

MIAOLING AFFORESTATION PROJECT



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

Project Title	Miaoling Afforestation Project
Version	05
Date of Issue	21-July-2021
Project Location	Guizhou Province, China
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Project Lifetime	20-April-2016~19-April-2046; 30-year lifetime
GHG Accounting Period	20-April-2016~19-April-2046; 30-year total period
History of CCB Status	N/A
Gold Level Criteria	N/A
Expected Verification Schedule	August 2021

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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	9,259,791 tCO ₂ e	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	30,169 Ha	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 suitable land for forest 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	18,443 (include 18,355 temporary planting workers and 88 long-term technicians)	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	11,053 (include 11,013 temporary planting workers and 40 long-term technicians)	2.3
Employment	Total number of people expected to be employed in project activities, ⁵ expressed as number of full-time employees ⁶	18,443 (include 18,355 temporary planting workers and 88 long-term technicians) ⁷	2.3
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	11,053 (include 11,013 temporary planting workers and 40 long-term technicians)	2.3

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 Because tree planting workers and technicians need different skills and working hours, tree planting work is temporary, and technicians need to carry out long-term management and monitoring during the project period, so 88 long-term technicians are a specific group of people, not included in the number of 18,355 temporary tree planting workers. At the same time, the above numbers are all counted by independent individuals, there was no situation where the same person participated in work at different times and counted twice, which means there is no double counting. This can be proved by the workers' wage record.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Livelihoods	Total number of people expected to have improved livelihoods ⁸ or income generated as a result of project activities	18,443 (include 18,355 temporary planting workers and 88 long-term technicians)	2.3
	Number of women expected to have improved livelihoods or income generated as a result of project activities	11,053 (include 11,013 temporary planting workers and 40 long-term technicians)	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
	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	N/A	N/A

⁸ 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
	scenario		
	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 ⁹ is expected to improve as a result of project activities	18,443 (include 18,355 temporary planting workers and 88 long-term technicians)	2.3
	Number of women whose well-being is expected to improve as a result of project activities	11,053 (include 11,013 temporary planting workers and 40 long-term technicians)	2.3
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation, ¹⁰ measured against the without-project scenario	30,169	5.2
	Expected number of globally Critically Endangered or Endangered species ¹¹ benefiting from reduced threats as a result of project activities, ¹² measured against the without-project scenario	3	5.2

⁹ 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.

¹⁰ 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

¹¹ Per IUCN's Red List of Threatened Species

¹² 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)

Miaoling Afforestation Project (hereafter refer to as “the project”) is located within Qiandongnan Miao and Dong Autonomous Prefecture, 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 suitable land for forest¹³ for GHG removal whilst contributing to local sustainable development goals.

30,169 ha (452,535 Mu¹⁴) of forest was planted on suitable land for forest in Qiandongnan Miao and Dong Autonomous Prefecture which used to be poor sustainable ecological environment and karst rocky desertification. Prior to the project, the project area was suitable land for forest, there is no forestry management and the coverage by planting trees is low, and there has never been any activity affecting the local ecosystem¹⁵. By checking the afforestation plan with the forestry bureau of Qiandongnan, it was confirmed that, a small number of trees have been planted in some project area before the project started, but the coverage by planting trees is low. So considering the low forest coverage, the forestry bureau of Qiandongnan determined that the project area is suitable for afforestation after investigation, then the local forestry bureau approved the supplementary planting without disturbing the existing trees in January 2016 to increase the vegetative cover.

The project is to plant without disturbing the existing trees, and only the trees actually planted in the project were monitored. The carbon credit of the original trees in the baseline scenario will not be monitored or counted in the actual net GHG removals by sinks.

The project involves including 4 counties: Congjiang county, Rongjiang county, Liping county, Leishan county. All suitable land for forest 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 or 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 Xinzhanxin consolidate the offset resources into sizeable forestry offset projects. Guizhou Xinzhanxin will profit-share with the villagers from selling VCUs. The

¹³ According to the “Chinese terms in resource and technology” issued by the China Science Publishing & Media Ltd. the definition of suitable land for forest refers to the land type with suitable site conditions for forest growth programmed by People's governments at or above the county level. The suitable land for forest described in this project is programmed by the Government of Qiandongnan Miao and Dong Autonomous Prefecture, and a small number of trees have been planted in some project area before the project started but the coverage by planting trees is low, so the Government of Qiandongnan defines the project area as suitable land for forest.

¹⁴ A Chinese metric unit of area, 1ha = 15 Mu.

¹⁵ Evidence: Land qualification certificate

implementation of the project activity has provided 18,443 jobs for local villagers, it includes 18,355 temporary planting jobs and 88 long-term technician jobs, among which 60 percent are women. The employment period of temporary planting workers was during the planting period of the project, from 20-April -2016 to 20-December-2017.

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 suitable land for forest. The main objective species are China fir, Masson pine and *Pinus yunnanensis* which are native species according to the baseline survey.

The implementation of the project is expected to reduce the GHG emissions amounting to 9,259,791 tCO₂e in 30 years, with an average annual GHG emission removal of 308,660 tCO₂e.

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 CNY 2.0 mln. 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 CNY 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)

Leishan County is located in the southwest of the Miao and Dong Autonomous Prefecture in Southeast Guizhou, between 107° 55'~108° 22' east longitude and 26° 02'~26° 34' north latitude, bordering Taijiang, Jianhe and Rongjiang counties in the east, and arriving in Guizhou in the south. Sandu Shui Autonomous County in the Southern Autonomous Prefecture is connected to Danzhai County in the west and Kaili City in the north. The total area of Leishan County is 1,218.5 square kilometers. It is 184 kilometers away from the provincial capital Guiyang and 42 kilometers away from the state capital Kaili¹⁶.

Liping County is located between 108° 31'~109° 31' east longitude and 25° 41'~26° 08' north latitude. It is located at the junction of the three provinces (regions) of Guizhou, Hunan, and Guangxi and the transitional area from the Yunnan-Guizhou Plateau to the Jiangnan hilly area, Liping River Valley. The entrance elevation is the lowest in Guizhou. It borders Hunan Jingzhou County, Tongdao County and

¹⁶ <http://www.leishan.gov.cn/mls/>

Guangxi Sanjiang County to the southeast, Rongjiang County and Congjiang County of Guizhou Province to the southwest, and Jianhe County and Jinping County of Guizhou Province to the northeast¹⁷.

Rongjiang County is located in the southeast of Guizhou Province and the south of Qiandongnan Miao and Dong Autonomous Prefecture. It straddles the Pearl River and Yangtze River basins. Among them, the area distributed in the Pearl River Basin accounts for four-fifths. It lies between 108° 04'~108° 44' east diameter and 25° 26'~26° 28' north latitude. Bordering with Liping County and Congjiang County to the east, Libo County in the south, Sandu Shui Autonomous County and Leishan County in Qiannan Prefecture in the west, and Jianhe County in the north¹⁸.

Congjiang County is located in the southeast of Qiandongnan Miao and Dong Autonomous Prefecture in Guizhou Province, at 108° 05'-109° 12" east longitude and 25° 16'-26° 05' north latitude. It is adjacent to Rongjiang County in the north, Libo County in Qiannan Prefecture and Huanjiang County in Guangxi in the west, Rongshui County in Guangxi in the south, Liping County in Benzhou and Sanjiang County in Guangxi in the east. The county is 94 kilometers long from east to west, 77.5 kilometers wide from north to south, and has a total area of 3244 square kilometers¹⁹.

Topography

Leishan County is located in the transitional slope of the Hunan-Guizhou hilly basin on the Yunnan-Guizhou Plateau. The terrain is high in the northeast and low in the southwest. Leigong Mountain is the highest, 2178.8 meters above sea level, and the lowest is 480 meters above sea level.²⁰

Liping County is located at the junction of the three provinces (regions) of Guizhou, Hunan, and Guangxi and the transitional area from the Yunnan-Guizhou Plateau to the Jiangnan hills. The entrance to the Liping Valley is the lowest in Guizhou.²¹

Congjiang County belongs to the low mountain and hilly area on the southeastern edge of the Yunnan-Guizhou Plateau. The general trend of its geomorphological characteristics is: high in the southwest, second in the north, low in the middle, and lower in the east.²²

Rongjiang County is located at the edge of the transition from Guizhou Plateau to Guangxi hills. The strata is part of Jiangnan ancient land. Its geology is divided into three parts: Mesozoic Cretaceous, Paleozoic Cambrian, Sinian and Proterozoic Banxi group. The landform is mainly composed of middle mountains, low mountains, hills, valleys and basins. There are 67 large and small rivers with a total length of 1,303 kilometers. The terrain is high in the northwest and low in the southeast, with the highest altitude

¹⁷ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#4>

¹⁸ <http://www.rongjiang.gov.cn/zjrj/>

¹⁹ <https://baike.baidu.com/item/%E4%BB%8E%E6%B1%9F%E5%8E%BF/5955832?fr=aladdin>

²⁰ http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

²¹ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#4>

²² http://www.congjiang.gov.cn/zjcj/zrdl/201805/t20180528_16245133.html

of 1704 meters and the lowest altitude of 213 meters.²³

Soils

The forest area of Leishan County accounts for 19.07% of the total area of Leishan County, and the grassland area accounts for 28% of the total area. Leishan County spans four soil belts: yellow-red soil, yellow soil, yellow-brown soil, and mountain shrub soil. It contains 7 soil types, 33 soil genera, and 77 soil species.²⁴

Liping County has a total land area of 6,666,292,200 Mu, equivalent to 4,441 square kilometers. The agricultural per capita is 16.17 Mu. It is at a medium level in Qiandongnan Miao and Dong Autonomous Prefecture. The per capita arable land is 1.27 Mu, including 1.14 Mu of rice fields, 0.1 Mu of dry land, and 0.04 Mu of vegetable land. Counties with less land.²⁵

The arable land area of Rongjiang County is 196,500 mu (including 161,900 mu of paddy fields), with high fertility and good water conservancy conditions. The mountainous area accounts for 98.27% of the total area, and most of the soil is thick, which has unique conditions for the development of forestry.²⁶

Congjiang County uses the progressive contours of the mountains on the two wings of the Liujiang River to form the topographical framework of Congjiang County. The mountain area is 2,963 square kilometers, accounting for 91.34% of the total area, and the dam area is 64 square kilometers, accounting for 2%. The river beach area About 4%.²⁷

Climate

Leishan County has a humid mid-subtropical monsoon climate. In most areas, the annual average temperature is between 14°C-15°C, the highest temperature is 35.6°C, and the lowest temperature is minus 8.9°C. The annual rainfall is 1310 mm and the annual average relative humidity is 80%. The frost-free period is 240-250 days, the annual average precipitation is 1375 mm, and the annual average sunshine is 1225 hours.²⁸

Liping County has a humid mid-subtropical monsoon climate with an average annual temperature of about 16°C. January is the coldest, with an average of 4.5°C and the extreme lowest temperature of -9.8°C. The county's annual average precipitation is 1325.9 mm, the highest year is 1690.4 mm, the least year is 1093.1 mm, and the average annual evaporation is 1255.9 mm.²⁹

Rongjiang County is a subtropical and central Asian climate zone. The climate is mild, the rainfall is abundant, the frost period is short, the annual average temperature is 18.1 °C , the accumulated

²³ http://www.rongjiang.gov.cn/zjrj/zrdl/202003/t20200302_52793993.html

²⁴ http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

²⁵ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#4>

²⁶ http://www.rongjiang.gov.cn/zjrj/zrdl/202003/t20200302_52793993.html

²⁷ http://www.congjiang.gov.cn/zjcj/zrdl/201805/t20180528_16245133.html

²⁸ http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

²⁹ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#4>

temperature is over 6500°C, the precipitation is 1211,2 mm, the frost-free period is 310 days, the total cloud cover is 7.9%, the relative humidity is 82%, and the evaporation is 756.4 mm. It has the characteristics of hot summer and warm winter, high accumulated temperature, early precipitation and long duration.³⁰

Congjiang County has four distinct seasons, with no intense heat in summer and severe cold in winter. The annual average temperature is 18.5 degrees, the average temperature of the hottest month is 27.4 degrees, the average temperature of the coldest month is 7.7 degrees, the extreme maximum temperature over the years is 39.2 degrees, and the extreme minimum temperature is -4.4 degrees. The annual average precipitation is 1185.9mm, the annual average frost-free period is 328 days, the annual average sunshine hours are 1304.9 hours, the annual average evaporation is 1185mm, and the annual average thunderstorm days are 52 days.³¹

Hydrology

Leishan County is located in the rainstorm center of Guizhou. Leishan County has 216 large and small streams with a total length of 647 kilometers, at an average runoff of 530 million cubic meters per year, and 15,600 kilowatts of hydropower resource can be developed. Leishan County is rich in water resources, with a drainage area of 1,218 square kilometers and the theoretical hydropower reserve capacity is 68,000 kilowatts.³²

There are six larger rivers in Liping County, with a total length of 3,480 kilometers and an area of 43 square kilometers. Among them, the Yangtze River system includes the Mengyan River, the Bazhou River, and the Hongzhou River. The Pearl River system includes the Nanjiang River, Shuangjiang River and Yudong River.³³

Rongjiang County has 67 large and small rivers with a total length of 1,303 kilometers. The theoretical hydropower reserve capacity is 259,900 kilowatts, and 103,700 kilowatts can be utilized.³⁴

The hydrological resources of Congjiang County are located in the Pearl River Basin, Liujiang River System, and the middle section of the Dulu River. Due to the topography and geomorphology, the main stream of the Liujiang River traverses the entire territory from north to south. There are 87 large and small rivers in the county, with a drainage area of 20. Square kilometers, the county river section is 66 kilometers long. The county's hydropower resource reserve storage is 278,705 kilowatts, and 193,327 kilowatts have been developed, accounting for 69.3% of the county's reserves, 37,450 kilowatts have

³⁰ http://www.rongjiang.gov.cn/zjrj/zrdl/202003/t20200302_52793993.html

³¹ http://www.congjiang.gov.cn/zjcj/zrdl/201805/t20180528_16245133.html

³² http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

³³ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#4>

³⁴ https://baike.baidu.com/item/%E6%A6%95%E6%B1%9F%E5%8E%BF#4_3

been sold, accounted for 13.4% of the county's reserves, and the planned undeveloped 45,860 kilowatts, accounted for 17.3% of the county's reserves.

Types of vegetation

In Leishan County, there are 23 second-class protected animals such as black bears and musk goats, and more than 200 rare wild Chinese medicinal materials such as gastrodia elata and eucommia. It is known as the "natural green cornucopia". The tea products such as Yinqiu tea and Qingming tea produced in Leishan County have won many provincial and ministerial honors. "Yinqiu Tea" was named "Ten Famous Tea in Guizhou".³⁵

Liping County has a forest area of 3.7 million mu, a forest coverage rate of 65%, and a standing tree stock volume of 14.15 million cubic meters. It ranks first among the 10 forestry counties in the province. There are 24 nationally protected rare tree species and 1,220 wild Chinese herbal medicines. There are 52 genera and 675 species of mammals. It mainly produces China fir, where is well-known as the "hometown of China fir". It is one of the top ten forest districts or counties in Guizhou Province, with a forest coverage rate of 58%. The main species of trees are: China fir, masson pine, camellia, hickory, tung oil, Sawtooth oak and bamboo.³⁶

Rongjiang County has a wide variety of biological resources and good vegetation. More than 2,000 species of plants. Among them: 1,312 species of seed plants. There are 49 species endemic to China, 566 species of woody trees, 386 species of shrubs; 1 species under national first-level protection, 20 species under second-level protection, and 18 species under third-level protection. The stock volume of standing timber is 21.28 million cubic meters, and the commodity rate is over 80%. It enjoys the reputation of Guizhou Forestry County.³⁷

Congjiang County is rich in ponkan, gastrodia elata, shiitake mushroom, eucommia, fungus and other famous and special products, as well as gall, eucommia, cork and other valuable Chinese medicinal materials.

2.1.6 Social Parameters (G1.3)

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

Main settlements

The total population of Leishan County is 161,000, and there are 5 ethnic groups with more than 1,000 people including Miao, Han, Dong, Shui and Yao. The minority population accounts for 91.2% of the total population. Among them, the Miao population accounts for 83.2% of 134,000. The Dong nationality's 4

³⁵ http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

³⁶ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#4>

³⁷ http://www.rongjiang.gov.cn/zjrj/zrdl/202003/t20200302_52793993.html

million people accounted for 2.5%, the Shui nationality's 6,400 people accounted for 4%, the Yao's 10,000 people accounted for 0.6%, and other ethnic minorities accounted for 1%.³⁸

Liping County has a total population of 560,000, living in 13 ethnic groups including Dong, Miao, Han, Yao, Zhuang, and Shui. Among them, the Dong has a population of 400,000, accounting for 71% of the county's total population. The second largest county in the province and the most populous county in the state. The county has a built-up area of 12 square kilometers and an urban population of 120,000.³⁹

The population of Rongjiang County is 379,900, of which the urban population is 103,100, the rural population is 276,800, and the permanent population of 290,300 in 2019 is half a year. According to a sample survey of rural households, the county's per capita disposable income of urban residents was CNY 31872, an increase of 8.9% year-on-year; the per capita disposable income of rural residents was CNY 9,761, an increase of 10.9% over the previous year. There are 15 ethnic groups including Dong, Miao, Han, Shui and Yao in Rongjiang County.⁴⁰

Congjiang is a multi-ethnic County with a land area of 322,476 hectares. As of 2017, the total population of the county was 374,586, of which ethnic minorities accounted for 95%. The main ethnic groups are Miao, Dong, Zhuang, Yao, Shui and other minorities. Nationality is dominant. As of 2017, the total permanent population of Congjiang County was 293,400, an increase of 1,300 from the end of the previous year. At the end of the year, the total number of households was 95,679, and the total registered population was 373,700, an increase of 10874 persons over the end of the previous year. The annual birth rate was 12.99‰, a decrease of 0.12‰ from the previous year; the death rate was 7.04‰, a decrease of 0.24‰ from the previous year; the natural population growth rate was 5.95‰, an increase of 0.12‰ from the previous year.⁴¹

Land use and economic activities

Leishan County has 15936.97 hectares of arable land, of which 11390.87 hectares of paddy fields and 4546.1 hectares of dry land. In 2017, Leishan County achieved a gross regional product (GDP) of CNY 3.183 billion, a year-on-year increase of 12.1%, ranking first in the state in terms of growth rate, with a per capita GDP of CNY 26,983 . Among them, the added value of the primary industry was CNY 748 million, an increase of 6.3% year-on-year; the added value of the secondary industry was CNY 507 million, an increase of 10.4%; the added value of the tertiary industry was CNY 1.928 billion, an increase of 14.8%. The structure of the three industries is 23.5:15.9:60.6.⁴²

Liping County has fertile land, a warm climate and abundant rainfall, suitable for the growth of various animals and plants, and is the gene bank of plants in southern China. In 2016, the county's GDP reached CNY 8.009 billion, 2.09 times that of 2011, with an average annual growth rate of 15.9%. The total fiscal

³⁸ http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

³⁹ http://www.lp.gov.cn/zjlp/lpgk/201610/t20161026_23198639.html

⁴⁰ <https://baike.baidu.com/item/%E6%A6%95%E6%B1%9F%E5%8E%BF#5>

⁴¹ <https://baike.baidu.com/item/%E4%BB%8E%E6%B1%9F%E5%8E%BF#5>

⁴² <https://baike.baidu.com/item/%E9%9B%B7%E5%B1%B1%E5%8E%BF/9622585?fr=aladdin#1>

revenue, the added value of industries above designated size, and the investment in fixed assets of more than CNY 5 million have doubled, from CNY 300 million, CNY 350 million, CNY 1.665 billion to 775 million, CNY 1.25 billion and 6.761 billion respectively. Residents' income has increased substantially. The per capita disposable income of urban residents and rural residents exceeded CNY 25,000 and 7,246, respectively, an increase of CNY 13,155 and 3397 over 2011. The realization of a well-off society in the county is expected to reach 88%.⁴³

Rongjiang County has good soil conditions, deep soil layer, high organic matter content, and mostly light sticky light soil. The river valleys and dams along the Sanhe River Basin (Pingyong River, Zhaihao River, Duliu River) have high land availability. The crops are two or three crops a year. In 2019, Rongjiang County achieved a total annual GDP of CNY 7.913 billion, an increase of 11% over the previous year, and a per capita GDP of CNY 27,207. In terms of industries, the primary industry completed CNY 1.979 billion, an increase of 5.5%; the secondary industry completed CNY 1.506 billion, an increase of 15.1%; the tertiary industry completed CNY 4.429 billion, an increase of 12.4%. The added value of the primary, secondary, and tertiary industries accounted for 25%, 19%, and 56% of the county's GDP respectively.⁴⁴

Congjiang County has an area of 483,700 mu of arable land, the amount of arable land has been stabilized at more than 358,100 mu, and the area of basic farmland protection has stabilized at more than 306,700 acres, ensuring the amount of arable land and the area of basic farmland protection throughout the county. Congjiang County's GDP was CNY 6.091 billion, an increase of 8% over the previous year. Among them, the added value of the primary industry was CNY 1.754 billion, an increase of 6.3%; the added value of the secondary industry was CNY 1.525 billion, an increase of 11.2%; the added value of the tertiary industry was CNY 2.812 billion, an increase of 7%. GDP per capita reached CNY 20,805, an increase of 7.4% over the previous year.⁴⁵

Relevant historic conditions

In Leishan County, during the Kangxi period of the Qing Dynasty, Zhenyuan, Pianqiao, and Qingping were merged into Zhenyuan, Shibing and Qingping counties respectively, and Xinglongwei was merged into Huangping Prefecture. In the seventh year of Emperor Yongzheng in the Qing Dynasty (AD 1729), the Danjiang Hall was located in Danjiang (now the old Danjiang), which belonged to Duyun Prefecture. In the eleventh year of Tongzhi (AD 1872), Danjiang Hall moved to Zhaoqing Fort (now the county seat). In 1913, Danjiang Hall was changed to Danjiang County, belonging to Qianzhong Road. In the 1941, Danjiang County was abolished and merged into Taigong and Bazhai counties. In 1944, Leishan was established to establish a governance bureau, which was the first administrative inspectorate. In 1950, Leishan's administrative bureau was changed to Leishan County, which is still in use today.⁴⁶

⁴³ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#9>

⁴⁴ http://www.rongjiang.gov.cn/zjrj/jfz/202002/t20200229_52255018.html
https://baike.baidu.com/item/%E6%A6%95%E6%B1%9F%E5%8E%BF#6_1

⁴⁵ https://www.sohu.com/a/305367633_114731
<https://baike.baidu.com/item/%E4%BB%8E%E6%B1%9F%E5%8E%BF#5>

⁴⁶ <https://baike.baidu.com/item/%E9%9B%B7%E5%B1%B1%E5%8E%BF/9622585?fr=aladdin#1>

Liping County is a transportation fortress that goes down to Huguang in the east and Yunnan and Guizhou in the west. It is also a major watershed between the Qingshui River and the Duli River. This place is rich in fir, fungus, yam, cowhide, etc. It is a place where merchants gathered in the past. The market is quite prosperous, and it has the elegant name of Little Nanjing. In the mid-Qing Dynasty, merchants from Hunan, Hubei, Guangdong, Guangxi, Zhejiang, Sichuan and Jiangxi established chambers of commerce in Liping. The existing Qing Dynasty Huguang Guild Hall in Jiaqing has a construction area of more than 3480 square meters. In the Yuwang Palace alone, there are more than 80 flat inscriptions such as "Exploring the Flower and the First" and "Zhuangyuan and the First".⁴⁷

Rongjiang County, during the Spring and Autumn Period and Warring States Period, it belonged to the State of Chu. For a long time, it was a place where the central dynasty was restrained and managed by native officials. In the 20th year of Yuan (AD 1360), it was set up as the General Administration Mansion of Bawandong in Guzhou, and later turned into the Military and Civilian Mansion, which belonged to the Sizhou Comfort Division. In the third year of Hongwu of the Ming Dynasty (AD 1370), the chief lawsuit of the barbarians in Guzhou was set up, which belonged to the Xuanwei Division of Sizhou; in the twenty-sixth year (AD 1393), the ancient state guard was set up and scrapped; the sixth year of Yongle (AD 1408) was set up as Guzhou Siliu Official head; in the twelfth year (AD 1414), the ruler of the barbarians in Guzhou belonged to Liping Prefecture. In the fifth year of the Yongzheng period of the Qing Dynasty (AD 1727), the Kaitai County was established to be stationed in Guzhou; in the seventh year (1729), the Guzhou Town was established, and the Guzhou Hall was set up, and the Liping Mansion was stationed there; the first year of Qianlong (AD 1736) Set Guzhou Bingbei Road; in the second year (AD 1738), Taixian County was moved to Langdong.⁴⁸

Congjiang County, Yuan is Fuluyongcong, Xishan Dadong and other places, belonging to Sizhou Military and Civilian Comforting Division. In the third year of Hongwu of the Ming Dynasty (AD 1370), the Fuluyong Cong was in a lawsuit, belonging to the Sizhou Xuanwei Division; in the fifth year of Yongle (1407), the lawsuit was established by the Xishanyangdong Chief, which belonged to the Sizhou Xuanwei Division; six years (AD 1408) The second chief official was added; in the twelfth year (AD1414), Fulu Yongcong and Xishanyangdong were subordinated to Liping Prefecture; the sixth year of orthodoxy (1441) was changed to Fulu Yongcong and Xishanyangdong barbarians. From the county, it belongs to Liping Prefecture. In the 22nd year of Emperor Kangxi of the Qing Dynasty (AD 1693), the lawsuit against the chief of Xishanyangdong was abolished; in the tenth year of Emperor Yongzheng (AD 1732), a member of Yongcong County was added and stationed in Bingmei, and the secretary of Tanxi in Liping Prefecture was moved to Xiajiang. In the thirty-sixth year of Qianlong (AD 1771), the Guiyang Mansion was stationed in Xiajiang, which was changed to Liping Mansion and the Xiajiang Hall was set. In the late Qing Dynasty, Congjiang County belonged to Yongcong County, Xiajiangting County, Kaitai County and Tanxisi.⁴⁹

⁴⁷ <https://baike.baidu.com/item/%E9%BB%8E%E5%B9%B3%E5%8E%BF/424519?fr=aladdin#9>

⁴⁸ <https://baike.baidu.com/item/%E6%A6%95%E6%B1%9F%E5%8E%BF#5>

⁴⁹ <https://baike.baidu.com/item/%E4%BB%8E%E6%B1%9F%E5%8E%BF#5>

Socio-cultural information

Table 1-1 Information of Population

	Population
Leishan County	As of the end of 2017, Leishan County has a total population of 161,000. There are 5 ethnic groups with more than 1,000 people including Miao, Han, Dong, Shui and Yao. The minority population accounts for 91.2% of the total population. Among them, the Miao population accounts for 134,000. 83.2%, 4 thousand Dong people accounted for 2.5%, Shui people 6400 people accounted for 4%, Yao people 1 thousand people accounted for 0.6%, and other ethnic minorities accounted for 1%. ⁵⁰
Liping County	Liping County has a total population of 560,000, living in 13 ethnic groups including Dong, Miao, Han, Yao, Zhuang, and Shui. Among them, the Dong has a population of 400,000, accounting for 71% of the county's total population. The second largest county in the province and the most populous county in the state. The county has a built-up area of 12 square kilometers and an urban population of 120,000. ⁵¹
Rongjiang County	The population of Rongjiang County is 379,900, of which the urban population is 103,100, and the rural population is 276,800. In 2019, the resident population is 290,300 for six months. According to a sample survey of rural households, the county's per capita disposable income of urban residents was CNY 31872, an increase of 8.9% year-on-year; the per capita disposable income of rural residents was CNY 9,761, an increase of 10.9% over the previous year. Rongjiang County is home to 15 ethnic groups including Dong, Miao, Han, Shui and Yao. ⁵²
Congjiang County	As of 2017, the total permanent population of Congjiang County was 293,400, an increase of 1,300 from the end of the previous year. At the end of the year, the total number of households was 95,679, and the total registered population was 373,700, an increase of 10874 persons over the end of the previous year. The annual birth rate was

⁵⁰ http://www.leishan.gov.cn/mls/ljsj/202002/t20200220_50337710.html

⁵¹ http://www.lp.gov.cn/zjlp/lpgk/201610/t20161026_23198639.html

⁵² <https://baike.baidu.com/item/%E6%A6%95%E6%B1%9F%E5%8E%BF#5>

	12.99‰, a decrease of 0.12‰ from the previous year; the death rate was 7.04‰, a decrease of 0.24‰ from the previous year; the natural population growth rate was 5.95‰, an increase of 0.12‰ from the previous year. ⁵³
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Table 1-2 Information of Income

	Income
Leishan County	In 2019, the per capita disposable income of urban residents reached CNY 32,319, a year-on-year increase of 8.8%. The per capita disposable income of rural residents reached CNY 10,310, a year-on-year increase of 10.9%. ⁵⁴
Liping County	In 2019, the county's rural residents' per capita disposable income was CNY 9,699, an increase of CNY 943 over the previous year, an increase of 10.8%, and the per capita disposable income of urban residents was 32,420 yuan, an increase of CNY 2622 over the previous year, an increase of 8.8%. ⁵⁵
Rongjiang County	In 2019, the county's per capita disposable income of urban residents was CNY 31872, an increase of 8.9% year-on-year; the per capita disposable income of rural residents was CNY 9,761, an increase of 10.9% over the previous year. ⁵⁶
Congjiang County	In 2019, the per capita disposable income of rural residents was CNY 10,219, an increase of 10.8% over the previous year, and the per capita disposable income of urban residents was CNY 32,557, an increase of 8.5% over the previous year. ⁵⁷

Table 1-3 Information of Education

	Education
Leishan County	Balanced development of education. In 2019, the county has 117 schools of all levels and types, of which: 48 independently operated kindergartens (8 privately-run), 62 primary schools (23 complete primary schools, 39 teaching sites), 5 junior high schools, and 1 general high school, 1 secondary

⁵³ <https://baike.baidu.com/item/%E4%BB%8E%E6%B1%9F%E5%8E%BF#5>

⁵⁴ http://www.ahmhxc.com/tongjigongbao/18758_3.html

⁵⁵ http://www.lp.gov.cn/xxgkml/jcgk/tjxx/202007/t20200728_61763226.html

⁵⁶ http://www.ahmhxc.com/tongjigongbao/18757_2.html

⁵⁷ http://www.congjiang.gov.cn/zwgk/xxgkml/zfxxgkml/tjxx/tjgb/202006/t20200603_60874571.html

	vocational school. There are 4878 kindergartens (classes), 12,336 elementary school students, 5,900 junior high school students, 2,924 regular high school students, and 225 full-time students in secondary vocational and technical schools. ⁵⁸
Liping County	There are 255 primary schools in the county, including 78 complete primary schools and 177 teaching centers. There are 44174 primary school students and 2561 primary school staff. There are 19 junior middle schools, 2 primary schools with 18596 students and 1089 junior middle school staff. There are 5 ordinary senior high schools with 9524 students and 697 Teaching staff. There are 2 secondary vocational schools with 3458 students and 105 teaching staff. There are 201 kindergartens, 72 schools have attached children's classes, 21271 children in the kindergarten (class) and 1334 teachers and workers; there is a special education school with 144 students and 25 special school staff. ⁵⁹
Rongjiang County	In the 2019-2020 school year, there are 236 schools in the county, including 155 primary schools, 65 kindergartens, 1 special education school, 10 junior middle schools, 3 ordinary senior high schools, 1 vocational high school and 1 work study school. There are 13968 Kindergarten (class) students, 32680 primary school students, 13326 junior high school students, 7243 ordinary senior high school students, 136 special school students, 754 vocational school students. ⁶⁰
Congjiang County	At the end of the year, there were 69,220 and 3,619 students and full-time teachers at all levels and types of schools. Among them, there are 32,252 regular primary school students, and the enrollment rate of primary school-age children is 100%; junior high school students are 13,048, with a gross enrollment rate of 100% at the junior high school stage; 5,498 regular high school students, with a gross enrollment rate of 88.3% at the high school stage. ⁶¹

Table 1-4 Information of Health

	Health
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⁵⁸ http://www.ahmhxc.com/tongjigongbao/18758_3.html

⁵⁹ http://www.lp.gov.cn/xxgkml/jcgk/tjxx/202007/t20200728_61763226.html

⁶⁰ http://www.ahmhxc.com/tongjigongbao/18757_2.html

⁶¹ http://www.congjiaang.gov.cn/zwgk/xxgkml/zfxgkml/tjxx/tjgb/202006/t20200603_60874571.html

Leishan County	The healthy development of health services. The medical insurance participation rate of urban and rural residents reached 98.62%, and 238,000 people were compensated. More than 14,200 people received assistance for major diseases, with assistance funds of RMB 9,268,100. The comprehensive reform of county-level public hospitals continued to advance, adding 7 departments including rehabilitation medicine and brain surgery, and the county hospitals passed the second-class review. Completed the construction of Wangfeng Township Health Center and County Women's Family Planning Center. Achieve full coverage of the standardized construction of the "Four Has Two Implementation One Service" in village clinics, and the contracted service rate of family doctors has reached 100%. ⁶²
Liping County	There are 485 medical and health units in the county, including 1 health and health administrative unit, 1 county health and health comprehensive administrative law enforcement brigade, 1 disease prevention and control institution, 2 county-level Medical Institutions [County People's Hospital, county hospital of traditional Chinese medicine, 1 County Maternal and child health and family planning service center, 25 township (street) health centers, 1 Chaoyang leprosy rehabilitation hospital, and community health service There are 3 hospitals, 391 village clinics and 59 private medical institutions, including 7 private hospitals and 52 private clinics. ⁶³
Rongjiang County	The county has 363 health institutions, including: 1 general hospital, 1 Chinese medicine hospital, 19 township health centers, 1 disease prevention and control center, 1 health supervision bureau, 1 maternal and child health care institution, and 323 village clinics , 16 clinics. The number of people participating in the new rural cooperative medical system reached 334,769. ⁶⁴
Congjiang County	There are 407 medical and health institutions in the county, including 2 county-level public hospitals, 1 County Maternal and child health care and family planning service center, 19 township hospitals, 366 village clinics, 11 clinics, 5 private hospitals, 1 Emergency Center, 1 Health Supervision Bureau and 1 disease prevention and control center. ⁶⁵

Table 1-5 Information of Employment

⁶² http://www.ahmhxc.com/tongjigongbao/18758_3.html

⁶³ http://www.lp.gov.cn/xxgkml/jcgk/tjxx/202007/t20200728_61763226.html

⁶⁴ http://www.ahmhxc.com/tongjigongbao/18757_2.html

⁶⁵ http://www.congjiang.gov.cn/zwgk/xxgkml/zfxgkml/tjxx/tjgb/202006/t20200603_60874571.html

	Employment
Leishan County	Consolidate and improve employment security, organize and carry out skills training for 4,124 people, 1835 people are employed in the county, and 1,873 people are migrant workers. ⁶⁶
Liping County	A total of 213 training sessions have been completed, including 10590 poverty-stricken households, 7179 new urban employment, 863 reemployment, 561 employment difficulties and 6585 new rural labor. The average registered unemployment rate of the whole county is 2.19%, and the registered urban unemployment rate is controlled within 4%. ⁶⁷
Rongjiang County	The county achieved 4,239 new jobs and 388 registered unemployed people in urban areas at the end of the year. ⁶⁸
Congjiang County	At the end of the year, the county's new urban employment was 3904, an increase of 0.8% over the previous year. ⁶⁹

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

The project is located in Qiandongnan Miao and Dong Autonomous Prefecture, including 4 counties, Congjiang County, Rongjiang County, Liping County, Leishan County. The geographical coordinate of the project is between 107°55' and 109°31' east longitudes, and between 25°20' and 26°34' north latitude.

The location of Guizhou province in China is shown in Figure 1-1, while the location of the project activity in Guizhou Province is illustrated in Figure 1-2. According to CCB standard, Qiandongnan Miao and Dong Autonomous Prefecture is defined as the project zone (shown in Figure 1-3), and the planting area in Qiandongnan Miao and Dong Autonomous Prefecture 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 Qiandongnan Miao and Dong Autonomous Prefecture as well as those of the 4 counties included in the project zone are listed below:

Table 2-1 Geographical Coordinates of the Project Activity in Qiandongnan Miao and Dong Autonomous Prefecture

	East longitude	North latitude
Qiandongnan Miao and	107° 17'20" —109° 35'24"	25° 19'20" —27° 31'40"

⁶⁶ http://www.ahmhxc.com/tongjigongbao/18758_3.html

⁶⁷ http://www.lp.gov.cn/xxgkml/jcgk/tjxx/202007/t20200728_61763226.html

⁶⁸ http://www.ahmhxc.com/tongjigongbao/18757_2.html

⁶⁹ http://www.congjiang.gov.cn/zwgk/xxgkml/zfxxgkml/tjxx/tjgb/202006/t20200603_60874571.html

Dong Autonomous Prefecture		
Congjiang County	108° 05'~109° 12'	25° 20'~26° 05'
Rongjiang County	108° 04'~108° 44'	25° 26'~26° 28'
Liping County	108° 37'~109° 31'	25° 44'~26° 31'
Leishan County	107° 55'~108° 22'	26° 02'~26° 34'



Figure 1-1 Map showing Guizhou Province, China

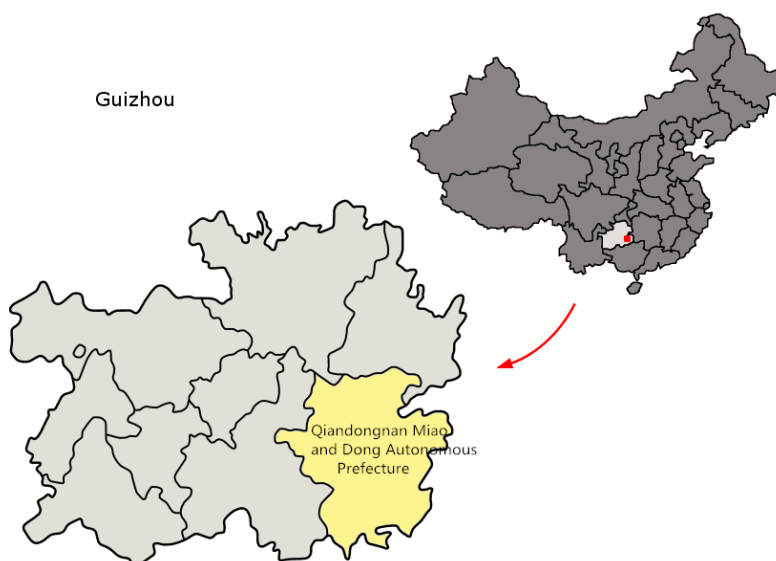


Figure 1-2 Map showing Qiongnan Miao and Dong Autonomous Prefecture, Guizhou, China



Figure1-3 The project location within the Qiandongnan Miao and Dong Autonomous Prefecture

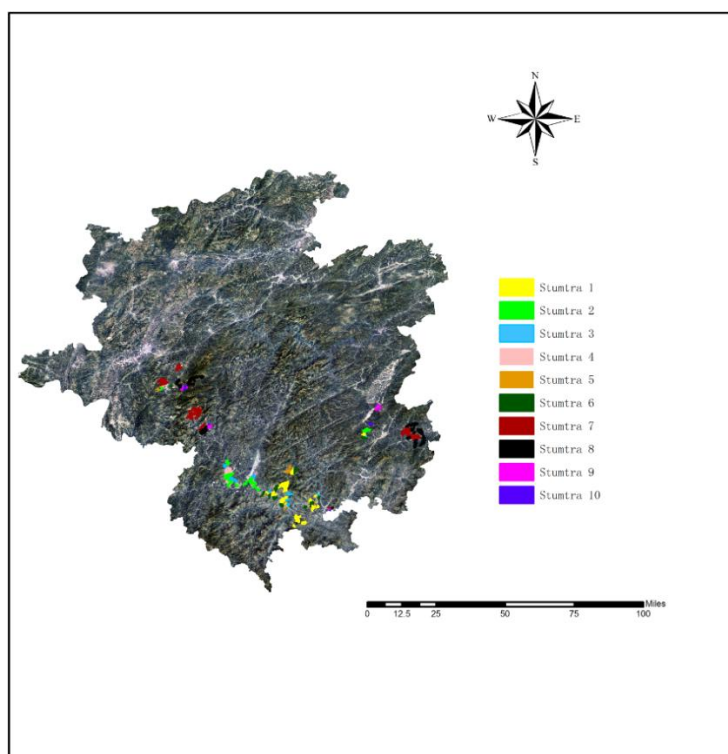


Figure 1-4 The boundaries of the project zone and project area

In figure 1-4, the yellow areas within the boundaries of Congjiang, Leishan and Liping counties represent the 23 villages involved in the project. In this area, China fir, which was planted at a density of 2,108 per ha in 2016, is the main species on stratification of Pro-1.

The green areas within the boundaries of Rongjiang, Leishan and Liping counties represent the 14 villages involved in the project. In this area, China fir, which was planted at a density of 2,396 per ha in 2017, is the main species on stratification of Pro-2.

The blue areas within the boundaries of Congjiang, Rongjiang and Liping counties represent the 10 villages involved in the project. In this area, China fir, which was planted at a density of 1,985 per ha in 2016, is the main species on stratification of Pro-3.

The pink areas within the boundaries of Rongjiang and Leishan counties represent the 11 villages involved in the project. In this area, China fir, which was planted at a density of 2,287 per ha in 2017, is the main species on stratification of Pro-4.

The orange areas within the boundaries of Congjiang, Leishan and Liping counties represent the 17 villages involved in the project. In this area, China fir, which was planted at a density of 1,951 per ha in 2016, is the main species on stratification of Pro-5.

The atrovirens areas within the boundaries of Congjiang, Leishan and Liping counties represent the 12 villages involved in the project. In this area, China fir, which was planted at a density of 2,345 per ha in 2017, is the main species on stratification of Pro-6.

The red areas within the boundaries of Leishan, Liping, Congjiang and Rongjiang counties represent the 38 villages involved in the project. In this area, Masson pine, which was planted at a density of 1,873 per ha in 2016, is the main species on stratification of Pro-7.

The black areas within the boundaries of Leishan, Liping, Congjiang and Rongjiang counties represent the 25 villages involved in the project. In this area, Masson pine, which was planted at a density of 2,208 per ha in 2017, is the main species on stratification of Pro-8.

The pinkish purple areas within the boundaries of Liping, Leishan, Rongjiang and Congjiang counties represent the 15 villages involved in the project. In this area, *Pinus yunnanensis*, which was planted at a density of 1,927 per ha in 2016, is the main species on stratification of Pro-9.

The purple areas within the boundaries of Liping, Leishan, Rongjiang and Congjiang counties represent the 9 villages involved in the project. In this area, *Pinus yunnanensis*, which was planted at a density of 2,145 per ha in 2017, is the main species on 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 Kaili city, Majiang county, Danzhai county, Huangping county, Shibing county, Zhenyuan county, Cengong county, Sansui county, Tianzhu county, Jianhe county, Taijiang county and Jinping county respectively. These counties 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 October 2015, the project participant and Qiandongnan 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) Local villagers in 4 counties: (including 18,355 local farmers had been hired as temporary planting workers):

The proposed project involved planting China fir, Masson pine and *Pinus yunnanensis* in 4 counties of Qiandongnan Miao and Dong Autonomous Prefecture.

In these counties, villagers have been directly affected by the activities of the project. In addition, the lands in the project area belong to these villagers and these lands are centrally managed by the 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 gathered the opinions and consent of the villagers located within their respective local villages through face-to-face meetings before deciding to apply to the local governments' and the forestry bureaus for permission to plant trees within the project area. The committees were also responsible for signing the cooperation agreement with the project proponent to ensure the project is developed properly.

Since October 2015, 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 suitable land for forest collectively owned by the villages to plant trees. In the end,

18,355 villagers were hired as temporary workers to plant trees, of whom 11,013 were women, accounting for 60 percent. The total villages are directly impacted by the project.

This afforestation activity has greatly benefited the local villages and could only carry out with the villagers' consent. Hence, the villagers within 4 counties of the project zone are recognized to be stakeholders in the project.

2) 88 skilled technicians worked as long-term workers in 4 counties:

After the start of the project, routine inspection and communication work need to be carried out. At the same time, monitoring work needs to be carried out every year. Therefore, 88 local villagers were hired as long-term technicians, and the local forestry bureau regularly trains them with relevant work knowledge.

3) The Forestry bureau of Qiandongnan and Forestry bureaus of 4 counties:

Planting techniques are provided by the local forestry 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.

4) Governments of 4 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.

5) Village committees in 4 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 capability was defined as the top 20% by household's income;
- Third, select 'representative', respected and knowledgeable key informants, especially the women representative since women accounted for 60% of the local villagers 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)?
Local villagers in the 174 villages from 4 counties (include 18,335 local farmers had been hired as temporary planting workers)	Job opportunity, safeguard of homeland from desertification	Create job opportunity, provide work training	Partnership
88 skilled technicians worked as long-term workers in 4 counties	Job opportunity, safeguard of homeland from desertification	Create job opportunity, provide work training	Partnership
The Forestry bureau of Qiandongnan and Forest Bureaus of 4 counties	Afforestation management, forest coverage	In charge of the official approval and management of the forest projects. Increased forest coverage	Partnership
Governments of 4 counties	Local social and environmental management, employment and welfare of county	Enhance local social and environmental management. Increased employment and improved welfare of county	Partnership
Village committees in 4 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
Local villagers in the 174 villages from 4 counties (include 18,335 local farmers had been hired as temporary planting workers)				☒
88 skilled technicians worked as long-term workers in 4 counties				☒
The Forestry bureau of Qiandongnan and Forest Bureaus of 4 counties		☒		
Governments of 4 counties		☒		
Village committees in 4 counties			☒	

Table 2-4 Importance of stakeholder to project achievement

Stakeholders	Importance of stakeholder to project achievement			
	Low	Moderate	Significant	Critical
Local villagers in the 174 villages from 4 counties (include 18,335 local farmers had been hired as temporary planting workers)				☒
88 skilled technicians worked as long-term workers in 4 counties				☒
The Forestry bureau of Qiandongnan and			☒	

Forest Bureaus of 4 counties				
Governments of 4 counties			☒	
Village committees in 4 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
Local villagers in the 174 villages from 4 counties (include 18,335 local farmers had been hired as temporary planting workers)	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.
88 skilled technicians worked as long-term workers in 4 counties	88 skilled technicians worked as long-term workers, They have long participated in project related work, such as daily forest protection, information collection and communication, project monitoring, etc. As a result, they are directly affected by the project.
The Forest Bureau of Qiandongnan and Forest Bureaus of 4 counties	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 4 counties	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 4 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.

2.1.10 Sectoral Scope and Project Type

The project is 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)

GHG emission reduction or removal activities

The project is aimed to increase carbon sequestration and contribute to local sustainable development by planting trees on suitable land for forest⁷⁰. 30,169 ha (452,535 Mu) of forest were directly afforested on suitable land for forest in Qiandongnan Miao and Dong Autonomous Prefecture, including 4 counties: Rongjiang county, Congjiang county, Liping county and Leishan county. According to Biodiversity Survey Report of the project, all the project areas were previously suitable land for forest without agricultural activities. There was no natural renewal and reforestation before the project, and some sites were covered by sparse shrub and scattered low coverage trees. 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.

Before the project, a small number of trees have been planted in some project areas. However, because of the poor natural conditions in the local karst area, coupled with the lack of planting technology and

⁷⁰ According to the "Afforestation standard at county level in Guizhou Province" issued by the Guizhou Technical Supervision Bureau, the definition of suitable land for forest refers to the land with forest cover density less than 20%.

management experience, the coverage by planting trees is low. Therefore, considering the low forest coverage, the forestry bureau of Qiandongnan determined that the project area is suitable for afforestation after investigation, then the forestry bureau of Qiandongnan approved the supplementary planting without disturbing the existing trees in January 2016 to increase the vegetative cover. According to the different species of trees and different densities, the project is confirmed to be divided into 10 carbon layers. Only the trees actually planted in the project were monitored. The carbon credit of the original trees in the baseline scenario will not be monitored or counted in the project credit.

In the project area, the trees planted before the project have been hung with eye-catching red signboards by the technicians, which means that these trees do not counted in the monitoring of the project. While the trees planted in the project are hung with green signboards by the technicians, and their growth is recorded in the subsequent monitoring. In order to eliminate the situation that the signboard falling, the corresponding red and green marks are also painted on the trunk. In conservative manner if the signboards and the marks on the trunk are lost, the corresponding trees will not be included in the monitoring records of the project.

Therefore, only the height and DBH of the trees actually planted in the project will be measured to calculate the carbon sink.

The species of ecological public welfare forest in the karst area mainly include Pine, Fir, Cypress, Toonasinensis, Populusadenopoda, Dodonaeaviscosa, etc. Among them, Pine, Fir and Cypress are the main forest species to control karst rocky desertification in Guizhou, because they have strong adaptability. Pine and China fir are prominent in rocky desertification areas due to their fast growth, shallow rooting and strong adaptability to the soil. They are both 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 of the trees, enhance 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, Masson pine and Pinus yunnanensis).

The project is estimated to generate GHG emission removals of 9,259,791tCO₂e in 30 years, with an average annual GHG emission removal of 308,660tCO₂e.

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 suitable land for forest, 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 CNY 1,550, 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 CNY 60 and the monthly salary for each part-time technician is CNY 200, 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;

Without the project, the muddy mountain roads are a major barrier to communication among villagers. Their incomes are too low to afford the expenditure of building roads, so they lack communication with each other. Even during the special festivals, including the Spring Festival, they simply celebrate at home. Similarly, their inability to make enough money to feed themselves makes them less likely to socialize and celebrate the holidays.

With the project, it is also necessary to build roads in the previously inaccessible mountains and wastelands while planting trees, which facilitates the daily passage of villagers living remotely. The accessibility of the roads has removed communication barriers between villagers, and the jobs brought by the project will increase their income, so will their sense of well-being. The reduced pressure of life makes villagers more willing to socialize in their spare time, especially when important local events and festivals come around. Smooth roads, good environment and close-knit communities make road construction a better livelihood project.

(2) Rocky desertification invasion focal issue:

Without the project, the project area would remain suitable land for forest with low forest coverage threatened by rocky desertification land and the surrounding villages would be threatened by rocky desertification invasion. Before the project, a small number of trees have been planted in the project area, however, because of the poor natural conditions in the local karst area, coupled with the lack of planting technology and management experience, the coverage by planting trees is low. The main reasons for this result are as follows: 1. The project is located in karst area, where the land is poor, the soil is thin, the wind and sand are strong, and there are many natural disasters such as debris flow, which make it difficult for trees to grow. 2. In the past, the planting technology was relatively backward, and the forest management measures such as artificial tending were lacking. After planting, it was allowed to grow freely, so it was easy to lack the necessary nutrients and lead to the withering of trees; 3. Some villagers

blindly pursue economic benefits and plant cash crops on Karst land, resulting in low survival rate of crops. These problems lead to the Rocky Desertification in the project area has not been improved, even more and more serious.

With the project, planting trees will improve the local problems, including mudslides, landslides, etc., resulting in higher crop yields in the surrounding area. The extend of rocky desertification will be significantly improved because planting trees improves the local soil structure, stabilizes the soil of mountain and keeps the soil moist so that plants could grow more easily. Also, planting trees improves the surrounding ecological environment and contributes to better air quality. The forest cover of the project zone was significantly increased which could mitigate the rocky desertification threaten. Until 2018 the ratio is raised to 67.98%⁷¹. In addition to the rewards for planting, farmers' income will increase because of the higher yields due to the consolidated soil structure.

Therefore, rocky desertification land will be improved and the living conditions of the communities will also be improved;

(3) The threat to biodiversity focal issue:

Without this project, the area would be constantly affected by desertification. This will also lead to deterioration of the local climate and biodiversity. The habitats of the wild animals would be destroyed and the animals would have no place to live.

With the project, a scientific and reasonable planting configuration method was adopted to increase the forest coverage rate. The implementation of the project will optimize the hydrological cycle, reduce the risk of drought and flood, promote the circulation of soil nutrients, then improve the local microclimate and other ecological environment.

Therefore, due to the better habitat environment, the number of animals may increase. With the implementation of the project, the expected output, outcomes and impacts are summarized in the following table:

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	Increase forest coverage, create job opportunities	Improve the local environment	Generate GHG emission removals	Climate
Offer permanent and temporary job	Increase household	Improve living conditions of the	Improve well-being of the local	Community

⁷¹ http://lyj.guizhou.gov.cn/xwzx/szdt/202008/t20200805_62164083.html

opportunities related to forest planting and management	incomes of local villagers	local villages	villagers	
Provide technical skills and training of forest planting and management	Improve motivation of community groups	Improve local villagers knowledge of forestry technology	Enhance the ability of local villagers to continuously obtain job opportunities	Community
Conduct constant management and protection of the forest	Improve local ecological environment	Provide a better habitat for wild animals	Increase the local biodiversity	Biodiversity

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
05- September -2015	Started the baseline survey.
12- December-2015	The Project Design for Afforestation Operation in 2016 was finished.
06- January -2016	The afforestation project design in 2016 was approved by Qiandongnan Forest Bureau.
12- January -2016	Biodiversity survey report of the project was completed.
19- January -2016	Participatory Rural Appraisal (PRA) report of the project was completed.
20- April -2016	Planting trees (start date of crediting period) was started.
06- January -2017	The Project Design for Afforestation Operation in 2017 was finished.
25- January -2017	The afforestation project design in 2017 was approved by Qiandongnan Forest Bureau.
10- October -2017	Training technical worker yearly.
20-December-2017	Planting was completed.

19- October -2018	Training technical worker yearly.
08- October -2019	Training technical worker yearly.
10-September-2020	Started collecting and sorting data to write PD
08- October -2020	Training technical worker yearly.
08-December-2020 to 08-January-2021	PD GSC
25-January-2021 to 27-January-2021	On-site visit by Auditor

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 20-April-2016 when the planting started.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

Planting started: 20- April -2016, the date on which the native community started its activities and led to greenhouse gas removal.

The project crediting period is from 20- April -2016 to 19- April -2046, and the project lifetime is 30 years from 20- April -2016 to 19- April -2046.

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 ₂ e)
20-April-2016~19-April-2017	13897
20-April-2017~19-April-2018	33254
20-April-2018~19-April-2019	58302
20-April-2019~19-April-2020	94092
20-April-2020~19-April-2021	136361
20-April-2021~19-April-2022	182586
20-April-2022~19-April-2023	230053

20-April-2023~19-April-2024	276222
20-April-2024~19-April-2025	318994
20-April-2025~19-April-2026	356789
20-April-2026~19-April-2027	388591
20-April-2027~19-April-2028	413897
20-April-2028~19-April-2029	432605
20-April-2029~19-April-2030	444959
20-April-2030~19-April-2031	451419
20-April-2031~19-April-2032	452582
20-April-2032~19-April-2033	449147
20-April-2033~19-April-2034	441806
20-April-2034~19-April-2035	431255
20-April-2035~19-April-2036	418139
20-April-2036~19-April-2037	403052
20-April-2037~19-April-2038	386516
20-April-2038~19-April-2039	368993
20-April-2039~19-April-2040	350871
20-April-2040~19-April-2041	332473
20-April-2041~19-April-2042	314069
20-April-2042~19-April-2043	295884
20-April-2043~19-April-2044	278078
20-April-2044~19-April-2045	260790
20-April-2045~19-April-2046	244115
Total estimated ERs	9,259,791
Total number of crediting years	30
Average annual ERs	308,660

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 suitable land for forest, thus the risk of fire is quite low in the early phase of the project. After the	Strengthen the work of forest fire prevention publicity education to increase the awareness of forest fire prevention in the whole society.

	trees grow to a certain age and the forest coverage is highly increased (about thirty years), the risk of fire may increase, and the project proponent will adopt the necessary measures for fire preventing.	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, we will implement mass prevention and control and effectively raise the people's 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 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 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 2-1 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 2016. 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.

The project area is an area of comparatively serious rocky desertification. The implementation of this project will effectively control the rocky desertification in this area and significantly improve the ecological environment. Firstly, even after the end of the lifetime of this project, the local government and forestry bureau will continue to supervise and manage according to the PRC Forest Law⁷² and the PRC Forest Law Implementing Regulations⁷³. It is illegal to cut down trees planted by this project, so the trees will continue to be protected. At the same time, the local government and forestry bureau shall continuously supervise and patrol the plants and animals in the project area according to the Law of the People's Republic of China on the Protection of Wild Animals⁷⁴ and the Measures for the Protection of Terrestrial Wild Animals of Guizhou Province⁷⁵, so the local plant and animal population will continue to maintain or increase. Besides, during the 30 years lifetime, the project proponent regular management measures,

⁷² http://www.gov.cn/xinwen/2019-12/28/content_5464831.htm

⁷³ http://www.gov.cn/gongbao/content/2016/content_5139476.htm

⁷⁴ http://www.gov.cn/xinwen/2016-07/03/content_5087722.htm

⁷⁵ <https://wenku.baidu.com/view/6bcfb353fe00bed5b9f3f90f76c66137ee064f0c.html>

such as training, patrol, publicity, etc., will further enhance the ecological protection consciousness of residents. After the end of the project, local villagers will also jointly supervise and manage the local trees and wildlife through open reporting calls and other reporting methods so that the continuous improvement of the surrounding community ecological environment will be effectively guaranteed. Thus, the agricultural production will be further increased, which leads to higher incomes of farmers.

Secondly, during the 30 years of the project crediting period, the project proponent will provide annual training for the technicians hired to ensure that they can acquire rich professional experience and the ecological protection consciousness. After the end of the project, a part of them will continue to implement the supervision and management work, the others will be paid by the relevant forestry bureau even beyond the project lifetime because they will train other staff by the knowledge and experience mastered.

Thirdly, the women involved in this project activity not only increase the family income but also learn extra skills during the project implementation period, which equip them well ecological environment protection consciousness and improve their social status. After the 30 years of the crediting period, they still have relevant professional ability to play a role in forestry, such as working for the forestry bureau, or choosing to work in forestry companies, seeding companies and other social organizations, so as to continue to reflect the value of women in society.

Finally, from a more profound perspective, the benefits of this project are ongoing. After 30 years of forest operation and management, not only the residents' awareness of ecological protection has been enhanced, but also the next generation will establish the awareness of ecological protection from an early age and continue to maintain and improve the ecological environment.

2.1.20 Financial Sustainability (G1.12)

According to the published suitable land for forest data, the forestry departments at all grade have made counting and verification on the afforestation area. Finally, according to the counted planting area, the nationality issued special funds for afforestation to Qiandongnan Miao and Dong Autonomous Prefecture, together with provincial funds from Guizhou and local funds from Qiandongnan Miao and Dong Autonomous Prefecture, 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 Xinzhanchin signed the Consulting Agreement with Shanghai Libra Investment & Management Co., Ltd, and 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. Before the implementation of the project, a small number of trees have been planted in the project areas, but the coverage by planting trees is low. The lands will remain suitable land for forest with low coverage 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 undeveloped counties, whose economy are 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 suitable land for forest with low forest coverage threaten by rocky desertification before the afforestation project. Based on the laws listed above, the existing laws, regulations, and governance arrangements would not likely affect land use in the absence of the project.

Finally, the project would not have been implemented under the without-project scenario due to significant financial, technological, institutional or capacity barriers which has been clearly listed in section 3.1.5.

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

No distinct climate, community and biodiversity benefits intended to be claimed as offsets for this project.

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 Chinese version, and the local village communities and other stakeholders

can easily download from the website. All the document of 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, including listing, registered, issuance, etc. Since the beginning of the project, there is no feedback has been received.

Miaoling Afforestation Project

ID: 2378

Program: VCS& CCB

Location: China

Project Activity: ARR

Sectoral Scope: 14

Methodology: ACM0003

Estimated annual ERR 458,449 tCO₂e.

Benefits achieved this monitoring period:

- 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.

Public Comment Period: 8 December 2020 – 8 January 2021

Figure 2-2 Published on VCS and CCB website

2.3.2 Dissemination of Summary Project Documents (G3.1)

Along with the project implementation, the project documentation has been published on VCS and CCB website for all stakeholders to obtain the detailed project information and development progress. Also, the summary of project description in local language has 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 25 October 2015, during the PRA survey period, the project proponent also held a stakeholder meeting at Leishan county involving stakeholder representatives from the 4 counties involved in the project, to collect to gather their opinions and suggestions, and distributed questionnaires to the

participants to collect their feedback. The land owners, representative of forestry bureaus, government officers expressed their opinions about the project activities. A total of 30 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.

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

On 25 October 2015, 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)

After the PD is published on the VCS website, a stakeholder meeting has been held meantime the DOE on site visiting. The meeting notice has been published on the notice board of each village including the contact person's telephone number.

The status and process of the project for CCB and VCS validation and verification would be published on local bulletin boards, also the mobile phone number of contact person of the project was provided to all the stakeholders so they can directly make a call in case they have any problem about the project.

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

The notice on the DOE site visit information has been published on the village board along with the stakeholder meeting information. On January 25, 2021, the auditor presided over the on-site visit meeting of the project, and 22 people from Shanghai Libra, the owner company, the local government and the forestry bureau of the project, farmers and technicians from some villages attended the meeting. At the

meeting, the auditors mainly interviewed the impact of the project on the local natural environment, community economy, living standards and biodiversity, and also interviewed everyone's opinions and suggestions on the project, while the meeting they talked to auditor freely.

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 Qiandongnan Forestry bureau, conducted a Participatory Rural Appraisal and CCB survey to meet the requirements of 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 land owners' opinions. A total of 100 questionnaires were distributed, and 100 were collected. The surveys took 3 months and completed on 19-January-2016. The data sheet of basic information of questionnaire participants and feedback collected is summarized below.

Parameter		Data value/ people
Location of participants	Leishan County	30
	Liping County	25
	Rongjiang County	20
	Congjiang County	25
Gender	Female	47
	male	53
Age	20-29	10
	30-39	24
	40-49	28
	50-59	25
	60-69	13
Job category	Employees of agriculture,	90
	Construction practitioners	5
	Other employees	5

- 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 11,013 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.

The figure displays five completed questionnaires for the '苗岭林业碳汇造林项目' (Guizhou Afforestation Project). Each questionnaire is a table with 16 numbered questions and handwritten answers in Chinese. The questionnaires are distributed to different stakeholders, as indicated by the names and dates at the top of each form.

Figure 2-3 Questionnaires distributed to stakeholders

The pictures above are 5 PRA and CCB questionnaires from Guizhou Academy of Social Sciences (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, the average annual income is CNY 9,820. The main economic sources are land and labor.
How many men and women are in your family?	On average there are 2.2 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 females
What kind of production activities does your family do?	crop farming
Do you have a religion?	No
What is your cultural level?	72% are elementary school culture, 15% are illiterate, 13% 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 work of this project? What is the expected salary?	Willing to participate; The average expected salary is CNY 180
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, 88 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 as a local fertilizer and saplings supplier has a good relationship with local villagers and familiar with the planting processing. The relevant government invited Guizhou Xinzhanxin as the project proponent.

During the project planning period, Project proponent called on all villagers or representatives in the project area to participate in the decision-making meeting by posting meeting notices, including ethnic minority villagers, left-behind young and middle-aged women, the elderly and other special classes. For stakeholders who did not participate in the meeting, the PRA survey was also used to allow the community to fully participate in decision-making, such as the selection and planting pattern selection. In this process, the survey organizers fully considered the living habits of different ethnic groups and genders in the project area, and conducted targeted field visits to investigate the views of the villagers of

the Miao, Dong, Shui, Yao, Zhuang, Han and other ethnic groups on the project. The survey organizers also introduced the purpose, process, benefits, potential costs and risks of the project in detail. Villagers of all ethnic groups agree to join the project and are willing to participate in tree planting. In terms of gender-sensitive manner, the survey paid special attention to the opinions of women, and 47% of the interviewees were women. The PRA survey methods include meetings, household interviews, questionnaires and telephone contacts to collect villagers' willingness to plant trees. The final results of PRA showed that all villagers of all ethnic groups agreed to implement this project. Most young people and healthy women want to participate in tree planting. The project proponent will also give priority to female workers in tree planting activities.

In the process of project implementation, the local village committee and local government are the direct implementers of the project, and the project proponent is the coordinator, responsible for the overall management of the project. All important information about the decision is posted on the bulletin board of the village committee so that local stakeholders can read it. It is considered that some ethnic minority villagers who cannot read in Chinese or female villagers with a lower level of education, the information obtained through the technicians. If there were any feedbacks from stakeholders, the decision would be revised after further discussion. In addition, project development status and the information on contact person will also be regularly posted on the bulletin board. If there were any negative feedbacks, a meeting shall be held immediately in the villages to discuss the solutions.

2.3.11 Anti-Discrimination Assurance (G3.7)

The project proponent should obey 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 farmers. Employed forest patrols will play an important role in dealing with common 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. The specific staff member shall propose a solution and mediation plan

within one week based on all the information collected by the relevant parties, and the conflict shall be handled within 30 days.

In case of a dispute, the following three steps will be adopted to resolve it

1. The project proponent will communicate with the stakeholders actively together with the representatives of the village committee for searching the solutions. After an agreement is reached and a paper response document is signed jointly, both parties shall keep a copy respectively. The dispute shall be solved within 30 days, and the relevant response should be posted on the bulletin board of the village committee.
2. If the problems cannot be solved by the representatives of the village committee and the project proponent by themselves, then the Forestry Bureau needs to step in to coordinate for them. As the forestry bureau must remain neutral because it is a relatively objective third-party government agency. Likewise, if the problem is solved by the forestry bureau, then a paper response document shall be signed jointly and the both parties shall keep a copy respectively. In this case, the dispute shall be solved within 30 days as well, and the response document should be posted on the bulletin board of the village committee.
3. If the dispute cannot be settled by the forestry bureau, then it can be submitted to the county's first-level arbitration department or court. Under the circumstances, the judgment or the arbitration result would be taken as the final solution and it should be signed by both parties and then they should keep a copy respectively. The time limit for submitting the dispute to the arbitration commission or appealing to the court is 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 2015, 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. The project has provided 18,443 job opportunities.

During the implementation of the project, the total number of local villagers involved in planting was approximately 18,355, and of which 60% were women. In addition, approximately 88 technicians 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 Xinzhaxin also signs long-term part-time employment contracts with 88 skilled technicians from local forestry bureaus and pays CNY 200 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.

During the implementation of the project, the total number of local farmers involved in temporary planting was 18,355, and of which 60% were women. In addition, 88 technicians (including 40 women) are long-term employed for project management and are provided related skill training regularly⁷⁶.

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 as 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 and the worker's rights are guaranteed in the labor contracts for each worker.

⁷⁶ Because tree planting workers and technicians need different skills and working hours, tree planting work is temporary, and technicians need to carry out long-term management and monitoring during the project period, so 88 long-term technicians are a specific group of people, not included in the number of 18,355 temporary tree planting workers. At the same time, the above numbers are all counted by independent individuals, there was no situation where the same person participated in work at different times and counted twice, which means there is no double counting. This can be proved by the workers' wage record.

2.3.17 Occupational Safety Assessment (G3.12)

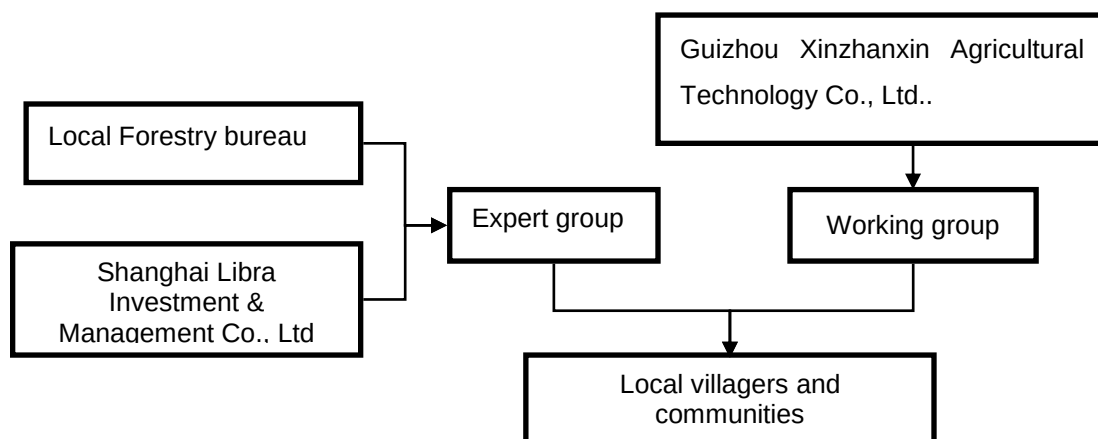
The project proponent has referenced Safety and Healthy in Forestry Work published by ILO and Labor Law of the People's Republic of China and adapted them to meet the local conditions to ensure workers' health and safety. The workers' health and safety policy, including items covering the health insurance scheme for workplace accidents and evacuation plans is 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 will be responsible for coordinating the project participants and providing technical services.

The local Forestry Bureau provided 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. 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. will play 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 standard. 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 88 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.

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

All the project participators including project operating organization, Guizhou Xinzhanxin, and Shanghai Libra Investment & Management Co., Ltd. are legally registered company 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. The both project participators have been running well for several years without debt and remain profitable⁷⁷. Furthermore, both companies will carry out financial audit annually in the future. So the both will continue to exist and continue to operate the project. The detail information is 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 acts 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 documentations are available to any stakeholders. 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.

⁷⁷ Refer to the Annual Financial Reports in 2019 provided by Guizhou Xinzhanxin and Shanghai Libra Investment & Management Co., Ltd.

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 farmers have the right to use the land within the project boundary. The number of the land owners is so big that they authorized Guizhou Xinzhanxin as project proponent. The project proponent and forestry department are responsible for the comprehensive 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 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 farmers, which has been confirmed by local government and Forestry Bureau, the land is suitable land for forest. Since these lands are all legal forestry land, 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 project owner and Guizhou Xinzhanxin only has all right related to carbon sink project including decide which kind of carbon credit project to develop, who to sell, selling price etc⁷⁸.

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

Prior to the project initiation, all of the project land are collective-owned by local villagers. On 25 October 2015, the project participant and 4 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.

⁷⁸ 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.

In the project area, a meeting with villagers is necessary before the village committee makes any decisions. Before the project started, in October 2015, the village meeting notice would be posted on the bulletin board of the village committee. The meeting was conducted by the village head. Firstly the village head had shown the project's purpose, process, benefit and risks. Secondly the villages would vote by showing hands for selecting the representative of them to make decision on the project. Finally, by voting with a show of hands, all the attending villagers agreed to develop the carbon sink project, and agreed to be signed carbon sink development agreement by the village committee on behalf of all villagers. After that, all village committees signed the carbon sink development agreement of this project with Guizhou Xinzhanxin Company on behalf of all villagers.

2.5.4 Property Rights Protection (G5.3)

Prior to the project implementation, the project area is suitable land for forest, 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. 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 current law of China, any illegal logging activities will be fined or sentenced to punishment. Currently all project lands are defined for forestry purpose by local government. Deforestation must be carried on under the approval of 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;

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 tree species.

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

2.5.8 Approvals (G5.7)

The forestry bureau of Qiandongnan approved the operational design of the afforestation project on 06-January-2016.

The forestry bureau of Qiandongnan approved the operational design of the afforestation project on 25-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 farmers 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/C9QS5G3CS8FW04MYXXDFOQDPXWM4OE>

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 wetland category.
- b) Soil disturbance attributable to the project activity does not cover more than 10 percent of 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. The average afforestation density was 2,122 plant/Ha, soil disturbance area ratio was 3.40%⁷⁹, less than 10%, and there was no repeated disturbance.

- ii. 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 Qiandongnan Forestry Bureau, it certify that Miaoling Afforestation project is located in Rongjaing county, Congjiang county, Liping county and Leishan county. The ownership of woodland is collective, covering a total area of 30,169 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 30,169 hectares of this project construction site are all suitable land for forest suitable for afforestation prior to the project, 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 for 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) 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.

⁷⁹ Proportion of soil disturbed area: $0.16 \text{ m}^2 \times 2122 / 10000 \text{ m}^2 = 3.40\%$, 0.16 m^2 was derived from the surface area calculated from the specification of artificial afforestation cavities in the Project Design (40cm*40cm)

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

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

The proposed project is large-scale afforestation a 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.

According to the definition requirements of ARR project of VCS AFOLU, eligible ARR activities are those that reduce GHG emissions by increasing vegetative cover through the planting trees. Meanwhile, according to the investigation report of suitable land for forest, the project area did not be cleared of native ecosystems within the 10 year period prior to the project start date. Therefore, this project is suitable for methodology, and also meets the project requirements of VCS standard about AFOLU.

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 suitable land for forest prior to the project.
- The afforestation land ownership is clear.
- The project is aiming to protect local biodiversity, mitigate water and soil erosion, and stimulate the development of 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 ₂ O	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 ₂ O	No	Not included in carbon pool
	Dead wood Litter and Soil organic	CO ₂	No	Insignificant and exclusion is conservative.
		CH ₄	No	Not included in carbon pool

Source		Gas	Included?	Justification/Explanation
	carbon	N ₂ O	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 ₂ O	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 ₂ O	No	Not included in carbon pool
	Burning of woody biomass	CO ₂	No	CO ₂ 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 ₂ O	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).

Through the site investigation of the current situation of land use in the project area, interviews with stakeholders and certification materials from relevant government agencies, three possible land use scenarios for the project that do not violate any existing laws and regulations, other mandatory provisions and national or local technical standards are identified and screened out:

- Scenario 1: Continuation of pre-project land use (i.e. Lands remain suitable land for forest with low forest coverage)

According to the "Chinese terms in resource and technology" issued by the China Science Publishing & Media Ltd. the definition of suitable land for forest refers to the land type with suitable site conditions for forest growth. Before the project, a small number of trees have been planted in the project area. However, due to the poor natural conditions in the local karst area, coupled with the lack of planting technology and management experience, the coverage by planting trees is low. So the lands will remain suitable land for forest with low coverage without the project. The main reasons for this result are as follows: 1. The project is located in karst area, where the land is poor, the soil is thin, the wind and sand are strong, and there

are many natural disasters such as debris flow, which make it difficult for trees to grow. 2. In the past, the planting technology was relatively backward, and the forest management measures such as artificial tending were lacking. After planting, it was allowed to grow freely, so it was easy to lack the necessary nutrients and lead to the withering of trees; 3. Some villagers blindly pursue economic benefits and plant cash crops on Karst land, resulting in low survival rate of crops. These problems lead to the Rocky Desertification in the project area has not been improved, even more and more serious.

The project is located in Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province. The Forestry Bureau of Qiandongnan State is the subordinate department of local government, which is responsible for forestry affairs in the entire state. The administrative level is the main division level. Therefore, the land eligibility certificate issued by the Forestry Bureau of Qiandongnan State for this project is the evidence provided by the official authority, it's valid and authoritative. The shapefiles attached to land eligibility certificate is the land topographic map provided by the Forestry Bureau of Qiandongnan State during the design period of the project. By checking the afforestation plan with the local forestry bureau, it was confirmed that, a small number of trees have been planted in some project area before the project started, but the coverage by planting trees is low. So considering the low forest coverage, the forestry bureau determined that the project area is suitable for afforestation after investigation, then the local forestry bureau approved the supplementary planting without disturbing the existing trees in January 2016 to increase the vegetative cover.

Only the trees actually planted in the project were monitored. The carbon credit of the original poor growing trees in the baseline scenario will not be monitored or counted in the actual net GHG removals by sinks.

In order to ensure that the trees actually planted in the project can be clearly distinguished from the existing trees before the start of the project, the project proponent has made an obvious distinction between the trees that need to be monitored and those that do not need to be monitored by hanging a signboard and making an obvious mark on each tree in the sample plot.

In the project area, the trees planted before the project have been hung with eye-catching red signboards by the technicians, which means that these trees do not counted in the monitoring of the project. While the trees planted in the project are hung with green signboards by the technicians, and their growth is recorded in the subsequent monitoring. In order to eliminate the situation that the signboard falling, the corresponding red and green marks are also painted on the trunk. In conservative manner if the signboards and the marks on the trunk are lost, the corresponding trees will not be included in the monitoring records of the project.

Therefore, only the height and DBH of the trees actually planted in the project will be measured to calculate the carbon sink.

The following is the development process of this project: Firstly, obtain a map of the project afforestation plot through the local forestry bureau. Secondly, Guizhou forestry survey and Design Institute carried out the work of the project design. The project was implemented after obtaining the approval from the local government. Finally, the afforestation project was carried out according to the project afforestation design maps. In the PD preparation stage of the project, Shanghai Libra charted the KML of the project according to the afforestation design maps.

Scenario 2: Agricultural use of the land.

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

The baseline scenario of this project belongs to Scenario 1 according to the additional analysis in Section 3.1.5. The specific analysis and demonstration shown in the Section 3.1.5.

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).

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

The project start date is 20-April-2016, when the activities that lead to the generation of GHG emission removals were first implemented. The planting activity was conducted from April 2016 to December 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 suitable land for forest with low forest coverage)
2. Agricultural use of the land
3. Forestation of the land within the project boundary without being registered as the VCS project

In 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 farmers 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 suitable land for forest with low forest coverage. 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 suitable land for forest 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 CNY 1,098,754,980, of which the total funds of governments at all levels is CNY 879,003,984, and the remaining CNY 219,750,996 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 Qiandongnan Government Work Report, the average annual income of the villagers in the project area is only CNY 9,227⁸⁰, and the main source of income is farming and labor. It is precisely because the income of local farmers is very low, it is impossible to plant trees with their own funds, so Xinzhanxin finally participates in the investment on the premise of considering the carbon sequestration income.

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 Rongjiang County, Congjiang County, Liping County, and Leishan County, where boasts the widest Karst area, as well as one of the districts that suffer serious Karst Rocky Desertification.

⁸⁰http://www.qdn.gov.cn/xxgk/zdgk/tjxx/tjnb/201904/t20190401_5074808.html

Although the forest companies and organizations are project proponents, local farmers are actually the project participants who planted trees due to the planting area is quite large and scattered among the local villages.

Local farmers 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 farmers, and lead to the failure of the project.

Because it is hard for the local farmers 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, they agreed Guizhou Xinzhanxin to 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 farmers to conduct the planting activity better. Without applying for VCS, local farmers 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 the investment and technical barriers.

In sum, Scenario 2 is not feasible. Scenario 1, the continuation of pre-project use (i.e. lands remain suitable land for forest with low forest coverage), remains the possible baseline scenario.

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 suitable land for forest 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 land⁸¹.

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,

⁸¹ http://www.gywb.cn/content/2014-12/10/content_2003257.htm

the afforestation was mainly established several years ago by a small number of relatively wealthy communities and farmers at a time when there were not many alternative investment opportunities⁸². 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 farmers 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 five Afforestation project registered as VCS&CCB in Guizhou province, but the tree species in this project is China Fir and Cypress, that is different from this project. Furthermore, the registered VCS&CCB project is located in southwest of the Guizhou province where has different climate, soil type, rainfall, vegetation, etc. comparing with this project area. These projects also need to apply for VCS & CCB to solve the barriers.

Thus, the proposed project is not a common practice.

Based on above demonstration, the proposed project is additional.

3.1.6 Methodology Deviations

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

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 suitable land for forest with low forest coverage. 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 CO₂-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 CO₂-e

⁸² <http://gzrb.gog.cn/system/2015/02/15/014118852.shtml>

$\Delta C_{SHRUB_BSL,t}$	=	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 4 counties had been suitable land for forest and do not change 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, the project area are suitable land for forest with low forest coverage. For this project, because the project is on the suitable land for forest for afforestation, forest floor only bushes and poor growing trees, to protect diversity, at the time of afforestation retained the original shrubs and poor growing trees. The project is to plant without disturbing the existing poor growing trees, and only the trees actually planted in the project were monitored. The carbon credit of the original poor growing trees in the baseline scenario will not be monitored or counted in the actual net GHG removals by sinks.

In order to ensure that the trees actually planted in the project can be clearly distinguished from the existing trees before the start of the project, the project proponent has made an obvious distinction between the trees that need to be monitored and those that do not need to be monitored by hanging a signboard and making an obvious mark on each tree in the sample plot.

In the project area, the trees planted before the project have been hung with eye-catching red signboards by the technicians, which means that these trees do not counted in the monitoring of the project. While the trees planted in the project are hung with green signboards by the technicians, and their growth is recorded in the subsequent monitoring. In order to eliminate the situation that the signboard falling, the corresponding red and green marks are also painted on the trunk. In conservative manner if the signboards and the marks on the trunk are lost, the corresponding trees will not be included in the monitoring records of the project.

Therefore, only the height and DBH of the trees actually planted in the project will be measured to calculate the carbon sink.



Figure 3 Photo of trees in the sample plot

Therefore, 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 tCO₂-e.

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-CO₂ 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 CO₂-e

$\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year t ; t CO₂-e

$GHG_{E,t}$ = Increase in non-CO₂ 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-CO₂ GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”; t CO₂-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-CO₂ 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 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

$\Delta C_{SHRUB_PROJ,t}$ = 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 CO₂-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 CO₂-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 CO₂-e

$$\Delta SOC_{AL,t} = \text{Change in carbon stock in SOC in project, in year } t, \text{ in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; } t \text{ CO}_2\text{-e}$$

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 to 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:

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

$$u_{dc} = \frac{\sqrt{(u_1 \times C_{TREE,t1})^2 + (u_2 \times C_{TREE,t2})^2}}{|DC_{TREE}|} \quad (6)$$

Where:

$$\Delta C_{TREE} = \text{Change in the carbon stocks in trees during the period between two points of time } t1 \text{ and } t2; t \text{ CO}_2\text{-e}$$

$C_{TREE,t1}$ = Carbon stock in trees as estimated at time t1; t CO₂-e

$C_{TREE,t2}$ = Carbon stock in trees as estimated at time t2; t CO₂-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 past 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 CO₂-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 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].

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]

For 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, Masson pine and Pinus yunnanensis. Local growth curves are used to estimate the average merchantable volume of one tree ($V_{TREE,j}$)

<i>China fir</i> ⁸³	$V_{TREE,j} = 0.1962(1 - e^{-0.08A})^{3.9012}$
<i>Masson pine</i> ⁸⁴	$V_{TREE,j} = 0.19073(1 - e^{-0.11A})^{6.06248}$
<i>Pinus yunnanensis</i> ⁸⁵	$V_{TREE,j} = 0.103743(1 - e^{-0.067959A})^{3.3420}$

Where,

$V_{TREE,j}$ = average merchantable volume of one tree in category i , at time t ; m³/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 in the below.

⁸³ Review on the Growth Equations of Pinus Massoniana, China Fir and Pinus elliottii in China [Journal of Northwest Forestry University].

⁸⁴ 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].

⁸⁵ Analysis of Growth Process Pinus yunnanensis Natural Secondary Forests in Yongren County of Yunnan Province [Journal of West China Forestry Science].

Table 3-1 Parameters used for different tree species

Tree species	D_j	BEF_j	R_j	CF_j
<i>China Fir</i>	0.307	1.634	0.246	0.520
<i>Masson pine</i>	0.380	1.472	0.187	0.460
<i>Pinus yunnanensis</i>	0.483	1.619	0.146	0.511
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 and planting density of the project, as well as the density of planted trees in the baseline scenario, the above ground biomass can be categorized ten stratifications⁸⁶.

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

Project Stratifications number	Category of tree	Plant site	Tree number per ha in category	Year to plant	Area (ha)
Proj -1	China fir	Congjiang County, Leishan County, Liping County.	2108	2016	3500
Proj -2	China fir	Rongjiang County, Leishan County, Liping County.	2396	2017	2000
Proj -3	China fir	Congjiang County, Rongjiang County, Liping County	1985	2016	3500
Proj -4	China fir	Rongjiang County, Leishan County	2287	2017	1200
Proj -5	China fir	Congjiang County, Leishan County, Liping County	1951	2016	3169
Proj -6	China fir	Congjiang County, Leishan County, Liping County	2345	2017	2300
Proj -7	Masson pine	Leishan County, Liping County, Congjiang County, Rongjiang County.	1873	2016	5000
Proj -8	Masson pine	Leishan County, Liping County,	2208	2017	5000

⁸⁶ According to the project Acceptance report, the specific situation of trees planted in the project and those have been planted before the project can be distinguished.

		Congjiang County, Rongjiang County.			
Proj -9	Pinus yunnanensis	Liping County, Leishan County, Rongjiang County, Congjiang County.	1927	2016	2500
Proj -10	Pinus yunnanensis	Liping County, Leishan County, Rongjiang County, Congjiang County.	2145	2017	2000

Table 3-3 Number of trees per hectare for the ten 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
20-April-2016~19-April-2017	7378000	0	6947500	0	6182719	0	9365000	0	4817500	0
20-April-2017~19-April-2018	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2018~19-April-2019	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2019~19-April-2020	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2020~19-April-2021	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2021~19-April-2022	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2022~19-April-2023	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2023~19-April-2024	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2024~19-April-2025	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2025~19-April-2026	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2026~19-April-2027	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2027~19-	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000

April-2028										
20-April-2028~19-April-2029	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2029~19-April-2030	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2030~19-April-2031	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2031~19-April-2032	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2032~19-April-2033	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2033~19-April-2034	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2034~19-April-2035	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2035~19-April-2036	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2036~19-April-2037	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2037~19-April-2038	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2038~19-April-2039	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2039~19-April-2040	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2040~19-April-2041	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2041~19-April-2042	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2042~19-April-2043	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2043~19-April-2044	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2044~19-April-2045	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000
20-April-2045~19-April-2046	7378000	4792000	6947500	2744400	6182719	5393500	9365000	11040000	4817500	4290000

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 ₂ e)	Estimated annual project removals of Proj-2 (tCO ₂ e)	Estimated annual project removals of Proj-3 (tCO ₂ e)	Estimated annual project removals of Proj-4 (tCO ₂ e)	Estimated annual project removals of Proj-5 (tCO ₂ e)	Estimated annual project removals of Proj-6 (tCO ₂ e)	Estimated annual project removals of Proj-7 (tCO ₂ e)	Estimated annual project removals of Proj-8 (tCO ₂ e)	Estimated annual project removals of Proj-9 (tCO ₂ e)	Estimated annual project removals of Proj-10 (tCO ₂ e)	Estimated total annual project removals (tCO ₂ e)
20-April-2016~19-April-2017	3748	0	3530	0	3141	0	820	0	2658	0	13897
20-April-2017~19-April-2018	6176	2434	5815	1394	5175	2740	2613	966	3575	2366	33254
20-April-2018~19-April-2019	10542	4011	9927	2297	8834	4514	6347	3081	5564	3185	58302
20-April-2019~19-April-2020	15602	6848	14692	3921	13075	7707	12101	7482	7709	4955	94092
20-April-2020~19-April-2021	20998	10133	19772	5804	17596	11406	19638	14266	9884	6864	136361
20-April-2021~19-April-2022	26414	13638	24873	7811	22134	15349	28417	23150	11998	8802	182586
20-April-2022~19-April-2023	31597	17156	29754	9825	26479	19310	37772	33500	13976	10684	230053
20-April-2023~19-April-2024	36360	20522	34237	11753	30469	23098	47036	44527	15774	12446	276222
20-April-2024~19-April-2025	40571	23616	38204	13525	33998	26580	55644	55449	17360	14047	318994
20-April-2025~19-April-2026	44158	26351	41582	15091	37004	29658	63170	65597	18719	15459	356789
20-April-2026~19-April-2027	47085	28680	44337	16425	39457	32281	69342	74468	19847	16669	388591
20-April-2027~19-April-2028	49353	30582	46474	17515	41358	34420	74031	81745	20745	17674	413897
20-April-2028~19-April-2029	50985	32055	48010	18358	42725	36078	77221	87272	21427	18474	432605

20-April-2029~19-April-2030	52024	33114	48988	18965	43596	37272	78985	91032	21903	19080	444959
20-April-2030~19-April-2031	52520	33790	49456	19351	44011	38031	79452	93112	22191	19505	451419
20-April-2031~19-April-2032	52532	34111	49466	19536	44022	38393	78791	93662	22308	19761	452582
20-April-2032~19-April-2033	52121	34120	49081	19540	43677	38402	77181	92884	22275	19866	449147
20-April-2033~19-April-2034	51348	33853	48352	19388	43030	38102	74806	90985	22107	19835	441806
20-April-2034~19-April-2035	50270	33350	47336	19100	42126	37537	71839	88186	21824	19687	431255
20-April-2035~19-April-2036	48942	32650	46087	18699	41013	36749	68436	84687	21442	19434	418139
20-April-2036~19-April-2037	47415	31788	44647	18205	39733	35777	64738	80677	20978	19094	403052
20-April-2037~19-April-2038	45731	30796	43064	17636	38322	34661	60864	76317	20444	18681	386516
20-April-2038~19-April-2039	43935	29702	41371	17011	36818	33431	56913	71750	19856	18206	368993
20-April-2039~19-April-2040	42060	28536	39605	16343	35245	32118	52965	67092	19225	17682	350871
20-April-2040~19-April-2041	40135	27318	37794	15645	33633	30746	49083	62438	18561	17120	332473
20-April-2041~19-April-2042	38189	26067	35960	14929	32002	29340	45317	57862	17875	16528	314069
20-April-2042~19-April-2043	36242	24804	34128	14205	30371	27917	41703	53423	17173	15918	295884
20-April-2043~19-April-2044	34314	23539	32312	13481	28755	26494	38265	49162	16464	15292	278078
20-April-2044~19-April-2045	32419	22287	30527	12764	27166	25085	35019	45108	15753	14662	260790
20-April-2045~19-April-2046	30568	21056	28784	12059	25617	23698	31975	41283	15047	14028	244115

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; tCO₂-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”; tCO₂-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.

$$LK_{AGRIC,t} = \frac{44}{12} \times (DC_{BIOMASS,t} + DSOC_{LUC,t})^{87} \quad (12)$$

Where:

$LK_{AGRIC,t}$ = Leakage due to the displacement of agricultural activities in year t; tCO₂-e

$DC_{BIOMASS,t}$ = Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year t; t d.m

$DSOC_{LUC,t}$ = Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year t; tC ha

According to the tool Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity, v2.0, paragraph 10 of the tool refers to the leakage emissions caused by the displacement of grazing activities are considered insignificant in some conditions, and hence accounted as zero. However, for the project, the baseline situation is suitable land for forest with low forest coverage, there is no vegetation, and the karst area is complex and unsuitable for grazing, so the project does not involve grazing⁸⁸. Therefore, the leakage due to grazing mentioned in the tool is not applicable.

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

⁸⁷ 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)

⁸⁸ According to the baseline survey and biodiversity baseline survey of the project.

decrease in carbon stock in the carbon pools of the land and 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.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
20-April-2016-19-April-2017	0	13897	0	13897
20-April-2017-19-April-2018	0	33254	0	33254
20-April-2018-19-April-2019	0	58302	0	58302
20-April-2019-19-April-2020	0	94092	0	94092
20-April-2020-19-April-2021	0	136361	0	136361
20-April-2021-19-April-2022	0	182586	0	182586
20-April-2022-19-April-2023	0	230053	0	230053
20-April-2023-	0	276222	0	276222

19-April-2024				
20-April-2024- 19-April-2025	0	318994	0	318994
20-April-2025- 19-April-2026	0	356789	0	356789
20-April-2026- 19-April-2027	0	388591	0	388591
20-April-2027- 19-April-2028	0	413897	0	413897
20-April-2028- 19-April-2029	0	432605	0	432605
20-April-2029- 19-April-2030	0	444959	0	444959
20-April-2030- 19-April-2031	0	451419	0	451419
20-April-2031- 19-April-2032	0	452582	0	452582
20-April-2032- 19-April-2033	0	449147	0	449147
20-April-2033- 19-April-2034	0	441806	0	441806
20-April-2034- 19-April-2035	0	431255	0	431255
20-April-2035- 19-April-2036	0	418139	0	418139
20-April-2036- 19-April-2037	0	403052	0	403052
20-April-2037- 19-April-2038	0	386516	0	386516
20-April-2038- 19-April-2039	0	368993	0	368993
20-April-2039- 19-April-2040	0	350871	0	350871
20-April-2040- 19-April-2041	0	332473	0	332473
20-April-2041-	0	314069	0	314069

19-April-2042				
20-April-2042- 19-April-2043	0	295884	0	295884
20-April-2043- 19-April-2044	0	278078	0	278078
20-April-2044- 19-April-2045	0	260790	0	260790
20-April-2045- 19-April-2046	0	244115	0	244115
Total	0	9,259,791	0	9,259,791

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	A _i
Data unit:	ha
Description:	Area of category i
Source of data:	Field measurement
Value applied:	The total area is 30,169 ha, 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
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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	National authority data

data or description of measurement methods 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> ⁸⁹
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 , except for trees planted in baseline scenario.
Source of data	Field measurement
Description of measurement methods	Standard operating procedures (SOPs) prescribed under national forest inventory are applied. In absence of these, SOPs from

⁸⁹ <https://www.renrendoc.com/p-20779950.html>

and procedures to be applied	published handbooks, or from the IPCC GPG LULUCF 2003, may be applied. Only the trees actually planted in the project were monitored. The carbon credit of the original trees in the baseline scenario will not be monitored or counted in the project credit. Please refer to section 3.2.1 for the method of distinguishing which trees need to be monitored and which do not.
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	3
	PROJ-2	China fir	2
	PROJ-3	China fir	3
	PROJ-4	China fir	1
	PROJ-5	China fir	3
	PROJ-6	China fir	2
	PROJ-7	Masson pine	4
	PROJ-8	Masson pine	5
	PROJ-9	Pinus yunnanensis	1
	PROJ-10	Pinus yunnanensis	1
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	The relative weight of the area of a stratum i is equal to the area of

measurement methods and procedures to be applied	the stratum i divided by the project area.		
Frequency of monitoring/recording	Before first verification.		
Value applied:	Project Stratifications	Category of tree	W_i
	PROJ-1	China fir	0.116
	PROJ-2	China fir	0.066
	PROJ-3	China fir	0.116
	PROJ-4	China fir	0.040
	PROJ-5	China fir	0.105
	PROJ-6	China fir	0.076
	PROJ-7	Masson pine	0.166
	PROJ-8	Masson pine	0.166
	PROJ-9	Pinus yunnanensis	0.083
	PROJ-10	Pinus yunnanensis	0.066
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		

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 Qiandongnan 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 Qiandongnan Miao and Dong Autonomous Prefecture ⁹⁰ .		
Frequency of monitoring/recording	Before first verification.		
Value applied:	Project Stratifications	Category of tree	S _i
	PROJ-1	China fir	26.517
	PROJ-2	China fir	29.328
	PROJ-3	China fir	24.970
	PROJ-4	China fir	27.994
	PROJ-5	China fir	24.542
	PROJ-6	China fir	28.704
	PROJ-7	Masson pine	24.553
	PROJ-8	Masson pine	28.328
	PROJ-9	Pinus yunnanensis	16.516
	PROJ-10	Pinus yunnanensis	17.837
Monitoring equipment	/		
QA/QC procedures to be applied	The variable coefficient times biomass carbon reserves at the end of Period ($t.d.m \cdot ha^{-1}$)		
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	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	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

⁹⁰ Evidence on variable coefficient data provided by Qiandongnan forestry bureau.

applied	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 2,122 plant/Ha, soil disturbance area ratio was 3.40%⁹¹, 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 stock

⁹¹Proportion of soil disturbed area: $0.16 \text{ m}^2 \times 2122 / 10000 \text{ m}^2 = 3.40\%$. among them, 0.16 m^2 was derived from the surface area calculated from the specification of artificial afforestation cavities in the Project Design (40cm*40cm)

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:

$\Delta C_{P,t}$ = 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 CO₂-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. $w_i=A_i/A$); 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
$s_{\Delta,i}^2$	=	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, we will choose the measurement of fixed area plots for the calculation.

In this method, sample plots of the same size (e.g. or of a hectare) are installed in a stratum. The trees that need to be monitored 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.

During monitoring, the trees that need to be monitored and those that do not need to be monitored will be strictly distinguished. The specific methods are as follows:

In the project area, the trees planted before the project have been hung with eye-catching red signboards by the technicians, which means that these trees do not counted in the monitoring of the project. While the trees planted in the project are hung with green signboards by the technicians, and their growth is recorded in the subsequent monitoring. In order to eliminate the situation that the signboard falling, the corresponding red and green marks are also painted on the trunk. In conservative manner if the signboards and the marks on the trunk are lost, the corresponding trees will not be included in the monitoring records of the project.

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):

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

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

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

Where:

$b_{TREE,p,i}$ = Tree biomass per hectare in sample plot p of stratum i; t d.m./ha

$B_{TREE,p,i}$ = Tree biomass in sample plot p of stratum i;; t d.m.

$A_{PLOT,i}$ = Size of sample plot in stratum i; ha

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

$B_{TREE,l,j,p,i}$ = 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; m³

D_j = Density of tree species j; t d.m/m³

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 trees ($H_{l,p,j,i}$) and Diameter at breast height of trees ($DBH_{l,p,j,i}$).

Monitoring Organization Structure

The project implementation unit has established a greenhouse gas voluntary emission reduction monitoring organization specifically for this carbon sink forestation project, and entrusted an independent expert group to be responsible for technical quality control. The monitoring recording team and the report writing team are composed of Xinzhanxin, Libra, the technicians and the Forestry Bureau. Libra and Xinzhanxin are responsible for macro guidance and decision making during the whole process of project monitoring and management. As a monitoring recording team, the technicians carry out monitoring work with the cooperation of each implementing unit of the project, and are responsible for data monitoring, recording and materials preservation. Libra, as a report writing team, is responsible for data review, calculation of project emission reduction, and compilation of project monitoring report. The monitoring organization 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.

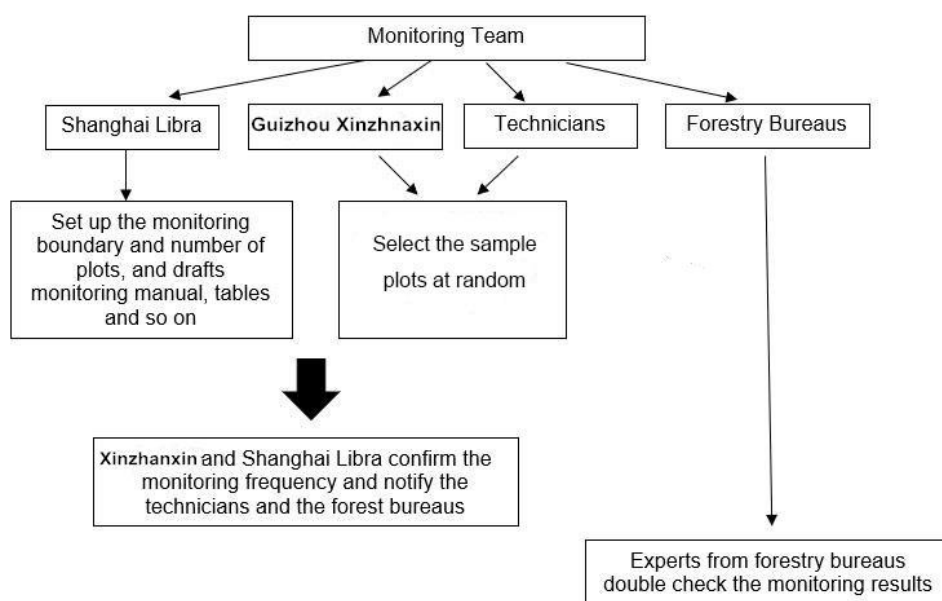


Figure 4 The figure of the monitoring organization

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, needs 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, monitor 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.

In the project area, the trees planted before the project have been hung with eye-catching red signboards by the technicians, which means that these trees do not counted in the monitoring of the project, that is to say, the parameter of $N_{i,j}$ does not contain the trees in the baseline scenario. While the trees planted in the project are hung with green signboards by the technicians, and their growth is recorded in the subsequent monitoring. In order to eliminate the situation that the signboard falling, the corresponding red and green marks are also painted on the trunk. In conservative manner if the signboards and the marks on the trunk are lost, the corresponding trees will not be included in the monitoring records of the project. Therefore, only the height and DBH of the trees actually planted in the project will be measured to calculate the carbon sink.

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

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 stratum and the area change, the number of sample plots need to be recalculated.

Although prior stratification from the baseline survey is the basis for project monitoring in the future, the variables in the project implementation make the actual situation deviate 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:

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

$$n_i = n \cdot \frac{w_i \cdot s_i}{\sum_i w_i \cdot s_i}$$

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
- W_i Relative weight of the area of stratum i (i.e. the area of the stratum i divided by the project area); dimensionless
- S_i Estimated standard deviation of biomass stock in stratum i; t d.m. 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	0.116	26.517	1.645	8.3708	24	3	3
China fir	0.066	29.328				2	3
China fir	0.116	24.970				3	3
China fir	0.040	27.994				1	3
China fir	0.105	24.542				3	3
China fir	0.076	28.704				2	3
Masson pine	0.166	24.553				4	4
Masson pine	0.166	28.328				5	5
Pinus yunnanensis	0.083	16.516				1	3
Pinus yunnanensis	0.066	17.837				1	3

Setting sample plots

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 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 stratus and carbon sub-stratus of each plot should be documented to ensure that distribution of fixed sample plots is uniform.

Determine the sample location

The sample is fixed circular area with a diameter of 30m each. When a sample on a slope is to be selected, the gradient must be monitored, and the horizontal long should be converted into 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. A person is responsible for the filing of all monitoring data, reports and documents. All documents must be signed completely before they are filed. Documents should be organized and kept neatly. Data archiving shall be kept until 2 years after the end of the project crediting period. The contents archived include:

1. Copies of all original measurements, data analysis and spreadsheets.
2. Calculation data of greenhouse gas emissions and related spreadsheets.
3. All the drawings, including the KML.
4. Copies of monitoring report of measurement.

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 Xinzhaxin will check the data. When they find that negative growth may result from data entry errors, they will feed 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.

The policies for oversight and accountability:

The training process shall be supervised by the Forestry Bureau, the data collection shall be supervised by Libra, and the correctness and rationality of the data shall be responsible for by Xinzhanxin. First of all, the personnel of Xinzhanxin Company must check the rationality of the data recorded by the forestry Bureau technician. During the inspection, the data should be sent to the director of the Libra for a two-way check. If there is any problem with the data, they must inform the technician who provided the data and find out the reason for the error. In addition, after the data is corrected, the Forestry Bureau will conduct a professional assessment on the technician until he meets the requirements for employment. However, if the fault is from the personnel of Xinzhanxin company or Libra Company, the two companies will hold the project responsible to account according to the respective company's policies and conduct an assessment of the project leader. The relevant work of the project cannot continue until the assessment is qualified. Secondly, after the accountability, the expert jointly hired by the Xinzhanxin and Libra company through the forestry Bureau invited will analyse the data to reach a solution. Internal auditing

Cross-check descriptions of project activity and other estimation parameters with information on source and sink categories and ensure that these are properly recorded and archived. The personnel of Xinzhanxin Company shall be responsible for collecting the data measured by the bureau of Forestry technicians on the spot and checking the rationality of the data. If there is no problem with the data, the signature of the Project manager of Xinzhanxin Company is needed before sending the data to the project manager of Libra Company. The project leaders of Libra Company check the data again before writing it into monitoring report. After the completion of monitoring report, it will be submitted to the general manager of Libra Company for inspection, and finally MR will be publicized.

Procedures for handling non-conformances

The technicians must carefully record the corresponding measurement data on the sample plot. The personnel of Xinzhanxin Company shall check and verify the data and arrange them into a spreadsheet after confirmation.

In order to avoid the errors as much as possible in the data entry process, the input data shall be reviewed by a team of Libra personnel to ensure the consistency.

If the errors or anomalies are found, the reasons and resolutions should be provided after communicating with personnel involved in data collection and review. If the problems cannot be solved, then the data is

not allowed to be used in the calculation of emission reductions. Instead, the uncertainty deduction method in the methodology development tool will be used, as follows:

According to the Appendix 2 of the tool (Uncertainty of the mean tree biomass per hectare within the project boundary was estimated as (Equation (15) in methodological tool ‘Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities’ (Version 04.2):), the uncertainty in the estimated mean value of a parameter is more than 10 per cent, the estimated mean value is either increased or decreased by a percentage of the uncertainty. The table provides the uncertainty discount factors to be applied for different ranges of uncertainty.

Uncertainty discount factors :

Uncertainty	Discount (% of U)
$U \leq 10\%$	0%
$10 < U \leq 15$	25%
$15 < U \leq 20$	52%
$20 < U \leq 30$	75%
$U > 30$	100%

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 Plan and Results will be published 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.

Well-being information:

Before the implementation of project, Liping County, Congjiang County, Leishan County and Rongjiang County were impoverished counties, because farmers' income was generally low resulting from the poor social economy and low GDP there. Moreover, the environmental problems such as rocky desertification causes poor crops, which brings heavy life pressure for local farmers. Serious environmental and economic problems lead to more famers are willing to be migrant workers in other more advanced cities, so aging of the population was arising.

Since the project was started, the income of farmers within the project is increased because they participated in the project activity, thus, their living standard has also been promoted. This is mainly reflected in three respects, materially, spiritually and environmentally. Firstly, famers have access to life supplies with better quality. Secondly, famers have an opportunity to enrich the spiritual life after the economic pressure is released. Thirdly, afforestation leads to an improvement of environment, which helps the growth of crops. All of the above mentioned can be reflected by the following data:

The total economic output of Leshan county increased from CNY 2.811 billion in 2016⁹² to CNY 4.037 billion in 2019⁹³. In the whole year, the per capita disposable income of urban residents increased from

⁹² <http://www.ahmhxc.com/tongjigongbao/9714.html>

CNY 24,662 in 2016 to CNY 32,319 in 2019, and the per capita disposable income of rural residents increased from CNY 7,559 in 2016 to CNY 10,310 in 2019, representing a marked increase in the per capita disposable income of urban and rural residents.

The total economic output of Rongjiang county increased from CNY 5.669 billion in 2016⁹⁴ to CNY 7.913 billion in 2019⁹⁵. In the whole year, the per capita disposable income of urban residents increased from CNY 24,566 in 2016 to CNY 31,872 in 2019, and the per capita disposable income of rural residents increased from CNY 7,169 in 2016 to CNY 9,761 in 2019, representing a marked increase in the per capita disposable income of urban and rural residents.

The total economic output of Congjiang county increased from CNY 5.728 billion in 2016⁹⁶ to 6.846 billion CNY in 2019⁹⁷. In the whole year, the per capita disposable income of urban residents increased from CNY 24,981 in 2016 to CNY 32,557 in 2019, and the per capita disposable income of rural residents increased from CNY 7,622 in 2016 to CNY 10,219 in 2019, representing a marked increase in the per capita disposable income of urban and rural residents.

The total economic output of Liping county increased from CNY 8.032 billion in 2016⁹⁸ to CNY 9.247 billion in 2019⁹⁹. In the whole year, the per capita disposable income of urban residents increased from CNY 24,966 in 2016 to CNY 32,420 in 2019, and the per capita disposable income of rural residents increased from CNY 7,213 in 2016 to CNY 9,679 in 2019, representing a marked increase in the per capita disposable income of urban and rural residents.

Community characteristics:

Without this project, a large part of farmers choose leave their hometown to be migrant workers, which results in young people is occupying a relatively low proportion of the local population. It is bad for the sustainable development of this community and inheritance of minority culture.

With this project implementation, the famers work together for this project and become more closely connected. They not only participate in training together, and discuss working methods together. Compared with the original relationship between famers before, they now communicate with each other more. They learn culture, ethnic customs and history from each other, and they can discuss the current social situation, the education of their children, and imagine a better life in the future. All of these contribute to a more stable and harmonious situation of the community.

Diversity within the community:

⁹³ <http://www.ahmhxc.com/tongjigongbao/18758.html>

⁹⁴ http://www.rongjiang.gov.cn/zwgk/xxgkml/jcxxgk/tjxx/tjgb/201704/t20170407_40575892.html

⁹⁵ <http://www.ahmhxc.com/tongjigongbao/18758.html>

⁹⁶ http://www.congjiaang.gov.cn/zwgk/xxgkml/zfxgkml/tjxx/tjgb/201711/t20171103_16005102.html

⁹⁷ http://www.ahmhxc.com/tongjigongbao/18755_7.html

⁹⁸ <http://www.ahmhxc.com/tongjigongbao/7811.html>

⁹⁹ http://www.lp.gov.cn/xxgkml/jcgk/tjxx/202007/t20200728_61763226.html

Leishan county:

The whole county has a registered population of 160,995. According to the ethnic composition, the Han population is 14,179, accounting for 8.8%, and the minority population is 146,816, accounting for 91.2%. Among them, the Miao population is 134,002, accounting for 83.2%, and the population of other ethnic minorities is 12,814, accounting for 8.0%. In 2016, there were 1,536 births, including 789 boys and 747 girls, with a sex ratio of 105.62.

Rongjiang county:

In 2016, there were 372,300 registered public security population, including 75,600 urban population and 29.67 rural population.

Congjiang county:

At the end of 2016, the total permanent population of the county was 292100, the total number of households at the end of the year was 93562, the total registered population was 362400, the annual birth rate was 13.11 ‰, the mortality rate was 7.28 ‰, and the natural growth rate of population was 5.83 ‰.

Liping county:

In 2016, the registered population of the county at the end of 2016 was 556800, an increase of 7300 over the previous year. At the end of the year, there were 391100 permanent residents in the county, an increase of 2000 over the previous year. The birth rate of the permanent population was 10.06 ‰, the mortality rate of the permanent population was 5.91 ‰, and the natural growth rate of the permanent population was 4.15 ‰.

There has been no significant community change in the past five years.

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

The local village communities within the project zone consist 4 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 village because of the roads they repaired when they planted trees. In recent years, more and more ethnic minorities are joined their festivals. During the implementation of the project, the Forestry Bureau provided skills training for technicians and farmers, so that they can master forestry related technical ability, which is helpful for their future work and life. During the project period, government agencies and village committees continued to pay attention to

and listen to farmers' opinions and suggestions through meetings, message books and other means, forming a smooth communication channel.

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 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 Rongjiang County, Congjiang County, Liping County and Leishan County, 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 in 4 counties: (include 18,355 local farmers had been hired as temporary planting workers, mentioned in section 2.1.8)
Impact(s)	1. Improve the living environment. 2. Increase household income during the planting period of the project. 3. Prevention of deteriorating living conditions and climatic relocations with less and less villagers are forced to move out of their homes.
Type of Benefit/Cost/Risk	The above 3 impacts are direct and actual benefit. During the verification, for all the above 3 impacts the Guizhou Academy of Social Sciences would be invited to provide report on whether the impacts have been improved or not by questionnaire. In addition, during the auditor on-site interview, on the stakeholder meeting the auditor also could talk to villagers freely and ask them if the impacts are improved.
Change in Well-being	The improvement of environmental quality will beneficial to all villagers. With the soil and water conservation, the crop harvest

	will be greatly improved, so the income will increase, and so will the villagers' happiness. As a result of the implementation of this project, villagers have increased local job opportunities, avoiding leaving their hometown to go to work, unable to take care of the elderly and children at home, and increasing the happiness of the villagers. The project will reduce debris flows and contribute to environmental protection and water and soil conservation, so farmers will feel better about the environment. The project will make the environment better and the soil more fertile. Farmers will choose to stay at home for farming and planting more cash crops to obtain higher income. The economic level will also be improved. The project will make farmers communicate more frequently and help each other more frequently when they are farming or the festivals come, thus improving the cohesion of villagers. The Guizhou Academy of Social Sciences would be invited to provide report whether the farmers' income has increased. Also, they would apply the questionnaire to determine whether the living environment has improved.
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Community Group	88 skilled technicians worked as long-term workers in 4 counties:
Impact(s)	1. Improve the living environment. 2. Increase household income during the project. 3. Prevention of deteriorating living conditions and climatic relocations with less and less villagers are forced to move out of their homes. They don't have to work in other places, so they can take care of their families more closely.
Type of Benefit/Cost/Risk	The above 3 impacts are direct and actual benefit. During the verification, for all the above 3 impacts the Guizhou Academy of Social Sciences would be invited to provide report on whether the impacts have been improved or not by questionnaire. In addition, during the auditor on-site interview, on the stakeholder meeting the auditor also could talk to villagers freely and ask them if the impacts are improved.
Change in Well-being	Long term job opportunities have improved the economic income of these technicians. At the same time, through participating in this project, they also get a lot of training opportunities and increase their technical ability, which lays a foundation for them to participate in other forestry related work in the future.
Community Group	Qiandongnan Forestry bureaus and Forestry bureaus of 4 counties

Impact(s)	1. Achieve goals in afforestation and increase forest cover. 2. Promote forest management and protection.
Type of Benefit/Cost/Risk	The above 1-2 impacts are indirect and actual benefit. During project verification, Guizhou Academy of Social Sciences (a third-party institution) will be asked to conduct a biodiversity survey and issue a report to assess whether afforestation targets have been achieved, so as to further improve the content of the forest protection manual issued by Guizhou Academy of Social Sciences (a third-party institution) also will do statistical for the forest coverage and whether the fire or trees felling happened.
Change in Well-being	Through the project, the afforestation area will be increased, the public's awareness of forest protection will be enhanced, and knowledge of forestry-related laws and regulations, planting techniques, and insect and pest prevention will more effectively popularize. The project will require the Forestry Bureau to provide experts to conduct annual training for technicians and provide training records. The inspection and protection of forests by the technicians will be recorded, which will positively help the Forestry Bureau meet its afforestation goals and increase the local forest coverage.

Community Group	Governments of 4 counties
Impact(s)	1. Improve the local ecological environment. 2. Improve people's living level.
Type of Benefit/Cost/Risk	The impacts are all direct and predicted benefit. During the verification, Guizhou Academy of Social Sciences (a third-party institution) will be invited to conduct community economic survey and biodiversity survey, and issue a report to assess the changes in people's living level and ecological environment.
Change in Well-being	Through the project, the local ecological environment will be improved, people's living level, happiness and economy will be improved, which has also promoted local infrastructure construction to a certain extent.

Community Group	Village committees in 4 counties
Impact(s)	1. Increase the collective cohesion of the village.

	2. Improve the working methods of the villagers.
Type of Benefit/Cost/Risk	The impacts are all indirect and predicted benefit. Stakeholders will organize the meetings, at which they will explain whether the cohesion between the communities has increased since the implementation of the project. In addition, during the DOE on-site interview, they will also know whether the cohesion has increased through interviews or questionnaires. On each meeting, the villagers can talk freely. The minutes of the meeting will be provided as evidence. The working methods are monitored by annual training, the training records will be provided as evidence. The working methods are monitored by annual training, the training records will be provided as evidence.
Change in Well-being	Through the implementation of this project, the village committee concentrated will train and organize villagers to carry out the implementation project together, which strengthened the cohesion of the village collective. The village committee will help villagers with skills, including female villagers, to become project technicians, so that they can earn more money without working outside. This will improve their quality of life and standard of living, thereby improve the health and well-being of local people. At the same time, the income of working women will increase, which will not only improve the status of the family, but also improve their personal working ability.

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.

In view of the potential risk of emergent disease when planting mentioned in section 2.3.4, the mitigation measures are as follows: stress the importance of work safety during training, and do not work with diseases. Some rescue skills will be trained to ensure timely treatment in case of emergency.

Furthermore, concerning about the nature disaster, the village committees will broadcast local meteorological disaster information or send massages to the villagers before nature disaster happen and prepare for disaster. In the monitoring manual it is strictly stipulated when nature disaster happened or about to happen, no one is allowed to work.

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

The main source of income for the local communities is agricultural in project area. Their production methods are backward, which leads to low agricultural productivity, also affected by the remote location. The project will benefit 4 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 will be ensured by Guizhou Xinzhanxin (CNY 60 per villager per day for tree-planting and CNY 200 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.

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 farmers involved in the project, and over 60% of them are adult women. Presently, a local household earns about CNY 13,645 on average a year and this project can provide CNY 2,400 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.

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 considerable 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 the crop growth. These knowledge and skills are fresh but very useful to the 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. 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, Masson pine and *Pinus yunnanensis*, which significantly contributes to the production increase of the economic crops

6) After the project is implemented, it can increase the area of green space and beautify the environment, which will not lead to deforestation and obstruction projects. In summary, the relevance of the project area does not have a harm impact 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 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 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 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:

The improvement as perceived benefit:

Variable	The change of living environment
monitoring methods to be applied	Questionnaire and collect villagers' opinions on whether the living environment is improved or not by questionnaire and interview.
Frequency of monitoring/recording	Before every verification event
Affected community groups	1. Local villagers in 4 counties (include 18,355 local farmers had been hired as temporary planting workers, mentioned in section 2.1.8) 2. 88 skilled technicians worked as long-term workers in 4 counties 3. Governments of 4 counties
Purpose of monitoring	Evaluate the change of living environment.

Variable	The change of living level.
monitoring methods to be applied	Questionnaire and collect villagers' opinions on whether the living level is improved or not by questionnaire and interview.
Frequency of monitoring/recording	Before every verification event
Affected community groups	1. Local villagers in 4 counties (include 18,355 local farmers had been hired as temporary planting workers, mentioned in section 2.1.8) 2. 88 skilled technicians worked as long-term workers in 4 counties
Purpose of monitoring	Evaluate the change of living level due to the implementation of the project and the happiness due to the job opportunities provided by the project and crop harvest

Variable	The public awareness of protecting local ecological environment
monitoring methods to be applied	Biodiversity survey report.
Frequency of monitoring/recording	Before every verification event
Affected community groups	Government of 4 counties
Purpose of monitoring	Evaluate the awareness of local people to improve the ecological environment and the promotion of local infrastructure construction.

The quantifiable improvement:

Variable	Households' income
monitoring methods to be applied	Payroll of the workers who worked as technicians related to the project.
Frequency of monitoring/recording	Before every verification event
Affected community groups	1. Local villagers in 4 counties (include 18,355 local farmers had been hired as temporary planting workers, mentioned in section 2.1.8) 2. 88 skilled technicians worked as long-term workers in 4 counties
Purpose of monitoring	Evaluate the change of living level due to the implementation of the project and the happiness due to the job opportunities provided by the project and crop harvest

Variable	The number of villagers forced to migrate because of the deteriorating weather and living conditions.
monitoring methods to be applied	Questionnaire and interview.
Frequency of monitoring/recording	Before every verification event
Affected community groups	1. Local villagers in 4 counties (include 18,355 local farmers had been hired as temporary planting workers, mentioned in section 2.1.8) 2. 88 skilled technicians worked as long-term workers in 4 counties
Purpose of monitoring	Evaluate the number of job opportunities provided after the implementation of the project and the change of life happiness brought by the project.

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Variable	The frequency of communication between the villagers
monitoring methods to be applied	Questionnaire and interview.
Frequency of monitoring/recording	Before every verification event
Affected community groups	Village committees in 4 counties
Purpose of monitoring	Evaluate the frequency and manner of communication among villagers due to the implementation of the project.

Variable	The forest cover rate
monitoring methods to be applied	Biodiversity survey report.
Frequency of monitoring/recording	Before every verification event
Affected community groups	Qiandongnan Forest Bureaus and Forest Bureaus of 4 counties

Purpose of monitoring	Evaluate the forest area increased or not.
Variable	The frequency of training
monitoring methods to be applied	The training records
Frequency of monitoring/recording	Before every verification event
Affected community groups	1. Local villagers in 4 counties (include 18,355 local farmers had been hired as temporary planting workers, mentioned in section 2.1.8) 2. 88 skilled technicians worked as long-term workers in 4 counties 3. Forest Bureaus of 4 counties
Purpose of monitoring	Evaluate the training time, frequency and participants during the implementation of the project.

Variable	Forest management and protection.
monitoring methods to be applied	Biodiversity survey report and Forest Management Manual.
Frequency of monitoring/recording	Before every verification event
Affected community groups	Forestry Bureaus of 4 counties
Purpose of monitoring	Evaluate the public awareness of forest management and protection after the implementation of the project.

4.4.2 Monitoring Plan Dissemination (CM4.3)

The community monitoring plan and results of every verification will be published on VCS and CCB website which can be easily download 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 community monitoring plan and the monitoring 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 4 counties where the project located, most of the project sites have relatively homogenous ecological structure and low biodiversity in recent years. Before the project started, because of the poor land, debris flow, backward planting and forest management technology, the survival rate of planting trees has been low, so the problem of rocky desertification has not been improved. The Karst rocky desertification is caused by irrational exploitation of soil resources by human activities. It is a disaster caused by land degradation that ultimately leads to poverty in the karst areas, southwestern 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 worked hard to attempt 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 southwestern China. The comprehensive control of 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, <i>Pinus yunnanensis</i> and Masson pine, 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 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 economy and society in 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 Ponkan, watermelon, Glutinous rice, tea.

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 <i>Prinia superciliaris</i> will increase (photo below). 
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5.2.2 Mitigation Measures (B2.3)

Afforestation of this project will use of China fir, *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. However as mentioned in section 2.1.18, the following risk is existing in the project area, the project proponent has established following mitigation measures:

Identify Risk	Actions needed and designed to mitigate the risk
Fire	Strengthen the work of forest fire prevention publicity education to increase the awareness of forest fire prevention in the whole society, and popularize the basic knowledge of fire prevention and extinguishing.
Diseases and Insects	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	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.

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

First, due to long-term farming, ecological structure of most project sites is relatively homogenous, with low biodiversity. The other small parts are wastelands, mainly covered with grass and scattered shrubs. Afforestation of this project will use China fir, *Pinus yunnanensis* and Masson pine with great vitality and adaptation to Karst area, implement afforestation activity with scientific and reasonable configuration method, with no burning and slash. Before plantation applying cave-like for soil preparation will protect the existing vegetation as much as possible. Therefore the implementation of this project will not decrease biodiversity of project sites. When planted trees gradually grow up to forest, project sites will gradually become ecological communities with the domain species of tall trees, which will improve biodiversity.

Second, 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 environment. In addition, as the project site is located in Congjiang County, Rongjiang County, Liping County and Leishan County in Guizhou Province, the surrounding area is concentrated of wildlife. Therefore revegetation of project sites will facilitate biodiversity protection of the whole project zone.

The 20 national protected species in the project zone are shown in the following table:

Animals	Plants
<i>Moschus berezovskii</i>	<i>Bretschneidera sinensis</i>
<i>Neofelis nebulosa</i>	<i>Annamocarya sinensis</i> (Dode) Leroy
<i>Macaca arctoides</i>	<i>Rhoiptelea chiliantha</i> Diels et Hand.-Mazz.
<i>Ursus thibetanus</i>	<i>Magnolia officinalis</i> Rehd. et Wils.
<i>Macaca mulatta</i>	<i>Cephalotaxus oliveri</i> Mast.
<i>Lutra lutra</i>	<i>Emmenopterys henryi</i> Oliv.
<i>Lophura nycthemera</i>	<i>Keteleeria calcarea</i> Cheng et L. K. Fu
<i>Syrmaticus ellioti</i>	<i>Keteleeria pubescens</i> Cheng et L. K. Fu

Catopuma temminckii	Liriodendron chinense (Hemsl.) Sargent.
Otus bakkamoena	Manglietia aromatica Dandy

Moschus berezovskii, Annamocarya sinensis (Dode) Leroy and Bretschneidera sinensis are globally endangered species according to IUCN.

In view of the above endangered or nationally protected animal species, the biodiversity monitoring plan describes in detail the habits and traces of these animals, including footprints, excrement, calls and other characteristics. When technicians find these traces in the monitoring of forest land, they need to record them with words and photos. Meanwhile if the traces of endangered or nationally protected animal have been captured, this trace area will be protected by setting up a conspicuous board forbidden to all human being entry, increasing the frequency of inspections for this area and inform forest bureau.

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 suitable land for forest, including China fir, Masson pine and Pinus yunnanensis.

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 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. Especially the biological measures to control pests and diseases will be adopted. Therefore, the pesticide application will be limited.
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Name	Biological control agents
Justification of Use	Upon routine overseeing, the pest will be treated by biological control once occurred according to 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 local environment and communities.

5.2.10 Waste Products (B2.9)

The waste products resulting from the project activities may include:

(1) Rubbish

The farmers 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 well 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 increase forest cover on suitable land for forest, 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 threaten the aim of the project and need to be intervened.

To monitor the net impacts to 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
		Soil and water conservation in the Karst region	/	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 associated with forest	/	According to the rules of the line transect methods, the monitoring shall last for 2 months. Daily time periods are from 05:30 to 09:30 and from 16:00 to 20:00. The staff walk along the transect line at a speed of 1.5–3km/h to record the species and populations of wild animals within three distances (0–25m, 25–100m, and more than 100m) along the transect line. The main monitored species include	Before every verification

				birds, mammals, amphibians and insects. Record the traces of these animals, including footprints, excrement, calls and other characteristics.	
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
		Effectuated 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 biodiversity 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 biodiversity 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