JIANGXI PROVINCE LE'AN COUNTY FOREST FARM CARBON SINK PROJECT

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Project Title	**Jiangxi Province Le'an County Forest Farm Carbon Sink Project**
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1 PROJECT DETAILS

Summary Description of the Project

The **Jiangxi Province Le'an County Forest Farm Carbon Sink Project** (hereafter "the project activity") is implemented in Le'an County, Jiangxi Province of China, which includes the Improved Forest Management (IFM) of the forests in from the conversion of logged to protected forest.

The area of the project activity is 7,746.7 ha, including 50 parcels spreading over Jinzhu department, Zhaoxie department, Zengtian department, Niutian department, Shipi department, Gongxi department; Shipi Harvest-Nuture department and Zhaoxie Harvest-Nuture department. All these departments are state-owned forests and have the legal right to forest ownership. The species involved in the project are Chinese Fir and Slash Pine.

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 3,377,151tCO_2e in 30 years and Verified Carbon Units is about 2,600,406 tCO_2e in 30 years.

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

Sectoral Scope and Project Type

Sectoral scope 14 (AFOLU)

Improved Forest Management: Logged to Protected Forest (LtPF)

Project Proponent

Beijing Shengdahuitong Carbon Management Co., Ltd.

Liu Jiahong

No.3106, West Tower of Mong Block Center

No. 2 of Guandongdian South Street, CBD, Chaoyang District, Beijing City

The roles/responsibilities of the project proponent is developing the carbon credits of the project.

Other Entities Involved in the Project

DTM (Beijing) Energy Technology Development Co., Ltd.

Project Start Date

The project start date is 01/01/2006, which is effective date of the Forest management and protected agreement.

Project Crediting Period

The project crediting period is from 01/01/2006 to 31/12/2035 with the total length of 30 years.

Project Scale and Estimated GHG Emission Reductions or Removals

Project	X
Mega-project	

Years	Estimate Average Annual Project Greenhouse Gas Verified Carbon Units (tCO2e)
Year 2006	86,680
Year 2007	86,680
Year 2008	86,680
Year 2009	86,680
Year 2010	86,680
Year 2011	86,680
Year 2012	86,680
Year 2013	86,680
Year 2014	86,680
Year 2015	86,680
Year 2016	86,680
Year 2017	86,680
Year 2018	86,680
Year 2019	86,680
Year 2020	86,680
Year 2021	86,680
Year 2022	86,680
Year 2023	86,680
Year 2024	86,680
Year 2025	86,680
Year 2026	86,680
Year 2027	86,680
Year 2028	86,680
Year 2029	86,680

Year 2030	86,680
Year 2031	86,680
Year 2032	86,680
Year 2033	86,680
Year 2034	86,680
Year 2035	86,680
Total estimated Verified Carbon Units	2,600,406
Total number of crediting years	30
Average Annual Project Greenhouse Gas Verified Carbon Units	86,680

Description of the Project Activity

The Improved Forest Management (IFM) project activity is located in Le'an County, Jiangxi Province of P.R.China, which belongs to the subtropical humid monsoon climate area. The annual average temperature is 17.1 ℃ and the annual average precipitation is 1,756.9 mm.

The project activity includes the Improved Forest Management (IFM) of the forests in 50 parcels spreading over Jinzhu department, Zhaoxie department, Zengtian department, Niutian department, Shipi department, Gongxi department; Shipi Harvest-Nuture department and Zhaoxie Harvest-Nuture department by the conversion of logged to protected forest. All the 50 parcels are shown in the table 1, which all have the legal right to harvest issued by local forest bureau before the implementation of the project activity. Before 2006, they were all forests farms which the trees could be logged and sold once reached to the rotation based on a timber harvest plan. After 2006, they are all converted to protected forests. All the parcels are divided to 5 strata based on the tree species and tree ages.

Table 1: The Project Land parcels

Parcel number	***Name of department***	***Serial number***	***Area (ha)***
1	*Shipi Harvest-Nuture department*	GS-SP-1	191.40
	Shipi department	LC-SP-1	
2	*Shipi Harvest-Nuture department*	GS-SP-2	148.67
3	*Zhaoxie Harvest-Nuture department*	GS-ZX-1	148.58
	Shipi department	LC-SP-4	
4	*Zhaoxie Harvest-Nuture department*	GS-ZX-2	64.20
	Shipi department	LC-SP-5	
5	*Zhaoxie Harvest-Nuture department*	GS-ZX-3	61.73
6	*Shipi department*	LC-SP-7	17.93
7	*Shipi department*	LC-SP-8	68.53
8		LC-SP-9	14.40

9		LC-SP-10	66.93
10		LC-SP-11	82.80
11		LC-SP-12	50.27
12		LC-SP-13	41.07
13		LC-SP-14	98.67
14	*Zengtian department*	LC-ZT-2	78.73
15		LC-ZT-3	64.00
16		LC-ZT-4	43.60
17		LC-ZT-5	170.87
18		LC-ZT-6	150.44
19	*Gongxi department*	LC-GX-1	57.27
20		LC-GX-2	176.00
21		LC-GX-4	351.07
22		LC-GX-5	169.47
23		LC-GX-6	319.00
24	*Niutian department*	LC-NT-2	4.07
25		LC-NT-3	126.47
26	*Zhaoxie department*	LC-ZX-1	87.93
27		LC-ZX-2	237.07
28		LC-ZX-3	116.00
29		LC-ZX-4	77.13
30		LC-ZX-5	58.07
31		LC-ZX-6	27.47
32		LC-ZX-7	142.07
33		LC-ZX-8	10.67
34	*Jinzhu department*	LC-JZ-1	1,897.07
35		LC-JZ-2	107.53
36		LC-JZ-3	145.20
37		LC-JZ-6	925.53
38		LC-JZ-4	6.80
39		LC-JZ-5	59.13
40		LC-JZ-7	218.33
41		LC-JZ-8	131.60
42		LC-JZ-9	105.07
43		LC-JZ-10	16.40
44		LC-JZ-11	64.00
45		LC-JZ-12	68.80
46		LC-JZ-13	167.53
47		LC-JZ-14	33.47
48		LC-JZ-15	50.00
49		LC-JZ-16	81.20
50		LC-JZ-17	146.47
SUM			**7,746.7**

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.

Project Location

The project locates in Le'an County, Jiangxi Province of P. R. China. The geo-coordinated range of the project is 26.83°N-27.75°N and 115.58°E-116.17°E. There are 50 parcels spreading over Jinzhu department, Zhaoxie department, Zengtian department, Niutian department, Shipi department, Gongxi department; Shipi Harvest-Nuture department and Zhaoxie Harvest-Nuture department. The locations of the departments are shown in table 2.

Table 2: Locations of the departments

Name of parcels	Location	Central Geographical coordinate
Jinzhu department	Located in branch vein of Wuyishan Mountain	X：39394140 Y：3000904
Zhaoxie department	Located in branch vein of Wuyishan Mountain	X：39388957 Y：3007210
Zengtian department	Located in branch vein of Wuyishan Mountain	X：39385542 Y：3027785
Niutian department	Located in branch vein of Wuyishan Mountain	X：39373661 Y：3021551
Shipi department	Located in branch vein of Wuyishan Mountain	X：39385925 Y：3036075
Gongxi department	Located in branch vein of Wuyishan Mountain	X：39391869 Y：3061482
Shipi Harvest-Nuture department	Located in the Fuhe River System	X：39385614 Y：3035850
Zhaoxie Harvest-Nuture department	Located in branch vein of Wuyishan Mountain and Northwest of Yushan Mountain	X：39388687 Y：3006787

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

Figure 1: The project location

Conditions Prior to Project Initiation

Before the implementation of the project activity, the trees are logged once reached to the rotation based on a timber harvest plan.

Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is in line with the Forest Law of People's Republic of China and Jiangxi province ecological public welfare forest management approach.

Ownership and Other Programs

1.1.1 Proof of Title

Beijing Shengdahuitong Carbon Management Co., Ltd. (hereafter "the project owner") was established in Oct 2004 with the registered equity of 10 million RMB. The main business of the project proponent is carbon capital development, management, trading and especially the forest carbon sink. The project proponent has the ownership and development right of the carbon sink credit.

1.1.2 Emissions Trading Programs and Other Binding Limits

N.A.

1.1.3 Participation under Other GHG Programs

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

1.1.4 Other Forms of Environmental Credit

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

1.1.5 Projects Rejected by Other GHG Programs

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

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.

Further Information

There are 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

Title and Reference of Methodology

VM0010 version 1.2: Methodology for Improved Forest Management: Conversion of Logged to Protected Forest

This methodology uses all VCS approved definitions from the VCS version 3 and the VCS Tool for AFOLU Methodological Issues.

Applicability of Methodology

According to VM0010 version 1.2, 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.

- *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 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.

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

  The project baseline scenario is planned timber harvest, which doesn't include conversion to managed plantations.

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

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

Project Boundary

According to VM0010 version 1.2, 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:

2.1.1 Geographical Boundaries

When describing physical project boundaries, the following information is shown for per discrete area in the below table:

Compartment number	Allotment number	Local name/ Unique identifier	Location	Geographical coordinate	Area (Ha)
GS	SP	GS-SP-1	Shipi Harvest-Nuture department	X：39385614 Y：3035850	17.87
		GS-SP-2			148.67
	ZX	GS-ZX-1	Zhaoxie Harvest-Nuture department	X：39388687 Y：3006787	61.87
		GS-ZX-2			17.00
		GS-ZX-3			61.73
LC	SP	LC-SP-1	Shipi department	X：39385925 Y：3036075	173.53
		LC-SP-4			86.71
		LC-SP-5			47.20
		LC-SP-7			17.93
		LC-SP-8			68.53
		LC-SP-9			14.40
		LC-SP-10			66.93
		LC-SP-11			82.80
		LC-SP-12			50.27
		LC-SP-13			41.07
		LC-SP-14			98.67
	ZT	LC-ZT-2	Zengtian department	X：39385542 Y：3027785	78.73
		LC-ZT-3			64.00
		LC-ZT-4			43.60
		LC-ZT-5			170.87
		LC-ZT-6			208.04
	GX	LC-GX-1	Gongxi department	X：39391869 Y：3061482	57.27
		LC-GX-2			176.00
		LC-GX-4			351.07
		LC-GX-5			169.47
		LC-GX-6			261.4
	NT	LC-NT-2	Niutian department	X：39373661 Y：3021551	4.07
		LC-NT-3			126.47
	ZX	LC-ZX-1	Zhaoxie department	X：39388957 Y：3007210	87.93
		LC-ZX-2			237.07
		LC-ZX-3			116.00

		LC-ZX-4			77.13
		LC-ZX-5			58.07
		LC-ZX-6			27.47
		LC-ZX-7			142.07
		LC-ZX-8			10.67
	JZ	LC-JZ-1	Jinzhu department	X：39394140 Y：3000904	1,897.07
		LC-JZ-2			107.53
		LC-JZ-3			145.20
		LC-JZ-6			925.53
		LC-JZ-4			6.80
		LC-JZ-5			59.13
		LC-JZ-7			218.33
		LC-JZ-8			131.60
		LC-JZ-9			105.07
		LC-JZ-10			16.40
		LC-JZ-11			64.00
		LC-JZ-12			68.80
		LC-JZ-13			167.53
		LC-JZ-14			33.47
		LC-JZ-15			50.00
		LC-JZ-16			81.20
		LC-JZ-17			146.47
2	**8**				**7,746.7**

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.

2.1.2 Temporal Boundaries

The following temporal boundaries shall be defined:

Start date and length of the project crediting period

According to VCS standard version 3.3, the start date of the project activity is 01/01/2006. The length of the project crediting period is 30 years.

Duration of the monitoring periods

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

2.1.3 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 accumulated)	Excluded	Following IPCC guidelines, it is assumed 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

2.1.4 Greenhouse Gases

The emissions sources included in or excluded from the project boundary are shown in Table 3.

Table 3: Emission sources other than resulting from changes in stocks in carbon pools

	Sources	**Included/Excluded**	**Justification/explanation of choice**
Carbon dioxide (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 case.
	Removal of herbaceous vegetation	Excluded	Based on CDM EB decision reflected in paragraph 11 of the report of the 23rd session of the board: cdm.unfccc.int/Panels/ar/023/ar_023_rep.pdf
Methane (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 case.
	Burning of Biomass	Included	Included as CO_2 equivalent emission
Nitrous oxide (N_2O)	Combustion of fossil fuels (in vehicles, machinery and equipment)	Excluded	Potential emissions are negligible
	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

Baseline Scenario

2.1.5 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), all the alternatives are as follow:

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

●Extrapolation of observed similar activities in the geographical area with similar socio-economic and ecological conditions to the proposed VCS AFOLU project activity occurring in the period beginning ten years prior to 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.

2.1.6 Modelling the baseline scenario

According to VM0010 version 1.2, 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 transport system to move harvested timber products from the land parcels to downstream processing or market entry points; and

e) list necessary harvest and transport machinery.

The timber harvest plan will follow local best practice for timber harvest and the timber resource volume and extraction quotas defined in the 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, spelling out details of harvest 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 of each land parcel is scheduled to occur;

c) the number of years each land parcel is in a post-harvest 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) technical specifications for the categories of wood products to be harvested; and

g) 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 shall be the mean extracted volume per unit area by species in each stratum in each year ($V_{EX,j,i|BSL}$).

2.1.7 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.

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.

Table 4 shows the 5strata specified based on the tree species and ages.

Table 4: Tree strata

Serial number of strata	Area (ha)	Tree species	Age in 2005
Chinese Fir-I	822.93	Chinese Fir	0~5
Chinese Fir-II	116.93	Chinese Fir	6-10

Chinese Fir-III	6,703.65	Chinese Fir	14-19
Slash Pine-I	43.20	Slash Pine	0~5
Slash Pine-II	60.00	Slash Pine	12~16
5	**7,746.7**		

Additionality

According to VM0010 version 1.2, 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 sections are applied for the project:

2.1.8 Identification of alternative land use scenarios to the AFOLU project activity;

2.1.8.1 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
- Extrapolation of observed similar activities in the geographical area with similar socio-economic and ecological conditions to the proposed VCS AFOLU project activity occurring in the period beginning ten years prior to 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.

2.1.8.2 **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, Jiangxi province ecological public welfare forest management approach and Le'an County ecological public welfare forest management approach. 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 above.

Outcome of Section 2.5.1.2:

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.

2.1.9 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.

2.1.9.1 **Determine appropriate analysis method**

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)*, there are three options can be applied for investment analysis, namely simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

For this project activity, the simple cost analysis is not applicable as the project activity will earn subsidies from the protected forest fund other than VCS related income.

Therefore, the project will use the investment comparison analysis (Option II) since the 2 alternatives identified in section 2.5.1 both have cost and benefit separately.

2.1.9.2 **Option II. Apply investment comparison analysis**
As the PP should be compared to determined which one is the more economic attractive scenario in the 2 scenarios identified in section 2.5.1.1, NPV will be used as the financial indicator to calculate the discounting in 30 years for decision-making context.

2.1.9.3 **Calculation and comparison of financial indicators (only applicable to options II and III):**
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 section 2.5.1.

The assumptions and input data for the investment analysis are shown in Table 5 below:

Table 5: The basic assumptions and input data for the investment analysis

Item	Unit	Project scenario value	baseline scenario value	Data source
Chinese Fir Price	RMB/m^3		435.31	Financial statement
Pine Price	RMB/m^3		540.02	Financial statement
Subsidy	RMB/Mu	5		Forest management and protected agreement
Total Area	Mu	116,200.5[1]		
A/R cost	RMB/Mu	0	330.00	A/R agreement
Harvest cost	RMB/m^3	0	120	Harvest agreement
Woods-raising fund	%	0	12%	Collecting of Woods-raising fund and Maintenance of Simple Reproduce Fee management regulation of Jiangxi Province
Maintenance of Simple Reproduce Fee	%	0	8%	
Administration Fee	RMB/Mu	11	11	Project Proposal
Forest Maintain Fee	RMB/Mu	1	0	Forest management and protected agreement
Discount rate	%	8%	8%	Economical Assessment Temporary Regulation on Electrical Technology Improvement Project

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

[1] 116,200.5Mu=7,746.7 ha

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 ¥8,314*10^4 Yuan with the discount rate of 8%. However, the NPV under the scenario of protected forest is only ¥-916*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 ¥5,965*10^4 Yuan. With revenue from VCS at the assumed price level, the project would be more financially attractive. Table 6 shows the comparison of the NPV between project and baseline scenario.

Table 6: Comparison of NPV at different scenarios

	NPV (10^4 Yuan)
Scenario of Logging	¥8,314
Scenario of protected	¥-916

2.1.9.4 Sensitivity analysis

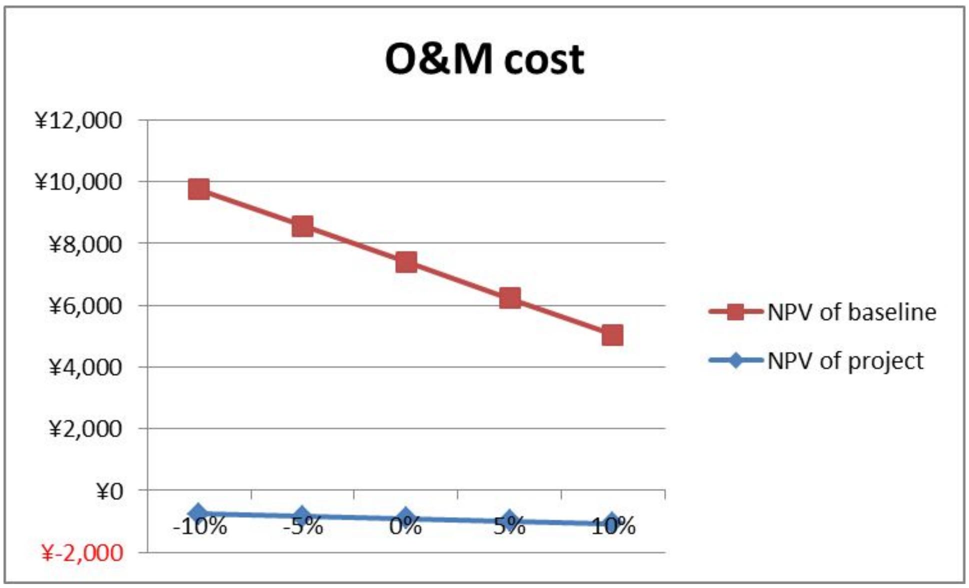
The objective of the sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic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

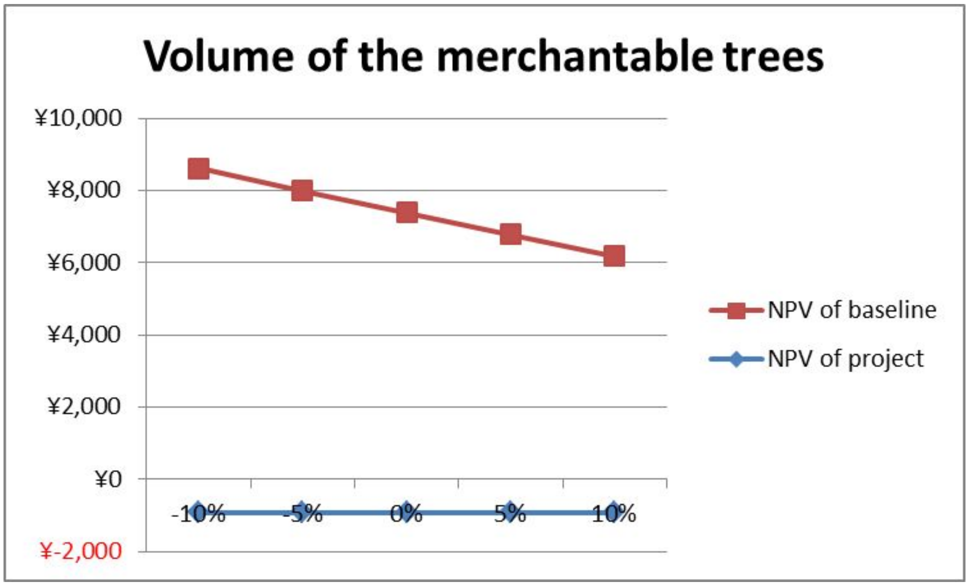
For the project, the key parameters of Price of the trees, the O&M cost, the volume of the extracted trees, and the subsidy price will be taken into account of the sensitivity analysis. Results of the four parameter factors are shown in the table 7 and figure 2 below:

Table 7: NPV comparison sensitivity analysis of the project

The Key parameters	**NPV of project**					**NPV of baseline**				
	-10%	**-5%**	**0%**	**5%**	**10%**	**-10%**	**-5%**	**0%**	**5%**	**10%**
Price of the trees	¥-916	¥-916	¥-916	¥-916	¥-916	¥5,892	¥7,103	¥8,314	¥9,525	¥10,736
O&M cost	¥-759	¥-837	¥-916	¥-994	¥-1,073	¥10,510	¥9,412	¥8,314	¥7,216	¥6,118
Volume of the extracted trees	¥-916	¥-916	¥-916	¥-916	¥-916	¥9,531	¥8,922	¥8,314	¥7,705	¥7,097
subsidy price	¥-981	¥-948	¥-916	¥-883	¥-850	¥8,314	¥8,314	¥8,314	¥8,314	¥8,314


Price of trees
¥12,000
¥10,000
¥8,000
¥6,000
¥4,000
¥2,000
¥0
¥-2,000
-10%
-5%
0%
5%
10%
NPV of baseline
NPV of project


O&M cost
¥12,000
¥10,000
¥8,000
¥6,000
¥4,000
¥2,000
¥0
¥-2,000
-10%
-5%
0%
5%
10%
NPV of baseline
NPV of project



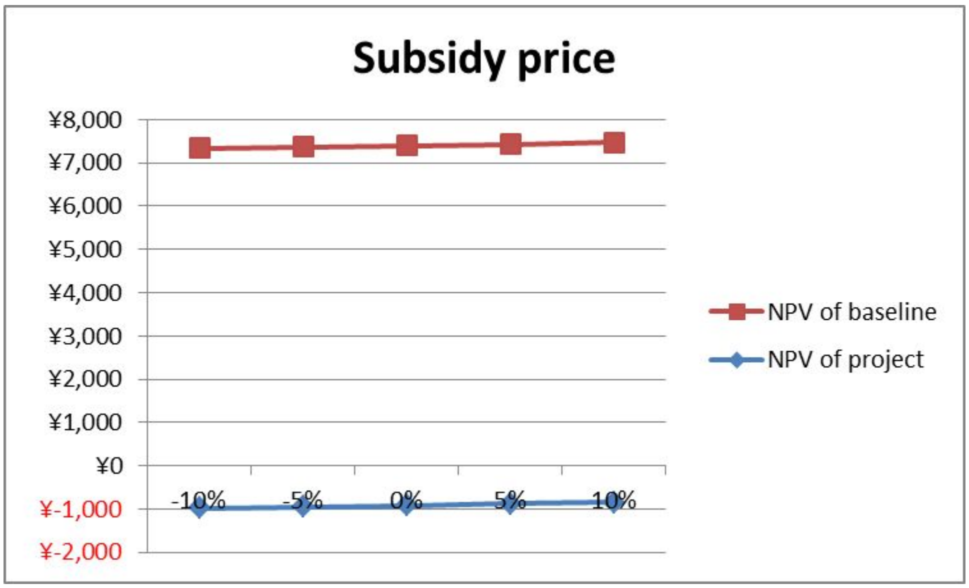


Figure 2: Sensitivity analysis of the project

By referring the Figures above, the NPV under protected scenario will not exceed the NPV under logged scenario if the Price of the trees, the O&M cost, the volume of the extracted trees, and the subsidy price varies within 10%.

In order to show the opportunity of the NPV under protected scenario exceeding the NPV under logged scenario is very little, the analysis of critical assumption is conducted, as shown in table below. That is to what extent the four sensitive factors can be reached when the NPV under protected scenario will exceed the NPV under logged scenario.

Sensitive factor	**Variation range**	
Price of the trees	−38. 11%	**the NPV under protected scenario will exceed the NPV under logged scenario**
O&M cost	45. 27%	
Volume of the extracted trees	75. 85%	
subsidy price	More than 1000%	

1) Price of the trees

If the Price of the trees was decreased by 38.11%, the NPV under protected scenario will exceed the NPV under logged scenario. However, the purchasing price indices for raw materials have been increasing in China in recent years which can impact the price of the trees. Take 2010 for example, the general index of investment price for fixed assets increased 3.6% compared with 2009, and the price of raw materials increased by 9.6%[2]. Consequently it is impossible to improve the financial attraction due to the decrease of Price of the trees. So it is impossible for Price of the trees to decrease by 38.11%.

2) O&M cost

If the annual O&M cost of the project increase by 45.27%, the NPV under protected scenario will exceed the NPV under logged scenario. However, as the PP will make their best to manage the project as well as they can, they will control the O&M cost not to increase so much and not to let the NPV decrease. Therefore, although maybe the price of material and salaries of the employees are increasing, it will not reach to the range of 45.27%. Thus, it is nearly impossible for the operating costs decreasing by 45.27%. This assumption is highly unlikely.

3) Volume of the extracted trees

In order to the NPV under protected scenario will exceed the NPV under logged scenario, the Volume of the extracted trees of the project must be increased by 75.85%. However, the estimation of the volume of the extracted trees is calculated through the selected allometric equations which are actually verified correctly. Therefore, this rate of decrease on Volume of the extracted trees of the project in the whole crediting period will be unlikely to happen.

4) Subsidy price

In order to the NPV under protected scenario will exceed the NPV under logged scenario, the subsidy price of the project must be increased more than 1000%.

The subsidy price is given by the government which is strictly regulated, so that there is no chance for project to negotiate with them. Even though it could be increase, the range of increase controlled by the government could not be huge, such as 1000%. Therefore, it is not possible to let the NPV under protected scenario exceed the NPV under logged scenario through an increase in the subsidy price.

[2] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20110228_402705692.htm

Therefore, the results of the sensitivity analysis confirm the conclusion that the project is financially unattractive.

2.1.10 Barriers analysis

Not applicable.

2.1.11 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"*.

There was a significant Reform of Collectively Owned Forest Right taken by Jiangxi Province[3] from September 2004 and then the Forest System was different compared to the situation before the reform. So considerations are limited to the period beginning September 2004. After the reform, the business model of collectively owned forest was significantly different from the stated-owned forest. As the project activity belongs to the stated-owned forest, there are essential distinctions between the project activity and the other collectively owned activities in Le'an county. Therefore, only stated-owned activities are included in the analysis.

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 Jiangxi Province. However, the geographic and geomorphic conditions are totally different in the whole province. For example, the forest development area has been divided to 6 areas based on the landform characteristics and the forest production situation by the Jiangxi Province Forest Department according to the Jiangxi province Forestry D*evelopment* Plan[4]. In this Plan, Le'an County belongs to the middle-east hilly mountain area of the Jiangxi Province together with the other 8 counties, which are Nancheng, Nanfeng, Jinxi, Zixi, Lichuan, Chongren, Yihuang and Guangchang.

Therefore, the stated-owned activities in the middle-east hilly mountain area of the Jiangxi Province from September 2004 have been identified.

In the middle-east hilly mountain area of the Jiangxi Province from September 2004, Le'an county and Guangchang county are two national level poverty-stricken counties[5] and the economic environment is not the same as other counties.

However, the Guangchang county was a *central Soviet area county* before[6] and could earn additional national subsidies for its economic development from 2001 till now[7]. So the economic environment in Guangchang county is different from Le'an county.

Therefore, according to the analysis above, essential distinctions which include a fundamental and verifiable change in circumstances under which the proposed VCS AFOLU project activity is

[3] http://www.forestry.gov.cn/ZhuantiAction.do?dispatch=content&id=267747&name=gzhy
[4] http://www.jxly.gov.cn/zwgk/fzgh/sjgh/201112/t20111215_61299.htm
[5] http://www.jxcn.cn/2444/2010-8-5/30053@743011.htm
[6] http://baike.baidu.com/view/2535024.htm
[7] http://www.pprd.org.cn/yanlun/201202/t20120228_238119.htm

implemented when compared to circumstances under which similar activities were carried out. So there are no similar activities in Le'an county.

Therefore, the project activity is not the baseline scenario and, hence, it is additional.

Methodology Deviations

N.A.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

Baseline Emissions

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

The baseline net greenhouse gas emissions are determined from calculation of deadwood generated in the process of timber harvest, the emissions resulting from production and subsequent retirement of wood products derived from the timber harvesting, minus the rates of forest regrowth post timber harvest.

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 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 harvesting plan.

According to VM0010 version 1.2, 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 the year of 2005, which 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 2005 by local forest bureau. The project involves 5 stratus and 394 subcompartments. For each strata, mean volume is estimated from sample plot size of 0.04 ha^2 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:

(1)

Where:

merchantable volume for species *j* in stratum *i* in sample plot *sp*, m^3;

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:

(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:

(3)

Where:

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

$V_{EX,j,i|BSL}$ 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};

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:

(4)

Where:

$C_{EX,j,i|BSL}$ mean carbon stock of extracted timber per unit area for species j in stratum i; $tC·ha^{-1}$;

$V_{EX,j,i|BSL}$ mean volume of extracted timber per unit area for species j in stratum i; in $m^3·ha^{-1}$;

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:

(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, $tC \cdot ha^{-1}$;

j 1, 2, 3 …J tree species;

i 1, 2, 3 …M strata; and

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:

(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 wood per hectare, $tC \cdot ha^{-1}$;

i 1, 2, 3 …M strata; and

j 1, 2, 3 …J 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:

(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:

(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:

(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 $tC{\cdot}ha^{-1}$;

OFk 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:

(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:

(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:

(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:

(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 are calculated according to equation 14 below. Note that there will be no more emissions quantified from decay of logging slash or wood products.

(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:

(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:

(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}.

Project Emissions

3.1.6 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.

3.1.6.1 **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.

3.1.6.2 **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.

3.1.6.3 **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:

(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.$^{-1}$;

$f_j(X,Y...)$ 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.

3.1.6.4 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:

(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.

3.1.6.5 Determining Mean Carbon Stocks

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

(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.

3.1.6.6 **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:

(20)

Where:

$\Delta C_{AB,t\|PRJ}$	anuual 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=t2 – t1); 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 and 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.

3.1.7 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

3.1.7.1 **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:

(21)

Where:

$\Delta C_{DIST\_FR,t\|PRJ}$	net greenhouse gas emissions resulting from fire disturbance in year *t*, tCO2e ;
$A_{burn,i,t}$	area burnt for stratum *i* at time *t*, ha;
$B_{i,t\|PRJ}$	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 CH4 (IPCC default: 21), tCO2e tCH4 $^{-1}$;
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:

(22)

Where:

$B_{i,t\|PRJ}$	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};
$V_{EX,j,i\|BSL}$	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.

(23)

Where:

$\Delta C_{DIST,t\|PRJ}$	net greenhouse gas emissions resulting from non-fire natural disturbance in year *t*, tCO2e ;
$A_{dist,i,t}$	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·ha^{-1};
44/12	ratio of molecular weights of carbon dioxide and carbon, tCO2e 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

3.1.7.2 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:

(24)

Where:

$\Delta C_{DIST\_IL,t\|PRJ}$	net carbon stock changes as a result of illegal logging at time *t*, tCO2e;
$A_{DIST\_IL,}i$	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, tCO2e;
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

3.1.8 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:

(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:

(26)

Where:

$GHG_{NET\|PRJ}$	net greenhouse gas emissions in the project scenario since the start of the project activity, tCO_2e
∆ CNET,t|PRJ	net greenhouse gas emissions in the project scenario in year t, tCO2e; and
t	1, 2, 3, t* years elapsed since start of the project activity.

Leakage

3.1.9 Activity shifting leakage

There may be no leakage due to activity shifting because:

- Comparing to the records of inventory data in 2009, the historical records of inventory data in 2005 shows trends in harvest volumes paired with records from the with-project time period showing no deviation from historical trends;
- Prior to the start of the project on 01/01/2006, forest management plans prepared in 2001 to 2005 shows harvest plans on all owned/managed lands paired with records from the with-project time period showing no deviation from management plans.

3.1.10 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:

(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.

According to the VM0010 version 1.2, the leakage factor is defined as 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 national law, the forest harvest limit every year is the maximum limit, which must be strictly implemented and could not be broken. For example, according to the Notice of the review opinion approved by the State Council which about the year's forest harvest limit in the 11th Five-year in all regions reported by State Forest Bureau (Guofa[2005]No.41), the annual extracted volume from 2006 to 2009 is $24815.5*10^4$ m^3, and the extracted volume of the project is 0.01%[8] of the national extracted volume. This proportion is very tiny and would not lead to the new concessions being assigned. Therefore, there would be no new concessions assigned. AND,

- According to the Notice of the review opinion approved by the State Council which about the year's forest harvest limit in the 11th Five-year in all regions reported by State Forest Bureau (Guofa[2005]No.41), the extracted volume from 2006 to 2009 is $99262*10^4$ m^3 which could not be increased within existing national concessions AND,

- Illegal logging is the activity of logging without approved by the forestry government or logging not conforming to the requirement of the forestry government. Then the limit for the project could not be used for other forests. According to the Article 39 of the Forestry Law of the People's Republic of China (the national law)[9], the illegal logging is forbidden as loss should be compensated if illegal logging was occurred. Replanting should be taken, trees or incomes should be confiscated and penalty should be imposed. If constitutes a crime, the criminal responsibilities should be affixed. Governments at all levels in China monitor and control the illegal logging closely. According to the Speech of the director Jia Zhibang of State Forestry Bureau at the national

[8] The extracted volume of the project from 2006 to 2009 is 106665 m^3.
[9] http://www.gov.cn/ziliao/flfg/2005-09/27/content_70626.htm

forestry department director session (from the national official website)[10], the illegal logging is absent

- .

Therefore,

$LF_{ME} = 0$

The actual value will be monitored when verification.

Summary of GHG Emission Reductions and Removals

3.1.11 Net Project Greenhouse Gas Emission Reductions

According to VM0010 version 1.2, the Net Project Greenhouse Gas Emission Reductions are calculated as:

(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

3.1.12 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.

3.1.12.1 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

[10] http://www.gov.cn/gzdt/2010-02/04/content_1527930.htm

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:

(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:

(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.

3.1.12.2 **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=t2 (the date of verification) for monitoring period T=t2-t1, is calculated as:

(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*=t1 in tCO_2e;

$Credits_{total.t2|LtPF}$ net anthroprogenic greenhouse gas removals by sinks, as estimated for t*=t2 in tCO_2e; and

$Bu_{|IFM-VCS}$ total number of credits withheld in VCS buffer account.

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

(1). For every stratum, the value of $V_{ex,j,i|BSL}$ is based on data from actual field measurements in Year 2005 shown below quoted from the inventory data, which are shown in table 8

Table 8:

subcompartment	Area (ha)	Species	numbers of plants/ha	V (in year 2005 m^3/ha)	D (in 20 years)	H (in 20 years)	V (m^3/plant)	V (20 years,m^3/ha)
LC-GX-4-1	17.53	Chinese Fir	3,005	0	13.67	15.45	0.11	333
LC-GX-4-2	34.40	Chinese Fir	2,580	0	13.67	15.45	0.11	286
LC-GX-4-3	34.53	Chinese Fir	2,980	0	13.67	15.45	0.11	330
LC-GX-4-4	21.73	Chinese Fir	2,990	0	13.67	15.45	0.11	331
LC-GX-5-1	27.53	Chinese Fir	2,565	0	13.67	15.45	0.11	284
LC-GX-6-2	20.27	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-GX-6-3	30.20	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-SP-14-1	21.73	Chinese Fir	3,000	0	13.67	15.45	0.11	333
LC-SP-14-2	25.60	Chinese Fir	2,955	0	13.67	15.45	0.11	328
LC-SP-14-3	31.20	Chinese Fir	2,895	0	13.67	15.45	0.11	321
LC-ZT-2-2	39.80	Chinese Fir	2,850	0	13.67	15.45	0.11	316
LC-ZT-2-3	38.93	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-3-2	37.20	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-4-1	43.60	Chinese Fir	3,075	0	13.67	15.45	0.11	341
LC-ZT-5-5	39.20	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-5-6	33.40	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-5-7	29.73	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-5-8	29.20	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-5-9	39.33	Chinese Fir	2,505	0	13.67	15.45	0.11	278
LC-ZT-6-9	27.73	Chinese Fir	3,075	0	13.67	15.45	0.11	341
LC-ZT-6-10	16.13	Chinese Fir	3,150	0	13.67	15.45	0.11	349
LC-NT-2-1	4.07	Chinese Fir	2,970	0	13.67	15.45	0.11	329
LC-NT-3-1	16.13	Chinese Fir	2,850	0	13.67	15.45	0.11	316
LC-NT-3-2	16.07	Chinese Fir	2,940	0	13.67	15.45	0.11	326
LC-NT-3-3	19.67	Chinese Fir	2,895	0	13.67	15.45	0.11	321
LC-NT-3-4	17.80	Chinese Fir	2,805	0	13.67	15.45	0.11	311
LC-ZX-1-1	27.93	Chinese Fir	3,300	0	13.67	15.45	0.11	366
GS-SP-2-1	22.00	Chinese Fir	2,775	0	13.67	15.45	0.11	308

GS-SP-2-3	60.27	Chinese Fir	2,700	0	13.67	15.45	0.11	299
29	822.93			0				309
LC-ZX-2-4	25.47	Chinese Fir	2,400	5	13.67	15.45	0.11	266
GS-SP-2-4	12.73	Chinese Fir	2,610	3	13.67	15.45	0.11	289
GS-ZX-2-1	17.00	Chinese Fir	2,875	3	13.67	15.45	0.11	319
GS-ZX-3-1	30.67	Chinese Fir	2,550	7	13.67	15.45	0.11	283
GS-ZX-3-2	31.07	Chinese Fir	2,250	4	13.67	15.45	0.11	249
5	116.93			4				281
LC-GX-1-1	27.47	Chinese Fir	1,644	69	13.67	15.45	0.11	182
LC-GX-1-2	29.80	Chinese Fir	1,669	88	13.67	15.45	0.11	185
LC-GX-2-1	28.80	Chinese Fir	1,520	87	13.67	15.45	0.11	168
LC-GX-2-2	33.40	Chinese Fir	1,599	92	13.67	15.45	0.11	177
LC-GX-2-3	21.20	Chinese Fir	1,604	99	13.67	15.45	0.11	178
LC-GX-2-4	25.27	Chinese Fir	1,504	92	13.67	15.45	0.11	167
LC-GX-2-5	31.40	Chinese Fir	1,408	66	13.67	15.45	0.11	156
LC-GX-2-6	35.93	Chinese Fir	1,543	76	13.67	15.45	0.11	171
LC-GX-4-6	25.93	Chinese Fir	1,574	78	13.67	15.45	0.11	174
LC-GX-4-7	24.93	Chinese Fir	1,703	88	13.67	15.45	0.11	189
LC-GX-4-8	37.93	Chinese Fir	1,681	68	13.67	15.45	0.11	186
LC-GX-4-9	21.40	Chinese Fir	1,535	51	13.67	15.45	0.11	170
LC-GX-4-10	37.27	Chinese Fir	1,762	87	13.67	15.45	0.11	195
LC-GX-4-11	21.60	Chinese Fir	1,684	67	13.67	15.45	0.11	187
LC-GX-4-12	26.27	Chinese Fir	1,686	79	13.67	15.45	0.11	187
LC-GX-4-13	26.87	Chinese Fir	1,581	83	13.67	15.45	0.11	175
LC-GX-4-14	20.67	Chinese Fir	1,541	72	13.67	15.45	0.11	171
LC-GX-5-2	28.80	Chinese Fir	2,361	48	13.67	15.45	0.11	262
LC-GX-5-3	29.07	Chinese Fir	1,609	60	13.67	15.45	0.11	178
LC-GX-5-4	30.00	Chinese Fir	2,135	94	13.67	15.45	0.11	237
LC-GX-5-5	19.27	Chinese Fir	1,705	65	13.67	15.45	0.11	189
LC-GX-5-6	34.80	Chinese Fir	1,809	76	13.67	15.45	0.11	201
LC-GX-6-1	34.80	Chinese Fir	1,946	53	13.67	15.45	0.11	216
LC-GX-6-4	33.27	Chinese Fir	1,822	42	13.67	15.45	0.11	202
LC-GX-6-5	31.47	Chinese Fir	1,734	63	13.67	15.45	0.11	192

LC-GX-6-6	32.47	Chinese Fir	1,615	64	13.67	15.45	0.11	179
LC-GX-6-7	31.93	Chinese Fir	1,971	70	13.67	15.45	0.11	218
LC-GX-6-12	22.53	Chinese Fir	1,406	82	13.67	15.45	0.11	156
LC-GX-6-13	25.73	Chinese Fir	1,519	66	13.67	15.45	0.11	168
LC-GX-6-14	24.80	Chinese Fir	1,590	56	13.67	15.45	0.11	176
LC-GX-6-15	14.53	Chinese Fir	1,838	72	13.67	15.45	0.11	204
LC-GX-6-16	17.00	Chinese Fir	1,687	82	13.67	15.45	0.11	187
LC-SP-1-1	5.13	Chinese Fir	1,463	67	13.67	15.45	0.11	162
LC-SP-1-2	11.40	Chinese Fir	2,121	70	13.67	15.45	0.11	235
LC-SP-1-3	7.60	Chinese Fir	1,382	41	13.67	15.45	0.11	153
LC-SP-1-4	10.00	Chinese Fir	1,474	61	13.67	15.45	0.11	163
LC-SP-1-5	10.33	Chinese Fir	1,533	74	13.67	15.45	0.11	170
LC-SP-1-6	8.00	Chinese Fir	1,521	76	13.67	15.45	0.11	169
LC-SP-1-7	9.60	Chinese Fir	1,364	58	13.67	15.45	0.11	151
LC-SP-1-8	7.00	Chinese Fir	998	65	13.67	15.45	0.11	111
LC-SP-1-9	10.60	Chinese Fir	1,328	74	13.67	15.45	0.11	147
LC-SP-1-10	10.00	Chinese Fir	1,316	88	13.67	15.45	0.11	146
LC-SP-1-11	11.80	Chinese Fir	1,581	79	13.67	15.45	0.11	175
LC-SP-1-12	11.93	Chinese Fir	1,492	76	13.67	15.45	0.11	165
LC-SP-1-13	13.00	Chinese Fir	1,325	89	13.67	15.45	0.11	147
LC-SP-1-14	9.60	Chinese Fir	1,364	73	13.67	15.45	0.11	151
LC-SP-1-15	8.00	Chinese Fir	1,707	79	13.67	15.45	0.11	189
LC-SP-1-16	7.40	Chinese Fir	1,327	78	13.67	15.45	0.11	147
LC-SP-1-17	8.93	Chinese Fir	1,819	77	13.67	15.45	0.11	202
LC-SP-1-18	6.80	Chinese Fir	1,638	60	13.67	15.45	0.11	182
LC-SP-1-31	6.40	Chinese Fir	1,685	78	13.67	15.45	0.11	187
LC-SP-4-1	8.07	Chinese Fir	1,339	60	13.67	15.45	0.11	148
LC-SP-4-2	8.80	Chinese Fir	1,266	92	13.67	15.45	0.11	140
LC-SP-4-3	17.93	Chinese Fir	1,834	71	13.67	15.45	0.11	203
LC-SP-4-4	18.07	Chinese Fir	1,547	79	13.67	15.45	0.11	171
LC-SP-4-5	25.13	Chinese Fir	1,765	72	13.67	15.45	0.11	196
LC-SP-4-6	8.71	Chinese Fir	1,548	65	13.67	15.45	0.11	172
LC-SP-5-1	20.80	Chinese Fir	1,825	73	13.67	15.45	0.11	202

LC-SP-5-2	26.40	Chinese Fir	1,815	67	13.67	15.45	0.11	201
LC-SP-7-1	17.93	Chinese Fir	1,514	78	13.67	15.45	0.11	168
LC-SP-8-1	25.20	Chinese Fir	1,571	72	13.67	15.45	0.11	174
LC-SP-8-2	21.73	Chinese Fir	1,542	79	13.67	15.45	0.11	171
LC-SP-8-3	21.60	Chinese Fir	1,580	70	13.67	15.45	0.11	175
LC-SP-9-1	14.40	Chinese Fir	1,569	65	13.67	15.45	0.11	174
LC-SP-10-1	22.27	Chinese Fir	1,778	66	13.67	15.45	0.11	197
LC-SP-10-2	29.20	Chinese Fir	1,576	64	13.67	15.45	0.11	175
LC-SP-10-3	15.47	Chinese Fir	1,665	60	13.67	15.45	0.11	185
LC-SP-11-1	13.73	Chinese Fir	1,916	63	13.67	15.45	0.11	212
LC-SP-11-2	15.87	Chinese Fir	1,589	52	13.67	15.45	0.11	176
LC-SP-11-3	25.73	Chinese Fir	1,632	68	13.67	15.45	0.11	181
LC-SP-11-4	27.47	Chinese Fir	1,878	63	13.67	15.45	0.11	208
LC-SP-12-1	12.80	Chinese Fir	1,598	65	13.67	15.45	0.11	177
LC-SP-12-2	14.00	Chinese Fir	1,559	59	13.67	15.45	0.11	173
LC-SP-12-3	23.47	Chinese Fir	1,736	66	13.67	15.45	0.11	192
LC-SP-13-1	16.53	Chinese Fir	1,576	64	13.67	15.45	0.11	175
LC-SP-13-2	24.53	Chinese Fir	1,879	72	13.67	15.45	0.11	208
LC-ZT-6-5	28.87	Chinese Fir	1,306	37	13.67	15.45	0.11	145
LC-ZT-6-6	31.27	Chinese Fir	2,091	33	13.67	15.45	0.11	232
LC-ZT-6-7	17.87	Chinese Fir	2,094	36	13.67	15.45	0.11	232
LC-ZT-6-8	28.60	Chinese Fir	1,559	68	13.67	15.45	0.11	173
LC-ZX-1-2	16.87	Chinese Fir	1,683	77	13.67	15.45	0.11	187
LC-ZX-1-3	17.40	Chinese Fir	1,947	82	13.67	15.45	0.11	216
LC-ZX-1-4	25.73	Chinese Fir	1,796	76	13.67	15.45	0.11	199
LC-ZX-2-1	24.20	Chinese Fir	1,620	74	13.67	15.45	0.11	180
LC-ZX-2-2	19.27	Chinese Fir	1,579	58	13.67	15.45	0.11	175
LC-ZX-2-3	19.33	Chinese Fir	1,572	67	13.67	15.45	0.11	174
LC-ZX-2-5	21.33	Chinese Fir	1,821	52	13.67	15.45	0.11	202
LC-ZX-2-6	12.60	Chinese Fir	1,712	70	13.67	15.45	0.11	190
LC-ZX-2-7	26.13	Chinese Fir	1,658	70	13.67	15.45	0.11	184
LC-ZX-2-8	31.07	Chinese Fir	1,465	59	13.67	15.45	0.11	162
LC-ZX-2-9	25.93	Chinese Fir	1,622	66	13.67	15.45	0.11	180

LC-ZX-2-10	31.73	Chinese Fir	1,960	68	13.67	15.45	0.11	217
LC-ZX-3-1	44.80	Chinese Fir	1,691	56	13.67	15.45	0.11	187
LC-ZX-3-2	31.33	Chinese Fir	1,757	74	13.67	15.45	0.11	195
LC-ZX-3-3	39.87	Chinese Fir	1,447	57	13.67	15.45	0.11	160
LC-ZX-4-6	16.80	Chinese Fir	1,662	55	13.67	15.45	0.11	184
LC-ZX-4-7	37.27	Chinese Fir	1,648	54	13.67	15.45	0.11	183
LC-ZX-5-1	29.93	Chinese Fir	1,671	61	13.67	15.45	0.11	185
LC-ZX-5-2	28.13	Chinese Fir	1,787	59	13.67	15.45	0.11	198
LC-ZX-6-1	27.47	Chinese Fir	1,566	50	13.67	15.45	0.11	174
LC-ZX-7-1	20.53	Chinese Fir	1,817	74	13.67	15.45	0.11	201
LC-ZX-7-2	9.80	Chinese Fir	1,656	65	13.67	15.45	0.11	184
LC-ZX-7-3	18.53	Chinese Fir	1,718	67	13.67	15.45	0.11	190
LC-ZX-7-4	18.87	Chinese Fir	1,888	62	13.67	15.45	0.11	209
LC-ZX-7-5	19.33	Chinese Fir	1,722	67	13.67	15.45	0.11	191
LC-ZX-7-6	19.53	Chinese Fir	1,588	51	13.67	15.45	0.11	176
LC-ZX-7-7	19.73	Chinese Fir	1,662	60	13.67	15.45	0.11	184
LC-ZX-7-8	15.73	Chinese Fir	1,739	68	13.67	15.45	0.11	193
LC-ZX-8-1	10.67	Chinese Fir	2,111	70	13.67	15.45	0.11	234
LC-JZ-1-1	15.93	Chinese Fir	1,870	59	13.67	15.45	0.11	207
LC-JZ-1-2	22.20	Chinese Fir	1,680	55	13.67	15.45	0.11	186
LC-JZ-1-3	19.93	Chinese Fir	1,962	32	13.67	15.45	0.11	217
LC-JZ-1-4	20.73	Chinese Fir	1,858	47	13.67	15.45	0.11	206
LC-JZ-1-5	13.00	Chinese Fir	1,664	53	13.67	15.45	0.11	184
LC-JZ-1-6	11.80	Chinese Fir	1,693	68	13.67	15.45	0.11	188
LC-JZ-1-7	11.20	Chinese Fir	1,935	44	13.67	15.45	0.11	214
LC-JZ-1-8	16.53	Chinese Fir	1,772	46	13.67	15.45	0.11	196
LC-JZ-1-9	18.33	Chinese Fir	2,090	29	13.67	15.45	0.11	232
LC-JZ-1-10	12.40	Chinese Fir	2,025	19	13.67	15.45	0.11	224
LC-JZ-1-11	10.33	Chinese Fir	2,091	33	13.67	15.45	0.11	232
LC-JZ-1-12	10.00	Chinese Fir	2,194	38	13.67	15.45	0.11	243
LC-JZ-1-13	14.40	Chinese Fir	1,875	20	13.67	15.45	0.11	208
LC-JZ-1-14	16.80	Chinese Fir	1,851	55	13.67	15.45	0.11	205
LC-JZ-1-15	18.60	Chinese Fir	1,536	25	13.67	15.45	0.11	170

LC-JZ-1-16	22.00	Chinese Fir	1,505	59	13.67	15.45	0.11	167
LC-JZ-1-17	14.20	Chinese Fir	1,974	46	13.67	15.45	0.11	219
LC-JZ-1-18	14.53	Chinese Fir	2,480	33	13.67	15.45	0.11	275
LC-JZ-1-19	9.13	Chinese Fir	2,204	36	13.67	15.45	0.11	244
LC-JZ-1-20	12.53	Chinese Fir	2,240	32	13.67	15.45	0.11	248
LC-JZ-1-21	20.40	Chinese Fir	1,908	21	13.67	15.45	0.11	211
LC-JZ-1-22	10.73	Chinese Fir	1,852	55	13.67	15.45	0.11	205
LC-JZ-1-23	14.33	Chinese Fir	2,221	39	13.67	15.45	0.11	246
LC-JZ-1-24	23.33	Chinese Fir	1,545	60	13.67	15.45	0.11	171
LC-JZ-1-25	13.33	Chinese Fir	1,966	32	13.67	15.45	0.11	218
LC-JZ-1-26	21.80	Chinese Fir	2,246	38	13.67	15.45	0.11	249
LC-JZ-1-27	21.00	Chinese Fir	1,802	29	13.67	15.45	0.11	200
LC-JZ-1-28	12.93	Chinese Fir	1,500	25	13.67	15.45	0.11	166
LC-JZ-1-29	13.93	Chinese Fir	1,735	64	13.67	15.45	0.11	192
LC-JZ-1-30	10.20	Chinese Fir	1,911	78	13.67	15.45	0.11	212
LC-JZ-1-31	9.00	Chinese Fir	1,707	61	13.67	15.45	0.11	189
LC-JZ-1-32	11.40	Chinese Fir	1,814	76	13.67	15.45	0.11	201
LC-JZ-1-33	10.80	Chinese Fir	2,037	41	13.67	15.45	0.11	226
LC-JZ-1-34	13.33	Chinese Fir	1,908	21	13.67	15.45	0.11	211
LC-JZ-1-35	11.80	Chinese Fir	1,734	59	13.67	15.45	0.11	192
LC-JZ-1-36	24.20	Chinese Fir	1,963	53	13.67	15.45	0.11	218
LC-JZ-1-37	10.73	Chinese Fir	1,536	25	13.67	15.45	0.11	170
LC-JZ-1-38	13.40	Chinese Fir	1,816	52	13.67	15.45	0.11	201
LC-JZ-1-39	13.33	Chinese Fir	1,937	31	13.67	15.45	0.11	215
LC-JZ-1-40	27.20	Chinese Fir	2,480	33	13.67	15.45	0.11	275
LC-JZ-1-41	23.20	Chinese Fir	2,146	38	13.67	15.45	0.11	238
LC-JZ-1-42	11.53	Chinese Fir	2,246	42	13.67	15.45	0.11	249
LC-JZ-1-43	20.20	Chinese Fir	2,250	42	13.67	15.45	0.11	249
LC-JZ-1-44	9.20	Chinese Fir	2,404	39	13.67	15.45	0.11	266
LC-JZ-1-45	21.80	Chinese Fir	2,525	18	13.67	15.45	0.11	280
LC-JZ-1-46	10.93	Chinese Fir	2,300	19	13.67	15.45	0.11	255
LC-JZ-1-47	14.60	Chinese Fir	1,967	24	13.67	15.45	0.11	218
LC-JZ-1-48	10.00	Chinese Fir	1,536	27	13.67	15.45	0.11	170

LC-JZ-1-49	14.33	Chinese Fir	1,840	26	13.67	15.45	0.11	204
LC-JZ-1-50	11.00	Chinese Fir	2,159	34	13.67	15.45	0.11	239
LC-JZ-1-51	12.13	Chinese Fir	1,904	31	13.67	15.45	0.11	211
LC-JZ-1-52	17.33	Chinese Fir	2,131	23	13.67	15.45	0.11	236
LC-JZ-1-53	16.73	Chinese Fir	2,922	32	13.67	15.45	0.11	324
LC-JZ-1-54	9.33	Chinese Fir	2,861	27	13.67	15.45	0.11	317
LC-JZ-1-55	19.73	Chinese Fir	2,025	19	13.67	15.45	0.11	224
LC-JZ-1-56	13.20	Chinese Fir	1,940	28	13.67	15.45	0.11	215
LC-JZ-1-57	17.40	Chinese Fir	2,300	19	13.67	15.45	0.11	255
LC-JZ-1-58	18.60	Chinese Fir	2,131	23	13.67	15.45	0.11	236
LC-JZ-1-59	13.33	Chinese Fir	2,423	33	13.67	15.45	0.11	269
LC-JZ-1-60	11.80	Chinese Fir	1,886	36	13.67	15.45	0.11	209
LC-JZ-1-61	18.20	Chinese Fir	2,091	36	13.67	15.45	0.11	232
LC-JZ-1-62	19.73	Chinese Fir	1,966	32	13.67	15.45	0.11	218
LC-JZ-1-63	12.93	Chinese Fir	1,922	19	13.67	15.45	0.11	213
LC-JZ-1-64	8.53	Chinese Fir	1,605	24	13.67	15.45	0.11	178
LC-JZ-1-65	17.20	Chinese Fir	1,643	24	13.67	15.45	0.11	182
LC-JZ-1-66	13.20	Chinese Fir	1,536	25	13.67	15.45	0.11	170
LC-JZ-1-67	13.33	Chinese Fir	1,518	21	13.67	15.45	0.11	168
LC-JZ-1-68	8.80	Chinese Fir	2,091	33	13.67	15.45	0.11	232
LC-JZ-1-69	12.00	Chinese Fir	1,523	32	13.67	15.45	0.11	169
LC-JZ-1-70	9.93	Chinese Fir	2,194	27	13.67	15.45	0.11	243
LC-JZ-1-71	9.00	Chinese Fir	1,868	36	13.67	15.45	0.11	207
LC-JZ-1-72	15.00	Chinese Fir	2,194	27	13.67	15.45	0.11	243
LC-JZ-1-73	13.73	Chinese Fir	961	18	13.67	15.45	0.11	107
LC-JZ-1-74	10.20	Chinese Fir	2,409	35	13.67	15.45	0.11	267
LC-JZ-1-75	12.20	Chinese Fir	1,908	33	13.67	15.45	0.11	211
LC-JZ-1-76	13.20	Chinese Fir	961	13	13.67	15.45	0.11	107
LC-JZ-1-77	13.80	Chinese Fir	1,802	29	13.67	15.45	0.11	200
LC-JZ-1-78	15.33	Chinese Fir	1,823	30	13.67	15.45	0.11	202
LC-JZ-1-79	14.20	Chinese Fir	1,908	33	13.67	15.45	0.11	211
LC-JZ-1-80	13.53	Chinese Fir	2,861	27	13.67	15.45	0.11	317
LC-JZ-1-81	11.00	Chinese Fir	1,802	31	13.67	15.45	0.11	200

LC-JZ-1-82	8.20	Chinese Fir	2,525	18	13.67	15.45	0.11	280
LC-JZ-1-83	9.73	Chinese Fir	2,025	19	13.67	15.45	0.11	224
LC-JZ-1-84	9.20	Chinese Fir	1,875	24	13.67	15.45	0.11	208
LC-JZ-1-85	11.20	Chinese Fir	2,053	23	13.67	15.45	0.11	228
LC-JZ-1-86	9.53	Chinese Fir	2,300	19	13.67	15.45	0.11	255
LC-JZ-1-87	12.20	Chinese Fir	4,652	33	13.67	15.45	0.11	516
LC-JZ-1-88	11.73	Chinese Fir	2,148	28	13.67	15.45	0.11	238
LC-JZ-1-89	10.93	Chinese Fir	2,652	19	13.67	15.45	0.11	294
LC-JZ-1-90	10.80	Chinese Fir	2,525	18	13.67	15.45	0.11	280
LC-JZ-1-91	8.40	Chinese Fir	1,875	29	13.67	15.45	0.11	208
LC-JZ-1-92	12.00	Chinese Fir	1,875	31	13.67	15.45	0.11	208
LC-JZ-1-93	13.80	Chinese Fir	2,146	33	13.67	15.45	0.11	238
LC-JZ-1-94	13.73	Chinese Fir	2,525	18	13.67	15.45	0.11	280
LC-JZ-1-95	12.60	Chinese Fir	1,875	26	13.67	15.45	0.11	208
LC-JZ-1-96	15.60	Chinese Fir	2,625	3	13.67	15.45	0.11	291
LC-JZ-1-97	14.20	Chinese Fir	2,146	28	13.67	15.45	0.11	238
LC-JZ-1-98	17.93	Chinese Fir	2,567	31	13.67	15.45	0.11	285
LC-JZ-1-99	14.73	Chinese Fir	2,486	47	13.67	15.45	0.11	276
LC-JZ-1-100	15.33	Chinese Fir	2,259	28	13.67	15.45	0.11	250
LC-JZ-1-101	16.93	Chinese Fir	2,087	33	13.67	15.45	0.11	231
LC-JZ-1-102	15.60	Chinese Fir	2,437	44	13.67	15.45	0.11	270
LC-JZ-1-103	18.40	Chinese Fir	2,053	23	13.67	15.45	0.11	228
LC-JZ-1-104	14.33	Chinese Fir	2,053	35	13.67	15.45	0.11	228
LC-JZ-1-105	15.33	Chinese Fir	2,146	30	13.67	15.45	0.11	238
LC-JZ-1-106	13.60	Chinese Fir	2,196	37	13.67	15.45	0.11	243
LC-JZ-1-107	6.73	Chinese Fir	1,953	64	13.67	15.45	0.11	216
LC-JZ-1-108	6.20	Chinese Fir	1,534	21	13.67	15.45	0.11	170
LC-JZ-1-109	10.53	Chinese Fir	2,246	38	13.67	15.45	0.11	249
LC-JZ-1-110	11.20	Chinese Fir	2,625	5	13.67	15.45	0.11	291
LC-JZ-1-111	6.13	Chinese Fir	2,146	28	13.67	15.45	0.11	238
LC-JZ-1-112	8.00	Chinese Fir	1,701	60	13.67	15.45	0.11	189
LC-JZ-1-113	18.73	Chinese Fir	1,753	45	13.67	15.45	0.11	194
LC-JZ-1-114	6.33	Chinese Fir	2,117	29	13.67	15.45	0.11	235

LC-JZ-1-115	18.00	Chinese Fir	2,167	27	13.67	15.45	0.11	240
LC-JZ-1-116	5.13	Chinese Fir	1,832	29	13.67	15.45	0.11	203
LC-JZ-1-117	9.60	Chinese Fir	2,259	35	13.67	15.45	0.11	250
LC-JZ-1-118	29.33	Chinese Fir	1,504	45	13.67	15.45	0.11	167
LC-JZ-1-119	20.93	Chinese Fir	4,652	33	13.67	15.45	0.11	516
LC-JZ-1-120	27.93	Chinese Fir	2,525	32	13.67	15.45	0.11	280
LC-JZ-1-121	35.67	Chinese Fir	2,259	37	13.67	15.45	0.11	250
LC-JZ-1-122	27.07	Chinese Fir	1,500	29	13.67	15.45	0.11	166
LC-JZ-1-123	27.80	Chinese Fir	1,932	31	13.67	15.45	0.11	214
LC-JZ-1-124	28.80	Chinese Fir	1,832	33	13.67	15.45	0.11	203
LC-JZ-1-125	28.33	Chinese Fir	1,966	32	13.67	15.45	0.11	218
LC-JZ-1-126	26.80	Chinese Fir	2,246	26	13.67	15.45	0.11	249
LC-JZ-1-127	28.47	Chinese Fir	2,361	39	13.67	15.45	0.11	262
LC-JZ-2-1	12.20	Chinese Fir	2,437	31	13.67	15.45	0.11	270
LC-JZ-2-2	12.60	Chinese Fir	1,719	31	13.67	15.45	0.11	191
LC-JZ-2-3	22.60	Chinese Fir	1,802	29	13.67	15.45	0.11	200
LC-JZ-2-4	11.00	Chinese Fir	1,832	20	13.67	15.45	0.11	203
LC-JZ-2-5	11.40	Chinese Fir	2,259	33	13.67	15.45	0.11	250
LC-JZ-2-6	7.40	Chinese Fir	1,832	24	13.67	15.45	0.11	203
LC-JZ-2-7	11.40	Chinese Fir	2,904	47	13.67	15.45	0.11	322
LC-JZ-2-8	11.53	Chinese Fir	2,240	32	13.67	15.45	0.11	248
LC-JZ-2-9	7.40	Chinese Fir	2,058	22	13.67	15.45	0.11	228
LC-JZ-3-1	9.80	Chinese Fir	2,531	27	13.67	15.45	0.11	281
LC-JZ-3-2	11.20	Chinese Fir	2,058	22	13.67	15.45	0.11	228
LC-JZ-3-3	10.40	Chinese Fir	2,058	22	13.67	15.45	0.11	228
LC-JZ-3-4	13.13	Chinese Fir	2,240	32	13.67	15.45	0.11	248
LC-JZ-3-5	20.60	Chinese Fir	2,459	25	13.67	15.45	0.11	273
LC-JZ-3-6	10.00	Chinese Fir	2,300	43	13.67	15.45	0.11	255
LC-JZ-3-7	17.00	Chinese Fir	2,148	23	13.67	15.45	0.11	238
LC-JZ-3-8	13.93	Chinese Fir	2,967	36	13.67	15.45	0.11	329
LC-JZ-3-9	15.80	Chinese Fir	2,148	43	13.67	15.45	0.11	238
LC-JZ-3-10	10.33	Chinese Fir	2,922	32	13.67	15.45	0.11	324
LC-JZ-3-11	13.00	Chinese Fir	1,966	22	13.67	15.45	0.11	218

LC-JZ-4-1	6.80	Chinese Fir	3,131	33	13.67	15.45	0.11	347
LC-JZ-5-1	3.53	Chinese Fir	1,875	20	13.67	15.45	0.11	208
LC-JZ-5-2	21.13	Chinese Fir	1,605	24	13.67	15.45	0.11	178
LC-JZ-5-3	17.73	Chinese Fir	2,861	27	13.67	15.45	0.11	317
LC-JZ-5-4	16.73	Chinese Fir	2,146	23	13.67	15.45	0.11	238
LC-JZ-6-1	15.93	Chinese Fir	2,255	61	13.67	15.45	0.11	250
LC-JZ-6-2	21.73	Chinese Fir	2,270	36	13.67	15.45	0.11	252
LC-JZ-6-3	17.33	Chinese Fir	2,131	23	13.67	15.45	0.11	236
LC-JZ-6-4	22.60	Chinese Fir	2,259	23	13.67	15.45	0.11	250
LC-JZ-6-5	18.93	Chinese Fir	2,271	46	13.67	15.45	0.11	252
LC-JZ-6-6	42.13	Chinese Fir	2,148	34	13.67	15.45	0.11	238
LC-JZ-6-7	7.80	Chinese Fir	1,536	21	13.67	15.45	0.11	170
LC-JZ-6-8	19.80	Chinese Fir	1,875	29	13.67	15.45	0.11	208
LC-JZ-6-9	32.53	Chinese Fir	2,166	53	13.67	15.45	0.11	240
LC-JZ-6-10	20.33	Chinese Fir	2,091	23	13.67	15.45	0.11	232
LC-JZ-6-11	23.80	Chinese Fir	2,922	32	13.67	15.45	0.11	324
LC-JZ-6-12	15.20	Chinese Fir	4,652	40	13.67	15.45	0.11	516
LC-JZ-6-13	15.20	Chinese Fir	961	16	13.67	15.45	0.11	107
LC-JZ-6-14	15.33	Chinese Fir	961	18	13.67	15.45	0.11	107
LC-JZ-6-15	22.80	Chinese Fir	2,525	25	13.67	15.45	0.11	280
LC-JZ-6-16	19.00	Chinese Fir	1,800	39	13.67	15.45	0.11	200
LC-JZ-6-17	40.80	Chinese Fir	2,194	27	13.67	15.45	0.11	243
LC-JZ-6-18	14.60	Chinese Fir	1,465	27	13.67	15.45	0.11	162
LC-JZ-6-19	16.13	Chinese Fir	1,643	28	13.67	15.45	0.11	182
LC-JZ-6-20	13.80	Chinese Fir	2,053	33	13.67	15.45	0.11	228
LC-JZ-6-21	15.93	Chinese Fir	2,390	56	13.67	15.45	0.11	265
LC-JZ-6-22	22.40	Chinese Fir	1,887	36	13.67	15.45	0.11	209
LC-JZ-6-23	22.20	Chinese Fir	3,025	29	13.67	15.45	0.11	335
LC-JZ-6-24	6.20	Chinese Fir	1,605	33	13.67	15.45	0.11	178
LC-JZ-6-25	25.73	Chinese Fir	2,152	38	13.67	15.45	0.11	239
LC-JZ-6-26	23.00	Chinese Fir	3,131	33	13.67	15.45	0.11	347
LC-JZ-6-27	24.33	Chinese Fir	2,044	39	13.67	15.45	0.11	227
LC-JZ-6-28	26.00	Chinese Fir	1,908	26	13.67	15.45	0.11	211

LC-JZ-6-29	9.20	Chinese Fir	1,500	21	13.67	15.45	0.11	166
LC-JZ-6-30	17.13	Chinese Fir	1,875	20	13.67	15.45	0.11	208
LC-JZ-6-31	17.13	Chinese Fir	2,922	32	13.67	15.45	0.11	324
LC-JZ-6-32	16.13	Chinese Fir	1,823	27	13.67	15.45	0.11	202
LC-JZ-6-33	25.20	Chinese Fir	2,242	42	13.67	15.45	0.11	249
LC-JZ-6-34	20.33	Chinese Fir	1,987	31	13.67	15.45	0.11	220
LC-JZ-6-35	26.80	Chinese Fir	1,779	46	13.67	15.45	0.11	197
LC-JZ-6-36	27.67	Chinese Fir	4,652	40	13.67	15.45	0.11	516
LC-JZ-6-37	35.20	Chinese Fir	2,118	41	13.67	15.45	0.11	235
LC-JZ-6-38	43.87	Chinese Fir	1,868	36	13.67	15.45	0.11	207
LC-JZ-6-39	32.47	Chinese Fir	1,802	29	13.67	15.45	0.11	200
LC-JZ-6-40	20.53	Chinese Fir	2,058	32	13.67	15.45	0.11	228
LC-JZ-6-41	28.07	Chinese Fir	1,788	17	13.67	15.45	0.11	198
LC-JZ-6-42	24.20	Chinese Fir	2,300	50	13.67	15.45	0.11	255
LC-JZ-7-1	13.40	Chinese Fir	2,261	21	13.67	15.45	0.11	251
LC-JZ-7-2	14.40	Chinese Fir	2,122	31	13.67	15.45	0.11	235
LC-JZ-7-3	8.13	Chinese Fir	2,037	38	13.67	15.45	0.11	226
LC-JZ-7-4	10.00	Chinese Fir	2,155	48	13.67	15.45	0.11	239
LC-JZ-7-5	9.33	Chinese Fir	2,170	45	13.67	15.45	0.11	241
LC-JZ-7-6	21.00	Chinese Fir	2,071	29	13.67	15.45	0.11	230
LC-JZ-7-7	34.80	Chinese Fir	2,166	48	13.67	15.45	0.11	240
LC-JZ-7-8	18.60	Chinese Fir	1,465	21	13.67	15.45	0.11	162
LC-JZ-7-9	14.60	Chinese Fir	2,122	23	13.67	15.45	0.11	235
LC-JZ-7-10	16.60	Chinese Fir	2,070	38	13.67	15.45	0.11	229
LC-JZ-7-11	18.53	Chinese Fir	1,971	39	13.67	15.45	0.11	218
LC-JZ-7-12	20.00	Chinese Fir	2,166	45	13.67	15.45	0.11	240
LC-JZ-7-13	18.93	Chinese Fir	1,465	27	13.67	15.45	0.11	162
LC-JZ-8-1	27.47	Chinese Fir	1,832	20	13.67	15.45	0.11	203
LC-JZ-8-2	17.87	Chinese Fir	2,025	51	13.67	15.45	0.11	224
LC-JZ-8-3	31.33	Chinese Fir	1,753	26	13.67	15.45	0.11	194
LC-JZ-8-4	21.47	Chinese Fir	2,146	33	13.67	15.45	0.11	238
LC-JZ-8-5	33.47	Chinese Fir	2,437	31	13.67	15.45	0.11	270
LC-JZ-9-1	25.67	Chinese Fir	1,643	24	13.67	15.45	0.11	182

LC-JZ-9-2	13.47	Chinese Fir	2,300	19	13.67	15.45	0.11	255
LC-JZ-9-3	28.33	Chinese Fir	1,518	21	13.67	15.45	0.11	168
LC-JZ-9-4	23.20	Chinese Fir	2,967	36	13.67	15.45	0.11	329
LC-JZ-9-5	14.40	Chinese Fir	1,534	21	13.67	15.45	0.11	170
LC-JZ-10-1	16.40	Chinese Fir	2,259	28	13.67	15.45	0.11	250
LC-JZ-11-1	35.60	Chinese Fir	2,246	32	13.67	15.45	0.11	249
LC-JZ-11-2	28.40	Chinese Fir	2,053	33	13.67	15.45	0.11	228
LC-JZ-12-1	21.33	Chinese Fir	2,148	28	13.67	15.45	0.11	238
LC-JZ-12-2	24.27	Chinese Fir	1,534	21	13.67	15.45	0.11	170
LC-JZ-12-3	23.20	Chinese Fir	2,246	38	13.67	15.45	0.11	249
LC-JZ-13-1	31.20	Chinese Fir	1,868	26	13.67	15.45	0.11	207
LC-JZ-13-2	24.40	Chinese Fir	2,196	44	13.67	15.45	0.11	243
LC-JZ-13-3	28.13	Chinese Fir	1,823	32	13.67	15.45	0.11	202
LC-JZ-13-4	26.47	Chinese Fir	2,423	48	13.67	15.45	0.11	269
LC-JZ-13-5	24.13	Chinese Fir	2,437	31	13.67	15.45	0.11	270
LC-JZ-13-6	33.20	Chinese Fir	4,652	33	13.67	15.45	0.11	516
LC-JZ-14-1	33.47	Chinese Fir	1,961	34	13.67	15.45	0.11	217
LC-JZ-15-1	22.53	Chinese Fir	1,961	39	13.67	15.45	0.11	217
LC0JZ-15-2	27.47	Chinese Fir	2,617	35	13.67	15.45	0.11	290
LC-JZ-16-1	15.73	Chinese Fir	1,788	31	13.67	15.45	0.11	198
LC-JZ-16-2	27.40	Chinese Fir	2,146	33	13.67	15.45	0.11	238
LC-JZ-16-3	16.53	Chinese Fir	1,534	21	13.67	15.45	0.11	170
LC-JZ-16-4	21.53	Chinese Fir	1,500	27	13.67	15.45	0.11	166
LC-JZ-17-1	28.00	Chinese Fir	1,756	29	13.67	15.45	0.11	195
LC-JZ-17-2	27.87	Chinese Fir	2,246	38	13.67	15.45	0.11	249
LC-JZ-17-3	29.73	Chinese Fir	2,058	36	13.67	15.45	0.11	228
LC-JZ-17-4	26.80	Chinese Fir	1,536	24	13.67	15.45	0.11	170
LC-JZ-17-5	34.07	Chinese Fir	1,500	29	13.67	15.45	0.11	166
LC-NT-3-5	14.93	Chinese Fir	1,564	78	13.67	15.45	0.11	173
LC-NT-3-6	15.07	Chinese Fir	1,592	46	13.67	15.45	0.11	176
LC-NT-3-7	13.93	Chinese Fir	2,154	52	13.67	15.45	0.11	239
LC-NT-3-8	12.87	Chinese Fir	1,691	81	13.67	15.45	0.11	187
GS-SP-1-1	17.87	Chinese Fir	1,716	61	13.67	15.45	0.11	190

GS-SP-2-5	34.20	Chinese Fir	1,841	45	13.67	15.45	0.11	204
GS-SP-2-6	19.47	Chinese Fir	1,827	46	13.67	15.45	0.11	203
GS-ZX-1-2	28.67	Chinese Fir	2,025	38	13.67	15.45	0.11	224
358	6,703.65			44				217

subcompartment	Aare (ha)	Species	numbers of plans/ha	V (in year 2005 m^3/ha)	D (in 30 years)	H (in 30 years)	V (m^3/plant)	V (30 years,m^3/ha)
LC-SP-14-6	20.13	Slash Pine	2,835	0	11.17	16.57	0.09	268.25
LC-ZX-4-5	23.07	Slash Pine	2,820	0	11.17	16.57	0.09	266.83
2	43.20	Slash Pine		0				268
LC-ZT-3-1	26.80	Slash Pine	1,824	30.42	11.17	16.57	0.09	172.59
GS-ZX-1-1	33.20	Slash Pine	1,861	16.71	11.17	16.57	0.09	176.09
2	60.00	Slash Pine		24				174

The forest inventory data and allowable harvest of the project is based on volume estimates to which expansion factors can be readily applied. The selected BCEF is a minimum DBH compatible with the minimum DBH defined in the timber harvest plan.

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:

(3)

According to VM0010 version 1.2, CF_j is 0.5 as a default value.

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:

(4)

According to VM0010 version 1.2, CF_j is 0.5 as a default value.

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

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:

(5)

Calculation of baseline carbon sequestered in wood products

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

(6)

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

(7)

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:

(8)

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

(9)

According to VM0010 version 1.2, as the project activity is located in China as the developing country, WW_k=24%. As the wood products are woodbase panels and emitted to atmosphere in more than 3 years, the SLF_k is 0. And as the project activity is located in temperate, OF_k is 0.86. In accordance with the harvest plan, $C_{WP0,i,|BSL}$, $C_{WPi,|BSL}$ and $C_{WP100,i,|BSL}$ are calculated on an annual basis in equations above. The detailed calculation is shown in the calculation excel form.

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 in each land parcel. Therefore, carbon sequestration resulting from forest regrowth after timber harvest is calculated as:

(10)

According to VM0010 version 1.2, RGR_i could be calculated from the IPCC default values for aboveground net biomass growth in natural forests[11]. Therefore, as the project activity is located in Jiangxi Province China, the subtropical/ subtropical humid forest/ Asia (continental ≤20 y) : 9.0 t d.m. ha^{-1} y^{-1} is selected for calculation. Also as the unit of above-ground biomass growth is t d.m. ha^{-1} y^{-1}, CF_j (tC t d.m. $^{-1}$) should be multiplied to transfer it to be RGR_i (tC ha^{-1} y $^{-1}$) as required by VM0010 version 1.2. Therefore, RGR_i is shown below:

Aboveground net biomass growth in natural forests (t d.m. ha^{-1} y^{-1})		**CF_j (tC t d.m. $^{-1}$)**	**RGR_i (tC ha^{-1} y $^{-1}$)**
subtropical/ subtropical humid forest/ Asia (continental ≤20 y)	9.0	0.5	4.5

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).

[11] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Table 4.9.

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:

(11)

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:

(12)

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

(13)

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

(14)

The calculation[12] of A_{t^*}, is cumulative area harvested until time t* since timber harvest in stratum i in land parcel p in the baseline scenario. In the estimation of baseline emissions, it is relevant to the rotation of the different kinds of trees and it could be calculated by MAX(Age_{2006} +30 – $Years_{since\ harvest\ to\ year\ t}$, 0) during the whole 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:

(15)

[12] Detailed calculation see the calculation excel form.

Here IFM_{CP} =30 years, t* is 30 years for the total crediting period for ex-ante calculation. According to the harvest plan, annual net change in carbon stock across all parcels in the baseline scenario is calculated. The total net change in carbon stock across all parcels in the baseline scenario is the sum of net change in each year. The detailed calculation is shown in the calculation excel form.

Therefore, = 199,476 tC.Species	$\Delta C_{NET\|BSL(1)}$	$\Delta C_{NET\|BSL(2-10)}$	$\Delta C_{NET\|BSL(11-20)}$	$\Delta C_{NET\|BSL(1+)}$	$\Delta C_{NET\|BSL}$	$GHG_{NET\|BSL}$
Chinese Fir	91967.20	252441.12	74056.12	-218272.38	199,476	731,414
Slash Pine	1305.47	1583.66	323.64	-3928.19		

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

=199,476*44/12

=731,414 tC

For the calculation of $GHG_{NET|PRJ}$, according to section 3.2, the process is shown below:

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.

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

(17)

The data of $f_j(X,Y...)$ is sourced from academic paper and equations developed for regional forest types.

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

(18)

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

(19)

Therefore, the at time 2035 and the are calculated as below: (CF_j=0.5 according to VM0010 version 1.2).

Tree species	Age in 2005	$BCEF_R$	$C_{AB,i,t2\|PRJ}$	$C_{AB,i,t1\|PRJ}$
Chinese Fir-I	0~5	0.53	120.57	0.00
Chinese Fir-II	6-10	0.53	120.81	1.16
Chinese Fir-III	14-19	0.53	101.51	11.69
Slash Pine-I	0~5	0.59	79.13	0.00
Slash Pine-II	12~16	0.59	53.39	6.95

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:

(20)

Here t2 = year 2035, t1= year 2006 and T= 30 years. Therefore, the $C_{AB,i,t1|PRJ}$=$C_{HB,j,i|BSL}$ and the is calculated as:

$\Delta C_{AB,t|PRJ}$

Tree species	Age in 2005	$A_{i,p}$ (Ha)	$C_{AB,i,t2\|PRJ}$	$C_{AB,i,t1\|PRJ}$	
Chinese Fir-I	0~5	822.93	120.57	0.00	12,126.61
Chinese Fir-II	6-10	116.93	120.81	1.16	1,709.99
Chinese Fir-III	14-19	6,703.65	101.51	11.69	73,596.28
Slash Pine-I	0~5	43.20	79.13	0.00	417.79
Slash Pine-II	12~16	60.00	53.39	6.95	340.55
					88,191

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; $\Delta C_{DIST,t|PRJ}$, carbon stock change due to non-fire natural disturbance in the project scenario; and $\Delta C_{DIST\_IL,i,t|PRJ}$, the net carbon stock changes as a result of illegal logging in stratum i at time t.

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.

Net greenhouse gas emissions in the project scenario

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

= (0+0+0) -88,191

= *-88,191* tCO_2e

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

= -88,191*30

= -2,645,737 tCO_2e

For the calculation of $GHG_{LK|LtPF}$, according to section 3.3:

$GHG_{LK|LtPF}$ =0

Therefore,

=731,414 – (-2,645,737) –0

=3,377,151 tCO_2e

The $GHG_{CREDITS|LtPF}$ is calculated for the project greenhouse gas credits associated with the implementation of improved forest management (IFM) activities in the project scenario for the whole 30 years' crediting period.

Then the ex-ante calculation (estimate) of baseline emissions/removals, project emissions/removals, leakage emissions and net emission reductions and removals are shown in the table below:

Years	Estimated baseline emissions or removals	Estimated project emissions or removals	Estimated leakage emissions	Estimated net GHG emission reductions or removals

	(tCO2e)	(tCO2e)	(tCO2e)	(tCO2e)
Total	731,414	-2,645,737	0	3,377,151

STEP 7 – Project Verified Carbon Units

For the baseline scenario:

According to *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*[13], 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:

(21)

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:

(22)

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.

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

The uncertainty are 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) Uncertainty of expansion factors:

   The Sample size, Sample mean and Standard 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 Chinese Fir:

Uncertainty of BCEF-Chinese Fir		10.80%	
Uncertainty of BEF-Chinese Fir	9.06%	Uncertainty of D-Chinese Fir	5.88%
BEF		D	
Sample size	251	Sample size	54
Sample mean (BEF)	1.74	Sample mean (D)	0.31
Standard error	0.08	Standard error	0.01
Standard deviation	1.27	Standard deviation	0.07
Average error	0.08	Average error	0.01
Confidence level	0.95	Confidence level	0.95
Degree of freedom	250	Degree of freedom	53
Two-sided Student's t-value	1.97	Two-sided Student's t-value	2.01
Allowable error	0.16	Allowable error	0.02
Lower confidence limit	1.58	Lower confidence limit	0.29
Upper confidence limit	1.90	Upper confidence limit	0.33
Confidence interval	0.16	Confidence interval	0.02

   For Slash Pine:

Uncertainty of BCEF-Slash Pine	10.80%

Uncertainty of BEF-Slash Pine	3.84%	Uncertainty of D-Slash Pine	10.09%
BEF		D	
Sample size	221	Sample size	43
Sample mean (BEF)	1.54	Sample mean (D)	0.38
Standard error	0.03	Standard error	0.02
Standard deviation	0.45	Standard deviation	0.12
Average error	0.03	Average error	0.02
Confidence level	0.95	Confidence level	0.95
Degree of freedom	220	Degree of freedom	42
Two-sided Student's t-value	1.97	Two-sided Student's t-value	2.02
Allowable error	0.06	Allowable error	0.04
Lower confidence limit	1.48	Lower confidence limit	0.34
Upper confidence limit	1.60	Upper confidence limit	0.42
Confidence interval	0.06	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 strata multiply by the uncertainty of expansion factors using formula (21):

For Chinese Fir:

Uncertainty of carbon stockChinese Fir-I	10.83%	Uncertainty of carbon stock-Chinese Fir-II	11.22%	Uncertainty of carbon stock-Chinese Fir-III	10.82%
Uncertainty of volume-Chinese Fir-I	0.88%	Uncertainty of volume-Chinese Fir-II	3.05%	Uncertainty of volume-Chinese Fir-III	0.70%
carbon stock-Chinese Fir-I	67431.82	carbon stock-Chinese Fir-II	8713.82	carbon stock-Chinese Fir-III	385440.19
Area(ha)	822.93	Area(ha)	116.93	Area(ha)	6703.65
Sample size	29	Sample size	5	Sample size	358
Sample mean (m^3/ha)	309.21	Sample mean (m^3/ha)	281.21	Sample mean (m^3/ha)	216.97
Standard deviation	7.16	Standard deviation	6.90	Standard deviation	14.51
Average error	1.33	Average error	3.09	Average error	0.77
Confidence level	0.95	Confidence level	0.95	Confidence level	0.95
Degree of freedom	28	Degree of freedom	4	Degree of freedom	357
Two-sided Student's t-value	2.05	Two-sided Student's t-value	2.78	Two-sided Student's t-value	1.97
Allowable error	2.72	Allowable error	8.57	Allowable error	1.51
Lower confidence limit	306.49	Lower confidence limit	272.64	Lower confidence limit	215.46
Upper confidence limit	311.93	Upper confidence limit	289.78	Upper confidence limit	218.48
Confidence interval	2.72	Confidence interval	8.57	Confidence interval	1.51

For Slash Pine:

Uncertainty of carbon stock-Slash Pine-I	10.84%	Uncertainty of carbon stock-Slash Pine-II	11.43%

Uncertainty of volume-Slash Pine-I	0.99%	Uncertainty of volume-Slash Pine-II	3.76%
carbon stock-Slash Pine-I	12.79	carbon stock-Slash Pine-II	43.82
Area(ha)	43.2	Area(ha)	60
Sample size	2	Sample size	2
Sample mean (m^3/ha)	267.54	Sample mean (m^3/ha)	174.34
Standard deviation	0.30	Standard deviation	0.73
Average error	0.21	Average error	0.52
Confidence level	0.95	Confidence level	0.95
Degree of freedom	1	Degree of freedom	1
Two-sided Student's t-value	12.71	Two-sided Student's t-value	12.71
Allowable error	2.66	Allowable error	6.56
Lower confidence limit	264.88	Lower confidence limit	167.78
Upper confidence limit	270.20	Upper confidence limit	180.90
Confidence interval	2.66	Confidence interval	6.56

Where the carbon stock of every stratum is calculated as the area multiply by the $C_{EX,j,i|BSL}$ (in tC/ha).

4) Uncertainty of regrowth

The uncertainty of regrowth is only associated with the parameter RGRi, which is quoted from IPCC Guidelines for National Greenhouse Gas Inventories (2006), Table 4.9, and the uncertainty for non-industrialized countries of 30% is regulated on page 4.19 at the same time. As China is a non-industrialized country, the uncertainty of RGRi and regrowth is 30%.

Based on the calculation of the 4 parameters and coefficients above, the calculation of $U_{Chinese\ Fir\text{-}k|BSL}$ and $U_{Slash\ Pine\text{-}j|BSL}$ are shown below:

Stratum		$A_{i,p}$ (Ha)	$V_{EX,j,i\|BSL}$ (m^3 ha^{-1})	BEF_R	D	$BCEF_R$	CFj	$C_{HB,j,i\|BSL}$ (tC ha^{-1})	$C_{EX,j,i\|BSL}$ (tC ha^{-1})	$\Delta C_{DW,i,p\|BSL}$	$C_{WP,i\|BSL}$	$\Delta C_{WP,i,p\|BSL}$	$\Delta C_{RG,i,p\|BSL}$	$\Delta C_{NET,i,P\|BSL}$
		A	**B**		**G**	**C**	**D**	**E=B*C*D**	**F=B*G*D**	**H=A*(E-F)**	**I=F*(1-WWK)*(1-SLFK)*(1-OFk)**	**J=(F-I)*A**	**K**	**L=H+J-K**
Calculation of every uncertainty			U of volume		U of D	U expansion factor		U of carbon stock					U of regrowth	
Chinese Fir-I	U	822.93	0.88%	9.06%	5.88%	10.80%		10.83%	5.95%	7.20%	5.95%	5.34%	30%	**12.02%**
	E		309.21	1.74	0.307	0.53	0.5	81.94	47.46	28372.26	5.77	34309.92	40168	22514.27
Chinese Fir-II	U	116.933	3.05%	9.06%	5.88%	10.80%		11.22%	6.62%	7.51%	6.62%	5.95%	30%	**4.71%**
	E		281.21	1.74	0.307	0.53	0.5	74.52	43.17	3666.38	5.25	4433.67	0	8100.05
Chinese Fir-III	U	6703.65	0.70%	9.06%	5.88%	10.80%		10.82%	5.92%	7.19%	5.92%	5.32%	30%	**10.36%**
	E		216.97	1.74	0.307	0.53	0.5	57.50	33.30	162175.78	4.05	196115.46	177664	180627.58
Slash Pine-I	U	43.2	0.99%	3.84%	10.09%	0.11		10.84%	10.14%	7.70%	10.14%	9.11%	30%	**6.21%**
	E		267.54	1.54	0.38	0.59	0.5	78.92	50.83	1213.56	6.18	1928.94	91	3051.91
Slash Pine-II	U	60	3.76%	3.84%	10.09%	10.80%		11.43%	10.77%	8.13%	10.77%	9.67%	30%	**17.47%**
	E		174.34	1.54	0.38	0.59	0.5	51.43	33.12	1098.34	4.03	1745.79	3838	-993.48

Therefore, as there are 5 strata in the project activity, the uncertainty across combined strata for is calculated with the revised equation below:

(23)

Where:

$U_{\|BSL}$	Total uncertainty in baseline scenario; %
$U_{Chinese\ Fir\text{-}k\|BSL}$	Uncertainty in baseline scenario in stratum Chinese Fir-k; %; k=I,II,III…Strata
$U_{Slash\ Pine\text{-}j\|BSL}$	Uncertainty in baseline scenario in stratum Slash Pine-j; %; j= I,II,III…Strata
$E_{Chinese\ Fir\text{-}k\|BSL}$	Sum of net change in carbon stock in the baseline scenario in stratum Chinese Fir-k in the baseline case; t CO_{2e} k=I,II,III…Strata
$E_{Slash\ Pine\text{-}j\|BSL}$	Sum of net change in carbon stock in the baseline scenario in stratum Slash Pine-j in the baseline case; t CO_{2e} j= I,II,III…Strata

After calculation, $U_{|BSL}$ is 8.87% for the baseline scenario.

For the project scenario:

According to *Carbon Inventory Methods*, the uncertainty in the project scenario is expressed for parameter $C_{AB,i,t2|PRJ}$ (tC/ha). The uncertainty across combined strata for $C_{AB,i,t2|PRJ}$ is calculated with the revised equation below:

Where:

$U_{\|PRJ}$	Total uncertainty in project scenario; %
$U_{Chinese\ Fir\text{-}k\|PRJ}$	Uncertainty in project scenario in stratum Chinese Fir-k; %; k=I,II,III…Strata
$U_{Slash\ Pine\text{-}j\|PRJ}$	Uncertainty in project scenario in stratum Slash Pine-j; %; j= I,II,III…Strata
$E_{Chinese\ Fir\text{-}k\|PRJ}$	Sum of net change in carbon stock in stratum Chinese Fir-k in the project case; t CO_{2e} k=I,II,III…Strata
$E_{Slash\ Pine\text{-}j\|PRJ}$	Sum of net change in carbon stock in stratum Slash Pine-j in the project case; t CO_{2e} j= I,II,III…Strata

VCUs adjusted for uncertainty and risk will be considered in the period of verification. Therefore, it will be considered $U_{|PRJ}$=0 in VCS-PD.

Total uncertainty

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

As U_{total} 0.15, then no deduction will result for uncertainty.

Therefore, $Credits_{total|LtPF}$=$GHG_{credits|LtPF}$=3,377,151 tCO_2e.

5) Calculation of verified carbon units

Based on the VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination version 3.1, the amount of VCU's that can be issued at time t=t2 (the date of verification) for monitoring period T=t2-t1, is calculated as below:

Based on the analysis in NON-PERMANENCE RISK REPORT, the overall risk rating of 23 is converted to a percentage as 23%. This percentage is multiplied by the net change in the project's carbon stocks in the project's carbon stocks. Therefore, the

For the estimate average annual project greenhouse gas verified carbon units, it will be 2,600,406/30 =86,680 tCO_2e.

4 MONITORING

Data and Parameters Available at Validation

Data Unit / Parameter:	$\mathbf{V_{l,j,i,sp}}$
Data unit:	m^3
Description:	Merchantable volume for tree *l* of species *j* in sample plot *sp* in stratum *i*
Source of data:	
Value applied:	See the detailed excel spreadsheet
Justification of choice of data or description of measurement methods and procedures applied:	
Any comment:	-

Data Unit / Parameter:	$\mathbf{CF_j}$
Data unit:	$tC{\cdot}td.m.^{-1}$
Description:	Carbon fraction of dry matter for species j
Source of data:	According to VM0010 version 1.2, 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	N/A

data or description of measurement methods and procedures applied:	
Any comment:	-

Data Unit / 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:	National species-specific values from Forestry Part of China's greenhouse gas emissions list. Ecological Environmental Institute. Chinese Academy of Forestry (National GHG inventory)
Value applied:	**Tree species** / **D_j**: Chinese Fir 0.307; Slash Pine 0.38
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	-

Tree species	D_j
Chinese Fir	0.307
Slash Pine	0.38

Data Unit / 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 are derived using a wide range of measured ages based on datasets that comprise at least 30 trees. Equations are based on statistically significant regressions and the r^2 is ≥ 0.8. The source of equations are chosen from academic paper and equations developed for regional forest types.
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	-

Data Unit / Parameter:	**$BCEF_R$**
Data unit:	t d.m. m^{-3}
Description:	Biomass conversion and expansion factor applicable to wood removals in the project area
Source of data:	The source of data is chosen with National forest type-specific from Forestry Part of China's greenhouse gas emissions list. Ecological Environmental Institute.
Value applied:	see table below
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	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 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).

Tree species	**$BCEF_R$**
Chinese Fir	0.53418
Slash Pine	0.5852

Data Unit / 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
Source of data:	According to VM0010 version 1.2, the default values are chosen.
Value applied:	Wood waste fraction (WW): Winjum et al 1998 indicate that the proportion of extracted biomass that is oxidized (burning or decaying) from the production of commodities to be equal to 24% for developing countries. Short-lived fraction (SLF) Winjum et al 1998 give decay rates for proportions of wood products with short-term (<3 yr) uses. As the wood products are more than 3 yr, this parameter will not be used. 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). As the wood products are woodbase panels for more than 3 years and the project is located in temperate area, this fraction over 95 years giving the additional proportion that is oxidized between the 3rd and 100th years after initial harvest is 0.86.
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	-

<table>
<tr><td>Data Unit / Parameter:</td><td>RGR_i</td></tr>
<tr><td>Data unit:</td><td>$tC.ha^{-1}.yr^{-1}$</td></tr>
<tr><td>Description:</td><td>Forest regrowth rate post timber harvest for stratum i</td></tr>
<tr><td>Source of data:</td><td>According to VM0010 version 1.2, the default values are chosen.</td></tr>
<tr><td>Value applied:</td><td>Regrowth rate shall be calculated from the IPCC default values for aboveground net biomass growth in natural forests in IPCC Guidelines for National Greenhouse Gas Inventories (2006), Table 4.9.
<table>
<tr><th colspan="2">Aboveground net biomass growth in natural forests ($t\ d.m.\ ha^{-1}\ y^{-1}$)</th><th>CF_j ($tC\ t\ d.m.^{-1}$)</th><th>RGR_i ($tC\ ha^{-1}\ y^{-1}$)</th></tr>
<tr><td>subtropical/ subtropical humid forest/ Asia (continental ≤20 y)</td><td>9.0</td><td>0.5</td><td>4.5</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>Any comment:</td><td>Default values shall be updated whenever new guidelines are produced by the IPCC</td></tr>
</table>

Data Unit / Parameter:	**$V_{EX,j,i\mid BSL}$**
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 ($V_{j,i\mid BSL}$), based on legal limits.
Value applied:	please refer to ER sheet
Justification of choice of data or description of	The measurement method is from academic paper and equations developed for regional forest types. Please refer to ER

measurement methods and procedures applied:	sheet
Any comment:	-

Data Unit / Parameter:	$TH_{i,p}$
Data unit:	Years
Description:	Number of years since timber harvest in stratum *i* in land parcel *p*
Source of data:	The timber harvest schedule specifies the year (*1,2,3...*) timber harvest in each land parcel is scheduled to occur and the number of years each land parcel is in a post harvest state during the project crediting period.
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	-

Data Unit / Parameter:	$A_{i,p}$
Data unit:	Ha
Description:	Area covered by stratum *i* over land parcel *p*
Source of data:	Legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	Be assumed ex-ante that land parcel boundaries and strata areas must not change through time

Data Unit / 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:	Legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of	-

measurement methods and procedures applied:	
Any comment:	-

Data Unit / Parameter:	$A_{2\text{-}10,i,p}$
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:	Legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	-

Data Unit / 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:	Legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	-

Data Unit / Parameter:	A_{t^*}
Data unit:	Ha
Description:	Cumulative area harvested until time t*
Source of data:	Legal parcel records
Value applied:	See the detailed Project Land Form
Justification of choice of data or description of measurement methods and procedures applied:	-

Any comment:	-

Data Unit / Parameter:	$A_{s,p}$
Data unit:	Ha
Description:	Area of sample plot s*p*
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
Any comment:	Ex-ante the size of the plots shall be defined and recorded in the monitoring plan.

Data Unit / Parameter:	t_{VAL}
Data unit:	dimensionless
Description:	Two-sided Student.s t-value, at infinite degrees of freedom in the first iteration and at degrees of freedom equal to (n-1) in subsequent iterations, for the required confidence level; dimensionless
Source of data:	Student's t-distribution table
Value applied:	**Confidence level**: Df – 95%; ∞ – 1.960 Df- degree of freedom
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	95% confidence level is prescribed in methodology VM0010 version 1.2.

Data Unit / Parameter:	**E**
Data unit:	T d.m. ha^{-1}
Description:	Acceptable margin of error (i.e. one-half the confidence interval) in estimation of biomass stock within the project boundary; in units used for S_i
Source of data:	A default value equal to 10% of the mean biomass stock within the project boundary

Value applied:	0.9960
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	-

Data Unit / 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:	Emission factor for stratum i for gas g
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	Default values shall be updated whenever new guidelines are produced by the IPCC

Data and Parameters Monitored

Data Unit / Parameter:	*Illegal Logging PRA Results*
Data unit:	
Description:	
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:	*0*
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	*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 Unit / Parameter:	*Result of Limited Illegal Logging Survey*
Data unit:	
Description:	
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:	*0*
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	*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 Unit / Parameter:	A_i
Data unit:	Ha
Description:	Area covered by stratum i
Source of data:	legal parcel records
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	-

Value applied:	See the detailed Project Land Form
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	In the baseline scenario strata areas shall not change through time. In the project scenario it shall be assumed *ex-ante* that stand boundaries and strata areas shall 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 delineated as a separate stratum for the purpose of monitoring the carbon stock changes.

Data Unit / Parameter:	*DBH*
Data unit:	Cm
Description:	Diameter at breast height of a tree in cm
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	Typically measured 1.3m aboveground. Measure all trees above some minimum *DBH* in the sample plots. The minimum *DBH* varies depending on tree species and climate; for instance, the minimum *DBH* may be as small as 2.5 cm or as high as 20 cm, but for humid tropical forests 10 cm is commonly used. Minimum DBH employed in inventories is held constant for the duration of the project.
Frequency of monitoring/recording:	Not more than 5 years
Value applied:	-
Monitoring equipment:	-
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.
Calculation method:	-
Any comment:	QA/QC procedures apply not only to DBH but to all tree or non-tree vegetation dimension variables measured, as may be identified by allometric equations employed but not specifically identified here.

Data Unit / Parameter:	*N*
Data unit:	dimensionless

Description:	Total number of possible sample plots within the project boundary (the sampling space or the population); dimensionless
Source of data:	Calculation
Description of measurement methods and procedures to be applied:	*N* is equal to project area divided by the size of the sample plot
Frequency of monitoring/recording:	-
Value applied:	*79*
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	W_i
Data unit:	dimensionless
Description:	Relative weight of the area of stratum i; dimensionless
Source of data:	Calculation
Description of measurement methods and procedures to be applied:	The relative weight of the area of a stratum i is equal to the area of the stratum i divided by the project area
Frequency of monitoring/recording:	-
Value applied:	*See the plot calculator*
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	S_i
Data unit:	t d.m.ha^{-1}
Description:	Estimated standard deviation of biomass stock in stratum i. Standard deviation of biomass stock per unit area (in t d.m. ha-1) may also be used for this purpose
Source of data:	Calculation
Description of measurement methods and	Approximate value of the standard deviation of biomass stock in each stratum is either known from existing data related to the

procedures to be applied:	project area or existing data related to a similar area, or is estimated from a preliminary sample
Frequency of monitoring/recording:	-
Value applied:	*See the plot calculator*
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$A_{burn,i,t}$
Data unit:	Ha
Description:	Area burnt in stratum *i* at time *t*
Source of data:	GPS 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:	-
Monitoring equipment:	-
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.
Calculation method:	-
Any comment:	*Ex ante estimations of areas burned shall be based on historic incidence of fire in the Project region*

Data Unit / Parameter:	$A_{dist,i,t}$
Data unit:	Ha
Description:	Area disturbed in stratum *i* at time *t*
Source of data:	GPS coordinates and/or Remote Sensing data
Description of measurement methods and procedures to be applied:	N/A

Frequency of monitoring/recording:	Areas disturbed shall be monitored at least every five years
Value applied:	-
Monitoring equipment:	-
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.
Calculation method:	-
Any comment:	*Ex ante estimations of areas burned must be based on historic incidence of fire in the Project region*

Data Unit / 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:	-
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	*Ex ante a limited survey can be used to determine a likely depth of degradation penetration*

Data Unit / Parameter:	$C_{DIST\_IL,i,t\|PRJ}$
Data unit:	tCO_2-e
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
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.
Calculation method:	-
Any comment:	*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 Unit / 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.
Measurement Frequency	Not more than five years
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.
Any comment:	*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 Unit / 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.
Measurement Frequency	Not more than five years
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.
Any comment:	*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.*

Description of the Monitoring Plan

4.1.1 Scope of monitoring and the monitoring plan

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.

4.1.2 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.

4.1.3 Monitoring of project implementation

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 georeferenced spatial data (e.g. maps, GIS datasets, aerial photography, or georeferenced 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.

4.1.4 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 and age of trees, which is shown in the Table 9.

Table 9: ex ante stratification of the project area

Serial number of strata	Area (ha)	Tree species	Age in 2005
Chinese Fir-I	822.93	Chinese Fir	0~5
Chinese Fir-II	116.93	Chinese Fir	6-10
Chinese Fir-III	6,703.65	Chinese Fir	14-19
Slash Pine-I	43.20	Slash Pine	0~5
Slash Pine-II	60.00	Slash Pine	12~16

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.

4.1.5 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 and age, 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[2] and at least 1 sample plot will be selected in 1 subcompartment. As the area of every subcompartment is larger than 0.8 ha[2], the area sampled is less than 5% of the subcompartment area, and then less than 5% of the project area, which means a small sampling fraction. Therefore, the following simplified equation can be used for estimating the number of sample plots:

(24)

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

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:

(25)

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

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 10 below:

Table 10: The estimation of number of sample plots required

STRATA No.	Stratum Name	Area (ha)	Plot size (ha)	Plot Quantity	Rounded Plot Quantity
Total Sample Size (n_{BSL})				19.50	
Strata 1 ($n_{BSL,1}$)	Chinese Fir-I	822.93	0.04	1.10	2
Strata 2 ($n_{BSL,2}$)	Chinese Fir-II	116.93	0.04	0.15	1
Strata 3 ($n_{BSL,3}$)	Chinese Fir-III	6,703.65	0.04	18.24	19
Strata 4 ($n_{BSL,4}$)	Slash Pine-I	43.20	0.04	0.00	1
Strata 5 ($n_{BSL,5}$)	Slash Pine-II	60.00	0.04	0.01	1
TOTAL NUMBER OF PLOTS					**24**

* Where the confidence level is 95% as required in the methodology VM0010 version 1.2 and Df is ∞. Therefore, t_{VAL} is 1.96.

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.

Box 3. Resource material for the design of forest field inventories.

IPCC Good Practice Guidance on Land Use. Land Use Change and Forestry (IPCC 2003)
http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html
The Sourcebook for Land Use Change and Forestry Projects (Pearson et al. 2005)
http://www.winrock.org/feature_ecosystem_200802.asp
Measurement guidelines for the sequestration of forest carbon (Pearson et al. 2007)
http://www.nrs.fs.fed.us/pubs/3292
Field Measurements for Forest Carbon Monitoring A Landscape-Scale Approach (Hoover. 2008)
The Winrock sampling calculator http://www.winrock.org/Ecosystems/tools.asp?BU=9086
The CDM A/R Methodological Tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 02)
http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html
The California Climate Action Reserve Registry Forest Project Protocol (Version 2) 2009
http://www.climateactionreserve.org/how-it-works/protocols/adopted-protocols/forest/forest-project-protocol-update/
Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States (Smith et al. 2006)http://nrs.fs.fed.us/pubs/8192

A Guide to Monitoring Carbon Storage in Forestry and Agroforestry Projects (MacDicken. 1997) http://www.winrock.org/fnrm/publications.asp?BU=9058

4.1.6 Conservative approach and uncertainty

Project proponents 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 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[14]. 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.

6 STAKEHOLDER COMMENTS

Comments by stakeholders have been invited using PRA approaches which were held in Dec 2005.

>> The comments received from the PRA survey were fully taken into account as follows:

All the stakeholders supported the conversion activity from logged to protected forest.

Participation of local farmers/communities and companies/farms is on a voluntarily basis.

All tree species used are native to local, and a mixed species arrangements will be used;

Use of chemical pesticides will be limited. Rather, disease and pest will be controlled by mixed tree species arrangement and other biological measures;

Slash and burn site preparation and overall ploughing for soil preparation will not be used.

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

In order to familiarize with the opinions and advices of this project from all stakeholders and to provide benefit to the residents of the areas affected, 14 local farmers were visited at the on-site visit on 15/01/2012. All of the stakeholders and the residents of the areas supported the conversion activity from logged to protected forest.