Verified Carbon Standard

VCS Methodology

VM0048

REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION

Version 1.0

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Sectoral Scope 14

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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:
    - *VMD0055 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, AUDeg*)
- 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]

- *VMD0001 Estimation of Carbon Stocks in Above- and Belowground Biomass in Live Tree and Non-tree Pools (CP-AB)*

[1] Where these modules refer to external documents (e.g., IPCC guidelines) and such documents are updated, the most recent version of the document must be used.

- *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)*
- *VMD0011 Estimation of Emissions from Market-effects (LK-ME)*
- *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)*

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

Additionality and Crediting Method	
Additionality	Project Method
Crediting Baseline	Project Method

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.

Reference to this methodology and the modules used to construct the project-specific methodology must be given in the project description. The project proponent must justify the choice of modules 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), optional (O) or to be determined (TBD) for all project activities covered by this methodology

Module/Tool	Project Activities		
	UDef	*PDef*	*UDeg*
AUDef	M	O	O
APDef	O	M	O
AUDeg	O	O	M
AFOLU Non-Permanence Risk Tool	M	TBD	TBD
E-NA	(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)[3]	TBD	TBD
LK-ME	(m)[3]	TBD	TBD
E-BPB	M	TBD	TBD
E-FFC	O	TBD	TBD
X-STR	M	TBD	TBD

TABLE NOTES

AUDef	*VMD0055 Estimation of Emissions from Avoiding Unplanned Deforestation*
APDef	*VMD00XX Estimation of Emissions from Avoiding Planned Deforestation (under development)*
AUDeg	*VMD00XX 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 leakage prevention activities include increases in the use of fertilizers
(m)[2]	Mandatory for the given project activity where this carbon pool is greater in the baseline (post-deforestation/degradation) than project scenario and significant; otherwise may be conservatively omitted
(m)[3]	Mandatory for the given project activity where the process of deforestation involves timber harvesting, fuel wood collection and/or charcoal production for commercial markets

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.

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

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

Forest
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.

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
GHG	Greenhouse gas
JNR	Jurisdictional and Nested REDD+
SOP	Standard operating procedure(s)
UDef	Unplanned deforestation

4 APPLICABILITY CONDITIONS

This methodology may only be used for eligible REDD projects and activities described in the *VCS Methodology Requirements*. The applicability conditions for each activity type are listed in *AUDef*, and will be listed in *APDef* and *AUDeg*.

5 PROJECT BOUNDARY

5.1 Geographic 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. 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 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., without 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 procedure outlined in Appendix 1.

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 3. 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,[2] 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	Major emissions source
		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 where 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 where determined negligible
Project	Burning of woody biomass	CO_2	Included	Major emissions source
		CH_4	Included	Major emissions source
		N_2O	Included	Major emissions source
	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) must be demonstrated as negligible to be omitted.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Excluded	Potential emissions are negligible.

[2] 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	Must be included where fertilizer use increases due to the project (e.g., as a leakage avoidance mechanism). Otherwise, it may be excluded if it is also excluded from the baseline.

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 (Section 7) and must be consistent with the description of the conditions prior to the project start date. *VT0001* must be used to assess the project additionality. The stepwise approach below must be followed in addition to *VT0001* to determine the most plausible baseline scenario.

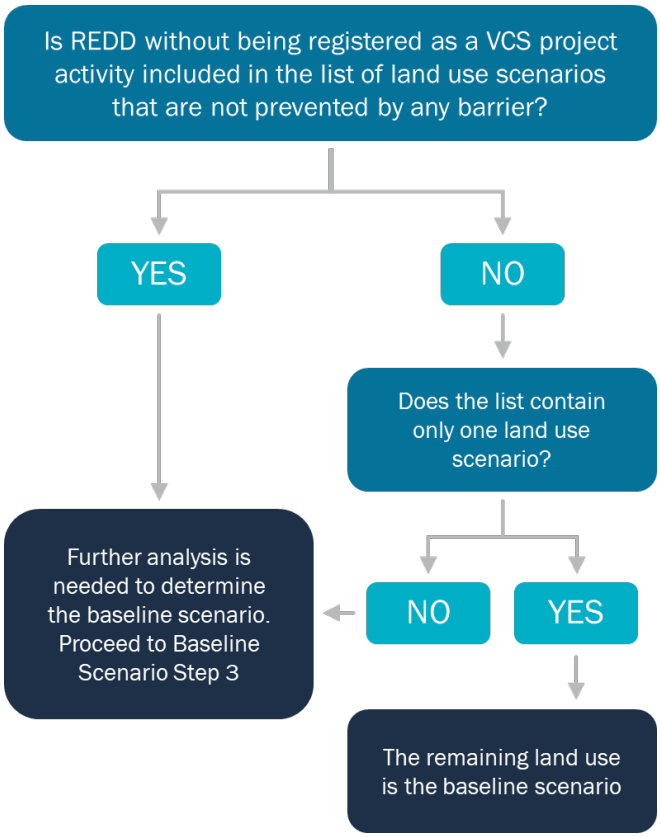
Step 1: Reuse the plausible alternative land use scenarios to the REDD project activity that have been listed as an outcome of Sub-step 1b of the additionality tool *VT0001*.

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

1) Continuation of the pre-project land use;
2) Project activity performed on the land within the project boundary 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: Where the *VT0001* barrier analysis is used to demonstrate additionality, apply the decision tree in Figure 1 to the list of all alternative land use scenarios from Step 1 that are not prevented by any barrier.

Figure 1. Barrier analysis decision tree



Step 2b: Where the *VT0001* investment analysis is used to demonstrate additionality, and if at least one land use scenario generates financial benefits other than carbon revenues, select the baseline scenario as below:

4) Where *VT0001* Option I is used, the baseline scenario is the land use scenario with the lowest costs over the crediting period). Option I may only be applied if the alternative scenarios do not include revenues.

5) Where *VT0001* Option II is used, the baseline scenario is the most economically or financially attractive land use scenario (i.e., the scenario with the most favorable financial indicator such as internal rate of return).

6) Where *VT0001* Option III is used and none of the alternative land use scenarios have a financial indicator that meets the benchmark, the baseline scenario is the continuation of the pre-project land use. Where Option III is used and at least one of the land use scenarios has a financial indicator that meets the benchmark, the baseline scenario is the scenario that has the most favorable financial indicator (e.g., internal rate of return, net present value or cost-benefit ratio).

Step 3: Where barrier analysis is used to demonstrate additionality but does not allow determination of the baseline scenario, implement one of the following:

1) An investment analysis following *VT0001* Option II (regardless of whether it has been used to demonstrate additionality). Select the most plausible baseline as specified in Step 2b above; or

2) Through qualitative analysis, estimate the baseline GHG emissions for each alternative land use scenario that is not prevented by any barrier. The baseline scenario is 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 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 registered JNR program are eligible to use this methodology for activities included under that program. However, projects must be nested according to the requirements set out in the *JNR Scenario 1 Requirements* or *JNR Scenario 2 Requirements,* as appropriate.

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).

Where 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. Where required by local regulations, 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* and by following the additional guidance on investment analysis of the latest version of the *VCS Methodology Requirements.*

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, where regulatory surplus is justified by the lack of systematic law enforcement it must be demonstrated that enforcement of the law is out of the control of the project proponent and other entities involved in the project. Such lack of control may be demonstrated by the barriers identified in Step 3 of *VT0001*.

8 QUANTIFICATION OF GHG EMISSION REDUCTIONS

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 *VM0048*

Where projects have verified using *VM0009* prior to their transition to *VM0048*, project proponents must follow the provisions set out in *VM0009* to revise the baseline emissions 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 emissions model predicts fewer GHG emission reductions than VCUs issued under the previous model, the project must compensate for this difference by one of the following methods:

1) Cancelation of VCUs from the project in the project proponent's Verra Registry account that have not been used for offsetting purposes ("active VCUs"), or of already issued active VCUs where the project proponent gains the consent of the current owner, and/or

2) Replacement of the emission reductions through immediate cancelation from subsequent issuances of VCUs to the project. The deduction may be distributed over more than one verification period 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 *VM0048*. The validation/verification body must assess the calculations and ensure that a deduction plan, where relevant, has been approved by Verra.

8.2 Project Emissions

The same procedure for project emissions 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

Emissions from different leakage sources must be estimated unless deemed de minimis:

1) Activity-shifting leakage;

2) Market-effect leakage; and

3) Emissions from leakage prevention activities.

The relevant activity modules specify the leakage sources that must be estimated. The significance of leakage and carbon pools must be determined using Appendix 1 of this methodology.

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

Leakage due to market effects must be considered using *LK-ME*. Market effects must be considered where the project leads to decreased timber, fuelwood or charcoal production.

Where leakage prevention activities result in significant increases in emissions from carbon stock changes, biomass burning and/or increased fertilizer usage,[3] any increase in GHG emissions associated with these activities must be accounted for following the relevant activity modules (e.g., *AUDef*), unless deemed de minimis.

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 de minimis and does not need to be quantified or reported.

Where leakage prevention leads to a significant increase in fertilizer use, module *E-NA* must be used.

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

The list of leakage sources with appropriate justification must be presented in the project description.

8.4 Net GHG Emission Reductions

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.

The potential number of Verified Carbon Units (VCUs) for the monitoring period *t* is estimated as follows:

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

Where:

VCU_t = Number of potential Verified Carbon Units at year $t = t_2 - t_1$ (VCU)

VCU_{AUDef} = Number of potential Verified Carbon Units from unplanned deforestation at year $t = t_2 - t_1$ (VCU)

VCU_{APDef} = Number of potential Verified Carbon Units from planned deforestation at year $t = t_2 - t_1$ (VCU)

[3] Potentially as part of 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

VCU_{AUDeg} = Number of potential 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 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 taken 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 people 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 lifetime of the project. Data stored in electronic formats must be backed up.

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

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 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 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 in the relevant module(s) (i.e., *AUDef, APDef,* and/or *AUDeg*) to monitor changes in forest cover and carbon stock changes. All relevant parameters from the modules must 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 periodically reassess the project baseline 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.
- Carbon stock data, where required, 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 projects using *AUDef*, the allocated annual deforestation area by stratum (hectares for each year of the monitoring period);
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 emissions from deforestation for the verification period and project area (tonnes CO_2e per year);
5) Aggregate annual emissions from deforestation for the verification period and leakage belt (tonnes CO_2e per year); and
6) Average emission factor for deforestation for the verification period and over the project area (tonnes CO_2e per hectare).

Additional values may be added as additional modules are added under this *VM0048.*

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 baseline 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.* Institute for Global Environmental Strategies (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 emissions 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.

1) 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 or annually for ex post estimates).

2) Identify and estimate the following where 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 source attributable to the project leakage mitigation measures (i.e., net carbon stock changes in above- and belowground tree biomass, emissions associated with biomass burning and 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.

3) Where needed, convert the GHG emissions to CO_2e using 100-year global warming potential (GWP) values from the latest version of the *VCS Standard*.

4) Calculate the relative contributions of the GHG emissions listed in Step 2a–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 = GHG project and leakage emissions for source *i* as estimated under Step 2a–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)

5) 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 emissions).

6) Start calculating the cumulative sum of the relative contributions RC_{Ei} (ordered according to Step 5), 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 GHG and project leakage emissions by source excluded from the cumulative sum in Step 6 are considered insignificant where their total is lower than five percent of net anthropogenic GHG ERRs in the project area. Otherwise, the procedure described in Step 6 must be continued beyond the threshold of 0.95 until this condition is met. Even where they are insignificant, project proponents may include any qualifying sources and sinks in the project case.

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 $\Delta C_{LK\text{-}UDef,t}$).

Significance test calculations must be summarized in the project description or monitoring reports and detailed in a calculation spreadsheet to be shared with the validation/verification body and Verra.

DOCUMENT HISTORY

Version		Comment
v1.0	27 Nov 2023	Initial version