



SCM0006 – Methodology for the Conservation of Areas of Biodiversity Importance

Document Prepared by the Social Carbon Foundation

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Methodology Details

1. Sources

This methodology uses the following sources:

- SOCIALCARBON Standard v6.0
- SOCIALCARBON Standard Definitions
- CDM Tool for the Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities
- VCS Methodology - VM0015

2. Summary description of the Methodology

This methodology is designed to offer a new financing mechanism for conservation efforts worldwide. The methodology quantified net GHG emission removals (NERs) from project activities that conserve terrestrial habitats of significant biodiversity and/or ecosystem value that are threatened by degradation and deforestation. The methodology quantifies net removals of CO₂ only.

Table 1: Additionality and Crediting Methods

Additionality and Crediting Method	
Additionality	Project Method
Crediting Baseline	Project Method

Historically, the carbon markets have focused on degraded habitats that require climate finance to protect and restore them. Areas that require conservation but exhibit limited degradation or deforestation have been largely excluded from eligibility within the market. As a result, the conservation of these areas has typically been financed through donations or grants. This methodology has been designed to offer a new financing mechanism that quantifies real, conservative GHG removals, whilst embedding biodiversity monitoring and local community engagement.

3. Definitions

In addition to the definitions set out in the latest version of the SOCIALCARBON Standard Definitions, the following definitions apply to this methodology:

Areas of Biodiversity Importance

Areas identified as of importance for biodiversity, as outlined in UNEP Biodiversity A-Z web page:

<https://www.biodiversitya-z.org/themes/areas?s=terms-page>

Cultural heritage

Cultural heritage is the heritage of tangible and intangible heritage assets of a group or society that is inherited from past generations.

Degradation

The persistent reduction of canopy cover and/or carbon stocks in a habitat due to human activities such as animal grazing, fuelwood extraction, timber removal or other such activities, but that does not result in the conversion of forest to non-forest land, and falls under the *IPCC 2003 Good Practice Guidance land category of forest remaining forest*. Under this methodology, poaching of keystone species that inhabit the project area is also considered degradation.

Donation

A donation is a voluntary transfer of property (often money) from the transferor (donor) to the transferee (donee) with no exchange of value (consideration) on the part of the recipient (donee).

Grant

A grant is an amount of money that a government or other institution gives to an individual or to an organisation for conservation.

Indigenous Land

Land that's land and natural resources therein, are owned by Indigenous peoples, either individually or collectively.

Indigenous Peoples

Indigenous Peoples are distinct social and cultural groups that share collective ancestral ties to the lands and natural resources where they live, occupy or from which they have been displaced. The land and natural resources on which they depend are inextricably linked to their identities, cultures, livelihoods, as well as their physical and spiritual well-being.

Keystone Species

Keystone species are those which have an extremely high impact on a particular ecosystem relative to its population. Keystone species are also critical for the overall structure and function of an ecosystem, and influence which other types of plants and animals make up that ecosystem. Thus, in the absence of a keystone species, many ecosystems would fail to exist.

Primary Formation

Vegetation cover where it is understood that human activities have not caused any significant changes in its original characteristics of structure and composition during a minimum period of 20 years prior to the project start date.

Secondary Formation

Vegetation cover where it is understood that human activities have caused significant changes in its original characteristics of structure and composition less than 20 years prior to the project start. There has been no conversion to alternative land use within the area or any degradation that would bring about a regression in its status within the process of ecological succession.

Sustenance

The maintaining of someone or something in life or existence. This does not include the sale of raw commodities for economic income e.g. logging.

Terrestrial

On land. In the context of this methodology, this also includes Mangroves.

Threatened Species

Species that the IUCN considers to be threatened with global extinction. This includes Critically Endangered, Endangered and Vulnerable Species.

4. Applicability Conditions

This methodology is applicable under the following conditions:

- The project area is located on registered indigenous land; or
- The project area is located in (in full or partially) or is located a maximum of 1km from a terrestrial area of biodiversity importance; and
- The project embeds local communities into the project activities to ensure local knowledge and cultures are applied within the project activities; and
- The project activities exclusively focus on conservation and/or restoration of the project area, with no conversion to non-native habitat / land use (i.e. conversion of forest to agricultural land); and
- The project shall design and implement strategies to remove or manage invasive species from within the project area; and
- The project area is vulnerable to degradation and/or deforestation if not conserved; and

- At least 60% of existing and/or historical¹ conservation activities within the project area prior to the project start date are not financed, or have been/are expected to be financed through donations and/or grants; and
- Poaching of keystone species within the project area must not exceed 5% of the baseline population. If this threshold is passed, no conservation removals can be claimed for that given year.

In addition to the applicability conditions outlined above, the project must also comply with the following applicability conditions if ARR project activities plan to be implemented:

- Vegetation planted as part of the ARR activities is native to the project area; and
- ARR activities do not result in the conversion of habitat types which are not native or historically present in the area; and
- Soil disturbance attributable to the project activity does not cover more than 10 per cent of area in each of the following types of land, when these lands are included within the project boundary:
 - a) Land containing organic soils;
 - b) Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in Appendix 2: Cropland in which soil disturbance is restricted and Appendix 3: Grassland in which soil disturbance is restricted to this methodology

5. Project Boundary

5.1 Carbon Pools and Sources of GHG Emissions

The following tables identify the carbon pools and emission sources included or excluded from the project boundary.

Table 2: Selected Carbon Pools under Baseline and Project Activity

Carbon Pools	Included?	Explanation
Aboveground woody biomass	Yes	Major pool considered in the project scenario
Aboveground non-woody biomass	Optional	The carbon stock in this pool is expected to increase as a result of the implementation of the project

¹ Historical financing can be determined through analysing funding sources up to 3 years prior to the project start date

Belowground biomass (to a depth of 30cm), refers to the root systems of the vegetation cover	Yes	The carbon stock in this pool is expected to increase as a result of the implementation of the project
Deadwood	No	Conservatively excluded
Litter	No	Conservatively excluded
Soil Organic Carbon (SOC)	No	Conservatively excluded

Table 3: GHG Sources included in or excluded from the Project Boundary

Source	Gas	Included?	Explanation	
Project Emissions	Degradation / Deforestation	CO ₂	Yes	Projects must deduct emissions from degradation and / or deforestation that occurs within the project area.
		CH ₄	No	Not applicable
		N ₂ O	No	Not applicable

Emissions from fossil fuel consumption within the project area is expected to be negligible and has been excluded from the project boundary. In addition, livestock management and biomass burning are not permitted under the scope of the methodology, therefore their emissions are not included.

5.2 Analysis of Land Use/Land Cover (LU/LC)

The goal of this step is to collect and analyse spatial data in order to identify current land-use and landcover conditions within the project area. The tasks to be accomplished are the following:

5.2.1 Collection of appropriate data sources;

5.2.2 Definition of classes of land-use and land-cover;

5.2.3 Estimation of the average carbon stocks of each LU/LC class;

5.2.4 Map accuracy assessment; and

5.2.5 Preparation of a methodology annex to the Project Description Document.

5.2.1 Collection of appropriate data sources

Collect the data that will be used to analyze land-use and land-cover within the project area. It is sufficient to collect data for one single date, which must be as closest as possible to the project start date (≤ 2 years).

As a minimum requirement:

- Collect medium resolution spatial data²(from at least 10m x 10m up to a maximum of 100m x 100m resolution) from optical and non-optical sensor systems, such as, but not limited to (Landsat, SPOT, ALOS, AVNIR2, ASTER, IRS sensor data) for a date closest to the project start date (≤ 2 years).
- Collect high resolution data from remote sensors ($< 5 \times 5$ m pixels) and/or from direct field observations for ground-truth validation of the posterior analysis. Describe the type of data, coordinates and the sampling design used to collect them.
- In tabular format (Table 4), provide the following information about the data collected:

Table 4: Data used for vegetation cover class analysis

Vector (Satellite, airplane, drone) ID	Sensor Name	Resolution		Coverage	Acquisition date	Source or point identifier	
		Spatial	Spectral	Km ²	(DD/MM/YY)	Path / Latitude	Row / Longitude

5.2.2 Definition of classes of land-use and land-cover;

Identify and describe the land-use and land-cover (LU/LC) classes present in the project area at start date. A LU/LC class is a unique combination of land-use and land-cover for which:

² Guidance on the selection of data sources (such as remotely sensed data) can be found in chapter 3A.2.4 of the IPCC 2006 GL A FOLU and in the latest version of the GOF-C-GOLD sourcebook on REDD.

- a) The boundary can be defined at hand of remotely sensed data and/or other sources of information, such as maps of vegetation, soil, elevation, management category, etc., as defined by the project proponent to unambiguously define a LU/LC class; and
- b) Carbon stocks per hectare (tCO₂e per hectare³) within each class are about homogeneous across the landscape. Carbon stocks must only be estimated for classes inside the project area, see section 5.2.3.

The following criteria shall be used to define the classes of vegetation cover:

- The minimum classes shall be “Forest Land” and “Non-Forest Land”.
- “Forest-land” will in most cases include strata with different carbon stocks. Forest-land must therefore be further stratified in forest classes having different average carbon densities within each class.
- “Non-Forest Land” may be further stratified in strata representing different non-forest classes. IPCC classes used for national GHG inventories may be used to define such classes (Crop Land, Grass Land, Wetlands, Settlements, and Other Land). See *IPCC 2006 GL AFOLU Chapter 3, Section 3.2, p.5-8* for a description of these classes. However, where appropriate to increase the accuracy of carbon stock estimates, additional or different sub-classes may be defined.
- The description of a LU/LC class must include criteria and thresholds that are relevant for the discrimination of that class from all other classes. Select criteria and thresholds allowing a transparent definition of the boundaries of the LU/LC polygons of each class. Such criteria may include spectral definitions as well as other criteria used in post-processing of image data, such as elevation above sea level, aspect, soil type, distance to roads and existing vegetation maps. Where needed, in the column “description” of Table 5 refer to more detailed descriptions in the methodological annex to be prepared in section 5.2.5.
- If a forest class has predictably growing carbon stocks (i.e. the class is a secondary forest), two different classes must be defined (see section 5.2.4 of this document for further detail).
- In most cases one single Land-Use and Land-Cover Map representing the spatial distribution of forest classes at the project start date will be sufficient.
- List the resulting LU/LC classes in Table 5.

³ The carbon stock per hectare is sometimes referred to as “carbon density” in the literature.

Table 5: List of all land use and land cover classes existing at the project start date within the project area.

Class Identifier		Trend in Carbon Stock ¹	Presence in project Area (hectares)	Baseline Activity (e.g. Logging, Fuel-wood collection etc.)	Description (including criteria for unambiguous boundary definition)
ID	Name				
1					
2					
...					
CI					

1. Note if “decreasing”, “constant”, “increasing”

The following products should be prepared for the project area:

- a) A Forest Cover Benchmark Map for at least the most recent date (≤ 2 years from the project start date), showing only “forest” and “non-forest”.
- b) A Land-Use and Land-Cover Map for the most recent date (≤ 2 years from the project start date) depicting the LU/LC-classes defined in step 5.2.2. If such a map cannot be generated at the levels of accuracy required by this methodology (see section 5.2.4), areas of the different LU/LC classes may be estimated by sampling techniques (e.g. by overlaying a grid of dots on the satellite image and then counting the points falling in each LU/LC-class, or by sampling the landscape with higher resolution images and then classifying the sampled images), or by using other sources of data, such as official statistical data on land-use (e.g. agricultural census data):

The mapping of LU/LC involves performing the following three tasks:

- 5.2.1.1 Pre-processing;
- 5.2.1.2 Interpretation and classification; and
- 5.2.1.3 Post-processing.

5.2.1.1 Pre-processing

Pre-processing typically includes, but is not limited to:

- a) Cloud and shadow removal using additional sources of data (e.g. radar, aerial photographs, field surveys).
- b) Reduction of haze, as needed.

Duly record all pre-processing steps for later reporting.

5.2.1.2 Interpretation and classification

As several methods are available to derive LU/LC maps. The methodology does not prescribe any specific method. As a general guidance:

- Automated classification methods should be preferred because the interpretation is more efficient and repeatable than a visual interpretation.
- Minimum mapping unit size shall not be more than one hectare

Duly record all interpretation and classification steps for later reporting.

5.2.1.3 Post-processing

Post-processing includes the use of non-spectral data to further stratify LU/LC-classes with heterogeneous carbon density in LU/LC classes with homogenous carbon density. Post-classification stratification can be performed efficiently using a Geographical Information System (GIS).

Some forest types (e.g. broadleaved forest, coniferous forests, mangroves) can be discriminated with high accuracy using remotely-sensed data only. LU/LC-classes that cannot be stratified further using remote sensing techniques but that are likely to contain a broad range of carbon density classes should be stratified using:

- Biophysical criteria (e.g. climate or ecological zone, soil and vegetation type, elevation, rainfall, aspect, etc.)⁴
- Disturbance indicators (e.g. vicinity to roads; forestry concession areas; etc.);
- Age (in cases of plantations and secondary forests);
- Land management categories (e.g. protected forest, indigenous reserve, etc.); and/or
- Other criteria relevant to distinguish carbon density classes.

⁴ IPCC 2006 Guidelines for National GHG Inventories provide default climate and soil classification schemes in Annex 3A.5 and guidance on stratifying LU/LC areas in Section 3.3.2.

See the most recent version of the IPCC 2006 GL AFOLU for further guidance on stratification. The criteria finally used should be reported transparently in the PD and referenced to in Table 5. Some iterations between steps 5.2.2, 5.2.3, and 5.2.4 may be necessary.

Duly record all post-processing steps for later reporting.

5.2.3 Estimation of the average carbon stocks of each LU/LC class

Average carbon stocks must be estimated for each class of vegetation cover. Project must estimate the average carbon stocks either through field measurements or remote sensing.

Field studies should align with the CDM methodological tool *“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”*.

Project Proponents are permitted to utilise emerging technology (e.g. remote sensing) with known uncertainty to measure the baseline carbon stocks for the class of vegetation cover. These emerging technology approaches must be supported by peer-reviewed literature which validates their accuracy and uncertainty. Justification for the chosen approach should be documented in the Project Description Document supplemented with appropriate evidence. Any uncertainty in the approach used must be discounted for.

The project proponent must duly document the approach taken to estimate the average carbon stocks of each LU/LC class. The approach taken at validation must be maintained for the duration of the project’s crediting period.

5.2.4 Map Accuracy Assessment

A verifiable accuracy assessment of the maps produced in the previous step is necessary to produce a credible baseline.

The accuracy must be estimated on a class-by-class (LU/LC map) and, where applicable, category-by-category (LU/LC map) basis, respectively. A number of sample points on the map and their corresponding correct classification (as determined by ground-surveys or interpretation of higher resolution data as collected in step 5.2.1) can be used to create an error matrix with the diagonal showing the proportion of correct classification and the off-diagonal cells showing the relative proportion of misclassification of each class or category into the other class or, respectively, categories. Based on the error matrix (also called confusion matrix), a number of accuracy indices can be derived (see e.g. Congalton, 1991 and Pontius, 2000).

The minimum overall accuracy of the Forest Cover Benchmark Map should be 90%.

The minimum classification accuracy of each class or category in the Land-Use and Land-Cover Map, respectively, should be 80%. If the classification of a class or category is lower than 80%, a class/category may be merged with other classes/categories.

Both commission errors (false detection of a class/category, such as “deforestation”) and omission errors (non-detection of actual class/category, such as “deforestation”) should be estimated and reported.

Where the assessment of map accuracy requires merging or eliminating classes or categories to achieve the required map accuracy, the definitions in the previous sub-steps must be adjusted accordingly. The final maps and the class/category definitions must be consistent.

5.2.5 Preparation of a methodology annex to the Project Description

Document

In general, the same source of remotely sensed data and data analysis techniques must be used within a period for which the baseline is fixed (fixed baseline period). However, if remotely sensed data have become available from new and higher resolution sources (e.g. from a different sensor system) during this period, these can only be used if the images based on interpretation of the new data overlap the images based on interpretation of the old data by at least 1 year and they cross calibrate to acceptable levels based on commonly used methods in the remote sensing community.

To achieve a consistent time-series, the risk of introducing artifacts from method change must be minimized. For this reason, the detailed methodological procedures used in pre-processing, classification, post classification processing, and accuracy assessment of the remotely sensed data, must be carefully documented in an Annex to the Project Description Document. In particular, the following information must be documented:

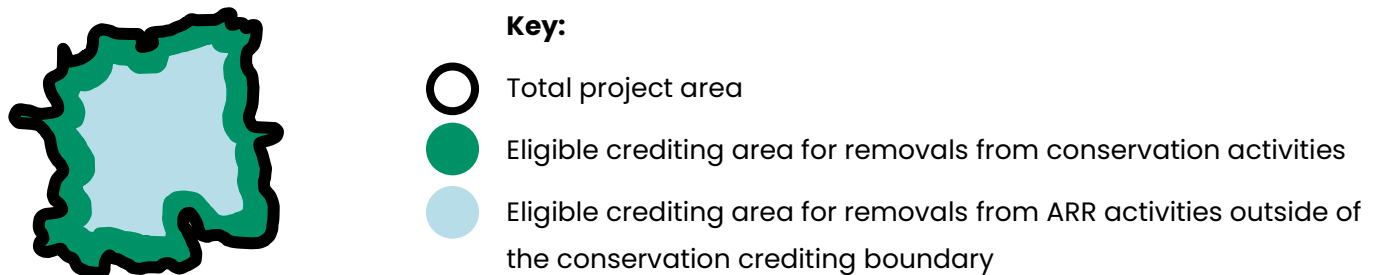
- a) Data sources and pre-processing: Type, resolution, source and acquisition date of the remotely sensed data (and other data) used; geometric, radiometric and other corrections performed, if any; spectral bands and indexes used (such as NDVI); projection and parameters used to geo-reference the images; error estimate of the geometric correction; software and software version used to perform pre-processing tasks; etc.
- b) Data classification and post-processing: Definition of the LU/LC classes; classification approach and classification algorithms; coordinates and description of the ground-truthing data collected for training purposes; ancillary data used in the classification, if any; software and software version used to perform the classification; additional spatial data and analysis used for post-classification analysis, including class subdivisions using non-spectral criteria, if any; etc.
- c) Classification accuracy assessment: Accuracy assessment technique used; coordinates and description of the ground-truth data collected for classification accuracy assessment; postprocessing decisions made based on the preliminary classification accuracy assessment, if any; and final classification accuracy assessment.

5.3 Defining the crediting area for GHG removals achieved through conservation and ARR activities.

GHG removals achieved through conservation activities are limited to an area 3,000 meters inside the project area’s perimeter. Project areas of size equal to or less than 15,000 hectares are eligible to claim the GHG removals from conservation activities for the entire project area. Project developers are not permitted to split a project area into multiple smaller projects in order to exploit the 15,000 hectare threshold to generate more carbon for a given area, unless they can demonstrate clear distinctions in land ownership and planned conservation activities within the area that requires separate projects.

ARR activities can occur on the entire project area, provided they meet the eligible conditions for ARR activities. Any GHG removals achieved through ARR activities within the conservation crediting boundary will be included in the conservation removals calculated for this area. GHG removals from ARR activities outside of the conservation removals boundary can be measured and claimed by the project. Diagram 1 below illustrates this further.

Diagram 1 – Monitoring GHG removals from Conservation and ARR activities.



Note: any ARR activities within the conservation crediting boundary (green area) will be included in the GHG removal calculations for that area. Also, if the total project area is equal to or less than 15,000 hectares, the total project area will come under the classification “Eligible crediting area for removals from conservation activities”. Under this scenario there will be no separate crediting area from ARR activities outside of the conservation crediting boundary (blue area). Table 6 further outlines how the crediting areas can be determined.

Table 6: Example allocation of crediting areas.

Total project area size (hectares)	Eligible crediting area for removals from conservation activities (hectares)	Eligible crediting area for removals from ARR activities outside of the conservation crediting boundary (hectares)
14,700	14,700	0
41,000	27,000	14,000
180,000	56,000	124,000

Note: the following figures are hypothetical and for demonstration purposes only.

6. Baseline Scenario

6.1 Reference Region

As per the applicability conditions, project proponents must demonstrate that the project area is vulnerable to anthropogenic deforestation and/or degradation. To demonstrate this, project proponents must provide historical evidence of anthropogenic deforestation and/or degradation in the reference region the project area is located within.

The reference region can be calculated through the following approaches:

- The province or state that the project area resides; or
- A circular area 10 times the size of the project area (Note: the project area must reside in the center of the reference region).

6.2 Vulnerability to Degradation and/or Deforestation

A maximum of 10 years prior to the project start date can be used to demonstrate historical degradation and/or deforestation trends within the respective reference region. The project must document these trends using the following steps.

- 6.2.1 Analysis of degradation and/or deforestation;
- 6.2.2 Identification of agents of degradation and/or deforestation;
- 6.2.3 Identification of degradation and/or deforestation drivers;
- 6.2.4 Identification of underlying causes;
- 6.2.5 Analysis of chain of events leading to degradation and/or deforestation;
- 6.2.6 Analysis of historical conservation activities within the project area; and
- 6.2.7 Conclusion

6.2.1 Analysis of degradation and/or deforestation

Projects must provide evidence of degradation and/or deforestation within the reference region. Data can be collected either through remote sensing (e.g. Global Forest Watch), peer-reviewed literature, government published reports, or field studies. At least three years' worth of data must be provided to demonstrate the mean deforestation/degradation rate in the reference region. Given that remote sensing data is openly available for recent years prior to the project start dates (e.g. from Global Forest Watch), project proponents must provide justification for historical data selected and why openly available data sets were not used (if applicable).

Under this methodology, poaching of keystone species is considered degradation. The minimum threshold for poaching-based degradation can be found in section 6.2.7.

When assessing vegetation degradation / deforestation, projects may use historical data and information up to 10 years prior to the project start date. Projects should use data published at the date closest to the project start date. The degradation/deforestation rate should be calculated as a weighted mean average across the historical time period analyzed, with the most recent values having a higher weighting.

$$\text{Weighting score: } \frac{1}{1-a}, \frac{a}{1-a}, \frac{a^2}{1-a}, \frac{a^3}{1-a}, \dots, \frac{a^x}{1-a}$$

$$a = 0.50$$

The following example demonstrates this:

Year (before project start date)	Mean Deforestation / Degradation rate	Weight score	Weighting	Weighted Mean Deforestation / Degradation rate
1	0.20%	2 (1/(1-0.5))	53% (2/3.75)	0.107% (0.20% * 53%)
2	0.50%	1 (0.5/(1-0.5))	27%	0.133%
3	0.60%	0.5 (0.5 ² /(1-0.5))	13%	0.080%
4	1.4%	0.25 (0.5 ³ /(1-0.5))	7%	0.093%
		3.75	100%	0.413% (sum of all weighted mean rates)

If the project proponent assesses both vegetation degradation / deforestation and poaching rates, the total weighted average for each degradation type should be documented in the Project Design Description. Only one form of degradation must meet the minimum thresholds for the project to be eligible.

6.2.2 Identification of agents of degradation and/or deforestation

Identify the main agent groups of degradation and/or deforestation (farmers, ranchers, loggers, etc.) and their relative importance (i.e. the amount of historical land-use change that can be attributed to each of them). To do this identification, use existing studies, remote sensing, expert-consultations, field-surveys and other verifiable sources of information, as needed.

If the relative importance of different agents is spatially correlated (e.g. small farmers are concentrated in the hills, while ranchers on the plains) it may be useful to stratify the reference region, the project area, and to continue the baseline assessment for each stratum *i* separately.

For each identified agent group, provide the following information:

- a) Name of the main agent group or agent, and whether they are responsible for degradation and/or deforestation;
- b) Brief description of the main social, economic, cultural and other relevant features of each main agent group. Limit the description to aspects that are relevant to understand why the agent group is degrading and/or deforesting;
- c) Brief assessment of the most likely development of the population size of the identified main agent groups in the reference region and project area;
- d) Statistics on historical degradation and/or deforestation attributable to each main agent group in the reference region and project area.

6.2.3 Identification of degradation and/or deforestation drivers

For each identified agent group, analyze factors that drive their land-use decisions. The goal is to identify the immediate causes of degradation and/or deforestation.

Two sets of driver variables have to be distinguished:

- a) Driver variables explaining the quantity (hectares) of degradation and/or deforestation, such as:
 - Prices of agricultural products;
 - Costs of agricultural inputs;
 - Population density;
 - Rural wages;
 - Etc.
- b) Driver variables explaining the location of deforestation, also called “predisposing factors” (de Jong, 2007), such as:
 - Access to habitat (such as vicinity to existing roads, railroads, navigable rivers and coastal lines);
 - Slope;
 - Proximity to markets;
 - Proximity to existing or industrial facilities (e.g. sawmills, pulp and paper mills, agricultural products processing facilities, etc.);
 - Proximity to habitat edges;
 - Proximity to existing settlements;
 - Spatial variables indicating availability within the habitat of land with good ecological conditions to expand agricultural activities, such as soil fertility and rainfall;
 - Management category of the land (e.g. national park, indigenous reserve, etc.);

For each of these two sets of variables:

- 1) List the 1 to 5 key driver variables and provide any relevant source of information that provides evidence that the identified variables have been a driver for degradation and/or deforestation during the historical reference period.
- 2) Briefly describe for each main agent group identified in step 6.1 how the key driver variables have and will most likely impact on each agent group's decision to degrade and/or deforest.
- 3) For each identified key driver variable provide information about its likely future development, by providing any relevant source of information.
- 4) For each identified driver variable briefly describe the project measures that will be implemented to address them, if applicable.

6.2.4 Identification of underlying causes of degradation and/or deforestation

The agents' characteristics and decisions are themselves determined by broader forces, the underlying causes of degradation and/or deforestation, such as:

- Land-use policies and their enforcement;
- Population pressure;
- Poverty and wealth;
- War and other types of conflicts;
- Property regime;
- Sustenance (e.g. bush meat)
- Etc.

- 1) List the 1 to 5 key underlying causes and cite any relevant source of information that provides evidence that the identified variables have been an underlying cause for degradation and/or deforestation in the reference area.
- 2) Briefly describe how each key underlying cause has determined and will most likely determine the key drivers identified in step 6.2.3 and the decisions of the main agent groups identified in step 6.2.2.
- 3) For each identified key underlying cause provide information about its likely future development, by citing any relevant source of information.
- 4) For each identified underlying cause describe the project measures that will be implemented to address them, if applicable.

6.2.5 Analysis of chain of events leading to degradation and/or deforestation

Based on the evidence collected, analyse the relations between main agent groups, key drivers and underlying causes and explain the sequence of events that typically has led and most likely will lead to degradation and/or deforestation. Consult local experts, literature and other sources of information, as necessary. Briefly summarise the results of this analysis in the Project Description Document.

6.2.6 Analysis of historical conservation activities within the project area

If conservation activities have been historically implemented in the project area, project proponents should document the activities that have been implemented. This should include a description of the activities implemented, the time period of activity implementation and explain the consequence of the activities. The consequence of the activities should be backed by quantitative data to support any benefits claimed by the project. If possible, the cost of implementing the conservation activities should be documented and so should the source of funding. Consult local experts, literature and other sources of information, as necessary. Summarise the results of this analysis in the Project Description Document.

6.2.7 Conclusion

Projects must demonstrate that the minimum threshold of degradation and/or deforestation is present within the reference region, as seen below:

Minimum thresholds for degradation and/or deforestation

- The degradation / deforestation rate in the reference region is equal to, or greater than 0.20%; or
- Poaching of keystone species is present in the reference region and meets one of the following thresholds:
 - The keystone species is recorded as Critically Endangered on the IUCN Red List; or
 - The keystone species' population has declined 20% or more in the last 20 years; or
 - The keystone species' population has declined 60% or more in the last 50 years

In addition to providing evidence that the minimum threshold for degradation and/or deforestation vulnerability has been met, the analysis should conclude on the primary threats to the project area, the impact of historical conservation activities within the project area, and what activities are required to address the identified threats.

7. Additionality

This methodology uses a project method for the demonstration of additionality.

Step 1: Regulatory Surplus

Project proponents must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the *SOCIALCARBON Standard*.

Step 2: Project Method

The project activity shall apply the additionality analysis method set out in the latest version of the *SOCIALCARBON Tool for the Demonstration and Assessment of Additionality in SOCIALCARBON Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (SCT0001)*.

In addition to demonstrating additionality and compliance with the eligibility criteria, project areas that are already being formally managed must provide evidence that a Management Plan⁵ has been developed and that the income from carbon finance is required for the delivery of the Management Plan.

For areas that are already implementing a Management Plan, the project must demonstrate that the area does not have access to funding to cover at least 50% of the next 5 years of implementation, or the availability of additional funding from the sale of carbon credits will increase the average conservation outcomes of the project by 40%. These scenarios must be evidenced with documentation and quantitative data to demonstrate their validity.

8. Quantification of GHG Emission

Removals

In order to measure the GHG removals from the atmosphere by native and newly planted vegetation in the project area, each class of vegetation cover shall be calculated and compared with the vegetation cover classifications. Projects shall use National Vegetation Classifications, the International Vegetation Classification, or peer-reviewed literature on vegetation classification relevant for the project area's geographic location.

8.1 Baseline Removals

The total carbon stocks of the project area shall be calculated at year 0 to facilitate the measurement of removals in the first year of monitoring. This should be calculated for the entire project area and the eligible crediting area for removals from conservation activities. This shall be calculated using the following equation:

$$BR_y = \sum_y BR_{vc} \quad \text{(Equation 1)}$$

Where:

BR_y = Total baseline carbon stocks within the project area at y; tCO₂e

$\sum_y BR_{vc}$ = Sum of baseline carbon stocks for each class of vegetation cover during year y; tCO₂e

⁵ A Management Plan is a document which sets out the management approach and goals, together with a framework for decision making, to apply in a specific protected area over a given period of time.

The GHG removals from each class of vegetation cover within the project area is calculated as follows:

$$BR_y = C_{vc,y} \times Area_{vc} \times \left(\frac{44}{12}\right) \quad (\text{Equation 2})$$

Where:

- BR_y = The baseline carbon stocks for the class of vegetation; tCO₂e
- $C_{vc,y}$ = The carbon stocks for the biomass and class of vegetation cover at year y ; tC/year
- $Area_{vc}$ = The area of the class of vegetation cover; ha
- $\frac{44}{12}$ = Equation to convert carbon (tC) to carbon dioxide equivalent (tCO₂e)

The Carbon Stock for each vegetation cover class shall be determined as per section 5.2.3 of this document.

8.2 Project Removals

This methodology considers the emissions from vehicles / equipment to be negligible. Project proponent should use the following equations to quantify the project removals achieved. If $y - 1$ is the Baseline year (i.e. y is the first monitoring report), replace (PR_{y-1}) with BR_y .

$$TR_y = (PR_y - PR_{y-1}) - PE_y \quad (\text{Equation 3})$$

Where:

- TR_y = Total GHG removals in year y ; tCO₂e
- PR_y = Total project GHG removals within the project area at y ; tCO₂e
- PE_y = Total project emissions from deforestation and/or degradation within the project area at y ; tCO₂e. Note: this value should only be calculated if the project proponent uses default values to calculate the incremental change in carbon stocks for a vegetation cover. The measured approach for calculate incremental changes in carbon stocks is expected to capture any reductions in carbon stocks due to deforestation and/or degradation.

The total project GHG removals are calculate through the sum of all GHG removals for each class of vegetation cover during the monitoring period.

$$PR_y = \sum_y PR_{vc} + \Delta PR_{ARR,y} \quad \text{(Equation 4)}$$

Where:

PR_y = Total project GHG removals within the project area during year y; tCO₂e

$\sum_y PR_{vc}$ = Sum of project GHG removals for each class of vegetation cover in the conservation crediting boundary during year y; tCO₂e (as calculated in Equation 5)

$\Delta PR_{ARR,y}$ = Change in carbon stocks in project from ARR activities outside the conservation crediting boundary but within the project area during year y; tCO₂e (using *CDM Methodology Tool: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*, or remote sensing provided the approach aligns with “2. Measurement” on page 23 of this document)

The GHG removals from conservation activities each class of vegetation cover within the eligible project area is calculated as follows:

$$PR_{vc,y} = CI_{vc,y} \times Coverage_{vc} \times Area_{vc} \times \left(\frac{44}{12}\right) \quad \text{(Equation 5)}$$

Where:

$PR_{vc,y}$ = The project GHG removals for the class of vegetation; tCO₂e

$CI_{vc,y}$ = The annual carbon increment for the biomass and class of vegetation cover; tC/year

$Coverage_{vc}$ = Ratio of vegetation cover biomass per hectare in land having a crown cover of 1.0 (i.e. 100 percent); percent

$Area_{vc}$ = The area of the class of vegetation cover; ha

$\frac{44}{12}$ = Equation to convert carbon (tC) to carbon dioxide equivalent (tCO₂e)

The annual carbon increment for the class of vegetation cover can be calculated through two approaches:

1. **Default values.** Using peer-reviewed academic literature or the most recent government-published default values for annual biomass growth per hectare for the native vegetation cover class (an example of this can be found in Appendix 1: [Example default values for incremental biome growth in Brazil](#)).
2. **Measurement.** Measuring changes in carbon stocks for the class of vegetation cover.

1. Default values

Project proponents may use peer-reviewed academic literature or the most recent government-published default values for annual biomass growth per hectare for the native vegetation cover class, provided the accuracy and conservativeness of the estimates are demonstrated. If discrepancies exist between default values (either government-published or academic literature), the lowest value of the range should be used. All default values used must be accompanied with references and justification for their use. The values used must be based on the same or lower vegetation cover (%) and density than in the project area (e.g. based on 30% tree crown cover per hectare).

If no default value exists, project are permitted to use the average annual increment in aboveground biomass in natural regeneration values outlined in table 3A.1.5 in the IPCC document [“Annex 3A.1 Biomass Default Tables for Section 3.2 Forest Land”](#). The project should calculate the total biomass incremental growth (including belowground biomass) per hectare using the following equation adapted from the CDM tool *“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”*.

$$CI_{vc,y} = CF_{vc} \times \Delta B_{vc} \times (1 + RS_{vc}) \quad (\text{Equation 6})$$

Where:

- CF_{vc} = Carbon fraction of vegetation cover biomass; tC/ha
Note: A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
- ΔB_{vc} = The annual dry-weight increment for the biomass and class of vegetation cover, as taken from table 3A.1.5 in the IPCC document [“Annex 3A.1 Biomass Default Tables for Section 3.2 Forest Land”](#); tonnes/hectare/year
- RS_{vc} = Root-shoot ratio for vegetation cover; dimensionless.
Note: unless transparent and verifiable information can be provided to justify a different value, the following values should be applied:
 Tree = 0.25
 Shrubs = 0.40

2. Measurement

Project proponents can measure the changes in carbon stocks for the class of vegetation cover through two approaches: field studies or remote sensing. Projects must use the same approach used to estimate the baseline carbon stocks for the duration of the crediting period.

Field studies should be conducted using the procedures outlined in the CDM methodological tool *“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”*. However, the destructive sampling method must not be used to calculate the carbon stocks of primary forests.

Project Proponents are permitted to utilise emerging technology (e.g. remote sensing) with known uncertainty to measure changes in carbon stocks for the class of vegetation cover. These emerging technology approaches must be supported by peer-reviewed literature which validates their accuracy and uncertainty. Justification for the chosen approach should be documented in the Project Description Document supplemented with appropriate evidence. Any uncertainty in the approach used must be discounted for. Where the class of vegetation cover is primary forest, remote sensing cannot be used; at

present, remote sensing is not an appropriate approach for this class of vegetation cover due to the comparably small incremental changes in carbon stocks arising from primary forests.

Changes in carbon stocks for the class of vegetation cover shall be determined as follows:

$$CI_{vc,y} = C_{vc,y} - C_{vc,y-1} \quad \text{(Equation 7)}$$

Where:

$C_{vc,y}$ = Total carbon stocks for the class of vegetation cover at year y ; tC/year

Estimating emissions from deforestation and/or degradation.

Annual anthropogenic-led vegetation degradation and/or deforestation within the project area must not exceed 0.05% of the baseline carbon stocks, this is exclusive of degradation and/or deforestation for sustenance by natives of the project area. The project proponent must monitor the entire project area to verify that the project is in compliance with the applicability condition on an annual basis. The project must provide evidence that no decrease has occurred within the project area. This must be documented prior to each verification period.

Any degradation and/or deforestation that does occur must be deducted from the eligible GHG removals for the project in the monitoring period. This deduction must be inclusive of degradation and/or deforestation for sustenance by natives of the project area.

Emission reductions shall be calculated as follows:

$$PE_y = \sum_y PE_{vc_change} \quad \text{(Equation 8)}$$

Where:

PE_y = Total project emissions within the project area during year y ; tCO₂e

$\sum_y PE$ = Sum of project emissions for each class of vegetation cover during year y ; tCO₂e (as calculated in Equation 9)

$$PE_{vc_change,y} = E_{vc_change,y} \times Area_{vc_change} \quad \text{(Equation 9)}$$

Where:

$PE_{vc_change,y}$ = The total project emissions from the change in class of vegetation cover in year y ; tCO₂e

$E_{vc_change,y}$ = The emissions from the change in class of vegetation cover in year y per hectare; tCO₂e

$Area_{vc_change}$ = Area of degradation or deforestation for the class of vegetation cover in year y; hectares

Table 7 below outlines how $E_{vc_change,y}$ should be calculated.

Table 7: Estimating emissions from degradation or deforestation in a class of vegetation cover.

Carbon Stock of the class of Vegetation Cover before degradation or deforestation (tCO2e per hectare)	Carbon Stock of the class of Vegetation Cover before degradation or deforestation (tCO2e per hectare)	The emissions from the change in class of vegetation cover (tCO2e per hectare)
e.g. 302 tCO2e per hectare	e.g. 120 tCO2e per hectare	e.g. 182 tCO2e per hectare (302 tCO2e – 120 tCO2e)

8.3 Leakage

Leakage due to the displacement of agricultural activities in year y, if applicable, shall be estimated using the CDM tool “*Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity*”; tCO2-e

8.4 Uncertainty

The approach used to quantify the changes in carbon stocks will determine how uncertainty is measured. If default values are applied no uncertainty deduction is required. Measured changes in carbon stocks must be discounted to reflect uncertainty.

Direct estimation of change by re-measurement of sample plots

$$u_{\Delta C} = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^M w_i^2 \times \frac{s_{\Delta i}^2}{n_i}}}{\Delta B_{vc,i}} \quad \text{(Equation 10)}$$

Where:

$u_{\Delta C}$ = Uncertainty in vegetation cover

t_{VAL} = Two-sided Student’s t-value for a confidence level of 90 per cent and degrees of freedom equal to $n - M$, where n is total number of sample plots within the vegetation cover biomass estimation strata, and M is the total number of vegetation cover biomass estimation strata

- w_i = Ratio of the area of stratum i to the sum of areas of biomass estimation strata; dimensionless
 n_i = Number of sample plots, in stratum i , in which vegetation cover biomass was re-measured
 $s_{\Delta,i}^2$ = Variance of mean change in vegetation cover biomass per hectare in stratum i ; tonnes/ha
 $\Delta B_{vc,i}$ = Mean change in carbon stock per hectare in vegetation cover biomass in stratum i ; tonnes/ha

Mean change in carbon stock per hectare in vegetation cover biomass in a stratum and the associated variance are estimated as follows:

$$u_{\Delta C} = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^M w_i^2 \times \frac{s_{\Delta,i}^2}{n_i}}}{\Delta B_{vc,i}} \quad \text{(Equation 11)}$$

Where:

- $\Delta B_{vc,i}$ = Mean change in vegetation cover biomass in stratum i ; tonnes/ha
 $\Delta B_{vc,p,i}$ = Change in vegetation cover biomass in plot p in stratum i ; tonnes/ha

$$s_{\Delta,i}^2 = \frac{n_i \times \sum_{p=1}^{n_i} \Delta B_{vc,p,i}^2 - (\sum_{p=1}^{n_i} \Delta B_{vc,p,i})^2}{n_i \times (n_i - 1)} \quad \text{(Equation 12)}$$

Where:

- $s_{\Delta,i}^2$ = Variance of mean change in vegetation cover biomass per hectare in stratum i ; tonnes/ha
 $\Delta B_{vc,p,i}$ = Change in vegetation cover biomass in plot p in stratum i ; tonnes/ha
 n_i = Number of sample plots, in stratum i , in which vegetation cover biomass was re-measured

If $u_{\Delta C}$ estimated from Equation 11 is greater than 10 percent, $CI_{vc,y}$ is made conservative by applying an uncertainty discount, whereby the estimated mean value is either increased or decreased by a percentage of the uncertainty. Table 8 below provides the uncertainty discount factors to be applied for different ranges of uncertainty.

Table 8: Uncertainty discount factors

Uncertainty Range	Discount (% of Uncertainty)	How applied
$U \leq 10\%$	0%	Example:

10 < U ≤ 15	25%	Estimated mean = 60±9 t d.m ha ⁻¹ i.e. U=9/60x100 = 15%
15 < U ≤ 20	50%	Discount = 25% x 9 = 2.25 t d.m ha ⁻¹
20 < U ≤ 30	75%	Discounted conservative mean: In baseline = 60+2.25 = 62.25 t d.m ha ⁻¹
U > 30	100%	In project = 60-2.25 = 57.75 t d.m ha ⁻¹

Remote sensing-based carbon stock measurements

Project Proponents are permitted to utilise emerging technology (e.g. remote sensing) with known uncertainty to measure changes in carbon stocks for the class of vegetation cover. The measured changes in carbon stocks must be discounted by the known uncertainty rate of the rate applied.

8.5 Net GHG Emission Removals

Net GHG emission removals are calculated by deducting the calculated Buffer amount from the Total Emission Removals calculated using equation 3.

$$NER_y = TER_y - Leakage_y - BUFFER_y \quad \text{(Equation 13)}$$

Where:

NER_y = Net Emission Removals in year y ; tCO₂e

TER_y = Total Emission Removals in year y ; tCO₂e

$Leakage_y$ = Leakage emissions to be deducted in year y ; tCO₂e

$BUFFER_y$ = The number of Buffer credits to be deducted in year y , calculated by: $(TER_y - Leakage_y) \times Non - Permanence Risk Score (\%)$; tCO₂e

9. Monitoring

Where discretion exists in the selection of a value for a parameter, the principle of conservativeness must be applied (as described in Section 2.3 of the SOCIALCARBON Standard, v6.0).

9.1 Data and Parameters Available at Validation

Data / Parameter	CI_{vc}
Data unit	tC / hectare
Description	The annual carbon increment for the biomass and class of vegetation cover.
Equations	5, 6
Source of data	Peer-reviewed academic literature, government published reports or measured (see section 8.2 “Measurement”)
Value applied	N/A
Justification of choice of data or description of	If default values are used the value should remain constant for the duration of the project lifetime unless more recent data is published. If
Data / Parameter	BR
Data unit	tCO ₂ e
Description	Total baseline carbon stocks within the project area at y; tCO ₂ e
Equations	1
Source of data	Calculated (see equation 1) $BR_y = \sum_y BR_{vc}$ $BR_{vc,y} = C_{vc,y} \times Area_{vc} \times \left(\frac{44}{12}\right)$
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	If default values are used the value should remain constant for the duration of the project lifetime unless more recent data is published. If the carbon increment is measured, this should be calculated for every monitoring period.
Purpose of Data	Calculation of the baseline and project GHG removals.

Comments	
Data / Parameter	BR_{vc}
Data unit	tCO ₂ e
Description	The baseline carbon stocks for the class of vegetation cover; tCO ₂ e
Equations	1, 2
Source of data	Peer-reviewed academic literature or measured (see section 8.2 “Measurement”)
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	If default values are used the value should remain constant for the duration of the project lifetime unless more recent data is published. If the carbon increment is measured, this should be calculated for every monitoring period.
Purpose of Data	Calculation of the baseline and project GHG removals.
Comments	

Data / Parameter	$Area_{vc}$
Data unit	Hectares
Description	The area of the class of vegetation cover at validation.
Equations	1, 2
Source of data	Measured in the project area / remote sensing
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Calculation of the baseline and project GHG removals.
Comments	

Data / Parameter	C_{vc}
Data unit	tC/ha
Description	The carbon stocks for the biomass of the class of vegetation cover at validation
Equations	2
Source of data	Peer-reviewed academic literature or measured (see section 8.2 “Measurement”)
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	$C_{vc} = AGB_{vc} + BGB_{vc}$
Purpose of Data	Calculation of the baseline and project GHG removals.
Comments	This value is inclusive of the aboveground and belowground biomass.

Data / Parameter	AGB_{vc}
Data unit	tC/ha
Description	The aboveground biomass of the class of vegetation cover at validation
Data / Parameter	BGB_{vc}
Data unit	tC/ha
Description	The belowground biomass of the class of vegetation cover at validation
Equations	1, 2
Source of data	Peer-reviewed academic literature or measured (see section 8.2 “Measurement”)
Value applied	N/A
Justification of choice of data or description of	NA

measurement methods and procedures applied	
Purpose of Data	Calculation of the total carbon stock for the vegetation class cover C_{vc} .
Comments	

Data / Parameter	A_0
Data unit	hectares
Description	Total project area
Equations	
Source of data	Measured in the project area / remote sensing
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Calculation of the baseline and project GHG removals.
Comments	

Data / Parameter	A_i
Data unit	hectares
Description	Sum of areas of vegetation cover class biomass estimation strata
Equations	11, 12
Source of data	Measured in the project area / remote sensing
Value applied	N/A
Justification of choice of data or description of	NA

measurement methods and procedures applied	
Purpose of Data	Calculation of uncertainty for direct estimation of change in biomass on sample plots.
Comments	

Data / Parameter	n_i
Data unit	dimensionless
Description	Number of sample plots, in stratum i , in which vegetation cover biomass was measured / will be re-measured
Data / Parameter	M_i
Data unit	dimensionless
Description	The total number of vegetation cover biomass estimation strata for stratum i
Equations	11, 12
Source of data	Measured in the project area
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Calculation of uncertainty for direct estimation of change in biomass on sample plots.
Comments	

Data / Parameter	RS_{vc}
Data unit	dimensionless
Description	Root-shoot ratio for class of vegetation cover
Equations	6

Source of data	Peer-reviewed academic literature or the most recent government-published default values.
Value applied	Unless transparent and verifiable information can be provided to justify a different value, the following values should be applied: Tree = 0.25 Shrubs = 0.40
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Calculation of baseline and project carbon stocks
Comments	

Data / Parameter	CF_{vc}
Data unit	dimensionless
Description	Carbon fraction of vegetation cover biomass
Equations	6
Source of data	Peer-reviewed academic literature or the most recent government-published default values.
Value applied	A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Calculation of baseline and project carbon stocks
Comments	This value must remain constant after validation.

Data / Parameter	$Coverage_{vc}$
Data unit	Percent
Description	Ratio of vegetation cover biomass per hectare in land having a crown cover

Equations	5
Source of data	Measured in project area
Value applied	NA
Data / Parameter	$Area_{conservation}$
Data unit	Hectares
Description	Total area within the conservation crediting period.
Equations	4
Source of data	Measured in project area
Value applied	NA
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Calculation of baseline and project carbon stocks
Comments	GHG removals achieved through conservation activities are limited to an area 3,000 meters inside the project area's perimeter. Project areas of size equal to or less than 15,000 hectares are eligible to claim the GHG removals from conservation activities for the entire project area. See section 5.3.

Data / Parameter	$Area_{ARR}$
Data unit	Hectares
Description	Total area of the project outside of the conservation crediting boundary eligible for carbon removals from ARR activities.
Equations	4
Source of data	Measured in project area
Value applied	NA
Justification of choice of data or description of	NA

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline and project carbon stocks
Comments	See section 5.3.

Data / Parameter	<i>Degradation/Deforestation rate</i>
Data unit	Percent
Description	Mean degradation / deforestation rate of vegetation in the project area's reference region.
Equations	NA
Source of data	Projects must provide evidence of degradation and/or deforestation within the reference region. Data can be collected either through remote sensing (e.g. Global Forest Watch), peer-reviewed literature, government published reports, or field studies. At least three years' worth of data must be provided to demonstrate the mean deforestation/degradation rate in the reference region.
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Demonstration of risk of degradation / deforestation in the project area.
Comments	

Data / Parameter	<i>Degradation/Deforestation rate</i>
Data unit	Percent
Description	Mean degradation / deforestation rate of vegetation in the project area's reference region.
Equations	NA
Source of data	Projects must provide evidence of degradation and/or deforestation within the reference region. Data can be collected either through remote sensing (e.g. Global Forest Watch), peer-reviewed literature, government published reports, or field studies. At least three years'

	worth of data must be provided to demonstrate the mean deforestation/degradation rate in the reference region.
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Demonstration of risk of degradation / deforestation in the project area.
Comments	

Data / Parameter	$Population_{BSL}$
Data unit	Integer
Description	Population of the keystone species at validation.
Equations	NA
Source of data	Measurement in the project area, government-published reports or peer-reviewed paper.
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Track keystone species' population and demonstrate with the eligibility criteria on poaching.
Comments	

Data / Parameter	$Poaching_{BSL}$
Data unit	Percent
Description	Historical poaching rates within the reference region over the past 20 and 50 years.
Equations	NA

Source of data	Measurement in the project area, government-published reports or peer-reviewed paper.
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	Track keystone species' population and demonstrate compliance with the eligibility criteria on poaching.
Comments	

9.2 Data and Parameters Monitored

Data / Parameter:	CI_{vc}
Data unit:	tC / hectare
Description:	The annual carbon increment for the biomass and class of vegetation cover.
Equations	5, 6, 7
Source of data:	Using peer-reviewed academic literature, the most recent government-published default values, or measured (see section 8.2 "Measurement")
Description of measurement methods and procedures to be applied:	See section 8.2
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.2
Purpose of data:	Calculation of change in carbon stocks per class of vegetation cover.
Calculation method:	NA
Comments:	

Data / Parameter:	PR_{vc}
Data unit:	tCO2e
Description:	GHG removals for a class of vegetation cover in the conservation crediting boundary during year y .
Equations	4, 5
Source of data:	$PR_{vc,y} = CI_{vc,y} \times Area_{vc} \times \left(\frac{44}{12}\right)$
Description of measurement methods and procedures to be applied:	See section 8.2
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.2
Purpose of data:	Calculation of change in carbon stocks per class of vegetation cover.
Calculation method:	NA
Comments:	This should be calculated for each vegetation cover eligible within the conservation crediting boundary.

Data / Parameter:	$\Delta PR_{ARR,y}$
Data unit:	tCO2e
Description:	Change in carbon stocks in project from ARR activities outside the conservation crediting boundary but within the project area during year y
Equations	4
Source of data:	Measured in the project area
Description of measurement methods and procedures to be applied:	See CDM Methodology Tool: <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.</i>

Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM Methodology Tool: <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.</i>
Purpose of data:	Calculation of change in carbon stocks per class of vegetation cover from ARR activities outside of the conservation crediting boundary.
Calculation method:	NA
Comments:	

Data / Parameter:	PR_y
Data unit:	tCO ₂ e
Description:	Total project GHG removals within the project area at y.
Equations	3, 4
Source of data:	Measured in the project area
Description of measurement methods and procedures to be applied:	$PR_y = \sum_y PR_{vc} + \Delta PR_{ARR,y}$
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	NA
Purpose of data:	Calculation of total project removals within the project in year y before leakage is deducted.
Calculation method:	NA
Comments:	

Data / Parameter:	$Area_{vc}$
Data unit:	hectares
Description:	The area of the class of vegetation cover within the conservation crediting boundary.
Equations	5
Source of data:	Measured in the project area.
Description of measurement methods and procedures to be applied:	See section 5.2 and 8.2
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 5.2 and 8.2
Purpose of data:	Calculation of change in carbon stocks per class of vegetation cover within the conservation crediting boundary.
Calculation method:	NA
Comments:	The data documented by the project proponent must be supplemented with remote sensing imagery to validate the value.

Data / Parameter:	ΔB_{vc}
Data unit:	tonnes/hectare/year
Description:	The annual dry-weight increment for the biomass and class of vegetation cover.
Equations	6
Source of data:	Table 3A.1.5 in the IPCC document “Annex 3A.1 Biomass Default Tables for Section 3.2 Forest Land”
Description of measurement methods and procedures to be applied:	NA

Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	NA
Purpose of data:	Calculation of change in carbon stocks per class of vegetation cover within the conservation crediting boundary.
Calculation method:	NA
Comments:	

Data / Parameter:	$C_{vc,y}$
Data unit:	tC
Description:	Total carbon stocks for the class of vegetation cover at year y
Equations	7
Source of data:	Measured in the project area.
Description of measurement methods and procedures to be applied:	See section 8.2 “Measurement” section for details on measuring changes in carbon stock for the vegetation class cover.
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Purpose of data:	Measure changes in Carbon Stock of vegetation class cover between two monitoring periods.
Calculation method:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Comments:	This approach is used when default values are not applied.

Data / Parameter:	$AGB_{vc,y}$
Data unit:	tC
Description:	The aboveground biomass of the class of vegetation cover at year y
Equations	7
Source of data:	Measured in the project area.
Description of measurement methods and procedures to be applied:	See section 8.2 “Measurement” section for details on measuring changes in carbon stock for the vegetation class cover. See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Purpose of data:	Measure changes in Carbon Stock of vegetation class cover between two monitoring periods.
Calculation method:	NA
Comments:	This approach is used when default values are not applied.

Data / Parameter:	$BGB_{vc,y}$
Data unit:	tC
Description:	The belowground biomass of the class of vegetation cover at year y
Equations	7
Source of data:	Measured in the project area.
Description of measurement methods and procedures to be applied:	See section 8.2 “Measurement” section for details on measuring changes in carbon stock for the vegetation class cover.

	See CDM methodological tool <i>“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”</i>
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM methodological tool <i>“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”</i>
Purpose of data:	Measure changes in Carbon Stock of vegetation class cover between two monitoring periods.
Calculation method:	NA
Comments:	This approach is used when default values are not applied.

Data / Parameter:	A_i
Data unit:	Hectares
Description:	Sum of areas of vegetation cover class biomass estimation strata
Equations	10, 11
Source of data:	Measured in the project area / remote sensing
Description of measurement methods and procedures to be applied:	See CDM methodological tool <i>“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”</i>
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM methodological tool <i>“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”</i>
Purpose of data:	Calculation of uncertainty for direct estimation of change in biomass on sample plots.
Calculation method:	NA
Comments:	This approach is used when default values are not applied.

Data / Parameter:	n_i
Data unit:	dimensionless
Description:	Number of sample plots, in stratum i , in which vegetation cover biomass was measured / will be re-measured
Equations	10, 11, 12
Source of data:	Measured in the project area
Description of measurement methods and procedures to be applied:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Purpose of data:	Calculation of uncertainty for direct estimation of change in biomass on sample plots.
Calculation method:	NA
Comments:	This approach is used when default values are not applied.

Data / Parameter:	M_i
Data unit:	dimensionless
Description:	The total number of vegetation cover biomass estimation strata for stratum i
Equations	10, 11
Source of data:	Measured in the project area
Description of measurement methods and procedures to be applied:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”

Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM methodological tool “ <i>Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities</i> ”
Purpose of data:	Calculation of uncertainty for direct estimation of change in biomass on sample plots.
Calculation method:	NA
Comments:	This approach is used when default values are not applied.

Data / Parameter:	RS_{vc}
Data unit:	dimensionless
Description:	Root-shoot ratio for class of vegetation cover
Equations	6
Source of data:	Peer-reviewed academic literature or the most recent government-published default values.
Description of measurement methods and procedures to be applied:	Unless transparent and verifiable information can be provided to justify a different value, the following values should be applied: Tree = 0.25 Shrubs = 0.40
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	NA
Purpose of data:	Calculation of incremental changes in carbon stocks.
Calculation method:	NA
Comments:	

Data / Parameter:	$Coverage_{vc}$
Data unit:	Percent
Description:	Ratio of vegetation cover biomass per hectare in land having a crown cover
Equations	5
Source of data:	Measured in project area through remote sensing.
Description of measurement methods and procedures to be applied:	See section 5.2
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 5.2
Purpose of data:	Calculation of incremental changes in carbon stocks.
Calculation method:	NA
Comments:	The percent documented by the project proponent must be supplemented with remote sensing imagery to validate the value.

Data / Parameter:	PE_y
Data unit:	tCO ₂ e
Description:	Total project emissions from deforestation and/or degradation within the project area at y
Equations	3, 8
Source of data:	Measured in project area through remote sensing
Description of measurement methods and procedures to be applied:	$PE_y = \sum_y PE_{vc_change}$ See section 8.2 “Estimating emission from deforestation and/or degradation”

Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.2
Purpose of data:	Calculation of project emissions within the project area due to deforestation / degradation.
Calculation method:	NA
Comments:	In the event that the project proponent states no degradation / deforestation in year y, evidence must be provided in the monitoring report. This evidence should include remote sensing data and satellite imagery.
Data / Parameter:	$PE_{vc_change,y}$
Data unit:	tCO2e
Description:	The total project emissions from the change in class of vegetation cover in year y
Equations	8, 9
Source of data:	Measured in project area through remote sensing
Description of measurement methods and procedures to be applied:	$PE_{vc_change,y} = E_{vc_change,y} \times Area_{vc_change}$ See section 8.2 “Estimating emission from deforestation and/or degradation”
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.2
Purpose of data:	Calculation of project emissions within the project area due to deforestation / degradation.
Calculation method:	NA
Comments:	

Data / Parameter:	$E_{vc_change,y}$
Data unit:	tCO2e
Description:	The emissions from the change in class of vegetation cover in year y per hectare
Equations	8, 9
Source of data:	Measured in project area through remote sensing
Description of measurement methods and procedures to be applied:	<p>See section 8.2 “Estimating emission from deforestation and/or degradation”</p> <p>The carbon stocks of the degraded vegetation can either be calculated using conservative default values published in peer-reviewed academic literature, the most recent host government-publications, or directly measured in the project area. If default values are used, the project proponent must align with the principles of conservativeness outlined in section 5.2.3 of this document.</p>
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.2
Purpose of data:	Calculation of project emissions within the project area due to deforestation / degradation.
Calculation method:	NA
Comments:	

Data / Parameter:	$Area_{vc_change}$
Data unit:	hectares
Description:	Area of degradation or deforestation for the class of vegetation cover in year y
Equations	8, 9
Source of data:	Measured in project area through remote sensing

Description of measurement methods and procedures to be applied:	See section 8.2 “Estimating emission from deforestation and/or degradation” See section 5.2 on mapping of land use/land cover.
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 5.2 on mapping of land use/land cover.
Purpose of data:	Calculation of project emissions within the project area due to deforestation / degradation.
Calculation method:	NA
Comments:	

Data / Parameter:	$Leakage_y$
Data unit:	tCO ₂ e
Description:	Leakage due to the displacement of agricultural activities in year y
Equations	13
Source of data:	Measured in project area through remote sensing
Description of measurement methods and procedures to be applied:	See CDM tool “ <i>Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity</i> ”
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See CDM tool “ <i>Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity</i> ”
Purpose of data:	Calculation of leakage
Calculation method:	See CDM tool “ <i>Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity</i> ”

Comments:	
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Data / Parameter:	$BUFFER_y$
Data unit:	tCO ₂ e
Description:	Number of Buffer credits to be deducted in year y
Equations	13
Source of data:	SOCIALCARBON AFOLU Non-Permanence Risk Tool
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	NA
Purpose of data:	Deduction of non-permanence risk credits
Calculation method:	See equation 13
Comments:	

Data / Parameter:	$u_{\Delta C}$
Data unit:	
Description:	Uncertainty in carbon stock change in class of vegetation cover in year y
Equations	10, 11
Source of data:	Calculated in project area
Description of measurement methods	See section 8.4

and procedures to be applied:	
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.4
Purpose of data:	Calculation of uncertainty for vegetation cover class
Calculation method:	See equations 10 and 11
Comments:	Calculated when default values are not applied.

Data / Parameter:	$s_{\Delta,i}^2$
Data unit:	tonnes/ha
Description:	Variance of mean change in vegetation cover biomass per hectare in stratum <i>i</i>
Equations	10, 11
Source of data:	Calculated in project area
Description of measurement methods and procedures to be applied:	See section 8.4
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.4
Purpose of data:	Calculation of uncertainty for vegetation cover class
Calculation method:	See equations 10 and 11
Comments:	Calculated when default values are not applied.

Data / Parameter:	$\Delta B_{vc,p,i}$
Data unit:	tonnes/ha
Description:	Change in vegetation cover biomass in plot p in stratum i
Equations	10, 11
Source of data:	Calculated in project area
Description of measurement methods and procedures to be applied:	See section 8.4
Frequency of monitoring/recording:	Annually
QA/QC procedures to be applied:	See section 8.4
Purpose of data:	Calculation of uncertainty for vegetation cover class
Calculation method:	See equations 10 and 11
Comments:	Calculated when default values are not applied.

Data / Parameter:	$Population_y$
Data unit:	Integer
Description:	Population of the keystone species at validation.
Equations	NA
Source of data:	Measured in the project area.
Description of measurement methods and procedures to be applied:	Population sizes should be measured through ongoing monitoring either by local stakeholders or dedicated rangers in the project area.
Frequency of monitoring/recording:	Annually

QA/QC procedures to be applied:	
Purpose of data:	Tracking keystone species population size within the project area and demonstrate compliance with the eligibility criteria on poaching.
Calculation method:	
Comments:	

9.3 Description of the Monitoring Plan

Project proponents must detail the procedures for collecting and reporting all data and parameters listed in Section 9.2. The monitoring plan must contain at least the following information:

- A description of each monitoring task to be undertaken, and the technical requirements therein;
- Definition of the accounting boundary, spatially delineating any differences in the accounting boundaries and/or quantification approaches;
- Definition of the Conservation Crediting Boundary;
- Remotely sensed data and data analysis techniques applied (see section 5.2.5)
- Parameters to be measured, including any parameters required for the selected model (if remote sensing used to monitor carbon stocks);
- Data to be collected and data collection techniques and sample designs for directly-sampled parameters;
- Anticipated frequency of monitoring, including anticipated definition of “year”;
- Quality assurance and quality control (QA/QC) procedures to ensure accurate data collection and screen for, and where necessary, correct anomalous values, ensure completeness, perform independent checks on analysis results, and other safeguards as appropriate;
- Data archiving procedures, including procedures for any anticipated updates to electronic file formats. All data collected as a part of monitoring process, including QA/QC data, must be archived electronically and be kept at least for two years after the end of the last project crediting period; and
- Roles, responsibilities and capacity of monitoring team and management.

Sample design

For all direct-sampled parameters, the project monitoring plan will clearly delineate spatially the sample population and specify sampling intensities, selection of sample units and sampling stages (where

applicable). The plan for statistical analysis of the measurements needs to be submitted as part of the sampling plan for project validation.

Tree Sampling

Projects shall use the CDM methodology tool “*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*” section 8 for the estimation of carbon stock in trees at a point in time. Estimations by measurement of sample plots shall be estimated either through Stratified random sampling or Doubling sampling.

Project Proponents are permitted to utilise emerging technology (e.g. remote sensing) with known uncertainty to measure changes in carbon stocks for the class of vegetation cover. These emerging technology approaches must be supported by peer-reviewed literature which validates their accuracy and uncertainty. The data and models applied must be documented. If required, VVBs must be able to access the models and replicate the estimates generated.

9.4 Management Plans

All project areas must develop a Management Plan (if one does not already exist). The Management Plan should be for a minimum of 5 years and align with industry best practice⁶. The Management Plan must be renewed once the previous Management Plan’s applicable time period has surpassed i.e. every 5 years.

⁶ <https://www.iucn.org/resources/publication/guidelines-management-planning-protected-areas>

10. References

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Appendix 1: Example default values for incremental biome growth in Brazil

The following tables are from the “Third national communication of Brazil to the United Nations Framework Convention on Climate Change”, pages 293 and 295.

TABLE A1.18

Annual aboveground and belowground biomass increment (t C/ha) of managed primary forest vegetation per biome, percentage of belowground increment in relation to that of aboveground, and references used

BIOME	ABOVEGROUND BIOMASS INCREMENT (t C/ha)	RATIO (%) (BELOWGROUND BIOMASS INCREMENT)	TOTAL INCREMENT (t C/ha)	REFERENCE
Amazon	0.34	25.8	0.43	Baker et al. (2004); Nogueira et al. (2008)
Cerrado			0.2	Rocha et al. (2002)
Atlantic Forest	0.30	20	0.32	Scaranello (2010); IPCC (2006)
Caatinga			0.1	Rocha et al. (2002)
Pantanal			0.2	Same as Cerrado
Pampa	0.30	20	0.32	Same as Atlantic Forest

TABLE A1.19

Average annual increment of carbon stocks in living biomass in secondary forest vegetation areas per biome; annual average increment of carbon stock of aboveground biomass; ratio of belowground biomass for the aboveground biomass; and respective literature reference

BIOME	ABOVEGROUND BIOMASS INCREMENT t C/ha	REFERENCE USED FOR ABOVEGROUND BIOMASS INCREMENT	RATIO A:B (%)	REFERENCE USED FOR RATIO A:B	TOTAL INCREMENT t C/ha
Amazon	3.94	Alves et al. (1997)	25.8	Nogueira (2008)	4.96
Cerrado	1.41	Durigan (2004)	22	Miranda et al. (2014)	1.72
Atlantic Forest	4.46	Melo and Durigan (2006)	20	IPCC (2006)	5.35
Caatinga	0.47	Gariglio et al. (2010); Isaia et al. (1992)	27	Costa et al. (2014)	0.60
Pantanal	2.25	Schongart et al. (2011)	23	Stape et al. (2011)	2.77
Pampa	1.4	Brun (2004)	26	Brun (2004)	1.76

Appendix 2: Cropland in which soil disturbance is restricted

Cropland which is subjected, in the baseline, to the land-use, land management practices, and inputs listed in the following table attracts the restriction on the extent of soil disturbance.

Table 9: Cropland in which soil disturbance is restricted

Region	Land use	Management	Inputs
Boreal	Long-term cultivated cropland	Reduced tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure High with manure
Temperate, cold, dry	Long-term cultivated cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	Medium High without manure
Temperate, cold, moist	Long-term cultivated cropland	Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure
			High with manure
Temperate, warm, dry	Long-term cultivated cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	Medium High without manure
Temperate, warm, moist	Long-term cultivated cropland	Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure
			High with manure

Tropical, dry	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	Medium
			High without manure
			High with manure
No-till	All		
Tropical, moist	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
			High without manure
		No-till	High without manure
High with manure			
Tropical, montane	Long-term cultivated cropland	No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High without manure
			High with manure
		No-till	Medium
			High without manure
High with manure			
Tropical, wet	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High without manure
			High with manure
		No-till	High without manure
			High with manure

Appendix 3: Grassland in which soil disturbance is restricted

Grassland which is subjected, in the baseline, to the land management practices and inputs listed in the following table attracts the restriction on the extent of soil disturbance.

Table 10: Grassland in which soil disturbance is restricted

Temperature / Moisture Regime	Management	Inputs
Boreal	Improved	All
	Non-degraded	All
	Moderately degraded	High
Temperate, cold, dry	Improved	All
	Non-degraded	All
	Moderately degraded	High
Temperate, cold, moist	Improved	All
	Non-degraded	All
	Moderately degraded	High
Temperate, warm, dry	Improved	All
	Non-degraded	All
	Moderately degraded	High
Temperate, warm, moist	Improved	All
	Non-degraded	All
	Moderately degraded	High
Tropical, dry	Improved	All
	Non-degraded	All
	Moderately degraded	High
Tropical, moist	Improved	All
	Non-degraded	All
	Moderately degraded	High
Tropical, montane	Improved	All
	Non-degraded	All
	Moderately degraded	High
Tropical, wet	Improved	All
	Non-degraded	High
	Moderately degraded	High