VCS Methodology

VM0007

REDD+ Methodology Framework (REDD+ MF)

Version 1.6

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Sectoral Scope 14

Methodology developed by:

Revision to include project activities on peatlands (version 1.5 of this methodology) prepared by Permian Global, Silvestrum and Greifswald University

Revision to include tidal wetland restoration and conservation activities (version 1.6 of this methodology) prepared by Silvestrum Climate Associates and Restore America's Estuaries

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Table of Contents

1 SOURCES

This methodology is comprised of a number of modules and tools each of which has been assigned an abbreviated title (e.g., *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/forest degradation and planned wetland degradation (BL-PL)*
- *VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation (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 (BL-ARR)*
- *VMD0042 Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities (BL-PEAT)*
- *VMD0050 Estimation of baseline carbon stock changes and greenhouse gas emissions in tidal wetland restoration and conservation project activities (BL-TW)*

Leakage modules:

- *VMD0009 Estimation of emissions from activity shifting for avoiding planned deforestation/forest degradation and avoiding planned wetland degradation (LK-ASP)*

- *VMD0010 Estimation of emissions from activity shifting for avoiding unplanned deforestation and avoiding unplanned wetland degradation (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 (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)*
- *VMD0051 Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in tidal wetland restoration and conservation project activities (M-TW)*

Miscellaneous modules:

- *VMD0016 Methods for stratification of the project area (X-STR)*
- *VMD0017 Estimation of uncertainty for REDD+ project activities (X-UNC)*
- *VMD0019 Methods to Project Future Conditions*
- *VMD0052 Demonstration of Additionality of Tidal Wetland Restoration and Conservation Project Activities (ADD-AM)*

Tools:

- CDM *Tool for testing significance of GHG emissions in A/R CDM project activities (T-SIG)*[1]
- CDM *Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (T-ADD)*[2]
- VCS *AFOLU Non-Permanence Risk Tool* (*T-BAR*)

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

Additionality and Crediting Method	
Additionality	WRC projects in tidal wetlands: Activity method All other project activities: 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
- Activities that reduce emissions from forest degradation
- Afforestation, reforestation and revegetation activities (ARR)
- Project activities that reduce emissions from planned (APWD) and unplanned (AUWD) wetland degradation
- Wetland restoration activities (RWE)

or combinations of these.

Hereafter in this methodology and all other modules related to this methodology applied to avoiding planned deforestation projects, where the term “planned deforestation” is used, it 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).

[1] Available at: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf
[2] Available at: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-02-v1.pdf; make sure to use the latest version of the tool

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

To identify the type of VCS-eligible project activity, use the decision trees in Tables 1 to 3 below. The decision trees must be used to provide a broad indication of likely baseline type and applicability. Ultimately, the relevant baseline modules (*BL-UP* – avoiding unplanned deforestation or wetland degradation; *BL-PL* – avoiding planned deforestation, planned degradation, or planned wetland degradation; *BL-DFW* – avoiding forest degradation (fuelwood/charcoal); *BL-ARR* - land suited for ARR; *BL-PEAT* – peatland and *BL-TW* – tidal wetland) 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 (e.g., Area A = avoiding planned deforestation; Area B = avoiding unplanned deforestation; Area C = avoiding degradation; Area D = reforestation; Area E = peatland rewetting and reforestation; Area F = tidal wetland restoration and reforestation). In such cases the areas that are eligible for different categories must be captured by different strata and clearly delineated (i.e., without spatial overlap), and the procedures outlined below applied to each of them separately. Projects may be stand-alone REDD, ARR and/or WRC. 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 provided in this methodology, unless, in the case of stand-alone REDD or ARR on wetlands, the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is deemed *de minimis*, or, in the case of stand-alone RWE with presence of vegetation, the expected emissions from the biomass pool or change in the biomass pool in the project scenario is deemed *de minimis*. The tool *T-SIG* must be used to justify the omission of carbon pools and emission sources.

The demonstration of eligibility must be reported in the PD.

Tables 1 and 2 below provide 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

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?			
YES[3]		**NO**	
Is the land legally authorized and documented to be converted to non-forest or a managed tree plantation?		Is the forest in the baseline expected to degrade by fuelwood extraction or charcoal production?	
YES[4]	**NO**	**YES**	**NO**
Avoiding planned deforestation/planned degradation	Avoiding unplanned deforestation	Avoiding forest degradation	Proposed project is not a VCS REDD+[5] activity currently covered by the methodology

Table 2: Determining ARR Suitability

Is part or all of the land non-forest land or with degraded and unmanaged forest?	
YES	**NO**
Suitable for ARR	Not suitable for ARR

If the project area includes peatland already drained[6], or tidal wetlands already degraded[7] or that would be drained or degraded in the baseline case, the project must combine the project activities identified above with the WRC category, as set out in Table 3 below.

Table 3: Determination of WRC and Combined Categories

Baseline Scenario		Project Activity	Combined or Stand-alone Categories
Pre-Project Condition	Land Cover		
Drained peatland or degraded tidal wetland	Non-forest	Peatland rewetting or tidal wetland restoration# combined with conversion to forest, or revegetation	RWE+ARR
		Wetland restoration without vegetation establishment or *de*	RWE

[3] 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).
[4] If the answer is "yes", evidence must be provided based on the application of Module *BL-PL*. Projects are required to show legal permissibility to deforest, suitability of project area for conversion and intent to deforest.
[5] If degradation is occurring through legal or sanctioned timber production this is an eligible IFM activity.
[6] See VCS *Program Definitions*
[7] See Section 3

		minimis vegetation changes	
	Forest with deforestation/ forest degradation	Peatland rewetting and avoiding deforestation/ forest degradation or tidal wetland restoration and avoiding deforestation/forest degradation	RWE+REDD
Undrained or partially drained peatland or intact or partially altered tidal wetland[8]	Non-forest	Avoiding drainage and/or interrupted sediment supply Avoiding conversion to open water or impounded wetland Avoiding degradation	CIW*
	Forest with deforestation/ forest degradation	Avoiding drainage or wetland degradation combined with avoiding deforestation/forest degradation	CIW+REDD

[#] Includes wetland creation (see *VCS Methodology Requirements*).
* Includes Avoiding Unplanned Wetland Degradation (AUWD) and Avoiding Planned Wetland Degradation (APWD).

Improved forest management (IFM) is not covered by this methodology.

In Table 4 below, the modules and tools are listed, and it is indicated when use of modules/tools is mandatory, optional or not applicable under each activity type.

Where REDD or ARR project activities take place in combination with WRC, the project must adhere to both the respective project category modules and the relevant WRC modules. For example, an AUDD project combined with AUWD on tidal wetland, must follow the instructions provided in both respective columns.

[8] The CIW category includes activities that reduce GHG emissions by avoiding degradation and/or the conversion of wetlands that are intact or partially altered while still maintaining their natural functions, including hydrological conditions, sediment supply, salinity characteristics, water quality and/or native plant communities.

Table 4: Determination of When Module/Tool Use is Mandatory (M) or Optional (O) for all project activities covered by this methodology

Module	AUDD	APD	AD[#]	ARR	RWE		AUWD		APWD	
					Peatland	Tidal Wetlands	Peatland	Tidal Wetlands	Peatland	Tidal Wetlands
REDD+ MF	M	M	M	M	M	M	M	M	M	M
M-REDD	M	M	M	-	-	-	M	M	M	M
M-ARR	-	-	-	M	-	-	-	-	-	-
M-PEAT	-	-	-	-	M	-	M	-	M	-
M-TW	-	-	-	-	-	M	-	M	-	M
T-ADD	M	M	M	M	M	@	M	@	M	@
T-BAR	M	M	M	M	M	M	M	M	M	M
X-UNC	M	M	M	M	M	M	M	M	M	M
X-STR	M	M	M	-***	M	M	M	M	M	M
BL-UP	M	-	-	-	-	-	M	M	-	-
BL-PL	-	M	-	-	-	-	-	-	M	M
BL-DFW	-	-	M	-	-	-	-	-	-	-
BL-ARR	-	-	-	M	-	-	-	-	-	-
BL-PEAT	-	-	-	-	M	-	M	-	M	-
BL-TW	-	-	-	-	-	M	-	M	-	M
LK-ASU	M	-	-	-	-	-	M	M	-	-
LK-ASP	-	M	-	-	-	-	-	-	M	M
LK-DFW	-	-	M	-	-	-	-	-	-	-
LK-ARR	-	-	-	M	-	-	-	-	-	-
LK-ECO	-	-	-	-	M	M	M	M	M	M
LK-ME	(m)[1]	(m)[1]	(m)[2]	-	-	-	-	-	-	-
CP-AB	M	M	M	-**	-***	-***	-***	-***	-***	-***
CP-D	(m)[3]	(m)[3]	(m)[3]	-**	-***	-***	-***	-***	-***	-***
CP-L	O	O	O	-**	-***	-***	-***	-***	-***	-***
CP-S	O	O	O	-**	-***	-***	-***	-***	-***	-***
CP-W	(m)[1]	(m)[1]	-	-	-***	-***	-***	-***	-***	-***

Module	AUDD	APD	AD[#]	ARR	RWE		AUWD		APWD	
					Peatland	Tidal Wetlands	Peatland	Tidal Wetlands	Peatland	Tidal Wetlands
E-BPB	M	M	M	-[**]	M	M	M	M	M	M
E-FFC	O	O	O	-	(m)[5]	(m)[5]	O	O	O	O
E-NA	(m)[4]	O	O	-	-	-	-	-	-	-

[#] Avoiding Degradation (Fuelwood / Charcoal)

- Not applicable

M Modules marked with an M are fully mandatory for the given project activity (i.e., the indicated modules and tools must be used)

O Modules marked with an O are fully optional for the given project activity (i.e., 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)

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

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

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

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

(m)[5] Mandatory for the given project activity on tidal wetlands where it includes fossil fuel combustion; otherwise optional

[*] VCS *AFOLU Requirements* and the tool *T-SIG* must be used to justify the omission of carbon pools and emission sources

[**] Procedures provided in Modules *BL-ARR* and *M-ARR*

[***] Procedures provided in Modules *BL-PEAT* and *M-PEAT* or *BL-TW* and *M-TW* (if WRC activities are combined with REDD, CP modules must be used except Module *CP-S*)

[@] For tidal wetlands, an activity method is applicable (see Module *ADD-AM*)

3 DEFINITIONS

In addition to the definitions set out in the VCS Program 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

Degraded Wetland
A wetland which has been altered by human or natural impact through the impairment of physical, chemical and/or biological properties, and in which the alteration has resulted in a reduction of the diversity of wetland-associated species, soil carbon and/or the complexity of other ecosystem functions which previously existed in the wetland.

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.

Organic Soil
Soil with a surface layer of material that has a sufficient depth and percentage of organic carbon to meet thresholds set by the IPCC (Wetlands supplement) for organic soil. Where used in this methodology, the term peat is used to refer to organic soil.

Terrestrial
On land, in the context of this methodology, though not on a wetland.

Tidal Wetland
A subset of wetlands under the influence of the wetting and drying cycles of the tides (e.g., marshes, seagrass meadows, tidal forested wetlands and mangroves). Sub-tidal seagrass meadows are not subject to drying cycles, but are still included in this definition.

Tidal Wetland Restoration
Reestablishing or improving the hydrology, salinity, water quality, sediment supply and/or vegetation in degraded or converted tidal wetlands. For the purpose of this methodology, this definition also includes activities that create wetland ecological conditions on uplands under the influence of sea level rise or activities that convert one wetland type to another or activities that convert open water to wetland.

Acronyms

APD	Avoiding Planned Deforestation
APWD	Avoiding Planned Wetland Degradation
ARR	Afforestation, Reforestation and Revegetation
AUDD	Avoiding Unplanned Deforestation and forest Degradation
AUWD	Avoiding Unplanned Wetland Degradation

CIW	Conservation of Intact Wetlands
CUPP	Conservation of Undrained or Partially drained Peatland
PD	Project Description
RDP	Rewetting of Drained Peatland
REDD	Reducing Emissions from Deforestation and forest Degradation
RWE	Restoration of Wetlands Ecosystems
SOC	Soil Organic Carbon
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
VVB	Validation and Verification Body
WRC	Wetlands Restoration and Conservation

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

4 APPLICABILITY CONDITIONS

4.1 General

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 unplanned 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.[9]

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.

4.2 All Project Activities

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.

[9] 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.

4.3 REDD

4.3.1 All REDD Activity Types

REDD activity types are applicable under the following conditions:

- Land in the project area has qualified as forest (following the definition used by VCS; in addition, see Section 5.1.2) for at least the 10 years prior to the project start date. Mangrove forests are excluded from any tree height requirement in a forest definition, as they consist of (close to) 100% mangrove species, which often do not reach the same height as other tree species, and occupy contiguous areas and their functioning as a forest is independent of tree height.
- If land within the project area is peatland or tidal wetlands and emissions from the SOC pool are deemed significant, the relevant WRC modules (see Table 3) 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:
    - 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 (e.g., rice paddy)
    - Intensifying livestock production through use of feed-lots[10] and/or manure lagoons.[11]

4.3.2 Avoiding Unplanned Deforestation

Avoiding unplanned deforestation activities are applicable under the following conditions:

- Baseline agents of deforestation must: (i) clear the land for tree harvesting, settlements, crop production (agriculturalist) or ranching or aquaculture, where such clearing for crop production or ranching or aquaculture does not amount to large scale industrial agriculture or aquaculture activities[12]; (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 5.1.2 below) or immigrants. Under any other condition this methodology must not be used.

[10] 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.
[11] 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.
[12] Small-scale / large-scale agriculture or aquaculture is to be defined and justified by the project.

- If, in the baseline scenario of avoiding unplanned deforestation project activities, post-deforestation land use constitutes reforestation, this methodology may not be used

4.3.3 Avoiding Planned Deforestation/Degradation

Avoiding planned deforestation/degradation activities are applicable under the following condition:

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

4.3.4 Avoiding Forest Degradation (Fuelwood/Charcoal)

Avoiding forest degradation activities are applicable under the following conditions:

- Fuelwood collection and charcoal production must be non-renewable[13] in the baseline period.
- If degradation is caused by either illegal or legal tree extraction for timber, this methodology cannot be used.

4.4 ARR

ARR activities are applicable under the following conditions:

- The project area is non-forest land or land with degraded forest.[14]
- In strata with drained[15] organic soil, ARR activities must be combined with rewetting.

ARR activities are not eligible under the following conditions:

- The project scenario involves the application of nitrogen fertilizers.
- If ARR activities enhance peat oxidation. Therefore, on peatland, the project must include at least some degree of rewetting. In a tidal system where the tidal regime is restored or continues to be in place, ARR activities are considered not to enhance peat oxidation.

Where project activities on wetlands are excluded by the applicability conditions of applied modules or tools, such applicability conditions can be disregarded for the purpose of their use within this methodology, as quantification procedures for peat and tidal wetland soils are provided in Modules *BL-PEAT, M-PEAT*, *BL-TW* and *M-TW*. Therefore, ARR activities on wetlands are regarded as combined ARR-RWE activities.

[13] As defined in Module *BL-DFW*

[14] Note that restoring carbon stocks in degraded and managed forest (e.g., enrichment planting) is not an eligible activity as it falls in the category of Improved Forest Management (IFM). Restoring carbon stocks in a degraded but unmanaged forest is an ARR activity.

[15] This requirement supports mangrove reforestation in the natural habitat. ARR activities located in tidal systems where the tidal regime is restored or continues to be in place are eligible.

4.5 WRC

4.5.1 All WRC Activity Types

WRC activities are not eligible under the following conditions:

- Project activities lower the water table, unless the project converts open water to tidal wetlands, or improves the hydrological connection to impounded waters.
- Changes in hydrology do not result in the accumulation or maintenance of SOC stock, noting that a) this pertains to projects that intend to sequester carbon through sedimentation and/or vegetation development and b) this does not pertain to projects that increase salinity to reduce CH_4 emissions. Projects that aim to decrease CH_4 emissions through increased salinity must account for any changes in SOC stocks.
- Hydrological connectivity of the project area with adjacent areas leads to a significant increase in GHG emissions outside the project area.
- Project activities include the burning of organic soil.
- Nitrogen fertilizer(s), such as chemical fertilizer or manure, are applied in the project area during the project crediting period.

4.5.2 RWE Project Activities

General

For RWE project activities, prior to the project start date, the project area must meet the following conditions[16]:

a) The area is free of any land use that could be displaced outside the project area, as demonstrated by at least one of the following, where relevant:

- The project area has been abandoned for two or more years prior to the project start date; or
- Use of the project area for commercial purposes (i.e., trade) is not profitable as a result of salinity intrusion, market forces, or other factors. In addition, timber harvesting in the baseline scenario within the project area does not occur; or
- Degradation of additional wetlands for new agricultural/aquacultural sites within the country will not occur or is prohibited by enforced law.

OR

b) The area is under a land use that could be displaced outside the project area, although in such case, baseline emissions from this land use must not be accounted for, and where

[16] These conditions are included to avoid leakage.

degradation of additional wetlands for new agricultural/aquacultural sites within the country will not occur or is prohibited by enforced law.

OR

c) The area is under a land use that will continue at a similar or greater level of service or production during the project crediting period (e.g., reed or hay harvesting, collection of fuelwood, subsistence harvesting, commercial fishing).

The project proponent must demonstrate (a), (b) or (c) above, based on verifiable information such as laws and bylaws, management plans, annual reports, annual accounts, market studies, government studies or land use planning reports and documents.

Peatland Rewetting

This methodology is applicable to rewetting drained peatland (RDP) activities on project areas that meet the VCS definition for peatland (see *VCS Program Definitions*)[17].

Tidal Wetland Restoration

Project activities restoring tidal wetlands may include any of the following, or combinations of the following:

- Creating, restoring and/or managing hydrological conditions (e.g., removing tidal barriers, improving hydrological connectivity, restoring tidal flow to wetlands or lowering water levels on impounded wetlands)
- Altering sediment supply (e.g., beneficial use of dredge material or diverting river sediments to sediment-starved areas)
- Changing salinity characteristics (e.g., restoring tidal flow to tidally-restricted areas)
- Improving water quality (e.g., reducing nutrient loads leading to improved water clarity to expand seagrass meadows, recovering tidal and other hydrologic flushing and exchange or reducing nutrient residence time)
- (Re-)introducing native plant communities (e.g., reseeding or replanting)
- Improving management practice(s) (e.g., removing invasive species, reduced grazing)
- In RWE-ARR project activities, the prescribed burning of herbaceous and shrub aboveground biomass (cover burns) may occur

4.5.3 CIW Project Activities

This methodology is applicable to conservation of undrained and partially drained peatland (CUPP) activities on project areas that meet the VCS definition for peatland (see *VCS Program Definitions*).

[17] RDP and CUPP project activities are both subcategories of Restoration of Wetland Ecosystems (RWE) and Conservation of Intact Wetlands (CIW) of the Wetlands Restoration and Conservation (WRC) project category.

Project activities conserving tidal wetlands may include:

- Protecting at-risk wetlands (e.g., establishing conservation easements, establishing community supported management agreements, establishing protective government regulations, and preventing disruption of water and/ or sediment supply to wetland areas)
- Improving water management on drained wetlands
- Maintaining or improving water quality for seagrass meadows
- Recharging sediment to avoid drowning of coastal wetlands
- Creating accommodation space for wetlands migrating with sea-level rise

Avoiding Unplanned Wetland Degradation (AUWD)

Avoiding unplanned wetland degradation activities[18] are eligible under the following condition:

- Baseline agents of wetland degradation (i) cause an alteration in the hydrology of the project area (involving drainage, interrupted sediment supply, or both) and/or a loss of soil organic carbon; (ii) have no documented and uncontested legal right to degrade the wetland; and (iii) are either residents in the reference region for wetland degradation (see Section 5.1.4 below) or immigrants. Under any other condition, this methodology must not be used.

Avoiding Planned Wetland Degradation (APWD)

Avoiding planned wetland degradation activities[19] are eligible under the following condition:

- Conversion of intact or partially altered wetlands to a degraded condition must be legally permitted.

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

[18] That is, not combined with REDD project activities. In combined activities, the applicability conditions for REDD apply, and those outlined in Modules *BL-TW* and *M-TW*.
[19] That is, not combined with REDD project activities. In combined activities, the applicability conditions for REDD apply, and those outlined in Modules *BL-TW* and *M-TW*.

5.1 Geographical Boundaries

5.1.1 General

The spatial boundaries[20] 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 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 (e.g., 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 landholder 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 (e.g., 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 (i.e., 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. Mangrove forests are excluded from any tree height requirement in a forest definition, as nearly 100% or all of their vegetation consists of mangrove species, which often do not reach the same height as other tree species, and they occupy contiguous areas. Ecologically, their functioning as a forest is independent of tree height.

In REDD project activities, various kinds of boundaries must be distinguished, depending on the REDD category (planned or unplanned deforestation, forest degradation), i.e., 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.

[20] For WRC project activities, including subtidal seagrass areas, where relevant.

- 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.

These procedures also apply to CIW or combined REDD+CIW project activities, see Section 5.1.4.

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 WRC project area must meet the definition as provided in the *VCS Standard*: “The project area shall meet an internationally accepted definition of wetland, such as from the IPCC, Ramsar Convention on Wetlands, those established by law or national policy, or those with broad agreement in the peer-reviewed scientific literature for specific countries or types of wetlands. Common wetland types include peatland, salt marsh, tidal freshwater marsh, mangroves, wet floodplain forests, prairie potholes and seagrass meadows.”

For RWE project activities, the project area must not have been 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 is limited to the difference between the remaining SOC 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*.

WRC project activities in tidal zones must take account of effects of sea-level rise on project boundaries. Procedures are provided in Module *X-STR*.

In CIW project activities that are not combined with REDD activities, various types of boundaries must be distinguished, depending on the CIW category (i.e., planned or unplanned wetland degradation). For example, in the case of:

- Avoiding planned wetland degradation (APWD), the project area and proxy area(s) must be defined. Refer to Module *BL-PL* for the detailed procedures to define these boundaries.
- Avoiding unplanned wetland degradation (AUWD), the project area, reference regions for wetland degradation, and leakage belt area must be defined. Refer to Module *BL-UP* for definitions and the detailed procedures to define these boundaries.

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 before project start date.

WRC

While developing WRC baselines, the project must reference a period of at least 10 years in order to model a spatial trend in drainage, and it must take into account long-term (20-year) average climate variables, for which procedures are provided in Modules *BL-PEAT* and *BL-TW*.

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 emission 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 AFOLU 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 starting 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 wetlands 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) and Soil organic carbon Depletion Time (SDT)

The PDT or SDT for a stratum in the baseline scenario equals the period during which the project can claim emission reductions from rewetting, restoration or conservation. Procedures for determining the PDT or SDT are provided in Module *X-STR*.

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.

Since the PDT and SDT are part of the baseline assessment, they 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 wetland areas, must be presented, as well as data collected 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 wetlands, 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 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 4.

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 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 ARR Project Activities

Carbon pool	Included?	Justification / Explanation
Aboveground tree biomass	Included	Carbon stock in this pool may increase or decrease in the baseline scenario and may increase due to the implementation of the project activity
Aboveground non-tree biomass	Included	Carbon stock in this pool (shrub and/or herbaceous vegetation) may increase or decrease 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 or decrease in the baseline scenario and is expected to increase due to the implementation of the project activity
Litter		
Terrestrial	Optional	Given the applicability conditions that the project area for ARR is non-forest land or land with degraded forest, 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 *BL-ARR* and *M-ARR*.
Wetlands	Optional	This pool is not mandatory on wetlands but may be included. If included, litter must be accounted for using procedures in Modules *BL-ARR* and *M-ARR*..
Dead wood		
Terrestrial	Optional	Given the applicability conditions that the project area for ARR is non-forest land or land with degraded forest, the deadwood 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 *BL-ARR* and *M-ARR*.
Wetlands	Optional	This pool is not mandatory on wetlands but may be included. If included, dead wood must be accounted for using procedures in Modules *BL-ARR* and *M-ARR*.
Soil		
Terrestrial	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.
Wetlands	Included	Carbon stock in this pool may increase due to the implementation of the ARR project activity. However, for organic soil this increase is not accounted for. Emissions from soil organic carbon are estimated in Modules *BL-PEAT* and *M-PEAT*.
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[21] are shown in Table 6 below. The selection of carbon pools and the appropriate justification must be provided in the PD.

Table 6: 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 shrub biomass	Excluded	Covered under REDD or ARR
Herbaceous biomass	Excluded	Covered under 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

[21] If combined with REDD or ARR, see Tables 4 and 5 for additional information of pools.

Soil	Included	Procedures in Modules *BL-PEAT*, *M-PEAT, BL-TW and M-TW* 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[22], 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 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 REDD Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change.
		CH_4	Included	Non-CO_2 gases emitted from woody biomass burning - it is conservative to exclude.
		N_2O	Included	
	Combustion of fossil fuels	CO_2	Included	It is conservative to exclude
		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	It is conservative to exclude
Project	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change.
		CH_4	Included	Non-CO_2 gases emitted from woody biomass burning - must be included if fire occurs.
		N_2O	Included	

[22] E.g., CH_4 or N_2O emission from agriculture that results from deforestation or fire to clear forest land.

Source		Gas	Included?	Justification/Explanation
	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 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 ARR Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change
		CH_4	Included	Non-CO_2 gases emitted from biomass burning - it is conservative to exclude.
		N_2O	Included	
Project	Burning of biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change
		CH_4	Included	Burning of biomass for the purpose of site preparation, or as part of forest management, is allowed
		N_2O	Included	

5.4.4 WRC

The GHG emission sources included in or excluded from the boundary of the WRC component are shown in Table 9 below. The selection of sources and the appropriate justification must be provided in the PD.

Table 9: GHG Sources Included In or Excluded From the WRC Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	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*
	Emissions from tidal wetlands mineral soil	CO_2	Included	Considered under carbon pools
		CH_4	Included	Required unless *de minimis* or conservatively omitted
		N_2O	Included	Required unless *de minimis* or conservatively omitted
	Peat or biomass combustion	CO_2	Included	It is conservative to exclude. Procedures are provided for REDD project activities with emissions from biomass burning, and REDD-WRC and ARR-RWE project activities with emissions from biomass and/or peat burning, and RWE project activities with emissions from peat burning.
		CH_4	Included	
		N_2O	Included	
	Combustion of fossil fuels	CO_2	Included	It is conservative to exclude
		CH_4	Included	
		N_2O	Included	
Project	Oxidation of drained peat	CO_2	Included	Considered under carbon pools
		CH_4	Included	Required unless *de minimis*
		N_2O	Excluded	Excluded as per applicability condition in Module *BL-PEAT*
	Emissions from tidal wetlands mineral soil	CO_2	Included	Considered under carbon pools
		CH_4	Included	Required unless *de minimis*
		N_2O	Included	Required unless *de minimis*
	Peat or biomass combustion	CO_2	Included	Procedure are provided for REDD project activities with emissions from biomass burning and REDD-WRC and ARR-RWE project activities with emissions from biomass and/or peat burning, as well as for RWE project activities with emissions from peat burning.
		CH_4	Included	
		N_2O	Included	
	Combustion of fossil fuels	CO_2	Included	Mandatory where RWE project activities on tidal wetlands include fossil fuel combustion; In CIW project activities, potential emissions are negligible.
		CH_4	Included	
		N_2O	Included	

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 for this methodology by applying the notes provided for Table 10, below.

Table 10: 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).

Where project proponents use available data sourced from a jurisdictional baseline that meets the requirements set out in the VCS *JNR Requirements*, those data sources may be used under this methodology, where conservative, even where data accuracy may be less stringent than required by this methodology.

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 the 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

7.1 Project method – all project activities other than tidal wetland conservation and restoration

The latest version of the tool referenced in *T-ADD* must be used to identify credible alternative land use scenarios and evaluate both the alternatives and the proposed project scenarios (see Section 6.1) and to demonstrate the additionality of the project.

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*.

- CDM tool *AR-Tool14 Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*

7.2 Activity Method – all tidal wetlands conservation and restoration project activities

This methodology uses an activity method for the demonstration of additionality of tidal wetlands conservation and restoration project activities. For such project activities, use Module *ADD-AM* (*Demonstration of Additionality of Tidal Wetland Restoration and Conservation Project Activities*).

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 (i.e., ARR or REDD with a WRC component) must develop a unique baseline considering peat or tidal wetland soils as the

SOC 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 net GHG removals in the baseline scenario must be estimated using Module *BL-ARR*.

8.1.4 WRC

Baseline net emissions from the SOC pool must be estimated using Module *BL-PEAT* or *BL-TW*, whichever is relevant (see Table 3). For peat strata within tidal wetlands, Module *BL-PEAT* must be used.

Socio-economic processes causing the degradation of wetlands are similar to those causing deforestation or forest degradation. Therefore, for stand-alone CIW project activities (e.g., conservation of salt marshes without a tree biomass component), similar methods for baseline determination can be used as for REDD project activities. Stand-alone CIW as well as CIW-REDD project activities use Module *BL-TW* or *BL-PEAT* (whichever is relevant) in conjunction with Module *BL-UP* or *BL-PL* (whichever is relevant).

Stand-alone RWE and RWE-ARR project activities must use Module *BL-PEAT* or *BL-TW* (whichever is relevant) for baseline net GHG emissions from the SOC pool. In case fossil fuel combustion is accounted for, Module *E-FFC* must be used as well. RWE-ARR project activities must also use Module *BL-ARR* for the accounting of biomass and biomass burning (if relevant). RWE-REDD project activities must use Module *BL-PEAT* or *BL-TW* for the estimation of baseline net GHG emissions from the SOC pool, and Module *BL-UP* or *BL-PL* for all other pools and emissions.

8.2 Project Emissions

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 SOC pool in the project scenario must be estimated using Module *M-PEAT* or *M-TW* (whichever is relevant). For peat strata within tidal wetlands, Module *M-PEAT* must be used.

Stand-alone CIW and CIW-REDD project activities must use Module *M-TW* or *M-PEAT* (whichever is relevant) for the estimation of project net emissions from the SOC pool, and Module *M-REDD* for all other pools and emissions (where relevant).

Stand-alone RWE and RWE-ARR project activities must use Module *M-PEAT* or *M-TW* (whichever is relevant) for project net GHG emissions from the SOC pool. Where fossil fuel combustion is accounted for, Module *E-FFC* must be used as well. RWE-ARR project activities must also use Module *M-ARR* for the accounting of biomass and biomass burning (where relevant). RWE-REDD project activities must use Module *M-PEAT* or *M-TW* (whichever is relevant) for the estimation of project net emissions from the SOC pool, and Module *M-REDD* for all other pools and emissions.

8.3 Leakage

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

- For planned deforestation/degradation and planned wetland degradation: Module *LK-ASP*
- For unplanned deforestation and unplanned wetland degradation: Module *LK-ASU*
- For fuel-wood/charcoal collection: Module *LK-DFW*
- For pre-project agricultural or aquacultural activities: Module *LK-ARR*
- For WRC project activities: Module *LK-ECO*

For stand-alone CIW project activities, similar methods for leakage determination can be used as for REDD project activities, and Module *LK-ASU*, *LK-ASP or LK-ME* (whichever is relevant) must be used.

Combined RWE-ARR projects must use Module *LK-ASP*.

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 (e.g., 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** ($t CO_2e$)

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

For *ex-ante* estimations of specific parameters, 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:

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

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

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

Where:

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

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

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** – from Module *LK-ASP* (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** – from Module *LK-ASU* (t CO_2e)
$\Delta C_{LK\text{-}ME}$	Net GHG emissions due to market-effects leakage up to year *t** – from Module *LK-ME* (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** – from Module *LK-DFW* (t CO_2e)

8.4.3 ARR

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

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

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** – from Module *BL-ARR* (t CO_2e)
$\Delta C_{WPS\text{-}ARR}$	Net GHG removals in the ARR project scenario up to year *t** – from Module *M-ARR* (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)

Where ARR projects include harvesting, the loss of carbon due to harvesting must be included in the quantification of project emissions. The maximum number of GHG credits available to projects does not exceed the long-term average GHG benefit, which is calculated using the procedure in Module *M-ARR*.

8.4.4 WRC

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

$$NER_{WRC} = GHG_{BSL\text{-}WRC} - GHG_{WPS\text{-}WRC} - GHG_{LK\text{-}WRC} \quad (6)$$

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)

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

Baseline scenario

For CIW-REDD, RWE-REDD or stand-alone CIW project activities:

$$GHG_{BSL\text{-}WRC} = GHG_{BSL\text{-}PEAT} + GHG_{BSL\text{-}TW} \quad (7)$$

Where:

$GHG_{BSL\text{-}WRC}$	Net GHG emissions in the WRC baseline scenario up to year t^* (t CO_2e)
$GHG_{BSL\text{-}PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}TW}$	Net GHG emissions in the WRC baseline scenario on tidal wetland up to year t^* (t CO_2e)

For CIW-REDD, RWE-REDD or stand-alone CIW project activities on peatland (including organic soils in tidal wetlands):

$$GHG_{BSL\text{-}PEAT} = GHG_{BSL\text{-}PEAT,planned} + GHG_{BLS\text{-}PEAT,unplanned} \quad (8)$$

For CIW-REDD, RWE-REDD or stand-alone CIW project activities on tidal wetland (excluding organic soils):

$$GHG_{BSL\text{-}TW} = GHG_{BSL\text{-}TW,planned} + GHG_{BLS\text{-}TW,unplanned} \quad (9)$$

Where:

$GHG_{BSL\text{-}PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}PEAT,planned}$	Net GHG emissions in the baseline scenario from planned peatland degradation up to year t^* – from Module *BL-PL* (t CO_2e)
$GHG_{BLS\text{-}PEAT,unplanned}$	Net GHG emissions in the baseline scenario from unplanned peatland degradation up to year t^* – from Module *BL-UP* (t CO_2e)
$GHG_{BSL\text{-}TW}$	Net GHG emissions in the WRC baseline scenario on tidal wetland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}TW,planned}$	Net GHG emissions in the baseline scenario from planned tidal wetland degradation up to year t^* – from Module *BL-UP*; t CO_2e
$GHG_{BSL\text{-}TW,unplanned}$	Net GHG emissions in the baseline scenario from unplanned tidal wetland degradation up to year t^* – from Module *BL-UP*; t CO_2e

Note that Modules *BL-UP* and *BL-PL* internally refer to Modules *BL-PEAT* and *BL-TW* (whichever is relevant) for the estimation of net GHG emissions from the SOC pool. Modules *BL-UP*-and *BL-PL* provide procedures for the estimation of biomass burning and fuel burning.

For RWE-ARR or stand-alone RWE project activities, any significant baseline fossil fuel combustion may be added to Equation 7, as follows:

$$GHG_{BSL\text{-}WRC} = GHG_{BSL\text{-}PEAT} + GHG_{BSL\text{-}TW} + GHG_{BSL\text{-}fuel} \quad (10)$$

Where:

$GHG_{BSL\text{-}WRC}$	Net GHG emissions in the WRC baseline scenario up to year t^* (t CO_2e)
$GHG_{BSL\text{-}PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}TW}$	Net GHG emissions in the WRC baseline scenario on tidal wetland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}fuel}$	Net CO_2e emissions from fossil fuel use in the baseline scenario up to year t^* (from Module *BL-TW*) (t CO_2e)
i	1, 2, 3, … M strata
t	1, 2, 3, …t^* years elapsed since the projected start of the WRC project activity

For RWE-ARR or stand-alone RWE project activities on peatland (including organic soils in tidal wetlands) $GHG_{BSL\text{-}PEAT}$ is taken from Module *BL-PEAT*. For the biomass component in RWE-ARR project activities, $\Delta C_{BSL\text{-}ARR}$ is taken from Module *BL-ARR*, see Section 8.4.3.

For RWE-ARR or stand-alone RWE on tidal wetland (excluding organic soils) $GHG_{BSL\text{-}TW}$ is taken from Module *BL-TW*. For the biomass component in RWE-ARR project activities, $\Delta C_{BSL\text{-}ARR}$ is taken from Module *BL-ARR*, see Section 8.4.3.

Project scenario

$$GHG_{WPS\text{-}WRC} = GHG_{WPS\text{-}PEAT} + GHG_{WPS\text{-}TW} \quad (11)$$

Where:

$GHG_{WPS\text{-}WRC}$	Net GHG emissions in the WRC project scenario up to year t^* (t CO_2e)
$GHG_{WPS\text{-}PEAT}$	Net GHG emissions in the WRC project scenario on peatland up to year t^* (t CO_2e)
$GHG_{WPS\text{-}TW}$	Net GHG emissions in the WRC project scenario on tidal wetland up to year t^* (t CO_2e)

For CIW-REDD, stand-alone CIW or RWE-REDD project activities on peatland (including organic soils in tidal wetlands), use Modules *M-REDD* and *M-PEAT*.

For CIW-REDD, stand-alone CIW or RWE-REDD project activities on tidal wetland (excluding organic soils), use Modules *M-REDD* and *M-TW*.

For RWE-ARR and stand-alone RWE project activities, use Modules *M-PEAT* and *M-TW* (whichever is relevant) for the soil component, and (for RWE-ARR) Module *M-ARR* for the vegetation component.

$$GHG_{LK\text{-}WRC} = GHG_{LK\text{-}WRC\text{-}AS,planned} + GHG_{LK\text{-}WRC\text{-}AS,unplanned} + GHG_{LK\text{-}ECO} \quad (12)$$

Where:

$GHG_{LK\text{-}WRC}$	Net GHG emissions due to leakage from the WRC project activity up to year t^* (t CO_2e)
$GHG_{LK\text{-}WRC\text{-}AS,unplanned}$	Net GHG emissions due to wetland degradation from unplanned deforestation displaced from the project area up to year t^* – from Module *LK-ASU* (t CO_2e)
$GHG_{LK\text{-}WRC\text{-}AS,planned}$	Net GHG emissions due to wetland degradation from planned deforestation displaced from the project area up to year t^* – from Module *LK-ASU* (t CO_2e)
$GHG_{LK\text{-}ECO}$	Net GHG emissions due to ecological leakage from the WRC project activity up to year t^{**} – from Module *LK-ECO* (t CO_2e)

8.4.5 Calculation of AFOLU Pooled Buffer Account Contribution

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, 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.

$$Buffer_{Total} = Buffer_{Planned} + Buffer_{Unplanned} + Buffer_{Degrad\_FW/C} + Buffer_{WRC} + Buffer_{ARR} \quad (13)$$

$$Buffer_{Planned} = \left(\left(\Delta C_{BSL,Planned} - \sum_{\substack{t=1 \\ BSL}}^{t^*} \sum_{\substack{i=1 \\ Planned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) - \left(\Delta C_{P,Planned} - \sum_{\substack{t=1 \\ P}}^{t^*} \sum_{\substack{i=1 \\ Planned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) \right) \times Buffer\% \quad (14)$$

$$Buffer_{Unplanned} = \left(\begin{pmatrix} \Delta C_{BSL,Unplanned} - \sum_{\substack{t=1 \\ BSL\ Unplanned}}^{t^*} \sum_{i=1}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \end{pmatrix} - \begin{pmatrix} \Delta C_{P,Unplanned} - \sum_{\substack{t=1 \\ P\ \ Unplanned}}^{t^*} \sum_{i=1}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \end{pmatrix} \right) \times Buffer\,\% \quad (15)$$

$$Buffer_{Degrad-FW/C} = \left(\begin{pmatrix} \Delta C_{BSL,Degrad-FW/C} - \sum_{\substack{t=1 \\ BSL\ Degrad-FW/C}}^{t^*} \sum_{i=1}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \end{pmatrix} - \begin{pmatrix} \Delta C_{P,Degrad-FW/C} - \sum_{\substack{t=1 \\ P\ \ Degrad-FW/C}}^{t^*} \sum_{i=1}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \end{pmatrix} \right) \times Buffer\,\% \quad (16)$$

$$Buffer_{ARR} = NGR_{ARR} \times Buffer\% \quad (17)$$

$$Buffer_{WRC} = NER_{WRC} \times Buffer\% \quad (18)$$

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 in the project scenario[23] (t CO_2e)
$E_{FC,i,t}$	Emission from fossil fuel combustion in stratum *i* in year *t* (t CO_2e)
$N_2O_{direct-N,i,t}$	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)

[23] 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.

Buffer%	Buffer withholding percentage[24] (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*[25]. Module *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 19.

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:

$$VCU_t = \left(Adjusted\_NER_{REDD+,t_2} - Adjusted\_NER_{REDD+,t_1}\right) - Buffer_{Total} \quad (19)$$

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 and 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 and adjusted to account for uncertainty (t CO_2e)

[24] 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.

[25] 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:

$$Adjusted\_NER_{REDD+} = NGR_{ARR} + (NER_{REDD} + NER_{WRC}) \times (100\% - NER_{(REDD+ERROR)} + 15\%) \quad (20)$$

Where:

$Adjusted\_NER_{REDD+}$	Total net GHG emission reductions of the REDD+ project activities up to year *t** and 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, 13
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, 14
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 and procedures applied	See Module *BL-ARR*
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$GHG_{BSL-WRC}$
Data unit	t CO_2e
Description	Net GHG emissions in the WRC baseline scenario up to year *t**
Equations	6, 7
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

Data / Parameter	$E_{FC,i,t}$
Data unit	t CO_2e
Description	Emissions from fossil fuel combustion in stratum *i* in year *t*
Equations	13 - 15
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	

9.2 Data and Parameters Monitored

Data / Parameter:	$\Delta C_{WPS-REDD}$
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	$\Delta C_{LK-AS,degrad-FW/C}$
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
Calculation method:	See Module *LK-DFW*
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
Calculation method:	See Module *LK-ASP*
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
Calculation method:	See Module *LK-ASU*
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
Calculation method:	See Module *LK-ME*
Comments	

Data / Parameter:	$\Delta C_{WPS-ARR}$
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:	ΔC_{LK-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	See Module *LK-ARR*

and procedures to be applied:	
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:	$GHG_{WPS-WRC}$
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-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
Calculation method:	See Module *LK-ECO*
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	13 - 15
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
Calculation method:	See Module *E-FFC*
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	13 - 15
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

Calculation method:	See Module *E-NA*
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 of 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 is 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[26]; 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.

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, the project must select values that will lead to an accurate estimation of net GHG emission reductions, taking into account uncertainties.

If uncertainty is significant, the 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 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

Expert judgement

The use of expert judgment for the selection and interpretation of methods, selection of input data to fill gaps in available data, and selection of data from a range of possible values or uncertainty

[26] 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 that such reports may not be permanently available.

ranges, are all well established in the IPCC 2006 good practice guidance. Obtaining well-informed judgments from domain experts regarding best estimates and uncertainties is an important aspect in various procedures throughout this methodology. The project proponent must use the guidance provided in Chapter 2 (Approaches to Data Collection), in particular, Section 2.2 and Annex 2A.1 of the IPCC 2006 good practice guidance.

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

For WRC project activities, continued compliance with the applicability conditions of this methodology must be ensured by monitoring that:

- The water table is not lowered except where the project converts open water to tidal wetlands, or improves the hydrological connection to impounded waters

- The burning of organic soil as a project activity does not occur

- Peatland fires within the project area do not occur in the project scenario. If they do occur as non-catastrophic events, they are accounted for by cancelling the Fire Reduction Premium for the entire project or the individual project activity instance.

- Nitrogen fertilizers are not used within the project area in the project scenario

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 or tidal wetlands, the monitoring plan must use the methods given in Module *M-PEAT* or *M-TW*, respectively. All relevant parameters from the modules are to be included as the SOC 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*.

ARR

Changes in 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

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 *BL-PEAT* or *BL-TW* and, where relevant, Modules *BL-UP and BL-PL* 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 have 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.

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* or *M-TW* 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.

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). http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html

IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Institute for Global Environmental Strategies (IGES). http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

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

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*.
v1.6	8 Sep 2020	Updated to include CIW and RWE project activities on tidal wetlands. Methodology now includes three new modules: *VMD0050 BL-TW, VMD0051 M-TW and VMD0052 ADD-AM.*