CORRECTIONS AND CLARIFICATIONS TO *VM0010 METHODOLOGY FOR IMPROVED FOREST MANAGEMENT: CONVERSION FROM LOGGED TO PROTECTED FOREST, V1.3*

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This document provides corrections and clarifications applicable to *VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.3*. Such corrections and clarifications are effective on their issuance date. Project proponents and validation/verification bodies (VVBs) shall apply and interpret *VM0010, v1.3* consistent with the clarifications set out in this document.

These updates will be incorporated into the next issued version of the methodology.

Correction/ Clarification	Description	Section reference in *VM0010, v1.3*
Correction 1	Addition of missing *p* subscript to parameter and legend in equation 11	Section 8.1.2
Correction 2	Correction to equation 12 to be consistent with equation 26	Section 8.1.4
Correction 3	Correction to equation 14	Section 8.1.4.1
Correction 4	Correction to equation 15	Section 8.1.4.2
Correction 5	Correction to equation 16	Section 8.1.4.3
Correction 6	Correction to equation 19	Section 8.1.4.4

Correction 7	Correction to Equation 26 and parameter A_t to be consistent with the stratum-based accounting	Section 8.1.6
Correction 8	Replaces and specifies requirements for forest growth accounting.	Section 8.2
Correction 9	Correction to equation 25	Section 8.1.6
Correction 10	Correction to equation 26	Section 8.1.6
Correction 11	Clarification of how to Account for carbon stock increase resulting from ongoing forest growth	Section 8.2
Correction 12	Correction to Equation 32 and parameter A_t to be consistent with the corrected requirements for forest growth accounting	Section 8.2.1.6
Correction 13	Correction to Equation 37	Section 8.2.2.2
Correction 14	Addition of parameter $A_{t*,i}$ to parameter tables	Section 9.1

CORRECTION 1

Correction

8.1.2 Calculation of baseline carbon sequestered in wood products

[…]

$$C_{WP100,i,p|BSL} = C_{WP,i|BSL} \times OF_k \quad (1)$$

Where:

$C_{WP100,i,p\|BSL}$	Cabron stored in wood products that are assumed to be retired between 3 - 100 years after harvest from stratum *i* in land parcel p, tC ha-1;

$C_{WP,i\|BSL}$	Carbon stock of extracted timber from stratum *i* that is assumed to enter the wood products pool that is not immediately emitted at the time of harvest, in tC·ha^{-1};
OF_k	Fraction of biomass carbon for wood product type *k* that is assumed to be emitted to the atmosphere between 3 and 100 years of timber harvest, dimensionless;[1] and
i	1,2,3 …*M* strata;
p	*1, 2, 3 …P* land parcels.

Background:

$C_{WP100,i,p|BSL}$ was expressed correctly, with a p subscript, in the legend but not in the equation.

CORRECTION 2

Correction:

8.1.4 Change in carbon stocks due to forest regrowth after harvest

This section calculates ~~Δ~~$C_{RG,i,p|BSL}$, the carbon sequestration resulting from forest regrowth after timber harvest and establishment of forestry infrastructure in stratum *i* in land parcel *p*; tC/ha.

The carbon sequestration in the baseline scenario resulting from forest regrowth after timber harvest up to year *t* is equal to the forest regrowth rate of each stratum.

Therefore, carbon sequestration resulting from forest regrowth after timber harvest is calculated as:

$$C_{RG,i,p|BSL} = \sum_i ~~RGRi~~ RGR_i \times t^* \qquad (2)$$

Where:

$C_{RG,i,p\|BSL}$	Carbon sequestration resulting from forest regrowth after timber harvest and establishment of forestry infrastructure in stratum *i* in land parcel *p* at time t^*, tC /ha ~~ha~~$^{-1}$;
RGR_i	Regrowth rate of forest post timber harvest post forestry infrastructure establishment for stratum *i*, tC/ha/yr ~~ha~~$^{-1}$~~yr~~$^{-1}$; [2]
i	1,2,3 …*M* strata
t^*	1, 2, …,~~10~~ t^* years elapsed since the start of the project (years)

[1] See Section 9.1 for information on data selection.

Background:

There was an inconsistency between the unit of $C_{RG,i,p|BSL}$ and RGR_i, which is fixed by multiplying by the monitoring period. Additionally, $C_{RG,i,p|BSL}$ is expressed per stratum i, therefore RGR_i must be expressed per stratum i, instead of doing a summation of all RGR_i which leads to expressing *RGR* over the whole project area.

CORRECTION 3

Correction:

8.1.4.1 Emissions Due to Harvesting Operations

[…]

$$E_{HARVEST} = FC_{HARVEST} \times EF_{FUEL} \times \sum_{j,i} V_{EX,j,i|BSL} \times A_i \quad (3)$$

Where:

$E_{HARVEST}$	Fossil fuel emissions due to harvesting operations such as felling and snigging, in tCO_2e;
$FC_{HARVEST}$	Fuel consumption of equipment employed for felling and snigging per m3 of merchantable log harvested, in kL/m3;
EF_{FUEL}	Fuel emission factor, in tCO2e/kL;
$V_{EX,j,i\|BSL}$	Mean volume of extracted timber per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
A_i	Logging area in stratum *i*, in ha;
i	1, 2, 3 … M strata; and
j	1, 2, 3 … J tree species;

Background:

The equation needs to factor in the total volume of extracted timber instead of the mean volume of extracted timber.

CORRECTION 4

Correction:

8.1.4.2 Emissions Due to Log Hauling

[…]

$$E_{HAULING} = FC_{HAULING} \times EF_{FUEL} \times \sum_{j,i} V_{EX,j,i|BSL} \times A_i \quad (4)$$

Where:

$E_{HAULING}$	Fossil fuel emissions due to log hauling, in tCO_2e;
$FC_{HAULING}$	Fuel consumption of equipment for hauling one m3 of merchantable log, in kL/m3;
EF_{FUEL}	Emissions due to log hauling, in tCO_2e/kL;
$V_{EX,j,i\|BSL}$	Mean volume of extracted timber per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
A_i	Logging area in stratum *i*, in ha;
i	1, 2, 3 …M strata; and
j	1, 2, 3 … J tree species.

Background:

The equation needs to factor in the total volume of extracted timber instead of the mean volume of extracted timber.

CORRECTION 5

Correction:

8.1.4.3 Emissions Due to Log Transport

[…]

$$N_{TRUCKS-TRANSPORT} = \frac{\sum_{j,i} V_{EX,j,i|BSL} \times A_i}{CAP_{TRUCK}} \quad \textbf{(5)}$$

Where:

$N_{TUCKS-TRANSPORT}$	Number of truck trips required for log transport from collection depot to processing plant;
A_i	Logging area in stratum *i*, in ha;
$V_{EX,j,i\|BSL}$	Mean volume of extracted timber per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
CAP_{TRUCK}	Truck load capacity, in m3/truck;
i	1, 2, 3 … M strata; and
j	1, 2, 3 … J tree species;

Background:

The equation needs to factor in the total volume of extracted timber instead of the mean volume of extracted timber.

CORRECTION 6

Correction:

8.1.4.4 Emissions Due to Timber Processing

[...]

$$Q_{PROCESSING} = \sum_{j,i} V_{EX,j,i|BSL} \times A_i \times E_{DEMAND} \quad \textbf{(6)}$$

Where:

$Q_{PROCESSING}$	Quantity of electricity consumption for processing in kWh;
$V_{EX,j,i\|BSL}$	Mean volume of extracted timber per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
A_i	Logging area in stratum *i*, in ha;
E_{DEMAND}	Electricity demand for processing per volume processed, in kWh/m^3;
i	1, 2, 3 … M strata; and
j	1, 2, 3 … J tree species.

Background:

The equation needs to factor in the total volume of extracted timber instead of the mean volume of extracted timber.

CORRECTION 7

Correction:

8.1.6 Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

[...]

~~$\Delta C_{NET|BSL(1)} = \sum_{i,p} A_{1,i,p} \times \sum_{i=1}^{M} \left(C_{DWSLASH,i,p\backslash BSL}/10 + C_{WP0,i,p\backslash BSL} + C_{WP100,i,p\backslash BSL}/20 \right)$~~

$$\Delta C_{NET|BSL(1)} = \sum_{i,p} A_{1,i,p} \times \left(\Delta C_{DWSLASH,i,p\backslash BSL}/10 + \Delta C_{WP0,i,p\backslash BSL} + \Delta C_{WP100,i,p\backslash BSL}/20 \right) \quad (7)$$

Where:

$\Delta C_{NET\|BSL(1)}$	Net change in carbon stock across all parcels in the baseline scenario in the first year since harvest in the baseline scenario, in tC;

$\Delta C_{DWSLASH,i,p\backslash BSL}$	Change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in tC ha-1;
$\Delta C_{WP0,i,p\backslash BSL}$	Change in carbon stock resulting from wood product conversion and retirement from stratum *i* in land parcel *p*, that is assumed to be emitted in the first year of harvest in the baseline tC ha-1;
$\Delta C_{WP100,i,p\backslash BSL}$	Carbon stored in wood products that is assumed to be retired between 3 - 100 years after harvest from stratum i in land parcel p, tC ha-1;
$A_{1,i,p}$	Area of stratum *i* in land parcel *p* that was harvested 1 year ago, ha;
i	1, 2, 3 …*M* strata; and
p	*1, 2, 3 …P* land parcels harvested within the project crediting period.

Background:

Area $A_{1,i,p}$ cannot be multiplied by the sum of carbon stocks on all stratum, instead the area of stratum $A_{1,i,p}$ is multiplied by the carbon stock of stratum i within parcel p.

CORRECTION 8

Correction:

8.1.6 Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

[…]

$$\Delta C_{NET|BSL(2-10)} = \sum_{i,p} A_{2-10,i,p} \times (\Delta C_{DWSLASH,i,p\backslash BSL}/10 + \Delta C_{WP100,i,p\backslash BSL}/20) \quad (8)$$

~~$$\Delta C_{NET|BSL(2-10)} = \sum_{i,p}^{\square} A_{2-10,i,p} \times \sum_{i=1}^{M} \left(\Delta C_{DWSLASH,i,p\backslash BSL}/10 + \Delta C_{WP100,i,p\backslash BSL}/20\right)$$~~

Where:

$\Delta C_{NET\|BSL(2-10)}$	Net change in carbon stock across all parcels in the baseline scenario in years 2 - 10 since harvest in the baseline scenario, in tC;
$\Delta C_{DWSLASH,i,p\backslash BSL}$	Change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in tC ha-1;
$\Delta C_{WP100,i,p\backslash BSL}$	Carbon stored in wood products that is assumed to be retired between 3 - 100 years after harvest from stratum i in land parcel p, tC ha-1;
$A_{2-10,i,p}$	Area of stratum *i* in land parcel *p* that was harvested between 2 and 10 year ago, ha;

i	1, 2, 3 …*M* strata; and
p	*1, 2, 3 …P* land parcels harvested within the project crediting period.

Background:

Area $A_{1,i,p}$ cannot be multiplied by the sum of carbon stocks on all stratum, instead the area of stratum $A_{1,i,p}$ is multiplied by the carbon stock of stratum i within parcel p.

CORRECTION 9

Correction:

8.1.6 Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

[…]

$$AC_{NET|BSL(11-20)} = \sum_{i,p} A_{11-20,i,p} \times \Delta C_{WP100,i,p\backslash BSL}/20 \times \sum_{i=1}^{M} (\Delta C_{WP100,i,p\backslash BSL}/20) \quad (9)$$

Where:

$\Delta C_{NET\|BSL(11-20)}$	Net change in carbon stock across all parcels in the baseline scenario in years 11 - 20 since the start of the project activity, in tC;
$\Delta C_{WP100,i,p\backslash BSL}$	Carbon stored in wood products that is assumed to be retired between 3 - 100 years after harvest from stratum i in land parcel p, tC ha-1;
$A_{11-20,i,p}$	Area of stratum *i* in land parcel *p* that was harvested between 11 and 20 years ago, ha;
i	1, 2, 3 …*M* strata; and
p	*1, 2, 3 …P* land parcels harvested within the project crediting period.

Background:

Area $A_{1,i,p}$ cannot be multiplied by the sum of carbon stocks on all stratum, instead the area of stratum $A_{1,i,p}$ is multiplied by the carbon stock of stratum i within parcel p.

CORRECTION 10

Correction:

8.1.6 Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

[…]

The net change (sequestration) in carbon stock due to forest regrowth across all parcels in all years since harvest in the baseline scenario ~~are~~ is calculated according to Equation (26)~~14~~ below. Note that there will be no more emissions quantified from decay of logging slash or wood products.

$$\Delta C_{NET|BSL(1+)} = \sum_{i,p} A_{t*} * \sum_{i=1}^{M} \left(- \Delta C_{RG,i,p\backslash BSL} \right) \quad (10)$$

$$\Delta C_{NET|BSL(1+)} = - \sum_{i,p=1}^{M} A_{t*,i,p} * C_{RG,i,p\backslash BSL} \quad (11)$$

Where:

$\Delta C_{NET\|BSL(1+)}$	Net change in carbon stock due to forest regrowth in all parcels that have been harvested in the baseline scenario (t C)
$\Delta C_{RG,i,p\backslash BSL}$	Carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* in land parcel *p* at time *t** (t C/ha)
$A_{t*,I,p}$	Cumulative area of parcel p harvested in stratum *i* at ~~until~~ time *t** (ha)[3]
*t**	1, 2, …, ~~10~~ *t** years elapsed since the start of the project (years)
i	1, 2, 3, …, *M* strata
p	1, 2, 3, …, *P* land parcels harvested within the project crediting period

Background:

Under the baseline scenario, carbon sequestration resulting from post-harvesting forest regrowth is determined for each stratum *i*. Therefore, it must be multiplied by the cumulative area harvested of each stratum *i* to obtain the total carbon stock change.

[3] See ~~Data and parameters not monitored (default or possibly measured one time) parameter list~~ Section 9.1 for information on data selection.

CORRECTION 11

Correction:

8.2 Project Emissions

[...]

~~It is not a requirement of this methodology for the project proponent to estimate carbon stock change from forest growth in the project scenario of undisturbed forest. However, where the project proponent chooses to determine stock change from forest growth in the project scenario, a detailed sampling plan must be provided in the project documents and follow the equations in Section 8.2.1 below~~

Under the project scenario, the project proponents must only estimate carbon stock change from forest growth in areas that would have been harvested under the baseline scenario.

Ongoing forest growth can only be included for individual trees, species, strata and tree stands would have been harvested under the baseline scenario and must reflect the harvesting plan timeframe. During a verification period, ongoing forest growth can only be accounted for in areas that would have been harvested under the baseline scenario, between the baseline year of harvest and the end of the verification period.

When forest growth is included in the project scenario net GHG emissions, a detailed sampling plan that follows Section 8.2.1 below must be provided in the project documents.

Background:

Accounting for carbon stock increase resulting from ongoing forest growth can only be attributed to a project where and when trees would have been harvested under the baseline scenario. Ongoing forest growth in areas and trees that are not at risk of being harvested would have occurred under the baseline scenario and cannot be considered a result of project implementation. This correction reinforces a restriction that was not sufficiently specified in Section 8.2.1.2 of the methodology.

CORRECTION 12

Correction:

8.2.1.6 Determining Carbon Stock Changes

The annual carbon stock change in aboveground biomass of trees in year *t* is the difference in mean carbon stock in aboveground biomass between sampling events and, when expressed in t CO_2e, is calculated as:

$$\Delta C_{AB,t|PRJ} = \left(\sum_{i,p=1}^{M,P} \left(A_{t*,i,p} * \frac{C_{AB,i,t2|PRJ} - C_{AB,i,t1|PRJ}}{T} \right) \right) * \frac{44}{12} \quad \textbf{(12)}$$

Where:

$\Delta C_{AB,t\|PRJ}$	=	Annual carbon stock change in aboveground biomass of trees in year *t* (t CO_2e/yr)
$C_{AB,i,t\|PRJ}$	=	Mean aboveground biomass carbon stock of trees in stratum *i* at time *t* (t C/ha)
$A_{t^*,I,p}$	=	Cumulative area harvested of parcel p in stratum *i* at time *t** (ha)
~~A_i~~	=	~~Area covered by stratum *i*, ha;~~
sp	=	1, 2, 3, …, *SP* sample plots
T	=	Number of years between monitoring time *t*1 and *t*2 (*T* = *t*2 − *t*1) (years)
t1	=	Beginning of the monitoring period or time of harvest event, whichever is later
i	=	1, 2, 3, …, *M* strata
t	=	1, 2, 3, … *t** years elapsed since the start of the project activity
p	=	1, 2, 3, …, *P* land parcels harvested within the project crediting period
44/12	=	Ratio of molecular weights of carbon dioxide and carbon (t CO_2e/t C)

The carbon stock change in aboveground biomass of trees ($\Delta C_{AB,t|PRJ}$) is the output of this section and is necessary to calculate net greenhouse gas emissions in the project scenario.

CORRECTION 13

Correction:

8.2.2.2 Illegal logging

$$\Delta C_{DIST-IL,t|PRJ} = \sum_{i=1}^{M}\left(A_{DIST-IL,i,\sout{j}} \times \frac{C_{DIST-IL,i,t|PRJ}}{AP_i}\right) \times \left(1 + \frac{V_{EX,INF,j,i|BSL}}{V_{EX,j,i|BSL}}\right) + C_{FUEL} \Big/ \sum_{i=1}^{I} C_{EX,i|BSL} \times \frac{44}{12} \times C_{DIST-IL,t|PRJ} \quad (13)$$

Where:

$\Delta C_{DIST\_IL,t\|PRJ}$	Net carbon stock changes as a result of illegal logging at time *t*, tCO_2e;
$A_{DIST\_IL,i}$	Area potentially impacted by illegal logging in stratum *I*, ha;
$C_{DIST\_IL,i,t\|PRJ}$	Biomass carbon of trees cut and removed through illegal logging in stratum *i* at time *t*, tCO_2e;

$V_{EX,j,i\|BSL}$	Mean volume of extracted timber per unit area for species *j* in stratum *i*, $m^3 \cdot ha^{-1}$;
$V_{EX,INF,j,i\|BSL}$	Mean volume of extracted timber for forestry infrastructure per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
C_{FUEL}	Total carbon emissions associated with the combustion of fossil fuel in forestry and wood processing machinery, in tC;
$C_{EX,i\|BSL}$	Change in carbon stock of extracted wood products resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in tC ha-1;
AP_i	Total area of illegal logging sample plots in stratum *i*, ha;
i	1, 2, 3 ...*M* strata in the in the project case; and
t	1, 2, 3, ... *t* years elapsed since the projected start of the project activity.

Background:

Error in subscript of the parameter $A_{DIST\_IL,i}$ in equation 37, *j* subscript was withdrawn.

CORRECTION 14

Correction:

9.1 Data and Parameters Available at Validation

Data/Parameter	$A_{t^*,i}$
Data unit	ha
Equations	(26), (32)
Description	Cumulative area harvested in stratum *i* at time *t**
Source of data	Timber harvesting plan. Geodetic coordinates, remote sensing data and/or legal parcel records.
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of data	

Comments	It must be assumed ex ante that land parcel boundaries and strata areas do not change through time.

[…]

~~Data/ parameter:~~	~~A_{t*}~~
~~Data unit:~~	~~Ha~~
~~Used in equations:~~	~~14~~
~~Description:~~	~~Cumulative area harvested until time t*~~
~~Source of data:~~	~~Geodetic coordinates, GIS Files or legal parcel records~~
~~Measurement procedures (if any):~~	
~~Any comment:~~	

Background:

Parameter $A_{t*,i}$ was added to Equation (32) and replaced parameter A_{t*} in Equation (26), therefore a corresponding parameter table has been created in Section 9.1.