QIANBEI AFFORESTATION PROJECT PROVINCE

Document Prepared By Shanghai Libra Investment & Management Co., Ltd

Project Title	Qianbei Afforestation Project
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Project Location	Guizhou Province, China
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Validation Body	CTI International Certification Contact: Wang Guolian Email: wangguolian@cti-cert.com
Project Lifetime	30-April-2015~29-April-2045; 30-year lifetime
GHG Accounting Period	01- January -2016~31- December -2044;29-year total period
History of CCB Status	N/A
Gold Level Criteria	N/A
Expected Verification Schedule	July 2020

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Create better ecological conditions and material welfare for ethnic minority people in the project area.	4.2
2) Provide experience of forest planting and management in the Karst region.	4.2
3) Mitigate the damage caused by rocky desertification to the soil.	4.2
4) Improve women's social status and promote equality between men and women.	4.2

1.2 Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	21,225,014tCO_2e	3.2.4
	Net estimated emission reductions in the project area, measured against the without-project scenario	N/A	N/A
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	N/A	N/A
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	50,061Ha	2.1
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occurred as a result of project activities, measured against the without-project scenario	N/A	N/A
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	N/A	N/A

[1] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)
[2] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)
[3] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)
[4] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	16,339	2.3
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	11,437	2.3
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	16,339	2.3
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	11,437	2.3
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	16,339	2.3
	Number of women expected to have improved livelihoods or income generated as a result of project activities	11,437	2.3
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	N/A	N/A

[5] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.
[6] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])
[7] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	N/A	N/A
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	N/A	N/A
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	N/A	N/A
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	N/A	N/A
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	N/A	N/A
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	16,339	2.3
	Number of women whose well-being is expected to improve as a result of project activities	11,437	2.3

[8] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	50,061	5.2
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	1	5.2

[9] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species
[10] Per IUCN's Red List of Threatened Species
[11] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

Qianbei Afforestation Project (hereafter refer to as "the project") is located in Zunyi City, Guizhou Province of China. It is an inland province, bordering Yunnan to the west, Sichuan to the northwest, Hunan to the east and Chongqing to the North. The province has a total population of 34 million. The project aims to plant native species on barren lands for GHG removal whilst contributing to local sustainable development goals. 50,061 ha (750,915Mu[12]) of the forest was planted on barren lands in Zunyi City which used to be poor sustainable ecological environment and karst rocky desertification. The project involves including 1 district and 7 counties: Bozhou district, Tongzhi county, Suiyang county, Zheng'an county, Daozhen county, Wuchuan county, Meitan county and Xishui county, with a total population of nearly 7,800,000. All the barren lands for afforestation activities belong to the villagers and the village committees manage the lands on behalf of villagers. Guizhou Xinzhanxin Agricultural Technology Co., Ltd. (hereafter referred to as Guizhou Xinzhanxin) has been fully authorized by all the village committees to act as the project proponent to implement project management and monitoring, and to sell VCUs generated from the project so that Guizhou Xinzhanxin consolidate the offset resources into sizeable forestry offset projects. Guizhou Xinzhanxin will profit-share with the villagers from selling VCUs. The implementation of the project activity has provided 16,339 jobs for local villagers, among which 70 percent are women

The project activity aims to:

- Sequester greenhouse gas and mitigate climate change;
- Enhance biodiversity conservation by increasing the connectivity of forests;
- Improve soil and water conservation in the Karst region;
- Generate income and job opportunities for local communities.

There is no natural renewal and reforestation before the project, and all sites were covered by the barren hill and degraded lands. The main objective species are China fir, Cypresses, Pinus yunnanensis and Masson pine which are native species according to the baseline survey.

[12]A Chinese metric unit of area, 1ha = 15 Mu.

The implementation of the project is expected to reduce the GHG emissions amounting to 21,225,014 tCO_2e over the next 29 years, with an average annual GHG emission removal of 731,897 tCO_2e.

2.1.2 Project Scale

Project Scale	
Project	
Large project	✓

2.1.3 Project Proponent (G1.1)

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Guizhou Xinzhanxin Agricultural Technology Co., Ltd. is a private entity, founded in 2013 with a registered capital of CNY2.0 million. The company has nearly 40 full-time employees and more than 350 part-time staff. Guizhou Xinzhanxin core business involves agricultural technology and forestry project development. Besides, Guizhou Xinzhanxin also has a team researching and developing the application of new agricultural technologies and forest technologies. Guizhou Xinzhanxin has maintained a good relationship with local governments and villagers for years through providing them with high-quality agricultural goods and services. Guizhou Xinzhanxin has been entrusted by the local villagers to act as the Project Owner for the Afforestation projects and to sell VCUs generated from those projects.

2.1.4 Other Entities Involved in the Project

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Shanghai Libra Investment & Management Co., Ltd (hereinafter referred to as Shanghai Libra or Libra) is founded in 2008 with a registered capital of 5 million and 8 full-time employees. Libra has developed more than 200 offset projects in China, ranging from wind, solar and forestry, under various standards including CDM, VCS, Gold Standard and CCER.

2.1.5 Physical Parameters (G1.3)

The project is located in Zunyi City, Guizhou Province, China. The geographical coordinates of the project are between 106°17' and 107°26' east longitude and between 27°13' and 28°04' north latitude.

According to CCB standard, the Zunyi City is defined as the project zone, and the planting area in Zunyi City is defined as the project area. The boundaries of the project area and project zone is shown in Figue2-1 and Figue2-2, and the KML file has also been submitted.

The basic physical parameters of the project zone are summarized as follows:

Topography

Guizhou province has a typical karst rocky desertification landform characteristic which is a process of land degradation involving serious soil erosion, extensive exposure of basement rocks, drastic decrease of soil productivity, and the appearance of desert. The potential rocky desertification area in Guizhou Province is 1971.20×103hm^2, accounting for 11.34% of the total province's land area while the slight rock desertification area is 2422.4×103hm^2, accounting for 13.94% of the province's land area.[13]

Zunyi city is located in the slope region from Yunnan-Guizhou plateau to Hunan hills and Sichuan basin. Elevation in general 800 ~ 1300 meters above sea level, is the national topography of the second level ladder. 65.08% of Zunyi is mountain while hilly accounts for 28.35%, and the rest are plain and valley basin. The Dalou mountain range stretches from southwest to northeast and becomes a natural barrier. It is the watershed between the north and south water systems in the city.

Soils

The soil area of the whole city accounts about 96% of the total land area (including natural soil, paddy fields and dry land). Soil types vary. Yellow soil, lime soil, paddy soil and tidal soil are mainly distributed in the hilly region with high land utilization rate. Calcareous soil, purple soil and coarse bone soil are mainly distributed in the low-Zhongshan area. The mountains above 1,400 meters above sea level are mainly distributed with yellow and brown soil, mostly forest land.

Climate

[13] https://www.docin.com/p-1009621410.html?docfrom=rrela, Research on Forest Change, Vegetation Restoration and Rocky Desertification Control in Karst Mountains of Guizhou Province, East China Normal University.

Zunyi is particularly affected by the monsoon. Winter and spring seasons are mostly affected by cold waves or cold air from the northern hemisphere. Winter winds are generally northeast or easterly. When Zunyi is affected by the north-eastern monsoon, the clouds are dense and low and thick. Once the cloud tops are cooled by radiation at night, it often produces night rain. In mid-April, the southwest monsoon headed north, with less cloudy weather and sunnier to cloudy days, and the temperature increased significantly. Because of the low latitude and strong solar exposure in Zunyi, even three days of clear temperature may rise to more than 30℃. Zunyi city belongs to the subtropical plateau humid monsoon area which demonstrates typical characteristic of distinct seasons, rain in hot season, long frost-free period and cloudy with little sunlight. Most of the region here is not cold in winter and not hot in summer. The annual average temperature is between 13℃ and 18℃, with abundant rainfall and sunshine[14]. The rainfall is relatively abundant and the annual precipitation is 1000 ~ 1300 mm with the range of change in 700 ~ 1500 mm in Zunyi city[15].

Hydrology

Zunyi river with the da Lou mountain range as the watershed, Zunyi river is divided into Wujiang, Chishui and Qijiang three water systems, are the Yangtze River basin. There are 9148.5 kilometers of flowing rivers in Zunyi city. The density of the river network is 0.3 kilometers per square kilometer. Two main rivers (Wujiang river and Chishui river) have the advantage of navigation. The inland river has a distance of 441 kilometers and leads directly to the Yangtze River. There were 60 first-grade tributaries, 168 second-grade tributaries, 149 third-grade tributaries, 33 fourth-grade tributaries and 4 fifth-grade tributaries. The runoff of the surface (river) is 17.880 billion cubic meters, which is about 17% of that of Guizhou province. The water yield per square kilometer is 580,000 cubic meters, which is about twice the national average[16].

Types of vegetation

There are 2009 species of wild and common higher plants in the city, which are typical of the subtropical evergreen broad-leaved forest, with the characteristics of north-south transition and ancient origin of the flora.[17]

2.1.6 Social Parameters (G1.3)

The basic social parameters of the project are summarized as follows:

Main settlements

[14] http://www.weather.com.cn/cityintro/101260201.shtml
[15] http://tianqi.eastday.com/news/38051.html
[16] https://baike.baidu.com/item/%E9%81%B5%E4%B9%89/450877?fromtitle=%E9%81%B5%E4%B9%89%E5%B8%82&fromid=1706561&fr=aladdin#3_3
[17] https://baike.baidu.com/item/%E9%81%B5%E4%B9%89/450877?fromtitle=%E9%81%B5%E4%B9%89%E5%B8%82&fromid=1706561&fr=aladdin#3_3

Zunyi, located in the northern part of Guizhou province, Guizhou, Sichuan and Chongqing three provinces of the junction of the central city, is the national model area for regional tourism. It is adjacent to Guiyang city in the south, Chongqing city in the north and Luzhou city in Sichuan province in the west. It is located in the core area and main corridor of Chengdu-Guizhou central economic zone, and the bridgehead, main position and pioneer area of the cooperation between Guizhou and Chongqing. It is an important transportation hub connecting the southwest with the north and south, the east and the west, and the river and the sea. The municipality has jurisdiction over 3 districts, 9 counties and 2 county-level cities[18].

Land use and economic activities

The economic aggregate of Zunyi is the second in the whole province, just behind the Guiyang. The long-term development goal of Zunyi is to cross the natural danger of Loushan pass and actively integrate into the 2-hour economic circle of Chongqing. By the end of 2019, the city's regional GDP had reached 300.23 billion CNY, with an increase of 10.4% over the previous year. According to industry types, the added value of the primary, secondary and tertiary industries is 411.36 billion CNY, 1374.16 billion CNY and 1214.71 billion CNY, respectively, with corresponding growth rates of 6.7%, 11.9% and 10.1%. In addition, the added value of the primary, secondary and tertiary industries accounted for 13.7%, 45.8% and 40.5% of the GDP, respectively. [19] According to the land rating, the "multiple suitability" land belonging to grade 1 ~ 4 suitable for the development of agriculture, forestry and animal husbandry accounts for 39% of the soil area, the "double suitability" land belonging to grade 5 ~ 7 suitable for the development of forestry and animal husbandry accounts for 58%, and the "unsuitable" land belonging to grade 8 accounts for 3%. Soil area of the city accounts for about 96% of the total land area (including natural soil, paddy field and dry land). The yearly grain cultivating area reached 768.99 million hectares, with an increase of 13.38 million hectares over the previous year. Besides, 142.84 thousand hectares of oil were planted, which had an increase of 0.31 thousand hectares over the previous year, and the planting area of flue-cured tobacco is 68.03 thousand hectares, which was 2.56 thousand hectares more than those of the previous year. In addition, the planting area of vegetables is 2.72 million mu, and the planting area of high-quality pepper is 1.761 million mu. The planting area of sorghum is 671,000 mu while the tea plantation covers an area of 1.5 million mu. The soil types of yellow soil, lime soil, paddy soil and tidal soil which have a high land utilization rate mainly distributed in low mountain hilly basin area. And in the lower zhongshan area, there are mainly limestone soil, purple soil and coarse bone soil with serious soil erosion, while the mountains over 1400 meters above sea level are mainly distributed with yellow brown soil, mostly for forest and livestock. [20]

Most of the project area are barren lands.

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[18] https://baike.baidu.com/item/%E9%81%B5%E4%B9%89/450877?fromtitle=%E9%81%B5%E4%B9%89%E5%B8%82&fromid=1706561&fr=aladdin#3_1

[19] http://www.tjcn.org/tjgb/24gz/35980.html

[20] http://www.zunyi.gov.cn/zmzy/ljzy/dlqh/201710/t20171024_10344122.html

Relevant historical conditions

Zunyi is one of the first national historical and cultural cities, with the world's cultural heritage hailong tun, the world's natural heritage Chishui Danxia. It has been awarded the title of "hometown of longevity", "hometown of magnolia", "hometown of honeysuckle", "hometown of high-quality green tea", "hometown of famous tea" and "hometown of guitar manufacturing". It has won many honors such as national civilized city, national forest city, national health city, Shuangyong model city, China excellent tourist city, national garden city, etc. It is also the hometown of Maotai liquor.[21]

Socio-cultural information

By the end of 2019, the number of permanent residents was 6.2707 million, 22,400 more than those at the end of the previous year. In 2018, the birth rate was 14.51 per thousand, the death rate was 7.22 per thousand, and the natural growth rate was 7.29 per thousand. A total of 135,100 new urban jobs were created, an increase of 1.2% over the previous year. Among them, 22,600 unemployed people were reemployed, 13,500 people who had difficulty finding jobs were employed, and 142,300 surplus rural labor forces were transferred. The registered urban unemployment rate was kept under 4.2%. The per capita disposable income of rural and permanent urban residents was 12,265 CNY and 32,312 CNY, respectively, an increase of 10.2 percent and 9.1 percent over the previous year. By the end of the year, there were 3,408 schools at all levels (including 7 institutions of higher learning) with 85,000 full-time teachers, down 2.3% from the previous year. There were 1.353 million students on campus, down 5.7 percent from the previous year. The enrollment rate of school-age children in primary schools was 99.9%, the retention rate of nine-year compulsory education was 96.2%, and the gross enrollment rate of senior high school was 90.5%. At the end of the year, there were 4,424 health institutions, down 1.5% from the end of the previous year. Among them, 414 were hospitals and health centers, an increase of 1.0% over the end of the previous year, and 16 were health centers for women and children. The number of beds in health institutions was 48,748, an increase of 1.6% over the end of the previous year, of which 46,398 were in hospitals and clinics, with an increase of 1.1%. There were 46,699 health technicians, an increase of 6.4% over the end of the previous year, among whom 15,561 were practicing (assistant) physicians, an increase of 7.8%. There were 20,949 registered nurses, with a raise of 8.9%. A total of 6.2647 million farmers participated in the new type of rural cooperative medical care, which accounted for 98.9% participation rate with an increase of 0.4 percentage points over the previous year. [22]

[21] https://baike.baidu.com/item/%E9%81%B5%E4%B9%89/450877?fromtitle=%E9%81%B5%E4%B9%89%E5%B8%82&fromid=1706561&fr=aladdin#1

[22] http://www.tjcn.org/tjgb/24gz/35980.html

2.1.7 Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2)

The project is located in Zunyi City, including 1 district and 7 counties: Bozhou district, Tongzhi county, Suiyang county, Zheng’ an county, Daozhen county, Wuchuan county, Meitan county, Xishui county. The geographical coordinates of the project are between 105°50' and 107°41' east longitude and between 25°06' and 29°13' north latitude.

while the location of the project activity in Guizhou Province is illustrated in Figure 1-2. According to CCB standard, Zunyi city is defined as the project zone (shown in Figure 1-3), and the planting area in Zunyi city is defined as the project area. The boundaries of the project area and project zone are shown in Figure 1-4, and the KML file has also been submitted.

The geographical coordinate of Zunyi city as well as those of the 1 district and 7 counties included in the project zone are listed below:

Table 2-1 Geographical Coordinates of the Project Activity in Zunyi city

	East longitude	North latitude
Zunyi city	105°50'-107°41'	25°06'-29°13'
Bozhou District	106°17'-107°26'	27°13'-28°04'
Tongzhi County	106°26'-107°17'	27°57'-28°54'
Suiyang County	106°57'-107°31'	27°49′-28°49′
Zheng’an County	107°04’-107°41’	28°09’-27°51’
Daozhen County	107°21’-107°26’	28°36’-29°13’
Wuchuan County	107°30’-108°13’	28°10’-29°05’
Meitan County	107°15’-107°41’	27°20’-28°12’
Xishui County	105°50’-106°44’	25°06’-28°50’

Guizhou

Figure 1-1 Map showing Guizhou Province, China

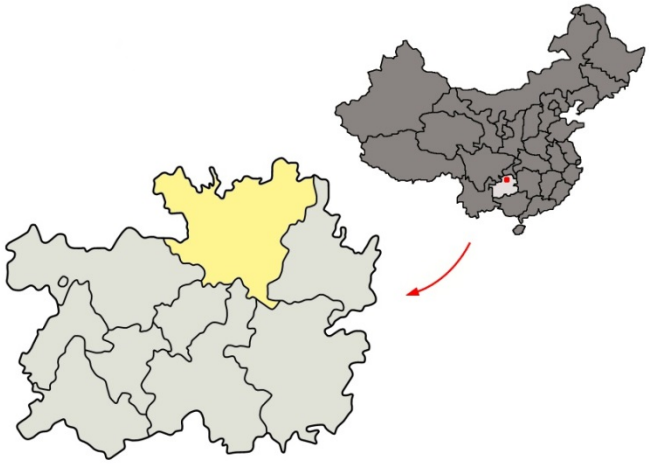

Figure 1-2 The project location

Figure 1-3 The project location

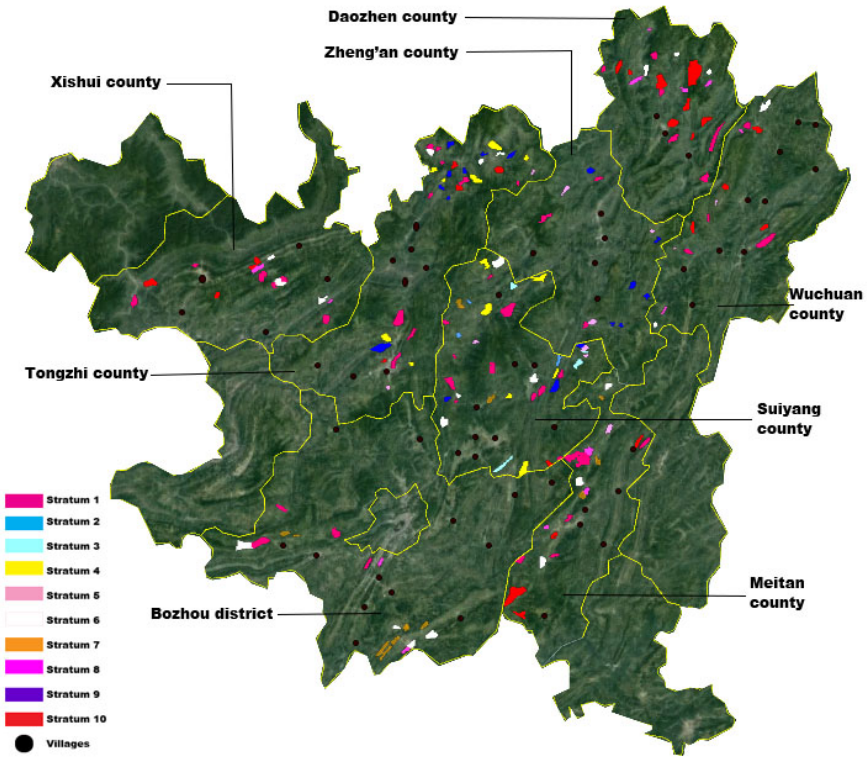

Figure 1-4 The boundaries of the project zone and project area

In figure 1-4, the pink areas within the boundaries of Bozhou district, Tongzhi county, Suiyang county, Zheng'an county, Daozhen county, Wuchuan county, Meitan county and Xishui county represent the 49 villages involved in the project. In this area, China fir is the main species planted in 2015 that is indicated the stratification of Pro-1.

The bule areas within the boundaries of Suiyang county represent the 3 villages involved in the project. In this area, Cypresses is the main species planted in 2015 that is indicated the stratification of Pro-2.

The wathet blue areas within the boundaries of Suiyang county represent the 4 villages involved in the project. In this area, Pinus yunnanensis is the main species planted in 2015 that is indicated the stratification of Pro-3.

The yellow areas within the boundaries of Tongzhi county and Suiyang county represent the 13villages involved in the project. In this area, China fir is the main species planted in 2016 that is indicated the stratification of Pro-4.

The hermosa pink areas within the boundaries of Tongzhi county, Suiyang county, Zheng'an county, Wuchuan county, Meitan county represent the 11 villages involved in the project. In this area, Cypresses is the main species planted in 2016 that is indicated the stratification of Pro-5.

The white areas within the boundaries of Bozhou district, Tongzhi county, Suiyang county, Daozhen county, Wuchuan county, Meitan county and Xishui county represent the 22 villages involved in the project. In this area, Pinus yunnanensis is the main species planted in 2016 that is indicated the stratification of Pro-6.

The khaki areas within the boundaries of Bozhou district, Suiyang county and Meitan county represent the 12 villages involved in the project. In this area, China fir is the main species planted in 2017 that is indicated the stratification of Pro-7.

The pinkish purple areas within the boundaries of Bozhou district, Wuchuan county, Meitan county and Xishui county represent the 13 villages involved in the project. In this area, Cypresses is the main species planted in 2017 that is indicated the stratification of Pro-8.

The purple areas within the boundaries of Tongzhi county, Suiyang county and Zheng'an county represent the 18 villages involved in the project. In this area, Pinus yunnanensis is the main species planted in 2017 that is indicated the stratification of Pro-9.

The red areas within the boundaries of Tongzhi county, Suiyang county, Daozhen county, Wuchuan county, Meitan county and Xishui county represent the 25 villages involved in the project. In this area, Masson pine is the main species planted in 2015 that is indicated the stratification of Pro-10.

Besides, as described in the following Section 3.3.3, there is no leakage of the project; therefore, no offsite climate impacts were predicted. And as described in Section 5.3.2, there are no potential negative offsite impacts on biodiversity, thus no offsite biodiversity impacts were predicted either.

The unlabeled areas in figure 1-4 represent Honghuagang district, Huichuan district, Chishui city, Renhuai city, Fenggang county and Yuqing county respectively. These districts have benefited when the afforestation activities were implemented as there have been improvements in both their climate and biodiversity.

2.1.8 Stakeholder Identification (G1.5)

The following proposed steps were adapted to identify stakeholders according to SBIA Manual:

Step 1: Brainstorm with key informants or focus groups to list and classify stakeholders

This stakeholder's identification starts by listing all the people or groups who might have an influence over or be impacted by a project. The local village committees and village officials were considered to be the key informants and focus groups who know best about the local villagers. In September 2014, the project participant and Zunyi Forest Bureau held a consultant meeting with local village committees during the PRA survey before the project start, and the main purpose of the meeting was to identify the stakeholders in the project.

1) Village residents in 1 district and 7 counties: (including 5,320,259 local villagers of which 16,339 are migrant rural workers and 11,437 are female rural workers mentioned in section 4.2.1)

The proposed project involved planting China fir, Cypress, Masson pine and Pinus yunnanensis in 1 district and 7 counties in Zunyi.

In 1 district and 7 counties, a total of 5,320,259 villagers have been directly affected by the activities of the project (described as local villagers mentioned in section 4.2.1). In addition, the lands in the project area belong to these villagers and are centrally managed by their respective village committees. The representatives of these village committees can manage the land only with the consent of all the villagers. Hence, the village committees collected the opinions and consent of the villagers in respective villages through face-to-face meetings before deciding to apply to the local governments' and the forestry bureaus for planting trees in the project area. The committees were also responsible for signing the cooperation agreements with the project proponents to ensure the proper development of the project.

Since September 2014, before the project started, the village committees conducted a survey of the local villagers' willingness to plant trees. This was done through meetings and interviews with villagers. All the villagers agreed to use the barren lands collectively owned by the villages to plant trees in the end, 16,339 villagers were hired to plant trees (described as migrant rural workers mentioned in section 4.2.1), of whom 11,437 were women (described as female rural workers mentioned in section 4.2.1), accounting for 70 percent.

A total of 5,320,259 villages are directly impacted by the project. Moreover, there are additional benefits for migrant rural workers and female rural workers as the result listed in section 4.2.1. Thus, these types of stakeholders are divided into three categories to specify the different advantages of the community. Refer to the specific impact for the different categories as described in section 4.2.1.

Figure 2-5 The picture showing the meeting attended by the representatives of Guizhou Xinzhanxin, the representatives of villagers, and the representatives of the village committee

The picture above was taken by Tongzhi Forestry Bureau in March 2014 and the meeting was attended by the representatives of Guizhou Xinzhanxin, the representatives of villagers, and the representatives of the village committee. The representatives of the Tongzhi Forestry Bureau also organized a meeting to solicit suggestions from villagers for the implementation of project activities and their willingness to participate in planting trees. The other one district and six counties held similar meetings as well.

This afforestation activity has greatly benefited the local villages and could only carry out with the villagers' consent. Hence, the villagers within 1 district and 7 counties of the project zone are recognized to be stakeholders in the project.

2) Zunyi Forest Bureaus and Forestry Bureaus of 1 district and 7 counties:

Planting techniques are provided by the local forest bureaus, which inspects successful planting. In this respect, the villagers, the committees, the local governments granting permission and local forestry bureaus providing advice and inspections, are all identified as relevant stakeholders in this project.

3) Governments of 1 district and 7 counties:

The local administration is responsible for the local social and environmental management. They are responsible and accountable to all local villagers for any violation of their rights.

4) Village committees in 1 district and 7 counties

They are responsible for collecting opinions from the respective locals and villages with the project proponent or forestry bureaus. They also represent all the locals to sign the carbon sink project cooperation agreement with Project proponent.

Step 2: Well-being ranking of local or community stakeholders

A well-being ranking exercise has been conducted during the PRA survey before the project start which involved the following stages:

- First, undertake a community mapping exercise to identify and list all households. This step was helped by local government and referred to local statistics;
- Second, consult with key informants and focus groups on poverty or well-being categories. For this project, three categories have been identified by household income per capita: capable, average and poor in which poor were defined as those households enjoying the minimum living guarantee from government, and the capable was defined as the top 20% by household income;
- Third, select 'representative', respected and knowledgeable key informants, especially the women representative since women accounted for 60% of the local residents involved in the project;
- Finally, get the key informants to classify the households into the well-being categories.

Step 3: Analyze each stakeholder group in terms of their interests, motivation to participate and relationships with other stakeholders

This information can be summarized in Table 2-2

Table 2-2 Stakeholder Analysis

Stakeholder or stakeholder sub-group	Interests in the project	Effect of project on their interest(s)	Relationship with other stakeholders (Partnership/Conflict)?
Village residents in 1 district and 7 counties	Job opportunity, safeguard of homeland from desertification	Create job opportunity, provide work training	Partnership
Zunyi Forest Bureaus and Forest Bureaus of 1 district and 7 Counties	Afforestation management, forest coverage	In charge of the official approval and management of the forest projects. Increased forest coverage	Partnership
Governments of 1 district and 1 district and 7 counties	local social and environmental management, employment and	Enhance local social and environmental management. Increased employment and	Partnership

	welfare of county	improved welfare of county	
Village committees in 7 counties	Job opportunity, development of economy and infrastructure	Create job opportunity, speed up local construction	Partnership

The descriptions of each community group has been stated in the following section 2.1.9.

Step 4: Analysis of the level of influence and importance of each potential stakeholder group

Influence refers to the extent to which a stakeholder or stakeholder group has power over the project, and can therefore facilitate or hinder project interventions, and importance refers to how much the achievement of project goals depends upon the involvement of a given stakeholder.

Table 2-3 Relative Influence of Stakeholders

Stakeholders	**Influence of Stakeholders**			
	Low	**Moderate**	**Significant**	**Highly influential**
Village residents in 1 district and 7 counties				☑
Zunyi Forest Bureaus and Forest Bureaus of 1 district and 7 Counties		☑		
Governments of 1 district and 7 counties		☑		
Village committees in 1 district and 7 counties			☑	

Table 2-4 Importance of stakeholder to project achievement

Stakeholders	**Importance of stakeholder to project achievement**			
	Low	**Moderate**	**Significant**	**Critical**
Village residents in 1 district and 7 counties				☑
Zunyi Forest Bureaus and Forest Bureaus of 1 district and 7 Counties			☑	
Governments of 1 district and 7 counties			☑	

Village committees in 1 district and 7 counties			☑	

Step 5: Publish the results of identified stakeholders

The results of identified stakeholders were publicly announced on CCB and VCS website as part of the draft PD which can be accessed by everyone, in case there is any other person who may consider themselves as one of the project's stakeholders, they can directly contact the project owner for consultation.

2.1.9 Stakeholder Descriptions (G1.6, G1.13)

Stakeholder	Rights, Interest and Overall Relevance to the Project
Residents in Bozhou district, Tongzhi county, Suiyang county, Zheng ' an county, Daozhen county, Wuchuan county, Meitan county, Xishui county.	Firstly, local villagers who own the using right of the project land through the village communities. Secondly, some of them participated in the implementation of the project by working on-site such as clearing, digging, planting, watering and follow-up management Consequently, they are directly affected by the project.
Zunyi Forest Bureaus and Forest Bureaus of Bozhou district, Tongzhi county, Suiyang county, Zheng ' an county, Daozhen county, Wuchuan county, Meitan county, Xishui county.	The local Forest Bureaus is in charge of the official approval and management of the forest projects. Technicians are employed by the Forestry Bureaus. They provided the local village communities with forest training, planting & maintenance skills and carried out inspections of the forested areas in order to be passed by the Forestry Bureaus.
Governments of Bozhou district, Tongzhi county, Suiyang county, Zheng ' an county, Daozhen county, Wuchuan county, Meitan county, Xishui county.	The local administration is responsible for the local social and environmental management. They are responsible and accountable to all local villagers if there is anything related to encroachments to villagers' rights.
Village committees in Bozhou district, Tongzhi county, Suiyang county, Zheng ' an county, Daozhen county, Wuchuan county, Meitan county, Xishui county.	They are responsible for collecting opinions from the respective locals and villages with the project proponent or forestry bureaus. They also represent

	all the locals to sign the carbon sink project cooperation agreement with Project proponent.

2.1.10 Sectoral Scope and Project Type

The project will be developed under VCS scope 14 'Agriculture, Forestry and Other Land Use (AFOLU)'with a project category of Afforestation, Reforestation and Revegetation (ARR). The project is not a grouped project.

2.1.11 Project Activities and Theory of Change (G1.8)

The project aims to increase carbon sequestration and contribute to local sustainable development by planting trees on the barren hill and degraded lands. 50,061ha (705,916 Mu) of forest were directly afforested on degraded lands in Zunyi City, including 1 district and 7 counties: Bozhou district, Tongzhi county, Suiyang county, Zheng'an county, Daozhen county, Wuchuan county, Meitan county, Xishui county. According to the Biodiversity Survey Report of the project, all the project areas were previously barren land without agricultural activities. There was no natural renewal and reforestation before the project, and some sites were covered by sparse shrub. Therefore, the project does not include activities that convert native ecosystems to generate GHG credits, which means the eligibility criteria of VCS AFOLU projects are fulfilled.

The species of ecological public welfare forest in the karst area mainly include Pine, China fir, Cypress, Toonasinersis, Populusadenopoda, Dodonaeaviscosa, etc.. Among them Pine, China fir and Cypress are the main forest species to control karst rocky desertification in Guizhou, because they have strong adaptability Guizhou. Pine and China fir, Cypress are prominent in rocky desertification areas due to their fast growth, shallow rooting and strong adaptability to the soil. They are all suitable afforestation species in limestone mountainous areas of subtropical monsoon climate zone.

The implementation of the project would generate GHG emission removals and improve local environment through growing trees, enhancing the capabilities of local communities and residents by providing their relevant technical skills and training, and increasing local biodiversity by establishing a forest of native trees (China fir, Cypresses, Pinus yunnanensis and Masson pine).

The project is estimated to generate GHG emission removals of 21,225,014 tCO_2e in 29 years, with an average annual GHG emission removal of 731,897 tCO_2e.

Theory of Change

As explained in the following sections, the without project scenario may have three focal issues:

(1) Continued low activity and interaction of local communities and community groups;

(2) Degraded welfare conditions due to invasion of rocky desertification into the settlements of local communities;

(3) Threat local climate conditions and biodiversity due to continued rocky desertification.

The main objective of the project is to establish forest cover in degraded land, by planting a variety of species of native trees to address the above issues.

(1) Community activity focal issue: The project has offered more job opportunities and the income of the local households have been increased. In the absence of the project, during a PRA survey by the Guizhou Academy of Social Sciences (GASS), the average monthly income of a household within the project area is about 1,780 CNY, and most villages defined as impoverished villages in the project zone. After the implementation of the project, the ratio of poor households was decreased due to the income increase, and opportunities for local villagers working together were given to them. The daily salary for a tree-planting post is 60 CNY and the monthly salary for each part-time technician is 200 CNY, which is a considerable contribution to the income level of both the villagers and technicians. Therefore, the project significantly improved the well-being of local communities;

(2) Rocky desertification invasion focal issue: The project provided a forest cover around the settlements hence preventing rocky desertification. In the absence of the project, the project area would remain rocky desertification land and the surrounding villages would be threatened by rocky desertification invasion. The forest coverage rate of Zunyi city is 55% in 2014.[23]. After the implementation of the project, the forest cover of the project zone was significantly increased which could mitigate the rocky desertification threaten. Until 2018 the ratio is raised to 62%.[24]. Therefore, the local environment will be improved and the living conditions of the communities will also be improved;

(3) The threat to biodiversity focal issue: The project increased the forest cover by applying scientific and reasonable configuration method of planting. In the absence of the project, the project area would continue to be rocky desert mountains with much threat to local climate and biodiversity conditions. The implementation of the project can adjust the hydrological cycle, reduce drought and flood risk, promote soil nutrient cycle, improve local micro-climate and other ecological environment. Consequently, the population of animals could be increased due to the better environment of habitat.

With the implementation of the project, the expected output, outcomes and impacts are summarized in the following table:

[23]http://www.doc88.com/p-1991754314841.html. Forestry development plan for Zunyi during the 13th five-year plan period (2016-2020)

[24]http://www.doc88.com/p-1991754314841.html. Forestry development plan for Zunyi during the 13th five-year plan period (2016-2020)

Table 2-5 The expected output, outcomes and impacts of the project activities

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Plant native species of trees, including preparing land for planting	Generate GHG emission removals	Improve the local environment Generate GHG emission removals	Establish a forest ecosystem; Generate GHG emission removals	Climate
Offer permanent and temporary job opportunities related to forest planting and management	Create job opportunities; Increase household incomes of local villagers	Improve living level of local villages	Improve well-being of local villagers	Community
Provide technical skills and training of forest planting and management	Improve motivation of community groups	Enhance capabilities of local villagers	Enhance social cohesion	Community
Conduct continuous management and protection of the forest	Maintain local ecological environment; Prevent frequent debris flow	Provide better habitat for wild lives ; Prevent rocky desertification	Increase local biodiversity Prevent rocky desertification	Biodiversity Community

2.1.12 Sustainable Development

The project will contribute to achieving sustainable development as following:

- Sequester greenhouse gas and mitigate climate change;
- Enhance biodiversity conservation by increasing the connectivity of forests which is critical for wildlife;
- Improve the quality and quantity of the vegetation;
- Improve soil and water conservation in the Karst region;
- Mitigate the damage caused by rocky desertification to the soil.
- Generate income and job opportunities for local communities.

2.1.13 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
17- September - 2014	The baseline survey was started.
10- January - 2015	The Project Design for Afforestation Operation in 2015 was finished.

19- January - 2015	The afforestation project design in 2015 was approved by Zunyi Forest Bureau.
17- February - 2015	Biodiversity survey report of the project was completed.
26- February - 2015	Participatory Rural Appraisal (PRA) report of the project was completed.
30- Apirl -2015	Planting trees (start date of crediting period) was started.
01- January - 2016	Start date of crediting period
20- January - 2016	The Project Design for Afforestation Operation in 2016 was finished.
22- February - 2016	The afforestation project design in 2016 was approved by Zunyi Forest Bureau.
10- January - 2017	The Project Design for Afforestation Operation in 2017 was finished.
20- January - 2017	The afforestation project design in 2017 was approved by Zunyi Forest Bureau.
17- October - 2017	Planting was completed.
12- October - 2018	Training technical worker yearly.
02- September - 2019	Started collecting and sorting data to write PD
08- October - 2019	Training technical worker
27- January - 2020 to 26- February-2020	Public Comment Period.,
27-April-2020 to 30-April-2020	On-site visit

2.1.14 Project Start Date

According to VCS standard, the project start date is the date on which activities that lead to the generation of GHG emission reductions or removals are implemented, for this project, the project start date is 30-April-2015 when the planting started.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

Planting started: 30-April-2015, the date on which the native community started its activities and led to greenhouse gas removal.

The project crediting period is from 01- January -2016~31- December -2044, and the project lifetime is 30 years from 30-April-2015 to 29-April-2045.

2.1.16 Differences in Assessment/Project Crediting Periods (G1.9)

The project's climate adaptive capacity and resilience, community, and/or biodiversity assessment and periods are all the same.

2.1.17 Estimated GHG Emission Reductions or Removals

Year	Estimated GHG emission reductions or removals (tCO_2e)
01-January-2016-31-December-2016	81,449
01-January-2017-31-December-2017	144,443
01-January-2018-31-December-2018	223,733
01-January-2019-31-December-2019	315,807
01-January-2020-31-December-2020	412,588
01-January-2021-31-December-2021	509,044
01-January-2022-31-December-2022	601,098
01-January-2023-31-December-2023	685,677
01-January-2024-31-December-2024	760,704
01-January-2025-31-December-2025	824,937
01-January-2026-31-December-2026	877,850
01-January-2027-31-December-2027	919,467
01-January-2028-31-December-2028	950,215
01-January-2029-31-December-	970,806

2029	
01-January-2030-31-December-2030	982,127
01-January-2031-31-December-2031	985,166
01-January-2032-31-December-2032	980,942
01-January-2033-31-December-2033	970,467
01-January-2034-31-December-2034	954,704
01-January-2035-31-December-2035	934,555
01-January-2036-31-December-2036	910,849
01-January-2037-31-December-2037	884,331
01-January-2038-31-December-2038	855,656
01-January-2039-31-December-2039	825,411
01-January-2040-31-December-2040	794,093
01-January-2041-31-December-2041	762,136
01-January-2042-31-December-2042	729,905
01-January-2043-31-December-2043	697,707
01-January-2044-31-December-2044	665,795
Total estimated ERs	21,225,014
Total number of crediting years	29
Average annual ERs	731,897

2.1.18 Risks to the Project (G1.10)

For the identification of probable natural risks and those induced by man, the tool approved by the VCS Standard was used: "Tool for the Risk of Non-Permanence of the Agriculture, Forestry and Other Land Uses" sector.

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Fire	The planting area is mostly flat barren land, thus the risk of fire is quite low in the early phase of the project. After the trees grow to a certain age (about thirty years), the risk of fire may increase, and the project proponent will adopt the necessary measures for the fire preventing.	Strengthen the work of forest fire prevention publicity education to increase the awareness of forest fire prevention in the whole society. Education activities, mainly covering forest law and forest fire prevention regulation, are carried out to popularize the basic knowledge of fire prevention and extinguishing. Relying on the masses, implementing mass

		prevention and mass control, and effectively improving the awareness of forest fire prevention.
Diseases and Insects	There could be diseases and insects that may damage the planted trees, but the diseases and insects will be prevented by routine overseeing.	Upon routine overseeing, the diseases will be treated immediately by biological control once occurred. The chemical pesticides are allowed to be used only if there is a serious pest problem outbreak in the project area, and the pesticides will be used in accordance with the National Pesticides Policy.
Pesticide	Improper pesticide applications would be harmful to the natural environment, including polluting soil, water and air conditions, as well as the habitat of the wildlife.	Pesticide will be strictly managed by well-trained staff to minimize the potential effect. Also, the Environmentally friendly measures will be adapted such as mixed species arrangement, seed and seedling quarantine. Especially the biological measures to control pests and diseases will be adopted. Therefore, the pesticide application will be limited.

Also, please refer to Non-Permanence Risk Report of the project for a more detailed analysis of project risk.

2.1.19 Benefit Permanence (G1.11)

To maintain and enhance the climate, community and biodiversity benefits, the native tree species with relative long mature age were selected to be planted in the project, which could guarantee the long-term benefit through and beyond the project lifetime. This project is an ecological afforestation project activity. In addition, according to Forest Management Manual, the primary purpose of this afforestation project is to improve the ecological environment of local rocky desertification by establishing forest of native trees,

commercial logging will be forbidden and human interference will be minimized.

Figure 2-6 The picture showing the scanned covers of the Forest Management Manual written by Guizhou Xinzhanxin

The pictures above are the scanned covers of the Forest Management Manual written by Guizhou Xinzhanxin in June 2015. The management norms and standards of forest land and trees involved in this project are described in detail. The manual sets out the management plan for the project forest, which provides a detailed description of the methods and work specifications of forest land monitoring, care operations, ranger systems and data surveys. At the same time, in terms of disease and disaster prevention in forest management, this manual establishes specific work requirements mainly from 3 aspects including forest fire prevention, pest control and pesticide use management.

2.1.20 Financial Sustainability (G1.12)

According to the reported barren mountain area data, the forestry departments at all levels have made counting and verification on the afforestation area. Finally, according to the counted planting area, the nationality issued special funds for afforestation to Zunyi city, together with provincial funds from Guizhou and local funds from Zunyi city, to form the funds for this project.

Stakeholders have taken carbon revenue seriously and believed that carbon benefits help break down economic barriers. Then Guizhou Xinzhanxin Agricultural Technology Co., Ltd. signed the Consulting Agreement with Shanghai Libra Investment & Management Co., Ltd. And Shanghai Libra will look for VER buyers on behalf of owners to get carbon benefits. The project proponent will use the carbon revenue for the continuous management and maintenance of the forest.

2.1.21 Grouped Projects

This is not a grouped project.

2.2 Without-project Land Use Scenario and Additionality

2.2.1 Land Use Scenarios without the Project (G2.1)

The baseline scenario is the same as the conditions existing prior to the project initiation. There is no forestry land in the project area before the project. The lands will remain barren without the project. please refer to section 3.1.4 for detailed information.

2.2.2 Most-Likely Scenario Justification (G2.1)

The most-likely scenario is the same as baseline scenario, please refer to section 3.1.4 for detailed information.

2.2.3 Community and Biodiversity Additionality (G2.2)

Project activity would not have been implemented under the without-project scenario due to technological, investment, and social barriers. Therefore, the community and biodiversity benefits would not have the opportunity to occur either.

Community benefits

In the absence of the project, people would continue to depend on the agricultural economy. This approach would result in that the long-term benefits of forests for biodiversity and climate change would continue to be poorly understood. Interviews with local village communities have shown that local villagers often lack access to quality seed sources, skills to produce quality seedlings and successfully plant trees, and skills to protect planted trees from fire, disease and insect attacks. This is a major obstacle for local villagers to plant trees on their land. In the proposed project activity, the local forestry bureau, as well as project proponent, had organized the training for local village communities on seed and seedling selection, nursery management, site preparation, planting models and integrated pest management. Without this project, locals would have trouble with developing alternative livelihoods, resulting in a worse economy. Staff training was held once a year, mainly for staff safety, health, technology and other aspects. The training covers forest clearing, afforestation, afforestation

management, carbon sink afforestation, carbon emission and other related knowledge. The project mobilized the participation of the entire community, including women, minorities and the poor. It provided everyone with equal opportunities to get a job.

Biodiversity benefits

In the absence of the project, animal habitat, plant biodiversity and overall landscape degradation would continue to be lost. Soil erosion and degradation would be continued causing soil erosion and degradation. The project activities generate new habitats for biodiversity by increasing quality and quantity of forest cover.

The project is focused on afforestation, biodiversity and conservation of ecosystem services. However, barriers to investment and the current ecological and social conditions of the land limit such initiatives. These barriers have negative repercussions on production. (Please refer to section 3.1.4 for detailed information). China has successively issued and revised a series of laws and administrative regulations related to forestry, such as the Regulations for Implementing the Forest Law , the Regulations for Grain for Green , the Regulations for the Protection of Wild Plants and Animals , the Regulation for Nature Reserve , the Regulation for Forest Fire Control , and the Regulation for Forest Diseases and Pests Control , etc.

To facilitate the restoration of forest resources, Chinese government has launched several programs over the past years, such as the Land Conversion Project (started in 2001) that subsidizes farmers to convert cropland to forest or grassland, the Natural Forest Conservation Program (launched in 1998), and China's wildlife protection and nature reserve construction project (started in 2000), etc.

Although these programs had set overall development goals for forestry development and were started before the adoption by the COP of the CDM M&P (/decision 17/CP.7, 11 November 2001), none of the programs mandate the forestation on Rocky desertification lands. Moreover, these programs have not been written in laws.

Besides the project is located in an undeveloped county, whose economy is struggling with low. In addition, the investment in afforestation of native tree species has no economic return for decades, so there is no commercial attraction. Due to this reason, the project area maintained a Rocky desertification before the afforestation project.

2.2.4 Benefits to be used as Offsets (G2.2)

Community benefits: To maximize the socio-economic benefit, the project design was prepared with a participatory approach. PRA methods were adopted by interviewing and consulting local villagers in the project areas to acquire the local villagers preferences, wishes and concerns so that the proposed project activity would better meet their desires for livelihood development. Please refer to section 4 for detailed information regarding community benefits.

Biodiversity benefits: After the afforestation project is fully launched, it not only produces positive benefits to soil erosion control, but also has far-reaching significance to wildlife resources protection. In the future, efforts should be made to strengthen the protection of natural forests, and the felling of natural forests should be banned in an all-round way. Meanwhile, the non-forested areas of most suitable forests should be restored as natural forests, which is more conducive to the survival and development of wildlife. Please refer to section 5 for detailed information regarding biodiversity benefits.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The full project documentation have been published on VCS and CCB website for public comments, as well as the project summary in the Chinese version, and the local village communities and other stakeholders can easily download from the website. All the documentation of the project was available in village committees and the local forestry bureaus for whom cannot use the internet. The project proponent has notice local stakeholders through the routine villager assembly regarding every milestones of the project development, such as listing, besides, the register, and issuance, etc. Since the beginning of the project, there is no feedback has been received.

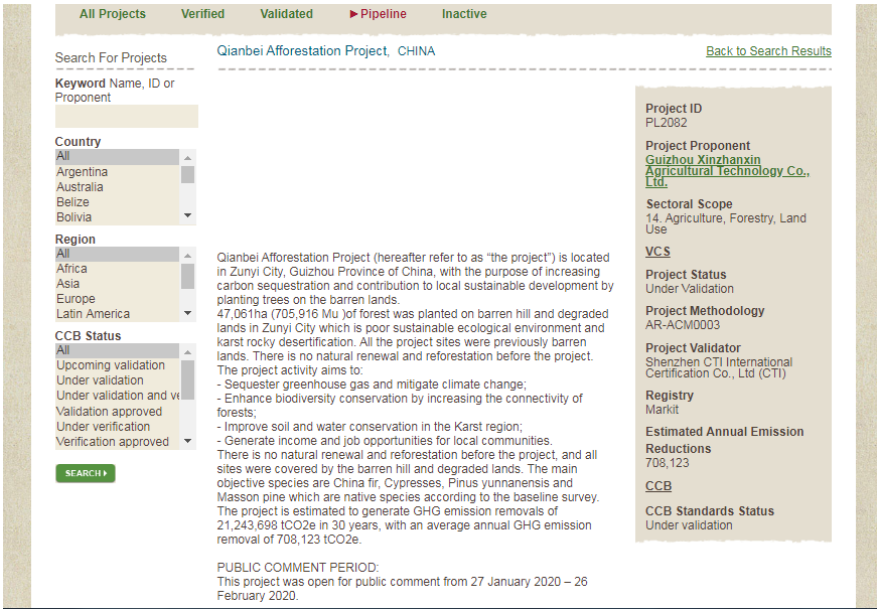

Figure 2-7 Published on VCS and CCB website

2.3.2 Dissemination of Summary Project Documents (G3.1)

Along with the project implementation, the project documentations have been published on VCS and CCB website for all stakeholders to obtain detailed project information and development progress. Also, the

summary of project description in the local language have been disseminated to local village communities through local government, as long as the summary of monitoring reports during each verification period.

2.3.3 Informational Meetings with Stakeholders (G3.1)

To ensure the continued effectiveness of the participation mechanisms, investigation team conducted a Participatory Rural Appraisal (PRA) in the counties where project located prior to project initiation, in order to obtain basic information, data and information of socio-economic situation on the project area and the surrounding, understand the major socio-economic and environmental issues from the stakeholders, collect the willingness to participate and take advantage of the demands of the proposed project activity and analysis the potential socio-economic and environmental impacts of the proposed project activity.

On 24 September 2014, during the PRA survey period, the project proponent also held a stakeholder meeting at Bozhou district involving stakeholder representatives from the 1 district and 7 counties involved in the project, to collect to gather their opinions and suggestions, and distributed questionnaires to the participants to collect their feedback. The landowners, representative of forestry bureaus, government officers expressed their opinions about the project activities. A total of 35 people participated in the meeting, 100 questionnaires were distributed, and 100 were collected. The villagers have been willing to participate in the project from beginning to present. All of them expressed their willingness to participate in the project not only because of the revenue generated by creating job opportunities for the local rural communities but also because of the improvement in living conditions. The officers expressed very clear support for the continuation of the project.

Figure 2-8 Investigators are collecting opinions from villagers and filling out questionnaires

2.3.4 Community Costs, Risks, and Benefits (G3.2)

On 24 September 2014, during the PRA surveys and stakeholder meetings, project proponent explained the potential costs, risks, and benefits to relevant villagers and stakeholders, and then asked for feedback.

Potential Costs	1. massive manpower needed for planting

	2. occupy the roads during the planting 3. short time impact on water resource for planting
Potential risks	1. emergent disease when planting 2. nature disaster
Benefits	1. carbon credit revenue 2. long term living condition improvement due to the better air quality 3. soil improvement 4. increasing rainfall benefit the crops 5. provide abundant job opportunities 6. rocky desertification control

2.3.5 Information to Stakeholders on Validation and Verification Process (G3.3)

The status and process of the project for CCB and the validation and verification for VCS would has been published through routine villager assembly and posted on local bulletin boards. The mobile phone number of the contact person of the project would has been provided to all the stakeholders so they can directly make a call in case they have any problems about the project. In addition, the relevant information of the verification will be announced in the manner described above.

2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

On 11 January 2020, a novel coronavirus outbroke in China[25], so the Chinese government launched the response of public health and epidemic prevention. Guizhou province where this project located launched a public health emergency response of level 1 on 24 January 2020[26], which was adjusted to level 3 at the end of the project on 23 February 2020[27]. It, however, does not allow people to gather together for parties and go out without masks. After the proponent was registered and recorded by the local government, most of the auditors conducted the interviews outdoor while others are indoor.

During this site visit time, the auditor visited through each home and did not bring everyone together, the local villagers, representatives of forestry bureaus, Liupanshui city government officers expressed their opinions about the project activities. The local villagers have participated in the project from beginning to present. The villagers asked the auditor how the reductions were calculated and when the benefits would be available. The project proponent and auditor responded to all the questions patiently. After the meeting, the auditor interviewed each participant separately and asked for their opinions and suggestions. All of them expressed their willingness to be involved in the project not only because of the revenue obtained

[25] http://wjw.wuhan.gov.cn/front/web/showDetail/2020011109035
[26] http://www.guizhou.gov.cn/xwdt/jrgz/202001/t20200124_45007797.html
[27] http://tyj.guizhou.gov.cn/zhxw/sjdt/202002/t20200224_51208270.html

from job opportunities created for the local village communities but also improvement in living conditions. The officers expressed very clear support for the continuation of the project.

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2.3.7 Stakeholder Consultations (G3.4)

Stakeholder consultations include PRA surveys and stakeholder meetings, requiring stakeholders to present their opinions on project design and their willingness to participate.

Before afforestation, the Guizhou Academy of Social Sciences, authorized by Zunyi Forestry Bureau, conducted a Participatory Rural Appraisal and CCB survey to meet the requirements of the carbon sink project. Guizhou Academy of Social Sciences (GASS) organized a team of people to interview the village representatives, relevant governmental officers and distribute the questionnaires to gather local villagers' opinions (picture is shown in section 2.3.3). A total of 100 questionnaires were distributed, and 100 were collected. The surveys took 2 months and completed on 26-February-2015.

-The feedback collected is summarized below.

- Most local villagers are well aware of the benefits of afforestation. They understand that forestry can reduce soil erosion, clean the air, protect the land, and reduce natural disasters. And they also have a strong sense of protection for animals and plants.

- Prior to the meeting, most local villagers had not heard of carbon trading, VCS, or carbon credits. After the introduction, they strongly agreed that the project should be registered as a carbon sink project and participate in the carbon trading market.

- Local villagers believe that the project can 1) create jobs; 2) get more benefits from selling carbon credits; 3) improve the local environment, protect cultivated land, and reduce natural disasters; 4) improve the social status of 10,654 females by hiring them for tree planting; Therefore, the stakeholders have no opinions on the project implementation, and no need to change the project design..

- The local forestry bureau is very clear about the benefits of afforestation, and also understands that carbon trading can make projects more sustainable and sustainable.

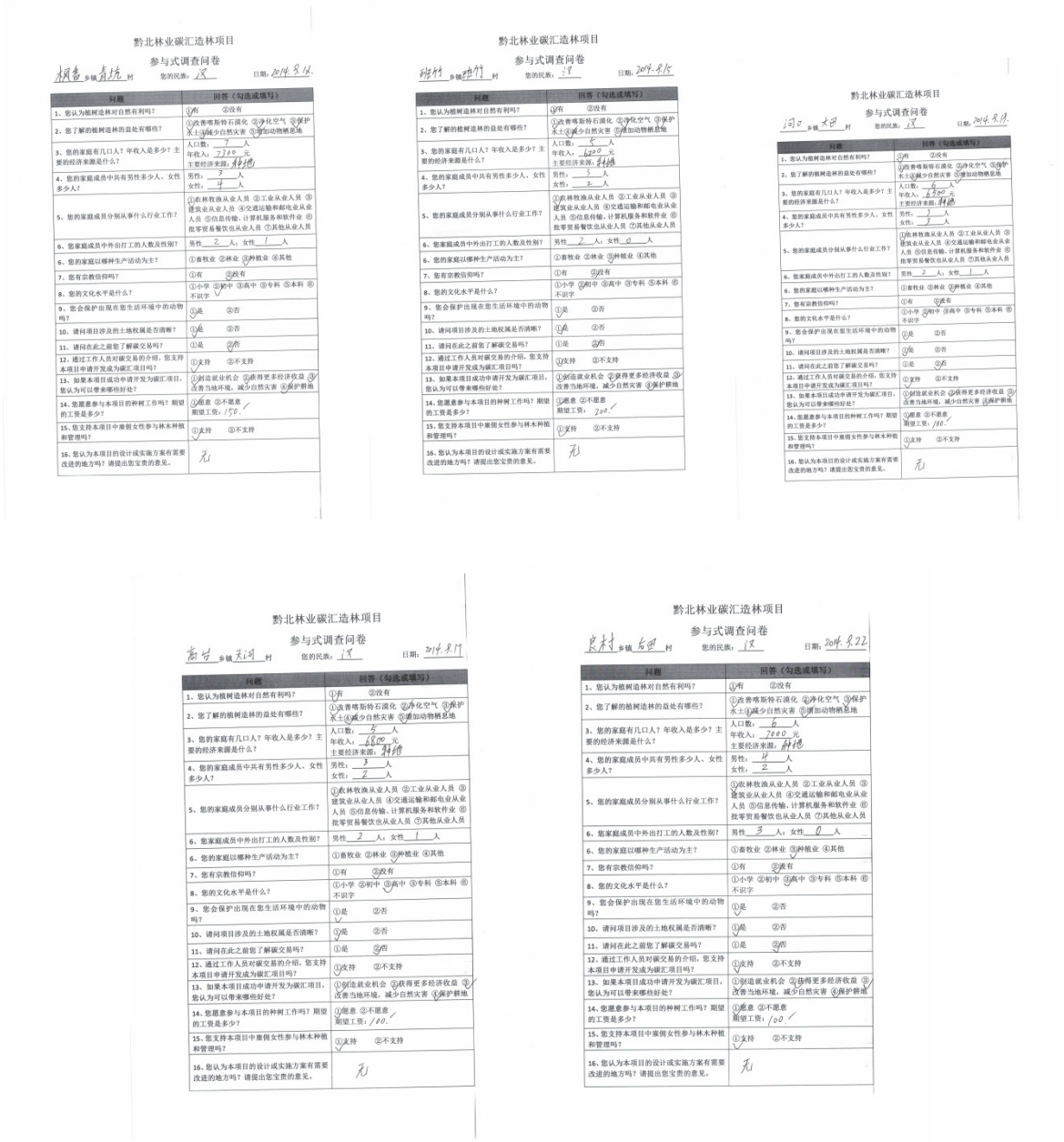


Figure 2-10 Questionnaires distributed to stakeholders

The pictures above are 5 PRA and CCB questionnaires from GASS filled out by the villagers.

Table 2-6 Survey Results Summary Sheet

Question	survey result
Do you think afforestation is good for nature?	It is favorable

What do you know about the benefits of afforestation?	Improve karst rocky desertification, purify air, protect water and soil, reduce natural disasters, increase animal habitat
How many people are there in your family? How much is the annual income? What are the main economic sources?	The average number of people is 4. 8, the average annual income is 9,249CNY. The main economic sources are land and labor.
How many men and women are in your family?	On average there are 2.3 males and 2.8 females
What industries does your family member work in?	Agriculture, forestry, animal husbandry and fishery workers
The number and gender of migrant workers in your family?	On average there are 3 males and 1.2 females
What kind of production activities does your family do?	crop farming
Do you have a religion?	No
What is your cultural level?	70% are elementary school culture, 20% are illiterate, 10% are junior high school culture
Will you protect the animals that appear in your environment?	Yes
Is the land ownership involved in the project clear?	Yes
Do you know carbon trading before then?	Most people don’t know much
Through the staff's introduction to carbon trading, do you support this project's application for development as a carbon sink project?	Support
If this project is successfully applied for development as a carbon sink project, what benefits do you think can bring?	Create more employment opportunities for economic benefits, improve the local environment, reduce natural disasters, and protect arable land
Are you willing to participate in the tree planting	Willing to participate; The average expected salary

work of this project? What is the expected salary?	is 180 CNY
Do you support hiring women to participate in forest planting and management in this project?	Support
Do you think there is anything that needs to be improved in the design or implementation of this project? Please provide your valuable comments.	No comments

2.3.8 Continued Consultation and Adaptive Management (G3.4)

There is a Suggestion Book published on the notice board in each of villages throughout the lifetime of the project. Stakeholders can write their comments or suggestions in the book anytime anonymously as they wish. The project proponent will check the book regularly and collect all the comments received.

Besides, 95 technicians have been working on forest management and tree and CCB monitoring. They will report any situations to the work group established by Guizhou Xinzhanxin periodically.

The technicians as the project monitoring executor have surveyed the project area. The distance from one village to another is so short that the locals can talk directly to the technicians or even the local forestry bureaus if they have any opinions. Meanwhile, technicians will also pay a regular visit to the villages and collect comments if any. Lastly, a third party, such as GASS would be invited to do the CCB survey at least every 5 years after project registration. If there is any improper management, the corrective action will be immediately initiated.

2.3.9 Stakeholder Consultation Channels (G3.5)

Local villagers directly impacted by the project were invited through their most convenient way: the routine villager assembly. Local policy makers and forest experts were also invited by phone calls. All the stakeholders have been informed directly or through their representatives.

2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

Guizhou Xinzhanxin has a good relationship with local villagers and familiar with the planting processing. The relevant government invited Guizhou Xinzhanxin as the project proponent.

In the project planning phase, the villagers were fully involved in decision-making such as the land selection and planting pattern selection through villagers meetings and PRA methods. PRA methods include meetings, household interviews, questionnaires and telephone contact to collect villagers'

willingness to plant trees. The final PRA results showed that all the villagers agree that most young adults, women want to participate in tree planting activities. All the meeting notices would be published on the notice board outside of each village committee office together with the contact numbers so that those who missed the meetings can also share their opinions. The meeting would introduce the purpose, process, benefits, potential costs, risks, etc. Consequently, the villagers agreed to join the project and were willing to participate in the planting of trees.

During the project implementation, the local village communities and government will play as the direct implementers of the project, and the project proponent will play as a coordinator who is in charge of the overall management.

All the critical information regarding decision-making will be published to local stakeholders, and the decision should be revised according to further discussion in case there is any feedback from stakeholders.

The project periodic development will be published on the notice board also with the contact persons' information. If there is any negative feedback, a meeting will be immediately held in the village.

2.3.11 Anti-Discrimination Assurance (G3.7)

The project proponent should obey the *Labor Law of the People's Republic of China* with anti-discrimination assurance, and workers will sign up voluntarily regardless of gender, race, religion or any other basis. In case of any discrimination, the project proponent will demand the person who is responsible for discrimination end his/her involvement with the project immediately and find someone else to take over his/her job.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

If there is a conflict of interest between the parties, the stakeholders can appeal to the local forestry bureau through the village representative or directly, which is the most effective way to solve the problem. They appeal through the phone number of the relevant contact or file a complaint during the meeting. In addition, community villagers participate in project implementation and can identify or seek to resolve conflicts and dissatisfaction in the project.

The project proponent has appointed a staff member to record and collect conflicts and dissatisfaction between local communities and individual villagers. Employed forest patrols will play an important role in dealing with conflicts and dissatisfaction and report to the Forestry Bureau. Upon receipt of the patrolman's report, the relevant management unit will contact and discuss with the relevant community or other stakeholders within 3 days. Based on the information collected by the relevant parties, the specific staff member shall propose a solution and mediation plan within one week and solve the conflict within 30 days.

2.3.13 Accessibility of the Feedback and Grievance Redress Procedure (G3.8)

The procedure of feedback and attention of claims will take into account the traditional methods that the communities and other actors use to resolve their conflicts, which will be available to all interested parties, the community and other actors; said information will be available from the consultations.

2.3.14 Worker Training (G3.9)

Interview with local village communities indicated that local villagers usually lack access to quality seed sources, skills to produce quality seedlings and successfully plant trees, and skills to protect planted trees from fire, disease and insect attacks. This is one of the most important barriers of local village communities in planting trees on their lands. In the proposed project activity, the local forestry bureau, and the project proponent had organized the training for local communities on seed and seedling selection, nursery management, site preparation, planting models and integrated pest management. Without this project, local people would have trouble with developing alternative livelihoods, resulting in a worse economy. The training for technicians is held on every October, starting from 2014 mainly focusing on the safety, health and technology of technicians. The training covers forest clearing, afforestation, afforestation management, carbon sink afforestation, carbon emission and other related knowledge. Any employee who cannot complete the training cannot become a forest technician. As there is annual training, recruits will be trained.

2.3.15 Community Employment Opportunities (G3.10)

The project mobilized the participation of the entire community, including women, minorities and the poor providing to everyone with equal opportunities to get a job.

During the implementation of the project, the total number of local villagers involved in planting was approximately 16,339, and of which 70% were women. In addition, approximately 95 locals are employed for project management and are provided related skill training regularly. 95 locals are employed for project management and are provided related skill training regularly. All the planting opportunities are given priority to the locals on the condition that the candidate is an adult without any disease. In Guizhou, however, the majority of adult men work in developed provinces for higher salaries. Hence, women played a big role in the planting of trees. After planting, they get the payment for the number of trees they planted.

As mentioned previously, Guizhou Xinzhanxin also signs long-term part-time employment contracts with 95 skilled technicians from local forestry bureaus and pays 200 CNY each technician every month to do the regular monitoring work which is required by of the project. The local forestry bureaus will supplement if there are any part-time technicians who terminate the contract or get retired.

2.3.16 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

The local people would be under the protection of the *Labor Law of the People's Republic of China* and no forced labor is forbidden, and they are free to establish and join any labor organizations they wish. In addition, by posting the labor law propaganda materials in the village, the villagers are aware of their right to participate in labor the worker's rights are guaranteed in the labor contracts for each worker.

2.3.17 Occupational Safety Assessment (G3.12)

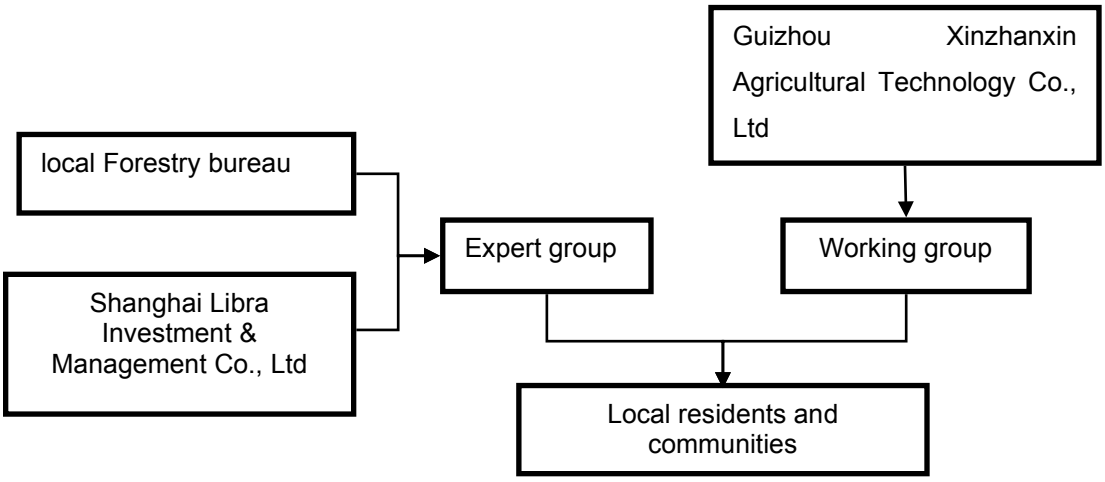
The project proponent has referenced Safety and Healthy in Forestry Work published by ILO and Labor Law of the People's Republic of China and adapted them to meet the local conditions to ensure workers' health and safety. The workers' health and safety policy, including health insurance schemes for workplace accidents and evacuation plans, has been made available for workers and implemented by the village committee.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The Project Management Offices (PMOs) that have been established by the project proponent was responsible for coordinating the project participants and providing technical services.

The local Forestry Bureau provide technical advice and training to technicians and project entity staff to measure and monitor actual greenhouse gas removals and leakages from proposed project activities. Shanghai Libra Investment & Management Co., Ltd has relevant experience in implementing carbon emission projects, and has set up a project expert group with relevant technical personnel from the forestry bureau to manage the project. A project expert group with relevant technical personnel from the forestry bureau to manage the project. Guizhou Xinzhanxin has rich experience in planting. The working group and expert group established for this project was jointly provide project guidance, training and various notifications to local villagers and committees in the project area.



2.4.2 Required Technical Skills (G4.2)

The project requires technical skills of community engagement, biodiversity assessment and carbon measurement and monitoring in order to implement the project activities. The table below outlines the skills required per project activity.

Table 2-7 Key skills required to implement the project activity

Project Activity	Sub-project Activity	Key Skills Required
Carbon stock measurements and monitoring	Aboveground and belowground biomass measurement, land cover mapping, subsidence monitoring, climate monitoring, biodiversity monitoring, community monitoring, and fire monitoring.	Forestry, GIS/ remote sensing, forest inventories, statistics, forest fire management and carbon monitoring, reporting, and verification (MRV)
Community engagement and development	Stakeholder consultation, livelihood development, and education program.	Community organizing, conflict resolution, business management, adult education, livelihoods and social science surveys.
Biodiversity assessment and monitoring	Habitat conservation and management and biodiversity monitoring	Forest conservation, conservation biology, and biodiversity monitoring

2.4.3 Management Team Experience (G4.2)

As mentioned above, local Forestry Bureau and Shanghai Libra Investment & Management Co., Ltd. act as the expert group (Management team) who is in charge of guiding and coordinating the project's overall implementation and decision-making.

Forestry bureaus already set up an expert pool on the land, soil, vegetation, animals and other natural resources affected by forests. Besides, forestry bureaus fed massive data to the biodiversity report and the experts from that pool will provide assistance and share experience during the biodiversity monitoring.

The project proponent Guizhou Xinzhanxin Agricultural Technology Co., Ltd. is in rich experience in forest management in Guizhou Province, including artificial afforestation, forest protection and management, forest damage control and technical training.

Shanghai Libra Investment & Management Co., Ltd. is experienced in carbon measurement and monitoring. In the past, Shanghai Libra Investment & Management Co., Ltd. has successfully developed

over 100 carbon projects in China, including validation and verification under GS, VCS and CDM standards. This experience will help project proponent to ramp up the capability of project implementing and management.

2.4.4 Project Management Partnerships/Team Development (G4.2)

The management team of the project is experience in forest project management and carbon project development, also, local Forestry Bureau provided instruction of reforestation and forest management, conducted the specific supervision of the implementation, and collected specific activity data at routine basis. When the verification begins, the measurement of data and the monitoring of biodiversity are mainly undertaken by 95 technicians employed by Guizhou Xinzhanxin. The local Forestry Bureau and local government provided technical support for community engagement and biodiversity assessment. The project manager of Guizhou Xinzhanxin will be responsible for on-site verification, continuously guiding the tasks and specifications of these technicians, and the final data collection and inspection.

Therefore, the project management team and monitoring team has sufficient experience and skills required by the project.

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2.4.5 Financial Health of Implementing Organization(s) (G4.3)

The project participators are legally registered companies in China, and according to the public information listed in National Enterprise Credit Information Publicity System, none of them were involved in nor complicit in any form of corruption such as bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion. For more information, please refer to Section 2.1.3 and 2.1.4.

2.4.6 Avoidance of Corruption and Other Unethical Behavior (G4.3)

In the institutional policy, in its code of ethics, all types of corruption such as bribery, embezzlement, fraud, favoritism, patronage, nepotism, extortion, and collusion are rejected.

2.4.7 Commercially Sensitive Information (*Rules* 3.5.13 – 3.5.14)

None of the project documents will be considered commercially sensitive information, and all of the documentation are available to any stakeholders.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

According to the 'Constitution of the People's Republic of China' and the 'Forest Law of the People's Republic of China', the land is village collective property. Local villagers have the right to use the land within the scope of the project boundary. The number of the landowners is large so they authorized Guizhou Xinzhanxin as project proponent. The project proponent and the forestry department are responsible for the full implementation and management of the project.

The local government proved that the land belongs to all the villagers so no one can encroach as private property and change the land usage. No matter whether the afforestation project applied for the VCS project or not the land is village collective property. The local government is responsible for all local villagers if there is anything relating to the encroachment of the locals' rights to the land.

2.5.2 Recognition of Property Rights (G5.1)

The ownership of the forest land of the afforestation project belongs to the village collective, and the right to use the forest land belongs to the villagers, which has been confirmed by the local government and Forestry Bureau. The land is a barren hill suitable for planting trees. Since these lands are all legal forestry lands, the ownership is clear, and there is no dispute over land ownership in the project site.

Furthermore, they also have right to authorize Guizhou Xinzhanxin as a representative of the project owner and Guizhou Xinzhanxin only has the right to decide on the carbon sink project including the type of the carbon credit project to be developed, the sales target, the sales price etc.[28].

2.5.3 Free, Prior and Informed Consent (G5.2)

Prior to the project initiation, all of the project land is collective-owned by local villagers. On 24 September 2014, the project participant and 1 district and 7 counties' Forest Bureau held a consultant meeting with local village committees during the PRA survey before the project start. PRA surveys and stakeholder meetings collected stakeholders' opinions on project design and their willingness to participate. More details is described in section 2.3.7.

To make sure the successful development of the project, Guizhou Xinzhanxin Agricultural Technology Co., Ltd. and the village collective which had the ownership of forest land had signed a carbon sink afforestation cooperation and development agreement, which clarifies the forest land rights by all parties during the project crediting period. So, the project will not encroach on private property, community property or government property.

[28] carbon sink project cooperation agreement signed between village committee and Guizhou Xinzhanxin.

The project documents on information of the project such as the nature, size, pace, the scope of the project, the reason for it, and its duration are presented in native language to villagers.

2.5.4 Property Rights Protection (G5.3)

Prior to the project implementation, the project area are mainly barren lands, and villagers voluntarily use these lands to plant trees, therefore the project activities will not lead to involuntary or demolition property rights holders from their lands or territories, and will not force the rights holder to relocate activities important to their culture or livelihood.[29] Before the implementation of the project, the proprietary office and the village committee signed the agreement on the cooperative development of carbon sequestration and afforestation on the basis of equality, freedom and prior informed. If the villagers carried out any housing relocation and other situations within the scope of the agreement, they would receive fair compensation.

2.5.5 Illegal Activity Identification (G5.4)

Under the current law of China, any illegal logging activities will be fined or sentenced to punishment. Currently all project lands are defined for forestry purposes by the local government. Deforestation must be carried on under the approval of the local Forestry Bureau, and the forests are nursed by project staff regularly as a result of the implementation of the project, routing inspected by forest police, so there will not be illegal deforestation. If there is any illegal deforestation happened, it will be punished based on Chinese law--"Forest Law" published in 1984. The project benefits are gained from legal activities. Therefore, the project's climate, community and biodiversity impacts will not be affected by the illegal activities.

2.5.6 Ongoing Disputes (G5.5)

As the project proponent signed a carbon sink project cooperation agreement with the village committees, the forest land was developed reasonably and legally, meanwhile, there is no ongoing disputes have been informed about to the project developer during stakeholders' meetings.

2.5.7 National and Local Laws (G5.6)

The project conforms to all kinds of regulations in the forestry field, as listed below:

PRC Constitution, PRC Forest Law, PRC Forest Law Implementing Regulations, PRC Wildlife Protection Law, Forest Fire Prevention Regulations, Insect Control Regulation, PRC Production Safety Law, PRC Labour Law;

[29] Evidence on carbon sink project cooperation agreement signed between village committee and Guizhou Xinzhanxin.

Technology regulation of national ecological public welfare forest construction;

Inspection and acceptance regulation of ecological public welfare forest construction;

The main provisions of technical design and investigation of forest resources;

Measurement and monitoring guide to afforestation project carbon sinks;

Design code for afforestation operation;

Technical specification for afforestation;

Regulations for tending of forest;

The planning and design principles of ecological public welfare forest construction;

Seedling quality classification of main afforestation species.

According to the Inspection and Acceptance Report of the project, the project has complied with the above regulations and laws during the construction period and will be subject to regular inspection by local government during the implementation period to ensure continuous compliance.

2.5.8 Approvals (G5.7)

The forestry bureau of Zunyi approved the operational design of the afforestation project on 10- January -2015.

The forestry bureau of Zunyi approved the operational design of the afforestation project on 22- February-2016

The forestry bureau of Zunyi approved the operational design of the afforestation project on 20 January 2017.

2.5.9 Project Ownership (G5.8)

According to the ’Constitution of the People's Republic of China’ and the ’Forest Law of the People's Republic of China’, the land is village collective property. Local villagers have the right to use the land within the project boundary, and the project proponent and forestry department are responsible for the comprehensive implementation and management of the project.

2.5.10 Management of Double Counting Risk (G5.9)

This project will not seek to generate or have received any form of environmental or social credit.

2.5.11 Emissions Trading Programs and Other Binding Limits

The project is not involved in an emission trading program or any other mechanism that includes GHG allowance trading.

2.5.12 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit.

2.5.13 Participation under Other GHG Programs

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

2.5.14 Projects Rejected by Other GHG Programs

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

2.5.15 Double Counting (G5.9)

The credits generated from the project will be sold as offsets on VCS registry, the series number of the issued credits can be tracked to avoid any potential double counting.

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

Consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0003/Version 2.0.0 'Afforestation and reforestation of lands except wetlands' is applied.

http://cdm.unfccc.int/methodologies/DB/C9QS5G3CS8FW04MYYXDFOQDPXWM4OE

The following methodological tools, to which the selected methodology refers to, are used:

- Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (Version 01)

- Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities (Version 04.2).

3.1.2 Applicability of Methodology

Consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0003/Version 2.0.0 'Afforestation and reforestation of lands except wetlands' is applicable under the following conditions:

a) The land subject to the project activity does not fall in the wetland category.

b) Soil disturbance attributable to the project activity does not cover more than 10 percent of the area in each of the following types of land, when these lands are included within the project boundary:

i. Land containing organic soils.

The soil disturbance due to this project is in line with the requirements of soil and water conservation. Afforestation density was 3,100 plant/Ha, soil disturbance area ratio was 4.96%[30], less than 10%, and there was no repeated disturbance.

ii. The land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in Appendix 1 and Appendix 2 in the methodology.

According to the land eligibility certificate of Zunyi city Forestry Bureau, it certify that Qianbei carbon sink project is located in Bozhou district, Tongzhi county, Suiyang county, Zheng' an county, Daozhen county, Wuchuan county, Meitan county and Xishui county. The ownership of woodland is collective, covering a total area of 50,061 hectares. They organized relevant afforestation technicians to conduct site visit and historical document inspection of the intended use of forest land for this project. It is determined that the 50,061 hectares of this project construction site are all waste hills and unreclaimed lands suitable for afforestation since 1970, with clear ownership. The afforestation plot of this project belongs to the forestry land stipulated by the state, and there is no agricultural activity before or after the afforestation activity of this project; therefore, there is no situation where existing agricultural activities have been transferred.

Therefore, AR-ACM0003 (Version 2.0.0) is applicable to the proposed project.

Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (Version 01) is applicable under the following conditions:

a) The forestation of the land within the proposed project boundary performed with or without being registered as the VCS project activity shall not lead to violation of any applicable law even if the law is not enforced.

Forestation of the land within the project boundary does not lead to violation of any applicable law.

[30] Proportion of soil disturbed area: 0.16 ㎡*3100/10000 ㎡=4.96%,0.16 ㎡ was derived from the surface area calculated from the specification of artificial afforestation cavities in the Project Design (40cm*40cm)

b) The tool is not applicable to small-scale afforestation and reforestation project activities.

The proposed project is a large-scale afforestation project.

Therefore, a combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (Version 01) is applicable for the proposed project.

Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities (Version 04.2) has no internal applicability conditions.

3.1.3 Project Boundary

The boundaries are the administrative boundaries of villages and forest farm, which is illustrated from Figure 1 before. The project location has the following qualifications:

- All the project plots were not forestry land on January 1st 2000 and even before.
- Afforestation land ownership is clear.
- The project is aiming to protect local biodiversity, mitigate water and soil erosion, and stimulate the development of the local economy.

Source		Gas	Included?	Justification/Explanation
Baseline	Above-ground biomass	CO_2	Yes	This is the major carbon pool subjected to project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Below-ground biomass	CO_2	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Dead wood Litter and Soil organic carbon	CO_2	No	Insignificant and exclusion is conservative.
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
Project'	Above-ground biomass	CO_2	Yes	This is the major carbon pool subjected to project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool

Source		Gas	Included?	Justification/Explanation
	Below -ground biomass	CO_2	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Burning of woody biomass	CO_2	No	CO2 emissions due to burning of biomass are accounted as a change in carbon stock
		CH_4	Yes	Burning of woody biomass for the purpose of site preparation, or as part of forest management, is allowed under this methodology
		N_2O	Yes	Burning of woody biomass for the purpose of site preparation, or as part of forest management, is allowed under this methodology

3.1.4 Baseline Scenario

The baseline scenario is defined by using "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" (Version 01).

STEP 0. Preliminary screening based on the starting date of the A/R project activity

The project start date is 30-April-2015, when the activities that lead to the generation of GHG emission removals were first implemented. The planting activity was conducted from April 2015 to October 2017.

According to the Project Design for Afforestation Operation, before the project implementation, the local Forest Bureau has seriously considered the incentive from carbon trading, which also has been confirmed by the Project Approval.

STEP 1. Identification of alternative land use scenarios to the proposed A/R CDM project activity

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

According to additionality tool, the alternative land use scenario of the proposed project includes:

1. Continuation of pre-project land use (i.e. Lands remain barren.)

2. Agricultural use of the land

3. Forestation of the land within the project boundary without being registered as the VCS project

The identification of the alternative land use scenario, field survey and data from the local forestry bureau has been applied. The identified scenarios are deemed as realistic and credible.

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

National, local and sectoral land-use policies or regulations since the 1980s are listed below:

China has successively issued and revised a series of laws and administrative regulations related to forestry, such as the Regulations for Implementing the Forest Law, the Regulations for Grain for Green, the Regulations for the Protection of Wild Plants and Animals, the Regulation for Nature Reserve, the Regulation for Forest Fire Control, and the Regulation for Forest Diseases and Pests Control, etc.

To facilitate the restoration of forest resources, Chinese government has launched several programs over the past years, such as the Grain for Green Program (started in 2001) that subsidizes villagers to convert degraded cropland to forests, the Natural Forest Conservation Program (launched in 1998), the Nature Reserve Development and Wild Conservation Program (started in 2000), etc.

Although these programs had set overall development goals for forestry development and were started before the adoption by the COP of the CDM M&P (/decision 17/CP.7, 11 November 2001), none of the programs mandate the forestation on barren lands. Moreover, these programs have not been written in-laws. Whether these programs can meet the initial targets highly depends on whether the program is fully funded, but the funding gap is very big. Thus, the project activity can hardly get any subsidy from the government. Thus Scenario 1 remains a possible baseline scenario.

The afforestation activity location is legally defined as forestry land. Farming and grazing are not allowed in these plots. Thus the second scenario “agricultural use of land” is not feasible.

Scenario 3 faces the investment and technical barrier which will be discussed in the next section. However it does not violate any existing enforced mandatory applicable laws and regulations.

In sum, scenarios 1 and 3 are in compliance with mandatory legislation and regulations.

STEP 2. Barrier analysis

Sub-step 2a: Identification of barriers that would prevent the implementation of at least one alternative land use scenario

1. Investment barrier

Since the project is not commercial afforestation and is afforestation of barren hills and wasteland which is prohibited from logging, so the trees in the project cannot be felled and used for commercial sales.

The investment scale of this project is 1,855,144,620CNY, of which the total funds of governments at all levels is 1,298,601,234CNY, and the remaining 556,543,386CNY was raised by Xinzhanxin Company, the proponent of the project, who signed a carbon sequestration development agreement with the village committee to handle relevant matters. According to the Zunyi City Government Work Report, the average

annual income of the villagers in the project area is only 12,265 CNY.[31], and the main source of income is farming and labor. This income level is far from the required investment.

Therefore, there would be no direct revenue from the implementation of the afforestation project expect for environmental and ecological benefits, the project has the inevitable financial obstacles.

2. Technological barriers

The project is located in Bozhou district, Tongzhi county, Suiyang county, Zheng' an county, Daozhen county, Wuchuan county, Meitan county, Xishui county, where boasts the widest Karst area, as well as one of the districts that suffer serious Karst Rocky Desertification with karsts accounting for 65.78% .[32] of the land area. Although the forest companies and organizations are project proponents, local villagers are actually the project participants who planted trees due to the planting area is quite large and scattered among the local villages.

Local villagers lack access to good quality saplings or seedlings as well as the necessary tending and forest management technique. They also lack the skills needed to produce high quality seedlings and successful tree planting in karst regions, and lack the skills needed to prevent planted trees from being subject to fire, pest and disease attack. In addition, the lack of organizational instruments also prevents them from overcoming technological barriers.

The technical barriers are summarized as 1) lack of access to planting materials; 2) lack of afforestation and forest management technology in karst regions; and 3) lack of skilled or properly trained labor force. If planting trees within the project boundary without registration as a VCS project (scenario 3), these technical barriers would be applied to the local villagers, and lead to the failure of the project.

Because it is hard for the local villagers to register their afforestation projects and apply for financial support individually. Under the advice of Guizhou Xinzhanxin, local forest bureaus called the villagers to discuss whether to apply for VCS for these forestry projects. The locals agreed to register the project as a VCS project and apply for additional carbon fund, and they agreed on Guizhou Xinzhanxin be their representatives. Then Guizhou Xinzhanxin works with the local Forest Bureaus and Shanghai Libra Investment & Management Co., Ltd to work out a better implementation plan for the project, and help local villagers to conduct the planting activity better. Without applying for VCS, local villagers would face the above mentioned technical barriers.

Sub-step 2b: Elimination of land use scenarios that are prevented by the identified barriers.

Scenario 1 does not require extra investment or labor force. Thus, it is not prevented by any of the identified barriers.

Scenario 2 faces investment and technical barriers.

In sum, Scenario 2 is not feasible. Scenario 1, the continuation of pre-project use (i.e. lands remain barren), remains the possible baseline scenario.

[31] http://www.tjcn.org/tjgb/24gz/35980_2.html
[32] http://www.karstdata.com/view.aspx?bh=53

STEP 3. Investment analysis (if needed)

Scenario 1 remains the only possible baseline scenario, which makes investment analysis not necessary.

STEP 4. Common practice analysis

Only converting farmland to forest is eligible for the subsidy. Planting activities that changing barren land such as this project is not eligible for the subsidy. Different from forestry in other provinces, forest in Guizhou Province is mainly Public welfare forest and stone desertification control forest land[33].

There has been some afforestation and reforestation in the project regions on lands similar to the degraded lands of the proposed A/R CDM project activity, but this has been limited. In Guizhou Province, the afforestation was mainly established several years ago by a small number of relatively wealthy communities and villagers at a time when there were not many alternative investment opportunities[34]. As it was not profitable and there was little market incentive, the activities could not be extended by investors. As the forestry industry has developed rapidly in recent years in Guizhou and the cost of labour and planting materials including seedling and fertilizers has increased significantly, the villagers and forest companies turn to plant short-rotation and fast-growth species in accessible areas rather than planting long-term local species in remote, degraded land, which is not economically attractive, due to slow tree growth, low land productivity and high transportation costs. Also, in recent years, large increases in the price of seedling and fertilizers, as well as the cost of labour, have greatly reduced the expected economic return.

All the above reasons explain that it is very difficult to conduct non-profit afforestation activity in the project zone. At present there are three Afforestation projects registered as VCS&CCB in Guizhou province, but the tree species in those project is China fir and Cypresses, that is different from this project. Furthermore, the registered VCS&CCB project is located in the middle of the Guizhou province where has different climate, soil type, rainfall, vegetation, etc. comparing with this project area.

Thus, the proposed project is not a common practice.

3.1.5 Additionality

Additionality has been fully analysed in the above section 3.1.4 Baseline Scenario with “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities” (Version 01).

Based on the above demonstration, the proposed project has its additionality.

3.1.6 Methodology Deviations

No deviations from the procedures indicated by the methodology have been made.

[33] http://www.gywb.cn/content/2014-12/10/content_2003257.htm
[34] http://gzrb.gog.cn/system/2015/02/15/014118852.shtml

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

As described above, the baseline scenario is the continuation of existing land use i.e. lands remain barren. Based on the applied methodology AR-ACM0003 (Version 2.0.0), the baseline net GHG removals by sinks is estimated as follows:

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t} \quad (1)$$

Where:

$\Delta C_{BSL,t}$ = Baseline net GHG removals by sinks in year t; t CO_2-e

$\Delta C_{TREE\_BSL,t}$ = Change in carbon stock in baseline tree biomass within the project boundary in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e

$\Delta C_{SHRUB\_BSL,t}$ = Change in carbon stock in baseline shrub biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e

$\Delta C_{DW\_BSL,t}$ = Change in carbon stock in baseline dead wood biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e

$\Delta C_{LI\_BSL,t}$ = Change in carbon stock in baseline litter biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e

With the baseline scenario, dead wood biomass and litter biomass would not be changed by local villagers. All the plots in 1 district and 7 counties had been barren and do not change after the 1970s and before the project. Thus, the change in carbon stock in baseline dead wood biomass and litter biomass can be negligible.

According to Participatory Rural Appraisal (PRA) Report of the project, most of the project area are bare land with very little grasses, therefore changes in carbon stocks in trees and shrubs in the baseline can be accounted as zero based on the tool '*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*'.

For this project, because the project is on the barren lands suitable for afforestation, forest floor only bushes and scattered raw wood, to protect diversity, at the time of afforestation retained the original shrubs and bulk raw wood, based on the principle of cost-effectiveness, the baseline scenario $\Delta C_{TREE\_BSL,t}$, $\Delta C_{SHRUB\_BSL,t}$ is zero.

For simplicity, the baseline net GHG removal by sinks is considered to be 0 tCO_2-e.

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3.2.2 Project Emissions (Actual net GHG removals by sinks)

According to the applied methodology AR-ACM0003 (Version 2.0.0), GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero.

The actual net GHG removals by sinks shall be calculated as the sum of the changes in carbon stocks in the project minus the increase in non-CO_2 GHG emissions within the project boundary, which is shown as follows:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t} \quad (2)$$

Where:

$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; t CO_2-e
$GHG_{E,t}$	=	Increase in non-CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, as estimated in the tool "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; t CO_2-e

According to the tool, the use of fire for site preparation and/or to clear the land of harvest residue prior to replanting is specifically excluded from the project management and therefore non-CO_2 GHG emissions are estimated as zero.

$GHG_{E,t}$ = 0

Change in the carbon stocks in project, occurring in the selected carbon pools in year t shall be calculated as follows:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t} \quad (3)$$

Where:

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO_2-e

$\Delta C_{TREE\_PROJ,t}$ = Change in carbon stock in tree biomass in project in year t, as estimated in the tool 'Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities'; t CO_2-e

$\Delta C_{SHRUB\_PROJ,t}$ = Change in carbon stock in shrub biomass in project in year t, as estimated in the tool 'Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities'; t CO_2-e

$\Delta C_{DW\_PROJ,t}$ = Change in carbon stock in dead wood in project in year t, as estimated in the tool 'Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities'; t CO_2-e

$\Delta C_{LI\_PROJ,t}$ = Change in carbon stock in litter in project in year t, as estimated in the tool 'Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities'; t CO_2-e

$\Delta SOC_{AL,t}$ = Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool 'Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities', as estimated in the same tool; t CO_2-e

For conservativeness, only change in carbon stock in tree biomass of project will be considered. Therefore, the above equation can be simplified as:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} \quad (4)$$

And the tool 'Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity' (Version 04.2) is used to estimate the change in carbon stock above the ground. According to the tool, change in carbon stock in trees between two points of time is estimated by using one of the following methods or a combination thereof:

(a) Difference of two independent stock estimations;

(b) Direct estimation of change by re-measurement of sample plots;

(c) Estimation by proportionate crown cover;

(d) Demonstration of 'no-decrease'.

Method (b) is efficient when there is a significant correlation between the plot biomass values on the two occasions (e.g. when there has been no harvest or disturbance in a stratum and therefore

no significant spatial re-distribution of biomass has occurred in the stratum after the first estimation) For the project, there will be no harvest or disturbance during the project period, thus Method (b) should be selected, but this method is applicable only in ex-post estimation of change in carbon stock in trees for monitoring of project activities. Therefore, Method (a) is used for the ex-ante estimation during validation, and method (b) will be used in the monitoring of the following verification.

Under Method (a), the change in carbon stock in trees and the associated uncertainty are estimated as follows:

$$\Delta C_{TREE} = C_{TREE,t1} - C_{TREE,t2} \quad (5)$$

$$u_{\Delta c} = \frac{\sqrt{(u_1 \times C_{TREE,t_1})^2 + (u_2 \times C_{TREE,t_2})^2}}{|\Delta C_{TREE}|} \quad (6)$$

Where:

ΔC_{TREE}	=	Change in the carbon stocks in trees during the period between two points of time t1 and t2; t CO_2-e
$C_{TREE,t1}$	=	Carbon stock in trees as estimated at time t1; t CO_2-e
$C_{TREE,t2}$	=	Carbon stock in trees as estimated at time t2; t CO_2-e
$u_{\Delta C}$	=	Uncertainty in ΔC_{TREE}
u_1, u_2	=	Uncertainties in $C_{TREE,t1}$ and $C_{TREE,t2}$ respectively

Carbon stock in trees at a point of time is estimated by using one of the following methods or a combination thereof:

(a) Estimation by measurement of sample plots;

(b) Estimation by modelling of tree growth and stand development;

(c) Estimation by proportionate crown cover;

(d) Updating the previous stock by independent measurement of change.

For the project, Method (b) is used for the ex-ante estimation during validation.

According to the Tool, under Method (b), existing data are used in combination with tree growth models to predict the growth of trees and the development of the tree stand over time, and ex-ante estimation (projection) of carbon stock in tree biomass is not subjected to uncertainty control. Stand parameters such as stocking (e.g. number of stems per hectare or basal area per hectare),

age-class structure, and species composition at different points of time are simulated from assumed (planned) tree planting and management practices (e.g. planting density, survival rate, thinning and pruning operations and their timing).

Tree growth (e.g. diameter or height increment) is simulated by taking into account local tree-growth data from experience (e.g. age-diameter curves, yield tables, yield curves) while also considering relevant site factors (e.g. soil, terrain, slope, aspect, precipitation) and stand parameters.

For the project, the growth curve equations are used to estimate the average volume of one tree, and the carbon stock in trees in the tree biomass estimation strata is estimated as follows:

$$C_{TREE,i,j} = \sum_{i,j} A_i \times N_{i,j} \times \frac{44}{12} \times CF_{TREE,j} \times B_{TREE,j} \quad (7)$$

$$B_{TREE,j} = V_{TREE,j} \times D_j \times BEF_j \times (1 + R_j) \quad (8)$$

Where:

$C_{TREE,i,j}$	=	Carbon stock in trees of tree species *j* of strata *i*; t CO_2-e
A_i	=	Area of strata *i*; Mu
$N_{i,j}$	=	Number of the tree species *j* of strata *i*; trees/ha
$CF_{TREE,j}$	=	Carbon fraction of tree biomass for tree species *j*; t C/t d.m.
$B_{TREE,j}$	=	Biomass of one tree of tree species *j*; t d.m.
$V_{TREE,j}$	=	Stem volume of one tree of tree species *j*; t d.m.
D_j	=	Density of tree species *j*; t d.m/m^3
BEF_j	=	Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species *j*; dimensionless
R_j	=	Root-shoot ratio for tree species *j*; dimensionless

Volume growth equation of China Fir; Review on the Growth Equations of Pinus Massoniana, China Fir and Pinus elliottii in China [Journal of Northwest Forestry University]

Volume growth equation of Cypresses: The biomass growth rule and forest biomass change of main vegetation types in Banqiao river small watershed at the early stage of (1991) governance were studied [Guizhou forestry science and technology, 1991, vol. 19, no. 4].

Volume growth equation of Pinus yunnanensis: Analysis of Growth Process Pinus yunnanensis Natural Secondary Forests in Yongren County of Yunnan Province[Journal of West China Forestry Science]

Volume growth equation of Masson pine: Study on biomass growth rule and forest biomass change of main vegetation types in early stage of Banqiao river small watershed management [Guizhou forestry science and technology, 1991].GuizhouFor the ex-post estimation during the following verification, the allometric equations of each tree species will be used to calculate the stem volume, and the allometric equation used will be demonstrated to be appropriate for the purpose of estimation of tree biomass by applying the tool "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" in project monitoring report.

Referring to equation (12), (13) and (14) in the Tool, the mean carbon stock in trees within the tree biomass estimation strata is estimated as follows:

$$C_{TREE,i,j} = \sum_{i,j} A_i \times N_{i,j} \times \frac{44}{12} \times CF_{TREE,j} \times B_{TREE,j} \quad (9)$$

And the biomass of tree is estimated as follows by referring to equation (5) in Appendix 1 of the Tool:

$$B_{TREE,j} = V_{TREE,j} \times D_j \times BEF_j \times (1 + R_j) \quad (10)$$

Where:

$C_{TREE,i,j}$	=	Carbon stock in trees of tree species *j* of strata *i*; t CO_2-e
A_i	=	Area of strata *i*; Mu
$N_{i,j}$	=	Number of the tree species *j* of strata *i*; trees/ha
$CF_{TREE,j}$	=	Carbon fraction of tree biomass for tree species *j*; t C/t d.m.
$B_{TREE,j}$	=	Biomass of one tree of tree species *j*; t d.m.
$V_{TREE,j}$	=	Stem volume of one tree of tree species *j*; m^3.
D_j	=	Density of tree species *j*; t d.m/m^3
BEF_j	=	Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species *j*; dimensionless
R_j	=	Root-shoot ratio for tree species *j*; dimensionless

The tree species adopted in the project are China fir, Cypresses, Pinus yunnanensis and Masson pine. Local growth curves are used to estimate the average merchantable volume of one tree ($V_{TREE,j}$)

China fir[35]	$V_{TREE,j}=0.1962(1-e^{-0.08A})^{3.9012}$
Cypresses[36]	$V_{TREE,j}=0.20420(1-e^{-0.05A})^{4.66995}$
Pinus yunnanensis[37]	$V_{TREE,j}=0.103743(1-e^{-0.067959A})^{3.3420}$
Masson pine	$V_{TREE,j}=0.19073(1-e^{-0.11A})^{6.06248}$

Where,

$V_{TREE,j}$ = average merchantable volume of one tree in category i, at time t; m^3/tree

A – stand age, year

Wood density (D), biomass expansion factor (BEF), root-shoot ratio and carbon fraction for China fir Masson pine and Pinus yunnanensis are listed below.

Table 3-1 Parameters used for different tree species

Tree species	**D_j**	**BEF_j**	**R_j**	**CF_j**
China Fir	0.307	1.634	0.246	0.520
Cypresses	0.478	1.732	0.220	0.510
Pinus yunnanensis	0.483	1.619	0.146	0.511
Masson pine	0.380	1.472	0.187	0.460
source	The tree species involved in the proposed project can be obtained from the table using the values in the second national bulletin on climate change of the People's Republic of China "list of land-use change and forest greenhouse gases"			

According to the growing years of the description of the project activity, the above ground biomass can be categorized 10 stratifications.

Table 3-2 Project Stratification of China fir, Cypresses, Pinus yunnanensis and Masson pine

[35] Review on the Growth Equations of Pinus Massoniana, China fir and Pinus elliottii in China [Journal of Northwest Forestry University].
[36] The biomass growth rule and forest biomass change of main vegetation types in Banqiao river small watershed at the early stage of (1991) governance were studied [Guizhou forestry science and technology, 1991, vol. 19, no. 4].
[37] Analysis of Growth Process Pinus yunnanensis Natural Secondary Forests in Yongren County of Yunnan Province [Journal of West China Forestry Science]

Project Stratifications number	Category of tree	Plant site	Tree number per ha in category	Year to plant	Area (ha)
Proj -1	**China fir**	Bozhou District,Tongzhi County,Suiyang County,Zheng'an County,Daozhen County,Wuchuan County,Meitan County,Xishui County	3100	2015	19245.27
Proj -2	**China fir**	Tongzhi County,Suiyang County	3100	2016	8477.07
Proj -3	**China fir**	Bozhou District,Suiyang County, ,Meitan County	3100	2017	3121.00
Proj -4	**Cypresses**	Suiyang County	3100	2015	500.00
Proj -5	**Cypresses**	Tongzhi County,Suiyang County,Zheng'an County, Wuchuan County,Meitan County	3100	2016	2345.00
Proj -6	**Cypresses**	Bozhou District, Daozhen County,Wuchuan County,Meitan County,Xishui County	3100	2017	2226.40
Proj -7	**Pinus yunnanensis**	Suiyang County	3100	2015	500.00
Proj -8	**Pinus yunnanensis**	Bozhou District, Tongzhi County, Suiyang County, Daozhen County, Wuchuan County, Meitan County, Xishui County	3100	2016	8204.40
Proj -9	**Pinus yunnanensis**	Tongzhi County, Suiyang County,Zheng'an County	3100	2017	2441.93
Proj -10	**Masson pine**	Tongzhi County, Suiyang County, Daozhen County, Wuchuan County, Meitan County, Xishui County	3100	2015	3000

Table 3-3 Number of trees per hectare for the 10 stratifications

Time	Proj-1	Proj-2	Proj-3	Proj-4	Proj-5	Proj-6	Proj-7	Proj-8	Proj-9	Proj-10
year	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees
01-January-2016-31-December-2016	59660327	26278917	0	1550000	2619500	0	1550000	25433640	0	9300000
01-January-2017-31-December-2017	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2018-31-December-2018	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2019-31-December-2019	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2020-31-December-2020	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2021-31-December-2021	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2022-31-December-2022	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2023-31-December-2023	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2024-31-December-2024	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2025-31-December-2025	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2026-31-December-2026	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2027-31-December-	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000

2027										
01-January-2028-31-December-2028	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2029-31-December-2029	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2030-31-December-2030	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2031-31-December-2031	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2032-31-December-2032	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2033-31-December-2033	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2034-31-December-2034	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2035-31-December-2035	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2036-31-December-2036	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2037-31-December-2037	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2038-31-December-2038	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2039-31-December-2039	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2040-31-December-2040	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2041-31-	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000

December-2041										
01-January-2042-31-December-2042	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2043-31-December-2043	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000
01-January-2044-31-December-2044	59660327	26278917	9675100	1550000	2619500	2251840	1550000	25433640	7569983	9300000

Taking all the above information into the formula, we reach the table below.

Table 3-4 The GHG Removals by Sinks of the Project Activity

Year	Estimated annual project removals of Proj-1 (tCO_2e)	Estimated annual project removals of Proj-2 (tCO_2e)	Estimated annual project removals of Proj-3 (tCO_2e)	Estimated annual project removals of Proj-4 (tCO_2e)	Estimated annual project removals of Proj-5 (tCO_2e)	Estimated annual project removals of Proj-6 (tCO_2e)	Estimated annual project removals of Proj-7(tCO_2e)	Estimated annual project removals of Proj-8 (tCO_2e)	Estimated annual project removals of Proj-9 (tCO_2e)	Estimated annual project removals of Proj-10 (tCO_2e)	Estimated total annual project removals (tCO_2e)
01-January-2016-31-December-2016	49936	13352	0	131	253	0	1150	14032	0	2595	81449
01-January-2017-31-December-2017	85249	21995	4916	283	614	240	1790	18877	4176	6303	144443
01-January-2018-31-December-2018	126162	37550	8098	514	1331	583	2481	29377	5619	12018	223733
01-January-2019-31-December-2019	169792	55572	13824	825	2410	1264	3180	40696	8743	19501	315807
01-January-2020-31-December-2020	213590	74789	20460	1215	3868	2288	3860	52185	12113	28220	412588
01-January-2021-31-December-2021	255505	94081	27535	1677	5698	3672	4497	63338	15532	37509	509044

01-January-2022-31-December-2022	294010	112544	34638	2204	7868	5410	5075	73787	18852	46710	601098
01-January-2023-31-December-2023	328071	129504	41435	2781	10334	7470	5585	83278	21961	55258	685677
01-January-2024-31-December-2024	357071	144507	47680	3398	13044	9812	6023	91651	24787	62731	760704
01-January-2025-31-December-2025	380742	157281	53203	4040	15934	12384	6386	98827	27279	68861	824937
01-January-2026-31-December-2026	399080	167708	57906	4696	18948	15128	6674	104778	29414	73518	877850
01-January-2027-31-December-2027	412280	175785	61745	5353	22024	17990	6894	109525	31186	76685	919467
01-January-2028-31-December-2028	420676	181599	64718	6002	25108	20910	7047	113120	32599	78436	950215
01-January-2029-31-December-2029	424688	185298	66860	6631	28148	23838	7140	115634	33668	78901	970806
01-January-2030-31-December-2030	424789	187064	68221	7234	31101	26724	7178	117155	34417	78244	982127
01-January-2031-31-December-2031	421467	187109	68871	7804	33928	29528	7167	117777	34870	76645	985166
01-January-2032-31-December-2032	415212	185646	68888	8334	36598	32212	7112	117598	35055	74287	980942
01-January-2033-31-December-2033	406496	182891	68349	8821	39086	34748	7022	116713	35001	71340	970467
01-January-2034-31-December-2034	395758	179052	67335	9262	41372	37109	6899	115218	34738	67961	954704
01-January-2035-31-December-	383403	174321	65922	9656	43441	39279	6749	113202	34293	64289	934555

2035											
01-January-2036-31-December-2036	369798	168880	64179	10000	45286	41244	6578	110749	33693	60442	910849
01-January-2037-31-December-2037	355270	162887	62177	10296	46901	42996	6389	107935	32963	56517	884331
01-January-2038-31-December-2038	340102	156487	59970	10543	48288	44529	6185	104829	32126	52597	855656
01-January-2039-31-December-2039	324543	149807	57614	10743	49446	45845	5972	101497	31201	48743	825411
01-January-2040-31-December-2040	308804	142953	55154	10897	50383	46946	5751	97993	30209	45003	794093
01-January-2041-31-December-2041	293065	136021	52631	11007	51106	47834	5526	94367	29166	41413	762136
01-January-2042-31-December-2042	277470	129088	50079	11076	51623	48522	5297	90664	28087	37999	729905
01-January-2043-31-December-2043	262145	122219	47526	11107	51948	49012	5068	86920	26985	34777	697707
01-January-2044-31-December-2044	247184	115468	44997	11100	52090	49321	4842	83169	25871	31753	665795

3.2.3 Leakage

According to the applied methodology AR-ACM0003 (Version 2.0.0), leakage emission is estimated as follows:

$$LK_t = LK_{AGRIC,t} \quad (11)$$

Where:

LK_t = GHG emissions due to leakage, in year t; tCO_2-e

$LK_{AGRIC,t}$ = Leakage due to the displacement of agricultural activities in year t, as estimated in the tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity"; tCO_2-e

According to the A/R Methodological tool 'Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity', leakage emission resulting from displacement of the activities is composed of decrease in carbon stock in the carbon pools of the land and change in soil organic carbon stock due to land-use change in the land.

$$LK_{AGRIC,t} = \frac{44}{12} \times (\Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t})^{38} \quad (12)$$

Where:

$LK_{AGRIC,t}$	=	Leakage due to the displacement of agricultural activities in year t; tCO_2-e
$\Delta C_{BIOMASS,t}$	=	Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year t; t d.m
$\Delta SOC_{LUC,t}$	=	Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year t; tC ha

The project was implemented by manual operation, rather than mechanical operation. Besides, no weeding, chopping, pruning, intermediate cutting activities are going to be conducted during the crediting period because of the natural condition, the economic condition and the slow growth pattern. Fertilization and watering are not going to take place, neither. Therefore, there is no expected leakage due to a decrease in carbon stock in the carbon pools of the land and a change in soil organic carbon stock. In other words, there is no expected leakage due to the displacement of agricultural activity from the project activity.

Therefore, leakage is zero for the proposed project.

3.2.4 Net anthropogenic GHG removals by sinks

The net anthropogenic GHG removals by the project shall be calculated as follows:

$$\Delta C_{AR,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t \quad (13)$$

Where:

$\Delta C_{AR,t}$	=	Net anthropogenic GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks, in year *t*; t CO_2-e
LK_t	=	GHG emissions due to leakage, in year *t*; t CO_2-e

The net anthropogenic GHG removals by the project are summarized below.

[38] Equation (1) in page 5 in the A/R Methodological tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (Version 02.0)

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
01-January-2016-31-December-2016	0	81,449	0	81,449
01-January-2017-31-December-2017	0	144,443	0	144,443
01-January-2018-31-December-2018	0	223,733	0	223,733
01-January-2019-31-December-2019	0	315,807	0	315,807
01-January-2020-31-December-2020	0	412,588	0	412,588
01-January-2021-31-December-2021	0	509,044	0	509,044
01-January-2022-31-December-2022	0	601,098	0	601,098
01-January-2023-31-December-2023	0	685,677	0	685,677
01-January-2024-31-December-2024	0	760,704	0	760,704
01-January-2025-31-December-2025	0	824,937	0	824,937
01-January-2026-31-December-2026	0	877,850	0	877,850
01-January-2027-31-December-2027	0	919,467	0	919,467

01-January-2028-31-December-2028	0	950,215	0	950,215
01-January-2029-31-December-2029	0	970,806	0	970,806
01-January-2030-31-December-2030	0	982,127	0	982,127
01-January-2031-31-December-2031	0	985,166	0	985,166
01-January-2032-31-December-2032	0	980,942	0	980,942
01-January-2033-31-December-2033	0	970,467	0	970,467
01-January-2034-31-December-2034	0	954,704	0	954,704
01-January-2035-31-December-2035	0	934,555	0	934,555
01-January-2036-31-December-2036	0	910,849	0	910,849
01-January-2037-31-December-2037	0	884,331	0	884,331
01-January-2038-31-December-2038	0	855,656	0	855,656
01-January-2039-31-December-2039	0	825,411	0	825,411
01-January-2040-31-December-2040	0	794,093	0	794,093
01-January-2041-31-December-	0	762,136	0	762,136

2041				
01-January-2042-31-December-2042	0	729,905	0	729,905
01-January-2043-31-December-2043	0	697,707	0	697,707
01-January-2044-31-December-2044	0	665,795	0	665,795
Total	0	21,225,014	0	21,225,014

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	Ai
Data unit:	ha
Description:	Area of category i
Source of data:	Field measurement
Value applied:	The total area is 50,061ha, please refer to Table 3-2 for details.
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of Data	The parameter is used to calculate actual net GHG removals.
Comments	N/A

Data / Parameter	$BEF_{2,j}$
Data unit	Dimensionless
Description	Biomass expansion factor for conversion of stem biomass to above-ground biomass
Source of data	The People's Republic of China Second National Communication on Climate Change, issued by NDRC, 2013
Value applied:	See Table 3-1 for details
Justification of choice of data or description of measurement methods and procedures applied	National authority data
Purpose of Data	The parameter is used to calculate actual net GHG removals.
Comments	N/A

Data / Parameter	CF_{TREE}
Data unit	t C t^{-1} d.m.
Description	Carbon fraction of tree biomass for species or group of species j
Source of data	The People's Republic of China Second National Communication on Climate Change, issued by NDRC, 2013
Value applied:	See Table 3-1 for details
Justification of choice of data or description of measurement methods and procedures applied	National authority data
Purpose of Data	The parameter is used to calculate actual net GHG removals.
Comments	N/A

Data / Parameter	D_j
Data unit	t d.m.m^{-3}
Description	Basic wood density
Source of data	The People's Republic of China Second National Communication on Climate Change, issued by NDRC, 2013
Value applied:	See Table 3-1 for details
Justification of choice of data or description of measurement methods and procedures applied	National authority data
Purpose of Data	The parameter is used to calculate actual net GHG removals.
Comments	N/A

Data / Parameter	R_j
Data unit	Dimensionless
Description	Root-shoot ratio
Source of data	The People's Republic of China Second National Communication on Climate Change, issued by NDRC, 2013
Value applied:	See Table 3-1 for details
Justification of choice of data or description of measurement methods	National authority data

and procedures applied	
Purpose of Data	The parameter is used to calculate actual net GHG removals.
Comments	N/A

Data / Parameter	t_{VAL} (for calculation of n)
Data unit	Dimensionless
Description	Two-sided Students t-value, at infinite degrees of freedom for the required confidence level
Source of data	Students t-distribution table in the tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 02.1.0)
Value applied	1.645
Justification of choice of data or description of measurement methods and procedures applied	Use the 90% confidence level for determination of biomass stock in A/R CDM project activities
Purpose of data	The parameter is used to calculate number of sample plots for measurements
Comments	This parameter was not included in the registered PD since it is only applicable for calculating number of sample plots during verification

3.3.2 Data and Parameters Monitored

Data / Parameter	$V_{TREE,j}$; $V_{TREE,l,p,j,i}$
Data unit	m^3
Description	Stem volume of tree species *j*; Stem volume of tree *l* of species *j* in sample plot *p* of stratum *i*
Source of data	Calculated
Description of measurement methods and procedures to be applied	For ex ante estimation, the growth curve (age-volume) equations are used to estimate the stem volume. For the ex-post estimation during the following verification will use allometric equations of each tree species to calculate the stem volume.
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	N/A

QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under National Forest Inventory are applied. In absence of these, QA/QC procedures from published handbooks or from IPCC GPG LULUCF 2003 may be applied.
Purpose of data	The parameter is used to calculate actual net GHG removals.
Calculation method	For the ex-post estimation during the following verification, using allometric equations based on tree dimensions to calculate the stem volume. The tree dimensions usually comprise of height and diameter at breast height.
Comments	N/A

Data / Parameter	$H_{l,p,j,i}$; $DBH_{l,p,j,i}$
Data unit	m; cm
Description	Height of tree *l* of species *j* in sample plot *p* of stratum *i*; Diameter at breast height of tree *l* of species *j* in sample plot *p* of stratum *i*
Source of data	Field measurements in sample plots
Description of measurement methods and procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied.
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	$DBH_{l,p,j,i}$:Vinyl tape, wooden stake $H_{l,p,j,i}$;:Hypsometer metric tape The equipment mentioned above has a state-recognized certificate of qualification and no need to be calibrated.
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under National Forest Inventory are applied. In absence of these, QA/QC procedures from published handbooks or from IPCC GPG LULUCF 2003 may be applied. The measure is in line with LY/T 2253-2014 <Guidelines on carbon accounting and monitoring for afforestation project> issued by National Forest Bureau & HJ 710.1-2014 “Technical guidelines for biodiversity monitoring—terrestrial vascular plants” issued by Ministry of environmental protection

Purpose of data	The parameter is used to calculate actual net GHG removals.
Calculation method	These two parameters are used for stem volume calculation of trees in volume equations.
Comments	For the ex-post calculation during the following verification, the allometric equations will be used to calculate the stem volume, and for the purpose of estimation of tree biomass by applying the tool "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" in project monitoring report.

Data / Parameter	A_i; $A_{PLOT,i}$
Data unit	ha
Description	Area of stratum *i*; Size of sample plot in stratum *i*
Source of data	Field measurement
Description of measurement methods and procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied.
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	GPS measuring equipment
QA/QC procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. The measure is in line with LY/T 2253-2014 <Guidelines on carbon accounting and monitoring for afforestation project>.[39]
Purpose of data	The parameter is used to calculate actual net GHG removals
Calculation method	N/A
Comments	N/A

Data / Parameter	$N_{i,j}$
Data unit	tree/ha
Description	Number of the tree species *j* of strata *i*
Source of data	Field measurement
Description of measurement methods and procedures to be	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, may

[39] https://www.renrendoc.com/p-20779950.html

applied	be applied.
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	Counter
QA/QC procedures to be applied	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. The measure is in line with LY/T 2253-2014 <Guidelines on carbon accounting and monitoring for afforestation project>
Purpose of Data	The parameter is used to calculate actual net GHG removals
Calculation method	N/A
Comments	N/A

.

Data / Parameter	n
Data unit	Dimensionless
Description	The number of sample plots
Source of data	Calculation
Description of measurement methods and procedures to be applied	This value is estimated based on a pre-sampling developed in the Project Area before monitoring.
Frequency of monitoring/recording	Before first verification.
Value applied:	24
Monitoring equipment	/
QA/QC procedures to be applied	$n = \left(\frac{t_{VAL}}{E}\right)^2 \times \left(\sum_i w_i \times s_i\right)^2$
Purpose of Data	The parameter is used to calculate number of sample plots
Calculation method	See § 3.3.3 - Post-stratification and determining the number of plots
Comments	N/A

Data / Parameter	n_i
Data unit	Dimensionless
Description	Number of sample plots allocated to strata i

Source of data	Calculation
Description of measurement methods and procedures to be applied	This value is estimated based on a pre-sampling developed in the Project Area before monitoring.
Frequency of monitoring/recording	Before first verification.
Value applied:	

Project Stratifications	Category of tree	n_i
PROJ-1	China fir	11
PROJ-2	China fir	5
PROJ-3	China fir	2
PROJ-4	Cypresses	0
PROJ-5	Cypresses	1
PROJ-6	Cypresses	1
PROJ-7	Pinus yunnanensis	0
PROJ-8	Pinus yunnanensis	3
PROJ-9	Pinus yunnanensis	1
PROJ-10	Masson pine	2

Monitoring equipment	/
QA/QC procedures to be applied	$n_i = n \times \frac{w_i \times s_i}{\sum_i w_i \times s_i}$
Purpose of Data	The parameter is used to calculate number of sample plots
Calculation method	See § 3.3.3 - Post-stratification and determining the number of plots
Comments	N/A

Data / 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	Before first verification.
Value applied:	See table below
Monitoring equipment	/
QA/QC procedures to be applied	The relative weight of the area of stratum i is equal to the area of the stratum *i* divided by the project area.
Purpose of Data	The parameter is used to calculate number of sample plots
Calculation method	See § 3.3.3 - Post-stratification and determining the number of plots
Comments	N/A

Project Stratifications	Category of tree	W_i
PROJ-1	China fir	0.384
PROJ-2	China fir	0.169
PROJ-3	China fir	0.062
PROJ-4	Cypresses	0.010
PROJ-5	Cypresses	0.047
PROJ-6	Cypresses	0.044
PROJ-7	Pinus yunnanensis	0.010
PROJ-8	Pinus yunnanensis	0.164
PROJ-9	Pinus yunnanensis	0.049
PROJ-10	Masson pine	0.060

Data / Parameter	S_i
Data unit	Dimensionless
Description	Estimated standard deviation of biomass stock per unit area in strata *i*
Source of data	Calculation
Description of measurement methods and procedures to be applied	Accordance with the tool, known from existing data related to the project area or existing data related to a similar area. According to the evidence issued by Zunyi city Forestry Bureau, the standard deviation of forestry survey and sampling in this area requires a commonly used coefficient of variation C, which is 30% in Zunyi city[40].
Frequency of	Before first verification.

[40] Evidence on variable coefficient data provided by Zunyi forestry bureau.

<table>
<tr><td>monitoring/recording</td><td></td></tr>
<tr><td>Value applied:</td><td>
<table>
<tr><th>Project Stratifications</th><th>Category of tree</th><th>S_i</th></tr>
<tr><td>PROJ-1</td><td>China fir</td><td>38.996</td></tr>
<tr><td>PROJ-2</td><td>China fir</td><td>37.945</td></tr>
<tr><td>PROJ-3</td><td>China fir</td><td>36.831</td></tr>
<tr><td>PROJ-4</td><td>Cypresses</td><td>30.712</td></tr>
<tr><td>PROJ-5</td><td>Cypresses</td><td>80.189</td></tr>
<tr><td>PROJ-6</td><td>Cypresses</td><td>82.994</td></tr>
<tr><td>PROJ-7</td><td>Pinus yunnanensis</td><td>26.570</td></tr>
<tr><td>PROJ-8</td><td>Pinus yunnanensis</td><td>25.778</td></tr>
<tr><td>PROJ-9</td><td>Pinus yunnanensis</td><td>24.948</td></tr>
<tr><td>PROJ-10</td><td>Masson pine</td><td>40.638</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>/</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The variable coefficient times biomass carbon reserves at the end of Period（t.d.m•ha^{-1}）</td></tr>
<tr><td>Purpose of Data</td><td>The parameter is used to calculate number of sample plots</td></tr>
<tr><td>Calculation method</td><td>See § 3.3.3 - Post-stratification and determining the number of plots</td></tr>
<tr><td>Comments</td><td>N/A</td></tr>
</table>

Data / 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
Source of data	A default value equal to 10% of the mean biomass stock within the project boundary was used, and the mean biomass stock within the project boundary was estimated from the preliminary sample plots.
Description of measurement methods and procedures to be applied	The project monitoring team set 3 preliminary sample plots for each strata and calculated the mean value of the biomass stock in each strata, and the mean value of biomass stock within the project boundary was the weighted average of all strata.
Frequency of monitoring/recording	Before every verification event
Value applied:	Please see Table 3-5 for details

Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of Data	The parameter is used to calculate number of sample plots for measurements
Calculation method	N/A
Comments	N/A

3.3.3 Monitoring Plan

Monitoring process

Monitor the applicability conditions listed in methodology and tools have been met

As mentioned in Section 3.1.2, the methodology AR-ACM0003 (version 2.0.0) is applicable under the following conditions:

a) The land subject to the project activity does not fall in the wetland category.

b) Soil disturbance attributable to the project activity does not cover more than 10 percent of the area in each of the following types of land when these lands are included within the project boundary:

i. Land containing organic soils.

ii. The land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in Appendix 1 and Appendix 2 in the methodology.

The soil disturbance due to this project is in line with the requirements of soil and water conservation. Afforestation density was 3,100 plant/Ha, soil disturbance area ratio was 4.96%.[41], less than 10%, and there was no repeated disturbance.

To monitor the applicability conditions, the following steps will be taken:

Method for estimation of the change in carbon stocks

As stated in section 3.2.2, the actual net GHG removals by sinks are calculated by the equation (4): $\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t}$

Where:

[41]Proportion of soil disturbed area:0.16 ㎡*3100/10000 ㎡=4.96%. Proportion of soil disturbed area: 0.16 ㎡*3,100/10,000 ㎡=4.96%, among them, 0.16 ㎡ was derived from the surface area calculated from the specification of artificial afforestation cavities in the Project Design (40cm*40cm)

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO2-e
$\Delta C_{TREE\_PROJ,t}$	=	Change in carbon stock in tree biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e

And the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity" (Version 04.2) is used to estimate the change in carbon stock above the ground, and Method (b) (Direct estimation of change by re-measurement of sample plots) will be applied for the monitoring during the following verification.

Under this method, the change in carbon stock and the associated uncertainty are estimated as follows:

$$\Delta C_{TREE} = \frac{44}{12} \times CF_{TREE} \times \Delta B_{TREE} \quad (14)$$

$$\Delta B_{TREE} = A \times \Delta b_{TREE} \quad (15)$$

$$\Delta b_{TREE} = \sum_{i=1}^{M} w_i \times \Delta b_{TREE,i} \quad (16)$$

$$u_{\Delta C} = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^{M} w_i^2 \times \frac{s_{\Delta i}^2}{n_i}}}{|\Delta b_{TREE}|} \quad (17)$$

Where:

ΔC_{TREE}	=	Change in carbon stock in trees between two successive measurements; t CO_2-e
CF_{TREE}	=	Carbon fraction of tree biomass; t C/t d.m.
ΔB_{TREE}	=	Change in biomass within the biomass estimation strata; t d.m.
A_i	=	Sum of the area of the biomass estimation strata; ha
Δb_{TREE}		Mean change in tree biomass per hectare within the biomass estimation strata; t d.m./ha
w_i	=	Ratio of the area of stratum i to the sum of areas of biomass estimation strata (i.e. wi=Ai/A); dimensionless
$\Delta b_{TREE,i}$	=	Mean change in tree biomass per hectare in strata i; t d.m./ha

$u_{\Delta C}$	=	Uncertainty in ΔC_{TREE}
t_{VAL}	=	Two-sided Student's t-value for a confidence level of 90 per cent and degrees of freedom equal to n – M, where n is total number of sample plots within the tree biomass estimation strata, and M is the total number of tree biomass estimation strata
$s^2_{\Delta,i}$	=	Variance of mean change in tree biomass per hectare in stratum i; (t d.m. ha-1)^2
n_i	=	Number of sample plots, in stratum i, in which tree biomass was re-measured

Methods of plot biomass measurement

Tree biomass per hectare in a sample plot is estimated by applying one of the plot measurement methods provided in Appendix 1 of the Tool. For the project, the measurement of fixed area plots for the calculation will be chosen.

In this method, sample plots of the same size (e.g. or of a hectare) are installed in a stratum. All trees in a sample plot above a minimum dimension are measured and the biomass of each tree is estimated. The biomass of the individual trees is added and the sum is divided by the area of the sample plot to obtain the plot biomass value.

The plot biomass value (i.e. per-hectare tree biomass at the centre of the plot) is estimated as follows (all time-dependent variables relate to the time of measurement):

$$b_{TREE,p,i} = \frac{\sigma_{TREE,p,i}}{A_{PLOT,i}} \quad (18)$$

$$B_{TREE,p,i} = \sum_j B_{TREE,j,p,i} \quad (19)$$

$$B_{TREE,j,p,i} = \sum_l B_{TREE,l,j,p,i} \quad (20)$$

Where:

$b_{TREE,p,j}$	=	Tree biomass per hectare in sample plot p of stratum i; t d.m./ha
$B_{TREE,p,j}$	=	Tree biomass in sample plot p of stratum i;; t d.m.
$A_{PLOT,i}$	=	Size of sample plot in stratum i; ha
$B_{TREE,j,p,j}$	=	Biomass of trees of species j in sample plot p of stratum i;; t d.m.

$B_{TREE,l,j,p,j}$ = Biomass of trees l of species j in sample plot p of stratum i;; t d.m.

Biomass of a tree in a sample plot is estimated by using the following equation:

$$B_{TREE,l,j,p,i} = V_{TREE,l,p,j,i} \times D_j \times BEF_j \times (1 + R_j) \quad (21)$$

Where:

$B_{TREE,l,p,j,i}$ = Biomass of tree l of species j in sample plot p of stratum i; t d.m.

$V_{TREE,l,p,j,i}$ = Stem volume of tree l of species j in sample plot p of stratum i, estimated from the tree dimension(s) as entry data into a volume table or volume equation; m^3

D_j = Density of tree species j; t d.m/m^3

BEF_j = Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species j; dimensionless

R_j = Root-shoot ratio for tree species j; dimensionless

For the Stem volume of tree l of species j in sample plot p of stratum i $V_{TREE,l,p,j,i}$, the tree dimensions used as entry data into a volume equations are Height of tress ($H_{l,p,j,i}$) and Diameter at breast height of trees ($DBH_{l,p,j,i}$).

Monitoring Team

The monitoring team consists of the project proponent, Shanghai Libra, technicians and the forestry bureau. First of all, Shanghai Libra sets the monitoring boundary, the number of plots, and drafts monitoring manual, tables and so on. Secondly, project proponent and technicians select the sample plots at random and mark out the plots with ropes. Thirdly, project proponent and Shanghai Libra confirm the monitoring frequency and notify the technicians and the forestry bureaus. Finally, the monitoring results will be double-checked by experts of the forestry bureaus.

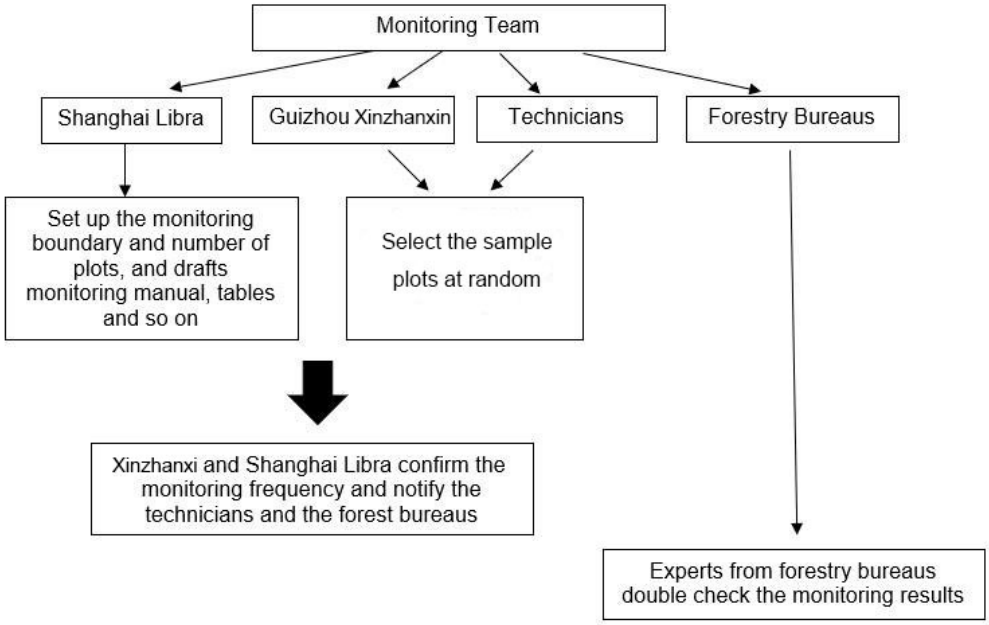

Figure 3-1 The figure of the monitoring team

Monitoring of boundary

The coordinate of the project boundary should be measured and managed strictly in accordance with regulations, and saved in KML files. Boundary information such as original records, need to store in both electronic and printed archive in the project proponent, and participants should keep a backup. Files need to be saved at least two years after the end of the crediting period.

In order to obtain valid and reliable boundary information, the monitoring team needs to use the KML or other verifiable methods to verify the project boundary. If the actual boundary is larger than the boundary in the project design, the excess section is not included in project boundary; instead, if the actual border boundary is smaller than the boundary in the project design, project boundary should be based on the actual boundary. If there are any changes to the boundary, the modified KML files must be provided.

During the crediting period, if the land use patterns such as deforestation and afforestation failure occur in the project area, these plots would be transferred out of the project boundary and no monitoring and verification would be conducted anymore. The areas that have been transferred out of the project border will no longer be allowed to enter the project boundary. If the area that has been transferred out of the project border has been verified, the pre-carbon stocks are still valid, included in the calculation of carbon stocks.

Post-stratification and determining the number of plots

For the first time of monitoring, if there are changes in the area and boundary, the carbon stratification of the project needs to update. In addition, if the number of carbon stratums and the area change, the number of sample plots need to be recalculated.

Although the primary stratification from the baseline survey is the basis for the future project monitoring, the variables in the project implementation deviate the actual situation from the plan. Therefore, the project needs to consider tree species, patterns and other factors in actual planting, and update stratification to post-stratification.

Step 1 Calculation of the number of sample plots

Using tool "Calculation of the number of sample plots for measurements within A/R CDM project activities (Version 02.1.0)" gets the number of plots within each stratum. In order to ensure the statistical independence of each stratum, the number of sample plots is at least 3. The calculation process is as follows:

$$n = \left(\frac{t_{VAL}}{E}\right)^2 * \left(\sum_i w_i * s_i\right)^2 \quad (1)$$

$$n_i = n \cdot \frac{w_i \cdot s_i}{\sum_i w_i \cdot s_i} \quad (2)$$

Where:

n Number of sample plots required for estimation of biomass stocks within the project boundary, dimensionless

n_i Number of sample plots allocated to stratum i 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

N Total number of possible sample plots within the project boundary (i.e. the sampling space or the population); dimensionless

Wi 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. ha^{-1}

E Acceptable margin of error (i.e. one-half the confidence interval) in estimation of biomass stock within the project boundary; t d.m. ha^{-1}

The standard deviation of biomass stock for each stratum (s_i) was conservatively determined as 30%. This was determined based on the 90% confidence level. A default value equal to 10% of the mean biomass stock was used as the acceptable margin of error. The mean biomass stock is the expected biomass at the time of monitoring.

The calculated results of the above monitoring parameters are shown in the following table：

Table 3-5 Number of sample plots

Category of tree	W_i	S_i	t_{VAL}	E	n	n_i	Number of sample plots
China fir	0.384	38.996	1.645	12.311	24	11	11
China fir	0.169	37.945				5	5
China fir	0.062	36.831				2	3
Cypresses	0.010	30.712				0	3
Cypresses	0.047	80.189				1	3
Cypresses	0.044	82.994				1	3
Pinus yunnanensis	0.010	26.570				0	3
Pinus yunnanensis	0.164	25.778				3	3
Pinus yunnanensis	0.049	24.948				1	3
Masson pine	0.060	40.638				2	3

Setting sample plots

The monitoring team needs to set fixed sample plots due to measuring requirements at regular intervals. Plot size is set to be a circular area with a diameter of 30m. The plot needs to determine the location at the centre point of the plot. The location of the fixed sample plot should be set systematically, but the starting fixed sample plot needs to be set randomly use GPS in field work. The location, administrative positions, number of carbon stratums and carbon sub-stratums of each plot should be documented to ensure that the distribution of fixed sample plots is uniform.

Determine the sample location

The samples are fixed circular areas, each 30m in diameter. When selecting the samples on the slope, it is necessary to monitor the gradient and covert the horizontal long to the oblique long. The management methodology (irrigation, fertilization, etc) within the samples must be the same as those outside the samples. If a fire breaks out, another sample could be selected near the original sample.

Monitoring frequency

The monitoring of the project implementation will take place at least every five years after the project registration in order to ensure the continuity of the benefits. Periodic verification and quantitative monitoring of the project will take place every five years.

Data management

All data collected as part of monitoring is archived electronically. All information should be stored by the technology department of the project proponent and all the materials have physical copies for backup. And all data collected shall be archived at least two years after the end of the last crediting period of the project activity.

QA/QC

A systematic internal review and correction process will be used to assure/control the quality. The technicians will provide the original record forms and Guizhou Xinzhanxin will check the data. When they find that negative growth may result from data entry errors, they will fed back to technicians and then correct the data before share it with Libra. Libra will draft the monitoring report based on the raw data and cross-check with the forestry bureau experts. If there are no further comments from the experts, Libra will finalise the report. All parties are required to reply to any questions raised within 30 days. The monitoring equipment should be updated annually if there are new versions or more efficient monitoring tools available. The forestry bureaus are responsible for the monitoring equipment renewal or update.

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

The Monitoring results will be announced on the VCS website, and villagers can download. The monitoring will publish in the notice board outside of each village committee office until the planting finished. During every year's training after the plan published, the monitoring plan is the main course for technicians. The monitoring plan and the monitoring manual are available in village committees and the local forestry bureaus.

The monitoring results and Chinese version summaries will be published on the village representatives and will be published on the villages' notice boards.

3.4 Optional Criterion: Climate Change Adaptation Benefits

3.4.1 Regional Climate Change Scenarios (GL1.1)

N/A..

3.4.2 Climate Change Impacts (GL1.2)

N/A.

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

N/A

4 COMMUNITY

4.1 Without-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CM1.1)

According to the PRA community survey, Local villages are mainly powered by electricity, with a small portion coming from agricultural surpluses such as coal and straw purchases. There is little demand for firewood.

Community well-being information:

As mentioned in section 2.1.8 and 2.1.9, there are four different community groups identified which will be effected by this project:

- *Village Residents in 1 district and 7 counties*
- *Forest Bureaus of 1 district and 7 counties*
- *Governments of 1 district and 7 counties*
- *Village committees in 1 district and 7 counties*

Zunyi is suggested for the comprehensive well-off, vigorously implement the poverty alleviation and development "three-step" development strategy, promoting poverty alleviation works "the people's livelihood project", to look for a job from the locational disadvantage advantage, seek development from resource endowment advantage, focus on the "precision" word fluctuation kongfu, incidence of poverty in the city town fell to 13.7% from 51.3% in 2010, the city poverty rate fell to 10.37% from 24.25% in 2011[42].

At the end of the year, there were 4,424 health institutions, down 1.5% from the end of the previous year. Among them, 414 were hospitals and health centers, an increase of 1.0% over the end of the previous year, and 16 were health centers for women and children. The number of beds in health institutions was 48,748, an increase of 1.6% over the end of the previous year, of which 46,398 were in hospitals and clinics, with an increase of 1.1%. There were 46,699 health technicians, an increase of 6.4% over the end of the previous year, among whom 15,561 were practicing (assistant) physicians, an increase of 7.8%. There were 20,949 registered nurses, with a raise of 8.9%. A total of 6.2647 million farmers participated in the new type of rural cooperative medical care, which accounted for 98.9% participation rate with an increase of 0.4 percentage points over the previous year.[43]

Community characteristics:

[42] http://www.gz.chinanews.com/content/2015/03-29/50354.shtml
[43] http://www.zunyi.gov.cn/zmzy/ljzy/dlqh/201710/t20171024_10344122.html

Zunyi is one of the first national historical and cultural cities, with the world cultural heritage hailong tun, the world natural heritage chishui Danxia .It has been awarded the title of "hometown of longevity", "hometown of magnolia", "hometown of honeysuckle", "hometown of high-quality green tea", "hometown of famous tea" and "hometown of guitar manufacturing". It has won many honors such as national civilized city, national forest city, national health city, Shuangyong model city, China excellent tourist city, national garden city, etc. It is also the hometown of Maotai liquor.

Diversity within the community:

The permanent resident population of Zunyi is 6.2483 million, including 3.2647 million urban population and 2.9836 million rural population. The urbanization rate is 52.25%. The total registered population at the end of the year was 8,051,500, and the birth rate was 14.1‰.The mortality rate was 5.2‰.The natural growth rate was 8.9‰. Zunyi has a number of ethnic groups, including Han, Tujia, Yi, Bai, Dai, Zhuang, Miao, Hui, Kelao, Susu, Lahu, Wa, Naxi, Yao, Tibetan, Jingpo, Blang, Buyi, Achang,Hani, Xibo, Pumi, Mongolian, Nu, Jinuo, De Ang, Shui, Man, Derung, etc. In 2019, the state's total GDP was 300.023 billion CNY, and the per capita disposable income of urban and rural residents was 32,312 CNY and 12,265CNY respectively[44].

Figure 4-1 Villages in Zheng'an county, Zunyi city in 2014

The picture above shows a villager's house with in the project in Zunyi city in 2014. At that time, the income of each household was very low.

[44] http://www.tjcn.org/tjgb/24gz/35980.html

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The local village communities within the project zone consist of 1 district and 7 counties. Villages within the project area are not far from each other, but due to poor infrastructure, it is difficult for villagers to visit and communicate with each other (whether through mountains or muddy roads).

Part of the revenue from the sale of the carbon credit will be used to improve local infrastructure, such as the roads connecting villages within the project area. Without the project, they may not gather together due to the bad country roads, but now they can easily visit any villages. In recent years, more and more ethnic minorities are joined their festivals.

4.1.3 High Conservation Values (CM1.2)

No HCVs are identified, which no negative affection by the project.

4.1.4 Without-Project Scenario: Community (CM1.3)

Agriculture is the main source of income for the community.The communities have no necessary skills, knowledge and funds to make use of the barren land for any land use . Thus, in the absence of project land use scenario, continued 'non-use' of existing land would have no benefit on the livelihoods and well-being of local communities and the community groups.

Without the program, villagers would have to grow corn and potatoes to survive. Besides, only a few cash crops can be exchanged for very little money. Villagers' average income would remain lower than the local minimum standard in Zunyi city Persistent erosion can lead to erratic harvests and in some years no harvest at all. Desertification can also lead to mudslides that threaten villages in the area. All the above would pose significant risks to the local population and the next generation, such as life risks, persistent poverty and low education levels.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Community Group	Local villagers (the number is 5,320,259 in total)
Impact(s)	Improve living conditions and secure safety from being forced to move out of their homelands due to desertification
Type of Benefit/Cost/Risk	Predicted indirect benefits
Change in Well-being	Improve living conditions and environment

Community Group	Migrant rural workers (16,339 within local villagers)
Impact(s)	The job positions offered by the project will give some migrant rural workers, who may choose to work in their living villages instead of going outside for more opportunities.
Type of Benefit/Cost/Risk	Predicted indirect benefits
Change in Well-being	Increase local job opportunities

The impacts on female rural workers are not only including improving living conditions, increasing local job opportunities that are impact to local villagers and migrant rural workers but also describe as following:

Community Group	Female rural workers (11,437 within migrant rural workers)
Impact(s)	Get more job opportunities and training from the project and will have more chance to participate in local activities,
Type of Benefit/Cost/Risk	Actual direct benefits
Change in Well-being	Increase household income and living level, and improve local women's capability and well-being.

4.2.2 Negative Community Impact Mitigation (CM2.2)

Based on the description of Section 4.2.1, no HCVs were identified related to community well-being in the project zone. There are no negative well-being impacts on community groups and the normal life of the community according to the assessment of 4.1.4 and 4.2.1 above.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The main source of income for the local communities is agricultural in the project area. Their production methods are backward, which leads to low agricultural productivity, also affected by the remote location. The project will benefit 1 district and 7 counties on both economic and social aspects.

1) Income improvement: During the project period, the net income generated by the project includes employment and labor income as well as carbon trading income. by Guizhou Xinzhanxin (60 CNY per villager per day for tree-planting and 200 CNY per technician per month for monitoring)..

This project has significantly alleviated the mudslides and improved the soil quality in the recent years since the trees were planted. As a result, the cash crops and crop yields have risen, allowing the villagers not only to meet their daily dietary needs but also to benefit from selling the majority of their products to the market, increasing their income.

Figure 4-2 Women are picking Ficus carica Linn

The pictures above show that women were picking Ficus carica Linn which means women have gained more job opportunities within the project zone. Besides, the project has improved the soil condition and increased villagers' incomes. For example, as the economic crops are increased so villagers can afford the house renovation. Their living condition has improved significantly with fewer droughts and flooding.

2) Job creation: The project will provide permanent and temporary employment opportunities, including soil preparation, planting and management. Most of the work will belong to local villagers involved in the project, and over 70% of them are adult women. Presently, a local household earns about 9,249 CNY on average a year and this project can provide 2,400 CNY per technician per year, which is a very effective and direct way for local villagers to improve their living standards

3) Enhance social cohesion: The project provides people not only increased income but also a joyful life style. Afforestation will form a close interaction between individuals, which will strengthen communication between communities and local governments, communities and communities. For instance, the villagers can often gather up for meetings and trainings becoming more bonded.

Figure 4-3 Gelao nationality Harvest Festival

This picture shows a traditional festival of the Gelao, called 'Harvest Festival' in Wuchuan county, Zunyi city, 2019

'Harvest Festival' is the product of Gelao nationality's agricultural belief, mainly praying for good weather and good harvest through praying. Gelao people attach great importance to this festival because it has two significant meanings. One is to honor our ancestors by cultivating grains instead of leaving wasteland, the other is to celebrate the arrival of harvest. But due to the muddy and rugged mountain roads, many villagers especially the elder and children could not join and celebrate it before the implementation of the project. In recent years, tree planting activities have brought more communication opportunities between villages and villages, women and women. With the crop harvests and increased incomes, the instructions have been improved and villagers can enjoy this festival more than ever, which lead to increased cohesion and happiness to the local village communities..4) Technical training and demonstration: The community generally lacks high-quality seed technology and high-quality seedlings, fire protection, forest pest control, which is also an important issue in local community forest management. The project is organized by the local forestry bureau to help villagers understand and evaluate problems in the implementation of the project, such as seedling selection, seedling management, land preparation model, pest control.

Guizhou Xinzhanxin has strong expertise in the application and research of new agricultural technologies and forest efficient seedling breeding. During the implementation of this project, Guizhou Xinzhanxin organized extensive training for the villagers on how to improve crop yields, how to properly use pesticides and fertilizers, and how to manage soil to speed up crop growth. These knowledge and skills are new but very useful to villagers

5) Before the implementation of the project, the income of the villagers who mainly relied on the surrounding crops was very low, because the serious soil erosion resulted in low crop yields. The transformation of ecological benefits into people's livelihood benefits, resulted from the project, provides a useful pilot for the national financial transfer payment and regional coordinated development, and provides policy support for the new ways of economic development and improvement of people's livelihood in multi-ethnic areas.


Figure 4-4 Local cash crops which are Ficus carica Linn

These pictures above show the main local cash crops in the project area, Ficus carica Linn. After the commencement of this project, the soil condition has been greatly improved. Soil on the karst landform which used to be very thin becomes thickening now through the planting of China fir, Cypresses, Masson pine and Pinus yunnanensis, which significantly contributes to the production increase of the economic crops

6) After the implementation of the project, the green space can be increased to beautify the environment without causing deforestation and obstructing the project. In summary, the relevance of the project area will not have a detrimental effect on the high value of protection.

4.2.4 High Conservation Values Protected (CM2.4)

No HCVs were identified related to community well-being in the project zone thus none of the HCVs related to community well-being will be negatively affected by the project.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

No potential negative offsite stakeholder impacts have been identified. In contract the project will bring benefits to the offsite communities, like providing additional employment opportunities, improving the local environment, as well as mitigating the impacts of climate change on the project zone.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

There is no negative well-being impact on other stakeholders.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

Project will have no negative impacts within and beyond the project zones. Besides, it will increase the income of the local communities and bring positive environmental benefits. Therefore, this project will not create negative impacts on the other stakeholder groups.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

To assess the actual changes in well-being resulting from the project activities for community groups, the project proponent will conduct a stakeholder meeting for each community groups affected by the project and collect all the relevant information through questionnaires. Also, any feedback or suggestions from them will be collected and addressed immediately to initiate an adaptive management plan if necessary.

Monitoring is conducted every five years after the initial monitoring, as described below.

Procedures:

a) Establishing PRA team: The teams will be set up to conduct the PRA process, which consists of social experts, project officers, local government officials and technical staff with various background (forestry, sociology and ecology)

b) Developing SOPs for the field PRA process;

c) Training: A training workshop will be held for discussing and training of PRA teams in order to ensure all PRA members fully understand the purposes, contents, procedures and specific methods of the PRA field survey;

d) Preparation: Developing detail PRA field survey plan including the responsibility of each member of PRA team; and contacting with relevant project counties, forestry farms, towns/townships and informing them PRA plan.

e) PRA survey: conducting PRA survey following SOPs.

Methods:

a) Village meeting: A meeting of farmer representatives will hold in villages sampled. The general agenda are:

(i) Introducing PRA team members and the purpose, procedures, methods and time schedules of the PRA process;

(ii) Explaining the way of villagers' participation;

(iii) Collecting information regarding the project progress, social-economic and environmental benefits shared from the projects, existing problems/difficulties encountered by local communities during the project implementation, as well as comments and suggestions on improvement of the project.

b) Semi-structured interviews: This includes VIP interview, farmer household interview and group interview

(i) Interviewing of VIP: including villager leaders, distinguished villagers, elder villagers and head of ethnic minority.

(ii) Interviewing of household: Some farmer households will be selected for the interview. The interviewed households shall cover rich household, poor household, new inhabitant household, etc.

(iii) Group interview: Villagers are grouped based on gender, age classes or land use types. The group interviews were conducted together with the village meeting.

c) Questionnaire: Questionnaire forms will be developed and distributed among different stakeholders, including farmer households, village committees, forest farms, township governments and forest bureau.

The following key variables will be monitored during each verification of the project:

Variable	Household income
monitoring methods to be applied	Questionnaire and interview
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local rural workers, surplus rural labors, female rural workers
Purpose of monitoring	Evaluate the change of living level due to the implementation of the project

Variable	Capability of technical skills
monitoring methods to be applied	Questionnaire and interview
Frequency of monitoring/recording	Before every verification event

Affected community groups	Rural cooperatives
Purpose of monitoring	Evaluate the technical improvement resulting from the project

Variable	Level of social activities
monitoring methods to be applied	Questionnaire and interview
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local rural workers
Purpose of monitoring	Evaluate the improvement of social activities resulting from the project.

4.4.2 Monitoring Plan Dissemination (CM4.3)

The monitoring plan and results of each verification will be published on VCS and CCB website which can be easily downloaded by stakeholders and the local stakeholders will be notified through the routine villager assembly. Also, a contact person with phone numbers will be published in case any stakeholders want to directly contact the project proponent and raise opinions. The monitoring plans and manual will be available in village committees and the local forestry bureaus.

4.5 Optional Criterion: Exceptional Community Benefits

N/A

4.5.1 Exceptional Community Criteria (GL2.1)

N/A.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

N/A.

4.5.3 Community Participation Risks (GL2.3)

N/A.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

N/A.

4.5.5 Net Impacts on Women (GL2.5)

N/A.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

N/A.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

N/A.

4.5.8 Governance and Implementation Structures (GL2.8)

N/A.

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

N/A.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

In the 1 district and 7 counties where the project located, most of the project sites have relatively homogenous ecological structure and low biodiversity in recent years. The project land is mostly wasteland, mainly karst rocky desertification area. The Karst rocky desertification is caused by the unreasonable exploration of soil resources by human activities. It is a disaster caused by land degradation, which eventually leads to poverty in the Karst areas south-western China where the project is located. What is worse, the sustainable development of this region would be restricted by the resources and environment. Although during recent years the governments to solve this problem and some scientific and technological methods on the comprehensive control of rocky desertification have been successfully applied, the aggravating trend of rocky desertification has not been alleviated. The reconstruction of the green ecosystem has become the key issue in the sustainable economic and social development in south-western China. The comprehensive control of the rocky desertification is still an urgent problem. The increasingly serious rocky desertification will restrict the sustainable development of the region and make the region poorer. At the same time, the continued rocky desertification has affected the survival of animal and plant species such as Grus nigricollis, Trachypithecus francoisi, Handeliodendron bodinieri, and Paphiopedilum micranthum. Continued rocky desertification will cause the soil layer to become thinner and more exposed rocks, which will eventually lead to the inability of vegetation to grow and the animals to be reduced due to lack of habitat. This is the main threat to biodiversity caused by rocky desertification. The rocky desertification in the karst mountainous areas of southwestern China where the

project is located is a specific phenomenon of land degradation, which is one of the most serious environmental problems that need to be resolved urgently.

5.1.2 High Conservation Values (B1.2)

This area does not involve national or local conservation of High Conservation Values organisms.

5.1.3 Without-project Scenario: Biodiversity (B1.3)

As mentioned above, the without-project land-use scenario is continuing the “non-use” of the current land which will have no effect on the biodiversity conditions.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Biodiversity Element	Species of plants
Estimated Change	Increase
Justification of Change	Afforestation of this project will use China Fir, Cypresses, Masson pine and Pinus yunnanensis, which have great vitality and adaptation to Karst area, implement afforestation activity through scientific and reasonable configuration method with no burning and slash. When planted trees gradually grow up to the forest, project sites will gradually become ecological communities with the domain species of tall trees, which will improve the biodiversity. Moreover, the reconstruction of the Karst desertification ecosystem is the key issue in deciding the sustainable development of the economy and society in the project area. Enlarged forest area, will increasing rainfall and improving soil and bring more types of crop and they grew faster than ever, such as pitaya, walnut, coriariasinica and purple perilla.
Biodiversity Element	Species of animals
Estimated Change	Increase
Justification of Change	Scientific and rational afforestation projects can improve Karst rocky desertification; adjust the hydrological cycle, reduce drought and flood risk; promote soil nutrient cycle, improve local micro-climate and other ecological environments. Therefore, the species of animals could be increased due to the better environment of habitat. The number of animals including woodpecker will increase (photo below). Figure 5-1 woodpecker

	

5.2.2 Mitigation Measures (B2.3)

Afforestation of this project will use of China fir, Cypresses, Pinus yunnanensis and Masson pine with strong vitality and adapted to karst area, implement afforestation activity through the scientific and reasonable method with no burning and slash, and protect the existing vegetation as much as possible. Therefore, the implementation of this project will not decrease the biodiversity of project sites and thus no mitigation measures are required.

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Firstly, due to long-term cultivation, the ecological structure of most project sites is relatively homogenous with low biodiversity. The other small areas are wastelands, mainly covered by grass and scattered shrubs. This project will use China fir, Cypresses, Pinus yunnanensis and Masson pine with great vitality and suitable for Karst area to implement afforestation activities in a scientific and reasonable configuration method, without burning and slash. Prior to planting the existing vegetation should be protected as much as possible by applying cave-type preparation. Therefore, the implementation of this project will not decrease the biodiversity of project sites. When planted trees gradually grow up to the forest, project sites will gradually become ecological communities with the domain species of tall trees, which will improve biodiversity.

Secondly, scientific and rational afforestation projects can adjust the hydrological cycle, reduce drought and flood risk; promote soil nutrient cycle, improve local micro-climate and other ecological environments. In addition, as the project site is located in Zunyi city in Guizhou Province, the surrounding area is concentrated on wildlife. Therefore, the revegetation of project sites will facilitate biodiversity protection of the whole project zone.

Thirdly, scientific and rational afforestation projects can adjust the hydrological cycle, reduce drought and flood risk, promote soil nutrient cycle, improve local micro-climate and other ecological environments. Therefore, a better habitat environment can increase the variety of animals. In the meantime, the original

wildlife in the Karst rocky desertification area around the project area will not be threatened, because they can provide sufficient living space for these animals. The increase in the number of animals mainly includes Enicurus scouleriGuizhou.

The 10 national protected species in the project zone are shown in the following table:

Animals	Plants
Francois's Leaf Monkey	cathaya argyrophylla
Moschus berezovskii	Mangnolia officinalis
otus bakkamoena	Douglas fir
Viverra zibetha	Camellia sinensis var assamica
Macaca mulatta	
Syrmaticus reevesii	

Francois's Leaf Monkey is a kind of global endangered species according to IUCN.

5.2.4 High Conservation Values Protected (B2.4)

This area does not involve national or local conservation of High Conservation Values organisms.

5.2.5 Species Used (B2.5)

The project planted native trees in barren land, including China fir, Cypresses, Pinus yunnanensis and Masson pine.

5.2.6 Invasive Species (B2.5)

No invasive and GMO species are applied in the project

5.2.7 Impacts of Non-native Species (B2.6)

No Non-native Species affected the project.

5.2.8 GMO Exclusion (B2.7)

No GMO species is applied in the project.

5.2.9 Inputs Justification (B2.8)

Name	Chemical pesticides
Justification of Use	The chemical pesticides are allowed to be used only if there is a serious disease problem erupted in the project area, and the pesticides will be used in accordance with the National Pesticides Policy.
Potential Adverse Effect	Improper pesticide application would be harmful to the natural environment, including polluting soil, water and air conditions, as well as the habitat of the wildlife. But for this project, pesticide will be strictly managed by well-trained staff to minimize the potential effect. Also, the environmental friendly measures will be adapted such as mixed-species arrangement, seed and seedling quarantine. In particular, the biological measures to control pests and diseases will be adopted. Therefore, the pesticide application will be limited.

Name	Biological control agents
Justification of Use	Upon routine overseeing, the pest will be treated by biological control once occurred according to the local Pest Control and Prevention Policy.
Potential Adverse Effect	The biological control agents are natural enemy of pest which are native species and have no adverse effect on the local environment and communities.

5.2.10 Waste Products (B2.9)

The waste products resulting from the project activities may include:

(1) Rubbish

The villagers will regularly clean up plastic, metal, paper and other waste products in the project area. Local forest technicians will also conduct frequent visits to ensure that waste and waste products are properly identified and cleaned.

(2) Human waste

There may be some waste of people, because there is no toilet on-site, the amount will be very small and can be naturally degraded, so no special treatment is required and there is no impact.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

As the project activities will increase the area of the habitat, as well as improve the habitats' quality, only positive biodiversity impacts can be identified. Therefore, there are no potential negative offsite impacts on biodiversity.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

Since there are no potential negative offsite impacts on biodiversity, the net offsite biodiversity benefits are positive.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

As mentioned in Section 2.1.11, according to Theory of Change, the main objective of the project is to establish forest cover on barren land, by planting a variety of species of native trees. And based on the analysis in Section 2.1.18, the risks of fire, diseases and insects, pesticide and frost might threat the aim of the project and need to be intervened.

To monitor the net impacts on biodiversity of the project, three types of monitoring indicators will be chosen, including Pressure, State, and Response (PSR). And considering the cost efficiency, the indicators that can be monitored with relative ease and reflect local conditions should be chosen.

The detailed monitoring plan for biodiversity is listed in the following table:

Table 5-2 Monitoring indicators for biodiversity

Indicator type	Description	Monitoring indicator	Indicator unit	Monitoring method	Monitoring frequency
State variables	The quantity and quality of forest in the project area	Forest cover	ha	Measure sample spots set during monitoring of Climate as described in Section 3.3	Before every verification
		Species of vegetation	/	Measure sample spots set during monitoring of Climate as described in Section 3.3	Before every verification
		Animal population	/	Monitor the observed numbers	Before every verification

		associated with forest (birds)		of the birds occurred around the monitoring points during a whole day, while the monitoring points will be set randomly and no less than 3.	
Pressure variables	The frequency or intensity of anthropogenic impacts that are directly harmful to biodiversity in the project zone	Number of fires occurred	/	Recorded by forest rangers and confirmed by local Forest Bureau	Once every year
		Affected forest area suffered insects and disease	ha	Recorded by forest rangers and confirmed by local Forest Bureau	Once every year
Response variables	The frequency or intensity of project interventions relevant to biodiversity	Forest area under prevention control from fires	ha	Recorded by forest rangers and confirmed by local Forest Bureau	Once every year
		Forest area under prevention control from insects and diseases	ha	Recorded by forest rangers and confirmed by local Forest Bureau	Once every year
		Forest area recovered from fire, insects or diseases		Recorded by forest rangers and confirmed by local Forest Bureau	Once every year
		Number of trees re-planted	/	Recorded by forest rangers and confirmed by local Forest Bureau	Once every year

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The monitoring plan and results of every verification will be published on VCS and CCB website which can be easily downloaded by stakeholders and the local stakeholders will be noticed through the routine villager assembly. Also, a contact person with phone numbers will be published in case any stakeholders want to directly contact the project proponent and raise opinions. The monitoring plan and the monitoring manual will be available in village committees and the local forestry bureaus.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

N/A

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

N/A