REDD – details and requirements are provided in the appropriate accounting modules (e.g., *AUDef*).

For projects where multiple AFOLU project activities are being implemented within the project boundary, the discrete areas where each activity is implemented must be spatially delineated.

5.2 Carbon Pools

The carbon pools included in or excluded from the boundary of REDD project activities are shown in Table 2.

The selection of carbon pools and the appropriate justification must be presented in the project description.

Where REDD activities take place in wetlands, the project must account for expected emissions from the soil organic carbon pool or changes in the soil organic carbon pool in the project scenario unless deemed de minimis. The significance of pools must be determined by using the

Table 2: Carbon pools included in or excluded from the REDD project boundary

Pool	Included?	Justification/Explanation
Aboveground tree biomass	Included	Major carbon pool that will significantly decrease in the baseline scenario in the case of deforestation or forest degradation.
Belowground tree biomass	Included	Major carbon pool that will significantly decrease in the baseline scenario in the case of deforestation or forest degradation.
Aboveground non-tree biomass	Included	Must be included in the baseline (post deforestation carbon stocks) but may be conservatively excluded from forest carbon stocks
Belowground non-tree biomass	Optional	Potential emissions are negligible.
Dead wood	Optional	Conservative to exclude.
Litter	Optional	Conservative to exclude.
Soil organic carbon	Optional / Included	Non-Wetland Soils: Conservative to exclude. Wetland Soils: Major carbon pool that may significantly increase or decrease in both the baseline and project scenarios. Appendix 1 of this methodology must be used to determine significance.
Harvested wood products	Optional	May be excluded where timber harvest is negligible in the baseline case. Appendix 1 of this methodology must be used to determine significance.

5.3 Sources of GHG Emissions

The project must account for any significant increases in emissions of carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) relative to the baseline that are reasonably attributable to the project activity.

The GHG emission sources included in or excluded from the boundary of the REDD project activity are shown in Table 2. The selection of sources and the appropriate justification must be provided in the project description.

Procedures specified in Appendix 1 of this methodology must be used to determine whether an emissions source is significant. Where a source is included in estimating baseline emissions,[3] it must also be included in calculating project and leakage emissions.

Table 3: GHG sources included in or excluded from the REDD project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change.
		CH_4	Optional	Non-CO_2 gases emitted from woody biomass burning - it is conservative to exclude.
		N_2O	Optional	
	Combustion of fossil fuels	CO_2	Optional	May be excluded if determined negligible.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Excluded	Potential emissions are negligible.
	Use of fertilizers	CO_2	Excluded	Potential emissions are negligible.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Optional	May be excluded if determined negligible.
Project	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change.
		CH_4	Included	Non-CO_2 gases emitted from woody biomass burning - must be included where fire occurs.
		N_2O	Included	
	Combustion of fossil fuels	CO_2	Optional	Emissions associated with the combustion of fossil fuels due to leakage prevention activities are always considered insignificant. Emissions associated with other activities (e.g., monitoring, patrolling, etc.) must be demonstrated as negligible to be omitted.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Excluded	Potential emissions are negligible.

[3] For example, CH_4 or N_2O emissions from agriculture resulting from deforestation or fire to clear forest.

Source		Gas	Included?	Justification/Explanation
	Use of fertilizers	CO_2	Excluded	Potential emissions are negligible.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Optional	May be excluded where excluded from baseline accounting except when fertilizer use is increased through project activities (e.g., as a leakage avoidance mechanism).

6 BASELINE SCENARIO

6.1 Determination of the most plausible baseline scenario

Determination of the most plausible baseline scenario builds on the outcome of the additionality analysis and must be consistent with the description of the conditions prior to the project start date. The most plausible baseline scenario is determined following the below stepwise approach.

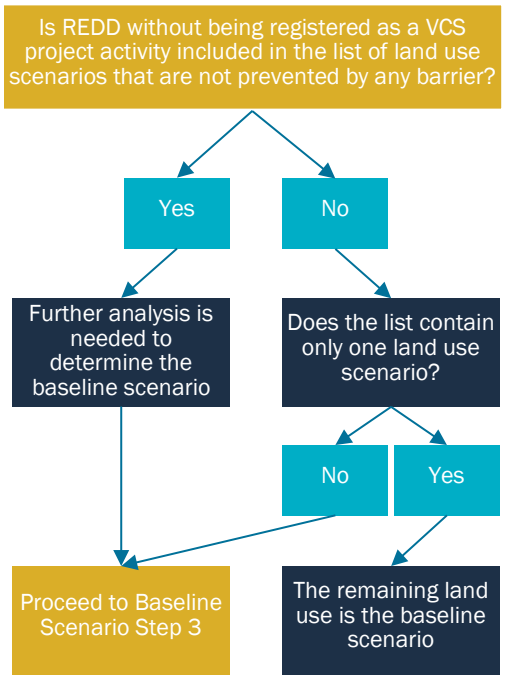
Step 1: Reuse the plausible alternative land use scenarios to the REDD project activity that have been listed as an outcome of Sub-step 1b of the additionality tool (VT0001).

Unless it has been demonstrated that any of these land use scenarios is not credible or do not comply with all mandatory applicable legislation and regulations as required by VT0001 Sub-step 1b, the list must at least include:

1) Continuation of the pre-project land use
2) Project activity on the land within the project boundary performed without being registered as a VCS REDD project, and
3) Activities similar to the proposed project activity on at least part of the land within the project boundary of the proposed REDD project.

Step 2a: If the project used the VT0001 barrier analysis to demonstrate additionality, apply decision tree in Figure 1 below to the list of all alternative land use scenarios that are not prevented by any barrier.

Figure 1. Barrier analysis decision tree



Step 2b: If the VT0001 investment analysis has been applied to demonstrate additionality and if at least one land use scenario generates financial benefits other than carbon revenues, select the baseline scenario as below:

1) If VT0001 Option I was used, the baseline scenario is the most economically or financially attractive land use scenario, i.e., the one that allows for the highest difference between incomes and costs over the crediting period.

2) If VT0001 Option II was used, the baseline scenario is the most attractive land use scenario, i.e., the scenario with the most favorable financial indicator (e.g., internal rate of return).

3) If VT0001 Option III was used and none of the alternative land use scenarios has a financial indicator that meets the benchmark, the baseline scenario is the continuation of the pre-project land use. If Option III has been used and at least one of the land use scenarios has financial indicator that meets the benchmark, the baseline scenario is the scenario that has the most favorable financial indicator (such as internal rate of return, net present value or cost benefit ratio).

Step 3: If the barrier analysis has been used to demonstrate additionality but doesn't allow to determine the baseline scenario, implement one of the following:

1) An investment analysis following VT0001 Option II or III (whether it has been used to demonstrate additionality or not). Select the most plausible baseline as specified in Step 2b above.

2) Through qualitative analysis, estimate the baseline GHG emissions for each alternative land use scenario that are not prevented by any barrier and select as the baseline, the land use scenario that allows for the lowest baseline GHG emissions. Estimates must be based on publicly available default factors and standards, such as the *IPCC 2006 Guidelines for National GHG Inventories* and its *2019 Refinements* or the *IPCC 2003 Good Practice Guidelines for LULUCF.* All other data used must be publicly available, and must come from recognized, credible sources, such as peer-reviewed literature.

Quantification of the GHG emissions under the selected baseline scenario must follow the applicable and relevant activity type module(s).

6.2 Projects implemented in jurisdictional REDD programs or where a government has established a REDD baseline

Projects that are implemented within a JNR-registered REDD program are eligible to use this methodology for activities included under the JNR REDD program but must nest projects according to the requirements of the hosting JNR-registered REDD program and the requirements set out in the VCS JNR framework.

REDD projects that are implemented within a non-JNR REDD jurisdictional program should also follow the relevant jurisdictional program's requirements (e.g., with respect to baseline, as set out in *AUDef*), but they must be registered and monitored under VCS following this methodology. Further clarification is set out in the relevant module(s).

If the baseline estimated using the activity data allocated to the project through this methodology is higher than the local government's baseline, a project proponent may elect to limit the amount of VCUs it issues to the amount that would be issued based on this lower baseline. If supported by local regulation, such limitation is mandatory.

6.3 Baseline validity

Baseline projections beyond the baseline validity period are not required for REDD project activities.

The project baseline must be reassessed per the *VCS Standard* and the requirement in the relevant module. The date of the next scheduled baseline reassessment must be specified in the project description.

7 ADDITIONALITY

Additionality of the project activities must be demonstrated using the most recent version of *VT0001 Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities.*

Project proponents must also demonstrate regulatory surplus in accordance with both the requirements on regulatory surplus set out in the latest version of the VCS Standard, and the rules and methods to assess and demonstrate regulatory surplus described in the latest version of the *VCS Methodology Requirements*.

In UNFCCC non-Annex I countries, when regulatory surplus is justified by the lack of systematic law enforcement, it must be demonstrated that enforcement of the law is out of control of the project proponent and other entities involved in the project. Such lack of control can be demonstrated by the barriers identified in Step 3 of VT0001.

8 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

8.1 Baseline Emissions

8.1.1 General Procedures

The same procedure for quantifying emissions and carbon stocks must be followed ex ante and ex post. For parameters monitored after project initiation, guidance is given in the parameter tables of the relevant modules for the values that must be used in ex ante calculations.

The baseline of the project activity is estimated ex ante. Ex ante baseline estimations are used in the ex ante and ex post estimation of net carbon stock changes and greenhouse gas emission reductions.

The relevant activity modules (e.g., *AUDef*) provide methods for estimating net baseline carbon stock changes and greenhouse gas emissions.

8.1.2 Baseline Reassessment and Transition to M0184

When projects have verified using VM0009 prior to their transition to M01848, they must follow the provisions set out in VM0009 to revise the baseline emission model (see Section 6.20 of VM0009, v3.0 or equivalent section in the most recent version of the methodology).

Where, after baseline reevaluation, the revised baseline emission model predicts fewer GHG emission reductions and removals than VCUs issued under the previous model, the project must discount this difference from the GHG emission reductions and removals verified against this M0184. The deduction can be distributed over several verification periods provided a deduction plan has been submitted to and approved by Verra.

Projects must describe the applicable calculations as a project description deviation in the first monitoring report submitted after transitioning to M0184. The VVB must assess the calculations and that a deduction plan, if relevant, has been approved by Verra.

8.2 Project Emissions

The same procedure must be followed ex ante and ex post. For parameters monitored after project initiation, guidance is given in the parameter tables of the relevant modules for ex ante calculations.

Methods for estimating net carbon stock changes and GHG emissions in the project scenario are provided in the relevant activity modules (e.g., *AUDef*).

8.3 Leakage

The relevant activity modules (e.g., *AUDef*) provide methods for estimating net carbon stock changes and GHG emissions due to activity shifting leakage.

The significance of leakage and carbon pools may be determined using Appendix 1 of this methodology. Where applicable, leakage due to market effects must be considered using *LK-ME*. Market effects must be considered where the project leads to a decrease in timber, fuelwood or charcoal production.

Where leakage prevention activities include tree planting, aquacultural intensification, agricultural intensification, fertilization, fodder production, other measures to enhance cropland and/or grazing land areas, leakage management zones or a combination of these, then any increase in GHG emissions associated with these activities must be accounted for, unless deemed de minimis, as determined using the procedures specified in Appendix 1 of this methodology .

Leakage prevention activities may lead to an increase in the combustion of fossil fuels; however, any increase in emissions because of the increased combustion of fossil fuels is considered insignificant.

Where leakage prevention leads to a significant increase in fertilizer use, module *E-NA* must be used. Appendix 1 of this methodology set out specific procedures to determine significance.

Leakage prevention may not include the flooding of agricultural lands (e.g., for new rice paddies) nor the creation of livestock feedlots or manure lagoons. Leakage prevention may also not include the drainage of peatland.

The list of leakage sources with appropriate justification must be presented.

Per the *VCS Standard,* projects must not account for positive leakage.

8.4 Net GHG Emission Reductions and Removals

The project proponent must present conservative ex ante estimations of the project activity's total net GHG emissions reductions.

Refer to the relevant accounting modules and the parameter tables within these modules for instructions on ex ante estimations of specific parameters.

8.4.1 Calculation of Verified Carbon Units

To calculate the number of Verified Carbon Units (VCUs) for the monitoring period $t = t_2 - t_1$, this methodology uses the following equation:

$$\boldsymbol{VCU_t = VCU_{AUDef} + VCU_{APDef} + VC_{AUDeg}} \quad (1)$$

Where:

VCU_t	=	Number of Verified Carbon Units at year $t = t_2 - t_1$ (VCU)
VCU_{AUDef}	=	Number of Verified Carbon Units from unplanned deforestation at year $t = t_2 - t_1$ (VCU)
VCU_{APDef}	=	Number of Verified Carbon Units from planned deforestation at year $t = t_2 - t_1$ (VCU)
VCU_{AUDeg}	=	Number of Verified Carbon Units from unplanned forest degradation at year $t = t_2 - t_1$ (VCU)

9 MONITORING

9.1 Data and Parameters Available at Validation

Relevant parameters are detailed within accounting and other source modules.

9.2 Data and Parameters Monitored

Relevant parameters are detailed within accounting and other source modules.

9.3 Description of the Monitoring Plan

9.3.1 Development of Monitoring Plan

General

The monitoring plan must address the following tasks:

- Monitoring of project implementation;
- Monitoring of actual carbon stock changes and greenhouse gas emissions;
- Monitoring of leakage carbon stock changes and greenhouse gas emissions; and
- Estimation of ex post net carbon stock changes and greenhouse gas emissions.

For each of these tasks, the monitoring plan must include the following information:

- Technical description of the monitoring task;
- Data to be collected (data and parameters to be collected must be listed in the project description);
- Overview of data collection procedures;
- Quality control and quality assurance procedures;
- Data archiving; and
- Organization and responsibilities of the parties involved in all of the above.

Uncertainty and Quality Management

As far as is practical, uncertainties related to the quantification of GHG emission reductions and removals by sinks should be reduced.

Uncertainties arising from input parameters would result in uncertainties in estimating baseline and project net GHG emissions – especially where global default factors are used. The project must identify critical parameters that would significantly influence the accuracy of estimates. Local values specific to the project circumstances must be obtained for these key parameters where possible. These values should be based on:

- Cited data from well-referenced peer-reviewed literature or other well-established published sources;

- National inventory data or default factors from IPCC literature that have, where possible and necessary, been checked for consistency against available local data specific to the project circumstances; or
- Expert opinion, in the absence of the above sources of information. Experts will often provide a range of data values and a proposed value for the data. The rationale for selecting a particular data value must be demonstrated.

In choosing key parameters or making important assumptions based on information not specific to the project circumstances, such as using default factors, the project proponent must select values that will lead to an accurate estimation of net GHG emission reductions, taking into account uncertainties.

Where uncertainty is significant[4], the project proponent must choose data that indisputably tends to under-estimating, rather than over-estimating, net GHG project benefits.

To ensure that GHG fluxes are estimated in a way that is accurate, verifiable, transparent and consistent across measurement periods, the project proponent must establish and document clear standard operating procedures and procedures for ensuring data quality. At a minimum, these procedures must include:

- Comprehensive documentation of all field measurements carried out in the project area. This documentation must be detailed enough to allow replication of sampling in the event of staff turnover between monitoring periods;
- Training procedures for all persons involved in field measurement or data analysis. The scope and date of all training must be documented;
- A protocol for assessing the accuracy of plot measurements using a check cruise and a plan for correcting the inventory where errors are discovered;
- Protocols for assessing data for outliers, transcription errors and consistency across measurement periods; and
- Safe archiving of data sheets for the life of the project. Data stored in electronic formats must be backed up.

Expert judgment

The use of expert judgment for selecting and interpreting methods, selecting input data to fill gaps in available data, and selecting data from a range of possible values or uncertainty ranges are all well defined in the *IPCC 2006 Guidelines for National GHG Inventories* and its *2019*

[4] In line with the *VCS Methodology Requirements*, uncertainty is deemed significant where it is expected to exceed 10 percent of the estimate.

Refinement. The project proponent must use the guidance provided in Volume 1 Chapter 2 Approaches to Data Collection (in particular, Section 2.2 and Annex 2A.1) of the *IPCC 2019 Refinement to the 2006 IPCC Guidelines for National GHG Inventories*.

Monitoring of Project Implementation

Information must be provided and recorded to establish the following:

1) The geographic position of the project boundary is recorded for all areas of land. The geographic coordinates of the project boundary (and any stratification or buffer zones inside the boundary) are established, recorded and archived. This may be achieved by field survey (e.g., GPS) or geo-referenced spatial data (e.g., maps, GIS datasets, orthorectified aerial photography or geo-referenced remote sensing images).

   The above also applies to strata recording, including strata resulting from peatland fires in the project scenario.

2) Commonly accepted principles of land use inventory and management are implemented.

Standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures for inventories, including field data collection and management, must be applied. Use or adaptation of SOPs already applied in national land use monitoring or available from published handbooks or the latest IPCC guidance documents is recommended.

The project plan and a record of the plan as implemented during the project must be available for validation or verification, as appropriate.

3) The monitoring plan must use the methods given in *M-REDD* to monitor changes in forest cover and carbon stock changes. All relevant parameters from the modules are to be included in the monitoring plan.

9.3.2 Monitoring

Ex post monitoring must accomplish two key tasks:

1) Monitoring according to the monitoring plan; and

2) Revising the baseline for future project crediting periods.

TASK 1: Monitoring According to the Monitoring Plan

Monitoring of Key Baseline Variables

Information required to reassess the project baseline periodically must be collected during the entire project crediting period. Key variables to be measured are:

- Changes in forest cover as specified in the relevant accounting modules (e.g., *AUDef*)

- Spatial variable datasets used in modeling, as specified in relevant accounting modules (e.g., *AUDef*). As a minimum, the variables used in the first baseline assessment must be monitored during any reassessments.
- Where required, carbon stock data, as specified in the relevant accounting module

Monitoring of Leakage

All significant sources of leakage identified are subject to monitoring following the procedures outlined in the monitoring plan. Such procedures must be consistent with the applicable leakage modules. The monitoring plan must include all relevant parameters in the leakage modules.

Reporting of Parameters in Each Monitoring Report

The following values must be reported using the unit in parentheses– each with an estimate of uncertainty, representing sampling error as a two-sided 90 percent confidence interval:

1) For unplanned deforestation projects (AUDef) the allocated annual deforestation area by stratum (hectares in each year);
2) Aggregate annual deforestation area for the verification period in the project area (hectares per year);
3) Aggregate annual deforestation area for the verification period in the leakage belt (hectares per year);
4) Aggregate annual emission from deforestation for the verification period and project area (tonnes CO_2e per year);
5) Aggregate annual emission from deforestation for the verification period and leakage belt (tonnes CO_2e per year);
6) Average emission factor for deforestation for the verification period and over the project area (tonnes CO_2e per hectare)

TASK 2: Revising the Baseline for Future Project Crediting Periods

The methodological procedure to update the baseline must be the same as in the first estimation.

10 REFERENCES

IPCC (2003). *Good Practice Guidance for Land Use, Land Use Change and Forestry*. Institute for Global Environmental Strategies (IGES).

IPCC (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Institute for Global Environmental Strategies (IGES).

IPCC (2019). *2019 Refinement to the 2006 IPCC Guidelines on National Greenhouse Gas Inventories (IGES)*

Additional references may be found in the modules referenced throughout this methodology.

APPENDIX 1: TESTING SIGNIFICANCE OF GHG EMISSIONS

The following stepwise procedure must be used to test the significance of GHG emissions. It is an adaptation of the CDM *Tool for testing the significance of GHG emissions in A/R CDM project activities, v01.* The procedure may be used to justify the omission of pools and GHG sources within the project boundaries, as well as to justify the omission of GHG emissions resulting from leakage mitigation measures.

The significance of GHG emission by source and carbon stock changes by pool must be at minimum tested ex ante to justify the project boundaries and at baseline reassessment. The significance of leakage GHG emissions must be tested ex ante for the entire baseline validity period and ex post for a specific monitoring period.

3) Define the period over which the significance will be tested (i.e., either a baseline validity period for ex ante estimates or a specific monitoring period for ex post estimates).

4) Identify and estimate the following as relevant:

    a) GHG emissions by source (per each source) to be included and tested for the specified period. Estimation must be based on site/project-specific data, scientific peer-reviewed literature, and/or the most recent default emission factors provided by IPCC.

    b) GHG emissions attributable to net carbon stock changes by pool (per each pool to be included and tested). The estimation of net carbon stock changes must follow the methodology and be consistent with the baseline scenario and project activities. Estimation must be based on site/project-specific data, scientific peer-reviewed literature, and/or the most recent default emission factors provided by IPCC.

    c) Leakage GHG emissions by sources attributable to the project leakage mitigation measures, i.e., the net carbon stock changes in above and belowground tree biomass, the emissions associated with biomass burning, the emissions associated with nitrogen application that the planned leakage mitigation measures are expected to cause during the fixed baseline period. Estimation must follow sound procedures consistent with calculation approaches in the applicable activity type module(s). Estimation must be based on site/project-specific data, scientific peer-reviewed literature, and/or the most recent default emission factors provided by IPCC.

5) When needed, convert the GHG emissions to CO_2e using 100-year global warming potential (GWP) values referred to in the most recent version of the VCS Standard.

6) Calculate the relative contributions of the GHG emissions listed in #2 a-c above according to the following equation:

$$RC_{E_i} = \frac{E_i}{\sum_{i=1}^{I} E_i} \quad (2)$$

Where:

RC_{E_i} = Relative contribution of each source *i* to the sum of project and leakage GHG emissions

E_i = Greenhouse gas project and leakage emissions by sources *i* as estimated under #2 a-c above

i = Index for individual sources of project and leakage GHG emissions due to leakage mitigation measures (I = total number of sources considered in step 1)

7) Rank the GHG emissions in descending order of their relative contributions RC_{Ei} and order them according to their ranks (i.e., the lowest emission must get the highest rank and must occupy the last position in the ordered sequence of leakage missions).

8) Start calculating the cumulative sum of the relative contributions RC_{Ei} (ordered according to step 4 above) beginning with the lowest rank. Cease the summation when the cumulative sum reaches the lowest value not less than the threshold of 0.95.

The greenhouse gas and project leakage emissions by sources not marked in step 5 are considered insignificant if their sum is lower than 5% of net anthropogenic GHG ERRs in the project area. Otherwise, the procedure described in step 5 above must be continued beyond the threshold of 0.95 until the above condition is met.

For the purposes of testing GHG emissions significance, the net GHG ERRs must be calculated before discounting the cumulative GHG emissions resulting from leakage, i.e., before discounting $\Delta C_{LK\text{-}UDef,t}$.

Significant test calculations must be summarized in the project description or monitoring reports and detailed in a calculation spreadsheet to be shared with the auditor and with Verra.

Document History

Version		Comment
v1.0	DD Month YYYY	Initial version