VCS Methodology

VM0007

REDD+ Methodology Framework (REDD-MF)

Version 1.5

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Sectoral Scope 14

Methodology developed by:

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1 SOURCES

This methodology is comprised of a number of modules and tools each of which has been assigned an abbreviated title (eg, *CP-AB*) which are referenced throughout the modules and tools. This methodology uses the latest versions of the following methodologies, modules and tools:

Methodologies:

- CDM methodology *AR-ACM0003 Afforestation and reforestation of lands except wetlands*

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 (mineral soils) (CP-S)*
- *VMD0005 Estimation of carbon stocks in the long-term wood products pool (CP-W)*

Baseline modules:

- *VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation and planned degradation (BL-PL)*
- *VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP)*
- *VMD0008 Estimation of baseline emission from forest degradation caused by extraction of wood for fuel (BL-DFW)*
- *VMD0041 Estimation of baseline carbon stock changes and greenhouse gas emissions in ARR project activities on peat and mineral soil (BL-ARR)*
- *VMD0042 Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities (BL-PEAT)*

Leakage modules:

- *VMD0009 Estimation of emissions from activity shifting for avoiding planned deforestation and planned degradation (LK-ASP)*
- *VMD0010 Estimation of emissions from activity shifting for avoiding unplanned deforestation (LK-ASU)*
- *VMD0011 Estimation of emissions from market-effects (LK-ME)*
- *VMD0012 Estimation of emissions from displacement of fuelwood extraction (LK-DFW)*

- *VMD0043 Estimation of emissions from displacement of pre-project agricultural activities (LK-ARR)*
- *VMD0044 Estimation of emissions from ecological leakage (LK-ECO)*

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)*
- CDM tool *Estimation of direct N_2O emissions from nitrogen application (E-NA)*

Monitoring modules:

- *VMD0015 Methods for monitoring of greenhouse gas emissions and removals in REDD project activities (M-REDD)*
- *VMD0045 Methods for monitoring greenhouse gas emissions and removals in ARR project activities on peat and mineral soil (M-ARR)*
- *VMD0046 Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities (M-PEAT)*

Miscellaneous modules:

- *VMD0016 Methods for stratification of the project area (X-STR)*
- *VMD0017 Estimation of uncertainty for REDD+ project activities (X-UNC)*

Tools:

- CDM *Tool for testing significance of GHG emissions in A/R CDM project activities (T-SIG)*
- CDM *Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (T-ADD)*
- VCS *AFOLU Non-Permanence Risk Tool* (T-BAR)

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

Additionality and Crediting Method	
Additionality	Project Method
Crediting Baseline	Project Method

This REDD+ Methodology Framework document is the basic structure of a modular REDD+ methodology. It provides the generic functionality of the methodology, which frames pre-defined

modules and tools that perform a specific function. It constitutes, together with the modules and tools it calls upon, a complete REDD+ baseline and monitoring methodology.

The modules and tools called upon in this document are applicable to project activities that reduce emissions from planned (APD) and unplanned (AUDD) deforestation, for activities that reduce emissions from forest degradation, for afforestation, reforestation and revegetation activities (ARR), or combinations of these, as well as to any of these activities when they occur on peatland and are combined with peatland rewetting or conservation (being sub-categories of wetland restoration and conservation - WRC). Hereafter in this module and all other modules in methodology VM0007 applied to avoiding planned deforestation projects, “planned deforestation” refers to both planned deforestation and planned degradation.

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

Identification of the Most Plausible VCS-eligible Activity(s)

To identify the type of VCS-eligible REDD+ project activity use the following decision tree. The decision tree must be used to provide a broad indication of likely baseline type and applicability. Ultimately the relevant baseline modules (*BL-UP* – avoiding unplanned deforestation; *BL-PL* – avoiding planned deforestation and planned degradation; *BL-DFW* – avoiding forest degradation (fuelwood/charcoal); *BL-ARR* - degraded land suited for ARR; and, where applicable, *BL-PEAT* – peatland) must be applied with relevant applicability conditions and criteria.

Provide all the necessary evidence to demonstrate the type of eligible activity as given in each module.

A project can include areas subject to different eligible activities (eg, Area A = avoiding planned deforestation; Area B = avoiding unplanned deforestation; Area C = avoiding degradation; Area D = reforestation; Area E = peatland rewetting and reforestation). In such cases the areas that are eligible for different categories must be captured by different strata and clearly delineated, and the procedures outlined below applied to each of them separately. Projects may combine WRC with REDD or WRC with ARR in a single area, in which case they must apply concomitantly the procedures for both categories.

The demonstration of eligibility must be reported in the PD.

Tables 1 below provides a decision tree for identifying the types of REDD+ and ARR project activities eligible under this methodology.

Table 1: Decision Tree for Determining REDD Project Activity Type and ARR Suitability

<table>
<tr><td colspan="4">Is the forest land expected to be converted to non-forest land in the baseline case, or expected to be subject to authorized conversion to a managed tree plantation in the baseline case?</td></tr>
<tr><td colspan="2">YES[1]</td><td colspan="2">NO</td></tr>
<tr><td colspan="2">Is the land legally authorized and documented to be converted to non-forest or a managed tree plantation?</td><td colspan="2">Is the forest in the baseline expected to degrade by fuelwood extraction or charcoal production?</td></tr>
<tr><td>YES[2]</td><td>NO</td><td>YES</td><td>NO</td></tr>
<tr><td>Avoiding planned deforestation/planned degradation</td><td>Avoiding unplanned deforestation</td><td>Avoiding forest degradation</td><td>Proposed project is not a VCS REDD[3] activity currently covered by the</td></tr>
<tr><td colspan="4">Is part of the land non-forest land or with degraded forest?</td></tr>
<tr><td colspan="2">YES</td><td colspan="2">NO</td></tr>
<tr><td colspan="2">Suitable for ARR</td><td colspan="2">No additional activity</td></tr>
</table>

If the project area includes peatland already drained or that would be drained in the baseline case, project must combine the project activities identified above with the WRC category, as set out in Table 2 below.

Table 2: Determination of WRC Combined Categories

Baseline Scenario		Project Activity	Combined Categories
Pre-Project Condition	Land Use		
Drained peatland	Non-forest	Rewetting and conversion to forest/revegetation	WRC+ARR
	Forest with deforestation/degradation	Rewetting and avoiding deforestation/degradation	WRC+REDD
Undrained peatland	Forest with deforestation/degradation	Avoiding drainage and deforestation/degradation	WRC+REDD[4]

REDD+ projects under the methodology are divided between the following activity types: avoiding unplanned deforestation/degradation due to collection of wood for fuel and production of charcoal (AUDD), avoiding planned deforestation (APD), forest rehabilitation (ARR), and peatland

[1] If the answer is "yes", evidence must be provided based on the application of the appropriate baseline module (BL-PL for APD and BL-UP for AUDD).
[2] If the answer is "yes", evidence must be provided based on the application of the BL-PL module. Project are required to show legal permissibility to deforest, suitability of project area for conversion and intent to deforest.
[3] If degradation is occurring through legal or sanctioned timber production then this is an eligible IFM activity.
[4] Includes Avoiding Unplanned Wetland Degradation and Avoiding Planned Wetland Degradation.

rewetting and conservation (RWE). Projects can be REDD, REDD+ARR, WRC+ARR, WRC+REDD+ARR. Improved forest management (IFM) is not covered by this methodology.

In Table 3 below the modules and tools are listed and it is indicated when use of modules/tools is mandatory under each activity type. Where any of these project activities take place on peatland, the project must adhere to both the respective project category modules and the relevant WRC modules, unless the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is deemed below *de minimis*. The tool T-SIG must be used to justify the omission of carbon pools and emission sources.

Table 3: Determination of When Module/Tool Use is Mandatory (M) or Optional (O)

	Module	Avoiding Unplanned Deforestation/ Degradation	Avoiding Planned Deforestation	Avoiding Degradration (Fuelwood / Charcoal)	ARR	REDD or ARR on Peatland
Always Mandatory	**REDD-MF**	M	M	M	M	M
	M-REDD	M	M	M	-	←
	M-ARR	-	-	-	M	←
	M-PEAT	-	-	-	-	M
	T-ADD	M	M	M	M	M
	T-BAR	M	M	M	M	M
	X-UNC	M	M	M	M	M
	X-STR	M	M	M	X***	M
Baselines	**BL-UP**	M	-	-	-	←
	BL-PL	-	M	-	-	←
	BL-DFW	-	-	M	-	←
	BL-ARR	-	-	-	M	←
	BL-PEAT	-	-	-	-	M
Leakage	**LK-ASU**	M	-	-	-	←
	LK-ASP	-	M	-	-	←
	LK-DFW	-	-	M	-	←
	LK-ARR	-	-	-	M	←
	LK-ECO	-	-	-	-	M
	LK-ME	(m)[1]	(m)[1]	(m)[2]	-	←
Pools*	**CP-AB**	M	M	M	X***	←
	CP-D	(m)[3]	(m)[3]	(m)[3]	X***	X****
	CP-L	O	O	O	X***	X****

	CP-S	O	O	O	X***	X****
	CP-W	(m)[1]	(m)[1]	-	-	←
Emissions *	**E-BPB**	M	M	M	X**	M
	E-FFC	O	O	O		←
	E-NA	(m)[4]	O	O	-	X

← See instructions under REDD and ARR categories

M Modules marked with an M are fully mandatory: the indicated modules and tools must be used

O Modules marked with an O are fully optional: the indicated pools and sources can be included or excluded as decided by the project but if included in the baseline they must also be included in the project scenario

X Modules marked with an X are excluded

(m)[1] Mandatory where the process of deforestation involves timber harvesting for commercial markets

(m)[2] Mandatory where fuelwood or charcoal is harvested for commercial markets

(m)[3] Mandatory if this carbon pool is greater in baseline (post-deforestation/degradation) than project scenario and significant; otherwise can be conservatively omitted

(m)[4] Mandatory where leakage prevention activities include increases in the use of fertilizers

* VCS requirements and the tool T-SIG must be used to justify the omission of carbon pools and emission sources

** Procedures provided in M-ARR.

*** Procedures provided in BL-ARR and M-ARR.

**** Procedures provided in BL-PEAT and M-PEAT.

3 DEFINITIONS

In addition to the definitions set out in VCS document *Program Definitions*, the following definitions apply to this methodology:

Baseline Period
The period of time with a fixed baseline (10 years), applicable to REDD and WRC baselines

Expert Judgment
Judgment on methodological choice and choice of input data and to fill gaps in the available data, to select data from a range of possible values or on uncertainty ranges as established in the *IPCC 2006 Good Practice Guidance*. Obtaining well-informed judgments from domain experts regarding best estimates and uncertainties of inputs to the quantification of emission reductions is an important aspect in various procedures throughout this methodology. The guidance provided

in Chapter 2, Volume 1 (Approaches to Data Collection) must be used, in particular, Section 2.2 and Annex 2A.1 of the *IPCC 2006 Guidelines for National Greenhouse Gas Inventories*.

Historical Reference Period
The historical period prior to the project start date that serves as the source of data for defining the baseline

4 APPLICABILITY CONDITIONS

This REDD+ Methodology Framework is a compilation of modules and tools that together define the project activity and necessary methodological steps. By choosing the appropriate modules, a project-specific methodology can be constructed. The justification of the choice of modules and why they are applicable to the proposed project activity must be given in the PD.

Specific applicability conditions exist for each module and must be met for the module to be used.

This methodology includes forest degradation caused only by extraction of wood for fuel. No modules are included for activities to reduce emissions from forest degradation caused by illegal harvesting of trees for timber.[5]

Use of this methodology is subject to the following applicability conditions, noting the project must also comply with the applicability conditions of the applied modules and tools:

4.1 General

All land areas registered under the CDM or under any other GHG program (both voluntary and compliance-oriented) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program must be monitored over time and reported in the monitoring reports.

4.2 REDD

4.2.1 All REDD Activity Types

REDD activity types applicable under the following conditions:

- Land in the project area has qualified as forest (following the definition used by VCS) at least 10 years before the project start date.
- If land within the project area is peatland and emissions from the soil carbon pool are deemed significant, the relevant WRC modules (see Table 1) must be applied alongside other relevant modules.
- Baseline deforestation and forest degradation in the project area fall within one or more of the following categories:

[5] Illegal timber harvest may be occurring in the project area in the baseline but conservatively no benefit can be calculated for preventing timber harvests, and any emissions arising from timber harvests in the project case must be monitored and deducted from calculated project net emission reductions.

- Unplanned deforestation (VCS category AUDD);
- Planned deforestation/degradation (VCS category APD);
- Degradation through extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD).

- Leakage avoidance activities must not include:
  - Agricultural lands that are flooded to increase production (eg, paddy rice);
  - Intensifying livestock production through use of feed-lots[6] and/or manure lagoons.[7]

4.2.2 Unplanned Deforestation

Unplanned deforestation activities are applicable under the following conditions:

- Baseline agents of deforestation must: (i) clear the land for settlements, crop production (agriculturalist) or ranching, where such clearing for crop production or ranching does not amount to large scale industrial agriculture activities[8]; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) be either residents in the Reference Region for Deforestation (cf. section 1 below) or immigrants. Under any other condition this methodology must not be used.
- If, in the baseline scenario of avoiding unplanned deforestation project activities, post-deforestation land use constitutes reforestation, this methodology may not be used.

4.2.3 Planned Deforestation/Degradation

Unplanned deforestation/degradation activities are applicable under the following condition:

- Conversion of forest lands to a deforested condition must be legally permitted.

4.2.4 Degradation (Fuelwood/Charcoal)

Degradation activities are applicable under the following conditions:

- Fuelwood collection and charcoal production must be non-renewable[9] in the baseline period.
- If degradation is caused by either illegal or legal tree extraction for timber, this methodology cannot be used.

[6] Feedlots are defined as areas in which naturally grazing animals are confined to an area which produces no feed and are fed on stored feeds.
[7] Anaerobic lagoons that function as receptacles for animal waste flushed from animal pens. Anaerobic organisms present in the manure and the environment decompose the waste in the lagoon.
[8] Small-scale / large-scale agriculture to be defined and justified by the project.
[9] As defined in Module BL-DFW

4.3 ARR

ARR activities are applicable under the following conditions:

- The project area is non-forest land or land with degraded forest.
- The project scenario does not involve the harvesting of trees. Therefore, procedures for the estimation of long-term average carbon stocks are not provided.
- The project scenario does not involve the application of nitrogen fertilizers.

Note, where project activities on wetlands are excluded by the applicability conditions of applied modules or tools, these can be disregarded for the purpose of their use within this methodology, as quantification procedures for the peat soil are provided in modules *BL-PEAT* and *M-PEAT*.

4.4 WRC

WRC activities are applicable under the following conditions:

- This methodology is applicable to rewetting drained peatland (RDP) and conservation of undrained and partially drained peatland (CUPP) activities on project areas that meet the VCS definition for peatland[10]. The scope of this methodology is limited to domed peatlands in the tropical climate zone.
- Fire reduction projects on peatland that exclude rewetting as part of the project activity are not eligible.
- Rewetting of drained peatland and conservation of undrained or partially drained peatland may be implemented in combination with REDD project activities. REDD project activities on peatland must not increase drainage.
- Rewetting of drained peatland may be implemented as a separate activity or in combination with ARR project activities. ARR activities must not enhance peat oxidation and therefore this activity requires at least some degree of rewetting.

5 PROJECT BOUNDARY

The following categories of boundaries must be defined:

1) The geographic boundaries relevant to the project activity;
2) The temporal boundaries;
3) The carbon pools that the project will consider;
4) The sources and associated types of greenhouse gas emissions that the project will affect.

[10] RDP (Rewetting of Drained Peatland) and CUPP (Conservation of Undrained or Partially Drained Peatland) project activities are both sub-categories of Restoration of Wetland Ecosystems (RWE) and Conservation of Intact Wetlands (CIW) of the Wetlands Restoration and Conservation (WRC) project category.

5.1 Geographical Boundaries

5.1.1 General

The spatial boundaries of a project must clearly be defined, so as to facilitate accurate measuring, monitoring, accounting, and verifying of the project's emissions reductions and removals. The REDD project activity may contain more than one discrete area of land. When describing physical project boundaries, the following information must be provided per discrete area:

- Name of the project area (eg, compartment number, allotment number, local name); Unique ID for each discrete parcel of land;
- Map(s) of the area (preferably in digital format);
- 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 / required by the VCS).
- Total land area; and
- Details of land holder and user rights.

The geographical boundaries of a project are fixed (*ex-ante*) and cannot change over the project lifetime (*ex-post*). Where multiple baselines exist (eg, planned deforestation, unplanned deforestation, forest degradation, degraded land) there must be no overlap in boundaries between areas appropriate to each of the baselines. Thus two project types cannot occur on the same piece of land, other than those including a WRC component (ie, combined REDD+WRC, ARR+WRC).

5.1.2 REDD

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 prior to the project start date.

In REDD project activities, various kinds of boundaries must be distinguished, depending on the REDD category (planned or unplanned deforestation, forest degradation), ie, in case of:

- Avoiding planned deforestation: project area and proxy area(s). Refer to module *BL-PL* for the detailed procedures to define these boundaries.
- Avoiding unplanned deforestation: project area, reference regions for deforestation, and leakage belt area. Refer to module *BL-UP* for definitions and the detailed procedures to define these boundaries.
- Avoiding forest degradation: Refer to module *BL-DFW* (for degradation due to removals for wood fuel or charcoal) for the detailed procedures to define these boundaries.

Methods for establishing the boundaries of areas subject to leakage from activity shifting are provided in the following modules:

- For avoiding planned deforestation/degradation: module *LK-ASP*
- For avoiding unplanned deforestation: module *BL-UP*

5.1.3 ARR

The project area must not have been not cleared of native ecosystems to create GHG emissions reductions/removals. Such proof is not required where such clearing took place prior to the 10-year period prior to the project start date. Areas that do not meet this requirement must be excluded from the project area.

5.1.4 WRC

The project area must not have been not drained or converted to create GHG emissions reductions/removals. Such proof is not required where such draining or conversion took place prior to 1 January 2008. Areas that do not meet this requirement must be excluded from the project boundary.

The maximum eligible quantity of GHG emission reductions in WRC project activities on peatland is limited to the difference between the remaining peat carbon stock in the project and baseline scenarios after 100 years. If a significant difference at the 100-years mark cannot be demonstrated, the project area is not eligible for carbon crediting. The assessment must be executed ex ante using conservative parameters. Procedures are provided in module *X-STR*.

5.2 Temporal Boundaries

The following temporal boundaries must be specified:

5.2.1 Start Date and End Date of the Historical Reference Period

REDD

The historical reference period is the temporal domain from which information on historical deforestation is extracted, analyzed and projected into the future. A historical reference period must be defined for all eligible REDD categories. The starting date of this period must be between 9 and 12 years in the past and the end date must be within two years of project start date.

WRC

While developing WRC baselines, project must reference a period of at least 10 years for modeling a spatial trend in drainage, taking into account the long-term (20-year) average climate variables, for which procedures are provided in module *BL-PEAT*.

5.2.2 Start Date and End Date of the Project Crediting Period

General

The project crediting period is the period of time for which GHG emissions reductions or removals generated by the project are eligible for crediting with the VCS Program. The project must have a robust operating plan covering this period.

The project crediting period for REDD+ projects must be between 20 and 100 years. The duration of the project activity/crediting period must be reported in the PD.

REDD

Projections of baseline emissions must be presented in the PD for the first 10-year period after the project start date. Emission reductions/removals can only be claimed for 10-year periods for which the baseline is fixed and a monitoring plan has been implemented.

WRC

Projections of baseline emissions from peatland must be presented in the PD for the first 10-year period after the start of the project. Emission reductions/removals can only be claimed for 10-year periods for which the baseline is fixed and a monitoring plan has been implemented.

Peat Depletion Time (PDT)

Peat depletion may be accelerated by peat fires and is attained if the peat has disappeared or if a stable water table inhibits further oxidation of the peat. The PDT for a stratum in the baseline scenario equals the period during which the project can claim emission reductions from rewetting. Procedures for determining the PDT are provided in module *X-STR*.

Since the PDT is part of the baseline assessment, it must be reassessed every 10 years.

5.2.3 Duration of the Monitoring Periods

The minimum duration of a monitoring period is one year and the maximum duration is 10 years.

Baseline projections must be annual and be available for each proposed future verification date.

Data on baseline deforestation and degradation rates, as well as on the hydrological layout and climatic variables in the peatland areas, must be presented as well as data collection for future baseline revision.

5.3 Carbon Pools

5.3.1 General

Any significant decreases in carbon stock in the project scenario and any significant increases in carbon stock in the baseline scenario must be accounted for. In addition, decreases in the baseline scenario and increases in the project scenario can be accounted for. Where ARR or REDD activities take place on peatland, the project must account for expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario, unless

they are is deemed *de minimis*. The significance of this pool may be determined by using the tool *T-SIG*.

Selection of carbon pools and the appropriate justification must be presented in PD.

5.3.2 REDD

The carbon pools (and corresponding methodology modules) included in or excluded from the boundary of REDD project activities are shown in Table 3.

Harvested wood products and dead-wood must be included when they increase more or decrease less in the baseline than in the project scenario. In all other cases only aboveground biomass is mandatory. If a carbon pool is included in the baseline accounting, it must also be included in project scenario and leakage accounting.

Where the carbon pool in harvested wood products and dead-wood increases more or decreases less in the baseline case than in the project case, the tool *T-SIG* must be used to determine whether significant. Insignificant pools can always be ignored.

5.3.3 ARR

The carbon pools included in or excluded from the boundary of the ARR component are shown in Table 4 below. The selection of carbon pools and the appropriate justification must be provided in the PD.

Table 4: Carbon Pools in Baseline and Project Scenario of ARR Project Activities

Carbon pool	Included?	Justification / Explanation
Aboveground tree biomass	Included	Mandatory pool in ARR project activities
Aboveground non-tree biomass	Included	Carbon stock in this pool may increase in the baseline scenario and may increase or decrease due to the implementation of the project activity
Belowground biomass	Included	Carbon stock in this pool may increase in the baseline scenario and is expected to increase due to the implementation of the project activity
Litter		
On mineral soil	Optional	Given the applicability conditions that the project area for ARR is non-forest land or land with degraded forest and that the project scenario does not involve the harvesting of trees, the litter carbon pool will increase due to project implementation. It is therefore conservative not to include litter. If included, litter must be accounted for using procedures in modules *CP-L*, *BL-ARR* and *M-ARR*.

On peatland	Optional	This pool is not mandatory on peatland but may be included. Given the applicability conditions that the project area for ARR is non-forest land or land with degraded forest and that the project scenario does not involve the harvesting of trees, the litter carbon pool will increase due to project implementation. It is therefore conservative not to include litter. If included, litter must be accounted for using procedures in modules *CP-L*, *BL-ARR* and *M-ARR*.
Dead wood		
On mineral soil	Optional	Given the applicability conditions that the project area for ARR is non-forest land or land with degraded forest and that the project scenario does not involve the harvesting of trees, the dead wood carbon pool will increase due to project implementation. It is therefore conservative not to include dead wood. If included, dead wood must be accounted for using procedures in modules *CP-D*, *BL-ARR* and *M-ARR*.
On peatland	Optional	This pool is not mandatory on peatland but may be included. Given the applicability conditions that the project area for ARR is non-forest land or land with degraded forest and that the project scenario does not involve the harvesting of trees, the dead wood carbon pool will increase due to project implementation. It is therefore conservative not to include dead wood. If included, dead wood must be accounted for using procedures in modules *CP-D*, *BL-ARR* and *M-ARR*.
Soil		
On mineral soil	Included	Carbon stock in this pool may increase due to the implementation of the project activity and this increase can be assessed as a carbon stock change.
On peatland	Included	Carbon stock in this pool may increase due to the implementation of the project activity but this increase is not accounted for; emissions from soil organic carbon are estimated in modules *BL-ARR* and *M-ARR*.
Wood products	Excluded	This pool is optional as per VCS rules.

5.3.4 WRC

The carbon pools included in or excluded from the boundary of the WRC component are shown in Table 5 below. The selection of carbon pools and the appropriate justification must be provided in the PD.

Table 5: Carbon Pools in Baseline and Project Scenario of WRC Project Activities

Carbon pool	Included?	Justification / Explanation
Aboveground tree biomass	Excluded	Covered under REDD or ARR
Aboveground non-tree biomass	Excluded	Covered under REDD or ARR
Belowground biomass	Included	This pool is not distinguished from the soil pool in WRC procedures
Litter	Excluded	Covered under REDD or ARR
Dead wood	Excluded	Covered under REDD or ARR
Soil	Included	The WRC procedures account for emissions from the soil pool based on proxies and default factors.
Wood products	Excluded	Covered under REDD or ARR

5.4 Sources of GHG Emissions

5.4.1 General

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, with additional guidance provided in Tables 6, 7 and 8.

T-SIG may be used to determine whether an emissions source is significant. If a source is included in the estimation of baseline emissions[11], it must also be included in the calculation of project and leakage emissions.

5.4.2 REDD

The GHG emission sources included in or excluded from the boundary of the REDD project activity are shown in Table 6 below. The selection of sources and the appropriate justification must be provided in the PD.

Table 6: GHG Sources Included In or Excluded From the REDD Project Boundary

Sources	Gas	Included?	Justification / Explanation
Biomass burning	CO_2	Excluded	However, carbon stock decreases due to burning are accounted as a carbon stock change

[11] Eg, CH_4 or N_2O emission from agriculture that results from deforestation or fire to clear forest land.

	CH_4	Included	Non-CO_2 gases emitted from woody biomass burning - it is conservative to exclude in the baseline but must be included in the project case if fire occurs.
	N_2O	Included	
Combustion of fossil fuels	CO_2	Included	Can be neglected if excluded from baseline accounting.
	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	Included	Can be excluded if excluded from baseline accounting except in the situation where fertilizer use is enhanced as a leakage avoidance mechanism.

5.4.3 ARR

The GHG emission sources included in or excluded from the boundary of the ARR component are shown in Table 7 below. The selection of sources and the appropriate justification must be provided in the PD.

Table 7: GHG Sources Included In or Excluded From the ARR Project Boundary

Sources	Gas	Included?	Justification / Explanation of choice
Burning of woody biomass	CO_2	Excluded	However, carbon stock decreases due to burning are accounted as a carbon stock change
	CH_4	Included	Burning of woody biomass for the purpose of site preparation, or as part of forest management, is allowed
	N_2O	Included	Burning of woody biomass for the purpose of site preparation, or as part of forest management, is allowed

Table 7 with the selection of sources and the appropriate justification must be presented in the PD.

5.4.4 WRC

The GHG emission sources included in or excluded from the boundary of the WRC component are shown in Table 8 below. The selection of sources and the appropriate justification must be provided in the PD.

Table 8: GHG Sources Included In or Excluded From the WRC Project Boundary

Sources	Gas	Included?	Justification / Explanation
Oxidation of drained peat	CO_2	Included	Considered under carbon pools
	CH_4	Included	Required unless *de minimis* or conservatively omitted
	N_2O	Excluded	Excluded as per applicability condition in module *BL-PEAT*
Peat combustion	CO_2	Included	Procedures provided in module *E-BPB*
	CH_4	Included	Procedures provided in module *E-BPB*
	N_2O	Included	Procedures provided in module *E-BPB*
Combustion of fossil fuels	CO_2	Excluded	Deemed *de minimis* in VCS *AFOLU Requirements*
	CH_4	Excluded	Deemed *de minimis* in VCS *AFOLU Requirements*
	N_2O	Excluded	Deemed *de minimis* in VCS *AFOLU Requirements*

6 BASELINE SCENARIO

6.1 Determination of the Most Plausible Baseline Scenario

For each of the included project activities, the most plausible baseline scenario must be determined using *T-ADD*, listed in Section 2 above. The tool has been designed for A/R CDM project activities, but is used by this methodology applying the notes provided in Table 9 below.

Table 9: Translation between VCS and CDM Terminology

Where the tool refers to:	It must be understood as referring to:
A/R, afforestation, reforestation, or forestation	REDD, ARR or WRC project activity
Net greenhouse gas removals by sinks	Net greenhouse gas emission reductions
CDM	VCS
DOE	VVB
tCERs, lCERs	VCUs

Footnotes 1 and 3 included in T-ADD can be disregarded. In case there is a conflict between the CDM tool requirements and the VCS rules, the VCS rules must be followed (as set out in VCS *AFOLU Guidance: Additional guidance for VCS Afforestation, Reforestation and Revegetation projects using CDM Afforestation/Reforestation Methodologies*, available on the VCS website.

6.2 Re-assessing the Baseline Scenario

The project baseline must be revised at the following frequencies:

- For planned deforestation projects, the baseline must be revised every 10 years for ongoing planned deforestation.
- For unplanned deforestation, the project baseline must be revised every 10 years from the project start date.
- For degradation, the baseline must be revised every 10 years.
- For WRC areas, the project must, for the duration of the project, reassess the baseline every 10 years and have this validated at the same time as the subsequent verification.

The date of the next scheduled revision must be specified. The starting point for the baseline revision of the project will be forest cover projected to exist at the end of the baseline period. Projections for each baseline revision will be subject to independent verification.

Reassessments must capture changes in the drivers and/or behavior of agents that cause the change in land use and/or land management practices and changes in carbon stocks. The new baseline scenario must be incorporated into revised estimates of baseline emissions. This baseline reassessment must include the evaluation of the validity of proxies for GHG emissions.

For REDD and WRC project activities, *ex-ante* baseline projections beyond a 10-year period are not required. For this assessment the historic reference period is extended to include the original reference period and all subsequent monitoring periods up to the beginning of the current monitoring period.

7 ADDITIONALITY

T-ADD must be used to identify credible alternative land use scenarios and evaluate both the alternatives and the proposed project scenarios and to demonstrate the additionality of the project.

The assessment and demonstration of additionality must be presented in the PD.

Default factors and standards used to ascertain GHG emission data and any supporting data for demonstrating additionality must be publicly available from a recognized, credible source, such as *IPCC 2006 Guidelines for National GHG Inventories* or the *IPCC 2003 Good Practice Guidelines for Land Use, Land-Use Change and Forestry*.

8 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

8.1 Baseline Emissions

8.1.1 General

Each activity type included in the project must estimate an individual baseline following the

provisions and specific modules mentioned below. Combined activities (ie, ARR or REDD with a WRC component) must develop a unique baseline considering peat as the soil carbon pool and incorporating the resulting emission estimates to the calculation of emissions and carbon stock changes of the ARR and/or REDD activities.

The same procedure must be followed *ex ante* and *ex post*. For parameters that will be monitored subsequent to project initiation, guidance is given in the parameter tables of the relevant modules for the values that must be used in *ex-ante* calculations.

8.1.2 REDD

The baseline of the REDD project activity is estimated *ex ante*. It can be monitored in a reference area (unplanned deforestation) or proxy area (planned deforestation) for the purpose of periodically adjusting the baseline. *Ex-ante* baseline estimations are therefore used in both the *ex-ante* and *ex-post* estimation of net carbon stock changes and greenhouse gas emission reductions.

Methods for estimating net baseline carbon stock changes and greenhouse gas emissions are provided in the following modules:

- For planned deforestation/degradation: module *BL-PL*
- For unplanned deforestation: module *BL-UP*
- For forest degradation from extraction of wood for fuel: module *BL-DFW*

8.1.3 ARR

The baseline net GHG removals must be estimated using module *BL-ARR*.

8.1.4 WRC

Baseline net emissions from the soil (peat) carbon pool in combined projects must be estimated using module *BL-PEAT*.

8.2 Project Emissions

For emissions and removals in the project scenario the following modules must be used:

- For REDD project activities: module *M-REDD*
- For ARR project activities: module *M-ARR*
- For WRC project activities module *M-PEAT*

8.2.1 General

The same procedure must be followed *ex ante* and *ex post*. For parameters that will be monitored subsequent to project initiation, guidance is given in the parameter tables of the relevant modules for the values that must be used in *ex-ante* calculations.

8.2.2 REDD

Methods for estimating net carbon stock changes and GHG emissions in the project scenario are provided in module *M-REDD*.

8.2.3 ARR

The net GHG removals in the project scenario must be estimated using module *M-ARR*.

8.2.4 WRC

Net GHG emissions from the soil (peat) carbon pool in the project scenario in combined projects must be estimated using module *M-PEAT*.

8.3 Leakage

Leakage must be considered for all activities using the following leakage modules:

- For planned deforestation/degradation: module *LK-ASP*
- For unplanned deforestation: module *LK-ASU*
- For fuel-wood/charcoal collection: module *LK-DFW*
- For pre-project agricultural activities: module *LK-ARR*

For WRC project activities that are not combined with REDD or ARR, where pre-project activities may be displaced to undrained or partially drained peatland areas, the procedures provided for activity shifting to peatland areas in module LK-ASP (planned drainage of peatland) or module LK-ASU (unplanned drainage of peatland) must be used.

For WRC projects activities, the following module must be used:

- For ecological leakage: module *LK-ECO*

The significance of leakage and the significance of carbon pools may be determined using *T-SIG*.

Where applicable, leakage due to market effects must be considered using module *LK-ME*. Market effects must be considered where the project leads to a decrease in the production of timber, fuelwood, or charcoal.

Where, pre-project, unsustainable fuelwood collection is occurring within the project boundary, modules *BL-DFW* and *LK-DFW* must be used to determine potential leakage.

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 significant increase in GHG emissions associated with these activities must be accounted for, unless deemed *de minimis*, as determined using *T-SIG*.

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

Where leakage prevention leads to a significant increase in the use of fertilizers, module *E-NA* must be used. *T-SIG* can be used to determine significance.

As per the applicability conditions, leakage prevention may not include the flooding of agricultural lands (eg, for new rice paddies) nor the creation of livestock feedlots and/or manure lagoons. Leakage prevention may also not include the drainage of peatland.

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

Positive leakage may not be accounted for.

8.4 Summary of GHG Emission Reduction and/or Removals

8.4.1 General

The total net greenhouse gas emissions reductions of the project are calculated as:

$$NER_{REDD+} = NER_{REDD} + NGR_{ARR} + NER_{WRC} \quad (1)$$

Where:

NER_{REDD+}	Total net GHG emission reductions of the REDD+ project activity up to year *t** (t CO_2e)
NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year *t** (t CO_2e)
NGR_{ARR}	Total net GHG removals of the ARR project activity up to year *t** (t CO_2e)
NER_{WRC}	Total net GHG emission reductions of the WRC project activity up to year *t** (t CO_2e)

Project must present conservative *ex-ante* estimations of the total net GHG emissions reductions of the project activity.

For *ex-ante* estimation for specific parameters project must refer to the parameter tables in the appropriate modules.

8.4.2 REDD

The total net greenhouse gas emissions reductions of the REDD project activity are calculated as follows:

$$NER_{REDD} = \Delta C_{BSL-REDD} - \Delta C_{WPS-REDD} - \Delta C_{LK-REDD} \quad (2)$$

Where:

NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year *t** ($t CO_2e$)
$\Delta C_{BSL\text{-}REDD}$	Net GHG emissions in the REDD baseline scenario up to year *t** ($t CO_2e$)
$\Delta C_{WPS\text{-}REDD}$	Net GHG emissions in the REDD project scenario up to year *t** ($t CO_2e$)
$\Delta C_{LK\text{-}REDD}$	Net GHG emissions due to leakage from the REDD project activity up to year *t** ($t CO_2e$)

$$\Delta C_{BSL,REDD} = \Delta C_{BSL,planned} + \Delta C_{BSL,unplanned} + \Delta C_{BSL,degrad-FW/C} \quad (3)$$

Where:

$\Delta C_{BSL\text{-}REDD}$	Net GHG emissions under the REDD baseline scenario up to year *t** ($t CO_2e$)
$\Delta C_{BSL,planned}$	Net GHG emissions in the baseline scenario from planned deforestation up to year *t** ($t CO_2e$)
$\Delta C_{BSL,unplanned}$	Net GHG emissions in the baseline scenario from unplanned deforestation up to year *t* ($t CO_2e$)
$\Delta C_{BSL,degrad\text{-}FW/C}$	Net GHG emissions in the baseline scenario from degradation caused by fuelwood collection and charcoal making up to year *t** ($t CO_2e$)

$$\Delta C_{LK-REDD} = \Delta C_{LK-AS,planned} + \Delta C_{LK-AS,unplanned} + \Delta C_{LK-AS,degrad-FW/C} + \Delta C_{LK-ME} \quad (4)$$

Where:

$\Delta C_{LK\text{-}REDD}$	Net GHG emissions due to leakage from the REDD project activity up to year *t** ($t CO_2e$)
$\Delta C_{LK\text{-}AS,planned}$	Net GHG emissions due to activity shifting leakage for projects preventing planned deforestation up to year *t** ($t CO_2e$)
$\Delta C_{LK\text{-}AS,unplanned}$	Net GHG emissions due to activity shifting leakage for projects preventing unplanned deforestation up to year *t** ($t CO_2e$)
$\Delta C_{LK\text{-}ME}$	Net GHG emissions due to market-effects leakage up to year *t** ($t CO_2e$)
$\Delta C_{LK\text{-}AS,degrad\text{-}FW/C}$	Net GHG emissions due to activity shifting leakage for degradation caused by extraction of wood for fuel up to year *t** ($t CO_2e$)

8.4.3 ARR

The total net greenhouse gas removals of the ARR project activity are calculated as follows:

$$NGR_{ARR,t} = \Delta C_{WPS\text{-}ARR} - \Delta C_{BSL\text{-}ARR} - \Delta C_{LK\text{-}ARR} \quad (5)$$

Where:

NGR_{ARR}	Total net GHG removals of the ARR project activity up to year *t** ($t CO_2e$)
$\Delta C_{BSL\text{-}ARR}$	Net GHG removals in the ARR baseline scenario up to year *t** ($t CO_2e$)
$\Delta C_{WPS\text{-}ARR}$	Net GHG emissions in the ARR project scenario up to year *t** ($t CO_2e$)

$\Delta C_{LK\text{-}ARR}$	Net GHG emissions due to leakage from the ARR project activity up to year *t** ($t CO_2e$)

8.4.4 WRC

The total net GHG emission reduction of the WRC project activity is calculated as follows:

$$NER_{WRC} = GHG_{BSL\text{-}WRC} - GHG_{WPS\text{-}WRC} + Fire\ Reduction\ Premium - GHG_{LK\text{-}ECO} \quad (6)$$

Where:

NER_{WRC}	Total net GHG emission reductions in the WRC project up to year *t** ($t CO_2e$)
$GHG_{BSL\text{-}WRC}$	Net GHG emissions in the WRC baseline scenario up to year *t** ($t CO_2e$)
$GHG_{WPS\text{-}WRC}$	Net GHG emissions in the WRC project scenario up to year *t** ($t CO_2e$)
Fire Reduction Premium	Greenhouse gas emission reduction from peat combustion due to rewetting and fire management up to year *t** ($t CO_2e$)
$GHG_{LK\text{-}ECO}$	Net GHG emissions due to ecological leakage from the WRC project activity up to year *t** ($t CO_2e$)

8.4.5 Calculation of VCS Buffer

The number of credits to be held in the AFOLU pooled buffer account is determined as a percentage of the total carbon stock benefits. For REDD project activities, this is equal to the net emissions in the baseline minus emissions from fossil fuel use and fertilizer use minus the net emissions in the project case minus emissions from fossil fuels and fertilizer use. Leakage emissions do not factor into the buffer calculations.

For REDD projects, the calculation of the net change in carbon stocks applied in this methodology includes an adjustment for emissions from fossil fuel combustion and direct N_2O emissions and excludes emissions from biomass burning. Besides other GHG fluxes, biomass burning involves a carbon stock change. The procedure, therefore, provides a conservative (larger) estimate of the buffer withholding.

For WRC project activities – where carbon stock changes are not estimated – the proxy for the net change in carbon stocks applied in this methodology is NER_{WRC}. As this proxy includes all net GHG emissions reductions it provides a conservative (larger) estimate of the buffer.

Since GHG emission reductions from ARR are unlikely to differ greatly from the net change in carbon stocks, the proxy for the net change in carbon stocks applied in this methodology is NGR_{ARR}. As this proxy includes all GHG emissions reductions and removals it provides a conservative (larger) estimate of the buffer withholding.

$$Buffer_{Total} = Buffer_{Planned} + Buffer_{Unplanned} + Buffer_{Degrad-FW/C} + Buffer_{WRC} + Buffer_{ARR} \quad (7)$$

$$Buffer_{Planned} = \left(\left(\Delta C_{BSL,Planned} - \sum_{\substack{t=1 \\ BSL}}^{t^*} \sum_{\substack{i=1 \\ Planned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) - \left(\Delta C_{P,Planned} - \sum_{\substack{t=1 \\ P}}^{t^*} \sum_{\substack{i=1 \\ Planned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) \right) \times Buffer\% \quad (8)$$

$$Buffer_{Unplanned} = \left(\left(\Delta C_{BSL,Unplanned} - \sum_{\substack{t=1 \\ BSL}}^{t^*} \sum_{\substack{i=1 \\ Unplanned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) - \left(\Delta C_{P,Unplanned} - \sum_{\substack{t=1 \\ P}}^{t^*} \sum_{\substack{i=1 \\ Unplanned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) \right) \times Buffer\% \quad (9)$$

$$Buffer_{Degrad-FW/C} = \left(\left(\Delta C_{BSL,Degrad-FW/C} - \sum_{\substack{t=1 \\ BSL}}^{t^*} \sum_{\substack{i=1 \\ Degrad-FW/C}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) - \left(\Delta C_{P,Degrad-FW/C} - \sum_{\substack{t=1 \\ P}}^{t^*} \sum_{\substack{i=1 \\ Degrad-FW/C}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) \right) \times Buffer\% \quad (10)$$

$$Buffer_{ARR} = NGR_{ARR} \times Buffer\% \quad (11)$$

$$Buffer_{WRC} = NER_{WRC} \times Buffer\% \quad (12)$$

Where:

$Buffer_{Total}$	Total permanence risk buffer withholding (t CO_2e)
$Buffer_{Planned}$	Buffer withholding for avoiding planned deforestation project activities (t CO_2e)
$Buffer_{Unplanned}$	Buffer withholding for avoiding unplanned deforestation project activities (t CO_2e)
$Buffer_{Degrad-FW/C}$	Buffer withholding for avoiding degradation through extraction of fuelwood project areas (t CO_2e)
$Buffer_{ARR}$	Buffer withholding for ARR project activities (t CO_2e)
$Buffer_{WRC}$	Buffer withholding for WRC project activities (t CO_2e)
$\Delta C_{BSL,Planned}$	Net GHG emissions in the baseline from planned deforestation (t CO_2e)
$\Delta C_{BSL,Unplanned}$	Net GHG emissions in the baseline from unplanned deforestation (t CO_2e)
$\Delta C_{BSL,Degrad-FW/C}$	Net GHG emissions in the baseline from degradation caused by fuelwood collection and charcoal making (t CO_2e)

ΔC_P	Net GHG emissions within the project area under the project scenario[12] (t CO_2e)
$E_{FC,i,t}$	Emission from fossil fuel combustion in stratum *i* in year *t* (t CO_2e)
$N_2O_{direct\text{-}N,i,t}$	Direct N_2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum *i* in year *t* (t CO_2e)
Buffer%	Buffer withholding percentage[13] (percent)
NER_{WRC}	Total net GHG emission reductions in the WRC project up to year *t** (t CO_2e)
NGR_{ARR}	Total net GHG removals of the ARR project activity up to year *t** (t CO_2e)
i	1, 2, 3, …*M* strata (unitless)
t	1, 2, 3, …t^* time elapsed since the start of the REDD+ project activity (years)

8.4.6 Uncertainty Analysis

Project must use module *X-UNC* to combine uncertainty information and conservative estimates and produce an overall uncertainty estimate of the total net GHG emission reductions. The estimated cumulative net anthropogenic GHG emission reductions must be adjusted at each point in time to account for uncertainty as indicated in module *X-UNC*[14]. *X-UNC* calculates an adjusted value for NER_{REDD+} for any point in time. This adjusted $Adjusted\_NER_{REDD+}$ must be the basis of calculations at each point in time in equation 13.

8.4.7 Calculation of Verified Carbon Units

To estimate the number of Verified Carbon Units (VCUs) for the monitoring period $T = t2\text{-}t1$, this methodology uses the following equation:

$$VCU_t = \left(Adjusted\_NER_{REDD+,t_2} - Adjusted\_NER_{REDD+,t_1}\right) - Buffer_{Total} \quad (13)$$

Where:

VCU_t	Number of Verified Carbon Units at year $t = t_2 - t_1$ (VCU)
$Adjusted\_NER_{REDD+,t2}$	Total net GHG emission reductions of the REDD+ project activity up to year t_2 adjusted to account for uncertainty (t CO_2e)
$Adjusted\_NER_{REDD+,t1}$	Total net GHG emission reductions of the REDD+ project activity up to year t_1 adjusted to account for uncertainty (t CO_2e)

[12] The project emissions must be divided between the emissions arising from the respective project areas for planned and unplanned deforestation and degradation through fuelwood extraction/charcoal production.

[13] Buffer withholding percentages are based on the project's overall risk classification, the percentage of carbon credits generated by the approved project activity that must be deposited into the AFOLU pooled buffer account to cover non-permanence related project risks. Buffer withholding percentage must be calculated using T-BAR. Different percentages will likely be calculated for each of the baseline types as relevant.

[14] The allowable uncertainty under this methodology is +/- 15% of NER_{REDD+} at the 95% confidence level. Where this precision level is met then no deduction should result for uncertainty. Where uncertainty exceeds 15% of NER_{REDD+} at the 95% confidence level then the deduction must be equal to the amount that the uncertainty exceeds the allowable level.

$Buffer_{Total}$ Total permanence risk buffer withholding (t CO_2e)

The adjusted value for NER_{REDD+} to account for uncertainty must be calculated as:

$$Adjusted\_NER_{REDD+} = NGR_{ARR} + (NER_{REDD} + NER_{WRC}) \times (100\% - NER_{(REDD+ERROR)} + 15\%) + 15\%) + 15\%)$$

Where:

$Adjusted\_NER_{REDD+}$	Total net GHG emission reductions of the REDD+ project activities up to year *t** adjusted to account for uncertainty (t CO_2e)
NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year *t** (t CO_2e)
NER_{WRC}	Total net GHG emission reductions of the WRC project activity up to year *t** (t CO_2e)
NER_{REDD+_ERROR}	Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year *t** (percent)
NGR_{ARR}	Total net GHG removals of the ARR project activity up to year *t** (t CO_2e)

For details see module *X-UNC*.

9 MONITORING

9.1 Data and Parameters Available at Validation

Data / Parameter	$\Delta C_{BSL,degrad-FW/C}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions in the baseline from degradation caused by fuelwood collection and charcoal making
Equations	3
Source of data	Module *BL-DFW*
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	See module *BL-DFW*
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$\Delta C_{BSL,planned}$
Data unit	t CO_2e

Description	Net greenhouse gas emissions in the baseline from planned deforestation
Equations	3
Source of data	Module *BL-PL*
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	See module *BL-PL*
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$\Delta C_{BSL,unplanned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions in the baseline from unplanned deforestation
Equations	3
Source of data	Module *BL-UP*
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	See module *BL-UP*
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$\Delta C_{BSL-ARR}$
Data unit	t CO_2e
Description	Net GHG removals in the ARR baseline scenario up to year *t**
Equations	5
Source of data	Module *BL-ARR*
Value applied	N/A
Justification of choice of data or description of measurement methods	See module *BL-ARR*

and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$GHG_{BSL\text{-}WRC}$
Data unit	t CO_2e
Description	Net GHG emissions in the WRC baseline scenario up to year *t**
Equations	6
Source of data	Module *BL-PEAT*
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	See module *BL-PEAT*
Purpose of Data	Calculation of baseline emissions
Comments	N/A

9.2 Data and Parameters Monitored

Data / Parameter:	$\Delta C_{WPS\text{-}REDD}$
Data unit:	t CO_2e
Description:	Net GHG emissions in the REDD project scenario up to year *t**
Equations	2
Source of data:	Module *M-REDD*
Description of measurement methods and procedures to be applied:	See module *M-REDD*
Frequency of monitoring/recording:	See module *M-REDD*
QA/QC procedures to be applied:	See module *M-REDD*
Purpose of data:	Calculation of project emissions
Calculation method:	See module *M-REDD*
Comments:	

Data / Parameter	$\Delta C_{LK\text{-}AS,degrad\text{-}FW/C}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to activity-shifting leakage for degradation caused by extraction of wood for fuel
Equations	4
Source of data	Module *LK-DFW*
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	See module *LK-DFW*
Purpose of Data	Calculation of leakage
Comments	

Data / Parameter	$\Delta C_{LK\text{-}AS,planned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation
Equations	4
Source of data	Module *LK-ASP*
Value applied	n/a
Justification of choice of data or description of measurement methods and procedures applied	See module *LK-ASP*
Purpose of Data	Calculation of leakage
Comments	

Data / Parameter	$\Delta C_{LK\text{-}AS,unplanned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to activity shifting for projects preventing unplanned deforestation
Equations	4
Source of data	Module *LK-ASU*
Value applied	n/a

Justification of choice of data or description of measurement methods and procedures applied	See module *LK-ASU*
Purpose of Data	Calculation of leakage
Comments	

Data / Parameter	$\Delta C_{LK\text{-}ME}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to market-effects leakage
Equations	4
Source of data	Module *LK-ME*
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	See module *LK-ME*
Purpose of Data	Calculation of leakage
Comments	

Data / Parameter:	$\Delta C_{WPS\text{-}ARR}$
Data unit:	t CO_2e
Description:	Net GHG emissions in the ARR project scenario up to year *t**
Equations	5
Source of data:	Module *M-ARR*
Description of measurement methods and procedures to be applied:	See module *M-ARR*
Frequency of monitoring/recording:	See module *M-ARR*
QA/QC procedures to be applied:	See module *M-ARR*
Purpose of data:	Calculation of project emissions
Calculation method:	See module *M-ARR*

Comments:	

Data / Parameter:	$\Delta C_{LK\text{-}ARR}$
Data unit:	t CO_2e
Description:	Net GHG emissions due to leakage from the ARR project activity up to year *t**
Equations	5
Source of data:	Module *LK-ARR*
Description of measurement methods and procedures to be applied:	See module *LK-ARR*
Frequency of monitoring/recording:	See module *LK-ARR*
QA/QC procedures to be applied:	See module *LK-ARR*
Purpose of data:	Calculation of leakage
Calculation method:	See module *LK-ARR*
Comments:	

Data / Parameter:	$GHG_{WPS\text{-}WRC}$
Data unit:	t CO_2e
Description:	Net GHG emissions in the WRC project scenario up to year *t**
Equations	6
Source of data:	Module *M-PEAT*
Description of measurement methods and procedures to be applied:	See Module *M-PEAT*
Frequency of monitoring/recording:	See module *M-PEAT*
QA/QC procedures to be applied:	See module *M-PEAT*
Purpose of data:	Calculation of project emissions
Calculation method:	See Module *M-PEAT*
Comments:	See Module *M-PEAT*

Data / Parameter	$GHG_{LK\text{-}ECO}$
Data unit	t CO_2e
Description	Net GHG emissions due to ecological leakage from the WRC project activity up to year *t*
Equations	6
Source of data	Module *LK-ECO*
Value applied	n/a
Justification of choice of data or description of measurement methods and procedures applied	See module *LK-ECO*
Purpose of Data	Calculation of leakage
Comments	

Data / Parameter	$E_{FC,i\,t}$
Data unit	t CO_2e
Description	Emission from fossil fuel combustion in stratum *i* in year *t*
Equations	8, 9, 10
Source of data	Module *E-FFC*
Value applied	n/a
Justification of choice of data or description of measurement methods and procedures applied	See module *E-FFC*
Purpose of Data	Calculation of project emissions
Comments	

Data / Parameter	$N_2O_{direct\text{-}N,i,t}$
Data unit	t CO_2e
Description	Direct N_2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum *i* in year *t*
Equations	8, 9, 10

Source of data	Module *E-NA*
Value applied	n/a
Justification of choice of data or description of measurement methods and procedures applied	See module *E-NA*
Purpose of Data	Calculation of project emissions
Comments	

9.3 Description of the Monitoring Plan

9.3.1 Development of Monitoring Plan

General

The monitoring plan must address the following monitoring tasks, which must be included in the monitoring plan:

- Monitoring of project implementation
- Monitoring of actual carbon stock changes and greenhouse gas emissions
- Monitoring of leakage carbon stock changes and greenhouse gas emissions
- 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:

a. Technical description of the monitoring task.

b. Data to be collected. The list of data and parameters to be collected must be given in PD.

c. Overview of data collection procedures.

d. Quality control and quality assurance procedure.

e. Data archiving.

f. Organisation and responsibilities of the parties involved in all the above.

Uncertainty and Quality Management

Quality management procedures are required for the management of data and information, including the assessment of uncertainty, relevant to the project and baseline scenarios. As far as practical, uncertainties related to the quantification of GHG emission reductions and removals by sinks should be reduced.

To help reduce uncertainties in the accounting of emissions and removals, this methodology uses whenever possible the proven methods from the latest available IPCC guidance documents (GPG-LULUCF and Reporting Guidelines) and peer-reviewed literature. Despite this, potential

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

- Data from well-referenced peer-reviewed literature or other well-established published sources[15]; or,

- National inventory data or default factors from IPCC literature that has, whenever possible and necessary, been checked for consistency against available local data specific to the project circumstances; or

- In the absence of the above sources of information, expert opinion may be used to assist with data selection. Experts will often provide a range of data, as well as a most probable value for the data. The rationale for selecting a particular data value must be briefly noted.

For any data provided by experts, documentation must also record the expert's name, affiliation, and principal qualification as an expert as well as a 1-page summary CV for each expert consulted, included in an annex.

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

If uncertainty is significant, project must choose data such that it indisputably tends to under-estimate, rather than over-estimate, 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 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 document 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

[15] Typically, citations for sources of data used should include: the report or paper title, publisher, page numbers, publication date etc. (or a detailed web address). If web-based reports are cited, hardcopies should be included as annexes in the PD if there is any likelihood such reports may not be permanently available.

plan for correcting the inventory if errors are discovered.

- Protocols for assessing data for outliers, transcription errors, and consistency across measurement periods.
- Data sheets must be safely archived for the life of the project. Data stored in electronic formats must be backed up.

Monitoring of Project Implementation

Information must be provided, and recorded, to establish that:

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 can be achieved by field survey (eg, using GPS), or by using georeferenced spatial data (eg, maps, GIS datasets, orthorectified aerial photography or georeferenced remote sensing images).

   The above also applies to the recording of strata, 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 data management must be applied. Use or adaptation of SOPs already applied in national land use monitoring, or available from published handbooks, or from the latest IPCC guidance documents (GPG–LULUCF, Reporting Guidelines, is recommended;
   - Apply SOPs, especially, for actions likely to cause peat disturbances;
   - The project plan, together with a record of the plan as actually implemented during the project must be available for validation or verification, as appropriate.

REDD

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

ARR

For monitoring carbon stock changes, the monitoring plan must use the methods given in module M-ARR. All relevant parameters from the modules are to be included in the monitoring plan.

WRC

For monitoring GHG emissions from peatland, the monitoring plan must use the methods given in

module *M-PEAT*. All relevant parameters from the modules are to be included as the soil carbon pool in the monitoring plan.

9.3.2 MONITORING

Ex-post monitoring must have two key aspects:

TASK 1. Monitoring according to monitoring plan

TASK 2. Revising the baseline for future project crediting periods

TASK 1: Monitoring According to the Monitoring Plan

Monitoring of Key Baseline Variables

REDD

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 in the Reference Regions for Deforestation (RRD) (at a minimum of every 10 years) as specified in module *M-REDD* and where relevant in module *BL-UP*.
- Spatial variable datasets used to model the location of deforestation, as specified in module BL-UP. As a minimum, the variables used in the first baseline assessment must be monitored at the time of the re-assessment to determine if they have changed.
- Where required, carbon stock data as specified in module *M-REDD*.

WRC

In projects with a WRC component, the information required to periodically reassess the project baseline must include changes in the drainage layout and climate variables, as specified in module M-PEAT and, where relevant, module *BL-PEAT*.

Monitoring of Actual Carbon Stock Changes and GHG Emissions

REDD

Changes in forest cover in the project area (and leakage belt for unplanned deforestation), must be measured before each verification as part of the monitoring. Methods must be consistent with the methodology given in module *M-REDD* and any technical guidance specified in the monitoring plan.

Carbon stocks in most cases will not have to be monitored during the baseline period, except in the following cases:

- Where there is an increased accuracy and precision of the *ex-ante* carbon stock estimates, which are also used for *ex-post* calculations. Verifiable evidence must be

provided to VCS verifiers that the accuracy and precision of the carbon stock estimates has improved compared to previous estimates. Any change in carbon stock densities will be subject to validation.

- Where emissions reductions/removals are claimed for avoiding forest degradation caused by extraction of wood for fuel or charcoal or carbon sequestration in forest land that would have been deforested in the baseline case. In such cases, the methods described in module *M-REDD*.

Carbon stocks must be reassessed at every baseline revision.

Where emissions are included in the baseline, they must be monitored in the project case, following the methodological procedures described in the emission modules (*E-BPB*, *E-FFC*, and *E-NA*).

The calculations of actual carbon stock changes and greenhouse gas emissions must be reported using transparent procedures.

ARR

Changes in woody biomass carbon stocks in the project area must be measured before each verification as part of the monitoring. Methods must be consistent with the methodology given in module *M-ARR* and any technical guidance specified in the monitoring plan.

WRC

Changes in water depths in the project area (and leakage belt for unplanned deforestation), must be measured before each verification as part of the monitoring. Methods must be consistent with the methodology given in module *M-PEAT* and any technical guidance specified in the monitoring plan.

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 (*LK-ASP*, *LK-ASU*, *LK-ME*, *LK-DFW*, *LK-ARR* and *LK-ECO*). All relevant parameters in the leakage modules must be included in the monitoring plan.

The calculations of leakage carbon stock changes and greenhouse gas emissions must be reported.

TASK 2: Revising the Baseline for Future Project Crediting Periods

Baselines must be revised over time because agents, drivers and underlying causes of deforestation as well as drainage layouts and climate variables change dynamically. The methodological procedure used to update the baseline must be the same as used 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)[16]

IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Institute for Global Environmental Strategies (IGES) [17]

Additional information can be found in the modules referenced throughout this methodology.

[16] http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html
[17] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

DOCUMENT HISTORY

Version	Date	Comment
v1.0	3 Dec 2010	Initial version
v1.1	7 Sept 2011	The REDD Methodology Framework was updated to limit the reassessment of the unplanned baseline scenario to every ten years. The methodology was also incremented to reflect a revision to the module for estimation of baseline carbon stock changes and greenhouse gas emission from unplanned deforestation (BL-UP), v2.0, which was approved under the VCS Program on 7 September 2011.
v1.2	31 July 2012	Table 2 was removed to avoid confusion with Table 1. Table 1 is now the exclusive source in the methodology for determining included/excluded pools.
v1.3	20 Nov 2012	The REDD Methodology Framework was updated to include avoided planned degradation as an allowable activity: • Removed the applicability condition "where post-deforestation land use constitutes reforestation this module must not be used" • Renamed "planned deforestation" to "planned deforestation and planned degradation" • Added the text "hereafter in this module, "deforestation" refers to both deforestation and planned degradation" A correction made to equation 8 to appropriately calculate the total VCUs available for issuance.
v1.4	3 May 2013	Applicability condition for unplanned deforestation "where post-deforestation land use constitutes reforestation this module must not be used" was removed. Equations 4, 5 and 6 were revised to appropriately account for the buffer.
v1.5	9 March 2015	Updated to include REDD+ project activities on peatlands as well as activities that include ARR. Methodology now includes six new modules: *VMD0041 BL-ARR*, *VMD0042 BL-PEAT*, *VMD0043 LK-ARR*, *VMD0044 LK-ECO*, *VMD0045 M-ARR*, and *VMD0046 M-PEAT*.