HUBEI HONGSHAN IFM (CONVERSION OF LOGGED TO PROTECTED FOREST) PROJECT

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Table of Contents

1. PROJECT DETAILS

1.1 Summary Description of the Project

The Hubei Hongshan IFM (conversion of logged to protected forest) Project (hereafter "the project activity") is implemented in Hongshan County, Suizhou City, Hubei Province of China by Zhejiang Zhongzheng Forestry Development Co.,Ltd, the geo-coordinate of the project is 112°43′E~113°46′E and 31°19′N~32°26′N, the total area is 302,800ha, which includes the Improved Forest Management (IFM) of the forests in the conversion of logged to protected forest.

The area of the project activity is 23,769.42ha, including 5,562 subcompartments spreading over Baoji country, Wangtai country, Baiguofan country, Huoyantao country, Jimingsi country, Sanshenmiao country, Peijiayan country, Qiaohe country, Shuangfeng country, Zhoujiawan country, Qinglongmiao country, Wushenggong country, Yutingling country, Jieshanchong country, Yunlin country, Sishan Neighborhood committee, Maocifan Neighborhood committee, Zhoujiazu country, Huangshansi country, Wenquan country, Gaojianshan country, Xujiachong country, Guanyintang country, Zhuji country, Liangtinghe country, Wangheshan country, Guoji country, Dianzihe country, Huangjiafan country, Guihuayuan country. All these countries have the legal right to forest ownership. The species involved in the project are Oak, Masson Pine, Broad-Leaved Mixed Forest and Coniferous and Broad-Leaved Mixed Forest.

Before the implementation of the project activity, the trees are logged based on a valid and verifiable government-approved timber management plan for harvesting the project area. The implementation of the project activity converses the trees to protected forest to reduce the GHG emissions for about 8,796,424 tCO_2e in 30 years, the average annual emission reduction is 293,214 tCO2e and Verified Carbon Units with buffer deduction is about 6,861,196 tCO_2e in 30 years, the average annual VCUs with buffer deduction is 228,707 tCO_2e.

The project activity will contribute to the environment (biodiversity conservation and soil erosion control), thus contribute to sustainable development.

1.2 Sectoral Scope and Project Type

Sectoral scope 14 (AFOLU)

Improved Forest Management: Logged to Protected Forest (LtPF)

1.3 Project Proponent

Organization name	Zhejiang Zhongzheng Forestry Development Co.,Ltd
Contact person	Zhou Xiongjie
Title	General Manager
Address	Room 308, Block C, Weiye Road, Puyan Street, Binjiang District,Hangzhou, Zhejiang
Telephone	+86 0571-87424258

Email	391190031@qq.com

1.4 Other Entities Involved in the Project

N/A

1.5 Project Start Date

The project start date is 01/01/2015, which is announced by the Local Forestry Bureau.

1.6 Project Crediting Period

The project crediting period is from 01/01/2015 to 31/12/2044 with the total length of 30 years.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Years	Estimated GHG emission reductions or removals (tCO_2e)	Estimated GHG emission reductions or removals with buffer deduction (tCO_2e)
01/01/2015-31/12/2015	247,522	193,067
01/01/2016-31/12/2016	247,398	192,970
01/01/2017-31/12/2017	247,742	193,238
01/01/2018-31/12/2018	247,415	192,983
01/01/2019-31/12/2019	247,723	193,223
01/01/2020-31/12/2020	247,657	193,172
01/01/2021-31/12/2021	247,940	193,393
01/01/2022-31/12/2022	249,271	194,431
01/01/2023-31/12/2023	250,462	195,360
01/01/2024-31/12/2024	250,800	195,624
01/01/2025-31/12/2025	252,827	197,205
01/01/2026-31/12/2026	254,452	198,472
01/01/2027-31/12/2027	255,636	199,396
01/01/2028-31/12/2028	251,236	195,964
01/01/2029-31/12/2029	328,441	256,183
01/01/2030-31/12/2030	262,771	204,961
01/01/2031-31/12/2031	268,216	209,208
01/01/2032-31/12/2032	273,361	213,221

01/01/2033-31/12/2033	281,827	219,825
01/01/2034-31/12/2034	319,711	249,374
01/01/2035-31/12/2035	376,797	293,901
01/01/2036-31/12/2036	439,032	342,444
01/01/2037-31/12/2037	481,481	375,555
01/01/2038-31/12/2038	404,224	315,294
01/01/2039-31/12/2039	330,187	257,545
01/01/2040-31/12/2040	298,276	232,655
01/01/2041-31/12/2041	313,694	244,681
01/01/2042-31/12/2042	304,201	237,276
01/01/2043-31/12/2043	306,691	239,218
01/01/2044-31/12/2044	309,433	241,357
Total estimated ERs	8,796,424	6,861,196
Total number of crediting years	30	
Average annual ERs	293,214	228,707

1.8 Description of the Project Activity

The Improved Forest Management (IFM) project activity is located in Hongshan County, Suizhou City, Hubei Province of China. The annual average temperature is 15.4 ℃ and the annual average precipitation is 960 mm.

The project activity includes the Improved Forest Management (IFM) of the forests in 5,562 subcompartments spreading over Wangjiatai country, Liangtinghe country, Baiguofan country, Zhoujiazui country, Zhuji country, Huangjiafan country, Peijiayan country, Yunlin country, Huanglongsi country, Baoji country, Dianzihe country, Paoji country, Gaojianshan country, Guanyintang country, Guihuayuan country, Guoji country, Huyantao country, Jimingsi country, Jieshanchong country, Maocifan country, Qiaohe country, Qinglongmiao country, Sanshenmiao country, Shuanghejie country, Sishan country, Wangheshan country, Wenquan country, Wushenggong country, Xujiachong country, Yutingling country, Zhoujiawan country by the conversion of logged to protected forest. All the subcompartments had the legal right to harvest issued by local forest bureau before the implementation of the project activity. Before 2015, they were all forests which the trees could be logged and sold once reached the cutting rotation age based on a timber harvest plan. After 2015, they are all converted to protected forests. Zhejiang Zhongzheng Forestry Development Co.,Ltd is in charge of applying VCS project.

The purpose of strata is to improve accuracy and reduce the sampling cost. The strata is usually based on the tree species, age and canopy density, but it does not mean all these factors should be considered for all projects, more strata means more workload and cost. For this project, the factor of species for strata could reduce the variation within the same stratum and reach the accuracy level of 90% under certain degree of freedom. So the strata are reasonable and feasible. All the subcompartments are divided into 4 strata based on the tree species .

Serial number of strata	Area (ha)	Tree species	Source
1	7415.59	Oak	Forest second class investigation issued by local forestry bureau
2	3087.63	Masson Pine	
3	7244.29	Broad-Leaved Mixed	
4	6021.91	Coniferous and Broad-Leaved Mixed	
Total	23769.42		

The implementation of the project activity includes the conversion from logged to protected forests in the parcels mentioned above. After the activity, trees could be avoided to be logged and then the carbon stocks could be increased. Therefore, net GHG emission reductions/removals resulting from the implementation of IFM projects aimed at the protection of forests that would be logged in the absence of carbon finance could be earned by the project activity.

1.9 Project Location

The project is located in Hongshan County, Suizhou City, Hubei Province of P.R.China. The geo-coordinate range of the project is 112°43′E~113°46′E and 31°19′N~32°26′N. There are 5,562 subcompartments spreading over Wangjiatai country, Liangtinghe country, Baiguofan country, Zhoujiazui country, Zhuji country, Huangjiafan country, Peijiayan country, Yunlin country, Huanglongsi country, Baoji country, Dianzihe country, Paoji country, Gaojianshan country, Guanyintang country, Guihuayuan country, Guoji country, Huyantao country, Jimingsi country, Jieshanchong country, Maocifan country, Qiaohe country, Qinglongmiao country, Sanshenmiao country, Shuanghejie country, Sishan country, Wangheshan country, Wenquan country, Wushenggong country, Xujiachong country, Yutingling country, Zhoujiawan country

The schematic diagram of the location of the project is shown in figure 1 below:

Figure 1: The project location

1.10 Conditions Prior to Project Initiation

Prior to the implementation of the project, the forest within the project area was logged annually according to the timber harvest plan.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is in line with the Forest Law of People's Republic of China

1.12 Ownership and Other Programs

1.12.1 Project Ownership

Zhejiang Zhongzheng Forestry Development Co.,Ltd. (hereafter "the project proponent"), established in June 2011. The project proponent has the ownership and legal right of the carbon sink credit of this project.

1.12.2 Emissions Trading Programs and Other Binding Limits

N/A

1.12.3 Other Forms of Environmental Credit

The project has neither intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program, nor any such credit has been or will be cancelled from the relevant program.

1.12.4 Participation under Other GHG Programs

The project has not been registered, or is seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

N/A

Leakage Management

N/A

Commercially Sensitive Information

There are no commercially sensitive information been excluded from the public version of the project description.

Sustainable Development

As one of the most precious ecological resources, forest is the key to biodiversity and all life forms. The protection of local forest will enrich the biodiversity and provide more opportunity for adaptive response to natural challenges and economic development (e.g. climate change). The project activity will result in significant carbon sequestration and contribute to the environment (e.g. biodiversity conservation and soil erosion control), thus contribute to sustainable development.

Further Information

There is no additional relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2. APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

VM0010 version 1.3: Methodology for Improved Forest Management: Conversion of Logged to Protected Forest

This methodology uses the latest versions of the following methodologies, modules and tools:

- *CDM Tool for Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities*
- *CDM Tool for testing significance of GHG emissions in A/R CDM project activities*
- *VCS methodology VM0003 Methodology for Improved Forest Management through Extension of Rotation Age*
- *VCS methodology VM0005 Methodology for Conversion of Low-Productive Forests to High-Productive Forests*
- *VCS methodology VM0007 REDD+ Methodology Framework (REDD-MF)*
- *VCS methodology VM0011 Methodology for Improved Forest Management: Calculating GHG Benefits from Logged to Protected Forest*
- *VCS tool VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities*

2.2 Applicability of Methodology

According to VM0010 version 1.3, Projects must fall within the AFOLU project category “IFM Logged to Protected Forest” as defined in the most recent version of the VCS AFOLU Guidance document. Therefore, specific conditions which can be applicable to the methodology are shown below:

- *Forest management in the baseline scenario must be planned timber harvest;*

  There is a planned timber harvest before the conversion of Logged to Protected Forest as the baseline scenario.

- *Under the project scenario, forest use is limited to activities that do not result in commercial timber harvest or forest degradation;*

  Under the project scenario, there is no forest use for commercial timber harvest or forest degradation.Only forest tending and managing are allowed in the timber harvest plan, which has been strictly carried out by the project proponent.

- *Planned timber harvest must be estimated using forest inventory methods that determine allowable offtake as volume of timber (m^3 ha^{-1});*

There are regular forest inventory taken by forestry survey company and the local forestry bureau who is qualified, experienced for the forestry investigation. Then local forestry bureau uses these data, based mainly on the stock volume to estimate the planned timber harvest and then to determine allowable offtake as volume of timber ($m^3\ ha^{-1}$),

- *The boundaries of the forest land must be clearly defined and documented;*

  The boundaries of the forest land could be clearly defined and documented through the maps and the forest inventory data. The location of the forest is measured by GPS and draw map. Both the forest map and forest second class investigation will be monitored periodically by the government according to the local laws and regulations.

- *Baseline scenario cannot include conversion to managed plantations;*

  According to the previously issued timber harvest plan, the project baseline scenario is planned timber harvest *within the project area*, which doesn't include conversion to managed plantations.

- *Baseline scenario, project scenario and project case cannot include wetland or peatland*

  The baseline scenario, project scenario and project case don’t include wetland or peatland.

- *All applicability conditions of VCS and CDM tools used in conjunction with this methodology must be met.*

  The project meets all applicability conditions of VCS and CDM tools used in conjunction with this methodology.

  The applicability conditions of Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities are:

  a) AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced;

  Yes, all projects are in conformity with law.

  b) The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.

  Yes, the baseline methodology uses a stepwise approach justifying the determination of the most plausible baseline scenario. And project proponent proposing new baseline methodologies ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.

2.3 Project Boundary

According to VM0010 version 1.3, the spatial boundaries of the project activity so as to facilitate accurate measuring, monitoring, accounting, and verifying of the project's emissions reductions and removals is defined below:

2.3.1 Geographical Boundaries

When describing physical project boundaries, the information is shown in Figure 1 above. The details of the subcompartments (e.g. area, age, species, stock volume and location) are shown in forest second class investigation as appendix submitted to DOE.

The geographic boundaries of the project activity are fixed and thus do not change over the project lifetime.

Following the VCS definition of market leakage the geographic boundaries for leakage from market effects are those of the country in which the project area occurs.

2.3.2 Temporal Boundaries

The following temporal boundaries shall be defined:

The temporal boundaries are defined by the project start date and length of the project crediting period

According to VCS standard version 3.7, the start date of the project activity is 01/01/2015. The length of the project crediting period is 30 years.

The minimum duration of a monitoring period is one year and the maximum duration is 10 years.

The project proponent decides the periodicity of verifications every 5 years.

2.3.3 Carbon Pools

The carbon pools included or excluded from the project boundary are shown in the table below:

Carbon pools	Included/Optional/ Excluded	Justification / Explanation of choice
Aboveground trees	Included	The stock change in the aboveground tree biomass is estimated
Aboveground non-tree	Excluded	Exclusion is always conservative when forests remains as forest
Belowground	Excluded	Unlikely to change significantly in forests remaining as forests and is difficult to measure - omission is conservative
Dead wood (logging slash)	Included in the baseline	The dead wood (logging slash) carbon pool is expected to be larger in the baseline than in the project scenario, and therefore this pool must be included
Dead wood (naturally	Excluded	Following IPCC guidelines, it is assumed

accumulated)		that carbon stocks in the naturally occurring dead wood pool (both standing and lying) are equivalent in both the project and baseline scenario, and therefore this pool is conservatively excluded.
Harvested wood products	Included	Will be greater in baseline than project scenario and significant
Litter	Excluded	Insignificant and exclusion is conservative
Soil organic carbon	Excluded	Exclusion is always conservative when forests remains as forest

2.3.4 Greenhouse Gases

The emissions sources included in or excluded from the project boundary are shown in the table below.

The project proponent has chosen to exclude to account for GHG emissions related to the combustion of fossil fuels, which is conservative.

Gas	Source	Included?	Justification
CO_2	Combustion of fossil fuels (in vehicles, machinery and equipment)	Excluded	Conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Removal of herbaceous vegetation	Excluded	Based on CDM EB decision reflected in paragraph11ofthe report of the 23rd session of the board: cdm.unfccc.int/Panels/ar/023/ar_023_rep.pdf
CH_4	Combustion of fossil fuels (in vehicles, machinery and equipment)	Excluded	Conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Burning of biomass	Included	Included as CO_2 equivalent emission
N_2O	Combustion of fossil fuels (in vehicles, machinery and equipment)	Excluded	Conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Nitrogen based fertilizer	Excluded	Potential emissions are negligible. Following the VCS update to the Tool for AFOLU Methodological Issues and Guidance for AFOLU Projects, emissions through the use of fertilizer are considered insignificant and are not

			considered here.
	Burning of biomass	Excluded	Potential emissions are negligible

2.4 Baseline Scenario

2.4.1 Selection of baseline

According to VM0010, the "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" (version 3.0), the following steps are applied for the demonstration of the additionality for the project by project proponent:

a) STEP 1. Identification of alternative land use scenarios to the AFOLU project activity;

b) STEP 2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios; or

c) STEP 3. Barriers analysis; and

d) STEP 4. Common practice analysis.

Step 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

Sub-step 1a. Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

a) Identify realistic and credible land-use scenarios that would have occurred on the land within the proposed project boundary in the absence of the AFOLU project activity under the VCS. The scenarios should be feasible for the project area taking into account relevant national and/or sectoral policies and circumstances, such as historical land uses, practices and economic trends. The identified land use scenarios at least include:

i) Continuation of the pre-project land use as the timber harvest plan;

ii) Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project;

iii) If applicable, activities similar to the proposed project activity on at least part of the land within the project boundary of the proposed VCS AFOLU project at a rate resulting from:

- Legal requirements; or
- Extrapolate similar activities in the geographical area under similar socioeconomic and ecological conditions to the proposed VCS AFOLU project activity which cover a period began a decade earlier than the project start date.

For (ii), the NPV under this scenario is obviously not financially attractive compared to the scenario of logging.

For (iii), the lands within the project boundary of the proposed VCS AFOLU project are all with the same legal requirements and are existed as forests more than ten years prior to the project start date. So (iii) is not applicable.

Therefore, the baseline scenario is continuation of the pre-project land use as the timber harvest plan.

The baseline is further confirmed by the timber harvest plan issued by the forestry authority and is determined both in PD and MR.

2.4.2 Modelling the baseline scenario

According to VM0010 version 1.3, a historical baseline scenario is used for determining how to model the baseline management scenario as:

1. Historical records of forest management exist for 5 years preceding the project start date;

2. Historical records indicate that the management practices have surpassed the legal requirements provided by conforming to all local and regional forest legislation;

3. Historical records that indicate that the historical management surpasses financial barriers by providing above average financial returns.

Box 1. Timber Harvest Plan

The description of harvesting in the form of a timber harvest plan forms the basis of the baseline scenario for greenhouse gas accounting.

The timber harvest plan describes the harvest of timber products:

a) reference the forest volume inventory (see Section 8.1.1 – parameter $V_{j,i|BSL}$) to identify the relative number of trees per hectare potentially available for harvest by species in each stratum;

b) demarcate all non-harvest areas within the forest based on legally required exclusions for environmental features such as slope, swamp areas or conservation buffers;

c) divide the harvestable forest into annual operating areas (referred to throughout this methodology as land parcels) using common practice;

d) include a design and presentation of the forestry infrastructure to harvest, skid/haul, store and move harvested timber products from the land parcels to downstream processing or market entry points. Where the project proponent accounts for emissions from forestry infrastructure, the design and presentation must include all forest roads, skidtrails and log landings that would be established under the baseline scenario as a georeferenced layer (shapefile or equivalent), and must list necessary harvest and transport machinery.

e) the timber harvest plan must follow local best practice for timber harvest practices, including planning of roads, skidtrails and log landings-and the timber resource volume and extraction quotas defined in any legal requirements.

For the purpose of estimating the net annual changes in carbon stocks resulting from planned timber harvest in the baseline scenario a detailed planned timber harvesting schedule will be developed from the timber harvest plan, setting out details of harvest and forestry infrastructure establishment for each land parcel in the project area in terms of the following:

a) the species to be harvested;

b) the year (1,2,3...) in which timber harvest and/or forestry infrastructure establishment of each land parcel is scheduled to occur;

c) the number of years each land parcel is in a post-harvest and/or forestry infrastructure establishment state during the project crediting period;

d) the maximum and minimum diameters at breast height (DBH), at stump and at top for tree harvesting;

e) the planned harvesting regime (clearfelling, specie/stratum-selective logging, area-selective logging);

f) the fraction of merchantable timber volume from clearing of forest roads, skidtrails and log landings that is to be processed into wood products ($F_{V,INF,HWP}$). Based on this fraction, as well as forest inventory and forestry infrastructure data, $V_{EX,INF,j,i|BSL}$ and $V_{notEX,INF,j,i|BSL}$ (see points 2 and 3 below) will be calculated.

g) technical specifications for the categories of wood products to be harvested; and

h) the total volumes or fractions to be harvested, broken down by categories of wood products defined as sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other.

The planned timber harvest schedule is determined ex ante to reflect the timber harvesting plan as stipulated in the legal right to harvest. The planned timber harvesting schedule will be developed for the Project Area to include all land parcels within the project boundary for the proposed IFM activity.

The output of the timber harvest plan and timber harvesting schedule must be:

1) The mean extracted volume of extracted merchantable timber per unit area by species in each stratum in each year ($V_{EX,j,i|BSL}$).

2) Where the project proponent accounts for forestry infrastructure, the mean volume of merchantable timber extracted for wood processing that is harvested during the process of forestry infrastructure establishment per unit area by species in each stratum in each year ($V_{EX,INF,j,i|BSL}$).

3) Where the project proponent accounts for forestry infrastructure, the mean volume of merchantable timber that is cleared during the process of forestry infrastructure establishment and NOT extracted for wood processing per unit area by species in each stratum in each year ($V_{notEX,INF,j,i|BSL}$).

The planned timber harvesting schedule will be submitted by the project proponent as part of the project documents.

Serial number of strata	**Area (ha)**	**Tree species**	**Source**
1	7415.59	Oak	Forest second class investigation issued by local forestry bureau
2	3087.63	Masson Pine	
3	7244.29	Broad-Leaved Mixed	
4	6021.91	Coniferous and Broad-Leaved Mixed	
Total	23769.42		

The timber harvest and management plan describes the harvest of timber products and includes:

<table>
<tr><th>Demands</th><th>The project activity</th></tr>
<tr><td>a) reference the forest volume inventory (see Section 8.1.1 – parameter $V_{j,i|BSL}$) to identify the relative number of trees per hectare potentially available for harvest by species in each stratum;</td><td>According to the forest volume inventroy, the $V_{j,i|BSL}$ is listed as follows:
<table>
<tr><th>Dominant Species</th><th>Area(ha)</th><th>Volume (m^3)</th><th>$V_{j,i|BSL}$ (m^3/ha)</th></tr>
<tr><td>Oak</td><td>7415.59</td><td>85762.1</td><td>11.57</td></tr>
<tr><td>Masson Pine</td><td>3087.63</td><td>104586.2</td><td>33.87</td></tr>
<tr><td>Broad-Leaved Mixed</td><td>7244.29</td><td>243487.4</td><td>32.61</td></tr>
<tr><td>Coniferous and Broad-Leaved Mixed</td><td>6021.91</td><td>72629.7</td><td>12.06</td></tr>
</table></td></tr>
<tr><td>b) demarcate all non-harvest areas within the forest based on legally required exclusions for environmental features such as slope, swamp areas or conservation buffers;</td><td>The project area only includes commercial forests, therefore, the legally required exclusions for environmental features such as slope, swamp areas or conservation buffer are obviously non-harvest areas, which are also excluded from the project boundary.</td></tr>
<tr><td>c) divide the harvestable forest into annual operating areas (referred to throughout this methodology as land parcels) using common practice;</td><td>Yes, the harvestable forests are listed into annual operating areas using clear felling. The timber harvest plan is announced by Local Forestry Bureau in 2011 is a long-term plan.</td></tr>
<tr><td>d) include a design and presentation of the forestry infrastructure to harvest, skid/haul, store and move harvested timber products from the land parcels to downstream processing or market entry</td><td>Because the emission from forestry infrastructure is hard to calculate, and if it is accounted in the baseline scenario, the total emission reduction will be greater. Considering the cost effectiveness and conservative, the project proponent didn’t account</td></tr>
</table>

points. Where the project proponent accounts for emissions from forestry infrastructure, the design and presentation must include all forest roads, skidtrails and log landings that would be established under the baseline scenario as a georeferenced layer (shapefile or equivalent), and must list necessary harvest and transport machinery.	for emission from from forestry infrastructure.
e) the timber harvest plan must follow local best practice for timber harvest practices, including planning of roads, skidtrails and log landings-and the timber resource volume and extraction quotas defined in any legal requirements.	The timber harvest plan has followed local best practice for timber harvest practices. The planning of roads, skidtrails and log landings meet the related national regulations and standard. The timber resource volume and extraction quota is defined according to forest second investigation data, which comply with the legal requirements.

The timber harvest schedule：

Demands	The project activity
a) the species to be harvested;	The species within the project area are Oak、Masson Pine 、 Broad-Leaved Mixed and Coniferous and Broad-Leaved Mixed
b) the year (1,2,3...) in which timber harvest and/or forestry infrastructure establishment of each land parcel is scheduled to occur;	The harvest plan has demonstrated the year in which timber harvest is scheduled to occur. The forestry infrastructures of departments were established when the company was founded, so the timber harvest schedule doesn’t include this part.
c) the number of years each land parcel is in a post-harvest and/or forestry infrastructure establishment state during the project crediting period;	According to the timber harvest plan, the land parcel will be regenerated after timber harvest occurred, the post-harvest state during the project crediting period will be not more than a year.
d) the maximum and minimum diameters at breast height (DBH), at stump and at top for tree harvesting;	There is no specific requirement for the maximum and minimum diameters at breast height (DBH), at stump and at top for tree harvesting, which is not applicable in China.
e) the planned harvesting regime (clearfelling, specie/stratum-selective logging, area-selective logging);	The planned harvesting regime is clear felling for the project.
f) the fraction of merchantable timber volume from clearing of forest roads, skidtrails and log landings that is to be processed into	The fraction of merchantable timber volume from clearing of forest roads, skidtrails and log landings that is to be processed into wood

wood products ($F_{V,INF,HWP}$). Based on this fraction, as well as forest inventory and forestry infrastructure data, $V_{EX,INF,j,i\|BSL}$ and $V_{notEX,INF,j,i\|BSL}$ (see points 2 and 3 below) will be calculated.	products is very small and hard to calculate precisely, so we didn't take the $V_{EX,INF,j,i\|BSL}$ and $V_{notEX,INF,j,i\|BSL}$ into account for calculate the baseline scenario emission. As this is conservative for emission reduction of the project, so it is reasonable.
g) technical specifications for the categories of wood products to be harvested; and	There is no technical specifications for the categories of the wood products, they will be determined by the requirements of the customers
h) the total volumes or fractions to be harvested, broken down by categories of wood products defined as sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other.	The wood products of the project is only sawnwood, there is no others such as wood-based panels, other industrial roundwood, paper and paper board, etc.

2.4.3 Stratification

As the project activity area contains different forest types or forests with different carbon density, stratification is carried out in order to improve the accuracy and precision of carbon stock estimates. The details of the subcompartments (e.g. area, age, species, stock volume and location) are shown in forest second class investigation as appendix submitted to DOE.

Based on the availability of data regarding the nature and composition of forest stocks in the project area, stratification is developed on the basis of existing vegetation stratification, where these are documented in the legal right to harvest. The purpose of strata is to improve accuracy and reduce the sampling cost. The strata is usually based on the tree species, age and canopy density, but it does not mean all these factors should be considered for all projects, more strata means more workload and cost. For this project, the factor of species for strata could reduce the variation within the same stratum and reach the accuracy level of 90% under certain degree of freedom. So the strata are reasonable and feasible.

Table 2 shows the 4 strata specified based on the tree species.

Table 2: Tree strara

Serial number of strata	Area (ha)	Tree species	Source
1	7415.59	Oak	Forest second class investigation issued by local forestry bureau
2	3087.63	Masson Pine	
3	7244.29	Broad-Leaved Mixed	
4	6021.91	Coniferous and Broad-Leaved Mixed	
Total	23769.42		

2.5 Additionality

According to VM0010 version 1.3, the additionality of the project is demonstrated using the VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" version 3.0.

The following four steps are applied for the project:

2.5.1 Step 1: Identification of alternative land use scenarios to the AFOLU project activity;

Sub-step 1a: Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

a) Identify realistic and credible land-use scenarios that would have occurred on the land within the proposed project boundary in the absence of the AFOLU project activity under the VCS. The scenarios should be feasible for the project area taking into account relevant national and/or sectoral policies and circumstances, such as historical land uses, practices and economic trends.

The identified land use scenarios shall at least include:

i) Continuation of the pre-project land use as the timber harvest plan as analysed in section 2.4;

ii) Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project.

iii) If applicable, activities similar to the proposed project activity on at least part of the land within the project boundary of the proposed VCS AFOLU project at a rate resulting from:

- Legal requirements; or
- Extrapolate similar activities in the geographical area under similar socioeconomic and ecological conditions to the proposed VCS AFOLU project activity which cover a period began a decade earlier than the project start date.

For (iii), the lands within the project boundary of the proposed VCS AFOLU project are all with the same legal requirements and are existed as forests more than ten years prior to the project start date. So (iii) is not applicable.

Pre-project land use scenario is the timber forest which is the common practice in China, it is feasible for the project area taking into account Forest Law of People's Republic of China. And there is no land within the project boundary performed being registered as the VCS AFOLU project.

b) All identified land use scenarios must be credible. All land-uses within the boundary of the proposed VCS AFOLU project that are currently existing or that existed at some time in the period beginning ten years prior to the project start date but no longer exist, may be deemed realistic and credible. For all other land use scenarios, credibility shall be justified. The justification shall include elements of spatial planning information (if applicable) or legal requirements and may include assessment of economic feasibility of the proposed land use scenario.

The (i) and (ii) identified land-use scenarios that would have occurred on the land within the proposed project boundary in the absence of the AFOLU project activity under the VCS are realistic and credible, as all land-uses within the boundary of the project activity that existed in the period beginning ten years prior to the project start date but no longer exist. Therefore, it is deemed realistic and credible. Outcome of Section 2.5.1.1:

The identified land use scenarios include the two below:

i) Continuation of the pre-project land use as the timber harvest plan as analysed in section 2.4;

ii) Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project.

Sub-step 1b: Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

The scenarios are feasible for the project area taking into account Forest Law of People's Republic of China. Therefore, the 2 identified realistic and credible alternative land used scenarios that could have occurred on the land within the project boundary of the VCS AFOLU project are listed below. The identified land use scenarios include the two below:

i) Continuation of the pre-project land use as the timber harvest plan as analysed in section 2.4;

ii) Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project.

2.5.2 Step 2: Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios; or

This section will determine whether the proposed project activity, without the revenue from the sale of GHG credits is economically or financially less attractive than at least one of the other land use scenarios. To conduct the investment analysis, use the following sections.

Sub-step 2a: Determine appropriate analysis method

Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis. If the VCS AFOLU project generates no financial or economic benefits other than VCS related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III). Note, that Options I, II and III are mutually exclusive hence, only one of them can be applied.

According to the tool, Option I is not applicable for the proposed project since the project will generate other financial and economic benefits (e.g. income from tending and managing instead of commercial harvest) other than VCS related income.

The benchmark analysis is not applicable for the proposed project since there is neither practical nor public available standard benchmark for forest industry within the project area.

Therefore, the project will use the investment comparison analysis (Option II) since the 2 alternatives identified in step 1 both have cost and benefit separately.

Sub-step 2b: Option II. Apply investment comparison analysis

As the PP should compare to determine which one is more economic attractive in the 2 scenarios identified in step 1, NPV will be used as the financial indicator to calculate the discounting in 30 years for decision-making context.

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to options II and III): NPV

a) Calculate the suitable financial indicator for the proposed VCS AFOLU project without the financial benefits from the VCS for the 2 alternatives identified in step 1. Include all relevant costs and revenues, and, as appropriate, non-market cost and benefits in the case of public investors.

Series	Item	Unit	Baseline value	Project value	Data source
Revenue					
1	Oak	RMB/m^3	862	0	Financial statement
2	Masson Pine	RMB/m^3	1316	0	
3	Broad-Leaved Mixed	RMB/m^3	934	0	
4	Coniferous and Broad-Leaved Mixed	RMB/m^3	1125	0	
Extracted Volume					
1	Oak	m^3	567755	0	Timber Harvest Plan
2	Masson Pine	m^3	236544	0	
3	Broad-Leaved Mixed	m^3	721089	0	
4	Coniferous and Broad-Leaved Mixed	m^3	440702	0	
5	Total Area	Mu	356541.3	356541.3	
Cost					
1	A/R cost	RMB/Mu	1200	0	Financial

2	Harvest cost	RMB/m^3	300	0	statement
3	Management Fee	RMB/Mu	200	200	
4	Additional maintenance cost for protected forest	RMB/Mu/working day	0	0.1	

b) Present the investment analysis in a transparent manner and provide all the relevant assumptions in the VCS AFOLU project description

The NPV before and after the conversion of logged to protected forest is shown in the table below. The NPV under the scenario of logging is ¥4,292*10^4 Yuan with the discount rate of 8%. However, the NPV under the scenario of protected forest is ¥-11,420*10^4 Yuan with the discount rate of 8%, which is lower than the scenario of logging. Therefore, the NPV under the scenario of protected forest is obviously not financially attractive compared to the scenario of logging. By taking into account the VCUs revenue, the NPV under the scenario of protected forest is increased to be ¥-8,550*10^4 Yuan. With revenue from VCS at the assumed price level, the project would be more financially attractive. Table 3 shows the comparison of the NPV between project and baseline scenario.

Table 3: Comparison of NPV at different scenarios

	NPV (10^4 Yuan)
Scenario of Logging	¥ 4,292
Scenario of protected	¥-11,420

Sub-step 2d: Sensitivity analysis

The objective of the sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the proposed VCS AFOLU project without the financial benefits from the VCS is unlikely to be financially attractive.

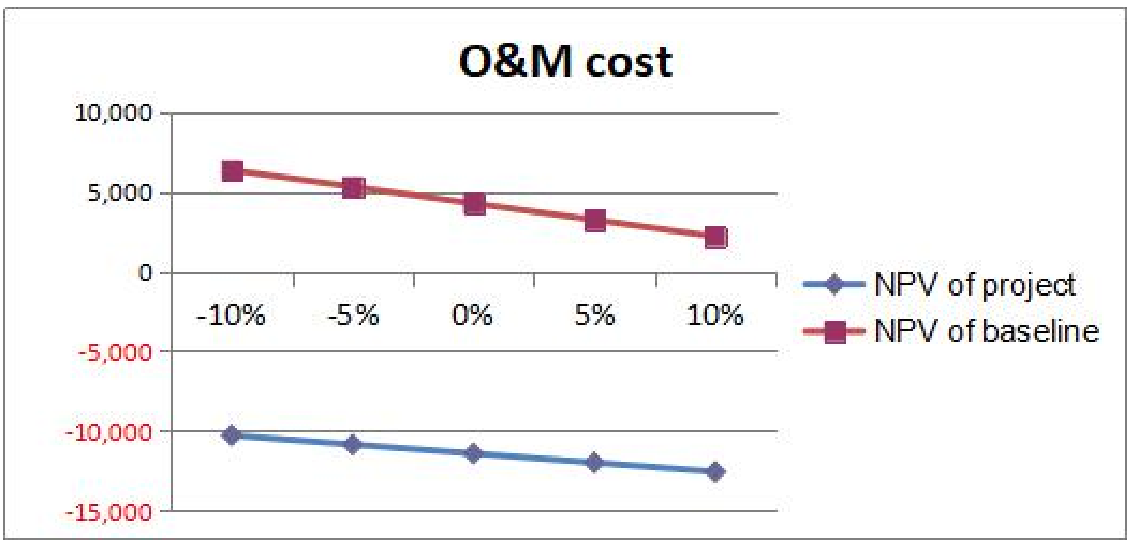
For the project, the key parameters of timber price, the O&M cost, and the extracted volume will be taken into account of the sensitivity analysis. Results of the 3 parameters are shown in the table 4 and figure 2 below:

Table 4: NPV comparison sensitivity analysis of the project

Key parameters	**NPV of baseline scenario (10^4 Yuan)**					**NPV of project scenario (10^4 Yuan)**				
	-10%	**-5%**	**0%**	**5%**	**10%**	**-10%**	**-5%**	**0%**	**5%**	**10%**
Timber price	1,779	3,035	4,292	5,548	6,804	-11,420	-11,420	-11,420	-11,420	-11,420
O&M cost	6,373	5,332	4,292	3,251	2,210	-10,278	-10,849	-11,420	-11,991	-12,562
Extracted	1,779	3,035	4,292	5,548	6,804	-11,420	-11,420	-11,420	-11,420	-11,420

volume											

Timber price
10,000
5,000
0
-5,000
-10,000
-15,000
-10%
-5%
0%
5%
10%
NPV of project
NPV of baseline



O&M cost
10,000
5,000
0
-5,000
-10,000
-15,000
-10%
-5%
0%
5%
10%
NPV of project
NPV of baseline

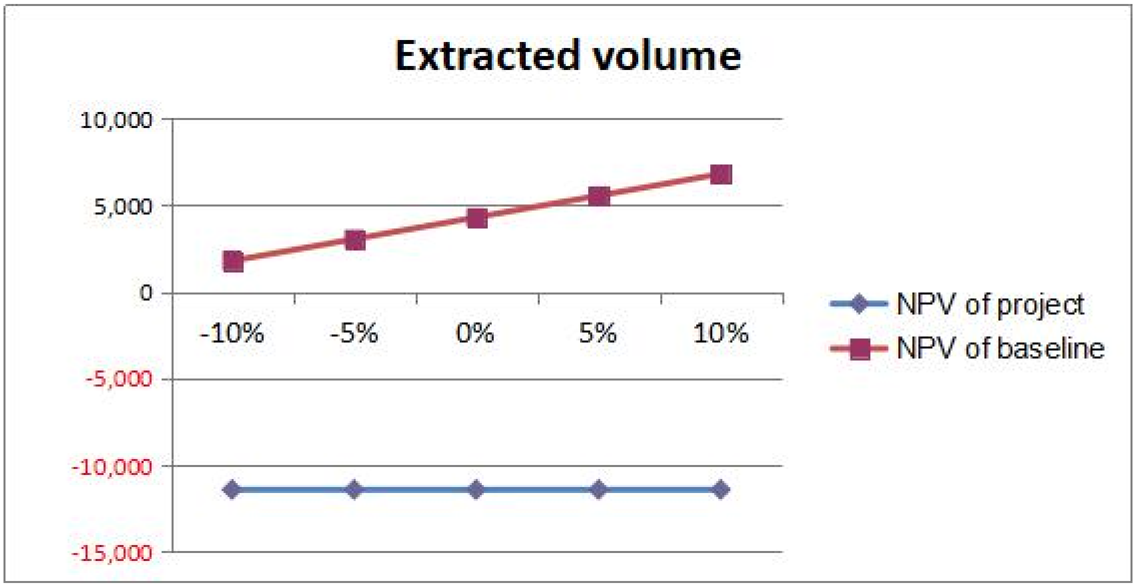


Figure 2: Sensitivity analysis of the project

By referring to the Figures above, the NPV under protected scenario will not exceed the baseline scenario if the price, the O&M cost and the extracted volume varies within ±10%.

In the baseline scenario, the project receives revenue from the commercial harvest. Under the project scenario, all the commercial harvest has been cancelled and only tending and managing is allowed, the revenue of the project scenario is 0. It is obvious that the revenue of the project can't reach the baseline scenario, which would not be influenced by the variation of the timber price and extracted volume. On the other hand, the cost in the project scenario will increase due to the more cost on tending and maintenance. Therefore, it is impossible for the NPV of the project scenario to reach to the baseline scenario no matter how the two parameters vary.

Therefore, the result of the sensitivity analysis confirms that the project is financially unattractive.

According to the tool, if after the sensitivity analysis it is concluded that the proposed VCS AFOLU project without the financial benefits from the VCS is unlikely to be financially most attractive (Option II and Option III), then proceed directly to Step 4 (Common practice analysis).

2.5.3 Step 3. Barrier analysis

Not applicable.

2.5.4 Step 4. Common practice analysis

According to the "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" (version 3.0). "Similar activities are defined as that which are of similar scale, take place in a comparable environment, inter alia, with respect to the regulatory framework and are undertaken in the relevant geographical area, subject to further guidance by the underlying methodology".China has a vast territory, the development policies and economic environment for projects in each province of China are not same. The investment climate varies considerably from province to province depending on the local conditions. The Project is located in Hubei Province. However, the geographic and geomorphic conditions are totally different in the whole province. And by searching the VCS, CDM websites, there is no similar project without applying the VCS, CDM[1] or other voluntary emission reduction project[2].

Therefore, according to the analysis above, the similar activities which haven't applied for the VCS are not common practice in Hubei Province. So the proposed project has additionality.

2.6 Methodology Deviations

N/A

3. QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Calculation of baseline emissions for all land parcels under both the historical and common practice baseline scenarios requires the application of the equations presented in Sections 8.1.1 to Section 8.1.6 of the methodology.

Baseline projections are calculated ex-ante and are not adjusted through-out the project lifetime.

According to the methodology, Section 8.1.1 serves to calculate carbon stocks in commercial timber volumes. Next, baseline emissions are estimated based on the calculation of deadwood (logging slash) generated in the process of timber harvest and establishment of forestry infrastructure (Section 8.1.2), the emissions resulting from production and subsequent retirement of wood products derived from timber harvesting (including timber harvesting from the establishment of forestry infrastructure (Section 8.1.3)), the combustion of fossil fuels in forestry machinery including mechanized felling, skidding / forwarding /hauling, loading and transporting inside the project area, and processing (Section 8.1.5), minus the rates of forest regrowth post-timber harvest (Section 8.1.6).

The following table lists the baseline emissions modelled by the methodology:

Included in modelling
1. Emission from wood product conversion 2. Decomposition of deadwood from harvested trees 3. Emissions from wood product retirement 4. Stock change due to regrowth following timber harvest
5. Decomposition of trees incidentally killed during tree felling Where project proponent accounts for forest infrastructure： 6. Decomposition of trees killed through skid trail creation 7. Decomposition of trees killed through road construction

[1] http://cdm.unfccc.int/
[2] http://cdm.ccchina.gov.cn/ccer.aspx

Optional (as omission is conservative) 8. Emissions from fossil fuels burned in baseline harvesting practices
Conservatively excluded from modeling
9. Emissions through subsequent forest re-entry

The options of 5 to 9 are hard to calculate and tiny in baseline scenario, so we exclude those from baseline emissions modelling considered of cost. As emission is conservative so it is reasonable to exclude those from baseline emissions modelling. Baseline commercial timber volumes must be derived for development of the timber harvest plan and for ex-post accounting of emissions resulting from natural forest disturbance.

The equations below calculate the total emissions across the project crediting period for each emission source. Total emissions are averaged across the crediting period to give annual emissions and are multiplied by t*, time elapsed since the start of project activity. EX-post, t* is updated so baseline projections are available for each proposed future verification date.

Data for input into these carbon stock change calculations for the baseline scenario shall be established from the same data used to create the timber harvest plan.

According to VM0010 version 1.3, the baseline emissions are calculated in the sections below:

3.1.1 Calculation of carbon stocks in commercial timber volumes

This section calculates $C_{HB,j,i|BSL}$, the mean carbon stock in total harvested biomass in $tC \cdot ha^{-1}$ and $C_{EX,j,i|BSL}$, the mean carbon stock in extracted timber (merchantable timber that leaves the forest) in $tC \cdot ha^{-1}$.

The pre-existing forest inventory data are used for this purpose provided that the pre-existing data:

a) represents the project strata;

b) is not more than 10 years old.

These inventory data used the method of sample plot inventory. These data were carried out through field surveys which were finished at the end of 2014 by who is qualified, experienced for the forestry investigation. The project involves 4 strata and 5,562 subcompartments. For each stratum, mean volume is estimated from sample plot size of 0.04 ha and at least 1 sample plot will be selected in 1 subcompartment within the project area using standard forest inventory assessment methods, which satisfies the number of sample plots required by the Tool for Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities (version 02.1.0) as stated in section 5.3.5.

The estimate of merchantable volume for each species j at the sample plot level will be calculated as:

$$V_{j,i,sp} = \sum_{l=1}^{L} V_{l,j,i,sp} \quad (1)$$

Where:

$V_{j,i,sp}$	merchantable volume for species j in stratum i in sample plot sp, m^3;
$V_{l,j,i,sp}$	merchantable volume for tree l of species j in stratum i in sample plot sp, m^3;
l	1, 2, 3 …L sequence of individual trees in sample plot;
i	1, 2, 3 …M strata;
sp	1, 2, 3 …SP sample plots; and
j	1, 2, 3 …J tree species.

Therefore, the merchantable volume per unit area of species j in stratum i will be calculated as the mean merchantable volume in all sample plots in stratum i:

$$V_{j,i|BSL} = \frac{1}{SP} * \sum_{sp=1}^{SP} \frac{V_{j,i,sp}}{A_{sp}} \quad (2)$$

Where:

$V_{j,i\|BSL}$	mean merchantable volume per unit area of species j in stratum i in the baseline scenario, $m^3 \cdot ha^{-1}$;
$V_{j,i,sp}$	merchantable volume for species j in stratum i in sample plot *sp*; m^3;
A_{sp}	area of sample plot *sp*, ha;
i	1, 2, 3 …M strata;
sp	1, 2, 3 …SP sample plots; and
j	1, 2, 3 …J tree species.

Therefore, the carbon stock of timber harvested per unit area for species j in stratum i will be calculated from this mean volume of extracted timber:

$$C_{HB,j,i|BSL} = V_{EX,j,i|BSL} * BCEF_R * C_j \quad (3)$$

Where:

$C_{HB,j,i\|BSL}$	mean carbon stock of harvested biomass per unit area for species j in stratum i, $tC \cdot ha^{-1}$;

$V_{EX,j,i\|BSL}$	mean volume of extracted timber per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
$BCEF_R$	biomass conversion and expansion factor applicable to wood removals in the project area, t.d.m m^{-3};
CF_j	carbon fraction of biomass for species j, tC t d.m^{-1};
i	1, 2, 3 …M strata; and
j	1, 2, 3 …J tree species.

Not all of the harvested biomass leaves the forest because the timber harvested has two components: 1) wood removed to market (extracted timber) and, 2) wood remaining in the forest as a result of harvest.

Therefore, the mean carbon stock of extracted timber per unit area for species j in stratum i will be calculated from the mean volume of extracted timber multiplied by density and carbon fractions:

$$C_{EX,j,i|BSL} = V_{EX,j,i|BSL} * D_j * CF_j \quad (4)$$

Where:

$C_{EX,j,i\|BSL}$	mean carbon stock of extracted timber per unit area for species j in stratum i; $tC \cdot ha^{-1}$;
$V_{EX,j,i\|BSL}$	mean volume of extracted timber per unit area for species j in stratum i, $m^3 \cdot ha^{-1}$;
D_j	basic wood density of species j; t d.m. m^{-3};
CF_j	carbon fraction of biomass for species j, tC t d.m^{-1};
i	1, 2, 3 …M strata; and
j	1, 2, 3 …J tree species.

3.1.2 Calculation of dead wood (logging slash) generated in the process of timber harvest

This section calculates $\Delta C_{DWSLASH,i,p|BSL}$, the change in carbon stock in dead wood resulting from timber harvest in stratum i in land parcel p, using $C_{EX,j,i|BSL}$ and $C_{HB,j,i|BSL}$ as calculated in section 3.1.1.

The simplifying assumption is made that dead wood created during timber harvest is emitted in the year of harvest.

Therefore, the change in carbon stock in the dead wood pool in stratum i in land parcel p will be calculated as the difference between the total carbon stock of the harvested biomass and the carbon stock of the extracted timber:

$$\Delta C_{DWSLASH,i,p|BSL} = \left[\sum_{j=1}^{J}\left(C_{HB,j,i|BSL} - C_{EX,j,i|BSL}\right)\right] \tag{5}$$

Where:

$\Delta C_{DWSLASH,i,p\|BSL}$	change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum i in land parcel p, in $tCha^{-1}$;
$C_{HB,j,i\|BSL}$	mean carbon stock of harvested biomass per unit area for species j in stratum i, $tC \cdot ha^{-1}$;
$C_{EX,j,i\|BSL}$	mean carbon stock of extracted timber per unit area for species j in stratum i, $tC \cdot ha^{-1}$;
i	1, 2, 3 …M strata; and
j	1, 2, 3 …J tree species.
p	1, 2, 3 ...P land parcels.

3.1.3 Calculation of baseline carbon sequestered in wood products

The carbon stock of extracted timber across species is calculated as:

$$C_{EX,i|BSL} = \sum_{j=1}^{J} C_{EX,j,i|BSL} \tag{6}$$

Where:

$C_{EX,i\|BSL}$	change in carbon stock of extracted wood products resulting from timber harvest per unit area in stratum i in land parcel p, $tC \cdot ha^{-1}$;
$C_{EX,j,i\|BSL}$	mean carbon stock of extracted timber per unit area for species j in stratum i, $tC \cdot ha^{-1}$;
i	1, 2, 3 …M strata; and
j	1, 2, 3 …J tree species.

In accordance with the VCS AFOLU Requirements, the amount of carbon stored in wood products that would decay within 3 years after harvest (ie, the Wood Waste (WW) and the Short Lived Fraction (SLF)), are assumed to be emitted at the time of harvest.

Wood products that are retired between 3 and 100 years after harvest (ie, the Additional Oxidised Fraction, OF), must be accounted according to a 20 year linear decay function. This decay function is applied when the net greenhouse gas emissions/removals are calculated on an annual basis in equations 11 and 12.

All other wood product pools are considered to permanently store carbon.

Therefore, the carbon stock of extracted timber that is immediately emitted to the atmosphere at the time of harvest is calculated as

$$C_{WP0,i|BSL} = \sum_{k} C_{EX,i,k|BSL} * (WW_k + SLF_k) \qquad (7)$$

Where:

$C_{WP0,i\|BSL}$	carbon stock of extracted timber from stratum i that is assumed to be emitted immediately at the time of harvest, in $tC \cdot ha^{-1}$;
$C_{EX,i\|BSL}$	mean carbon stock of extracted timber per unit area in stratum i, for wood product type k, $tC \cdot ha^{-1}$;
WW_k	fraction of biomass carbon from wood waste that is assumed to be emitted to the atmosphere immediately at the time of harvest for wood product k, dimensionless;
SLF_k	fraction of biomass carbon from the short lived wood product pool that is assumed to that be emitted to the atmosphere immediately at the time of harvest for wood product k, dimensionless;
i	1, 2, 3 …M strata; and
k	Wood products (sawnwood, wood base products, etc).

The amount of extracted carbon stock that is assumed to enter the wood products pool that is not immediately emitted at harvest is calculated as per equation 8 below:

$$C_{WPi|BSL} = \sum_k C_{EX,i,k|BSL} - C_{WP0,i|BSL} \qquad (8)$$

Where:

$C_{WP,i\|BSL}$	carbon stock of extracted timber from stratum i that is assumed to enter the wood products pool that is not immediately emitted at the time of harvest ,in $tC \cdot ha^{-1}$;
$C_{EX,i\|BSL}$	mean carbon stock of extracted timber per unit area in stratum i, for wood product type k, $tC \cdot ha^{-1}$;
$C_{WP0,i\|BSL}$	carbon stock of extracted timber from stratum i that is assumed to be emitted immediately at the time of harvest, in $tC \cdot ha^{-1}$;
i	1, 2, 3 …M strata; and
k	Wood products (sawnwood, wood base products, etc).

Therefore, the carbon stock of wood products assumed to be retired between 3-100 years following harvest is calculated as:

$$C_{WP100,i|BSL} = C_{WP,i|BSL} * OF_k \tag{9}$$

Where :

$C_{WP100,I,p\|BSL}$	Amount of carbon stored in wood products that are assumed to be retired between 3-100 years after harvest from stratum i in land parcel p, $tC \cdot ha^{-1}$;
$C_{WP,i\|BSL}$	carbon stock of extracted timber from stratum i that is assumed to enter the wood products pool that is not immediately emitted at the time of harvest ,in $tC \cdot ha^{-1}$;
OF_k	fraction of biomass carbon for wood product type k that is assumed to be emitted to the atmosphere between 3 and 100 years of timber harvest, dimensionless; and
i	1, 2, 3 …M strata

3.1.4 Change in carbon stocks due to forest regrowth after harvest

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

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

$$C_{RG,i,p|BSL} = \sum_i RGRi \tag{10}$$

Where:

$C_{RG,i,p\|BSL}$	carbon sequestration resulting from forest regrowth after timber harvest in stratum i in land parcel p, $tC\ ha^{-1}\ yr^{-1}$;
RGR_i	regrowth rate of forest post timber harvest for stratum i, $tCha^{-1}\ yr^{-1}$;
i	1, 2, 3 …M strata

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

The net carbon stock change to be converted to emissions is equal to the carbon stock change as a result of timber harvest plus the carbon stock change resulting from conversion and retirement of wood products minus carbon sequestration from forest regrowth after harvest.

In order to generate the annual carbon stock change in the baseline scenario, the total net change in carbon stocks for parcels within is multiplied by the area of forest in the particular age class (ie, years since harvest in the baseline).

The annualized calculations vary between years 1, 2-10; 10-20; and all years since the start of the project activity, depending on which decay functions apply.

Therefore, the net change in carbon stock from wood products and logging slash across all parcels within the first year of harvest in the baseline is calculated as:

$$\Delta C_{NET|BSL(1)} = \sum\nolimits_{i,p} A_{1,i,p} * \sum_{i=1}^{M} (C_{DWSLASH,i,p\backslash BSL}/10) + C_{WP0,i,p\backslash BSL} + (C_{WP100,i,p\backslash BSL}/20) \tag{11}$$

Where:

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

The net change in carbon stock from wood products and logging slash across all parcels the years 2-10 since harvest in the baseline are calculated as:

$$\Delta C_{NET|BSL(2-10)} = \sum\nolimits_{i,p} A_{2-10,i,p} * \sum\nolimits_{i=1}^{M} (C_{DWSLASH,i,p\backslash BSL}/10) + (C_{WP100,i,p\backslash BSL}/20) \tag{12}$$

Where:

$\Delta C_{NET\|BSL(2-10)}$	net change in carbon stock across all parcels in the baseline scenario in years 2-10 since harvest in the baseline scenario, in tC;
$\Delta C_{DWSLASH,i,p\backslash BSL}$	change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum i in land parcel p, in tC ha^{-1};

$\Delta C_{WP100,i,p\backslash BSL}$	Amount of carbon stored in wood products that is assumed to be retired between 3-100 years after harvest from stratum i in land parcel p, tC ha^{-1};
$A_{2-10,i,p}$	the area of stratum i in land parcel p that was harvested 2 and 10 years ago, ha;
i	1, 2, 3 …M strata; and
p	1, 2, 3 ...P land parcels harvested within the project crediting period.

The net change in carbon stock from wood products across all parcels the years 11-20 since harvest in the baseline are calculated as:

$$\Delta C_{NET|BSL(11-20)} = \sum_{i,p} A_{11-20,i,p} * \sum_{i=1}^{M} (C_{WP100,i,p\backslash BSL}/20) \quad (13)$$

Where:

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

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

$$\Delta C_{NET|BSL(1+)} = \sum_i A_{t*} * \sum_{i=1}^{M} (-\Delta C_{RG,i,p\backslash BSL}) \quad (14)$$

Where:

$\Delta C_{NET\|BSL(1+)}$	net change in carbon stock due to forest regrowth in all parcels that have been harvested in the baseline scenario, in tC;
$\Delta C_{RG,i,p\backslash BSL}$	carbon sequestration resulting from forest regrowth after timber harvest in stratum i in land parcel p, tC ha^{-1}
A_{t*}	Cumulative area harvested until time t*, ha;
i	1, 2, 3 …M strata; and

p 1, 2, 3 ...P land parcels harvested within the project crediting period.

Therefore, net change in carbon stock across all parcels harvested over each year of the project crediting period in the baseline scenario since the start of the project activity is calculated as:

$$\Delta C_{NET|BSL,t*} = \sum_{p=1}^{P} \Delta C_{NET|BSL(1)} + \Delta C_{NET|BSL(2-10)} + \Delta C_{NET|BSL(11-20)} + \Delta C_{NET|BSL(1+)} \quad (15)$$

Where:

$\Delta C_{NET\|BSL,t*}$	net change in carbon stock across all parcels in the baseline scenario in the year t* since the start of the project activity, in tC;
$\Delta C_{NET\|BSL(1)}$	net change in carbon stock in the baseline scenario for all parcels p that are within 1 year of harvest in the baseline scenario, in tC;
$\Delta C_{NET\|BSL(2-10)}$	net change in carbon stock in the baseline scenario for all parcels p, that were harvested between 2-10 years ago in the baseline scenario, in tC;
$\Delta C_{NET\|BSL(11-20)}$	net change in carbon stock in the baseline scenario in parcel p, that were harvested between 11-20 years ago in the baseline scenario, in tC;
$\Delta C_{NET\|BSL(1+)}$	net change in carbon stock due to forest regrowth in the baseline scenario for all parcels p that have been harvested in the baseline scenario, in tC;
t*	time elapsed since the start of the project, in years; and
p	1, 2, 3 ...P land parcels harvested within the project crediting period.

The net carbon stock change in the baseline scenario must be converted to net greenhouse gas emissions and is calculated as:

$$GHG_{NET|BSL,t*} = \Delta C_{NET|BSL,t*} * \frac{44}{12} \quad (16)$$

Where:

$GHG_{NET\|BSL,t*}$	net greenhouse gas emissions in the baseline scenario in the year t* since the start of the project activity, tCO_2e;
$\Delta C_{NET\|BSL}$	net change in carbon stock across all parcels in the baseline scenario in the year t* since the start of the project activity, tC; and
44/12	ratio of molecular weights of carbon dioxide and carbon, tCO_2-e tC^{-1}.

3.2 Project Emissions

3.2.1 Ongoing forest growth in the project scenario

This section calculates $\Delta C_{AB,t|PRJ}$ annual carbon stock change in aboveground biomass of trees in the project scenario, in tCO_2e.

3.2.1.1 Allometry

Select the appropriate allometric equation for forest type/group of species j (e.g. tropical humid forest or tropical dry forest) or for each species or family j (group of species) found in the inventory (hereafter referred to as species group) that converts tree dimensions from field timber inventories on sample plots to aboveground biomass of trees.

3.2.1.2 Measurements

Only the individual trees, species and strata which were to be harvested in the baseline scenario are to be measured. Any minimum values employed in inventories are held constant for the duration of the project.

3.2.1.3 Determining Sample Plot Carbon Stocks

The carbon stock in aboveground biomass for each individual tree of species group j in the sample plot located in stratum i will be estimated using the selected allometric equation applied to the tree dimensions resulting from section 3.2.1.2.

Therefore, the sum of the carbon stock in each sample plot will be calculated as:

$$C_{AB,j,i,t,sp|PRJ} = \sum_{l=1}^{L_{j,i,sp,t}} f_j(X, Y \ldots) * CF_j \qquad (17)$$

Where:

$C_{AB,j,i,t,sp\|PRJ}$	carbon stock in aboveground biomass of trees of species j in plot sp in stratum i at time t in the project scenario, tC
CF_j	carbon fraction of biomass for tree group j, tC t d.m.$^{-1}$;
$f_j(X,Y\ldots)$	aboveground biomass of trees based on allometric equation for species group j based on measured tree variable(s), t. d.m. tree-1;
i	1, 2, 3, …M strata;
j	1, 2, 3 … J tree species;
l	1, 2, 3, … $L_{j,i,t,sp}$ sequence number of individual trees of species group j in stratum i at time t in sample plot sp;
t	0, 1, 2, 3, …t* years elapsed since start of the project activity; and

sp	1, 2, 3 …SP sample plots.

3.2.1.4 Determining Stratum Carbon Stocks

The total carbon stock in the aboveground biomass of all trees present in sample plot sp in stratum i at time t, must be calculated as:

$$C_{AB,i,t,sp|PRJ} = \sum_{j=1}^{J} C_{AB,j,i,t,sp|PRJ}$$

(18)

Where:

$C_{AB,i,t,sp\|PRJ}$	aboveground biomass carbon stock of all trees of stratum i at time t in sample plot sp in the project scenario, tC;
$C_{AB,j,i,t,sp\|PRJ}$	carbon stock in aboveground biomass of trees of species j in stratum i at time t in plot sp in the project scenario, tC;
i	1, 2, 3, …M strata;
j	1, 2, 3 … J tree species; and
t	0, 1, 2, 3 …t* years elapsed since the start of the project activity.

3.2.1.5 Determining Mean Carbon Stocks

Therefore, the mean carbon stock in aboveground biomass for each stratum per unit area is calculated as:

$$C_{AB,i,t|PRJ} = \frac{1}{SP} * \sum_{SP=1}^{SP} \left(\frac{C_{AB,i,t,sp|PRJ}}{A_{sp}}\right)$$

(19)

Where:

$C_{AB,i,t\|PRJ}$	mean aboveground biomass carbon stock of trees in stratum i at time t, tC ha^{-1};
$C_{AB,i,t,sp\|PRJ}$	aboveground biomass carbon stock of trees in stratum i at time t in sample plot sp, tC;
$A_{,sp}$	area of sample plot sp, ha;
sp	1, 2, 3 … SP sample plots;
i	1, 2, 3 … M strata; and

t	0, 1, 2, 3 … t* years elapsed since the start of the project activity.

3.2.1.6 Determining Carbon Stock Changes

The annual carbon stock change in aboveground biomass of trees in year t is the difference in mean carbon stock in aboveground biomass between sampling events and, when expressed in tCO_2e, is calculated as:

$$\Delta C_{AB,t|PRJ} = (\sum_{i=1}^{M}(A_i * \frac{C_{AB,i,t2|PRJ} - C_{AB,i,t1|PRJ}}{T})) * \frac{44}{12} \tag{20}$$

Where:

$\Delta C_{AB,t\|PRJ}$	annual carbon stock change in aboveground biomass of trees in year t, $tCO_2e\ yr^{-1}$;
$C_{AB,i,t\|PRJ}$	mean aboveground biomass carbon stock of trees in stratum i at time t, tC ha^{-1};
$A_{,i}$	area covered by stratum i, ha;
sp	1, 2, 3 … SP sample plots;
T	number of years between monitoring time t1 and t2 ($T=t_2 - t_1$); years;
i	1, 2, 3 … M strata; and
t	0, 1, 2, 3 … t* years elapsed since the start of the project activity; and
44/12	ratio of molecular weights of carbon dioxide divided carbon, $tCO_2e\ tC^{-1}$.

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

3.2.2 Forest disturbance in the project scenario

This section calculates $\Delta C_{DIST\_FR,t|PRJ}$, carbon stock change due to fire disturbance in the project scenario; tCO_2-e, $\Delta C_{DIST,t|PRJ}$, carbon stock change due to non-fire natural disturbance in the project scenario; tCO_2-e

3.2.2.1 Natural disturbance

3.2.2.1a Natural Disturbance - Fire

Where fires occur ex post in the project area, the area burned shall be delineated. Therefore, based on the IPCC 2006 Inventory Guidelines, estimation of greenhouse gas emissions from biomass burning shall be calculated as:

$$\Delta C_{DIST_{FR},t|PRJ} = \sum_{i=1}^{M} A_{burn,i,t} * B_{i,t|PRJ} * COMF_i * G_{g,i} * 10^{-3}.GWP_{CH4} \quad (21)$$

Where:

$\Delta C_{DIST\_FR,t\mid PRJ}$	net greenhouse gas emissions resulting from fire disturbance in year *t*, tCO_2e ;
$A_{burn,i,t}$	area burnt for stratum *i* at time *t*, ha;
$B_{i,t\mid PRJ}$	average aboveground biomass stock present in the project scenario but absent in the baseline scenario before burning stratum *i*, time *t*; t d. m. ha^{-1};
$COMF_i$	combustion factor for stratum *i*, dimensionless;
$G_{g,i}$	emission factor for stratum *i* for methane, g kg^{-1} dry matter burnt;
GWP_{CH4}	global warming potential for CH_4 (IPCC default: 21), tCO_2e tCH_4^{-1};
i	1, 2, 3 …*M* strata; and
t	1, 2, 3, … *t** years elapsed since the start of the IFM project activity.

The average aboveground biomass stock present in the project scenario but absent in the baseline scenario before burning for a particular stratum shall be calculated as:

$$B_{i,t|PRJ} = \sum_{j=1}^{J} \{V_{EX,i,j|BSL} * BCEF_R\} \quad (22)$$

Where:

$B_{i,t\mid PRJ}$	average aboveground biomass stock present in the project scenario but absent in the baseline before burning for stratum *i*, time *t*, t d. m. ha^{-1};
$V_{EX,j,i\mid BSL}$	mean volume of extracted timber per unit area for species *j* in stratum *i*, m3·ha^{-1};
$BCEF_R$	biomass conversion and expansion factor applicable to wood removals in the project area, t.d.m m^{-3};
i	1, 2, 3 …*M* strata;
j	1, 2, 3 …*J* tree species; and
t	1, 2, 3, … *t** years elapsed since the start of the IFM project activity.

3.2.2.1b Natural Disturbance – Non-Fire

There are no fire disturbance occurred in the project area, therefore, $\Delta C_{DIST\_FR,t|PRJ}=0$

Where non-fire natural disturbances occur ex post in the project area, the area disturbed must be delineated.

$$\Delta C_{DIST,t|PRJ} = \sum_{i=1}^{M}\left(A_{dist,i,t} * \sum_{j=1}^{J}\{C_{AB,j,i|BSL}\}\right) * \frac{44}{12}$$

(23)

Where:

$\Delta C_{DIST,t\|PRJ}$	net greenhouse gas emissions resulting from non-fire natural disturbance in year *t*, tCO_2e ;
$A_{dist,i,t}$	area disturbed for stratum *i* at time *t*, ha;
$C_{AB,i\|BSL}$	carbon stock in aboveground biomass per unit area in stratum *i*, $tC \cdot ha^{-1}$;
44/12	ratio of molecular weights of carbon dioxide and carbon, $tCO_2e\ tC^{-1}$;
i	1, 2, 3 …*M* strata;
j	1, 2, 3 …*J* tree species; and
t	1, 2, 3, … *t** years elapsed since the start of the IFM project activity.

There are non-fire natural disturbances occur ex post in the project area, therefore, $\Delta C_{DIST,t|PRJ}$=0

3.2.2.2 Illegal logging

Where the PRA and the limited sampling indicate degradation is occurring, net carbon stock changes as a result of illegal logging shall be calculated as:

$$\Delta C_{DIST-IL,t|PRJ} = \sum_{i=1}^{M}\left(A_{DIST-IL,j} * \frac{C_{DIST-IL,i,t|PRJ}}{AP_i}\right)$$

(24)

Where:

$\Delta C_{DIST\_IL,t\|PRJ}$	net carbon stock changes as a result of illegal logging at time *t*, tCO_2e;
$A_{DIST\_IL,i}$	area potentially impacted by illegal logging in stratum *I*, ha;
$C_{DIST\_IL,i,t\|PRJ}$	biomass carbon of trees cut and removed through illegal logging in stratum i at time t, tCO_2e;
APi	total area of illegal logging sample plots in stratum *i*, ha;
i	1, 2, 3 …*M* strata in the in the project case; and
t	1, 2, 3, … *t* years elapsed since the projected start of the project activity.

There are no degradation occurred indicated in PRA and limited sampling, therefore, $\Delta_{CDIST\_IL,t|PRJ}$ =0

3.2.3 Net greenhouse gas emissions in the project scenario

This section calculates $\Delta C_{NET,t|PRJ}$, the net greenhouse gas emissions in the project scenario in year t, in tCO_2e.

The net greenhouse gas emissions in the project scenario are the sum of net greenhouse gas emissions resulting from fire and non-fire forest disturbance, plus any carbon stock changes that occur as a result of illegal logging, minus the annual carbon stock change in the aboveground biomass of trees due to forest growth.

Therefore, net greenhouse gas emissions in the project scenario in year t, is calculated as:

$$\Delta C_{NET,t|PRJ} = \left(\Delta C_{DIST-FR\ ,t|PRJ} + \Delta C_{DIST,t|PRJ} + \Delta C_{DIST-IL\ ,t|PRJ}\right) - \Delta C_{AB,t|PRJ}$$

(25)

Where:

$\Delta C_{NET,t\|PRJ}$	net greenhouse gas emissions in the project scenario in year t, tCO_2-e
$\Delta C_{DIST\_FR,t\|PRJ}$	net greenhouse gas emissions resulting from fire disturbance in year t, tCO_2e
$\Delta C_{DIST,t\|PRJ}$	net greenhouse gas emissions resulting from non-fire natural disturbance in year t, tCO_2e
$\Delta C_{DIST\_IL,t\|PRJ}$	Net carbon stock changes as a result of illegal logging at time t, tCO_2e
$\Delta C_{AB,t\|PRJ}$	annual carbon stock change in aboveground biomass of trees in year t, tCO_2e yr^{-1}; and
t	1, 2, 3, t* years elapsed since start of the project activity.

The net greenhouse gas emissions across in the project scenario since the start of the project activity is calculated as:

$$GHG_{NET|PRJ} = \sum_{t=1}^{t^*} \Delta C_{NET,t|PRJ}$$

(26)

Where:

$GHG_{NET\|PRJ}$	net greenhouse gas emissions in the project scenario since the start of the project activity, tCO_2e
$\Delta C_{NET,t\|PRJ}$	net greenhouse gas emissions in the project scenario in year t, tCO_2e; and
t	1, 2, 3, t* years elapsed since start of the project activity.

3.3 Leakage

3.3.1 Activity shifting leakage

The project does not involve in the activity shifting leakage .In China, the forest timber harvest is strictly controlled by the authority. Also, the China Forest Law also clearly stipulates the punishment for the illegal logging, which not only requires 5-10 times compensation of replanting, but also 2-10 times economic penalty. in China, the timber harvest is tightly controlled by the forestry authority, the illegal logging is severely punished.

Therefore, for the project activity, the PP have no right to harvest more in other parcels outside the project activity and the project does not involve in the activity shifting leakage .

3.3.2 Market leakage

Leakage due to market effects is equal to the net emissions from planned timber harvest activities in the baseline scenario multiplied by an appropriate leakage factor:

$$GHG_{LK|LtPF} = LF_{me} * GHG_{NET|BSL,t*} \quad (27)$$

Where:

$GHG_{LK\|LtPF}$	is total market leakage as a result of IFM LtPF activities, tCO_2e;
LF_{ME}	is the dimensionless leakage factor for market-effects calculations;
$GHG_{NET\|BSL,t*}$	net greenhouse gas emissions in the baseline scenario in the year t* since the start of the project activity, tCO_2e.

The leakage factor is determined by considering where in the country logging will be increased as a result of the decreased timber supply caused by the project.

Leakage factor calculation

The leakage factor is determined by considering where in the country logging will be increased as a result of the decreased supply of the timber caused by the project. If the areas liable to be logged have a higher ratio of merchantable biomass to total biomass higher than the project area it is likely that the proportional leakage is higher and vice versa.

Therefore,

$LF_{ME} = 0$

If it can be demonstrated that no market-effects leakage will occur within national boundaries, that is if no new concessions are being assigned AND annual extracted volumes cannot be increased within existing national concessions AND illegal logging is absent (or de minimis) in the host country.

For the project,

- According to the 13th Five-year Forest Harvest Limit issued by State Council (Guohan [2016] No.32)[3], the total harvest volume limit from 2016 to 2020 is 25,403.6*10^4 m^3, and the planned harvest volume of the project is196.6*10^4 m^3, accounting 0.77% of the national harvest volume, which will not result in the significant national concession and illegal logging;

- The annual extracted volume is unlikely increase within existing national concessions AND illegal logging is strictly forbidden and will be severely punished by the law.

In summary,

$LF_{ME} = 0$

The actual value will be monitored when verification.

3.4 Net GHG Emission Reductions and Removals

3.4.1 Net Project Greenhouse Gas Emission Reductions

According to VM0010 version 1.3, the Net Project Greenhouse Gas Emission Reductions are calculated as:

$$GHG_{CREDITS|LtPF,t*} = GHG_{NET|BSL,t*} - GHG_{NET|PRJ,t*} - GHG_{LK|LtPF,t*} \qquad (28)$$

Where:

$GHG_{CREDITS\|LtPF,t*}$	project greenhouse gas credits associated with the implementation of improved forest management (IFM) activities in the year t* since the start of the project activity, in the project scenario, tCO_2e
$GHG_{NET\|BSL,t*}$	net greenhouse gas emissions in the baseline scenario in the year t* since the start of the project activity, tCO_2e
$GHG_{NET\|PRJ,t*}$	net greenhouse gas emissions in the project scenario in the year t* since the start of the project activity, tCO_2e; and
$GHG_{LK\|LtPF,t*}$	total greenhouse gas emissions due to leakage arising outside the project boundary as a result of the implementation of improved forest management (IFM) activities in the year t* since the start of the project activity, in the project scenario, tCO_2e

3.4.2 Project Verified Carbon Units

The number of Verified Carbon Units (VCUs) for each year t in the project crediting period is the greenhouse gas emission reductions and removals adjusted for uncertainty and risk.

[3] http://www.gov.cn/zhengce/content/2016-02/16/content_5041486.htm

3.4.2.1 Adjustment for uncertainty

Estimated greenhouse gas emissions and emission reductions from IFM activities have uncertainties associated with parameters and coefficients including estimates of area, carbon stocks, regrowth and expansion factors. It is assumed that the uncertainties associated with input data are available, either as default uncertainty values given in most recent IPCC guidelines, or as statistical estimates based on sampling.

Uncertainty at all times is defined at the 95% confidence interval where the estimated variance exceeds +/- 15 percent from the mean. Procedures including stratification and the allocation of sufficient measurement plots will help ensure that low uncertainty results and ultimately full crediting can result.

Uncertainties arising from the measurement and monitoring of carbon pools and greenhouse gases shall always be quantified. Errors in each pool shall be weighted by the size of the pool so that projects may reasonably target a lower precision level in pools that only form a small proportion of the total stock.

For both the baseline and the with-project case the total uncertainty is equal to the square root of the sum of the squares of each component uncertainty and is calculated at the time of reporting through propagating the error in the baseline stocks and the error in the project stocks.

Therefore, total uncertainty for LtPF project is calculated as:

$$U_{TOTAL|LtPF} = \sqrt{U_{|PRJ}^2 + U_{|BSL}^2} \quad (29)$$

Where:

$U_{total|LtPF}$	total uncertainty for LtPF Project, dimensionless;
$U_{|PRJ}$	total uncertainty for the improved forest management activities in the project scenario, dimensionless; and
$U_{|BSL}$	total uncertainty for the baseline scenario, dimensionless.

Project proponents must justify the selection of uncertainty propagation in the VCS-PD.

If $U_{total|LtPF} \leq 0.15$ then no deduction will result for uncertainty.

If $U_{total|LtPF} > 0.15$ then the amount of greenhouse gas emission credits associated with IFM activities will be deducted as follows:

$$Credits_{total|LtPF} = GHG_{credits|LtPF} \cdot (1 - U_{total|LtPF}) \quad (30)$$

Where:

$Credits_{total\|LtPF}$	total greenhouse gas credits adjusted for uncertainty for each year t in the project crediting period;
$GHG_{credits\|LtPF}$	project greenhouse gas credits associated with the implementation of improved forest management (IFM) activities in the project scenario, $tCO_2e \cdot year^{-1}$; and
$U_{total\|LtPF}$	total uncertainty for LtPF Project, dimensionless.

3.4.2.2 Calculation of verified carbon units

The amount of greenhouse gas credits estimated at section 3.4.2.1 above shall be adjusted to account for risk.

They shall be subject to deductions based on application of the most recent version of the VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

Therefore, the amount of VCU's that can be issued at time $t=t_2$ (the date of verification) for monitoring period $T=t_2-t_1$, is calculated as:

$$VCU_{net|LtPF} = \left(Credits_{total,t2|LtPF} - Credits_{total,t1|LtPF}\right) - Bu_{|IFM-VCS} \quad (31)$$

Where:

$VCU_{net\|LtPF}$	number of verified carbon units; dimensionless;
$Credits_{total.t1\|LtPF}$	net anthroprogenic greenhouse gas removals by sinks, as estimated for $t^*=t_1$ in tCO_2e;
$Credits_{total.t2\|LtPF}$	net anthroprogenic greenhouse gas removals by sinks, as estimated for $t^*=t_2$ in tCO_2e; and
$Bu_{\|IFM-VCS}$	total number of credits withheld in VCS buffer account

3.4.3 The calculation process

3.4.3.1 The calculation process of baseline emission

Therefore, for the calculation of $GHG_{NET|BSL}$, according to section 3.1, the process is shown below:

Table 5: Basic Parameter of Baseline Scenario

Basic Parameter		Value	Data Unit	Data Source
Total Area of Stratum	Oak	7415.59	ha	Timber harvest plan issued by local forestry bureau, and calculated from Forest second class investigation issued by local forestry bureau
	Masson Pine	3087.63	ha	
	Broad-Leaved Mixed	744.29	ha	

	Coniferous and Broad-Leaved Mixed	6021.91	ha	
$V_{,j,I,BSL}$	Oak	11.57	m^3/ha	
	Masson Pine	33.87	m^3/ha	
	Broad-Leaved Mixed	33.61	m^3/ha	
	Coniferous and Broad-Leaved Mixed	12.06	m^3/ha	
$V_{EX,j,i\|BSL,y}$	Refer to ER sheet		m^3/ha	
$A_{i,p,y}$	Refer to ER sheet		ha	
D_j	Oak	0.676	t d.m. m^{-3}	"Land Use Change and Forestry GHG Inventory(2013)" of "Second National Information Notification on China Climate Change"
	Masson Pine	0.38	t d.m. m^{-3}	
	Broad-Leaved Mixed	0.482	t d.m. m^{-3}	
	Coniferous and Broad-Leaved Mixed	0.486	t d.m. m^{-3}	
BEF	Oak	1.355	dimensionless	
	Masson Pine	1.472	dimensionless	
	Broad-Leaved Mixed	1.514	dimensionless	
	Coniferous and Broad-Leaved Mixed	1.656	dimensionless	
$BCEF_R$	Oak	0.916	t d.m. m^{-3}	calculated by BEF and D
	Masson Pine	0.559	t d.m. m^{-3}	
	Broad-Leaved Mixed	0.73	t d.m. m^{-3}	
	Coniferous and Broad-Leaved Mixed	0.805	t d.m. m^{-3}	
CF_j	Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and	0.5	tC t d.m.$^{-1}$	VM0010 version 1.3

	Broad-Leaved Mixed			
WW	Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed	24%	kg kg^{-1}	
SLF	Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed	0.12	kg kg^{-1}	
OF	Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed	0.62	kg kg^{-1}	
Regrowth rate in baseline scenario	Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed	1.5	$m^3.ha^{-1}.yr^{-1}$ $m^3.ha^{-1}.yr^{-1}$ $m^3.ha^{-1}.yr^{-1}$ $m^3.ha^{-1}.yr^{-1}$	The statement on the growth volume in Hongshan issued by local forest bureau

Table 6: The baseline emission during the crediting period

Year	$\Delta C_{NET\|BSL}$	$GHG_{NET\|BSL}$
01/01/2015-31/12/2015	30	110
01/01/2016-31/12/2016	-4	-14
01/01/2017-31/12/2017	90	330
01/01/2018-31/12/2018	1	3
01/01/2019-31/12/2019	85	311
01/01/2020-31/12/2020	67	245
01/01/2021-31/12/2021	144	528
01/01/2022-31/12/2022	507	1,859
01/01/2023-31/12/2023	832	3,050
01/01/2024-31/12/2024	924	3,388

01/01/2025-31/12/2025	1,477	5,415
01/01/2026-31/12/2026	1,920	7,040
01/01/2027-31/12/2027	2,243	8,224
01/01/2028-31/12/2028	1,043	3,824
01/01/2029-31/12/2029	22,099	81,029
01/01/2030-31/12/2030	4,189	15,359
01/01/2031-31/12/2031	5,674	20,804
01/01/2032-31/12/2032	7,077	25,949
01/01/2033-31/12/2033	9,386	34,415
01/01/2034-31/12/2034	19,718	72,299
01/01/2035-31/12/2035	35,287	129,385
01/01/2036-31/12/2036	52,260	191,620
01/01/2037-31/12/2037	63,837	234,069
01/01/2038-31/12/2038	42,767	156,812
01/01/2039-31/12/2039	22,575	82,775
01/01/2040-31/12/2040	13,872	50,864
01/01/2041-31/12/2041	18,077	66,282
01/01/2042-31/12/2042	15,488	56,789
01/01/2043-31/12/2043	16,167	59,279
01/01/2044-31/12/2044	16,915	62,021
Total	374,747	1,374,064
Average	12,492	45,802

3.4.3.2 The calculation of project emission

The ex-ante estimation of project emission of the proposed project is as follows:

Table 7: Basic Parameter of Project Scenario

Basic Parameter		Value	Data Unit	Data Source
Total Area of Stratum	Oak	7415.59	ha	Timber harvest plan
	Masson Pine	3087.63	ha	
	Broad-Leaved Mixed	7244.29	ha	
	Coniferous and Broad-Leaved Mixed	6021.91	ha	
D_j	Oak	0.676	t d.m. m^{-3}	"Land Use Change and Forestry GHG Inventory(2013)" of "Second
	Masson Pine	0.38	t d.m. m^{-3}	

	Broad-Leaved Mixed	0.482	t d.m. m^{-3}	National Information Notification on China Climate Change"
	Coniferous and Broad-Leaved Mixed	0.486	t d.m. m^{-3}	
BEF	Oak	1.355	dimensionless	
	Masson Pine	1.472	dimensionless	
	Broad-Leaved Mixed	1.514	dimensionless	
	Coniferous and Broad-Leaved Mixed	1.656	dimensionless	
$BCEF_R$	Oak	0.916	t d.m. m^{-3}	calculated by BEF and D
	Masson Pine	0.559	t d.m. m^{-3}	
	Broad-Leaved Mixed	0.73	t d.m. m^{-3}	
	Coniferous and Broad-Leaved Mixed	0.805	t d.m. m^{-3}	
CF_j	Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed	0.5	tC t d.m.$^{-1}$	VM0010 version 1.3
Ongoing growth rate in project scenario	Oak	7.5	$m^3.ha^{-1}.yr^{-1}$	The statement on the growth volume in Hongshan issued by local forest bureau
	Masson Pine	4.5	$m^3.ha^{-1}.yr^{-1}$	
	Broad-Leaved Mixed	8	$m^3.ha^{-1}.yr^{-1}$	
	Coniferous and Broad-Leaved Mixed	7	$m^3.ha^{-1}.yr^{-1}$	

Because the forest inventory conducted by a forestry survey company and local forest bureau didn’t include the detail of each tree in the subcompartment, so we didn’t use allometric equation to estimate the project emission here. And according to the methodology, it is acceptable to use pre-existing forest inventory data for this purpose, so we use the ongoing growth rate to predict the project emission.

On-going growth rate is predicted by the local forest bureau based on the historical data, so the emissions of each year during the whole crediting period are same. In the monitoring report, the actual stock volume will be measured, then re-calculate the emission within the crediting period.

Table 8: The project emission during the crediting period

Year	$\Delta C_{AB,t\|PRJ}$	$\Delta C_{DIST\_FR,t\|PRJ}$	$\Delta C_{DIST,t\|PRJ}$	$\Delta C_{DIST\_IL,t\|PRJ}$	$\Delta C_{NET,t\|PRJ}$
01/01/2015-31/12/2015	247,412	0	0	0	-247,412
01/01/2016-31/12/2016	247,412	0	0	0	-247,412
01/01/2017-31/12/2017	247,412	0	0	0	-247,412
01/01/2018-31/12/2018	247,412	0	0	0	-247,412
01/01/2019-31/12/2019	247,412	0	0	0	-247,412
01/01/2020-31/12/2020	247,412	0	0	0	-247,412
01/01/2021-31/12/2021	247,412	0	0	0	-247,412
01/01/2022-31/12/2022	247,412	0	0	0	-247,412
01/01/2023-31/12/2023	247,412	0	0	0	-247,412
01/01/2024-31/12/2024	247,412	0	0	0	-247,412
01/01/2025-31/12/2025	247,412	0	0	0	-247,412
01/01/2026-31/12/2026	247,412	0	0	0	-247,412
01/01/2027-31/12/2027	247,412	0	0	0	-247,412
01/01/2028-31/12/2028	247,412	0	0	0	-247,412
01/01/2029-31/12/2029	247,412	0	0	0	-247,412
01/01/2030-31/12/2030	247,412	0	0	0	-247,412
01/01/2031-31/12/2031	247,412	0	0	0	-247,412
01/01/2032-31/12/2032	247,412	0	0	0	-247,412
01/01/2033-31/12/2033	247,412	0	0	0	-247,412
01/01/2034-31/12/2034	247,412	0	0	0	-247,412
01/01/2035-31/12/2035	247,412	0	0	0	-247,412
01/01/2036-31/12/2036	247,412	0	0	0	-247,412
01/01/2037-31/12/2037	247,412	0	0	0	-247,412
01/01/2038-31/12/2038	247,412	0	0	0	-247,412
01/01/2039-31/12/2039	247,412	0	0	0	-247,412
01/01/2040-31/12/2040	247,412	0	0	0	-247,412
01/01/2041-31/12/2041	247,412	0	0	0	-247,412
01/01/2042-31/12/2042	247,412	0	0	0	-247,412
01/01/2043-31/12/2043	247,412	0	0	0	-247,412
01/01/2044-31/12/2044	247,412	0	0	0	-247,412
Total	7,422,360	0	0	0	-7,422,360
Average	247,412	0	0	0	-247,412

Forest disturbance in the project scenario:

According to the analysis in section 3.2, $\Delta C_{DIST\_FR,t|PRJ}$, $\Delta C_{DIST,t|PRJ}$ and $\Delta C_{DIST\_IL,i,t|PRJ}$ are all = 0.

Therefore,

$GHG_{LK|LtPF}$ =0

3.4.4 Uncertainty for the baseline scenario:

According to *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*[4], the uncertainty in the baseline scenario is associated with parameters and coefficients including estimates of area, carbon stocks, regrowth and expansion factors, the calculation process follows the two rules below:

Rule A: Where uncertainties are to be combined by addition, the standard deviation of the sum will be the square root of the sum of the squares of the standard deviations of the quantities that are added with the standard deviations all expressed in absolute terms (this rule is exact for uncorrelated variables).

Using this interpretation, a simple equation can be derived for the uncertainty of the sum, that when expressed in percentage terms becomes:

$$U_{total} = \frac{\sqrt{(U_1 \times E_1)^2 + (U_2 \times E_2)^2 + \cdots + (U_n \times E_n)^2}}{E_1 + E_2 + \cdots + E_n} \quad (32)$$

Where:

U_{total}	is the percentage uncertainty in the sum of the quantities (half the 95% confidence interval divided by the total (i.e. mean) and expressed as a percentage);
E_i and U_i	are the uncertain quantities and the percentage uncertainties associated with them, respectively
Rule B	Where uncertain quantities are to be combined by multiplication, the same rule applies except that the standard deviations must all be expressed as fractions of the appropriate mean values (this rule is approximate for all random variables).

A simple equation can also be derived for the uncertainty of the product, expressed in percentage terms:

[4] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, Chapter 6, Quantifying Uncertainties in Practice .

$$U_{total} = \sqrt{U_1^2 + U_2^2 + \cdots + U_n^2} \qquad (33)$$

Where:

U_{total} is the percentage uncertainty in the product of the quantities (half the 95% confidence interval divided by the total and expressed as a percentage);

U_i are the percentage uncertainties associated with each of the quantities.

The uncertainty is calculated per stratum by dividing the 95% confidence interval by the mean value of the uncertainty quantities. The corresponding standard deviation is calculated over the measured plot values of the uncertainty quantities. The 95% confidence interval is calculated based on the standard deviation and the t-value for n-1 degree of freedom of plots per stratum.

As the uncertainty in the baseline scenario is associated with parameters and coefficients including estimates of area, carbon stocks, regrowth and expansion factors, the calculation of the 4 parameters and coefficients are shown below:

1) Uncertainty of Area:

In the baseline scenario, the area of every stratum are quoted from the field survey inventory data and legal right of harvest, so no data are from measurement and monitoring. Therefore, it is deemed as 0 in the period of validation. It will be monitored in the period of verification.

2) The Sample size, Sample mean and Standard Uncertainty of expansion factors:

rd error of expansion factors are quoted from Forestry Part of China's greenhouse gas emissions list divided as tree species, and the uncertainty of expansion factors are calculated as below:

For Oak:

Uncertainty of BCEF-Oak		7.63%	
Uncertainty of BEF-Oak	6.77%	Uncertainty of D-Oak	3.53%
BEF		D	
Sample size	73	Sample size	82
Sample mean (BEF)	1.36	Sample mean (D)	0.68
Standard deviation	0.39	Standard deviation	0.11
Average error	0.05	Average error	0.01
Confidence level	0.95	Confidence level	0.95
Degree of freedom	72	Degree of freedom	81
Two-sided Student's t-value	1.99	Two-sided Student's t-value	1.99
Allowable error	0.09	Allowable error	0.02

Lower confidence limit	1.26	Lower confidence limit	0.65
Upper confidence limit	1.45	Upper confidence limit	0.70
Confidence interval	0.09	Confidence interval	0.02

For Masson Pine:

Uncertainty of BCEF-Masson Pine		11.91%	
Uncertainty of BEF-Masson Pine	6.33%	Uncertainty of D-Masson Pine	10.09%
BEF		D	
Sample size	103	Sample size	43
Sample mean (BEF)	1.47	Sample mean (D)	0.38
Standard deviation	0.48	Standard deviation	0.12
Average error	0.05	Average error	0.02
Confidence level	0.95	Confidence level	0.95
Degree of freedom	102	Degree of freedom	42
Two-sided Student's t-value	1.98	Two-sided Student's t-value	2.02
Allowable error	0.09	Allowable error	0.04
Lower confidence limit	1.38	Lower confidence limit	0.34
Upper confidence limit	1.57	Upper confidence limit	0.42
Confidence interval	0.09	Confidence interval	0.04

For Broad-Leaved Mixed:

Uncertainty of BCEF-Broad-Leaved Mixed		6.33%	
Uncertainty of BEF-Broad-Leaved Mixed	3.94%	Uncertainty of D-Broad-Leaved Mixed	4.95%
BEF		D	
Sample size	84	Sample size	82
Sample mean (BEF)	1.51	Sample mean (D)	0.48
Standard deviation	0.27	Standard deviation	0.11
Average error	0.03	Average error	0.01
Confidence level	0.95	Confidence level	0.95
Degree of freedom	83	Degree of freedom	81
Two-sided Student's t-value	1.99	Two-sided Student's t-value	1.99
Allowable error	0.06	Allowable error	0.02
Lower confidence limit	1.45	Lower confidence limit	0.46
Upper confidence limit	1.57	Upper confidence limit	0.51
Confidence interval	0.06	Confidence interval	0.02

For Coniferous and Broad-Leaved Mixed:

Uncertainty of BCEF-Coniferous and Broad-Leaved Mixed		9.91%	
Uncertainty of BEF-Coniferous and Broad-Leaved Mixed	5.99%	Uncertainty of D-Coniferous and Broad-Leaved Mixed	7.89%
BEF		D	
Sample size	103	Sample size	43
Sample mean (BEF)	1.66	Sample mean (D)	0.49
Standard deviation	0.51	Standard deviation	0.12
Average error	0.05	Average error	0.02
Confidence level	0.95	Confidence level	0.95
Degree of freedom	102	Degree of freedom	42
Two-sided Student's t-value	1.98	Two-sided Student's t-value	2.02
Allowable error	0.10	Allowable error	0.04
Lower confidence limit	1.56	Lower confidence limit	0.45
Upper confidence limit	1.76	Upper confidence limit	0.52
Confidence interval	0.10	Confidence interval	0.04

3) Uncertainty of carbon stock:

The calculation of uncertainty of carbon stock is based on the uncertainty of volume in every stratum multiply by the uncertainty of expansion factors using formula (32):

Uncertainty of carbon stock-Oak	7.64%	Uncertainty of carbon stock-Masson Pine	11.95%
Uncertainty of volume-Oak	0.17%	Uncertainty of volume-Masson Pine	0.96%
carbon stock-Oak	802557.61	carbon stock-Masson Pine	144881.36
Area(ha)	7415.59	Area(ha)	3087.63
Sample size	1407	Sample size	583
Sample mean (m^3/ha)	236.30	Sample mean (m^3/ha)	167.88
Standard deviation	7.69	Standard deviation	19.80
Average error	0.20	Average error	0.82
Confidence level	0.95	Confidence level	0.95
Degree of freedom	1406	Degree of freedom	582
Two-sided Student's t-value	1.96	Two-sided Student's t-value	1.96
Allowable error	0.40	Allowable error	1.61
Lower confidence limit	235.90	Lower confidence limit	166.27
Upper confidence limit	236.70	Upper confidence limit	169.49
Confidence interval	0.40	Confidence interval	1.61

Uncertainty of carbon stock-Broad-Leaved Mixed	6.37%	Uncertainty of carbon stock-Coniferous and Broad-Leaved Mixed	9.91%
Uncertainty of volume-Broad-Leaved Mixed	0.29%	Uncertainty of volume-Coniferous and Broad-Leaved Mixed	0.24%
carbon stock-Broad-Leaved Mixed	677868.81	carbon stock-Coniferous and Broad-Leaved Mixed	520787.01
Area(ha)	7244.29	Area(ha)	6021.91
Sample size	2469	Sample size	1103
Sample mean (m^3/ha)	256.36	Sample mean (m^3/ha)	214.86
Standard deviation	18.90	Standard deviation	8.67
Average error	0.38	Average error	0.26
Confidence level	0.95	Confidence level	0.95
Degree of freedom	2468	Degree of freedom	1102
Two-sided Student's t-value	1.96	Two-sided Student's t-value	1.96
Allowable error	0.75	Allowable error	0.51
Lower confidence limit	255.62	Lower confidence limit	214.35
Upper confidence limit	257.11	Upper confidence limit	215.37
Confidence interval	0.75	Confidence interval	0.51

4) Uncertainty of regrowth

The uncertainty of regrowth is only associated with the parameter RGR_i, as for the value quoted from the expertise of the local forest authority, the uncertainty of 10% is adopted from the National Forest Resource Continuous Investigation Technical Regulation issued by the State Forestry Bureau . And this uncertainty is adopted for the project for conservative.

Based on the calculation of the 4 parameters and coefficients above, the calculation of $U_{Oak|BSL}$,$U_{Masson\ Pine|BSL}$,$U_{Broad\text{-}Leaved\ Mixed\ |BSL}$ and $U_{Coniferous\ and\ Broad\text{-}Leaved\ Mixed|BSL}$ are shown below:

Stratum	Parameter	A_{rea}(Ha)	$V_{EX,j,i\|BSL}$ (m3/ha)	BEF	D(tdm/m^3)	$BCEF_R$ (tdm/m^3)	CFj(tc/tdm)	$C_{HB,j,i\|BSL}$ (tC/ha)	$C_{EX,j,i\|BSL}$ (tC ha^{-1})	$\Delta C_{DW,i,p\|BSL}$
		a	b	c	d	e=c*d	f	g=b*e*f	h=b*d*f	i=g-h
								$U_g=\sqrt{U_b^2+U_e^2}$	$U_h=\sqrt{U_b^2+U_d^2}$	$U_i=\frac{\sqrt{(E_g*U_g)^2+(E_h*U_h)^2}}{(E_g+E_h)}$
Oak	E	7415.59	174.06	1.355	0.676	0.916	0.5	79.72	58.83	20.89
	U		0.17%	6.77%	3.53%	7.63%		7.64%	3.54%	4.64%
Masson Pine	E	3087.63	97.98	1.472	0.380	0.559	0.5	27.39	18.62	8.77
	U		0.96%	6.33%	10.09%	11.91%		11.95%	10.14%	8.21%
Broad-Leaved Mixed	E	7244.29	209.42	1.514	0.482	0.730	0.5	76.44	50.47	25.97
	U		0.29%	3.94%	4.95%	6.33%		6.34%	4.96%	4.30%
Coniferous and Broad-Leaved Mixed	E	6021.91	154.68	1.656	0.486	0.805	0.5	62.26	37.59	24.67
	U		0.24%	5.99%	7.89%	9.91%		9.91%	7.89%	6.86%

Stratum	Parameter	WW_k	SLF_k	$C_{wp,0\|BSL}$ (tc/ha)	$C_{WP,i\|BSL}$(tc/ha)	OF_k	$\Delta C_{WP,100\|BSL}$ (tc/ha)	Ai,p(ha)	$\Delta C_{NET\|BSL(1)}$(tC)
		j	k	l=h*(j+k)	m=h-l	n	o=m*n	p	q=(i/10+l+o/20)*p
				$U_l=U_h$	$U_m=\frac{\sqrt{(E_h*U_h)^2+(E_l*U_l)^2}}{(E_h+E_l)}$		$U_o=U_m$	$U_p=0$	$U_m=\frac{\sqrt{(E_i*U_i)^2+(E_l*U_l)^2+(E_o*U_o)^2}}{(E_i+E_l+E_o)}$
Oak	E	24%	0.12	21.18	37.65	0.62	23.34	688.70	16828.60
	U			3.54%	2.76%		2.76%		2.12%
Masson Pine	E	24%	0.12	6.70	11.91	0.62	7.39	1078.24	8569.88
	U			10.14%	7.92%		7.92%		5.03%

Broad-Leaved Mixed	E	24%	0.12	18.17	32.30	0.62	20.03	645.81	14057.54
	U			4.96%	3.88%		3.88%		2.54%
Coniferous and Broad-Leaved Mixed	E	24%	0.12	13.53	24.06	0.62	14.91	644.04	10783.94
	U			7.89%	6.17%		6.17%		4.15%

Stratum	Parameter	$\Delta C_{NET\|BSL(2-10)}$(tC)	$\Delta C_{NET\|BSL(11-20)}$(tC)	regrowth rate (m3/ha/yr)	$\Delta C_{NET\|BSL,t^*}$(tC)	ΔCNET, i,P|BSL
		r=(i/10+o/20)*p	s=o/20*p	t	v=e*f*p*t	w=q+r+s-v
		$U_r=\frac{\sqrt{(E_i*U_i)^2+(E_o*U_o)^2}}{(E_i+E_o)}$	$U_s=U_o$	$U_t=10\%$	$U_v=\sqrt{U_e^2+U_t^2}$	$U_m=\frac{\sqrt{(E_q*U_q)^2+(E_r*U_r)^2+(E_s*U_s)^2+(E_v*U_v)^2}}{(E_q+E_r+E_s+E_v)}$
Oak	E	2242.35	803.86	1.50	473.14	19401.68
	U	2.63%	2.76%	10.00%	12.58%	1.80%
Masson Pine	E	1343.76	398.24	1.50	452.05	9859.83
	U	5.74%	7.92%	10.00%	15.55%	4.13%
Broad-Leaved Mixed	E	2323.70	646.66	1.50	353.58	16674.32
	U	2.96%	3.88%	10.00%	11.84%	2.11%
Coniferous and Broad-Leaved Mixed	E	2069.21	480.28	1.50	388.84	12944.59
	U	4.86%	6.17%	10.00%	14.08%	3.37%
					U_{BSL}	1.32%

Therefore, as there are 4 strata in the project activity, the uncertainty across combined strata for is calculated with the revised equation below:

$$U_{|BSL} = \frac{\sqrt{(U_{1|BSL} * E_{1|BSL})^2 + (U_{2|BSL} * E_{2|BSL})^2 + (U_{3|BSL} * E_{3|BSL})^2 + (U_{4|BSL} * E_{4|BSL})^2}}{E_{1|BSL} + E_{2|BSL} + E_{3|BSL} + E_{4|BSL}} \quad (34)$$

Where:

$U_{\|BSL}$	Total uncertainty in baseline scenario; %
$U_{1\|BSL}$	Uncertainty in baseline scenario in stratum Oak; %;
$U_{2\|BSL}$	Uncertainty in baseline scenario in stratum Masson Pine; %;
$U_{3\|BSL}$	Uncertainty in baseline scenario in stratum Broad-Leaved Mixed; %;
$U_{4\|BSL}$	Uncertainty in baseline scenario in stratum Coniferous and Broad-Leaved Mixed; %;
$E_{1\|BSL}$	Sum of net change in carbon stock in the baseline scenario in stratum Oak in the baseline case; t CO_2e
$E_{2\|BSL}$	Sum of net change in carbon stock in the baseline scenario in stratum Masson Pine in the baseline case; t CO_2e
$E_{3\|BSL}$	Sum of net change in carbon stock in the baseline scenario in stratum Broad-Leaved Mixed in the baseline case; t CO_2e
$E_{4\|BSL}$	Sum of net change in carbon stock in the baseline scenario in stratum Coniferous and Broad-Leaved Mixed in the baseline case; t CO_2e

After calculation, U_{BSL} is 1.32% for the baseline scenario.

3.4.5 Uncertainty for the project scenario:

uncertainty of project

Stratum	Parameter	A_{rea}(Ha)	BEF	D(tdm/m3)	$BCEF_R$ (tdm/m3)	CFj (tc/tdm)	Ongoing growth rate(m3.ha-1.yr-1)	$\Delta C_{AB,t\|PRJ}$(tCO2)
		a	b	c	d=b*c	e	f	g=f*a*d*e*f*44/12

							U_f=10%	$U_g = \sqrt{U_d^2 + U_f^2}$ $U_g = \sqrt{U_d^2 + U_f^2}$
Oak	E	7415.59	1.355	0.676	0.916	0.5	7.50	93399.36
	U		6.77%	3.53%	7.63%		10.00%	12.58%
Masson Pine	E	3087.63	1.472	0.380	0.559	0.5	4.50	14239.38
	U		6.33%	10.09%	11.91%		10.00%	15.55%
Broad-Leaved Mixed	E	7244.29	1.514	0.482	0.730	0.5	8.00	77562.20
	U		3.94%	4.95%	6.33%		10.00%	11.84%
Coniferous and Broad-Leaved Mixed	E	6021.91	1.656	0.486	0.805	0.5	7.00	62211.35
	U		5.99%	7.89%	9.91%		10.00%	14.08%
							U|PRJ	7.05%

Total uncertainty

Total uncertainty for LtPF project is calculated according to the follow equation:

$$U_{Totall|LtPF} = \sqrt{U_{|PRJ}^2 + U_{|BSL}^2} = \sqrt{1.32^2 + 7.05\%^2} = 7.17\% = 0.0717$$

According to the methodology, if $U_{total,LtPF} \leq 0.15$ then no deduction will result for uncertainty, as $U_{total}<0.15$, then no deduction will result from uncertainty.

3.4.6 Calculation of verified carbon units

Based on the analysis in NON-PERMANENCE RISK REPORT, the overall risk rating is 22, then 22% of the total emission reductions should be deducted .

Therefore, the emission reduction detail is listed:

Year	Estimated baseline	Estimated project	Estimated leakage	Estimated net GHG	Estimated net GHG

	emissions or removals (tCO_2e)	emissions or removals (tCO_2e)	emissions (tCO_2e)	emission reductions or removals (tCO_2e)	emission reductions or removals with buffer deduction (tCO_2e)
01/01/2015-31/12/2015	110	-247,412	0	247,522	193,067
01/01/2016-31/12/2016	-14	-247,412	0	247,398	192,970
01/01/2017-31/12/2017	330	-247,412	0	247,742	193,238
01/01/2018-31/12/2018	3	-247,412	0	247,415	192,983
01/01/2019-31/12/2019	311	-247,412	0	247,723	193,223
01/01/2020-31/12/2020	245	-247,412	0	247,657	193,172
01/01/2021-31/12/2021	528	-247,412	0	247,940	193,393
01/01/2022-31/12/2022	1,859	-247,412	0	249,271	194,431
01/01/2023-31/12/2023	3,050	-247,412	0	250,462	195,360
01/01/2024-31/12/2024	3,388	-247,412	0	250,800	195,624

01/01/2025-31/12/2025	5,415	-247,412	0	252,827	197,205
01/01/2026-31/12/2026	7,040	-247,412	0	254,452	198,472
01/01/2027-31/12/2027	8,224	-247,412	0	255,636	199,396
01/01/2028-31/12/2028	3,824	-247,412	0	251,236	195,964
01/01/2029-31/12/2029	81,029	-247,412	0	328,441	256,183
01/01/2030-31/12/2030	15,359	-247,412	0	262,771	204,961
01/01/2031-31/12/2031	20,804	-247,412	0	268,216	209,208
01/01/2032-31/12/2032	25,949	-247,412	0	273,361	213,221
01/01/2033-31/12/2033	34,415	-247,412	0	281,827	219,825
01/01/2034-31/12/2034	72,299	-247,412	0	319,711	249,374
01/01/2035-31/12/2035	129,385	-247,412	0	376,797	293,901
01/01/2036-31/12/2036	191,620	-247,412	0	439,032	342,444

01/01/2037-31/12/2037	234,069	-247,412	0	481,481	375,555
01/01/2038-31/12/2038	156,812	-247,412	0	404,224	315,294
01/01/2039-31/12/2039	82,775	-247,412	0	330,187	257,545
01/01/2040-31/12/2040	50,864	-247,412	0	298,276	232,655
01/01/2041-31/12/2041	66,282	-247,412	0	313,694	244,681
01/01/2042-31/12/2042	56,789	-247,412	0	304,201	237,276
01/01/2043-31/12/2043	59,279	-247,412	0	306,691	239,218
01/01/2044-31/12/2044	62,021	-247,412	0	309,433	241,357
Total	1,374,064	-7,422,360	0	8,796,424	6,861,196
Average	45,802	-247,412	0	293,214	228,707

4. MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter:	$V_{l,j,i,sp}$
Data unit:	m^3
Description:	Merchantable volume for tree l of species j in sample plot sp in stratum i
Source of data:	Calculated from volume tables or equations linking diameter at breast height (DBH, at typically 1.3 m aboveground level), and merchantable height (MH), to commercial (merchantable) volume of trees in the sample plots above the minimum DBH set in the timber harvest plan. If locally derived equations or yield tables are not available use relevant regional, national or default equations from IPCC literature, national inventory reports or published peer-reviewed studies– such as those provided in Tables 4.A.1 to 4.A.3 of the GPG-LULUCF (IPCC 2003).
Value applied:	See the detailed excel spreadsheet
Justification of choice of data or description of measurement methods and procedures applied:	It is necessary to verify the applicability of equations used. Allometric equations can be verified by both: 1. Verification of equation conditions Justification should be provided for the applicability of the equation to the project locations. Such justification should include identification of climatic, edaphic, geographical and taxonomic similarities between the project location and the location in which the equation was derived. Any equation used should have an r2 value of greater than 0.5 (50%) and a p value that is significant (<0.05 at the 95% confidence level). 2. Additional field verification The following limited measures method must be used for field verification: select at least 10 trees per species distributed across the age range (but excluding trees less than 15 years old for which there is rarely a great relative inaccuracy in equations) ; measure DBH, and height to a 10 cm diameter top or to the first branch; calculate stem volume from measurements; and plot the estimated volume of all the measured trees along with the curve of volume against diameter as predicted by the allometric equation. If the estimated volume of the measured trees are distributed both

	above and below the curve (as predicted by the allometric equation) the equation may be used. The equation may also be used if the measured individuals have a volume consistently higher than predicted by the equation. The equation may not be used if >75% of the measured trees have a volume lower than the predicted curve. In this instance another equation must be selected.
Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	CF_j
Data unit:	$tC \cdot td.m.^{-1}$
Description:	Carbon fraction of dry matter for species j
Source of data:	According to VM0010 version 1.3, the default value 0.5 $tC \cdot t\ d.m.^{-1}$ is used and the same value is used in all instances where this parameter is used.
Value applied:	0.5
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	D_j
Data unit:	$t\ d.m.\ m^{-3}$
Description:	Basic wood density of species j in $t\ d.m.\ m^{-3}$
Source of data:	According to VM0010 version 1.3, it must be chosen with priority from higher to lower preference as follows: National species-specific or group of species-specific values (eg, from National GHG inventory); Species-specific or group of species-specific values from neighboring countries with similar conditions. When species-specific data from neighboring countries is of higher quality, being more representative of the species in the project scenario, it may be preferable to use these values than lower quality national data; Global species-specific or group of species-specific (eg, IPCC 2006 AFOLU Chapter 4 Tables 4.13 and 4.14). Species-specific wood densities may not always be available, and may be difficult to apply with certainty in the typically species rich forests of the humid tropics, hence it is acceptable practice to use wood densities developed for forest types or plant families or species groups.

	"Land Use Change and Forestry GHG Inventory(2013)" of "Second National Information Notification on China Climate Change" matches the first choice.
Value applied:	<table><tr><th>Tree species</th><th>D_j</th></tr><tr><td>Oak</td><td>0.676</td></tr><tr><td>Masson Pine</td><td>0.38</td></tr><tr><td>Broad-Leaved Mixed</td><td>0.482</td></tr><tr><td>Coniferous and Broad-Leaved Mixed</td><td>0.486</td></tr></table>
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	$f_j(X, Y…)$
Data unit:	t d.m. $tree^{-1}$
Description:	Allometric equation(s) for species j linking measured tree variable(s) to aboveground biomass of living trees
Source of data:	Equations must have been derived using a wide range of measured variables (eg, DBH, Height, etc.) based on datasets that comprise at least 30 trees. Equations must be based on statistically significant regressions and must have an r2 that is ≥ 0.8. The source of equation(s) must be chosen with priority from higher to lower preference, as available, as follows: a) National species-, genus-, family-specific; b) Species-, genus-, family-specific from neighbouring countries with similar conditions (ie, broad continental regions); c) National forest-type specific; d) Forest-type specific from neighbouring countries with similar conditions (ie, broad continental regions); e) Forest type-specific such as those provided Tables 4.A.1 to 4.A.3 of the GPG-LULUCF (IPCC 2003); or in Pearson, T., Walker, S. and Brown, S. 2005. Sourcebook for Land Use, Land-Use Change and Forestry Projects. Winrock International and the World Bank Biocarbon Fund. 57pp.; or in Chave, J., C. Andalo, S. Brown, M. A. Cairns, J. Q. Chambers, D. Eamus, H. Folster, F. Fromard, N. Higuchi, T. Kira, J.-P. Lescure, B. W. Nelson, H. Ogawa, H. Puig, B. Riera, T. Yamakura. 2005. Tree allometry and improved estimation

	of carbon stocks and balance in tropical forests. Oecologia 145: 87-99. Species-, genus- and family-specific allometric equations may not always be available, and may be difficult to apply with certainty in the typically species rich forests of the humid tropics. Hence it is acceptable practice to use equations developed for regional forest types, provided that their accuracy has been validated with direct site-specific data following guidance given below. If a forest-type specific equation is used, it should not be used in combination with species-specific equation(s) (ie, it must be used for all tree species).
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	It is necessary to validate the applicability of equations used. Source data from which equation(s) was derived should be reviewed and confirmed to be representative of the forest type/species and conditions in the project and covering the range of potential independent variable values. Allometric equations can be validated either by: 1. Limited Measurements select at least 30 trees (if validating forest type-specific equation, selection should be representative of the species composition in the project area, ie, species representation in roughly in proportion to relative basal area). Minimum diameter of measured trees must be 20cm and maximum diameter must reflect the largest trees present or potentially present in the future in the project area (and/or leakage belt); measure DBH, and height to a 10 cm diameter top or to the first branch; calculate stem volume from measurements and multiplying by species-specific density to gain biomass of bole; apply a biomass expansion factor to estimate total aboveground biomass from stem biomass37; and plot the estimated biomass of all the measured trees along with the curve of biomass against diameter as predicted by the allometric equation. If the estimated volume of the measured trees are distributed both above and below the curve (as predicted by the allometric equation) the equation may be used. The equation may also be used if the measured individuals have a biomass consistently higher than predicted by the equation. If >75% of the measured trees have a biomass lower than the predicted curve, destructive sampling must

	be undertaken or another equation must be selected. 2. Destructive Sampling select at least 5 trees (if validating forest type-specific equation, selection should be representative of the species composition in the project area, ie, species representation in roughly in proportion to relative basal area) at the upper end of the range of independent variable values existing in the project area; measure DBH and commercial height and calculate volume using the same procedures/equations used to generate commercial volumes to which BCEFs will be applied; fell and weigh the aboveground biomass to determine the total (wet) mass of the stem, branch, twig, leaves, etc. Extract and immediately weigh subsamples from each of the wet stem and branch components, followed by oven drying at 70 degrees C to determine dry biomass; determine the total dry weight of each tree from the wet weights and the averaged ratios of wet and dry weights of the stem and branch components; and plot the estimated biomass of all the measured trees along with the curve of biomass against diameter as predicted by the allometric equation. If the estimated volume of the measured trees are distributed both above and below the curve (as predicted by the allometric equation) the equation may be used. The equation may also be used if the measured individuals have a biomass consistently higher than predicted by the equation. If >75% of the measured trees have a biomass lower than the predicted curve another equation must be selected. Details of destructive sampling measurements are given in: Brown, S. 1997. Estimating biomass and biomass change of tropical forests: a primer. FAO Forestry Paper 134, Rome, Italy. Available at http://www.fao.org/docrep/W4095E/W4095E00.htm If using species-specific equations, and new species are encountered in the course of monitoring, new allometric equations must be sourced from the literature and validated, if necessary, as per requirements and procedures above. Default values must be updated whenever new guidelines are produced by the IPCC

Data / Parameter:	$BCEF_R$
Data unit:	t d.m. m^{-3}
Description:	Biomass conversion and expansion factor applicable to wood removals in the project area

<table>
<tr><td>Source of data:</td><td>The source of data must be chosen with priority from higher to lower preference as follows:
Existing local forest type-specific;
National forest type-specific or eco-region-specific (eg, from national GHG inventory);
Forest type-specific or eco-region-specific from neighboring countries with similar conditions. Sometimes (c) might be preferable to (b);
Global forest type or eco-region-specific (eg, IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.5).
Alternatively:
BCEFR = BEFR * D
Where BCEF values are not directly available, they can be calculated as Biomass Expansion Factor (BEF)* basic wood density (D).
Application of this equation requires caution because basic wood density and biomass expansion factors tend to be correlated. If the same sample of trees was used to determine D, BEF or BCEF, conversion will not introduce error, therefore, it is acceptable to use this equation. If, however, basic wood density is not known with certainty, transforming one into the other might introduce error, as BCEF implies a specific but unknown basic wood density, therefore, all conversion and expansion factors must be derived or their applicability checked locally.
"Land Use Change and Forestry GHG Inventory(2013)" of "Second National Information Notification on China Climate Change" matches the second choice.</td></tr>
<tr><td>Value applied:</td><td><table>
<tr><th>Tree species</th><th>$BCEF_R$</th></tr>
<tr><td>Oak</td><td>0.916</td></tr>
<tr><td>Masson Pine</td><td>0.559</td></tr>
<tr><td>Broad-Leaved Mixed</td><td>0.73</td></tr>
<tr><td>Coniferous and Broad-Leaved Mixed</td><td>0.805</td></tr>
</table></td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied:</td><td>N/A</td></tr>
<tr><td>Purpose of Data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Comments:</td><td>The combustion factor is a measure of the proportion of the fuel that is actually combusted, which varies as a function of the size and architecture of the fuel lcad (ie, a smaller proportion of large, coarse</td></tr>
</table>

	fuel such as tree stems will be burnt compared to fine fuels, such as grass leaves), the moisture content of the fuel and the type of fire (ie, intensity and rate of spread). Default values must be updated whenever new guidelines are produced by the IPCC

Data / Parameter:	G_{gi}
Data unit:	g kg^{-1} dry matter burnt
Description:	Emission factor for stratum i for gas g
Source of data:	Defaults can be found in Volume 4, Chapter 2, of the IPCC 2006 Inventory Guidelines in table 2.5
Value applied:	Please refer to the spreadsheet
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	Default values shall be updated whenever new guidelines are produced by the IPCC

Data / Parameter:	OF, SLF,WW
Data unit:	Kg kg^{-1}
Description:	OF = Fraction of wood products that will be emitted to the atmosphere between 3 and 100 years after production; SLF = Fraction of wood products that will be emitted to the atmosphere within 3 years of production; and WW = Fraction of extracted biomass effectively emitted to the atmosphere during production Wood waste fraction(WW): Winjum et al. 1998indicatethattheproportionofextracted biomass that is oxidized (burning or decaying) from the production of commodities to be equal to19%fordevelopedcountries, 24% for developing countries. Short-lived fraction (SLF) Winjumetal1998 give decay rates for proportions of wood products, which were converted to with short-term (<3yr) uses (applicable internationally) as below: Sawnwood 0.12 Woodbase panels 0.06 Other industrial roundwood 0.18 Paper and Paperboard 0.24

<table>
<tr><td></td><td>Additional oxidized fraction (OF)
Winjum et al 1998 gives annual oxidation fractions for each class of wood products split by forest region (boreal, temperate and tropical).
This methodology projects these fractions over 95 years to give the additional proportion that is oxidized between the 3rd and the 100th year after initial harvest:
<table>
<tr><th rowspan="2">Wood Product Class</th><th colspan="3">OF</th></tr>
<tr><th>Boreal</th><th>Temperate</th><th>Tropical</th></tr>
<tr><td>Sawnwood</td><td>0.39</td><td>0.62</td><td>0.86</td></tr>
<tr><td>Woodbase panels</td><td>0.62</td><td>0.86</td><td>0.98</td></tr>
<tr><td>Other industrial roundwood</td><td>0.86</td><td>0.98</td><td>0.99</td></tr>
<tr><td>Paper and paperboard</td><td>0.39</td><td>0.62</td><td>0.99</td></tr>
</table>
</td></tr>
<tr><td>Source of data:</td><td>According to VM0010 version 1.3, the default values are chosen.</td></tr>
<tr><td>Value applied:</td><td>
<table>
<tr><th>Parameters</th><th>Species</th><th>Value</th></tr>
<tr><td>OF</td><td>Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed</td><td>0.62</td></tr>
<tr><td>SLF</td><td>Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed</td><td>0.12</td></tr>
<tr><td>WW</td><td>Oak/Masson Pine/Broad-Leaved Mixed/Coniferous and Broad-Leaved Mixed</td><td>24%</td></tr>
</table>
</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied:</td><td>N/A</td></tr>
<tr><td>Purpose of Data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Comments:</td><td>N/A</td></tr>
</table>

Data / Parameter:	RGR_i
Data unit:	$tC.ha^{-1}.yr^{-1}$
Description:	Forest regrowth rate post timber harvest for stratum i
Source of data:	Regrowth rate must be calculated from either a) data generated in a reference area using measurements of timber volume in a chronosequence of replicated sample plots; or b) published data on forest growth after timber harvest of the same forest type within the same region as the project; or c) the IPCC default values for aboveground net biomass growth in natural forests.
Value applied:	(see table below)
Justification of choice of data or description of measurement methods and procedures applied:	Method b is applied. The average annual regrowth is confirmed by local forest bureau . And the RGRi can therefore be calculated by the biomass expansion factor, density and carbon fraction of the separate species.
Purpose of Data	Calculation of baseline emissions
Comments:	Default values must be updated whenever new guidelines are produced by the IPCC

Species	Value	Uint
Oak	1.5	$m^3.ha^{-1}.yr^{-1}$
Masson Pine	1.5	$m^3.ha^{-1}.yr^{-1}$
Broad-Leaved Mixed	1.5	$m^3.ha^{-1}.yr^{-1}$
Coniferous and Broad-Leaved Mixed	1.5	$m^3.ha^{-1}.yr^{-1}$

Data / Parameter:	$V_{EX,j,i\|BSL}$
Data unit:	$m^3.ha^{-1}$
Description:	Mean volume of extracted timber per unit area for species j in stratum i
Source of data:	The timber harvest plan sets the allowable mean extracted volume is equal to the merchantable volume of timber in the forest inventory ($V_{j,i\|BSL}$), based on legal limits.
Value applied:	please refer to ER sheet
Justification of choice of data or description of measurement methods and procedures applied:	The measurement method is from academic paper and equations developed for regional forest types. Please refer to ER sheet

Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	$A_{i,p}$
Data unit:	Ha
Description:	Area covered by stratum i over land parcel p
Source of data:	Geodetic coordinates and/or Remote Sensing data and/or legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions-
Comments:	It must be assumed ex-ante that land parcel boundaries and strata areas must not change through time

Data / Parameter:	$A_{1,i,p}$
Data unit:	Ha
Description:	The area of stratum i in land parcel p that was harvested 1 year ago
Source of data:	Geodetic coordinates, GIS Files or legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	$A_{2-10,i,p}$
Data unit:	Ha
Description:	The area of stratum i in land parcel p that was harvested between 2 and 10 year ago
Source of data:	Geodetic coordinates, GIS Files or legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	N/A

Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	$A_{11\text{-}20,i,p}$
Data unit:	Ha
Description:	The area of stratum i in land parcel p that was harvested between 11 and 20 year ago
Source of data:	Geodetic coordinates, GIS Files or legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	A_{t^*}
Data unit:	Ha
Description:	Cumulative area harvested until time t*
Source of data:	Geodetic coordinates, GIS Files or legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	Calculation of baseline emissions
Comments:	N/A

Data / Parameter:	$A_{s,p}$
Data unit:	Ha
Description:	Area of sample plot sp
Source of data:	Recording and archiving of size of sample plots
Justification of choice of data or description of measurement methods and procedures applied:	Standard procedures for plot delineation in forest timber inventory surveys shall be used
Purpose of Data	Calculation of baseline emissions
Comments:	Ex-ante the size of the plots shall be defined and recorded in the monitoring plan.

4.2 Data and Parameters Monitored

Data / Parameter:	Illegal Logging PRA Results
Data unit:	Dimensionless
Description:	N/A
Source of data:	PRA
Description of measurement methods and procedures to be applied:	The PRA must evaluate whether timber harvest may be occurring in the project area and shall consist of semi-structured interviews / questionnaires. If ≥ 10% of those interviewed/surveyed believe that illegal logging may be occurring within the project boundary then the limited on-the-ground illegal logging survey shall be triggered. An additional output of the PRA shall be a depth of penetration of illegal logging pressure. A maximum distance shall be recorded for penetration into the forest from access points (such as roads, rivers, already cleared areas) for the purpose of harvesting timber.
Frequency of monitoring/recording:	Every two years
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex ante estimation shall be made of illegal logging in the with-project case. If the belief is that zero illegal logging will occur within the project boundaries then this parameter may be set to zero if clear infrastructure, hiring and policies are in place to prevent illegal logging.

Data / Parameter:	Result of Limited Illegal Logging Survey
Data unit:	Dimensionless
Description:	N/A
Source of data:	Limited on-the-ground illegal logging survey
Description of measurement methods and procedures to be applied:	Sampled by surveying multiple transects of known length and width across the access-buffer area to check whether new tree stumps are evident or not. The access-buffer area shall be equal in area to at least 1% of $A_{DIST\_IL,i}$
Frequency of monitoring/recording:	Must to be repeated each time the PRA indicates a potential for illegal logging.

Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex ante an estimation shall be made of illegal logging in the with-project case. If the belief is that zero illegal logging will occur within the project boundaries then this parameter may be set to zero if clear infrastructure, hiring and policies are in place to prevent illegal logging.

Data / Parameter:	$A_{burn,i,t}$
Data unit:	Ha
Description:	Area burnt in stratum i at time t
Source of data:	Geodetic coordinates and / or Remote Sensing data
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Areas burnt must be monitored at least every five years
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Standard quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex ante estimations of areas burned shall be based on historic incidence of fire in the Project region

Data / Parameter:	$A_{dist,i,t}$
Data unit:	Ha
Description:	Area disturbed in stratum i at time t
Source of data:	Geodetic coordinates and / or Remote Sensing data
Description of	N/A

measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Areas disturbed shall be monitored at least every five years
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Standard quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex ante estimations of areas burned must be based on historic incidence of fire in the Project region

Data / Parameter:	$A_{DIST\_IL,i}$
Data unit:	Ha
Description:	Area potentially impacted by illegal logging in stratum i
Source of data:	GIS delineation and ground truthing
Description of measurement methods and procedures to be applied:	Must be composed of a buffer from all access points (access buffer), such as roads and rivers or previously cleared areas. The width of the buffer shall be determined by the depth of degradation penetration as defined as a PRA output
Frequency of monitoring/recording:	Repeated each time the PRA indicates a potential for degradation
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex ante a limited survey can be used to determine a likely depth of degradation penetration

Data / Parameter:	$C_{DIST\_IL,i,t\|PRJ}$
Data unit:	tCO_2e
Description:	biomass carbon of trees cut and removed through illegal logging in

	stratum i at time t
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	The sampling plan must be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone ($A_{DIST\_IL,i}$). The diameter of all tree stumps will be measured and conservatively assumed to be the same as the DBH. Where the stump is a large buttress, several individuals of the same species nearby shall be located and a ratio of the diameter at DBH to the diameter of buttress at the same height above ground as the measured stumps shall be determined. This ratio will be applied to the measured stumps to estimate the likely DBH of the cut tree.The aboveground carbon stock of each harvested tree will be estimated using the allometric regression equations chosen for forest growth in the project scenario. The mean aboveground carbon stock of the harvested trees is conservatively estimated to be the total emissions and to all enter the atmosphere
Frequency of monitoring/recording:	Repeated each time limited sampling of A_{DIST_IL}, indicates illegal logging
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Standard quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	If species-specific equations are used and species cannot be identified from stumps then it shall be assumed that the harvested species is the species most commonly harvested. A PRA shall be used to determine the most commonly harvested species.

Data / Parameter:	AP_i
Data unit:	Ha
Description:	Total area of illegal logging sample plots in stratum i
Source of data:	Ground measurement
Description of measurement methods and procedures to be applied:	A sampling plan must be designed using multiple sample plots systematically placed across the buffer zone so that they sample at least 3% of the area of the buffer zone.

Frequency of monitoring/recording:	Not more than five years
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Standard quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex ante estimation should be made of area of plots. This should be set to exactly 3% of the buffer zone $A_{DIST\_IL,i}$

Data / Parameter:	PMP_i
Data unit:	%
Description:	Merchantable biomass as a proportion of total aboveground tree biomass for stratum i within the project boundaries
Source of data:	Within each stratum divide the summed merchantable biomass (defined as total gross biomass of a tree 15cm DBH or larger) by the summed total of aboveground tree biomass.
Description of measurement methods and procedures to be applied:	A sampling plan must be designed using multiple sample plots systematically placed across the buffer zone so that they sample at least 3% of the area of the buffer zone.
Frequency of monitoring/recording:	Not more than five years
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Standard quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	Calculation of project emissions
Calculation method:	N/A
Comments:	Ex-ante a time zero measurement shall be made of this factor. The timber harvest plan sets the allowable mean extracted volume from the merchantable volume of timber in the forest inventory

	($V_{j,i\|BSL}$), based on legal limits.

Data / Parameter:	Ai
Data unit:	Ha
Description	Area covered by stratum i
Source of data	Geodetic coordinates and/or Remote Sensing data and/or legal parcel records
Description of measurement methods and procedures to be applied	The stratum is from the second class forestry inventory
Frequency of monitoring/recording:	Every ten years.
Value applied:	see table below
Monitoring Equipment:	Tape Measure
QA/QC procedures to be applied:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	For the calculation of the baseline and project emissions.
Calculation method:	N/A
Comments	In the baseline scenario strata areas must not change through time. In the project scenario it must be assumed ex-ante that stand boundaries and strata areas must not change through time. Ex post adjustments of the project scenario strata may be needed if unexpected disturbances occur during the project crediting period, severely affecting different parts of an originally homogenous stratum. This disturbance will be delineate as a separate stratum for the purpose of monitoring the carbon stock changes.

Value applied:

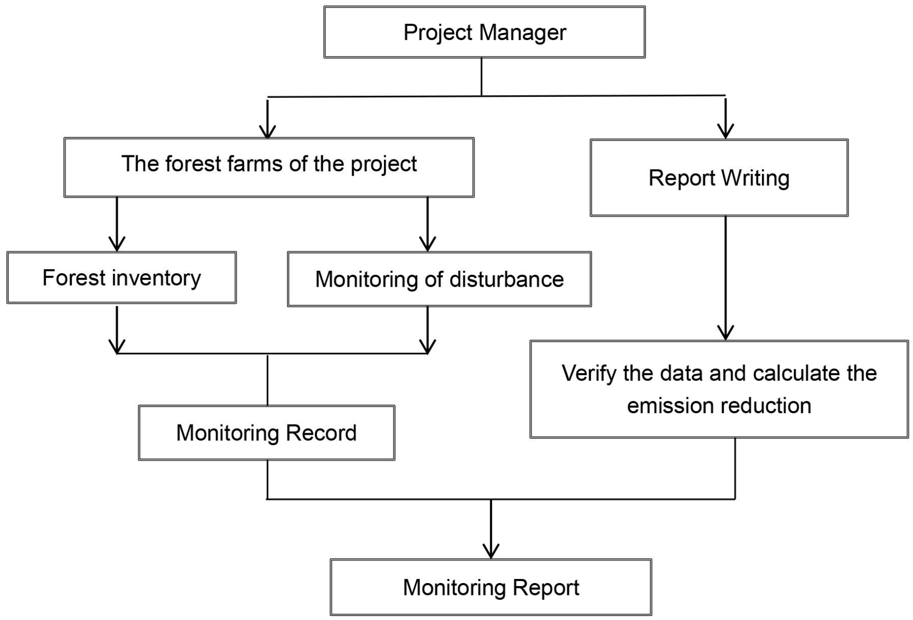
Serial number of strata	Area (ha)	Tree species
1	7415.59	Oak
2	3087.63	Masson Pine
3	7244.29	Broad-Leaved Mixed
4	6021.91	Coniferous and Broad-Leaved Mixed
Total	23769.42	

Data / Parameter:	DBH
Data unit:	cm
Description	Diameter at breast height of tree
Source of data	On site measuring on the sample spot.
Description of measurement methods and procedures to be applied	The National Forest Resource Continuous Investigation Technical Regulation issued by the State Forestry Bureau has detailed requirement of the measurement method.
Frequency of monitoring/recording:	Not more than five years
Value applied:	N/A
Monitoring Equipment:	Tape Measure
QA/QC procedures to be applied:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of Data	Calculation of tree volume, then to carbon stock change further to the project emissions.
Calculation method:	N/A
Comments	As for the project tree species, there are no allometric equation applied in the project area, the average annual growth and biomass expansion method is adopted for the estimated calculation of carbon stock change. Based on the DBH.and local volume table, the volume can be calculated, combined by the BCEF and CF, the carbon stock can be obtained.

4.3 Monitoring Plan

4.3.1 Scope of monitoring and the monitoring plan

The project proponent and consultant will set up a team together to conduct the monitoring. The team is in charge of collecting, monitoring and verifying the data, while the project manager will be assisted by the consultant company. The findings should be reported to the project manager and work out a solution. The operational and management structure is as follows:



Monitoring is required to

a) determine changes in forest carbon stocks and greenhouse gas emissions from project activity;

b) confirm project activity; and

c) determine changes in forest carbon stocks and greenhouse gas emissions from disturbance and illegal logging.

In some cases monitoring may also be implemented to update stratification.

The monitoring plan addresses the monitoring of project implementation, the monitoring of actual carbon stock changes from project activity, and estimation of ex-post net carbon stock changes from the conversion of logged to protected forest.

4.3.2 General requirements for monitoring

All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the project crediting period. All measurements will be conducted according to relevant standards.

Data archiving shall take both electronic and paper forms, and copies of all data shall be provided to each project participant.

All electronic data and reports shall also be copied on durable media such as CDs and copies of the CDs are to be stored in multiple locations.

The archives shall include:

- Copies of all original field measurement data, laboratory data, data analysis spreadsheets;
- Estimates of the carbon stock changes in all pools and non-CO_2 GHG and corresponding calculation spreadsheets;
- GIS products; and
- Copies of the measuring and monitoring reports.

4.3.3 Monitoring of project implementation

Information must be provided, and recorded in the VCS-PD, to establish that:

- The geographic position of the project boundary is recorded for all areas of land;
- The geographic coordinates of the project boundary (and any stratification inside the boundary) are established, recorded and archived. This will be achieved by field survey (e.g. using GPS) or by using geo-referenced spatial data (e.g. maps, GIS datasets, aerial photography, or geo-referenced remote sensing images);
- Commonly accepted principles of forest inventory and management are implemented;
- Standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management will be applied. SOPs already applied in national forest monitoring or available from published handbooks or from the IPCC GPG LULUCF 2003 will be used.
- The project plan, together with a record of the plan as actually implemented during the project, shall be available for validation or verification as appropriate.

4.3.4 Stratification

An ex ante stratification of the project area in the project scenario is developed by project proponents through sampling in the project area according to the species.

Sampling to adjust the number and boundaries of the strata defined ex ante where an update is required because of

a) unexpected disturbances occurring during the project crediting period affecting differently various parts of an originally homogeneous stratum and/or

b) forest management activities that are implemented in a way that affects the existing stratification in the project scenario.

Established strata may also be merged if the reasons for their establishment have disappeared.

4.3.5 Monitoring of actual carbon stock changes

Carbon stocks will be measured according to the stock assessment equations with field sampling based on forest inventory methods. Various sources exist to assist with the design of a verifiable forest field inventory based on best practice for sampling, data management and analysis (Box 3).

In the project area the inventory plan is specified as below:

a) adequate forest stratification, sample size estimation methods and consider uncertainty:

The forest stratification is based on the species, which is adequate according to the methodology. The sample size estimation methods, allocation among strata and uncertainty consideration is according to the “Calculation of the number of sample plots for measurements within A/R CDM project activities” (version 02.1.0) approved by the CDM Executive Board.

b) a sampling framework including sample size, plot size, plot shape and information to determine plot location:

The design of a verifiable forest field inventory based on best practice for sampling, data management and analysis are selected from the Box 3 of the methodology. The sample size estimation methods, allocation among strata and uncertainty consideration is according to the most recent version of the tool for the “Calculation of the number of sample plots for measurements within A/R CDM project activities” (version 02.1.0) approved by the CDM Executive Board.

For the baseline scenario, the calculation process is shown below:

Parameter	Unit	Description
n	dimensionless	Number of sample plots required for estimation of biomass stocks within the project boundary
n_i	dimensionless	Number of sample plots allocated to stratum *i* for estimation of biomass stocks within the project boundary

In the baseline scenario:

n_{BSL} for n and $n_{BSL,i}$ for n_i.

In the project scenario:

N_{PROJ} for n and $n_{PROJ,i}$ for n_i

The sample plot will be 0.04 ha and at least 3 sample plots will be selected in 1. Approximate value of the standard deviation of biomass stock in each stratum at the time of estimation is either known from existing data applicable to the project area or existing data related to a similar area, or is estimated on the basis of a preliminary sample or an expert judgement. Number of sample plots required for estimation of biomass stocks within the project boundary is calculated iteratively

Therefore, the following simplified equation can be used for estimating the number of sample plots according to the CDM tool:

$$n = \frac{N * t_{VAL}{}^2 * (\sum_i w_i * s_i)^2}{N * E^2 + t_{VAL}{}^2 * \sum_i w_i * s_i{}^2} \quad (36)$$

where:

n	Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless
t_{VAL}	Two-sided Student's *t*-value at infinite degrees of freedom for the required confidence level; dimensionless
E	Acceptable margin of error (i.e. one-half the confidence interval) in estimation of biomass stock within the project boundary; t d.m. (or t d.m. ha^{-1}), i.e. in the units used for S_i
w_i	Relative weight of the area of stratum i (i.e. the area of the stratum i divided by the project area); dimensionless
S_i	Estimated standard deviation of biomass stock in stratum i; t d.m. (or t d.m. ha^{-1})
i	1, 2, 3, … biomass stock estimation strata within the project boundary

After the estimation of total number of sample plots (n), allocation of number of sample plots among strata is calculated as:

$$n_i = n * \frac{\omega_i * S_i}{\sum_i \omega_i * S_i} \quad (37)$$

where:

n_i	Number of sample plots allocated to stratum i; dimensionless
n	Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless
w_i	Relative weight of the area of stratum i (i.e. the area of the stratum i divided by the project area); dimensionless
S_i	Estimated standard deviation of biomass stock in stratum i; t d.m. (or t d.m. ha^{-1})
i	1, 2, 3, … biomass stock estimation strata within the project boundary

Based on the data of biomass stocks in a carbon pool in the baseline scenario, the estimation of number of sample plots required in shown in table 9 below:

Table 9: The estimation of number of sample plots required

Strata No	Stratum Name	Area (ha)	Mean tonnes C/ha	Standard Deviation (tC/ha)	Plot size (ha)	Wi	W_i * Si
Strata 1	Oak	7415.59	108.23	7.69	0.04	0.31	2.40
Strata 2	Masson Pine	3087.63	46.92	19.80	0.04	0.13	2.57
Strata 3	Broad-Leaved Mixed	7244.29	93.57	18.90	0.04	0.30	5.76
Strata 4	Coniferous and Broad-Leaved Mixed	6021.91	86.48	8.67	0.04	0.25	2.20

		Number of Plots	
STRATA NO	Stratum Name	Plot Quantity	Rounded Plot Quantity
Total Sample Size		170	
Strata 1	Oak	31.55	32
Strata 2	Masson Pine	33.83	34
Strata 3	Broad-Leaved Mixed	75.74	76
Strata 4	Coniferous and Broad-Leaved Mixed	28.88	29
TOTAL NUMBER OF PLOTS			**171**

* Where the confidence level is 95% as required in the methodology VM0010 version 1.3 and D_f is 2. Therefore, t_{VAL} is 4.303.

Carbon stock changes over time shall be estimated by taking measurements in plots at each monitoring event. Monitoring events shall take place at intervals of 5, or preferably 3 years. Including monitoring all the parameters needed. Monitoring reports can use such extrapolated parameter values for the determination of net emissions by sources and removals resulting from the project.

The design of the sampling regime will be determined by the number of strata and timber harvest the baseline case.

4.3.6 Conservative approach and uncertainty

Project proponent will also apply all relevant equations for the ex-ante calculation of net anthropogenic GHG removals by sinks with care and provide transparent estimations for the parameters that are monitored during the project crediting period. These estimates shall be based on measured or existing published data where possible and project proponents should retain a conservative approach; that is, if different values for a parameter are equally plausible, a value that does not lead to over-estimation of net anthropogenic GHG removals by sinks must be selected

An uncertainty analysis is required for all estimates from monitoring related to change in area, change in carbon stocks and emissions for both the baseline and project case.

5. SAFEGUARDS

5.1 No Net Harm

There is no potential negative environmental or socio-economic impact due to the project.

5.2 Environmental Impact

An Environmental Impact Assessment (EIA) is not required for logged to protected forest projects according to Construction project classification management of environmental impact assessment list[5]. The key mitigation action of the project activity is avoiding the illegal harvest of the forest, which can protect and improve the surviving environment, keep the ecological balance, save the species resources and enhance homeland security.

5.3 Local Stakeholder Consultation

Questionnaires were distributed by the project proponent to the residents who lives in the community and closely related to the project. The questions aimed to find out their concerns and opinions about the project. The questionnaires covered areas of economic, social benefit and environmental effect etc. The content of the questionnaire includes the following information：

1. The purpose of the questionnaire
2. Basic information of the participants
3. Questions

1) Do you know the proposed project?

2) What do you think the proposed project will bring to you?

3) Do you support the implementation of the proposed project?

4) What is your concern about the proposed project?

5) What is your opinion and suggestion regarding the proposed project?

[5] http://www.gov.cn/gongbao/content/2009/content_1265996.htm

The Survey was conducted through distributing and collecting responses to a questionnaire in Dec 2014. Totally 40 questionnaires returned out of 40 with 100% response. The following is a summary of the key findings based on returned questionnaires.

1. The education background of the participants

The targets of this investigation are the people who will be affected by the project. A part of them finished the middle high school education, the rest of them graduated from college.

2. Attitude towards the proposed project

All of them support the implementation of the project, they think the protection of forest instead of cutting is good the environment, and will benefit the sustainable development.

3. The concern about the proposed project

The participants particularly hoping that the proposed project can improve local environmental situation and increase employment opportunities at the same time.

4. Conclusion

The survey shows that the proposed project is 100% supported by local people. It is because they believe the implementation of the project will bring multiple benefits.

5.4 Public Comments

N/A