Plan Vivo Guidance and Resources

Climate Benefit Estimation

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Climate benefit estimation

Projects that develop Plan Vivo certificates contribute to climate change mitigation by reducing greenhouse gas emissions and/or enhancing carbon sinks. These 'climate benefits' must be quantified in tonnes of carbon dioxide equivalent (tCO_2e) reduced or removed from the atmosphere as a result of project interventions.

Potential project interventions are:

- Ecosystem restoration – Enabling the recovery of an ecosystem which has been degraded, damaged or destroyed by re-establishing the structure, productivity and species diversity previously present in the area e.g. restoring a degraded forest by planting trees, or other assisted natural regeneration processes
- Ecosystem rehabilitation – Assisting the recovery of an ecosystem that has been degraded, damaged or destroyed through the reparation of ecosystem processes, productivity and services, but without re-establishing a pre-existing species composition and structure e.g. inter-planting native tree species on degraded agricultural land to restore soil functions
- Prevention of ecosystem conversion or degradation – Protection of an ecosystem from degradation or conversion e.g. prevention of deforestation by reducing agricultural expansion into forest land, or prevention of grassland degradation by introducing new grazing practices
- Improved land management – Improving or introducing new land use and land use management practices to increase the provision of ecosystem services e.g. changing tillage practices, residue management or burning regimes in agricultural land to reduce greenhouse gas emission and/or increase soil carbon stocks

For all intervention types climate benefits are estimated by comparing greenhouse gas emissions and removals expected in the absence of project interventions (the baseline scenario) to emissions and removals with the project intervention after subtracting any emissions that result from leakage.

Expected climate benefits, and the approaches by which they are estimated, are described for each intervention in a Project Design Document (PDD). PDDs are reviewed by the Plan Vivo Foundation, and experts from the Plan Vivo Technical Advisory Group who assess whether the approaches, assumptions and data used provide a credible and conservative estimate of the climate benefits that are likely to be achieved as a result of the project intervention. Projects then monitor activities and impacts to demonstrate whether the expected climate benefits are achieved.

The following information on climate benefit estimation is needed for the PDD:

Baseline scenario – A description of the most likely land use scenario in the project area(s) in the absence of project interventions.

Estimation of emissions and removals – Estimated emissions and removals from within the project area under the baseline scenario, and separately with the project interventions after

subtracting any emissions expected to result from leakage, are used to describe the expected climate benefit of the project.

Risks of non delivery and reversals – An assessment of the risks of non-delivery and non-permanence of climate benefits and assignment of an appropriate risk buffer.

Monitoring – A description of indicators that will be monitored to determine whether climate benefits have been achieved.

Baseline scenario

The baseline scenario for a given project area is a description of land use and land cover at the start of a project intervention, and how this is expected to change if no project intervention took place. The baseline scenario must be described in sufficient detail for baseline emissions and removals to be estimated for the period over which climate benefits are quantified.

The Plan Vivo Standard does not require a specific approach for describing a baseline scenario, but a narrative description of the baseline scenario, and a justification for why it is the most likely of all credible alternatives, is required in Section G4 of the PDD. Evidence, such as reference to published documents or analyses performed by the project (e.g. interviews, field studies, satellite image analyses), must be provided. It must also be made clear to what geographical area the baseline scenario applies, for example through the inclusion of maps in addition to a purely narrative description.

For project interventions that aim to increase carbon stocks in vegetation and/or soil (i.e. ecosystem restoration and rehabilitation, and improved land management), and that plan to expand over time, the baseline scenario should be applicable to all areas where project interventions will be carried out. If a single baseline scenario does not apply to all potential project areas, more than one scenario can be included, but the area of applicability must be clearly stated for each. For interventions in small-holder agricultural areas the baseline scenario will often be a continuation of current land use practices.

For project interventions that aim to reduce carbon dioxide emissions by preventing ecosystem conversion or degradation (e.g. reducing deforestation and forest degradation) a baseline scenario that applies to a specific, delimited, project area is usually required. Often this will be informed by past patterns of land use change in the surrounding landscape.

One method for describing and justifying a baseline scenario is to use a barrier analysis, applying the following approach:

1. Create a list of land use scenarios that could occur in the absence of the project intervention. Alternative land use scenarios can be described using different approaches including - conducting field surveys, assessing historical changes using a time series of land use and land cover maps, and obtaining information directly from communities and other stakeholders;
2. Carry out a barrier analysis to identify which of the alternative land use scenarios are not prevented by legal regulations or other barriers (see the Plan Vivo Approved Approach – Additionality); and
3. If more than one potential scenario remains after the barrier analysis, the baseline scenario adopted should be either the option with highest greenhouse gas removals (or lowest emissions), or the option that would generate the greatest income to the community.

Estimation of emissions and removals

All projects that generate Plan Vivo certificates must include a credible and conservative estimate of the climate benefits that are expected to result from the project intervention during a specified quantification period. This is recorded in Section F1 of the PDD. Expected climate benefits are estimated by comparing emissions and removals expected under the baseline scenario with the expected emissions and removals with the project intervention. If the project intervention could create an increase in emissions or reduction in removals outside the project area, this leakage must also be subtracted from the expected climate benefits.

The PDD requires the following information regarding estimation of emissions and removals within the project area:

A summary of carbon pools and emission sources for which emissions and removals are estimated;

A description of the approved approaches used to estimate emissions and removals under the baseline scenario and project intervention, including emissions from leakage;

A full description of all data sources and assumptions used to estimate emissions and removals, including a justification for why they are appropriate; and

An assessment of the uncertainty of estimated emissions and removals.

Carbon pools and emission sources

A table showing carbon pools and emission sources included when estimating emissions and removals is required in Section G4 of the PDD. The following carbon pools and emission sources must be considered for inclusion:

Carbon pools

- Above-ground woody biomass
- Below-ground woody biomass
- Dead wood
- Litter
- Soil organic carbon
- Long term wood products

Emission sources

- Emissions from biomass burning
- Emissions from fossil fuel combustion
- N_2O emissions from fertilizer application

Emissions and removals from all carbon pools and emission sources included must be estimated in the baseline scenario, with the project intervention, and for leakage. Carbon pools and emission sources can be excluded if their exclusion will not lead to a significant over-estimation of climate benefits.

A carbon pool or emission source can therefore be excluded if:

- The carbon stock is expected to be lower, or emissions are expected to be higher, in the baseline scenario than with the project intervention; or
- The carbon stock or emission source is insignificant in comparison to the carbon pools and emission sources that are included. The total carbon stocks and emission sources excluded under this criterion should be definitely less than 5% of the total carbon stock and emissions in all included pools and emission sources.

If a carbon pool or emission source is not excluded under either of these criteria, but cannot be cost-effectively assessed and monitored, the possibility of using a proxy should be considered. For example below-ground tree biomass can usually be estimated if above-ground tree biomass is known. If a suitable proxy is not available, a deduction must be made from expected climate benefits to ensure they are not overestimated.

Justification and evidence that exclusion criteria have been met must be provided in the PDD for all excluded carbon pools and emission sources.

Approved approaches

The Plan Vivo Standard requires the use of approved approaches for estimating emissions and removals from the baseline scenario, and project intervention, and for emissions from leakage. If a suitable approved approach is not available, projects can develop or adopt their own approaches for estimating emissions and removals and submit these to the Plan Vivo Foundation for approval, either separately or in the relevant sections of the PDD.

Methodologies developed for other standards can be considered, although it should be noted that Plan Vivo projects are encouraged to make use of simple, low cost approaches where possible. Methodologies from other standards can be complex and costly to implement, with the aim of providing precise estimates of all emission reductions and removals. Many of these methodologies can prove impractical when applied to smaller scale projects, and the use of simpler methods, with conservative assumptions, can often reduce cost and complexity without the risk of over-estimating benefits.

A full list of approved approaches and a template that should be used when submitting new approaches can be found here

Approved approaches should include clear applicability criteria describing the conditions under which the approach can be used. When adopting an approved approach for estimating emissions and removals, care should be taken to ensure that the project area, baseline scenario and project intervention meet all of the applicability criteria specified for the approach. Conditions under which estimated climate benefits are valid must be described in Section G1 of the PDD.

Leakage

Some types of project intervention have the potential to displace emissions or reduce removals outside the project area. This is referred to as 'leakage'. Leakage can occur, for example, if the activities of stakeholders in a project area are regulated and insufficient project activities are put in place to compensate for any reduction in income that results from the regulations. In this case it is likely that the stakeholders who lose out as result of project activities would simply relocate their activities and generate emissions outside the project area.

There is potential for leakage from project interventions that reduce agricultural productivity or that reduce access to timber, livestock grazing or other forms of resource use with the potential to generate emissions or reduce removals if displaced. Emissions from leakage will depend on the area activities are displaced to, which is often unknown or unclear at the start of a project; but a conservative estimate based on the worst-case scenario can usually be derived.

The risk of leakage can be reduced by projects that implement activities to increase productivity and/or provide alternative sources of income in a manner that does not contribute to leakage. By describing the increases in productivity and income from alternative livelihood activities that project activities are expected to deliver, projects can demonstrate how the potential for leakage will be reduced.

To avoid all leakage, project activities would need to increase productivity and/or income by an amount equal to or greater than any decreases in productivity or income that result from controls on agricultural practices, livestock grazing, timber harvesting or other resource use activities with potential to cause leakage.

To estimate expected emissions from leakage, projects must identify all project activities and stakeholder groups with the potential to cause leakage, and describe what mitigation measures are in place to reduce the likelihood or impacts of this leakage. It is stressed that it is far better to prevent leakage where possible, but if leakage is a significant possibility it must be estimated and/or monitored using an approved approach so that it can be subtracted from the carbon benefits.

For some types of project activity direct monitoring of leakage may not be feasible. For project interventions that aim to reduce deforestation and forest degradation for example determining whether deforestation and degradation that takes place outside a project area is the result of project activities presents and considerable challenge. If direct monitoring of leakage is not feasible leakage emissions can be estimated, based on the assumption that any reduction in productivity or income that results from project activities, and that is not replaced by the identified mitigation measures, will result in leakage. The amount of leakage assumed should be equal to that required to result in no net-loss of productivity or income as a result of project activities. If the areas that are likely to be affected by leakage are unclear, the worst-case scenario should be assumed.

For each project activity with the potential to cause leakage, Section G6 of the PDD requires a description of leakage mitigation measures the project will put in place; and an estimate of

potential leakage emissions, with details of how leakage is estimated and justification of any assumptions used.

For project activities that do not have the potential to cause leakage, a justification for why this is the case should be provided.

Data sources and assumptions

Approved approaches require the use of data and assumptions to estimate emissions and removals from the baseline scenario and project interventions. Depending on the type of information required, potential data sources include:

- Surveys or research conducted within the project area, or other representative areas;
- Analysis of maps and remote sensing data;
- Published and unpublished papers and reports from the region; and
- Default values from national or global studies.

Data sources used must contribute to a credible and conservative estimate of climate benefits, and projects are encouraged to make use of available sources of information where possible to reduce the cost of data collection and increase the speed of approval.

Conservative assumptions can also be used if appropriate data are not available, and the cost of data collection is prohibitive. An example of a conservative assumption would be that if forest area is expected to be degraded under the baseline scenario, but the cost of estimating reduction in above-ground woody biomass under the baseline scenario is prohibitive, it could be conservatively assumed that baseline carbon stocks in above-ground woody biomass remain constant under baseline scenario. This assumption is conservative if the project intervention is expected to increase above-ground woody biomass since it means that climate benefits are underestimated.

All assumptions and sources of data used to estimate emissions and removals must be identified, and a justification for why they are appropriate must be provided in the PDD for the baseline scenario (PDD Section G4), the project intervention (PDD Section G5), and leakage (PDD Section G6). If projects conduct their own surveys, research, or mapping, full details of data collection and analysis methodologies and results must be made available in an Annex to the PDD (for example, spreadsheets containing field data, tables showing the corner or centre coordinates of field plots, geotifs of the analysed remote sensing data, kml or shapefiles of landcover classes, etc).

Uncertainty

All estimates of emission reductions and removals have some uncertainty associated with them. Sometimes it will be possible to quantify this uncertainty, other times it will not. Estimates of climate benefits with high levels of uncertainty are unlikely to be credible unless projects can demonstrate that the estimates are conservative. Plan Vivo projects are therefore required to identify the main sources of uncertainty in their estimates of climate benefits, to quantify these where possible, and to describe why the treatment of uncertainty contributes to a conservative estimate of climate benefits. This information must be presented in PDD Section G6.

Risks of non-delivery and reversals

All projects that issue Plan Vivo certificates are exposed to some risk that that climate benefits that have been achieved and that have had Plan Vivo certificates issued against them will be reversed in the future as a result of changing land use practices, or natural disasters. Projects that are issued certificates in advance of climate benefits achieved being verified, have the additional risk that expected climate benefits will not be achieved.

Plan Vivo projects must therefore consider these risks when developing project interventions and, where possible, put measures in place to mitigate them. Mitigation measures are unlikely to be sufficient to remove all risks however, so projects are also required to use appropriate risk buffers to insure against the risks of non-delivery and reversal of climate benefits.

Risk buffer

A proportion of climate benefits from all Plan Vivo projects must be held in a risk buffer and remain unsold, to be used to account for future reversals of emission reductions and removals. These buffer credits are held in the Plan Vivo pooled buffer account, which effectively provides insurance in the case of major reversal events for all the purchasers of Plan Vivo credits.

For projects that issue Plan Vivo certificates in advance of verification an additional buffer is required against the risk of non-delivery of climate benefits for which certificates have been issued.

To ensure that the risk buffer assigned is proportional to the level of risk the project is exposed to, the risk buffer should be determined by consideration of specific risk factors and mitigation actions. Details of the risk assessment and justification for the level or risk buffer assigned is required in Section H of the PDD.

The Plan Vivo Standard does not require a specific approach to determining a risk buffer. However, it is recommended that all projects provide a description of the risk of reversals associated with specific risk factors for the following risk categories: Social, Economic, Environmental, Technical and Administration. Actions the project will take to mitigate the risks, can then be described and a risk level assigned for each category with a value between 1 (very low) and 10 (very high). A non-permanence risk buffer percentage can then be determined by summing the risk level scores for each of the five risk categories to give a non-permanence risk buffer value between 5% and 50%.

For projects that receive Plan Vivo certificates in advance of verification an additional risk assessment is required for the risk of non-delivery. The same approach can be followed as for the determining the non-permanence risk buffer. The total risk buffer for the project is then the sum of risk buffer percentages for non-permanence and non-delivery.

The minimum risk buffer for Plan Vivo projects is 10%, and in most cases the risk buffer will be 20% or higher.

Examples of risk factors for the five risk categories are provided below, although projects are encouraged to identify and describe risk factors that are specific to their project area, and project intervention.

Risk category	Risk factors
Social	• Land tenure and/or rights to climate benefits are disputed • Political or social instability • Community support for the project is not maintained
Economic	• Insufficient finance secured to support project activities • Alternative land uses become more attractive to the local community • External parties carry out activities that reverse climate benefits
Environmental	• Fire • Pest and disease attacks • Extreme weather or geological events

Technical	• Project activities fail to deliver expected climate benefits • Project activities fail to deliver expected livelihood benefits • Technical capacity to implement project activities is not maintained
Administration	• Capacity of the project coordinator to support the project is not maintained

Monitoring

Plan Vivo projects must submit annual monitoring reports that describe the progress of project activities. Projects that develop Plan Vivo certificates must include an estimate of climate benefits achieved in their annual reports, and have these verified by an independent auditor every five years, or more frequently.

For project interventions that aim to increase carbon stocks in vegetation and/or soil (i.e. ecosystem restoration and rehabilitation, and improved land management), climate benefits may accrue slowly, especially in the early years of the project intervention. For example, for tree planting activities significant climate benefits are only realized once trees are established and of a reasonable size. The highest costs of these management activities are typically experienced in the early years of the intervention, however.

Plan Vivo therefore allows some projects to receive certificates in advance of the climate benefits being achieved, if the annual reports provide evidence that the project is on track to achieving the expected climate benefits. Certificates issued in advance of climate benefits being achieved, are known as '*ex-ante'* certificates. Ex-ante certificates can only be verified after the emission reductions or removals have been achieved.

For project interventions where the management costs, and/or climate benefits, are more evenly distributed throughout the project period (e.g. reducing deforestation and forest degradation); certificates are usually issued after the climate benefit has been achieved. Certificates issued after climate benefits have been achieved are known as *'ex-post'* certificates.

Projects can be issued certificates on the basis of annual monitoring reports that include indicators to assess whether project activities have been carried out as planned. Certificates are verified once estimates of emission reductions and removals achieved by the project are idenpendently reviewed, and some projects may choose only to issue certificates after verification.

Details of indictors that will be monitored for annual reporting of climate benefits must be described in PDD Section K1, and approaches that will be used for verification must be described in PDD Section G6.

Annual reporting

Monitoring for annual reporting is required to demonstrate whether the project is likely to have achieved the expected climate benefits described in the PDD, or if they are on-track to achieving them for projects that develop ex-ante certificates. Projects must therefore develop a set of indicators that are sufficient to demonstrate this, and that can be efficiently and accurately assessed on an annual basis.

Indicators for annual reporting of climate benefits can be directly or indirectly linked to climate benefit estimation. Direct indictors, for example measurements of planted trees, forest inventories, and assessment of land cover change, typically require specialist skills and can be expensive to assess. Many Plan Vivo projects therefore adopt simpler, activity-based indictors for use in their annual reporting – unless they require all certificates to be verified before they are issued.

Activity-based indicators typically have an indirect link to climate benefits that is described by the project logic. The project logic is that if all activities are carried out as planned, the expected climate benefits will be achieved. The evidence that supports this logic is assessed during the PDD technical review. If activity-based monitoring is used for annual reporting, the indicators used must be sufficient to allow reviewers to assess whether project activities have been carried out as planned. Projects should be careful to choose a targeted, realistic set of activity-based indicators, and not to over-commit. A normal expectation would be that if activity-based targets are missed two years running (i.e. if corrective actions after a single year were not effective), or not reported against in a single year when the PDD stated they would be reported against, issuances of certificates from the project will be suspended until the indicator targets are met.

Whether direct or indirect indictors are used for annual monitoring, all indicators must be fully described in the PDD, with details of when, and by whom, monitoring will be carried out. For each indicator, thresholds that must be met to demonstrate that climate benefits are likely to have been achieved, or are on track being achieved, must be identified; along with corrective actions that will be carried out if thresholds are not met.

Verification

Verification by an independent auditor is used to determine whether expected climate benefits have been achieved. All projects that develop Plan Vivo certificates must be verified at least every 5 years. At the time of verification key parameters and assumptions used to estimate expected climate benefits should be reviewed, and where possible revised using data and information from the project area. Key parameters and assumptions must be described in PDD Section G6, along with a description of information that will be gathered to review them, and how this will be used to revise estimated of climate benefits.

Projects are encouraged to make use of direct indicators of climate benefits to review and revise key parameters and assumptions. For projects that involve planting trees, the most important parameters and assumptions are likely to be related to tree survival and growth. Tree measurements may therefore be needed to assess whether the growth planted trees conforms to models used to estimate climate benefits. For projects where climate benefits result from preventing ecosystem conversion or degradation it is likely to be necessary to make a direct assessment of changes in land cover that have occurred in the project area using analysis of satellite images or other mapping approaches.

For some key parameters and assumptions, measuring direct indictors of climate benefits may not be feasible, even at five-yearly intervals; for example the cost of measuring changes in soil carbon stocks across large project areas is likely to prohibitive for many projects, or direct monitoring of leakage from forest protection activities may not be feasible if it is not possible to link observed land cover changes outside the project area to project activities. In these cases a review of activity data collected from the project area, and other literature relevant to the models or assumptions used can be used to revise climate benefit estimates.

Approved approaches

Guidance and resources> Climate benefit estimation>Approved approaches

The following approaches and tools have been approved for use by Plan Vivo projects that meet the specified applicability requirements. Projects that plan to develop or adopt an approach not listed here should contact Plan Vivo to discuss the approach and request an approved approach template.

Type	Project types	Geographical area	Carbon pool/emission source	Approach/Tool
Additionality assessment	All	Global	N/A	Plan Vivo Approved Approach – Additionality
Estimation of emissions and removals (Baseline scenario; Project intervention)	Afforestation; Reforestation, Agroforestry; Agricultural land management	Sub-Saharan Africa	Above-ground woody biomass; Below-ground woody biomass; Soil organic carbon; Biomass burning; Fertilizer application	SHAMBA - Small-Holder Agriculture Monitoring and Baseline Assessment methodology
Estimation of emissions and removals (Baseline scenario)	Prevention of deforestation	Tropical/sub-tropical evergreen or semi-evergreen forests	Above-ground woody biomass	Plan Vivo Approved Approach – Estimating Reference Emission Levels
Estimation of emissions and removals (Baseline scenario; Project intervention; Leakage)	REDD in community managed forests	Global	Above-ground woody biomass; Below-ground woody biomass	Under development

Plan Vivo Approved Approach Template

Title	Title of the approved approach that includes details of scope and applicability
Version	Version number
Date of approval	Date the approach was approved by Plan Vivo
Scope	List all of the following that are included in the approach and/or add a description of the scope of the approach: Additionality assessment; Baseline scenario; Estimation of emissions and removals (Baseline scenario); Estimation of emissions and removals (Project scenario); Estimation of emissions and removals (Leakage); Risk buffer; Monitoring
Project type(s)	List all of the following that apply and/or add a description of the project type(s) the approach is applicable to: Reforestation, Forest restoration, Afforestation, Agroforestry, Prevention of deforestation and forest degradation, Agricultural land management
Geographical area	Add a description of the geographical area within which the approved approach is applicable
Carbon pool(s)/Emission source(s)	List all of the following that apply: Above-ground woody biomass; Below-ground woody biomass; Dead wood; Litter; Soil organic carbon; Long term wood products

Summary

A concise summary of the approach

Definitions

Definitions of all acronyms and technical terms used in the approach that are not defined in the Glossary of the most recent version of the Plan Vivo Standard

Applicability

Description

A description of the project type(s), geographical area(s) and circumstances that the approach is applicable to

Applicability conditions

A list of all conditions under which the approach can be applied including geographical areas, socio-economic, edaphic and environmental conditions, management types, and any other conditions necessary to ensure that the assumptions and data sources used in the approach are applicable

Exclusion criteria

A list of any conditions under which the approach is not applicable that are not explicit from the applicability conditions

Approach

A description of the approach with sufficient detail that it can be applied by project developers. Justification should be provided for the methodological approaches and assumptions employed, and all data and parameters required must be clearly identified.

Data and parameters

Provide the following information for any data and parameters in the approach that will be used in the PDD and/or used for verification	
Description	Description of the data/parameter
Symbol	The symbol used to identify the data/parameter in the approach
Units	Units that the data/parameter is measured in
Value	Value of the data/parameter, or a description of how the value should be determined
Source	Source of data/parameter
Justification	Justification for why the value, or approach for determining the value, is appropriate
Use	Description of how the data/parameter is used
Comments	Any further comments, for example relating to how values should be selected or determined
Frequency	Frequency with which parameters are assessed

References

List of all sources referred to in the approach. If the sources are not publicly available they should be added as an Annex to the approach.