PV CLIMATE MODULE

PU002

Estimation of baseline and project GHG emissions from carbon pools in Plan Vivo projects

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Developed by:

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1 Summary

This module is part of the Plan Vivo Agriculture and Forestry Project Carbon Benefit Assessment Methodology (**PM001**). It is applicable to project interventions that result in net-reduction of GHG emissions from carbon pools as a result of forest protection. It can be used to provide values for the following parameters.

Baseline emissions from eligible carbon pools:

$BE_{WB,a,y}$ Net GHG emissions from aboveground woody biomass under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.1.1)

$BE_{NB,a,y}$ Net GHG emissions from aboveground non-woody biomass under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.1.1)

$BE_{BG,a,y}$ Net GHG emissions from belowground biomass under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.1.1)

$BE_{DW,a,y}$ Net GHG emissions from dead wood under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.1.1)

$BE_{LI,a,y}$ Net GHG emissions from litter under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.1.1)

$BE_{SO,a,y}$ Net GHG emissions from soil organic carbon under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.1.1)

$BE_{WP,a,y}$ Net GHG emissions from wood products under the baseline scenario for project area *a* up to year *y* (t CO_2e; see Section 5.2)

Project emissions from eligible carbon pools:

$PE_{WB,a,y}$ Net GHG emissions from aboveground woody biomass under the project scenario for project area *a* up to year *y* (t CO_2e; see Section 0)

$PE_{NB,a,y}$ Net GHG emissions from non-woody biomass under the project scenario for project area *a* up to year *y* (t CO_2e; see Section 0)

$PE_{BG,a,y}$ Net GHG emissions from below-ground biomass under the project scenario for project area *a* up to year *y* (t CO_2e; see Section 0)

$PE_{DW,a,y}$ Net GHG emissions from dead wood under the project scenario for project area *a* up to year *y* (t CO_2e; see Section 0)

$PE_{LI,a,y}$ Net GHG emissions from litter under the project scenario for project area *a* up to year *y* (t CO_2e see Section 0)

$PE_{SO,a,y}$ Net GHG emissions from soil organic carbon under the project scenario for project area *a* up to year *y* (t CO_2e; see Section 0)

$PE_{WP,a,y}$ Net GHG emissions from wood products under the project scenario for project area *a* up to year *y* (t CO_2e; see Section 5.2)

Procedures for estimating baseline emissions and expected project emissions for carbon pools use modelling based on a projection of historical deforestation in the project area and/or matched

control areas and expected effectiveness of project interventions. Procedures for estimating actual project emissions use land cover change assessment combined with emission factors for deforestation and forest degradation.

Procedures for estimation of baseline emissions from allocation of jurisdictional reference emission levels, and/or sample-based approaches are proposed – but are yet to be developed.

2 Sources

This module applies the following Plan Vivo tools:

PT002 Estimation of Carbon Benefits from REDD in Community Managed Forest, Version 2.0

3 Definitions

Definitions used in this module follow the latest version of the PV Climate Glossary and definitions in **PM001**.

4 Applicability Conditions

This module is applicable to Plan Vivo project interventions that result in net-reduction of GHG emissions from carbon pools. This includes the following intervention types:

- Forest protection

This module can be used for:

- Estimation of net GHG emissions by carbon pools in the baseline scenario,
- Estimation of expected net GHG emissions by carbon pools in the project scenario, and
- Estimation of net GHG emissions by carbon pools in the project scenario

This module is applicable under the following conditions:

- Projects applying this module shall also comply with the applicability conditions of any tools applied.

5 Procedures

5.1 Biomass and soil

5.1.1 Baseline emissions from carbon pools

Baseline emissions from aboveground and belowground woody and non-woody biomass can be estimated with either of the following approaches:

i. Allocation of jurisdictional reference emission levels according to risk of deforestation and forest degradation in the project area, using an approved tool for jurisdictional risk mapping and allocation (to be developed),
ii. Modelling based on projection of historical deforestation in the project area and/or matched control areas, following the procedures described in the **PT002** v2.0, or
iii. Sample-based approaches using stratified estimation, using an approved tool that applies the procedures described by Olofsson *et al.* 1993 (to be developed)

If using the procedures in **PT002** v2.0, expected baseline emissions from carbon pools are calculated with Equation 1, and actual baseline emissions from carbon pools are calculation with Equation 2.

Expected baseline emissions are used for estimating expected carbon benefits, and actual baseline emissions are used for verification of carbon benefits.

Calculation of expected baseline emissions from carbon pools

$$BE_{WB,a,y} + BE_{NB,a,y} + BE_{BG,a,y} + BE_{DW,a,y} + BE_{LI,a,y} + BE_{SO,a,y} = \sum_{VP} E_{BL,VP}$$

Equation 1

Where:

$E_{BL,VP}$ Baseline scenario emissions from deforestation and forest degradation expected during verification period *VP* (t CO_2e; from **PT002** v2.0 with the end of the most recent verification period set to *y* years)

Calculation of actual baseline emissions from carbon pools

$$BE_{WB,a,y} + BE_{NB,a,y} + BE_{BG,a,y} + BE_{DW,a,y} + BE_{LI,a,y} + BE_{SO,a,y} = \sum_{VP} AE_{BL,VP}$$

Equation 2

Where:

$AE_{BL,VP}$ Actual baseline scenario emissions from deforestation and forest degradation during verification period *VP* (t CO_2e; from **PT002** v2.0 with the end of the most recent verification period set to *y* years)

5.1.2 Project emissions from biomass and soil

Expected project emissions from biomass and soil

Expected project emissions from aboveground and belowground woody and non-woody biomass can be estimated with the following approach:

i. Modelling based on assumptions of project effectiveness, following procedures in **PT002** v2.0

If using the procedures in **PT002** v2.0, expected project emissions from aboveground and belowground woody and non-woody biomass are calculated with Equation 3.

Calculation of expected project emissions from biomass

$$PE_{WB,a,y} + PE_{NB,a,y} + PE_{BG,a,y} + PE_{DW,a,y} + PE_{LI,a,y} + PE_{SO,a,y} = \sum_{VP} E_{PS,VP}$$

Equation 3

Where:

$E_{PS,VP}$ Expected project scenario emissions from deforestation and forest degradation expected during verification period *VP* (t CO_2e; from **PT002** v2.0 with the end of the most recent verification period set to *y* years)

Actual project emissions from biomass

Actual project emissions from aboveground and belowground tree and non-tree biomass must be measured using the same approaches used for estimating baseline emissions. These include:

i. Land cover change assessment combined with emission factors for deforestation and forest degradation, following **PT002** v2.0, or
ii. Sample-based approaches using stratified estimation following an approved tool that applies the procedures described by Olofsson *et al.* 1993.[1]

If using the procedures in **PT002** v2.0, project emissions from aboveground and belowground wood and non-woody biomass are calculated with Equation 4.

Calculation of project emissions from biomass

$$PE_{WB,a,y} + PE_{NB,a,y} + PE_{BG,a,y} + PE_{DW,a,y} + PE_{LI,a,y} + PE_{SO,a,y} = \sum_{VP} AE_{PS,VP}$$

Equation 4

Where:

$AE_{PS,VP}$ Actual emissions from deforestation and forest degradation that occurred in the project area during verification period *VP* (t CO_2e; from **PT002** v2.0 with the end of the most recent verification period set to *y* years)

5.2 Wood products

Baseline and project emissions from wood products ($BE_{WP,a,y}$ and $PE_{WP,a,y}$) can be estimated and measured with the following approach:

i. Modelling using an approved approach based on the conceptual framework detailed in Winjum et al 1998 (to be developed)

6 Parameters

Data/Parameter	$E_{BL,VP}$
Units	t CO_2e
Description	Baseline scenario emissions from deforestation and forest degradation expected during verification period *VP*
Equations	Equation 1
Source	**PT002** with the end of the most recent verification period set to *y* years
Value	NA
Justification of choice of data or description of measurement methods and procedures applied	See **PT002** 2.0
Purpose of Data	Calculation of expected baseline emissions
Comments	NA

Data/Parameter	$AE_{BL,VP}$
Units	t CO_2e

[1] Olofsson, P., Foody, G.M., Stehman, S.V. and Woodcock, C.E., 2013. Making better use of accuracy data in land change studies: Estimating accuracy and area and quantifying uncertainty using stratified estimation. *Remote Sensing of Environment*, 129, pp.122-131.

Description	Actual baseline scenario emissions from deforestation and forest degradation during verification period *VP*
Equations	Equation 2
Source	**PT002** with the end of the most recent verification period set to *y* years
Value	NA
Justification of choice of data or description of measurement methods and procedures applied	See **PT002** 2.0
Purpose of Data	Calculation of actual baseline emissions
Comments	NA

Data/Parameter	$E_{PS,VP}$
Units	t CO_2e
Description	Baseline scenario emissions from deforestation and forest degradation expected during verification period *VP*
Equations	Equation 3
Source	**PT002** with the end of the most recent verification period set to *y* years
Value	NA
Justification of choice of data or description of measurement methods and procedures applied	See **PT002** v0.2
Purpose of Data	Calculation of expected project emissions
Comments	NA

Data/Parameter	$AE_{PS,VP}$
Units	t CO_2e
Description	Actual emissions from deforestation and forest degradation that occurred in the project area during verification period *VP*
Equations	Equation 4
Source	**PT002** v0.2 with the length of the project period set to *y* years
Value	NA
Justification of choice of data or description of measurement methods and procedures applied	See **PT002** v0.2
Purpose of Data	Calculation of project emissions
Comments	NA

7 References

Plan Vivo Standard Glossary, Version 1.0. Available from: https://www.planvivo.org/pv-climate-methodologies

PM001 Plan Vivo Agriculture and Forestry Project Carbon Benefit Assessment Methodology, Version 1.0. PV Climate Methodology. Available from: https://www.planvivo.org/pv-climate-methodologies

PT002 Estimation of Carbon Benefits from REDD in Community Managed Forest, Version 2.0. PV Climate Tool. Available from: https://www.planvivo.org/pv-climate-methodologies

Olofsson, P., Foody, G.M., Stehman, S.V. and Woodcock, C.E., 2013. Making better use of accuracy data in land change studies: Estimating accuracy and area and quantifying uncertainty using stratified estimation. *Remote Sensing of Environment*, 129, pp.122-131.

Winjum, J.K., Brown, S. and Schlamadinger, B. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44: 272-284