PLAN VIVO

PV Climate Tool

Concept Note

Estimation of Baseline and Project Emissions From Harvested Wood Products

Version 1.0

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PLAN VIVO

1 Summary

While most nature-based solutions (NBS) carbon project methodologies tend to focus on the effect of land use on carbon stocks, harvested wood products (HWPs) shift the focus to how carbon can remain sequestered once removed from the land from which they originate. Ultimately, HWPs represent a time-delayed release of sequestered carbon, and, depending on the type of product, can offer a level of permanence comparable to what is commonly expected of carbon projects in the market today. Peer registries, such as Verra, American Carbon Registry, Climate Action Reserve, and others already have developed and deployed HWP tools for the quantification of baseline and project emissions, emissions reductions and removals generated.

The proposed tool will be integrated into the PV Climate Agriculture and Forestry Carbon Benefit Assessment Methodology (**PM001**)[1] to provide approaches for estimating carbon stored in wood products harvested from PV Climate project areas under baseline and project scenarios. The tool will be applicable to any project areas where there is harvesting of timber is for used for long lived (i.e. >50 years) wood products. The procedures will be based on the conceptual framework detailed in Winjum et al 1998.[2]

The tool will be used to generate values for the following parameters that are used to estimate climate benefits following **PM001**:

$BR_{WP,a,y}$ Net GHG removals in wood products under the baseline scenario for project area *a* up to year *y* (t CO_2e)

$PR_{WP,a,y}$ Net GHG removals in wood products under the project scenario for project area *a* up to year *y* (t CO_2e)

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

[1] PM001 Plan Vivo Agriculture and Forestry Project Carbon Benefit Assessment Methodology, Version 1.0. PV Climate Methodology. Available from: https://www.planvivo.org/projects/certify-a-project/pvclimate/methodologies/approved-methodologies

[2] Winjum, J.K., Brown, S. and Schlamadinger, B., 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science, 44(2), pp.272-284. https://doi.org/10.1093/forestscience/44.2.272

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

2 Relationship to Existing Approaches

ORIGINS

Efforts to provide an accounting framework of carbon stored in harvested wood products can be traced to approaches developed or adopted by the International Panel on Climate Change (IPCC) since 1996 for accounting under National Greenhouse Gas Inventories. There are six main frameworks:

1. **Instantaneous oxidation** (IO; Pool based) – The 'original' approach and also the simplest (but least accurate), Instantaneous Oxidation assumes that all harvested wood "instantaneously oxidizes", i.e. that it decays immediately and its emissions released into the atmosphere.
2. **Stock Change** (SC; Pool based) – The Stock Change assigns removal/emission figures depending on whether a country is a net importer (consuming country) or exporter (producing country) of wood products. SC does not, however, estimate decay rate of HWP classes, and instead assumes instantaneous oxidation. This approach necessitates robust trade information for a country to determine the responsible administrative boundary where an HWP emission is to be accounted.
3. **Atmospheric Flow** (AF; Flux based) – With this approach, net exporters of HWPs are considered to have 'removed' carbon, whereas net importers of HWPs are considered to have 'emitted' carbon, but only when the HWP is estimated to have oxidized (i.e. not instantaneous). Sato and Nojiri note that this approach is not appropriate for system boundaries smaller than a country due to data requirements.
4. **Production** (Pool based) – The Production approach is similar to the Stock Change approach but differs from it in that the Production approach attributes all emissions related to HWPs are attributed to the country where the HWPs were produced. Further, emissions from imported HWPs are not accounted for, regardless of durability. This, in combination with IO, is the primary approach utilized by VCM methodologies.
5. **Stock Change Approach for HWP of Domestic origin** (SCAD; Pool based) - A hybrid of Stock-Change and Production approaches, SCAD inventories domestically produced stocks consumed within producing country only and does not provide a complete estimation of national stocks of HWP, the effects from imported and exported wood are not evaluated.

6. **Simple Decay** (Flux based) – The 'simple-decay' approach deals with actual fluxes of carbon associated with HWP to the atmosphere. The 'simple decay' approach covers CO2 emissions arising from wood harvested by a producing country, so that emissions from HWP and woody biomass used for energy purposes are reported by a producing country.

The 1998 Winjum et al. paper introduced the Stock Change and Atmospheric Flow approaches, a version of which (i.e. the Production approach) serves as the basis for the majority of VCM HWP accounting methodologies. The other major HWP accounting methodology, known as the 1605b approach, is similar to the Production approach, but strives to be more accurate and region-specific than simply utilizing Winjum-style generic categorical efficiency and decay classifications such as "developing" vs "developed", and "temperate" vs "tropical" vs "boreal".

PLAN VIVO METHODOLOGIES

The tool will be referenced in relevant sections of the following approved PV Climate Modules:

> **PU001** Estimation of baseline and project GHG removals by carbon pools in Plan Vivo projects[3]
>
> **PU002** Estimation of baseline and project GHG emissions from carbon pools in Plan Vivo projects[4]

PU001 and **PU002** both indicate that:

> "*Baseline and project removals in wood products can be estimated with... modelling following procedures in a tool approved by Plan Vivo based on the conceptual framework detailed in Winjum et al 1998.*"

To date, there has been no tool approved for this purpose.

OTHER METHODOLOGIES

In the development of this concept note, the following methodologies and tools approved for use in other GHG programmes were reviewed:

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[3] PU001 Estimation of Baseline and Project GHG Removals by Carbon Pools in Plan Vivo Projects, Version 1.1. PV Climate Module. Available from: https://www.planvivo.org/projects/certify-a-project/pvclimate/methodologies/approved-modules

[4] PU002 Estimation of Baseline and Project GHG Emissions from Carbon Pools in Plan Vivo Projects, Version 1.0. PV Climate Module Available from: https://www.planvivo.org/projects/certify-a-project/pvclimate/methodologies/approved-modules

ACR

- IFM on Canadian Forestlands v1.0
- IFM on Non-Federal US Forestlands v2.1
- IFM on Small Non-Industrial Private Forestlands v1.0
- Active Conservation and Sustainable Management on US Forestlands v1.0

CAR

- US Forest Protocol v5.1
- Mexico Forest Protocol v1.0
- Guatemala Forest Protocol v1.0
- Panama Forest Protocol v1.0

California Air Resources Board (ARB)

- US Forest Protocol v2015

Verra / VCS

- **VM0003** Methodology for Improved Forest Management through Extension of Rotation Age, v1.3
- **VM0005** Methodology for Conversion of Low-Productive Forest to High-Productive Forest, v1.2
- **VM0006** Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects, v2.2
- **VM0007** REDD+ Methodology Framework (REDD+MF), v1.8
- **VM0010** Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.4
- **VM0011** Methodology for Calculating GHG Benefits from Preventing Planned Degradation, v1.0
- **VM0012** Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2
- **VM0015** Methodology for Avoided Unplanned Deforestation, v1.2
- **VM0034** Canadian Forest Carbon Offset Methodology, v2.0
- **VM0045** Improved Forest Management Using Dynamic Matched Baselines from National Forest Inventories, v1.2
- **VM0048** Reducing Emissions from Deforestation and Forest Degradation, v1.0
- **VMD0005** Estimation of Carbon stocks in the long-term wood products pool (CP-W) v1.1

None of these methodologies have gone through the approval process for use in PV Climate projects, but may still inform the development of procedures in the proposed tool, with adaptations where appropriate to facilitate implementation in the PV Climate project context.

3 Scope and Applicability

The proposed tool will include procedures for the estimation of expected and actual emissions or removals in harvested wood products under baselines and/or project scenarios where wood harvesting occurs. Example activities include but are not limited to:

- Forest protection – Forest protection, e.g. Logged to Protected Forests (LtPF) and Reducing Emissions from Deforestation and Forest Degradation (REDD), implies a change from a forest being subjected to extractive and potentially degradative activities to one where those activities will be prohibited, preventing further degradation or deforestation. In this activity, baseline HWPs would be accounted for both emissions and removals.
- Forest conservation – Forest conservation, e.g. Improved Forest Management (IFM) and Reducing Emissions from Deforestation and Forest Degradation (REDD), implies a change from a forest being subjected to extractive and potentially degradative activities to one where those activities will be allowed but with certain restrictions. In this activity, baseline and project HWPs would be accounted for both emissions and removals.
- Afforestation, Reforestation, and Revegetation (ARR) – ARR projects establish or increase forest cover (i.e. Afforestation and Reforestation) and/or woody biomass (i.e. Revegetation) as compared to the baseline. In this activity, HWPs would be considered *de minimus* in the baseline. HWPs in the project are only accounted for if the project activity includes harvesting.
- Forest restoration activities may also apply the proposed HWP tool if harvesting occurs in either the baseline or the project or both. 'Restoration' implies that the current forest ecosystem is in a degraded state (e.g. reduced species richness, biodiversity, habitat, ecosystem services, etc.), and the goal of the activity is to restore the forest to a healthy state. This may involve removal of "undesirable" species (e.g. invasives, exotics, species representative of an undesirable successional stage) or age classes and human assistance to recovery / restoration to the desired state.

The following table (Table 1) illustrates applicability of various carbon pools and emission sources for the proposed tool.

Variable	Baseline	Project
Harvested above-ground biomass	Excluded if no harvesting in baseline. Otherwise, optional and conservative to exclude if there is no harvesting in the project scenario AND transparent and verifiable information can show that carbon stocks in HWPs are rising faster in the project than in the baseline OR are decreasing faster in the baseline than in the project scenario.	Forest Protection: Excluded Forest Conservation: Required ARR: Required if project activity includes harvesting
Below-ground biomass of harvested vegetation		Required if project activity includes harvesting
Harvested Wood Products (HWPs)		Required if project activity includes harvesting
Residual above-ground standing dead wood	Optional; conservative to exclude, but must be included if below-ground standing dead wood is also included	Optional; conservative to exclude, but must be included if below-ground standing dead wood is also included
Residual below-ground standing dead wood	Optional; conservative to exclude, but must be included if above-ground standing dead wood is also included	Optional; conservative to exclude, but must be included if above-ground standing dead wood is also included
Residual lying dead wood	Optional; conservative to exclude	Conditional, may be excluded if residual in-situ biomass is not burned following harvest
Residual litter	Excluded	Excluded

The tool will be applicable globally to estimate baseline and project biomass emissions or removals from project areas where timber is harvested for use in long-lived wood products under the baseline and/or project scenario. It will therefore be possible to apply the tool to generate fPVCs, rPVCs and vPVCs.

It is expected that the tool will be applied by PV Climate projects that operate in forests, or that implement reforestation or agroforestry activities such as Scolel'te, Mexico[5] and Kukumuty, Mozambique.[6]

4 Baseline Scenario and Additionality

The proposed tool will be applied within **PM001**, so the procedures for describing the baseline scenario and demonstrating additionality will follow **AR-TOOL02.**[7]

5 Quantification of Carbon Benefits

The proposed tool will be applied within **PM001**, so the procedures for potential and actual leakage emissions will follow PV Climate Module **PU004** Estimation of GHG emissions from leakage in Plan Vivo projects,[8] and procedures for calculation of carbon benefits will follow the equations in **PM001** with the uncertainty adjustment defined following PV Climate Module **PU005** Estimation of uncertainty of carbon benefit estimates in Plan Vivo projects.[9] If the procedures developed are not consistent with these existing methodology elements, alternatives will either be integrated into the tool or provided through updates to the existing methodology or modules.

An overview of the procedures for estimating the carbon baseline, and expected and actual project emissions and removals, is provided below. Compliance of the proposed approaches with the PV Climate Methodology Requirements[10] is summarised in Table 2.

[5] https://www.planvivo.org/scolelte

[6] https://www.planvivo.org/kukumuty

[7] AR-TOOL02 Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities, Version 1.0. CDM Tool. Available from: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-02-v1.pdf/history_view

[8] PU004 Estimation of GHG Emissions from Leakage in Plan Vivo Projects, Version 1.0. PV Climate Module. Available from: https://www.planvivo.org/projects/certify-a-project/pvclimate/methodologies/approved-modules

[9] PU005 Estimation of Uncertainty of Carbon Benefit Estimates in Plan Vivo Projects, Version 1.1. PV Climate Module. Available from: https://www.planvivo.org/projects/certify-a-project/pvclimate/methodologies/approved-modules

[10] PV Climate Methodology Requirements. Available from: https://www.planvivo.org/projects/certify-a-project/pvclimate/documents

Carbon Baseline and Project Scenario Quantification

The tool will estimate the amount of carbon stored in HWPs in the baseline and project scenarios by calculating:

1. the amount of **carbon delivered to the mills from the area of interest (i.e. project area)**, which depends on the harvested volume data from the project and expected wood products. In other words, if the harvested wood is intended for pulp and paper, then the whole tree is typically consumed, whereas if the wood is intended for dimensional lumber, then a biomass expansion factor is used to determine merchantable part of the tree, with the rest (i.e. the "slash") being scattered in the woods or piled and burned.
2. the portion of the carbon that is converted to wood products using a coefficient that **estimates the mill's efficiency**, and
3. **determining the wood product classes manufactured by the mill**, as different wood products have different decay rates, then
4. **applying the corresponding decay rate** for each wood product class to the annual estimated baseline volumes in each

Expected and Potential Data Sources

Data sources that are expected or could be used in the full tool may include, but are not limited to:

- IPCC Guidelines
- National or sub-national datasets
- Peer-reviewed literature such as Winjum et al. 1998, among others, and
- Primary information such as inventory data, harvest records, mill receipts

Expected Project Emissions/Removals

Ex-ante carbon storage in HWPs for the project scenario will be determined similarly as with the baseline, but based on the project model of expected harvesting, quantification for which is to be verified and adjusted accordingly following implementation of the activity.

Actual Project Emissions/Removals

Actual project carbon storage in HWPs may be verified by confirming cruising of marked timber, actual harvest levels via post-harvest inventory data, or directly from mill receipts upon delivery of harvested wood to the "mill gate".

Table 2 Justification for compliance with PV Climate Methodology Requirements

Methodology Requirement Type	**Summary of Compliance**
1.1 Methodology Structure	• The tool will be prepared using the latest template provided by Plan Vivo.
1.2 Uncertainty	• When sampling approaches are used, uncertainty will be estimated using the Equation 1 in PU005 Section 5.1.1; or an alternative approach for estimating sampling uncertainty at a 90% confidence level. • For model-based approaches, the tool will include procedures for estimating model error at a 90% confidence level and reporting this as a percentage of the carbon benefit derived from the biomass pool.
1.3 Quantifying Emissions and Removals	• The tool will only be used to quantify changes in harvested wood product carbon stocks. • All procedures will be consistent with international good practices in greenhouse gas accounting. • All data, parameters, assumptions and calculations will be fully described and justified.
1.4 Measurements and Sampling	• All procedures that involve measurements will apply established approaches for sample collection and analysis that minimise measurement error.
1.5 Models, Default Factors and Proxies	• Only publicly available models will be applied, and procedures will include requirements to demonstrate that models have been appropriately calibrated to the project conditions, and to ensure that models are applied in a manner that minimises potential for over-estimation of carbon benefits. • Any default values used will be sourced from reliable peer-reviewed literature that is appropriate to the scope of application. • Proxy values will only be used if there is robust evidence that they are strongly correlated to the parameter they represent.
2.1 Applicability Conditions	• The tool will have global application and the project interventions it can be applied to will be specified. • It will be possible to apply the tool to generate fPVCs, rPVCs and vPVCs.

2.2 Carbon Pools and Emission Sources	• The tool will be applicable to projects where harvested wood products have been identified as a significant carbon pool following the procedures in **PM001** that require application of **AR-TOOL04**.[11]
2.3 Baseline Scenario and Additionality	• The tool be will applied within **PM001**, so the procedures for describing the baseline scenario and demonstrating additionality will follow **AR-TOOL02.**
2.4 Carbon Baseline	• The tool will describe approaches for estimating annualised baseline emissions/removals from biomass, based on the identified baseline scenario. • The tool will include approaches for updating carbon baselines where appropriate.
2.5 Project Emissions and Removals	• The tool will describe approaches for estimating annual emissions/removals from biomass carbon pools under the project scenario. • The tool will include indicators and procedures for estimating project emissions/removals in each verification period.
2.6 Harvesting	• The tool will be integrated with approaches for estimating changes in biomass carbon pools under different harvesting practices in **PU001**.
2.7 Leakage	• The tool will be applied within **PM001**, so the procedures for accounting for leakage will follow **PU004**. PU004 assigns its applicability to all PV project interventions that have a risk of activity shifting or market leakage. Given that both harvest frequency and intensity may differ between the baseline and project scenarios, there is a risk that leakage may occur (e.g. if harvesting is allowed in the baseline but prohibited in the project, the harvesting may be done elsewhere). PU004 includes variables related to wood harvesting in equations 4 and 5. It is therefore necessary that any project using the HWP tool also use PU004.
2.8 Calculation of Carbon Benefits	• Calculation of carbon benefits will follow the procedures in **PM001**.

[11] AR-TOOL04 Tool for testing significance of GHG emissions in A/R CDM project activities, Version 1.0. CDM Tool. Available from:https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-amtool-04-v1.pdf/history_view

6 Development Team

Development of the tool will be led by Plan Vivo Technical Advisory Committee member Klaus Geiger with input from expert advisors from the Plan Vivo TAC and Plan Vivo project representatives working together in a formalized Working Group.

> Klaus Geiger is a forester with 15+ years' technical, commercial, and policy experience across nearly every level and setting as both representative of and consultant to land management entities, public and private, from small-holders to industrially managed timberlands. Klaus' experience leans most heavily in carbon due diligence, forest management certification (including post-harvest processing chain of custody), and international development. He has extensive experience in forest management, carbon and co-benefit certification, analytical decision-support tool development, MRV, client relationship management and stakeholder consultation.

Plan Vivo TAC members supporting tool development through the HWP Working Group include Akshaya R, Guido Cencini, Akeem Olawale Olaniyi, and Anko Stilma.