LIANGDU AFFORESTATION PROJECT PROVINCE

Document Prepared By Timing Carbon Asset Management Co., Ltd

Project Title	Liangdu Afforestation Project
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Project Location	Guizhou Province, China.
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Validation Body	CTI International Certification Contact: Wang Guolian Email: wangguolian@cti-cert.com
Project Lifetime	28-April-2015~27- April -2045; 30-year lifetime
GHG Accounting Period	01- January -2016~31- December-2044; a total period of 29 years
History of CCB Status	N/A
Gold Level Criteria	N/A
Expected Verification Schedule	July 2020

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

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

1.2 Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	10,077,450 tCO_2e	3.2.4
	Net estimated emission reductions in the project area, measured against the without-project scenario	N/A	N/A
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	N/A	N/A
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	23,720 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 non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	N/A	N/A

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	15,220	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	10,654	2.3
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	15,220	2.3
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	10,654	2.3
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	15,220	2.3
	Number of women expected to have improved livelihoods or income generated as a result of project activities	10,654	2.3
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	N/A	N/A

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	N/A	N/A
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	N/A	N/A
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	N/A	N/A
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	N/A	N/A
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	N/A	N/A
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	15,220	2.3
	Number of women whose well-being is expected to improve as a result of project activities	10,654	2.3

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	23,720	5.2
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	1	5.2

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

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

Liangdu Afforestation Project (hereafter refer to as “the project”) is located in Liupanshui City, Guizhou Province of China,Guizhou is an inland province, bordering Yunnan to the west, Sichuan to the northwest, Hunan to the east and Chongqing to the North. Guizhou province has a total population of 34 million. The project aims to plant native species on barren lands for GHG removal whilst contributing to local sustainable development goals. 23,720ha (355,800 Mu[12]) of the forest was planted on barren lands in Shuicheng county, Pan county, Liuzhi special district which used to be poor sustainable ecological environment and karst rocky desertification..

The project involves including 1 district and 2 counties: Shuicheng county, Pan county, Liuzhi special district, The project zone with a total population of nearly 2,900,753. All the barren lands for afforestation activities belong to the villagers and the village committees manage the lands on behalf of villagers. Guizhou Xinzhanxin Agricultural Technology Co., Ltd. (hereafter referred to as Guizhou Xinzhanxin) has been fully authorized by all the village committees to act as the project proponent to implement project management and monitoring, and to sell VCUs generated from the project so that Guizhou Xinzhanxin consolidate the offset resources into sizeable forestry offset projects. Guizhou Xinzhanxin will profit-share with the villagers from selling VCUs. The implementation of the project activity has provided 15,220 jobs for local villagers, among which 70 percent are women.

The project activity aims to:

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

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

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

The implementation of the project is expected to reduce the GHG emissions amounting to 10,077,450 tCO_2e over the next 29years, with an average annual GHG emission removal of 347,498tCO_2e.

2.1.2 Project Scale

Project Scale	
Project	
Large project	✓

2.1.3 Project Proponent (G1.1)

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

2.1.4 Other Entities Involved in the Project

Organization name	Timing Carbon Asset Management Co., Ltd
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Timing Carbon Asset Management Co., Ltd is founded in 2007 with a registered capital of 30 million and 10 full-time employees. Timing Carbon Asset Management Co., Ltd has developed more than 50 offset projects in China, ranging from wind, solar and forestry, under various standards including CDM, VCS, Gold Standard and CCER.

2.1.5 Physical Parameters (G1.3)

The project is located in Liupanshui City, Guizhou Province, China. The geographical coordinates of the project are between 104°18' and 105°42' east longitude and between 25°19' and 26°55' north latitude.

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

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

Topography

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

Liupanshui's terrain is high in the west and low in the east as well as high in the north and low in the south. The general area is between 1400 and 1900 meters above sea level. The highest point on the ground is Dawan town in Zhongshan district, 2845.7 meters above sea level. The lowest point in the Liuzhi special District Maokou township Beipanjiang river valley, which is 586 meters above sea level. The relative height difference is 2259.7 m. The platform landscape is mainly mountains and hilly, and there are also basin, mountain, plateau, platform and other landform types.

Soils

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

The soil types are mainly yellow loam, mountain yellow and brown loam, mountain scrub meadow soil, lime soil, purple soil, rice soil, tide soil and swampy soil, which are divided into 24 subtypes, 74 soil genera and 141 soil species. The soil area is 9,333,300 mu, accounting for 62.74% of the total land area. Yellow soil is a kind of zonal soil with an area of 4.2232 million mu, accounting for 50.62% of the total soil area. The city tectonic structure belongs to the fold belt of the Yangtze platform. Located in the upper Yangtze platform fold belt (grade II structure) of the Yangtze platform fold belt (grade II structure), the Weining to Shuicheng fold bundle, the southwest Guizhou fold bundle and the extreme western edge of the early ancient arch fold bundle in central Guizhou and the southern Guizhou fold bundle.

Climate

North subtropical monsoon humid climate region, affected by the low latitude and high altitude, warm winter and cool summer, pleasant climate. The average annual temperature is 13 to 14℃, including 3 to 6.3℃ in January and 19.8℃ to 22℃ in July respectively. Annual precipitation is 1200 to 1500 mm. Frost-free period of 200 to 300 days. Due to the large relief, local climate differences are obvious. The city's total water volume is about 14.218 billion cubic meters, of which the average annual flow of surface water is 6.4 billion cubic meters, and the average annual flow of underground water is 5.268 billion cubic meters.

Hydrology

Liupanshui City is located in the watershed of the Yangtze River and the pearl river, with Yunnan and Guizhou railway as the watershed line. The Wujiang river system, with Sancha river as its mainstream in the city, is located in the northern region, including Shuicheng county, Liuzhi special District and part of the Zhongshan District. The mainstream of the Pearl river system is the Beipanjiang river, which runs through the belly of the city from west to east. There are 71 rivers with a length of more than 10 kilometers or a catchment area of more than 20 square kilometers in the city, including 14 Wujiang river system and 57 Zhujiang river system. According to the basin area, there are 24 rivers of 10 ~ 50 square kilometers, 19 rivers of 51 ~ 100 square kilometers, 19 rivers of 101 ~ 500 square kilometers, 3 rivers of 501 ~ 1000 square kilometers and 6 rivers of 1001 square kilometers or more. The density of the river network is 0.167 kilometers per square Kilometer. Inside the river in addition to a few mainstreams, more than a main source of the river, short flow source, the dry season often appear cut off.

Types of vegetation

There are many kinds of wild plants in Liupanshui city, which can be classified into four types according to their USES: herbage, medicinal, fruit and other types. There are 514 species of herbage in 192 genera and 40 families. There are about 700 species of medicinal plants, 195 of which are the main species. Wild fruit categories have roxburgh rose, kiwi, apple pear, hawthorn, cherry, grapes, batch, bayberry, strawberry and so on. Other useful wild plants are chestnut, MAO pulse mountain oak, okang son, ferns, firethorn, wild tea, bitter tincture tea, anise, pepper, palm, etc. There were 223 arbor species and bamboo species, belonging to 62 species and 140 genera.

2.1.6 Social Parameters (G1.3)

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

Main settlements

Liupanshui, one of the six prefecture-level cities in Guizhou province. It is also known as the China's 'cool capital', located in the western region of Guizhou Wumeng mountain. The city covers an area of 9,965 square kilometers and has jurisdiction over 2 districts, 1 county-level city and 1 county, with a permanent resident population of 2,907,000.

Land use and economic activities

Lying to the west of Guizhou Province, Liupanshui, which is abundant in natural and social resources, Liupanshui is a major city of power transmission from the west to the east and an important industrial base of energy and raw materials in the southwest and even south China. Land use is dominated by agricultural land, while the economic activities are mainly agriculture, including planting and breeding.

All of the project area is barren lands.

Relevant historical conditions

Zangke country used to be a territory under the jurisdiction of Liupanshui City in the Spring and Autumn Period. During the Warring States Period, the city was a dependency of Yelang State. Due to the use of metal tools, it entered the farming era and reflected the characteristics of slavery production relations, After the Qin Dynasty unified China, it became the subordinate land of Bajun Hanyang County.

Socio-cultural information

There are 2.9 million people in Liupanshui City, of which 31% are ethnic minorities, including 44 ethnic groups, such as Yi, Miao, Buyi, Bai, Hui, Gelao and Aquaiche, the birth rate of the whole city is 13.14‰, and the natural population growth rate is 6.13‰. In 2016, the state's total GDP was 131.37 billion yuan, and the per capita disposable income of urban and rural residents was 25,473 yuan and 8,230 yuan respectively.

Table 1-1 Information of Population

	Population
Shuicheng county	The number of existing national and provincial minority ethnic villages in Shuicheng County is 15 with the ethnic minority population of about 800,000 people, excluding the northern five township. Among, them, there are 31 ethnic minorities including Miao, Yi, Chuanqingren, Buyi, Hui, Bai, Shui, Gelao, Mongolian, Tujia, Zhuang, Li, Tsai Famliy, Dong, etc.[14]

[14] http://www.shuicheng.gov.cn/zjsc/gk/

Pan county	It is home to 29 ethnic groups, including Han, Yi, Miao, Bai and Hui, with a population of 1.2 million.[15]
Liuzhi special district	Liuzhi special zone has jurisdiction over 245 village (residential) committees among 3 streets， 6 townships and 9 towns, including 32 nationalities such as Han, Yi, Miao, Buyi and Gelao. In 2017, there were 755,710 registered residents and 611,090 permanent residents. [16].

Table 1-2 Information of Income

	Income
Shuicheng county	In 2018, the GDP reached 29.55 billion CNY, and the per capita disposable income of urban and rural residents reached 28,195 CNY and 9,402 CNY, respectively. [17]
Pan county	In 2018, the GDP reached 59.644 billion CNY, and the per capita disposable income of urban and rural residents reached 29,240 CNY and 10,310 CNY, respectively. [18]
Liuzhi special district	In 2018, the GDP reached 18.852 billion CNY, and the per capita disposable income of urban and rural residents reached 28,279.47 CNY and 9,576 CNY, respectively. [19]

Table 1-3 Information of Education

	Education
Shuicheng county	Preliminary statistics show that in 2018, the county's gross enrollment rate for pre-school students was 90.12%, the retention rate for nine-year compulsory education was 94.05%, and the gross enrollment rate for senior high schools was 92.18%. There were 349 schools at all levels, including 145 kindergartens, 151 primary schools, 40 junior middle schools (including 9 nine-year systems), 7 senior high schools (including 2 junior high schools, 3 senior high schools and two 12-year systems), 5 secondary vocational schools and 1 special education school. [20]

[15] http://www.panzhou.gov.cn/zjpz/pzjj/
[16] http://www.liuzhi.gov.cn/xylz/lzjj/
[17] http://www.shuicheng.gov.cn/zjsc/gk/
[18] http://www.panzhou.gov.cn/zjpz/pzjj/
[19] http://www.liuzhi.gov.cn/xylz/jjfz/201703/t20170329_20535954.html
[20] http://www.shuicheng.gov.cn/zjsc/gk/

Pan county	In 2016, there were 465 primary and secondary schools (kindergartens) in Pan county. Among these, there were 166 kindergartens with 40,176 students, 3,626 staff and 2,437 full-time teachers; there were 221 primary schools with 66,554 students, 4,269 staff and 4,131 full-time teachers; there were 59 middle schools with 41,787 students, 3,298 staff and 3,117 full-time teachers; there were 12 high schools with 32,684 students, 2,061 staff and 1,952 full-time teachers; there was one special school with 217 students, 43 staff and 37 full-time teachers; there are one reformatory school with 67 students, 33 staff and 30 full-time teachers. [21]
Liuzhi special district	At the end of 2016, there were 305 schools of all kinds in Liuzhi special zone, with 8,426 faculty and staff, 5,214 full-time teachers and 136,626 students. The enrollment rate of primary school-age children reached 99.5%, the six-year retention rate of primary schools reached 95%, the three-year gross enrollment rate of pre-school students reached 88.6%, the gross enrollment rate of junior middle school students reached 111%, and the gross enrollment rate of senior high school students reached 87.6%. [22]

Table 1-4 Information of Health

	Health
Shuicheng county	According to preliminary statistics, a total of 793,300 people took part in the new rural cooperative medical service in 2018, with a participation rate of 99.52%. There were 36 health institutions, including 11 hospitals and 25 health centers. There were 2,640 beds in health institutions, including 826 in hospitals and 1,814 in hospitals. There were a total of 2124 health technicians, including 550 occupational (assistant) physicians and 560 registered nurses. [23]
Pan county	In 2016, the number of medical and health institutions at various levels in Pan county was 634, including 512 public medical institutions (1 tertiary hospital, 2 secondary hospital 2 and I hospital of traditional Chinese medicine), while that of social medical institutions was 122, with 5,315 beds and 4,542 staff (including 1,767 physicians and 2,775 nurses). With the comprehensive implementation of the new type of rural cooperative medical, a total of

[21] https://baike.baidu.com/item/%E7%9B%98%E5%B7%9E/20130955?fromtitle=%E7%9B%98%E5%8E%BF&fromid=2707210&fr=aladdin#7_2

[22] https://baike.baidu.com/item/%E5%85%AD%E6%9E%9D%E7%89%B9%E5%8C%BA?fromtitle=%E5%85%AD%E6%9E%9D&fromid=5667484#7_1

[23] http://www.shuicheng.gov.cn/zjsc/sh/

	951,600 farmers had participated in the program, accounting for 99.35%, and the annual medical reimbursement amounted to 425.45 million CNY. [24]
Liuzhi special district	At the end of 2016, there were 38 hospitals and health centers, 1 blood collection institution, 1 maternal and child health and family planning technical service center, 1 disease prevention and control center and 1 health supervision center in Liuzhi special zone. The number of beds in health institutions was 2,561, the number of registered population at the end of 2016 was 735,244, and the number of beds in 1,000 people's health institutions was 3.48. There were 921 licensed (assistant) doctors, and the registered population was 735,244 at the end of 2016, and the number of 1,000 licensed (assistant) doctors was 1.25. There were 51 deaths and 5,779 live births among children under five years of age, and the mortality rate among children under five years of age was 8.83 per thousand [25]

Table 1-5 Information of Employment

	Employment
Shuicheng county	According to preliminary statistics, 9,729 new urban jobs were created in 2018, up 1.4% while 796 laid-off workers were reemployed and 532 people who had difficulty finding jobs were reemployed. A total of 21,652 agricultural workers were transferred to work, and 29,336 rural workers and registered urban unemployed received vocational training. The registered urban unemployment rate was kept below 4.2%. [26]
Pan county	A total of 26,200 people got the opportunities to work in 2016 in Pan county, which has an increase of 2.6% compared to that in 2015. The number of registered urban and rural unemployed people was 3,190, and its registered unemployment rate was 3.87%. [27]
Liuzhi special district	20,277 people got jobs accounting for 101.39% of the 20,000 assigned. Among them, 1,067 people are reemployed laid-off workers accounting for 101.62% of the 1,050 people assigned while 865 people with difficulties in finding jobs were provided jobs are 102.98%

[24] https://baike.baidu.com/item/%E7%9B%98%E5%B7%9E/20130955?fromtitle=%E7%9B%98%E5%8E%BF&fromid=2707210&fr=aladdin#7_5

[25] https://baike.baidu.com/item/%E5%85%AD%E6%9E%9D%E7%89%B9%E5%8C%BA?fromtitle=%E5%85%AD%E6%9E%9D&fromid=5667484#7_3

[26] http://www.shuicheng.gov.cn/zjsc/sh/

[27] https://baike.baidu.com/item/%E7%9B%98%E5%B7%9E/20130955?fromtitle=%E7%9B%98%E5%8E%BF&fromid=2707210&fr=aladdin#7_4

	of the 840 people assigned. The main employment channels are individual business, flexible employment, community services, public welfare posts in administrative institutions and non-public enterprises. 22,365 rural workers were transferred to the non-agricultural sectors, which is 101.8% of the 21,970 rural workers assigned. [28]

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

The project is located in Liupanshui City, including 1 district and 2 counties: Shuicheng county, Pan county, Liuzhi special district. The geographical coordinates of the project are between 104°18' and 105°42' east longitude and between 25°19' and 26°55' north latitude.

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

The geographical coordinate of Liupanshui city as well as those of the 1 district and 2 counties included in the project zone are listed below:

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

	East longitude	North latitude
Liupanshui city	104°18'-105°42'	25°19'-26°55'
Liuzhi Special district	105°08'-105°42'	25°59'-26°33'
Shuicheng county	104°33'-105°15'	26°02'-26°55'
Pan county	104°18'-104°57'	25°29'-26°17'

.

[28] http://www.liuzhi.gov.cn/xylz/rkjy/202003/t20200302_52743164.html

Figure 1-1 Map showing Guizhou Province, China

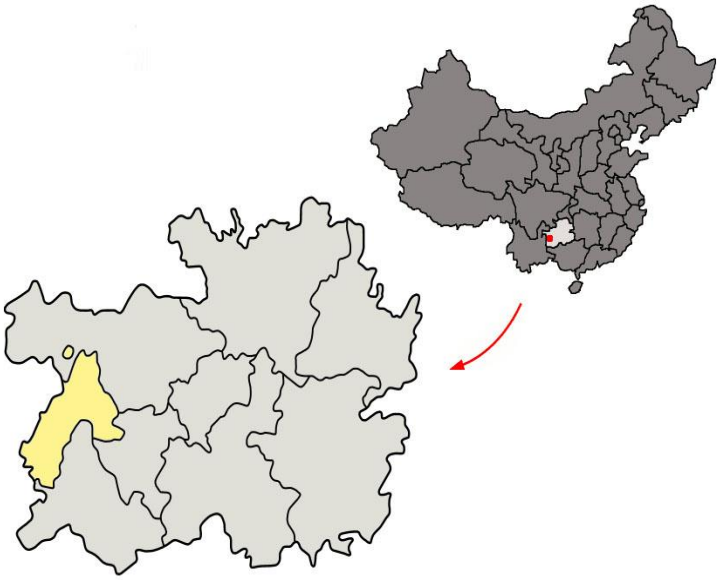

Figure 1-2 The project location

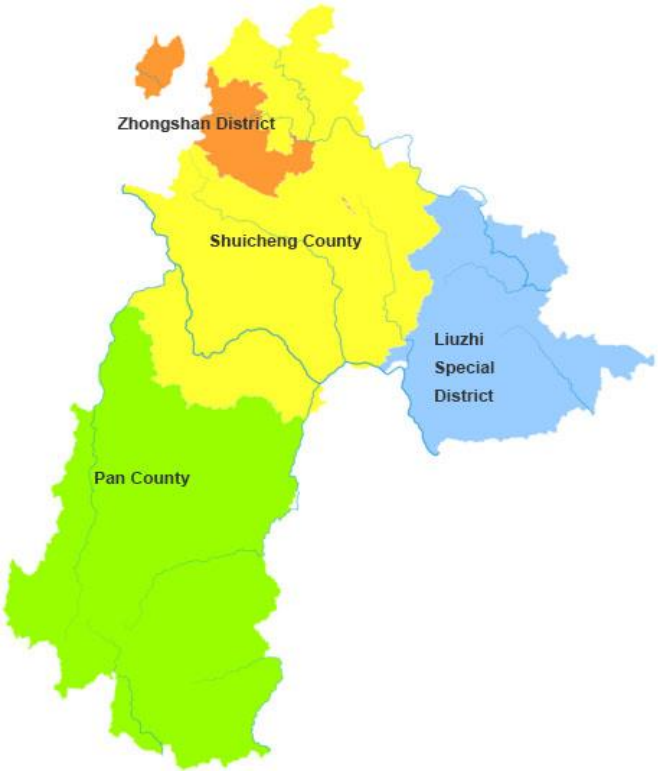

Figure 1-3 The project location

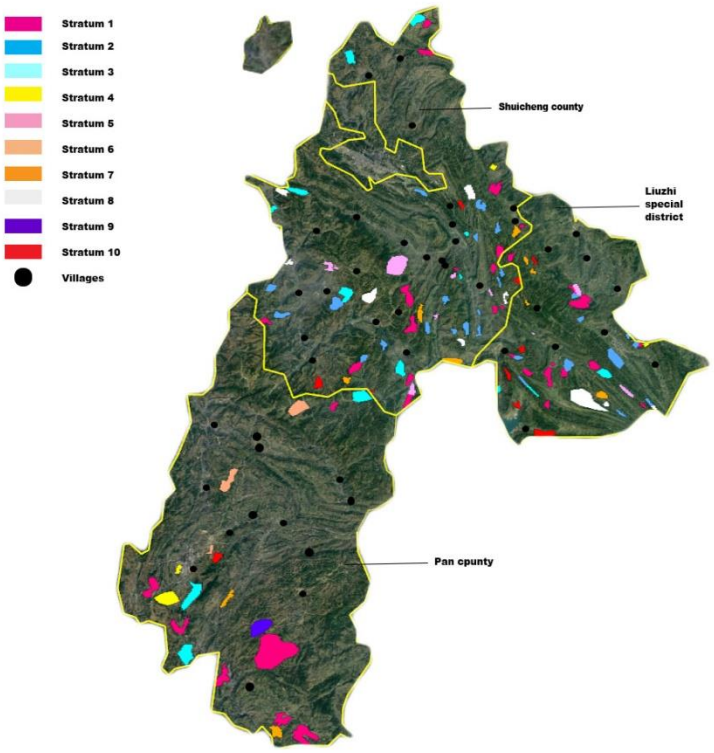

Figure 1-4 The boundaries of the project zone and project area

In figure 1-4, the pink areas within the boundaries of Shuicheng county, Pan county, Liuzhi special district represent the 36 villages involved in the project. In this area, China fir is the main species planted in 2015 that is indicated the stratification of Pro-1.

The bule areas within the boundaries of Shuicheng county and Liuzhi special district represent the 28 villages involved in the project. In this area, Cypresses is the main species planted in 2015 that is indicated the stratification of Pro-2.

The wathet blue areas within the boundaries of Shuicheng county, Pan county, Liuzhi Special district represent the 15 villages involved in the project. In this area, Pinus yunnanensis is the main species planted in 2015 that is indicated the stratification of Pro-3.

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

The hermosa pink areas within the boundaries of Shuicheng county and Liuzhi special district represent the 9 villages involved in the project. In this area, Cypresses is the main species planted in 2016 that is indicated the stratification of Pro-5.

The beige areas within the boundaries of Shuicheng county and Liuzhi special district represent the 3 villages involved in the project. In this area, Pinus yunnanensis is the main species planted in 2016 that is indicated the stratification of Pro-6.

The khaki areas within the boundaries of Shuicheng county, Pan county, Liuzhi special district represent the 10 villages involved in the project. In this area, China fir is the main species planted in 2017 that is indicated the stratification of Pro-7.

The pinkish purple areas within the boundaries of Pan county represent the 9 villages involved in the project. In this area, Cypresses is the main species planted in 2017 that is indicated the stratification of Pro-8.

The purple areas within the boundaries of Pan county represent the 1 villages involved in the project. In this area, Pinus yunnanensis is the main species planted in 2017 that is indicated the stratification of Pro-9.

The red areas within the boundaries of Pan county, Liuzhi special district represent the 10 villages involved in the project. In this area, Masson pine is the main species planted in 2015 that is indicated the stratification of Pro-10.

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

The unlabeled areas in figure 1-4 represent Zhongshan district respectively. These district 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

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

1) Village residents in 1 district and 2 counties: (including 1,800,000 local villagers of which 15,220 are migrant rural workers and 10,654 are female rural workers mentioned in section 4.2.1)

The proposed project involved planting China fir, Cypress, Masson pine and Pinus yunnanensis in 1 district and 2 counties of Liupansui City.

In these 1 district and 2 counties, a total of 1,800,000 villagers have been directly affected by the activities of the project (described as local villagers mentioned in section 4.2.1). In addition, the lands in the project area belong to these villagers and are centrally managed by their respective village committees. The representatives of these village committees can manage the land only with the consent of all the villagers. Hence, the village committees collected the opinions and consent of the villagers in respective villages through face-to-face meetings before deciding to apply to the local governments' and the forestry bureaus for planting trees in the project area. The committees were also responsible for signing the cooperation agreements with the project proponents to ensure the proper development of the project.

Since September 2014, before the project started, the village committees conducted a survey of the local villagers' willingness to plant trees. This was done through meetings and interviews with villagers. All the

villagers agreed to use the barren lands collectively owned by the villages to plant trees in the end, 15,220 villagers were hired to plant trees(described as migrant rural workers mentioned in section 4.2.1), of whom 10,654 were women(described as female rural workers mentioned in section 4.2.1), accounting for 70 percent.

A total of 2,900,753 villages are directly impacted by the project. Moreover, there are additional benefits for migrant rural workers and female rural workers as the result listed in section 4.2.1. Thus, these type of stakeholders are divided into three categories to specify the different advantages of the community. Refer to the specific impact for the different categories as described in section 4.2.1.

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

The picture above was taken by Shuicheng Forestry Bureau in September 2014 and the meeting was attended by the representatives of Guizhou Xinzhanxin, the representatives of villagers, and the representatives of the village committee. The representatives of the Shiucheng Forestry Bureau also organized a meeting to solicit suggestions from villagers for the implementation of project activities and their willingness to participate in planting trees.

This afforestation activity has greatly benefited the local villages and could only carry out with the villagers' consent. Hence, the villagers within1 district and 2 counties the project zone are recognized to be stakeholders in the project.

2) Forestry bureaus of 1 district and 2 counties:

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

3) Governments of 1 district and 2 counties

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

4) Village committees in 1 district and 2 counties

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

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

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

- First, undertake a community mapping exercise to identify and list all households. This step was helped by local government and referred to local statistics;
- Second, consult with key informants and focus groups on poverty or well-being categories. For this project, three categories have been identified by household income per capita: capable, average and poor in which poor were defined as those households enjoying the minimum living guarantee from government, and the capable was defined as the top 20% by household income;
- Third, select 'representative', respected and knowledgeable key informants, especially the women representative since women accounted for 70% of the local residents involved in the project;
- Finally, get the key informants to classify the households into the well-being categories.

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

This information can be summarized in Table 2-2

Table 2-2 Stakeholder Analysis

Stakeholder or stakeholder sub group	Interests in the project	Effect of project on their interest(s)	Relationship with other stakeholders (Partnership/Conflict)?
Village residents in 1 district and 2 counties	Job opportunity, safeguard of homeland from desertification	Create job opportunity, provide work training	Partnership
Forest Bureaus of 1 district and 2 counties	Afforestation management, forest coverage	In charge of the official approval and management of the forest projects. Increased forest coverage	Partnership
Governments of 1	local social and	Enhance local social	Partnership

district and 2 counties	environmental management, employment and welfare of county	and environmental management. Increased employment and improved welfare of county	
Village committees in 1 district and 2 counties	Job opportunity, development of economy and infrastructure	Create job opportunity, speed up local construction	Partnership

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

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

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

Table 2-3 Relative Influence of Stakeholders

Stakeholders	**Influence of Stakeholders**			
	Low	**Moderate**	**Significant**	**Highly influential**
Village residents in 1 district and 2 counties				☑
Forest Bureaus of 1 district and 2 counties		☑		
Governments of 1 district and 2 counties		☑		
Village committees in 1 district and 2 counties			☑	

Table 2-4 Importance of stakeholder to project achievement

Stakeholders	**Importance of stakeholder to project achievement**			
	Low	**Moderate**	**Significant**	**Critical**
Village Communities in 1 district and 2 counties				☑
Forest Bureaus of 1 district and 2 counties			☑	
Governments of 1 district and 2 counties			☑	
Village committees in 1 district and 2 counties			☑	

Step 5: Publish the results of identified stakeholders

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

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

Stakeholder	Rights, Interest and Overall Relevance to the Project
Residents in Shuicheng county, Pan county, Liuzhi special district.	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.
Forest Bureaus of Shuicheng county, Pan county, Liuzhi special district.	The local administration 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 Shuicheng county, Pan county, Liuzhi special district.	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 Shuicheng county, Pan county, Liuzhi special district.	They are responsible for collecting opinions from the respective locals and villages with the project proponent or forestry bureaus. They also represent all the locals to sign the carbon sink project cooperation agreement with Project proponent.

2.1.10 Sectoral Scope and Project Type

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

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

GHG emission reduction or removal activities

The project aims to increase carbon sequestration and contribute to local sustainable development by planting trees on the barren hill and degraded lands. 23,720 ha (355,800 Mu) of forest were directly afforested on degraded lands in Liupanshui City, including 1 district and 2 counties: Shuicheng county, Pan county, Liuzhi special district. According to the Biodiversity Survey Report of the project, all the project areas were previously barren lands without agricultural activities. There was no natural renewal and reforestation before the project, and some sites were covered by sparse shrub. Therefore, the project does not include activities that convert native ecosystems to generate GHG credits, which means and the eligibility criteria of VCS AFOLU projects are fulfilled.

The species of ecological public welfare forest in the karst area mainly include Pine, China fir, Cypress, Toonasinersis, Populusadenopoda, Dodonaeaviscosa, etc.. Among them Pine, China fir

and Cypress are the main forest species to control karst rocky desertification in Guizhou, because they have strong adaptability. Pine and China fir, Cypress are prominent in rocky desertification areas due to their fast growth, shallow rooting and strong adaptability to the soil. They are suitable for afforestation species in limestone mountainous areas of subtropical monsoon climate zone.

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

The project is estimated to generate GHG emission removals of 10,077,450 tCO_2e in 29 years, with an average annual GHG emission removal of 347,498tCO_2e.

Theory of Change

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

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

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

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

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

(1) Community activity focal issue: Without the project, the income of local villagers is low. According to PRA survey by the Guizhou Academy of Social Sciences (GASS), the average monthly income of a household within the project area is about 1,820 CNY, and most villages defined as impoverished villages in the project zone.

With the project, the project has offered more job opportunities and the income of the local households have been increased. The daily salary for a tree-planting post is 60CNY and the monthly salary for each part-time technician is 200 CNY, which is a considerable contribution to the income level of both the villagers and technicians. The ratio of poor households was obviously decreased due to the income increase, and opportunities for local villagers working together were given to them.
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 increase 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.
Therefore, the project enhanced social cohesion.

(2) Rocky desertification invasion focal issue:

Without the project, the project area would remain rocky desertification land and the surrounding villages would be threatened by rocky desertification invasion. The forest coverage rate of Liupanshui city is 49.77% in 2015[29] .. It is almost impossible for any crops to grow in the rocky desertification land, which is very thin soil and will be downstream as long as rain washes away.

[29] http://www.doc88.com/p-1991754314147.html. Forestry development plan for liupanshui during the 13th five-year plan period (2016-2020)

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 tress 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 2020 the ratio is raised to 62%[30]. 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 the project, the project area would continue to be rocky desertification land with much threat to local climate and biodiversity conditions. Some of habitat for wild animals is threatened even there is no home from them.

With the project, the forest cover increased by applying scientific and reasonable configuration method of planting.. The implementation of the project can adjust the hydrological cycle, reduce drought and flood risk, promote soil nutrient cycle, improve local micro-climate and other ecological environment. Consequently, the population of animals could be increased due to the better environment of habitat.

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

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

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short-term)	Outcomes (medium-term)	Impacts (long-term)	
Plant native species of trees, including preparing land for planting	Generate GHG emission removals	Improve the local environment Generate GHG emission removals	Establish a forest ecosystem; Generate GHG emission removals Improves the local soil structure	Climate
Offer permanent and temporary job opportunities related to forest planting and	Create job opportunities; Increase household incomes of local	Improve living level of local villages	Improve the well-being of local villagers	Community

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

management	villagers			
Provide technical skills and training of forest planting and management	Improve motivation of community groups	Enhance the capabilities of local villagers	Enhance social cohesion	Community
Conduct continuous management and protection of the forest	Maintain local ecological environment; Prevent frequent debris flow	Provide better habitat for wild lives ; Prevent rocky desertification	Increase local biodiversity; Prevent rocky desertification	Biodiversity Community

2.1.12 Sustainable Development

The project will contribute to achieving sustainable development as following:

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

2.1.13 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
15- September - 2014	The baseline survey was started.
09- January - 2015	The Project Design for Afforestation Operation in 2015 was finished.
18- January - 2015	The afforestation project design was approved in 2015 by Liupanshui Forest Bureau.
14- February - 2015	Biodiversity survey report of the project was completed.
24- February - 2015	Participatory Rural Appraisal (PRA) report of the project was completed.
28-April-2015	Planting trees was started.
01-January-2016	Start date of crediting period
20- January -	The Project Design for Afforestation Operation in 2016 was finished.

2016	
22- February - 2016	The afforestation project design in 2016 was approved by Liupanshui Forest Bureau.
10- January - 2017	The Project Design for Afforestation Operation in 2017 was finished.
20- January - 2017	The afforestation project design in 2017 was approved by Liupanshui Forest Bureau.
15- October - 2017	Completed planting
09- October - 2018	Training technical worker yearly.
05- September 2019	Started collecting and sorting data to write PD
11- October - 2019	Training technical worker
30- January - 2020 to 29- February-2020	Public Comment Period.,
23-April-2020 to 26-April-2020	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 28-April-2015 when the planting started.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

Planting started: 28- April -2015, the date on which the native community started its activities and led to greenhouse gas removal.

The project crediting period of 29 years is from 01- January -2016 to 31- December-2044, and the project lifetime is 30 years from 28- April -2015 to 27- April -2045.

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

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

2.1.17 Estimated GHG Emission Reductions or Removals

Year	Estimated GHG emission reductions or removals (tCO_2e)
01-January-2016-31-December-2016	36,507
01-January-2017-31-December-2017	66,670
01-January-2018-31-December-2018	103,955
01-January-2019-31-December-2019	148,388
01-January-2020-31-December-2020	195,478
01-January-2021-31-December-2021	242,646
01-January-2022-31-December-2022	287,790
01-January-2023-31-December-2023	329,313
01-January-2024-31-December-2024	366,118
01-January-2025-31-December-2025	397,552
01-January-2026-31-December-2026	423,332
01-January-2027-31-December-2027	443,439
01-January-2028-31-December-2028	458,083
01-January-2029-31-December-2029	467,618
01-January-2030-31-December-2030	472,485
01-January-2031-31-December-2031	473,189
01-January-2032-31-December-2032	470,248
01-January-2033-31-December-2033	464,174
01-January-2034-31-December-2034	455,463
01-January-2035-31-December-2035	444,582
01-January-2036-31-December-2036	431,952
01-January-2037-31-December-2037	417,960
01-January-2038-31-December-2038	402,936
01-January-2039-31-December-2039	387,192

01-January-2040-31-December-2040	370,977
01-January-2041-31-December-2041	354,512
01-January-2042-31-December-2042	337,988
01-January-2043-31-December-2043	321,556
01-January-2044-31-December-2044	305,347
Total estimated ERs	10,077,450
Total number of crediting years	29
Average annual ERs	347,498

2.1.18 Risks to the Project (G1.10)

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

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Fire	The planting area is mostly flat barren land; thus the risk of fire is quite low in the early phase of the project. After the trees grow to a certain age (about thirty years), the risk of fire may increase, and the project proponent will adopt the necessary measures for the fire preventing.	Strengthen the work of forest fire prevention publicity education to increase the awareness of forest fire prevention in the whole society. Education activities, mainly covering forest law and forest fire prevention regulation, are carried out to popularize the basic knowledge of fire prevention and extinguishing. Relying on the masses, implementing mass prevention and mass control, and effectively improving the awareness of forest fire prevention.
Diseases and Insects	There could be diseases and insects that may damage the planted trees, but the diseases and insects will be prevented by routine overseeing.	Upon routine overseeing, the diseases will be treated immediately by biological control once occurred. The chemical pesticides are allowed to be used only if there is a serious pest problem outbreak in the project area, and the pesticides will be used in accordance with the National Pesticides Policy.
Pesticide	Improper pesticide applications would be harmful to the natural environment, including polluting soil, water and air conditions, as well as the habitat of the wildlife.	Pesticide will be strictly managed by well-trained staff to minimize the potential effect. Also, the Environmentally friendly measures will be adapted such as mixed-species arrangement, seed and seedling quarantine. Especially the biological measures to control pests and diseases will be adopted. Therefore, the pesticide application will be limited.

Also, please refer to the Non-Permanence Risk Report of the project for a more detailed analyses 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 and increase the carbon sequestration by establishing forest of native trees. In addition, commercial logging will be forbidden within the project area and human interference will be minimized.

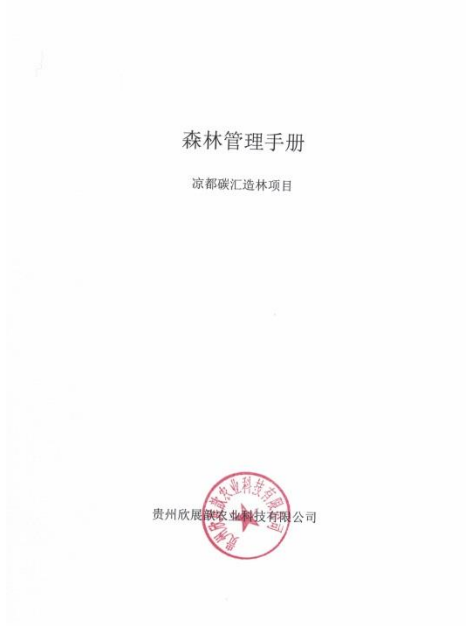

Figure 2-6 The picture showing the scanned covers of the Forest Management Manual written by Guizhou Xinzhanxin

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

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2.1.20 Financial Sustainability (G1.12)

According to the reported barren mountain area data, the forestry departments at all levels have made counting and verification on the afforestation area. Finally, according to the counted planting area, the nationality issued special funds for afforestation to Liupanshui city, together with provincial funds from Guizhou and local funds from Liupanshui city, to form the funds for this project. In the investment scale of this project, the total amount of funds from governments at all levels accounts for 70%, and the remaining 30% shall be jointly raised by the village committee and the villagers.

Stakeholders have taken carbon revenue seriously and believed that carbon benefits help break down economic barriers. Then Guizhou Xinzhanxin Agricultural Technology Co., Ltd signed the ERPA with Timing Carbon Asset Management Co., Ltd. The project proponent will use the carbon revenue for the continuous management and maintenance of the forest.

2.1.21 Grouped Projects

This is not a grouped project.

2.2 Without-project Land Use Scenario and Additionality

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

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

2.2.2 Most-Likely Scenario Justification (G2.1)

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According to the certificate of land qualification issued by the Liupanshui Forestry Bureau, the land in this project area is the barren and degraded since 1970. On one hand, these blocks are not intended for industrial or residential use because of their remoteness from the city and they cannot be used for agricultural, neither, because of their barren and karst topography. On the other hand, it will be almost impossible to plant trees on these blocks without the project because of the difficulty and cost of planting on barren lands. Therefore, these lands will continue to be abandoned without this project scenario.

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 desert lands. Moreover, these programs have not been written in laws.

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

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

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 the Chinese version, and the local village communities and other stakeholders can easily download from the website. All the documentation of the project was available in village committees and the local forestry bureaus for who cannot use the internet. The project proponent has noticed local stakeholders through the routine villager assembly regarding every milestones of the project development, such as listing, beside, the register, and issuance, etc. When the relevant content of the project was publicized on the Internet, the documents related to the project would also be posted on the roadside or bulletin board of each village committee, so as to facilitate stakeholders to view the project situation and provide valuable Suggestions.

Since the beginning of the project, there is no feedback has been received.

Verra Projects Open fo ×

https://verra.org/open-for-public-comment/

Liangdu Afforestation Project
ID: PL2083
Program(s): VCS and CCB Programs
Location: China
Project Proponent: Guizhou Xinzhanxin Agricultural Technology Co., Ltd.
Benefits planned over project lifetime

- 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 River basin;
  - Generate income and job opportunities for local communities

There is no natural renewal and afforestation before the project, and all sites were covered by the barren hill. The main objective specie is Cypresses and China fir which are native species according to the baseline survey.

Public Comment Period: 30 January – 29 February 2020

Figure 2-7 Published on VCS and CCB website

Figure 2-8 The project documents posted

2.3.2 Dissemination of Summary Project Documents (G3.1)

Along with the project implementation, the project documentation have been published on VCS and CCB website for all stakeholders to obtain detailed project information and development progress. Also, the summary of project description in the local language 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 22-September-2014, during the PRA survey period, the project proponent also held a stakeholder meeting at Shuicheng county involving stakeholder representatives from the 1 district and 2 counties involved in the project to gather their opinions and suggestions, and distributed questionnaires to the participants to collect their feedback. The villagers, 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 since the beginning. All of them expressed their willingness to participate in the project not only because of the revenue generated by creating job opportunities for the local rural communities but also because of the improvement in living conditions. The officers expressed very clear support for the continuation of the project.

Figure 2-9 Investigators are collecting opinions from villagers and filling out questionnaires

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

On 22-September-2014, during the PRA surveys and stakeholder meetings at Shuicheng County, 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)

2.3.6 The status and process of the project for CCB and the validation and verification for VCS would has been published through routine villager assembly and posted on local bulletin boards. The mobile phone number of the contact person of the project would have been provided to all the stakeholders so they can directly make a call in case they have any problems about the project. In addition, the relevant information of the verification will be announced in the manner described above. Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

On 11 January 2020, a novel coronavirus outbroke in China[31], so the Chinese government launched the response of public health and epidemic prevention. Guizhou province where this project located launched a public health emergency response of level 1 on 24 January 2020[32], which was adjusted to level 3 at the end of the project on 23 February 2020[33]. It, however, does not allow people to gather together for parties and go out without masks. After the proponent was registered and recorded by the local government, most of the auditors conducted the interviews outdoor while others are indoor.

During site visit time from 23-April-2020 to 26-April-2020, the auditor visited through each home and did not bring everyone together, the local villagers, representatives of forestry bureaus, Liupanshui city government officers expressed their opinions about the project activities. The local villagers have participated in the project from beginning to present. The villagers asked the auditor how the reductions were calculated and when the benefits would be available. The project proponent and auditor responded to all the questions patiently. After the meeting, the auditor interviewed each participant separately and asked for their opinions and suggestions. All of them expressed their willingness to be involved in the

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

project not only because of the revenue obtained from job opportunities created for the local village communities but also improvement in living conditions. The officers expressed very clear support for the continuation of the project.

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2.3.7 Stakeholder Consultations (G3.4)

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

Before afforestation, the Guizhou Academy of Social Sciences, authorized by the Liupanshui Forestry Bureau, conducted a Participatory Rural Appraisal and CCB survey to meet the requirements of the carbon sink project. Guizhou Academy of Social Sciences (GASS) organized a team of people to interview the village representatives, relevant governmental officers and distribute the questionnaires to gather local villagers' opinions (picture is shown in section 2.3.3). A total of 100 questionnaires were distributed, and 100 were collected. The surveys took 2 months and completed on 24-February-2015. The feedback collected is summarized below:

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

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

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

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

凉都林业碳汇造林项目

参与式调查问卷

问题	回答（勾选或填写）
1、您认为植树造林对自然有利吗？	①是 ②没有
2、您了解的植树造林的益处有哪些？	①改善喀斯特石漠化 ②净化空气 ③保护水土 ④减少自然灾害 ⑤增加动物栖息地
3、您的家庭有几口人？年收入是多少？主要的经济来源是什么？	人口数：7 人；年收入：7240 元；主要经济来源：种植
4、您的家庭成员中共有男性多少人、女性多少人？	男性：3 人；女性：4 人
5、您的家庭成员分别从事什么行业工作？	①农林牧渔从业人员 ②工业从业人员 ③建筑业从业人员 ④交通运输和邮电业从业人员 ⑤信息传输、计算机服务和软件业 ⑥批零贸易餐饮也从业人员 ⑦其他从业人员
6、您家庭成员中外出打工的人数及性别？	男性：2 人；女性：1 人
6、您的家庭以哪种生产活动为主？	①畜牧业 ②林业 ③种植业 ④其他
7、您有宗教信仰吗？	①有 ②没有
8、您的文化水平是什么？	①小学 ②初中 ③高中 ④专科 ⑤本科 ⑥不识字
9、您会保护出现在您生活环境中的动物吗？	①是 ②否
10、请问项目涉及的土地权属是否清晰？	①是 ②否
11、请问在此之前您了解碳交易吗？	①是 ②否
12、通过工作人员对碳交易的介绍，您支持本项目申请开发成为碳汇项目吗？	①支持 ②不支持
13、如果本项目成功申请开发为碳汇项目，您认为可以带来哪些好处？	①创造就业机会 ②获得更多经济收益 ③改善当地环境，减少自然灾害 ④保护耕地
14、您愿意参与本项目的种树工作吗？期望的工资是多少？	①愿意 ②不愿意 期望工资：100元
15、您支持本项目中雇佣女性参与林木种植和管理吗？	①支持 ②不支持
16、您认为本项目的设计或实施方案有需要改进的地方吗？请提出您宝贵的意见。	无

凉都林业碳汇造林项目

参与式调查问卷

问题	回答（勾选或填写）
1、您认为植树造林对自然有利吗？	①是 ②没有
2、您了解的植树造林的益处有哪些？	①改善喀斯特石漠化 ②净化空气 ③保护水土 ④减少自然灾害 ⑤增加动物栖息地
3、您的家庭有几口人？年收入是多少？主要的经济来源是什么？	人口数：5 人；年收入：2500 元；主要经济来源：种植
4、您的家庭成员中共有男性多少人、女性多少人？	男性：2 人；女性：3 人
5、您的家庭成员分别从事什么行业工作？	①农林牧渔从业人员 ②工业从业人员 ③建筑业从业人员 ④交通运输和邮电业从业人员 ⑤信息传输、计算机服务和软件业 ⑥批零贸易餐饮也从业人员 ⑦其他从业人员
6、您家庭成员中外出打工的人数及性别？	男性：2 人；女性：0 人
6、您的家庭以哪种生产活动为主？	①畜牧业 ②林业 ③种植业 ④其他
7、您有宗教信仰吗？	①有 ②没有
8、您的文化水平是什么？	①小学 ②初中 ③高中 ④专科 ⑤本科 ⑥不识字
9、您会保护出现在您生活环境中的动物吗？	①是 ②否
10、请问项目涉及的土地权属是否清晰？	①是 ②否
11、请问在此之前您了解碳交易吗？	①是 ②否
12、通过工作人员对碳交易的介绍，您支持本项目申请开发成为碳汇项目吗？	①支持 ②不支持
13、如果本项目成功申请开发为碳汇项目，您认为可以带来哪些好处？	①创造就业机会 ②获得更多经济收益 ③改善当地环境，减少自然灾害 ④保护耕地
14、您愿意参与本项目的种树工作吗？期望的工资是多少？	①愿意 ②不愿意 期望工资：120元
15、您支持本项目中雇佣女性参与林木种植和管理吗？	①支持 ②不支持
16、您认为本项目的设计或实施方案有需要改进的地方吗？请提出您宝贵的意见。	无

凉都林业碳汇造林项目

参与式调查问卷

问题	回答（勾选或填写）
1、您认为植树造林对自然有利吗？	①是 ②没有
2、您了解的植树造林的益处有哪些？	①改善喀斯特石漠化 ②净化空气 ③保护水土 ④减少自然灾害 ⑤增加动物栖息地
3、您的家庭有几口人？年收入是多少？主要的经济来源是什么？	人口数：7 人；年收入：6500 元；主要经济来源：种植
4、您的家庭成员中共有男性多少人、女性多少人？	男性：4 人；女性：2 人
5、您的家庭成员分别从事什么行业工作？	①农林牧渔从业人员 ②工业从业人员 ③建筑业从业人员 ④交通运输和邮电业从业人员 ⑤信息传输、计算机服务和软件业 ⑥批零贸易餐饮也从业人员 ⑦其他从业人员
6、您家庭成员中外出打工的人数及性别？	男性：2 人；女性：1 人
6、您的家庭以哪种生产活动为主？	①畜牧业 ②林业 ③种植业 ④其他
7、您有宗教信仰吗？	①有 ②没有
8、您的文化水平是什么？	①小学 ②初中 ③高中 ④专科 ⑤本科 ⑥不识字
9、您会保护出现在您生活环境中的动物吗？	①是 ②否
10、请问项目涉及的土地权属是否清晰？	①是 ②否
11、请问在此之前您了解碳交易吗？	①是 ②否
12、通过工作人员对碳交易的介绍，您支持本项目申请开发成为碳汇项目吗？	①支持 ②不支持
13、如果本项目成功申请开发为碳汇项目，您认为可以带来哪些好处？	①创造就业机会 ②获得更多经济收益 ③改善当地环境，减少自然灾害 ④保护耕地
14、您愿意参与本项目的种树工作吗？期望的工资是多少？	①愿意 ②不愿意 期望工资：100元
15、您支持本项目中雇佣女性参与林木种植和管理吗？	①支持 ②不支持
16、您认为本项目的设计或实施方案有需要改进的地方吗？请提出您宝贵的意见。	无

凉都林业碳汇造林项目

参与式调查问卷

问题	回答（勾选或填写）
1、您认为植树造林对自然有利吗？	①是 ②没有
2、您了解的植树造林的益处有哪些？	①改善喀斯特石漠化 ②净化空气 ③保护水土 ④减少自然灾害 ⑤增加动物栖息地
3、您的家庭有几口人？年收入是多少？主要的经济来源是什么？	人口数：5 人；年收入：7640 元；主要经济来源：种植
4、您的家庭成员中共有男性多少人、女性多少人？	男性：3 人；女性：2 人
5、您的家庭成员分别从事什么行业工作？	①农林牧渔从业人员 ②工业从业人员 ③建筑业从业人员 ④交通运输和邮电业从业人员 ⑤信息传输、计算机服务和软件业 ⑥批零贸易餐饮也从业人员 ⑦其他从业人员
6、您家庭成员中外出打工的人数及性别？	男性：1 人；女性：1 人
6、您的家庭以哪种生产活动为主？	①畜牧业 ②林业 ③种植业 ④其他
7、您有宗教信仰吗？	①有 ②没有
8、您的文化水平是什么？	①小学 ②初中 ③高中 ④专科 ⑤本科 ⑥不识字
9、您会保护出现在您生活环境中的动物吗？	①是 ②否
10、请问项目涉及的土地权属是否清晰？	①是 ②否
11、请问在此之前您了解碳交易吗？	①是 ②否
12、通过工作人员对碳交易的介绍，您支持本项目申请开发成为碳汇项目吗？	①支持 ②不支持
13、如果本项目成功申请开发为碳汇项目，您认为可以带来哪些好处？	①创造就业机会 ②获得更多经济收益 ③改善当地环境，减少自然灾害 ④保护耕地
14、您愿意参与本项目的种树工作吗？期望的工资是多少？	①愿意 ②不愿意 期望工资：120元
15、您支持本项目中雇佣女性参与林木种植和管理吗？	①支持 ②不支持
16、您认为本项目的设计或实施方案有需要改进的地方吗？请提出您宝贵的意见。	无

Figure 2-10 Questionnaires distributed to stakeholders

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

Table 2-6 Survey Results Summary Sheet

Question	survey result
Do you think afforestation is good for nature?	It is favorable
What do you know about the benefits of afforestation?	Improve karst rocky desertification, purify air, protect water and soil, reduce natural disasters, increase animal habitat

How many people are there in your family? How much is the annual income? What are the main economic sources?	The average number of people is 4.8, the average annual income is 7522CNY. The main economic sources are land and labor.
How many men and women are in your family?	On average there are 2.6 males and 2.2 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 2 males and 0.4 females
What kind of production activities does your family do?	crop farming
Do you have a religion?	No
What is your cultural level?	70% are elementary school culture, 20% are illiterate, 10% are junior high school culture
Will you protect the animals that appear in your environment?	Yes
Is the land ownership involved in the project clear?	Yes
Do you know carbon trading before then?	Most people don't know much
Through the staff's introduction to carbon trading, do you support this project's application for development as a carbon sink project?	Support
If this project is successfully applied for development as a carbon sink project, what benefits do you think can bring?	Create more employment opportunities for economic benefits, improve the local environment, reduce natural disasters, and protect arable land
Are you willing to participate in the tree planting work of this project? What is the expected salary?	Willing to participate; The average expected salary is 180 CNY
Do you support hiring women to participate in forest planting and management in this project?	Support

Do you think there is anything that needs to be improved in the design or implementation of this project? Please provide your valuable comments.	No comments

2.3.8 Continued Consultation and Adaptive Management (G3.4)

There is a Suggestion Book published on the notice board in each village 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, 90 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 policymakers and forest experts were also invited by phone calls. All the stakeholders have been informed directly or through their representatives.

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

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

In the project planning phase, the villagers were fully involved in decision-making such as the land selection and planting pattern selection through villagers meetings and PRA methods. PRA methods include meetings, household interviews, questionnaires and telephone contact to collect villagers' willingness to plant trees. The final PRA results showed that all the villagers agree that most young adults, and women want to participate in tree planting activities. All the meeting notices would be published on the notice board outside of each village committee office together with the contact numbers so that those who missed the meetings can also share their opinions. The meeting would introduce the purpose,

process, benefits, potential costs, risks, etc. Consequently, the villagers agreed to join the project and were willing to participate in the planting of trees.

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

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

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

2.3.11 Anti-Discrimination Assurance (G3.7)

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

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

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

The project proponent has appointed a staff member to record and collect conflicts and dissatisfaction between local communities and individual villagers. Employed forest patrols will play an important role in dealing with 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. Based on the information collected by the relevant parties, the specific staff member shall propose a solution and mediation plan within one week and solve the conflict within 30 days.

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

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

2.3.14 Worker Training (G3.9)

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

2.3.15 Community Employment Opportunities (G3.10)

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

During the implementation of the project, the total number of local villagers involved in planting was approximately 15,220, and of which 70% were women. In addition, approximately 90 locals are employed for project management and are provided related skill training regularly. All the planting opportunities are given priority to the locals on the condition that the candidate is an adult without any disease. In Guizhou, however, the majority of adult men work in developed provinces for higher salaries. Hence, women played a big role in the planting of trees. After planting, they get the payment for the number of trees they planted.

As mentioned previously, Guizhou Xinzhanxin also signs long-term part-time employment contracts with 90 skilled technicians from local forestry bureaus and pays 200 CNY each technician every month to do the regular monitoring work which is required by of the project. The local forestry bureaus will supplement if there are any part-time technicians who terminate the contract or get retired.

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

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

2.3.17 Occupational Safety Assessment (G3.12)

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

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

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

The local Forestry Bureau provide technical advice and training to technicians and project entity staff to measure and monitor actual greenhouse gas removals and leakages from proposed project activities. Timing Carbon Asset 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.

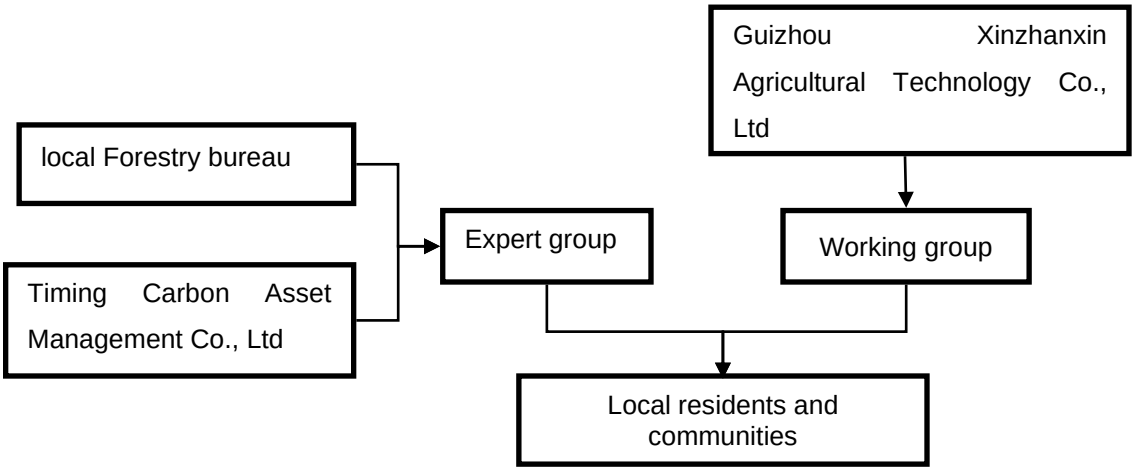

Figure 2-11 The picture showing the structures of the project governance

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	Habitat conservation and management and biodiversity	Forest conservation, conservation biology, and biodiversity monitoring

monitoring	monitoring	

2.4.3 Management Team Experience (G4.2)

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

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

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

Timing Carbon Asset Management Co., Ltd is experienced in carbon measurement and monitoring. In the past, Timing Carbon Asset Management Co., Ltd has successfully developed over 30 carbon projects in China, including validation and verification under GS, VCS and CDM standards. This experience will help project proponent to ramp up the capability of project implementing and management.

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

The management team of the project is experience in forest project management and carbon project development, also, local Forestry Bureau provided instruction of reforestation and forest management, conducted the specific supervision of the implementation, and collected specific activity data at routine basis. When the verification begins, the measurement of data and the monitoring of biodiversity are mainly undertaken by 90 technicians employed by Guizhou Xinzhanxin. The local Forestry Bureau and local government provided technical support for community engagement and biodiversity assessment. The project manager of Guizhou Xinzhanxin will be responsible for on-site verification, continuously guiding the tasks and specifications of these technicians, and the final data collection and inspection.

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

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

The project participators are legally registered companies in China, and according to the public information listed in National Enterprise Credit Information Publicity System, none of them were involved

in nor complicit in any form of corruption such as bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion. For more information, please refer to Section 2.1.3 and 2.1.4.

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

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

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

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

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

According to the 'Constitution of the People's Republic of China' and the 'Forest Law of the People's Republic of China', the land is village collective property. Local villagers have the right to use the land within the scope of the project boundary. The number of the land owners is large so that they authorized Guizhou Xinzhanxin as project proponent. The project proponent and the forestry department are responsible for the full 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 the VCS project or not the land is village collective property. The local government is responsible for all local villagers if there is anything relating to the encroachment of the locals' rights to the land.

2.5.2 Recognition of Property Rights (G5.1)

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

Furthermore, they also have right to authorize Guizhou Xinzhanxin as a representative of the project owner and Guizhou Xinzhanxin only has all the right to decide on the carbon sink project including the type of the carbon credit project to be developed, the sales target, the sales price etc[34].

[34] Source: carbon sink project cooperation agreement signed between village committee and Guizhou Xinzhanxin.

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

Prior to the project initiation, all of the project land is collective-owned by local villagers. In September 2014, the project participant and 1 district and 2 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 implementation of the project, Guizhou Xinzhanxin Agricultural Technology Co., Ltd. and the village collective who had the ownership of forest land had signed a carbon sink afforestation cooperation and development agreement, clarifying 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.

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

2.5.4 Property Rights Protection (G5.3)

Prior to the project implementation, the project area are mainly barren land, and villagers voluntarily use these lands to plant trees, therefore the project activities will not lead to involuntary or demolition property rights holders being removed from their lands or territories, and will not force the rights holder to relocate activities important to their culture or livelihood.[35]

2.5.5 Illegal Activity Identification (G5.4)

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

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

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;

The technical specification for afforestation;

Regulations for tending of forest;

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

Seedling quality classification of main afforestation species.

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

2.5.8 Approvals (G5.7)

The forestry bureau of Liupanshui approved the operational design of the afforestation project on 18-January -2015.

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

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

2.5.9 Project Ownership (G5.8)

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

2.5.10 Management of Double Counting Risk (G5.9)

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

2.5.11 Emissions Trading Programs and Other Binding Limits

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

2.5.12 Other Forms of Environmental Credit

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

2.5.13 Participation under Other GHG Programs

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

2.5.14 Projects Rejected by Other GHG Programs

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

2.5.15 Double Counting (G5.9)

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

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

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

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

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

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

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

3.1.2 Applicability of Methodology

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

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

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

i. Land containing organic soils.

The soil disturbance due to this project is in line with the requirements of soil and water conservation. Afforestation density was 3,100 plant/Ha, soil disturbance area ratio was 4.96%[36], less than 10%, and there was no repeated disturbance.

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

According to the land eligibility certificate of Liupanshui city Forestry Bureau, it certify that Liangdu carbon sink project is located in Liuzhi special district, Pan county and Shuicheng county of Liupanshui city. The ownership of woodland is collective, covering a total area of 23,720 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 23,720 hectares of this project construction site are all waste hills and unreclaimed lands suitable for afforestation since 1970, with clear ownership.

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

The afforestation plot of this project belongs to the forestry land stipulated by the state, and there is no agricultural activity before or after the afforestation activity of this project; therefore, there is no situation where existing agricultural activities have been transferred.

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

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

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

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

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.

3.1.3 Project Boundary

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

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

Source		Gas	Included?	Justification/Explanation
Baseline	Above-ground biomass	CO_2	Yes	This is the major carbon pool subjected to project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Below-ground	CO_2	Yes	Carbon stock in this pool is expected to increase due to the implementation of the

Source		Gas	Included?	Justification/Explanation
	biomass			project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Dead wood Litter and Soil organic carbon	CO_2	No	Insignificant and exclusion is conservative.
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
Project'	Above-ground biomass	CO_2	Yes	This is the major carbon pool subjected to project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Below -ground biomass	CO_2	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
		CH_4	No	Not included in carbon pool
		N_2O	No	Not included in carbon pool
	Burning of woody biomass	CO_2	No	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_2O	Yes	Burning of woody biomass for the purpose of site preparation, or as part of forest management, is allowed under this methodology

3.1.4 Baseline Scenario

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

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 barren.)

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 is 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 28-April-2015, when the activities that lead to the generation of GHG emission removals were first implemented. The planting activity was conducted from April 2015 to October 2017.

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

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

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

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

1. Continuation of pre-project land use (i.e. Lands remain barren.)
2. Agricultural use of the land
3. Forestation of the land within the project boundary without being registered as the VCS project

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

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

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

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

To facilitate the restoration of forest resources, Chinese government has launched several programs over the past years, such as the Grain for Green Program (started in 2001) that subsidizes villagers to convert

degraded cropland to forests, the Natural Forest Conservation Program (launched in 1998), the Nature Reserve Development and Wild Conservation Program (started in 2000), etc.

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

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

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

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

STEP 2. Barrier analysis

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

1. Investment barrier

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

The investment scale of this project is 935,042,400 [37]CNY, of which the total funds of governments at all levels is 654,529,680, and the remaining 280,512,720 needs to be raised by village committees and villagers. According to the Liupanshui city Prefecture Government Work Report, the average annual income of the villagers in the project area is only 7,522 CNY[38], and the main source of income is farming and labor. This income level is far from the required investment.

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

2. Technological barriers

The project is located in Shuicheng county, Panxian county, Liuzhi special district. etc, where boasts the widest Karst area, as well as one of the districts that suffer serious Karst Rocky Desertification with karsts accounting for 63.18% of the national territory. Although the forest companies and organizations are project proponents, local villagers are actually the project participants who planted trees due to the planting area is quite large and scattered among the local villages.

[37] <The Project Design for Afforestation Operation> in 2015/2016/2017
[38] http://www.tjcn.org/tjgb/24gz/32922_4.html

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

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

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

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

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

Scenario 2 faces investment and technical barriers.

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

STEP 3. Investment analysis (if needed)

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

STEP 4. Common practice analysis

Only converting farmland to forest is eligible for the subsidy. Planting activities that changing barren land such as this project is not eligible for the subsidy. Different from forestry in other provinces, forest in Guizhou Province is mainly Public welfare forest and stone desertification control forest land[39].

There has been some afforestation and reforestation in the project regions on lands similar to the degraded lands of the proposed A/R CDM project activity, but this has been limited. In Guizhou Province, the afforestation was mainly established several years ago by a small number of relatively wealthy communities and villagers at a time when there were not many alternative investment opportunities[40]. As it was not profitable and there was little market incentive, the activities could not be extended by investors.

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

As the forestry industry has developed rapidly in recent years in Guizhou and the cost of labour and planting materials including seedling and fertilizers has increased significantly, the villagers and forest companies turn to plant short-rotation and fast-growth species in accessible areas rather than planting long-term local species in remote, degraded land, which is not economically attractive, due to slow tree growth, low land productivity and high transportation costs. Also, in recent years, large increases in the price of seedling and fertilizers, as well as the cost of labour, have greatly reduced the expected economic return.

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

Thus, the proposed project is not a common practice.

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

3.1.6 Methodology Deviations

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

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

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

$$\Delta C_{BSL,t} = \Delta C_{TREE_BSL,t} + \Delta C_{SHRUB_BSL,t} + \Delta C_{DW_BSL,t} + \Delta C_{LI_BSL,t} \quad (1)$$

Where:

$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks in year t; t CO_2-e
$\Delta C_{TREE_BSL,t}$	=	Change in carbon stock in baseline tree biomass within the project boundary in year t, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO_2-e
$\Delta C_{SHRUB_BSL,t}$	=	Change in carbon stock in baseline shrub biomass within the project boundary, in year t, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO_2-e

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

With the baseline scenario, dead wood biomass and litter biomass would not be changed by local villagers. All the plots in 2 Counties and 1 district had been barren and do not change after the 1970s and before the project. Thus, the change in carbon stock in baseline dead wood biomass and litter biomass can be negligible.

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

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

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

3.2.2 Project Emissions (Actual net GHG removals by sinks)

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

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

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

Where:

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

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

$GHG_{E,t}$ = 0

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

$$\Delta C_{P,t} = \Delta C_{TREE_PROJ,t} + \Delta C_{SHRUB_PROJ,t} + \Delta C_{DW_PROJ,t} + \Delta C_{LI_PROJ,t} + \Delta SOC_{AL,t} \quad (3)$$

Where:

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO_2-e
$\Delta C_{TREE_PROJ,t}$	=	Change in carbon stock in tree biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e
$\Delta C_{SHRUB_PROJ,t}$	=	Change in carbon stock in shrub biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e
$\Delta C_{DW_PROJ,t}$	=	Change in carbon stock in dead wood in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e

$\Delta C_{LI_PROJ,t}$	=	Change in carbon stock in litter in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e
$\Delta SOC_{AL,t}$	=	Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t CO_2-e

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

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

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

(a) Difference of two independent stock estimations;

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

(c) Estimation by proportionate crown cover;

(d) Demonstration of "no-decrease".

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

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

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

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

Where:

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

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

(a) Estimation by measurement of sample plots;

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

(c) Estimation by proportionate crown cover;

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

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

According to the Tool, under Method (b), existing data are used in combination with tree growth models to predict the growth of trees and the development of the tree stand over time, and ex-ante estimation (projection) of carbon stock in tree biomass is not subjected to uncertainty control. Stand parameters such as stocking (e.g. number of stems per hectare or basal area per hectare), age-class structure, and species composition at different points of time are simulated from assumed (planned) tree planting and management practices (e.g. planting density, survival rate, thinning and pruning operations and their timing).

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

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

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

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

Where:

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

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

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

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

Volume growth equation of Masson pine: Study on biomass growth rule and forest biomass change of main vegetation types in early stage of Banqiao river small watershed management [Guizhou forestry science and technology, 1991].

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

China fir[41]	$V_{TREE,j}=0.1962(1-e^{-0.08A})^{3.9012}$
Cypresses[42]	$V_{TREE,j}=0.20420(1-e^{-0.05A})^{4.66995}$

[41] Review on the Growth Equations of Pinus Massoniana, China Fir and Pinus elliottii in China [Journal of Northwest Forestry University].
[42] The biomass growth rule and forest biomass change of main vegetation types in Banqiao river small watershed at the early stage of (1991) governance were studied [Guizhou forestry science and technology, 1991, vol. 19, no. 4]..

Pinus yunnanensis[43]	$V_{TREE,j}=0.103743(1-e^{-0.067959A})^{3.3420}$
Masson pine[44]	$V_{TREE,j}=0.19073(1-e^{-0.11A})^{6.06248}$

Where,

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

A – stand age, year

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

Table 3-1 Parameters used for different tree species

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

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

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

Project Stratifications number	**Category of tree**	**Plant site**	**Tree number per ha in category**	**Year to plant**	**Area (ha)**
Proj -1	**China fir**	Liuzhi, Shuicheng, Pan	3100	2015	5033.33
Proj -2	**China fir**	Liuzhi, Shuicheng	3100	2016	7000
Proj -3	**China fir**	Liuzhi, Shuicheng, Pan	3100	2017	3666.67

[43] Analysis of Growth Process Pinus yunnanensis Natural Secondary Forests in Yongren County of Yunnan Province[Journal of West China Forestry Science]
[44] 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]

Proj -4	**Cypresses**	Liuzhi, Shuicheng, Pan	3100	2015	300
Proj -5	**Cypresses**	Liuzhi, Shuicheng	3100	2016	499.67
Proj -6	**Cypresses**	Pan	3100	2017	200
Proj -7	**Pinus yunnanensis**	Liuzhi, Shuicheng, Pan	3100	2015	3500
Proj -8	**Pinus yunnanensis**	Liuzhi, Shuicheng	3100	2016	1920.33
Proj -9	**Pinus yunnanensis**	Pan	3100	2017	500
Proj -10	**Masson pine**	Liuzhi, Shuicheng, Pan	3100	2015	1100

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

Time	Proj-1	Proj-2	Proj-3	Proj-4	Proj-5	Proj-6	Proj-7	Proj-8	Proj-9	Proj-10
year	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees	No. of trees
01-January-2016-31-December-2016	15603323	21700000	0	930000	1548977	0	10850000	5953023	0	3410000
01-January-2017-31-December-2017	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2018-31-December-2018	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2019-31-December-2019	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2020-31-December-2020	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2021-31-December-2021	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2022-31-December-2022	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2023-31-December-	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000

2023										
01-January-2024-31-December-2024	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2025-31-December-2025	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2026-31-December-2026	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2027-31-December-2027	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2028-31-December-2028	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2029-31-December-2029	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2030-31-December-2030	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2031-31-December-2031	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2032-31-December-2032	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2033-31-December-2033	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2034-31-December-2034	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2035-31-December-2035	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2036-31-December-2036	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2037-31-	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000

December-2037										
01-January-2038-31-December-2038	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2039-31-December-2039	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2040-31-December-2040	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2041-31-December-2041	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2042-31-December-2042	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2043-31-December-2043	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000
01-January-2044-31-December-2044	15603323	21700000	11366677	930000	1548977	620000	10850000	5953023	1550000	3410000

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

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

Year	Estimated annual project removals of Proj-1 (tCO_2e)	Estimated annual project removals of Proj-2 (tCO_2e)	Estimated annual project removals of Proj-3 (tCO_2e)	Estimated annual project removals of Proj-4 (tCO_2e)	Estimated annual project removals of Proj-5 (tCO_2e)	Estimated annual project removals of Proj-6 (tCO_2e)	Estimated annual project removals of Proj-7(tCO_2e)	Estimated annual project removals of Proj-8 (tCO_2e)	Estimated annual project removals of Proj-9 (tCO_2e)	Estimated annual project removals of Proj-10 (tCO_2e)	Estimated total annual project removals (tCO_2e)
01-January-2016-31-December-2016	13060	11025	0	79	54	0	8053	3284	0	952	36507
01-January-2017-31-December-2017	22295	18163	5775	170	130	21	12532	4418	855	2311	66670

01-January-2018-31-December-2018	32996	31007	9514	308	284	53	17361	6876	1150	4406	103955
01-January-2019-31-December-2019	44407	45889	16242	495	513	113	22262	9526	1790	7151	148388
01-January-2020-31-December-2020	55861	61758	24037	729	825	206	27020	12214	2481	10347	195478
01-January-2021-31-December-2021	66824	77688	32349	1006	1214	329	31478	14825	3180	13753	242646
01-January-2022-31-December-2022	76894	92933	40694	1323	1676	486	35526	17271	3860	17127	287790
01-January-2023-31-December-2023	85803	106940	48679	1668	2202	671	39099	19492	4497	20262	329313
01-January-2024-31-December-2024	93387	119327	56016	2039	2780	882	42159	21452	5075	23001	366118
01-January-2025-31-December-2025	99577	129876	62505	2424	3395	1112	44698	23131	5585	25249	397552
01-January-2026-31-December-2026	104374	138486	68031	2817	4037	1359	46724	24525	6023	26956	423332
01-January-2027-31-December-2027	107826	145156	72540	3212	4693	1616	48257	25635	6386	28118	443439
01-January-2028-31-December-2028	110022	149957	76034	3601	5350	1879	49329	26477	6674	28760	458083
01-January-2029-31-December-2029	111071	153010	78549	3979	5998	2141	49979	27066	6894	28931	467618
01-January-2030-31-December-2030	111098	154470	80148	4341	6627	2401	50243	27421	7047	28689	472485
01-January-2031-31-December-	110228	154507	80913	4682	7229	2652	50168	27567	7140	28103	473189

2031											
01-January-2032-31-December-2032	108594	153298	80932	5000	7799	2894	49789	27525	7178	27239	470248
01-January-2033-31-December-2033	106313	151024	80299	5293	8328	3121	49153	27318	7167	26158	464174
01-January-2034-31-December-2034	103505	147853	79108	5557	8815	3334	48292	26968	7112	24919	455463
01-January-2035-31-December-2035	100273	143947	77447	5794	9257	3528	47245	26496	7022	23573	444582
01-January-2036-31-December-2036	96716	139454	75401	6000	9649	3705	46045	25922	6899	22161	431952
01-January-2037-31-December-2037	92916	134505	73047	6178	9994	3863	44720	25264	6749	20724	417960
01-January-2038-31-December-2038	88949	129220	70455	6325	10289	4000	43299	24536	6578	19285	402936
01-January-2039-31-December-2039	84879	123704	67687	6446	10536	4118	41804	23757	6389	17872	387192
01-January-2040-31-December-2040	80764	118045	64798	6538	10735	4217	40257	22936	6185	16502	370977
01-January-2041-31-December-2041	76647	112320	61833	6604	10890	4297	38677	22088	5972	15184	354512
01-January-2042-31-December-2042	72568	106595	58834	6646	11000	4359	37080	21221	5751	13934	337988
01-January-2043-31-December-2043	68560	100923	55836	6664	11069	4403	35480	20344	5526	12751	321556
01-January-2044-31-December-2044	64648	95349	52864	6660	11099	4431	33889	19467	5297	11643	305347

3.2.3 Leakage

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

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

Where:

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

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

$$LK_{AGRIC,t} = \frac{44}{12} \times (\Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t})^{45} \quad (12)$$

Where:

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

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

Therefore, leakage is zero for the proposed project.

3.2.4 Net anthropogenic GHG removals by sinks

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

[45] 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)

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

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_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
01-January-2016-31-December-2016	0	36507	0	36507
01-January-2017-31-December-2017	0	66670	0	66670
01-January-2018-31-December-2018	0	103955	0	103955
01-January-2019-31-December-2019	0	148388	0	148388
01-January-2020-31-December-2020	0	195478	0	195478
01-January-2021-31-	0	242646	0	242646

December-2021				
01-January-2022-31-December-2022	0	287790	0	287790
01-January-2023-31-December-2023	0	329313	0	329313
01-January-2024-31-December-2024	0	366118	0	366118
01-January-2025-31-December-2025	0	397552	0	397552
01-January-2026-31-December-2026	0	423332	0	423332
01-January-2027-31-December-2027	0	443439	0	443439
01-January-2028-31-December-2028	0	458083	0	458083
01-January-2029-31-December-2029	0	467618	0	467618
01-January-2030-31-December-	0	472485	0	472485

2030				
01-January-2031-31-December-2031	0	473189	0	473189
01-January-2032-31-December-2032	0	470248	0	470248
01-January-2033-31-December-2033	0	464174	0	464174
01-January-2034-31-December-2034	0	455463	0	455463
01-January-2035-31-December-2035	0	444582	0	444582
01-January-2036-31-December-2036	0	431952	0	431952
01-January-2037-31-December-2037	0	417960	0	417960
01-January-2038-31-December-2038	0	402936	0	402936
01-January-2039-31-December-2039	0	387192	0	387192

01-January-2040-31-December-2040	0	370977	0	370977
01-January-2041-31-December-2041	0	354512	0	354512
01-January-2042-31-December-2042	0	337988	0	337988
01-January-2043-31-December-2043	0	321556	0	321556
01-January-2044-31-December-2044	0	305347	0	305347
Total	0	10,077,450	0	10,077,450

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	Ai
Data unit:	ha
Description:	Area of category i
Source of data:	Field measurement
Value applied:	The total area is 23,720 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

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

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

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

Data / Parameter	R_j
Data unit	Dimensionless
Description	Root-shoot ratio
Source of data	The People's Republic of China Second National Communication on Climate Change, issued by NDRC, 2013
Value applied:	See Table 3-1 for details
Justification of choice of data or description of measurement methods 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	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 caculation 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>[46]
Purpose of data	The parameter is used to calculate actual net GHG removals
Calculation method	N/A
Comments	N/A

Data / Parameter	$N_{i,j}$
Data unit	tree/ha
Description	Number of the tree species *j* of strata *i*
Source of data	Field measurement
Description of measurement methods and procedures to be 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	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

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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.

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

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	6
PROJ-2	China fir	8
PROJ-3	China fir	4
PROJ-4	Cypresses	0
PROJ-5	Cypresses	0
PROJ-6	Cypresses	0
PROJ-7	Pinus yunnanensis	3
PROJ-8	Pinus yunnanensis	1
PROJ-9	Pinus yunnanensis	0
PROJ-10	Masson pine	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 measurement methods and procedures to be applied	The relative weight of the area of a stratum i is equal to the area of the stratum i divided by the project area.
Frequency of monitoring/recording	Before first verification.
Value applied:	

Project Stratifications	Category of tree	W_i
PROJ-1	China fir	0.212
PROJ-2	China fir	0.295
PROJ-3	China fir	0.155
PROJ-4	Cypresses	0.013
PROJ-5	Cypresses	0.021
PROJ-6	Cypresses	0.008
PROJ-7	Pinus yunnanensis	0.148
PROJ-8	Pinus yunnanensis	0.081
PROJ-9	Pinus yunnanensis	0.021
PROJ-10	Masson pine	0.046

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 Liupanshui 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 Liupanshui city[47].
Frequency of monitoring/recording	Before first verification.
Value applied:	

Project Stratifications	Category of tree	S_i
PROJ-1	China fir	38.996
PROJ-2	China fir	37.945
PROJ-3	China fir	36.831
PROJ-4	Cypresses	30.712
PROJ-5	Cypresses	28.895
PROJ-6	Cypresses	27.078
PROJ-7	Pinus yunnanensis	26.570
PROJ-8	Pinus yunnanensis	25.778
PROJ-9	Pinus yunnanensis	24.948
PROJ-10	Masson pine	40.638

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

[47] Evidence on variable coefficient data provided by Liupanshui forestry bureau.

Data unit	t d.m. ha^{-1}
Description	Acceptable margin of error (i.e. one-half the confidence interval) in estimation of biomass stock within the project boundary
Source of data	A default value equal to 10% of the mean biomass stock within the project boundary was used, and the mean biomass stock within the project boundary was estimated from the preliminary sample plots.
Description of measurement methods and procedures to be applied	The project monitoring team set 3 preliminary sample plots for each strata and calculated the mean value of the biomass stock in each strata, and the mean value of biomass stock within the project boundary was the weighted average of all strata.
Frequency of monitoring/recording	Before every verification event
Value applied:	Please see Table 3-5 for details
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of Data	The parameter is used to calculate number of sample plots for measurements
Calculation method	N/A
Comments	N/A

3.3.3 Monitoring Plan

Monitoring process

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

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

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

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

i. Land containing organic soils.

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

The soil disturbance due to this project is in line with the requirements of soil and water conservation. Afforestation density was 3,100 plant/Ha, soil disturbance area ratio was 4.96%[48], 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

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 CO_2-e

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

CF_{TREE}	=	Carbon fraction of tree biomass; t C/t d.m.
ΔB_{TREE}	=	Change in biomass within the biomass estimation strata; t d.m.
A_i	=	Sum of the area of the biomass estimation strata; ha
Δb_{TREE}		Mean change in tree biomass per hectare within the biomass estimation strata; t d.m./ha
w_i	=	Ratio of the area of stratum i to the sum of areas of biomass estimation strata (i.e. wi=Ai/A); dimensionless
$\Delta b_{TREE,i}$	=	Mean change in tree biomass per hectare in strata i; t d.m./ha
$u_{\Delta C}$	=	Uncertainty in ΔC_{TREE}
t_{VAL}	=	Two-sided Student's t-value for a confidence level of 90 per cent and degrees of freedom equal to n – M, where n is total number of sample plots within the tree biomass estimation strata, and M is the total number of tree biomass estimation strata
$s^2_{\Delta,i}$	=	Variance of mean change in tree biomass per hectare in stratum i; (t d.m. ha-1)^2
n_i	=	Number of sample plots, in stratum i, in which tree biomass was re-measured

Methods of plot biomass measurement

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

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

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

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

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

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

Where:

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

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

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

Where:

$B_{TREE,l,p,j,i}$	=	Biomass of tree l of species j in sample plot p of stratum i; t d.m.
$V_{TREE,l,p,j,i}$	=	Stem volume of tree l of species j in sample plot p of stratum i, estimated from the tree dimension(s) as entry data into a volume table or volume equation; m^3
D_j	=	Density of tree species j; t d.m/m^3
BEF_j	=	Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species j; dimensionless
R_j	=	Root-shoot ratio for tree species j; dimensionless

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

Monitoring Team

The monitoring team consists of the project proponent, Timing Carbon Asset Management Co., Ltd, technicians and the forestry bureau. First of all, Timing Carbon Asset Management Co., Ltd 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 Timing Carbon Asset Management Co., Ltd confirm the monitoring frequency and notify the technicians and the forestry bureaus. Finally, the monitoring results will be double-checked by experts of the forestry bureaus.

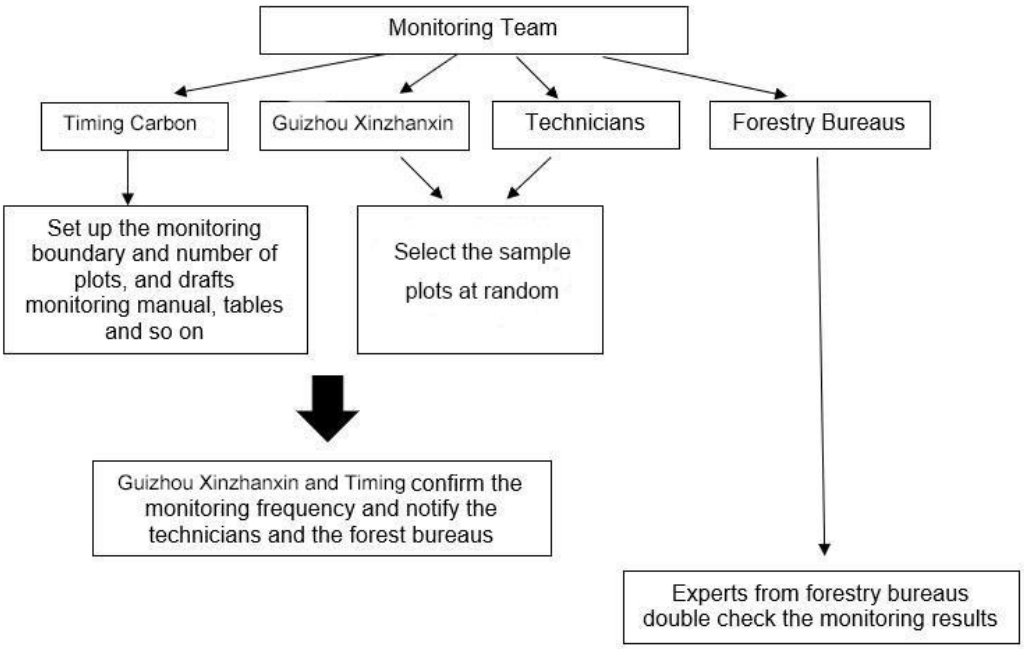

Figure 3-1 The figure of the monitoring team

Monitoring of boundary

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

In order to obtain valid and reliable boundary information, the 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.

During the crediting period, land-use pattern such as deforestation, afforestation failure in the project area will be transferred out of the project boundary and will no longer be monitored and verified. The area that has 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 remain valid and is included in the carbon stock calculation.

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

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

Step 1 Calculation of the number of sample plots

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

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

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

Where:

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

n_i Number of sample plots allocated to stratum i for estimation of biomass stocks within the project boundary, dimensionless

t_{VAL} Two-sided Student's t-value, at infinite degrees of freedom, for the required confidence level; dimensionless

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

Wi Relative weight of the area of stratum i (i.e. the area of the stratum i divided by the project area); dimensionless

S_i Estimated standard deviation of biomass stock in stratum *i*; t d.m. ha^{-1}

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

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

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

Table 3-5 Number of sample plots

Project Stratifications	Category of tree	W_i	S_i	t_{VAL}	E	n	n_i	Number of sample plots
PROJ-1	China fir	0.212	38.996	1.645	11.603	24	6	6
PROJ-2	China fir	0.295	37.945				8	8
PROJ-3	China fir	0.155	36.831				4	4
PROJ-4	Cypresses	0.013	30.712				0	3
PROJ-5	Cypresses	0.021	28.895				0	3
PROJ-6	Cypresses	0.008	27.078				0	3
PROJ-7	Pinus yunnanensis	0.148	26.570				3	3
PROJ-8	Pinus yunnanensis	0.081	25.778				1	3
PROJ-9	Pinus yunnanensis	0.021	24.948				0	3
PROJ-10	Masson pine	0.046	40.638				1	3

Setting sample plots

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

Determine the sample location

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

Monitoring frequency

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

Data management

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

QA/QC

A systematic internal review and correction process will be used to assure/control the quality. The technicians will provide the original record forms and Guizhou Xinzhanxinwill check the data. When they find that negative growth may result from data entry errors, they will fed back to technicians and then correct the data before share it with Timing Carbon Asset Management Co., Ltd. Timing Carbon Asset Management Co., Ltd 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, Timing Carbon Asset Management Co., Ltd will finalise the report. All parties are required to reply to any questions raised within 30 days. The monitoring equipment should be updated annually if there are new versions or more efficient monitoring tools available. The forestry bureaus are responsible for the monitoring equipment renewal or update.

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

The Monitoring results will be announced on the VCS website, and villagers can download. The monitoring 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.

Community well-being information:

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

- *Village Residents in 1 district and 2 counties*
- *Forest Bureaus of 1 district and 2 counties*
- *Governments of 1 district and 2 counties*
- *Village committees in 1 district and 2 counties*

From 2012 to 2017, the poverty-stricken population in Liupanshui city has decreased from 975,200 to 186,700, reducing the poverty-stricken population by 788,500, and the incidence of poverty has decreased from 38.3% to 7.34%, lower than the provincial average for the first time.By the end of July this year, there were still 203,400 poor people in rural areas in liupanshui (including an increase of 16,700 after special management), and the poverty incidence rate was 8%[49].

In 2016, 2,295,500 people in the city participated in the new rural cooperative medical care, and the participation rate of villagers reached 99.25%. At the end of the year, there were 1,667 health institutions in the city. Among them, the number of hospitals and health care centers (office or stations) for women and children are the same as those in the previous year, 100 and 5 respectively. The number of beds in the city's health institutions reached 175.17 million, increased by 19.09%.There were 14,257 health technicians, increased by 9.22%. Among them, there were 4,905 practicing (assistant) physicians, with a growth of 8.88% and 6,258 registered nurses, with a rise of 17.37%. .

Community characteristics:

Zangke country is a territory under the jurisdiction of Liupanshui City in the Spring and Autumn Period. During the Warring States Period, the city was a dependency of Yelang State. Due to the use of metal tools, it entered the farming era and reflected the characteristics of slavery production relations, After the Qin Dynasty unified China, it became the subordinate land of Bajun Hanyang County

Diversity within the community:

[49] http://wb.gywb.cn/epaper/gywb/html/2018-10/16/content_26345.htm

There are 2.9 million people in Liupanshui City, of which 31% are ethnic minorities, including 44 ethnic groups, such as Yi, Miao, Buyi, Bai, Hui, Gelao and Aquaiche, the birth rate of the whole city is 13.14‰, and the natural population growth rate is 6.13‰. In 2016, the state's total GDP was 131.37 billion CNY, and the per capita disposable income of urban and rural residents was 25,473 CNY and 8,230 CNY respectively.

Figure 4-1 Villages in Liuzhi special district.Liupanshui city in 2014

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

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

The local village communities within the project zone consist of 1 district and 2 counties. Villages within the project area are not far from each other, but due to poor infrastructure, it is difficult for villagers to visit and communicate with each other (whether through mountains or muddy roads).

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

4.1.3 High Conservation Values (CM1.2)

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

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

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

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

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Community Group	Village residents in 1 district and 2 counties
Impact(s)	Improved the living environment，increase household income and living level
Type of Benefit/Cost/Risk	1.Enjoying benefit brought by environmental improvement 2.Enhance cohesion among villagers
Change in Well-being	The improvement of environmental quality is 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.

Community Group	Forest Bureaus of 1 district and 2 counties
Impact(s)	Predicted goals in afforestation and promote forest management and protection
Type of Benefit/Cost/Risk	1.Time is required for training and work 2.Accomplish work goals and increase forest cover
Change in Well-being	Through the project, the afforestation area increased, the public's awareness of forest protection was enhanced, and

	knowledge of forestry-related laws and regulations, planting techniques, and insect and pest prevention was more effectively popularized.

Community Group	Governments of 1 district and 2 counties
Impact(s)	Improve the local ecological environment and improve people's living level
Type of Benefit/Cost/Risk	1. Enjoying benefit brought by environmental improvement 2. Supervising anything related to violations of villagers' rights
Change in Well-being	Through the project, the local ecological environment has been improved, people's living level, happiness and economy have been improved, which has also promoted local infrastructure construction to a certain extent.

Community Group	Village committees in 1 district and 2 counties
Impact(s)	It will increase the collective cohesion of the village, improved the working methods of the villagers, and increased income without going out to work. At the same time, women's job opportunities, income and social status have increased.
Type of Benefit/Cost/Risk	1.Time is required for training and work 2.Consuming physical strength for forest management, forest monitoring and forest patrol 3.Gaining extra pay 4.Enjoying benefit brought by environmental improvement
Change in Well-being	Through the implementation of this project, the village committee concentrated training and organized villagers to carry out the implementation project together, which strengthened the cohesion of the village collective. The village committee helps villagers with skills, including female villagers, to become project technicians, so that they can earn more money without working outside. This improves their quality of life and standard of living, thereby improving the health and well-being of local people. At the same time, the income of working women has increased, which has not only improved the status of the family, but also improved 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

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

The main source of income for the local communities is agricultural in the project area. Their production methods are backward, which leads to low agricultural productivity, also affected by the remote location. The project will benefit 1 district and 2 counties on both economic and social aspects.

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

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

Figure 4-2 Women are picking kiwi fruit

The pictures above show that women were picking kiwi fruit which means women have gained more job opportunities within the project zone. Besides, the project has improved the soil condition and increased villagers' incomes. For example, as the economic crops are increased so villagers can afford the house renovation. Their living condition has improved significantly with fewer droughts and flooding.2) Job creation: The project will provide permanent and temporary employment opportunities, including soil preparation, planting and management. Most of the work will belong to local villagers involved in the

project, and over 70% of them are adult women. Presently, a local household earns about 7,522 CNY on average a year and this project can provide 2,400 CNY per technician per year, which is a very effective and direct way for local villagers to improve their living standards.

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

Figure 4-3 Yi torch festival

This picture shows a traditional festival of the Yi nationality, called 'Yi torch festival' in Shuicheng county, Liupanshui city, 2019

'Yi torch festival' is a gathering time. But due to the muddy and rugged mountain roads, many villagers especially the elder and children could not join and celebrate it before the implementation of the project. In recent years, tree planting activities have brought more communication opportunities between villages and villages, women and women. With the crop harvests and increased incomes, the instructions have been improved and villagers can enjoy this festival more than ever, which lead to increased cohesion and happiness to the local village communities.

4) Technical training and demonstration: The community generally lacks high-quality seed technology and high-quality seedlings, fire protection, forest pest control, which is also an important issue in local community forest management. The project is organized by the local forestry bureau to help villagers understand and evaluate problems in the implementation of the project, such as seedling selection, seedling management, land preparation model, pest control.

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

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

Figure 4-4 Local cash crops which are thorn pear

These pictures above show the main local cash crops in the project area, thorn pear. After the 5-year commencement of this project, the soil condition has been greatly improved. Soil on the karst landform which used to be very thin becomes thickening now through the planting of China fir, Cypresses, Masson pine and Pinus yunnanensis, which significantly contributes to the production increase of the economic crops.

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

4.2.4 High Conservation Values Protected (CM2.4)

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

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

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

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

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

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

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

4.4 Community Impact Monitoring

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

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

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

Procedures:

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

b) Developing SOPs for the field PRA process;

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

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

e) PRA survey: conducting PRA survey following SOPs.

Methods:

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

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

(ii) Explaining the way of villagers' participation;

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

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

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

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

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

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

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

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

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

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

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

4.4.2 Monitoring Plan Dissemination (CM4.3)

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

4.5 Optional Criterion: Exceptional Community Benefits

N/A

4.5.1 Exceptional Community Criteria (GL2.1)

N/A.

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

N/A.

4.5.3 Community Participation Risks (GL2.3)

N/A.

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

N/A.

4.5.5 Net Impacts on Women (GL2.5)

N/A.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

N/A.

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

N/A.

4.5.8 Governance and Implementation Structures (GL2.8)

N/A.

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

N/A.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

In the 1 district and 2 counties where the project located, most of the project sites have relatively homogenous ecological structure and low biodiversity in recent years. The project land is mostly wasteland, mainly karst rocky desertification area. The Karst rocky desertification is caused by the unreasonable exploration of soil resources by human activities. It is a disaster caused by land degradation 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 attempted 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 the rocky desertification is still an urgent problem. The increasingly serious rocky desertification will restrict the sustainable development of the region and make the region poorer.. At the same time, the continued rocky desertification has affected the survival of animal and plant species such as Grus nigricollis, Trachypithecus francoisi, Handeliodendron bodinieri, and Paphiopedilum micranthum. Continued rocky desertification will cause

the soil layer to become thinner and more exposed rocks, which will eventually lead to the inability of vegetation to grow and the animals to be reduced due to lack of habitat. This is the main threat to biodiversity caused by rocky desertification. The rocky desertification in the karst mountainous areas of southwestern China where the project is located is a specific phenomenon of land degradation, which is one of the most serious environmental problems that need to be resolved urgently.

5.1.2 High Conservation Values (B1.2)

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

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

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

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

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

5.2.2 Mitigation Measures (B2.3)

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

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

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

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

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

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

The 11 national protected species in the project zone are shown in the following table:

Animals	Plants
Francois's Leaf Monkey	Pterocarya in-signis
Moschus berezovskii	Mangnolia officinalis
otus bakkamoena	Douglas fir
Viverra zibetha	Camellia sinensis var assamica
Macaca mulatta	
Syrmaticus reevesii	
Enicurus scouleri	

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

5.2.4 High Conservation Values Protected (B2.4)

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

5.2.5 Species Used (B2.5)

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

5.2.6 Invasive Species (B2.5)

No invasive and GMO species are applied in the project.

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

No Non-native Species affected the project.

5.2.8 GMO Exclusion (B2.7)

No GMO species is applied in the project.

5.2.9 Inputs Justification (B2.8)

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

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

5.2.10 Waste Products (B2.9)

The waste products resulting from the project activities may include:

(1) Rubbish

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

(2) Human waste

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

5.3 Offsite Biodiversity Impacts

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

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

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

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

5.4 Biodiversity Impact Monitoring

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

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

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

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

Table 5-2 Monitoring indicators for biodiversity

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

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

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

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

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

N/A

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

N/A