# ZHANGYE IMPROVED GRASSLAND MANAGEMENT PROJECT

Document Prepared By Gansu Heihe Electric Power Sales Co. Ltd

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| **Project Title** | Zhangye Improved Grassland Management Project |
| **Version** | 1.1 |
| **Date of Issue** | 24-December-2021 |
| **Project Location** | Zhangye City, Gansu Province, China |
| **Project Proponent(s)** | Zhangye Academy of Forestry Sciences<br>Quan Jinpeng<br>Ten kilometers outside the east gate of Ganzhou District, Zhangye City, Gansu Province, China<br>+86 0936-8671238, 1622371231@qq.com |
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| **Project Lifetime** | 25-July-2017 to 24-July-2057; 40-year lifetime |
| **GHG Accounting Period** | 25-July-2017 to 24-July-2057; 40-year lifetime |
| **History of CCB Status** | N/A |

| | |
|---|---|
| **Gold Level Criteria** | N/A |
| **Expected Verification Schedule** | January 2022 |

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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) Restored 261,059.80 ha of degraded grassland and improve grassland productivity and forage quality in the project zone of Zhangye city, and prevented continued degradation of grassland, which could significantly improve the ecological aesthetics value of local touristic resources. | 2.1 |
| 2) Improve the cultural collision within ethnic groups by full communication among stakeholders on a regular basis during the implementation of the project. Attracts tourists from all parties, which greatly promotes the diffusion of traditional culture. | 4.2 |
| 3) Increase biodiversity of project zone, such as Qilian mountains which has been regarded as ecological security barrier. | 5 |

## 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 | 29,440,243 $tCO_2e$ | 3.2 |
| | Net estimated emission reductions in the project area, measured against the without-project scenario | / | |
| 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 | Not applicable | / |
| | For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario | Not applicable | / |
| 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 | Not applicable | / |
| | 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 | Not applicable | / |
| 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 | 11,727 | 2.3 |

[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 |
|---|---|---|---|
| | Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities | 6,039 | 2.3 |
| Employment | Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6] | 952[7] | 2.3 |
| | Number of women expected to be employed as a result of project activities, expressed as number of full-time employees | 493 | 2.3 |
| Livelihoods | Total number of people expected to have improved livelihoods[8] or income generated as a result of project activities | 11,727 | 2.3 |
| | Number of women expected to have improved livelihoods or income generated as a result of project activities | 6,039 | 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 | Not applicable | / |
| | Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario | Not applicable | / |

[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] During the implementation of the project, about 11,727 local herders will directly participate in grass seeding and rodent control, of which 51.5% were women. According to the payment records, the working hours was 1,904,000 hours per year during this monitoring period, and the legal working hours is 2,000 hours per year according to Labour Law of China. Therefore, total number of people employed in the project expressed as number of full-time employees is 952 (1,904,000/2,000 =952).
[8] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

| Category | Metric | Estimated by the End of Project Lifetime | Section Reference |
|---|---|---|---|
| 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 | Not applicable | / |
| | 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 | Not applicable | / |
| 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 | Not applicable | / |
| | 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 | Not applicable | / |
| Well-being | Total number of community members whose well-being[9] is expected to improve as a result of project activities | 11,727 | 2.3 |
| | Number of women whose well-being is expected to improve as a result of project activities | 6,039 | 2.3 |
| Biodiversity conservation | Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[10] measured against the without-project scenario | 4,087,400[11] | 2.1 |

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

[10] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species

[11] According to PRA Report, the total area of Zhangye is 4,087,400 ha. The project restored degraded grassland, guided herders to graze reasonably, prevented sustainable degradation of grassland, provided more habitats for wild animals and increased biodiversity in the project zone.

| Category | Metric | Estimated by the End of Project Lifetime | Section Reference |
|---|---|---|---|
| | Expected number of globally Critically Endangered or Endangered species[12] benefiting from reduced threats as a result of project activities,[13] measured against the without-project scenario | 7 | 5.2 |

[12] Per IUCN's Red List of Threatened Species
[13] 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)

Zhangye Improved Grassland Management Project (hereafter as “the project”) is located in Zhangye City, Gansu Province of China. Zhangye City is located in the northwest of Gansu Province and in the middle of Hexi corridor where the Qinghai Tibet Plateau and Mongolia Plateau meet. The project’s aim is to restore the local degraded grassland ecosystem by seeding grass and building fence on the degraded grassland, increase carbon sequestration and contribute to local development by introducing sustainable grazing and management of grassland. The project proponent is Zhangye Academy of Forestry Sciences.

The project covers Gaotai County, Shandan County, Mingle County, Sunan County, Ganzhou district and Shandan Racecourse. According to the baseline survey, before the implementation of the project, the grassland in the region has been facing serious degradation and even desertification due to the impact of climate change and human activities.

Totally, 261,059.80 ha of degraded grassland have been managed scientifically by fence building and reseeding of local high-quality forage. There are three main restoration measures as followed in the project:

Rotational grazing requires that the grazing time shall be halved by dividing grasslands into seasonal grazing land according to the livestock carrying capacity of the grassland by fence building. Then based on specified grazing order, grazing cycle and zoning grazing time, the grassland is grazed area by area and used in turn. 76,608.83 ha of degraded grassland have been managed scientifically by the implementation of rotational grazing.

Rest grazing requires that grazing shall not be carried out within 90 days when the grass turns green every year by building the fence and sustainable management.106,562.38 ha of degraded grassland have been managed scientifically by the implementation of rest grazing.

Reseeding grass is sowing grass seeds of local high-quality forage such as *Elymus nutans* Griseb (Hook head grass), *Elymus sibiricus* L. (Barley grass) and *Poa pratensis* L. (Bluegrass), *Agropyron cristatum* L.( Ice grass), *Festuca rubra* L (Pennlawn). and Artemisia sphaerocephala Krasch (sagebrush). According to the National standard documents of the people's Republic of China[14] and Project Design Report, the total grass yield decreased by 50% compared with that before degradation is regard as seriously degraded grasslands. In our project, 77,888.59 ha of degraded grassland have been managed scientifically by the implementation of reseeding grass.

In general, rest grazing and rotational grazing are implemented in slightly degraded areas (the total grass yield decreased by 30%-50% compared with that before degradation), and reseeding is implemented in severely degraded areas. Besides these main restoration measures, the project also alleviates soil desertification and restore grassland vegetation to improve soil carbon storage and local biodiversity through grassland management measures, such as daily management measures from other protect projects like rodent and pest control and grassland fire prevention to ensure the long-term sustainable management of the project area. The project is estimated to

[14] GB19377-2003 Parameters for degradation, sandification and salification of rangelands

generate GHG emission removals of 29,440,243 $tCO_2e$ in 40 years, with an average annual GHG emission removal of 736,006 $tCO_2e$.

The objectives of the project including:

**Climate:** Restore the degraded grassland ecosystem, increase grassland coverage, increase grassland carbon sink function and reduce GHG emissions.

**Community:** Improve the livelihood of local herders, provide permanent and temporary job opportunities for them, increase their income. Provide technical skills and training in sustainable grassland management, increases interaction within the community and improve the well-being of local communities.

**Biodiversity:** Provide more suitable habitats for wild animals and increase local biodiversity.

### 2.1.2 Project Scale

| Project Scale | |
|---|---|
| Project | |
| Large project | √ |

### 2.1.3 Project Proponent (G1.1)

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### 2.1.4 Other Entities Involved in the Project

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Climate Bridge (Shanghai) Ltd. is responsible for providing technical support for the entire project development cycle.

### 2.1.5 Physical Parameters (G1.3)

The project is located in Zhangye City, Gansu Province of China. The geographical coordinates of the project are east longitude 97°20′~102°12′and north latitude 37°28′~39°57′.

According to CCB standard, Zhangye City is defined as the project zone, a state-owned enterprise (Shandan Racecourse), four counties and a district are defined as project area. The boundaries of project area and project zone are shown in Figure 2-1 and Figure 2-2, and the KML file has also been uploaded to Verra Registry.

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

**Topography**

Qilian Mountain is in south of Zhangye, Heli Mountain and Long shou Mountain in the north, and the inclined plain with an altitude of 1410-2230 meters in the middle. Heihe River runs through the whole area, forming a unique scene of barren oasis. Zhangye shows diverse natural views varying from snow mountains to forests, grasslands, wetlands and barrens.

**Soils**

Under the long-term comprehensive effect of natural and human factors, the soil types in Zhangye are diversified. Among them, the main soil types of cultivated land are chestnut soil, irrigated barren soil and gray calcium soil; the main soil types of forest land are gray brown barren soil, gray calcium soil and subalpine meadow soil; the main soil types of grassland are meadow soil, swamp soil and subalpine meadow soil; the unused land is mostly barren, and the soil types are mostly salt soil and sandy soil. Because the main obstacle factors of soil are salinization, the characteristics of high content of organic matter and available potassium, low content of phosphorus and medium content of nitrogen are formed.

**Climate**

The project zone has a continental climate characterized by dryness, with an annual average temperature of 6 ℃, the coldest in January and the hottest in July. Zhangye corridor plain and Beishan Mountain belong to temperate continental arid climate, Qilian Mountain belongs to alpine

semi-arid climate. Zhangye has the characteristics of abundant light energy but large temperature difference. It is short and hot in summer while long and cold in winter. It is very dry with little rainfall and distributed unevenly. The average temperature of the city is 6-8 ℃, the annual precipitation is 104-328 mm, the annual evaporation is 1639-2341 mm, the annual sunshine hours are 3000-3600 hours. The main disastrous weather includes drought, cold spring, sandstorm, dry hot wind and frost. The climate characteristics of drought and less rain and the disastrous weather have certain influence on the development of agriculture, but the long sunshine hours and large temperature difference between day and night are conducive to the development of agriculture.

**Hydrology**

Zhangye City is located in the east of Heihe River Basin. There are 26 large and small rivers available for development and utilization, all of which originate from the northern foot of Qilian Mountain. The annual average runoff of the East water system of Heihe River is 2.475 billion $m^3$, including 1.58 billion $m^3$ of Yingluoxia station, 237 million $m^3$ of liyuanbao station and 658 million $m^3$ of other tributaries along the mountain. The amount of groundwater resources that do not overlap with the surface is 175 million $m^3$, and the total amount of groundwater resources in the city is 2.65 billion $m^3$. The characteristics of water resources are as follows: First, the total amount is large but the available amount is small; Second, the runoff supply forms are various, including natural precipitation, glacier melt water and groundwater, most of which are mixed supply, of which precipitation supply accounts for about 64.7% ~ 70%, groundwater supply accounts for about 25.1% ~ 31.8%, and glacier melt water supply accounts for about 3.5% ~ 4.2%; third, the runoff distribution is uneven in the year, the water supply from the largest Heihe River main stream in the city accounts for 24.5% of the whole year in the annual irrigation period from April to June, 55.7% in the flood period from July to September and 19.8% in the period from October to next March; fourth, the annual variation of runoff is relatively small, and the annual variation coefficient is mostly between 0.1 and 0.35; fifth, the surface water and groundwater have been repeatedly transformed and reused by people.

**Types of vegetation**

According to different ecological regions and geographical components, the project covers Gaotai County, Shandan County, Mingle County, Sunan County, Ganzhou district and Shandan Racecourse where mainly include three project management types covers total area of 261,059.80 ha of degraded grasslands. Among of them, 76,608.83 ha of degraded grassland have been managed scientifically by the implementation of rotational grazing; 106,562.38 ha of degraded grassland have been managed scientifically by the implementation of rest grazing; 77,888.59 ha of degraded grassland have been managed scientifically by the implementation of reseeding grass.

The main vegetation types of lands under different management types include barren Gobi vegetation, xerophyte and hyperaerophyte plants such as Nostoc, Nitraria, Overlord, Achnatherum splendens and Artemisia; arid barren grassland vegetation, the vegetation is sparse, and there are small shrubs and drought resistant herbs, such as alkali firewood, pearl firewood, bitter beans, etc.; warm and cool semi-arid barren vegetation, mainly including Stipa, donkey Artemisia, camel Artemisia, Caragana, etc.; warm and cool semi-humid grassland vegetation, mainly including horseradish, Saposhnikovia divaricata, Potentilla chinensis, Polygonum viviparum, Achnatherum inebrians etc.; alpine forest and grassland vegetation, mainly including alpine willow, golden dew, silver dew, Spiraea salicifolia, Caragana, etc. The main tree species are Picea crassifolia and Sabina przewalskii; Barren vegetation: mainly Sea buckthorn, Artemisia, Tamarix, Elaeagnus

angustifolia, reed grass and other wind erosion & sand burying resistant drought-enduring plants; Halophytic meadow and swamp vegetation: main plants such as Suaeda salsa, black fruit wolfberry, wormwood, water Sparganium, Alisma orientalis etc.

### 2.1.6 Social Parameters (G1.3)

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

**Main settlements[15]**

The project zone covers Ganzhou District, Linze County, Gaotai County, Shandan County, Mingle County and Sunan County in Zhangye City. It has 65 towns and 836 village committees in total. The total population of the city is 1.2242 million, of which 56.07% are rural population. According to the sixth census data[16], the main ethnic groups in Zhangye include the Han (accounts for 97.85%) and minorities (accounts for 2.15%) including Yughur, Hui, Tibetan, Manchu, Mongolian and Monguor, Yi Nationality. The minorities mainly cluster in Sunan Yugur Autonomous County and four ethnic townships, namely Sunan Baiyin Mongolian Township, Ganzhou Pingshanhu Mongolian Towinship, Sunan Qifeng Tibetan Township and Sunan Mati Tibetan Township.

**Land use and economic activities**

Zhangye city covers an area of 38,592 square kilometers, accounting for about 9.07% of the land area of the whole province; Among them, the cultivated land area is 354,100 ha, accounting for 9.18%; The forest land area is 421,153 ha, accounting for 10.91%; The grassland area is 2,109,627ha, accounting for 54.67%.

In 2016, the city raised 10.8919 million livestock of all kinds, and the added value of agriculture and animal husbandry reached 10.8 billion RMB(1.67 billion USD). At the end of the year, there were 4.0313 million livestock of all kinds, and the output of meat, poultry eggs and fresh milk could reach 116800 tons, 13500 tons and 85100 tons respectively. The per capita disposable net income of farmers and herders is 11646 RMB (1801.11 USD).

**Relevant historic conditions**

Since ancient times, Zhangye has been the important town and throat of merchants on the silk road. It is named Zhangye with the meaning of " Open the arms of the country (Han Dynasty) to connect with the western regions". Ganzhou is the origin of the word "Gan" in Gansu Province. Zhangye is known as "Jiangnan on the frontier fortress" and "Golden Zhangye". It has both the natural beauty of "half city reed" and the historical style of "half city tower shadow". It has two national nature reserves and is rated as a national famous historical and cultural city, an excellent tourist city in China and a pilot city of national ecological civilization demonstration project.

**Socio-cultural information**

Zhangye City governs 65 townships and 836 administrative villages. In 2016, the permanent resident population of the city was 1,224,200, and the population of Tibetan, Mongolian, Hui, Turkish and other ethnic minorities dominated by Yugur was 26,000, accounting for 2.15% of the total population. By age, there are 193,500 people aged 0-14, 918,500 people aged 15-64 and

[15] Zhangye City Statistics Yearbook 2016
[16] http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm

112,100 people aged 65 and over. According to the data of the sixth census in 2010, the male population is 612,594 and the female population is 586,921.

There are 5 scientific research institutions and 21,900 professional technicians in the city. The annual expenditure on science and technology was 85.12 million RMB (13.19 million USD), an increase of 60.54% over the previous year. In the whole year, 60 scientific and technological achievements above the provincial level, 65 award projects and 4 high-tech industrialization demonstration projects were obtained. There are 1,589 health institutions, 9,276 health technicians, and 8395 beds in medical and health institutions, including 7,784 beds in hospitals and health centers.

The annual per capita disposable income of urban residents was 21,503 RMB(3331 USD), an increase of 9.3% over the previous year; The per capita consumption expenditure of urban residents was 18,923 RMB (2,931 USD), an increase of 10.3%; The Engel coefficient of urban households was 30.66%, a decrease of 0.17 percentage points over the previous year. The per capita disposable income of rural residents is 11,646 RMB (1804 USD); The per capita consumption expenditure of rural residents was 10,379 RMB (1608 USD), an increase of 8.9%; The Engel coefficient of rural households was 34.82%.

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

The project is located in Zhangye City, Gansu Province of China. The geographical coordinates of the project are east longitude 97°20′~ 102°12′and north latitude 37°28′~39°57′.

According to CCB standard, Zhangye City is defined as the project zone, and the planting and fence building areas in a state-owned enterprise (Shandan Racecourse), four counties and a district where are defined as project area. The boundaries of project area and project zone are shown in Figure 2-1 and Figure 2-2, and the KML file has also been uploaded to Verra Registry.

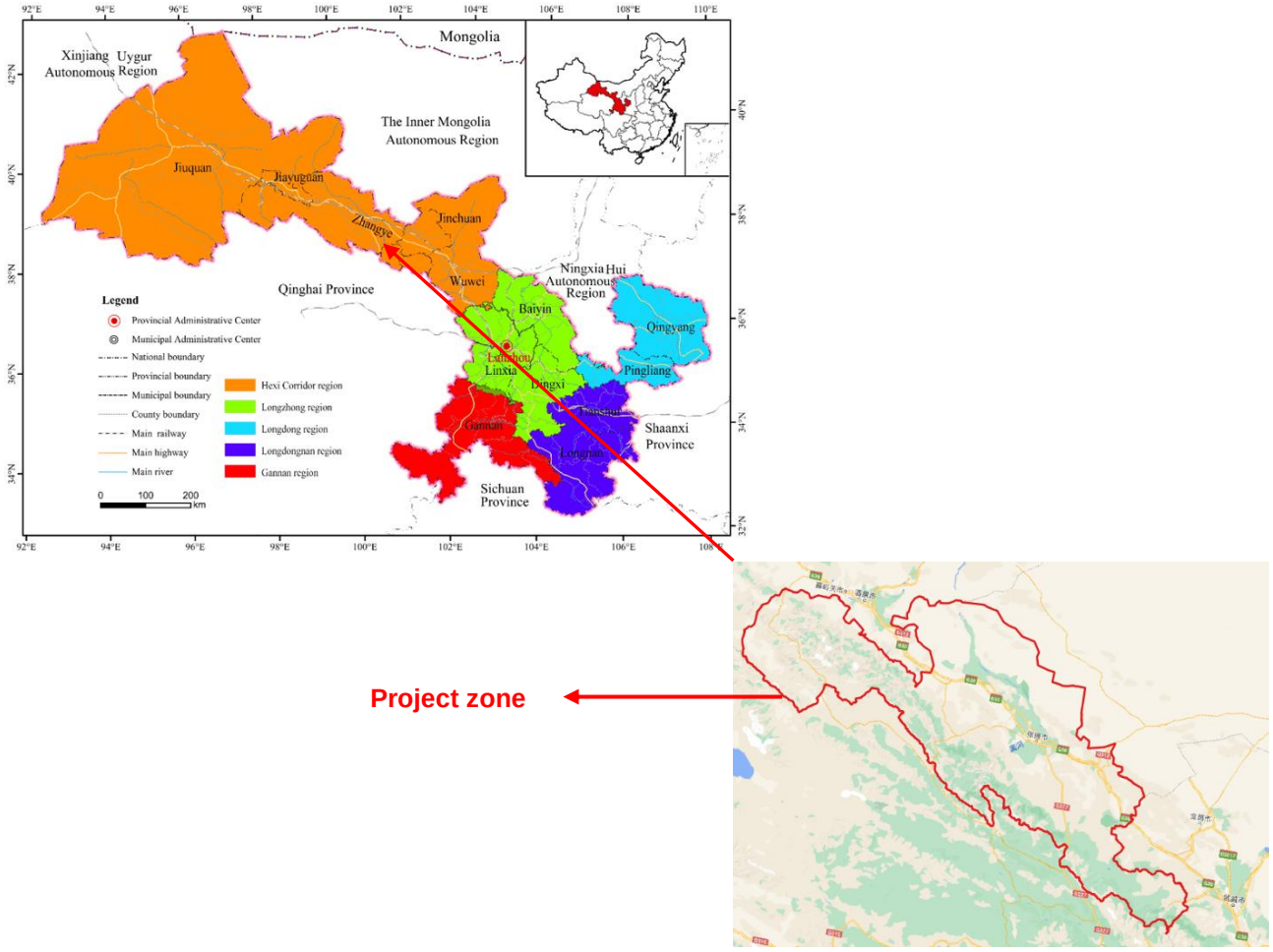


Figure 2-1 The project location

There are no offsite biodiversity impacts areas and no negative well-being impacts on other stakeholders.

As described in section 3.2.3, grazing frequency will be managed after the implementation of the project, and the County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. So, there is leakage in the project zone due to grazing displacement activities. And the offsite climate impacts areas are defined as the project zone, which is outside of the project area, as shown in Figure 2-2.

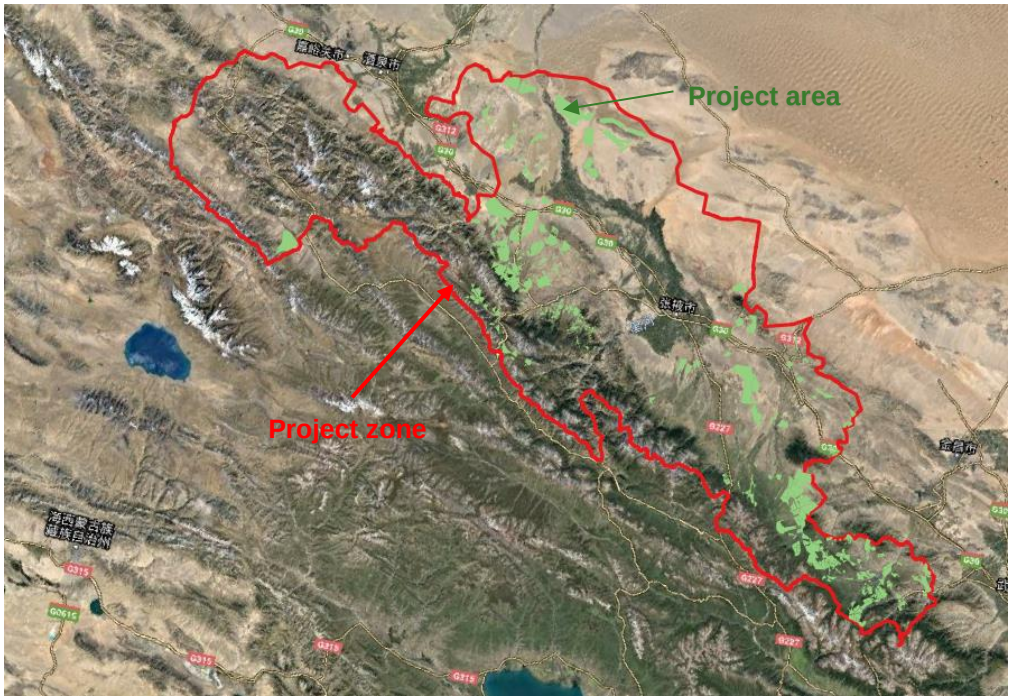


Figure 2-2 The project area

### 2.1.8 Stakeholder Identification (G1.5)

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

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

This brainstorm 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 residents.

Zhangye comprises of Sunan County, Ganzhou district, Shandan County, Minle County, Gaotai County, an independent state-owned enterprise, Shandan Racecourse, which have been identified as the project zone. And it will be impacted directly by the project activities, hence all communities, community groups in zhangye should be identified as stakeholders. In addition, other stakeholders affected by the project activities are identified. The most meaningful stakeholder categories are listed below.

1) **Local residents around project area**

The first, the project provided short-term work such as fence building and grass seeding but also the long-term work such as the grassland guardians for local residents around project area, which will increase their household income. The second, the project restored the degraded grassland and improved their living environment. These residents can be divided into the following categories:

**Local minorities nationality**

Sunan County occupies most of the project zone (63.77%), where the population of the minorities nationality accounting for 98%. In 2016, the minorities population in Sunan County was 22045, accounting for 56.92% of the total population of Sunan County[17]. So, the minorities nationality are the main participants in the project, they should be identified as stakeholders.

**Local women**

Women and men often have very different roles and interests in natural resource management and can contribute complementary skills and knowledge. Generally, women are more involved in subsistence activities like planting, protecting, or caring for seedlings and small trees, as well as in home orchards and public land. There is also evidence that when women receive income, positive welfare outcomes are more likely: gender equity can thus be key to wider poverty and equity impacts. Therefore, women should be regard as the important stakeholders. In project, more than half of the local residents directly involved in the project are women. The project provided them with skills training in fence building and sustainable grassland management, which is conducive to increasing family income and improving local ecological environment.

**Local herders**

Local herders live by grazing, so the grassland ecosystem will have a great impact on their traditional livelihood. Also overgrazing is the main factor leading to the continued degradation of the grassland ecosystem. The project restored the degraded grassland and guided them to graze reasonably.

**Grassland guardians**

Approximately 999 local herders were employed as grassland guardians, with an annual salary of 36,000 RMB (5,569.2USD) /year per person. They will protect and manage the grassland under the guidance of the project proponent and the local forestry and grassland bureau.

**2) Village collectives**

According to Grassland Law of People's Republic of China, the ownership of grassland belongs to the state and the collectives. Therefore, village collectives that own the grassland should be identified as stakeholders.

3) **Zhangye Forestry and Grassland Bureau**

Zhangye Forestry and Grassland Bureau is a government department responsible for implementing national forestry and grassland regulations, formulating development strategies, and managing local forest and grassland resources. The project was approved by Zhangye Animal Husbandry and Veterinary Bureau in 2016, and the Animal Husbandry and Veterinary Bureau has been dismissed in 2019 due to the reform of government function, and some functional departments related to grassland management have been transferred to Zhangye Forestry and Grassland Bureau. Therefore, Zhangye Forestry and Grassland Bureau should be identified as stakeholders.

[17] Zhangye City Statistics Yearbook 2016

4) **County Forestry and Grassland Bureau**

The local County-level Forestry and Grassland Bureau is responsible for the supervision and management of the county's grassland and ecological construction, including fence building, seeding grass, fire prevention, the protection and rational development of terrestrial wildlife resources, and the construction of forestry and grassland teams, and other tasks assigned by Zhangye Forestry and Grassland Bureau and local government. Each local County Forestry and Grassland Bureau is positive to assist and participate in the routine management during the implementation phase of the project. Therefore, the County Forestry and Grassland Bureau should be also identified as stakeholders.

5) **Local government**

The government agency Zhangye Finance Bureau provided the initial funds for the implementation of the project. The government also supervises the environmental and social impacts of the project, such as the restoration of the grassland ecosystem and employment issues.

6) **Other stakeholders**

According to the definition of other stakeholders mentioned above, some groups are identified separately, which include scientific research institutions and tourism companies.

**Scientific research institutions**

Grassland is of great significance in purifying water sources and improving the ecological environment. Research institutions have carried out research on grass species, grassland degradation mechanisms, and grassland restoration, which are the key to promoting sustainable grassland development. The project aims to restore the degraded grassland faced desertification, which is the hot topic of scientific research in grassland ecological protection.

**Tourism companies**

The grassland ecosystem in the project zone is seriously degraded, which is not conducive to the sustainable development of tourism. After the successful implementation of the project, the restored grassland is beneficial to rebuild local pleasant and beautiful ecological system which has higher ecological aesthetic value of tour and sightseeing. Therefore, the project will generate a certain degree of impact for all tourism companies within or outside the project zone.

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

Reference to procedures: The “Who Counts First?” matrix evolved as part of the “Criteria and Indicators” for sustainable forest management process of Center for International Forestry Research (CIFOR), we also involve ranking stakeholder groups according to seven dimensions of well-being or importance:

• Proximity to the grassland

• Pre-existing rights

• Dependency on the grassland

• Poverty level

• Local or indigenous knowledge

• Grassland/culture integration (i.e., the cultural importance of the grassland)

• Power deficit of stakeholder group compared to other stakeholders

Each stakeholder group is scored, according to the extent that each dimension applies to them, with the following simple scoring system:

1 = high

2 = medium

3 = low

Table 2-1 Importance of stakeholder groups analysis

| Stakeholder | Local residents around project area | Village collectives | Zhangye Forestry and Grassland Bureau | County Forestry and Grassland Bureau | Local government | Scientific research institutions | Tourism companies |
|---|---|---|---|---|---|---|---|
| Proximity to the grassland | 1 | 1 | 2 | 2 | 3 | 3 | 3 |
| Pre-existing rights | 2 | 2 | 1 | 1 | 1 | 3 | 3 |
| Dependency on the grassland | 1 | 2 | 1 | 1 | 2 | 2 | 2 |
| Poverty level | 1 | 2 | 3 | 3 | 3 | 3 | 3 |
| Local or indigenous knowledge | 1 | 1 | 1 | 1 | 2 | 3 | 2 |
| Grassland/culture integration (i.e., the cultural importance of the grassland) | 1 | 1 | 2 | 2 | 2 | 3 | 2 |
| Power deficit of | 2 | 1 | 1 | 1 | 2 | 3 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| stakeholder group compared to other stakeholders | | | | | | | |
| Average score | 1.29 | 1.43 | 1.57 | 1.57 | 2.14 | 2.86 | 2.57 |

An average over the seven dimensions is estimated as stakeholder groups scores. In the case study applications of this method, stakeholder groups scores with less than 2 are regarded as important stakeholders from an equity perspective, while those scoring 2 or more are regarded as less critical.

**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) | Capacity and motivation to participate | Relationship with other stakeholders |
|---|---|---|---|---|
| Local residents around project area | Job opportunity | Create job opportunity, provide work training and extra subsides from government | Higher income | Partnership |
| Village collectives | Restoration of degraded grassland and drive the development of tourism. | Increase the coverage and ecological value of grassland; provide sustainable grassland management training | Achievement | Partnership |
| Zhangye Forestry and Grassland Bureau | Sustainable grassland management | Organize project implementation and protect grasslands as the achievement | Achievement and duty | Partnership |
| County Forestry and Grassland Bureau | Sustainable grassland management | Organize project implementation and protect grasslands as the achievement | Achievement and duty | Partnership |
| Local government | Financial support, Local social and environmental management, | Enhance local social and environmental management. Increased employment and | Achievement | Partnership |

| | | | | |
|---|---|---|---|---|
| | employment and welfare of county | improved welfare of county | | |
| Scientific research institutions | Provide experimental evidence for theoretical research | Apply research results to specific projects | Achievement | Partnership |
| Tourism companies | Obtain tourism income | Attract more people to travel and increase income | Higher income | Partnership |

The descriptions of each community group have 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. The levels of influence and importance are classified into low, moderate, significant and critical.

In the project, according to the step 1 and step 3, the relevant analysis is summarized as below.

**A. Local residents around project area**

Some local residents around the project area participated in the implementation of the project, such as fence building and seeding grassland. However, the absence of local residents around the project area will not hinder the implementation of the project. Therefore, the importance of local residents around the project area is assessed as ‘Significant’ and its influence is ‘Critical’.

**B. Village collectives**

According to Grassland Law of People's Republic of China, the ownership of grassland belongs to the state and the collectives. Therefore, without the support of the village collectives, the project cannot be successfully carried out. Therefore, the importance and village collectives are assessed as ‘moderate’ and influence is ‘significannt’

**C. Zhangye Forestry and Grassland Bure**au

In 2019, some functional departments of Zhangye Animal Husbandry and Veterinary Bureau was transferred to Zhangye Forestry and Grass Bureau, and the Forestry and Grassland Bureau is responsible for the sustainable management of project. The Forestry and Grassland Bureau provide guidance of the sustainable management for County Forestry and Grassland Bureau to field implementation. In addition, the government of Zhangye agreed to carry out the grassland carbon sink project by Zhangye Forestry and Grassland Bureau. Therefore, the importance of Zhangye Forestry and Grassland Bureau are assessed as Moderate’ and the influence is ‘Critical’.

**D. County Forestry and Grassland Bureau**

In 2019, the County Grassland Station which belongs to County Animal Husbandry and Veterinary Bureau has transferred to County Forestry and Grassland Bureau which is responsible for the project implementation such as providing training on fence building, seeding grass and reasonable grazing for the project implementers according to the government. Therefore, the importance of County Forestry and Grassland Bureau are assessed as 'Significant' and influence is 'Critical'.

**E. Local government**

Local government provide the fund to the project, but they did not participate in the management and implementation of the project. Therefore, the importance of local government is assessed as 'low' and its influence is 'Significant'.

**F. Scientific research institutions**

Research institutions have carried out research on grass ecosystem, grassland degradation mechanisms, and grassland restoration, which are the key to promoting sustainable grassland development. However, the scientific research institutions have low influence to hinder the implementation of the project. Therefore, the importance of scientific research institutions is assessed as 'moderate' and its influence is 'Low'.

**G. Tourism companies**

The relationship of tourism companies and the project is reciprocal in long term. The success of the project may bring abundant of tourism resources, in turn, the tour and sightseeing may play a role of dissemination and facilitate development of similar project. And the tourism companies have low influence to hinder the implementation of the project. Therefore, the importance and influence of tourism companies is assessed as 'Low'.

Table 2-3 Influence and Importance of stakeholder to project achievement

| Influence of Stakeholder | Importance of stakeholder to project achievement | | | |
|---|---|---|---|---|
| | Low | Moderate | Significant | Critical |
| Low | G | F | | |
| Moderate | | | | |
| Significant | E | B | | |
| Critical | | C | A, D | |

According to the above scoring and analysis, the local residents around the project area and local Forestry and Grassland Bureau are the most important stakeholders in this project.

**Step 5: Publish the results of identified stakeholders**

According to the results of step 1 and step 4, combine with the society well-being, importance and influence rank of stakeholders is as follow:

Table 2-4 Final Stakeholders

| Stakeholders Group | Category Code | Rank of well-being | Rank of importance | Rank of influence | Total Rank |
|---|---|---|---|---|---|
| Local residents around project area | A | 1 | 1 | 3 | 1 |
| Village collectives | B | 2 | 2 | 1 | 1 |
| Zhangye Forestry and Grassland Bureau | C | 3 | 2 | 3 | 3 |
| County Forestry and Grassland Bureau | D | 3 | 1 | 3 | 2 |
| Local government | E | 4 | 3 | 1 | 3 |
| Scientific research institutions | F | 5 | 2 | 2 | 4 |
| Tourism companies | G | 6 | 3 | 2 | 5 |

The final stakeholders are identified the top three of the total rank and they will be stated in the following section 2.1.9.

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.

**Step 6: Final continuous input / grievance mechanism**

According to the step 5, there are different response mechanisms with different rank level of stakeholders group, are summarized as below.

As mentioned above, during the whole credit period, the project will be under the supervision and management of Zhangye Forestry and Grassland Bureau and county forestry and grassland bureau. Therefore, once there are any complaints or grievances, project proponent shall contact and discuss with relevant community or other stakeholders within 3 days firstly; Then, the specific staff of project proponent should propose a solution and mediation which is performed by relevant

government agency within a week based on all collected information; Thirdly, the project proponent will address their complaints or grievances by relevant legal method such as arbitration and courts if necessary. Finally, the entire complaints or grievances redress process shall be dealt within 30 days.

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

As described above, Zhangye City is defined as the project zone, so the stakeholders can summarize below:

Table 2-5 Stakeholder descriptions

| Stakeholders Group | Rights, Interest and Overall Relevance to the Project |
|---|---|
| Local residents around project area | Local residents around the project area will be affected by the project through participating the implementation of the project. |
| Village collectives | According to Grassland Law of People's Republic of China, the ownership of grassland belongs to the state and the collectives. And the implementation of the protect will improve the income of villagers |
| Zhangye Forestry and Grassland Bureau | Zhangye Forestry and Grassland Bureau is a government department responsible for the technology guidance of the project. |
| County Forestry and Grassland Bureau | The local County-level Forestry and Grassland Bureau is responsible for the supervision and management of the county's grassland and ecological construction |
| Local government | The government provided the initial fund, approved and supervised the environmental and social impacts of the project, such as the restoration of the grassland ecosystem and employment issues. |

### 2.1.10 Sectoral Scope and Project Type

According to Appendix of 1 Eligible AFOLU Project Categories of the VCS Standard (version 4.1), eligible Agricultural Land Management (ALM) activities are those that reduce net GHG emissions on croplands and grasslands by increasing carbon stocks in soils and woody biomass and/or decreasing $CO_2$, $N_2O$ and/or $CH_4$ emissions from soils, which include Improved Cropland Management (ICM), Improved Grassland Management (IGM) and Cropland and Grassland Land-use Conversions (CGLC).

The project restores degraded grassland by planting grass and sustainable management of grazing activities, thus increasing soil carbon stocks. So, the project is developed under VCS scope 14 “Agriculture, Forestry and Other Land Use (AFOLU)” with a project category of Agricultural Land Management (ALM) and belongs to the category of Improved Grassland Management (IGM) that

demonstrably reduce net GHG emissions of grassland ecosystems by increasing soil carbon stocks. 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 main measure of the project is rotational grazing and rest grazing through building grassland fences, to achieve fixed-point grazing and grazing by hurdles. According to the Project Design Report, the grasslands is divided into seasonal grazing land, and then the seasonal grazing land is divided into several small areas by the livestock carrying capacity of the grassland. Then based on specified grazing order, grazing cycle and zoning grazing time, the grassland is grazed area by area and used in turn. The other measures planted grass seeds on the degraded grassland. According to the National standard documents of the people's Republic of China[18] and Project Design Report, the total grass yield decreased by 50% compared is regard as seriously degraded grasslands. Through scientific and sustainable management of grazing, relevant training about technical skills, scientific and effective management plan, alleviate soil desertification and restore grassland vegetation to improve soil carbon storage and local biodiversity, and enhance the capabilities of local communities and residents.

The project is estimated to generate GHG emission removals of 29,440,243 $tCO_2e$, with average annual GHG emission removals of 736,006 $tCO_2e$.

Figure 2-3 The fence building and reseeding measures in the project area

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

**Theory of Change**

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

*1)* Zhangye City is located in arid and semi-arid areas, with arid climate, low rainfall and fragile ecological environment. The extensive mode of animal husbandry production reduces the productivity of grassland, aggravates soil desertification and seriously threatens the local grassland ecosystem due to the increasingly serious population pressure, over grazing and

[18] GB19377-2003 Parameters for degradation, sandification and salification of rangelands

climate change. Under without-project scenario, it will continue to degrade, which will bring serious damage to the local environment and sustainable development.

*2)* Continuous degradation of grassland ecosystem will deteriorate the living environment of local herders and affect their livelihoods.

*3)* Continuous degradation of grassland ecosystem poses a long-term threat to local climate conditions and biodiversity.

The main objective of the project is to restore the degraded grassland ecosystem by reseeding grass to restore grassland vegetation and through building grassland fences to achieve rotational grazing and rest grazing and carrying out sustainable grassland management to address the above issues.

**Grassland ecosystem degradation focal issue:** In the absence of the project, the project area will remain as degraded grassland and the surrounding communities will be threatened by continuous degradation of grassland ecosystem. After the implementation of the project, the grassland coverage has increased and grazing measures have been improved, which is beneficial to the local environment by maintenance of the water and soil, and healthy grassland ecosystem is an attractive landscape which could significantly benefit local touristic resources and promote the local economy.

**Local herders' livelihood focal issue:** Local herders live by grazing, without the project, the area available for grazing will gradually decrease, and their income will decrease in long-term. The project will offer some short-term and long-term job opportunities for local residents which could increase the income of the households. The restoration of degraded grassland and sustainable grazing will improve grazing productivity of local herders. And the project provides equal job opportunities for local women and men which could build community capacity in gender equity by empowering women. In addition, the local residents employed by the project are mostly belong to ethnic minorities. The implementation of the project requires full communication among stakeholders on a regular basis. At the same time, it also attracts tourists from all parties, which greatly promotes the cultural collision of all ethnic groups and is conducive to the dissemination of ethnic minorities and grassland culture. All these will significantly improve the well-being of local communities.

**Threat to biodiversity focal issue:** Part of the project area is located in Qilian mountains, which is an ecological security barrier. The grassland in the project area is an important habitat and breeding place for wild animals (e.g. IUCN threatened species: Falco cherrug (Saker) and *Aythya nyroca* (White-eyed Pochard)). In addition, the behaviour of reseeding grass could restore vegetation of the degraded grassland, and in the absence of the project, the project area will continue degradation with much threat to local climate and biodiversity condition. There is regular occurrence of 1 species of endangered animals (birds) and 6 species of vulnerable animals in the IUCN Red List of Endangered Species (please refer to Section 5.5.2 for details of the endangered bird species) at the project site for its unique grassland habitat. The implementation of the project can preserve the natural habitats of wild animals by increase vegetation cover and avoid soil desertification in the project area. Therefore, the population of the endangered animals could be

maintained and enhanced due to the better environment of the habitat which could increase the long-term biodiversity of local ecosystem.

Table 2-6 Project Activities and Theory of Change Table

| Activity description | Expected climate, community, and/or biodiversity | | | Relevance to project's objectives |
|---|---|---|---|---|
| | Outputs (short term) | Outcomes (medium term) | Impacts (long term) | |
| Reseeding grass on degraded grassland and build grassland fences to achieve rotational grazing and rest grazing | Increased cover of vegetation by reseeding; | Increase habitat area for wild lives; Generate GHG emission removals; Improve the knowledge or skills of local herders | Maintain and enhance the natural grassland ecosystem in project area; Increase the population of the endangered animals within the project zone; Improve local touristic development and promote the local economy. | Climate benefits Biodiversity benefits Community benefits |
| Offer permanent and temporary job opportunities to local herders, including women | Create 11,727 job opportunities (952 permanent jobs and 10,775 temporary jobs), which is equally offered to local women and men | Empower women and build community capacity in gender equity;<br><br>Improve living level of local residents | With other employees participating in community activities, women may get more happiness than doing housework only, so their well-being would be significantly improved. | Community benefits |
| Provide technical skills and training of sustainable grazing method | Improve grazing productivity;<br><br>Prevent continue degradation of grassland ecosystem | Enhance capabilities of local herders and increase their household income;<br><br>Provide better habitat for wild lives | Improve well-being of local residents;<br><br>Increase local biodiversity | Community benefits;<br><br>Biodiversity benefits |
| Organize special community cultural activities for local residents, since 54% of the | Increase social connection of local minorities and improve the | The project is located in Zhangye which is a silk culture region, the project provides | Improve well-being of local residents;<br><br>The connection between local | Community benefits |

| | | | | |
|---|---|---|---|---|
| local residents employed by the project are minorities | interaction within the community | more opportunities for residents to transport their traditional culture in a positive way | minorities herders and other community members could indirectly promote the diffusion of traditional culture | |

The Grassland Station of County Forestry and Grassland Bureau will be responsible for the implementation and management of the project during the project lifetime. And Zhangye Forestry and Grassland Bureau will take over of the responsibility beyond the project lifetime. The technicians from local forestry and grassland bureau will measure the grass yield regularly in the project area and guide the herders to graze in a sustainable way. In addition, approximately 952 local herders were employed as grassland guardians to manage and protect the grassland under the guidance of the project proponent and the local forestry and grassland bureau through and beyond the project lifetime.

The improvement of the living standard for local herders would accelerate their transition of traditional overgrazing to sustainable grazing which could benefit for the maintenance and conservation of the local grassland ecosystem. In addition, the implementation of the project offers permanent and temporary job opportunities to local herders, including women, which empower women and build community capacity in gender equity and improve living level of local residents. The healthy grassland ecosystem is an attractive landscape which could significantly benefit local touristic resources and promote the local economy, which could therefore enhance the long-term benefit beyond the project lifetime.

All of these could guarantee the long-term climate, community, and biodiversity benefits.

### 2.1.12 Sustainable Development

According to the United Nations Sustainable Development Goals, the project provided many benefits that will help to achieving the goals as following:

Table 2-7 Sustainable Development goals that the project achieved

| | |
|---|---|
|  | All the employees that were involved in grass seeding, fence building was paid 150 RMB (23.49 USD)/day. Grassland guardians were paid around 24,000 RMB (3,758.4 USD) / year. Women and vulnerable people who come from the poorest local households were not only provided with equal opportunities but also consciously ensured that they can be part of the project. These measures could improve the income and reduce poverty of local residents. |

| | |
|---|---|
|  | The project proponent has referenced Labor Law of the People's Republic of China and adapted them to meet the local conditions to ensure workers' health and safety. The workers' health and safety policy, including items covering the health insurance scheme for workplace accidents and evacuation plans is made available for workers and implemented by county forestry and grassland bureau. |
|  | During the project implementation, about 11,727 local herders participated in the project, of which 6,039 are women. By being trained with the sustainable grassland management skills and participating the community activities together with other employees, women may gain more happiness compares to doing housework only. This will contribute to empower women and build community capacity in gender and sustainable grassland management. |
|  | The purpose of the project is to restore the degraded grassland ecosystem by seeding grass or managed grazing which will generate GHG emission removals by increasing soil organics or avoiding soil degradation, mitigate the impact of climate change on the local ecological environment. |
|  | The project can improve the quality and quantity of the grassland vegetation and provide more habitat for wild animals to enhance biodiversity conservation by reseeding grass or scientific grazing. |

### 2.1.13 Implementation Schedule (G1.9)

Table 2-8 Timeline of the project

| Date | Milestone(s) in the project's development and implementation |
|---|---|
| September-2016 | The Project Design Report was completed |
| 15-November-2016 | The Participatory Rural Appraisal (PRA) Report was completed |
| 20-December-2016 | The baseline biodiversity survey report was completed |
| 27-December -2016 | The Project Design was approved by Zhangye animal husbandry and Veterinary Bureau |

| | |
|---|---|
| 25-July-2017 | Started grass seeding and fence building (start date of project activity and crediting period) |
| September-2019 | Completed reseeding and fence building |
| 3-November-2020 to 7-December-2020 and 25-May-2021 to 20-June-2021 | Biodiversity monitoring in winter and summer season respectively |
| 16-September-2021 to1-October-2021 | Filed monitoring and survey for climate and community impact |
| 22- November -2021 | Draft PD and PD summary finished |
| 25-November-2021 | Draft MR and MR summary finished |

### 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 25-July-2017 when the seeding started[19].

### 2.1.15 Benefits Assessment and Crediting Period (G1.9)

The project crediting period is from 25-July-2017 to 24-July-2057 with a lifetime of 40 years which is the same as the CCB benefits assessment period.

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

The GHG emissions accounting, 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

Table 2-9 Estimated GHG removals of the project

| Year | Estimated GHG emission removals ($tCO_2e$) |
|---|---|
| 1 | 808,845 |
| 2 | 759,408 |
| 3 | 732,333 |
| 4 | 733,504 |
| 5 | 733,504 |
| 6 | 733,504 |
| 7 | 733,504 |

[19] Date of signing reseeding contract.

| | |
|---|---|
| 8 | 733,504 |
| 9 | 733,504 |
| 10 | 733,504 |
| 11 | 733,504 |
| 12 | 733,504 |
| 13 | 733,504 |
| 14 | 733,504 |
| 15 | 733,504 |
| 16 | 733,504 |
| 17 | 733,504 |
| 18 | 733,504 |
| 19 | 733,504 |
| 20 | 733,504 |
| 21 | 733,504 |
| 22 | 733,504 |
| 23 | 733,504 |
| 24 | 733,504 |
| 25 | 733,504 |
| 26 | 733,504 |
| 27 | 733,504 |
| 28 | 733,504 |
| 29 | 733,504 |
| 30 | 733,504 |
| 31 | 733,504 |
| 32 | 733,504 |
| 33 | 733,504 |
| 34 | 733,504 |
| 35 | 733,504 |
| 36 | 733,504 |
| 37 | 733,504 |
| 38 | 733,504 |
| 39 | 733,504 |
| 40 | 733,504 |
| Total estimated ERs | 29,440,243 |
| Total number of crediting years | 40 |

| | |
|---|---|
| Average annual ERs | 736,006 |

### 2.1.18 Risks to the Project (G1.10)

Table 2-10 Risk analysis of the project

| Identify Risk | Potential impact of risk on climate, community and/or biodiversity benefits | Actions needed and designed to mitigate the risk |
|---|---|---|
| Fire | The project area is degraded grassland with low coverage; thus, the risk of fire is quite low in the early phase of the project. With the increase of grassland coverage, the risk of fire may increase, and the project owner will adopt the necessary measures for fire preventing. | According to the Chinese Grassland Law and Regulations on grassland fire prevention, the local government should carry out the construction of grassland fire prevention facilities, strengthen grassland fire observation during dry grass period to strictly prevent grassland fire. Once a fire disaster occurs, the local government should be responsible for relevant rescuing immediately. |
| Rodents and pests | There could be rodents and pests that may damage the grassland, but the rodents and pests will be prevented by routine overseeing. | The biological methods are used to control rodents, such as building eagle's nest. The chemical pesticides are allowed to be used only if there is a serious pest problem erupted in the project area, and the pesticides will be used in accordance with the National Pesticides Policy. The project proponent is also experienced in local natural risk control and has established a Grassland monitoring technical manual for the project which includes specific instruction in rodents and pests prevention and control. |
| Overgrazing | Overgrazing is the main factor leading to grassland degradation. It is possible that a few herders do not obey sustainable management and overgrazing occurs | The local government guide herders to carry out sustainable grazing, which can slow down the degradation of grassland. Also, local forestry and grassland bureau vigorously promotes grassland protection, provides relevant training for herders, and raises herders' awareness of grassland protection. |
| Frost | The project area is located in the North foot of Qilian Mountains, where the Grassland and forest are adjacent, so the frost disaster has little impact on the grassland. | Grass species planted in the project are native species, which can adapt to the local climate. In case of frost disaster, grass can grow smoothly in the second year. |

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

Also, the AFOLU Non-permanence Risk tool was used to describe and analyse the issue of non-permanence risk, and the results showed that 10% of net change in the project's carbon stocks should be deposited in the AFOLU Pooled Buffer Account. Please refer to Non-Permanence Risk Tool calculation for the detail.

### 2.1.19 Benefit Permanence (G1.11)

To maintain and enhance the climate, community and biodiversity benefits, the project build grassland fences to achieve rotational grazing and rest grazing and carrying out sustainable grassland management. Meanwhile, the forage suitable for alpine region (*Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra and Artemisia sphaerocephala* ) were selected to be planted in the project. After the completion of the project, strictly implement the Grassland Law Regulations on Grassland Fire Prevention and Gansu Grassland Regulations to formulate the basic grassland protection system, grass and livestock balance system.

At the same time, strictly implement the Measures for the Management of Network Fence of Grazing Returning Project, further implement the management and protection responsibilities of the degraded grassland and its fence facilities to townships, villages and households, sign management and protection responsibility letters at all levels, and clarify responsibilities and obligations. The grassland supervision department shall strengthen grassland law enforcement, and timely stop, investigate and deal with illegal acts such as unauthorized grazing, destruction of grassland vegetation and its fence facilities during the rest period.

According to Grassland Law of People's Republic of China, the ownership of grassland belongs to the state and the collectives. After the implementation of the project, Zhangye animal husbandry and Veterinary Bureau Department has been dismissed in 2019 due to the reform of government function, and some functional departments related to grassland management have been transferred to Zhangye Forestry and Grassland Bureau. Then, Grassland Station of local Forestry and Grassland Bureau help with the sustainable grassland management. To make sure the successful development of the relevant carbon credits of the project, with support of Zhangye animal husbandry and Veterinary Bureau in early stage, local state-owned grassland, local villages who owned the project lands all agreed to authorize Zhangye Academy of Forestry Sciences the rights of lands and grassland management within the project boundary during the project crediting period, and the authorization has also been confirmed by Zhangye City Forestry and Grassland Bureau later.

So, Zhangye Academy of Forestry Sciences have the rights to control and operate the project as Project Proponent during the whole project crediting period. The carbon revenue will be used to pay the salaries of the grassland guardians, which is conducive to the sustainable development of the project.

The Grassland Station of County Forestry and Grassland Bureau will be responsible for the implementation and management of the project during the project lifetime. And Zhangye Forestry and Grassland Bureau will take over of the responsibility beyond the project lifetime. The technicians from local forestry and grassland bureau will measure the grass yield regularly in the project area and guide the herders to graze reasonably. In addition, approximately 952 local herders were employed as grassland guardians to manage and protect the grassland under the

guidance of the project proponent and the local forestry and grassland bureau through and beyond the project lifetime.

All of these could guarantee the long-term climate, community, and biodiversity benefits.

### 2.1.20 Financial Sustainability (G1.12)

The cost of building fence for rotational grazing and rest grazing is about 31.15 RMB / Mu, reseeding grass is about 75 RMB (138.78 USD)/Mu, and the estimated cost for subsequent management and protection would reach 22.8 million RMB (3.57 million USD)/year during the whole lifetime. It is difficult to raise enough funds and effectively maintain the implementation of the project during such a long period. Grassland Station of Zhangye Forestry and Grassland Bureau has organized and managed the project implementation during the early phase, including conducting baseline survey and raising initial fund for the grass planting and fence building. The initial funds were raised from Zhangye Finance Department. However, the initial fund is not sufficient for the continued maintenance of the grassland which is crucial for sustainable management and restoration of the grassland ecosystem, therefore, after the implementation of the project, local Forestry and Grassland Bureau is responsible for the grassland sustainable management. To make sure the successful development of the relevant carbon credits of the project, Zhangye Forestry and Grassland Bureau has authorized Zhangye Academy of Forestry Sciences the rights to control and operate the project as Project Proponent during the whole project crediting period.

Also, Zhangye Academy of Forestry Sciences and Zhangye Forestry and Grassland Bureau have signed consulting and agency contract on  with Gansu Heihe Electric Power Sales Co. Ltd who will be responsible for development of the carbon credits and selling the credits in the international carbon markets. Except for carbon benefits, the project has no other benefits. As described in section 2.1, the project is estimated to generate GHG emission removals of 29,440,243 $tCO_2e$, with an average annual GHG emission reduction of 736,006  $tCO_2e$. Estimated at 30 RMB (4.70 USD)/$tCO_2e$, the annual carbon revenue is about 22.35 million RMB (3.48 million USD). The carbon revenue generated by the project will be used to maintain the implementation and management of the projects during the project lifetime. Therefore, the carbon revenue could help to mitigate the funding shortage and ensure the sustainable grassland management.

### 2.1.21 Grouped Projects

No applicable

## 2.2 Without-project Land Use Scenario and Additionality

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

According to the land cover data of Zhangye in year 2006 (Figure 2-5), which released by the National Basic Geographic Information Center, the satellite image (Figure 2-4, 2-6 and 2-7), and project area photos taken in 2016 (Figure 2-5), the project area is identified as grassland. Comparing the satellite images in 2006 and 2016, there is no change in land use in the project area.

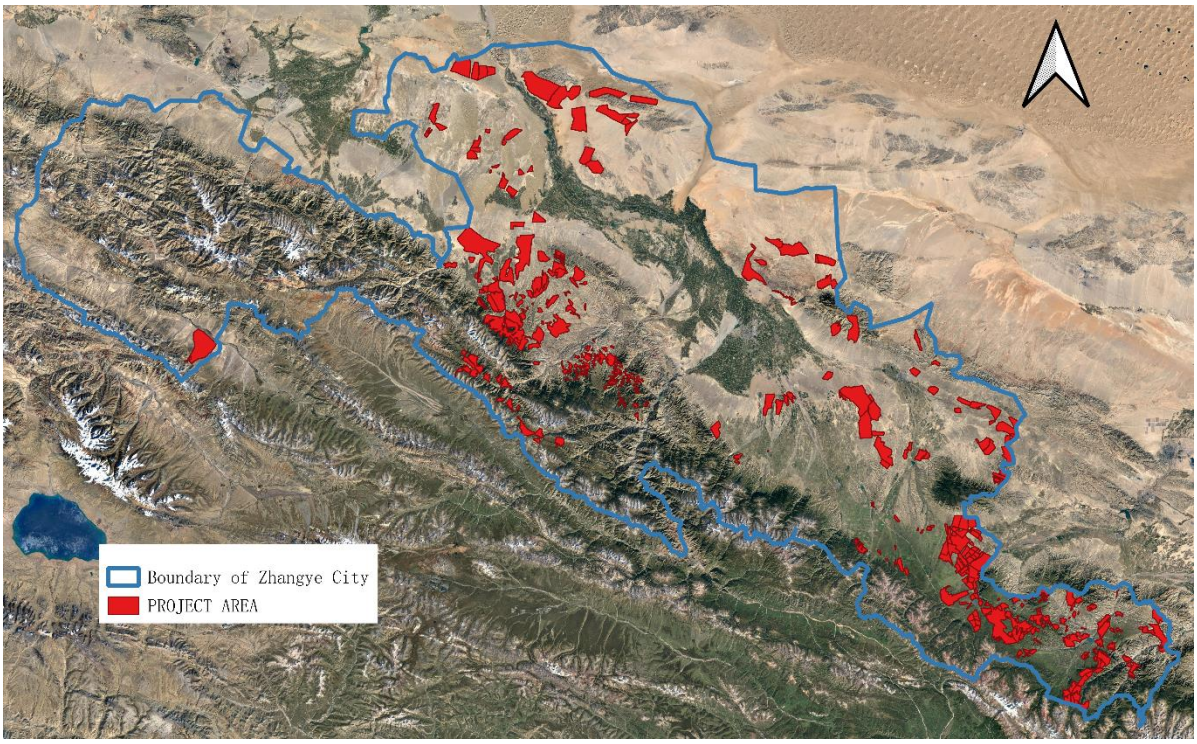


Figure 2-4 Satellite images of the project area

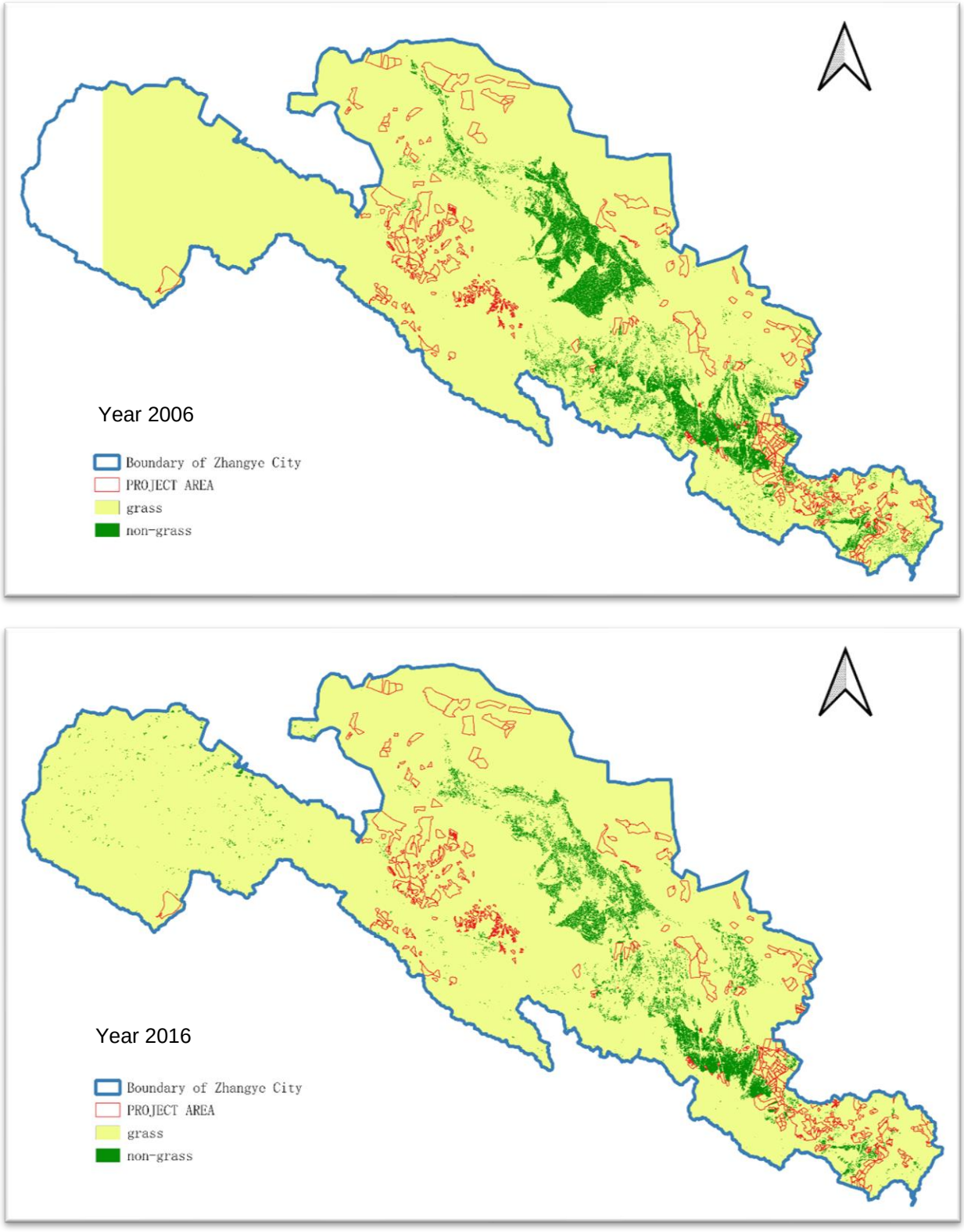


Figure 2-5 The land use scenarios of the project zone in 2006 and 2016

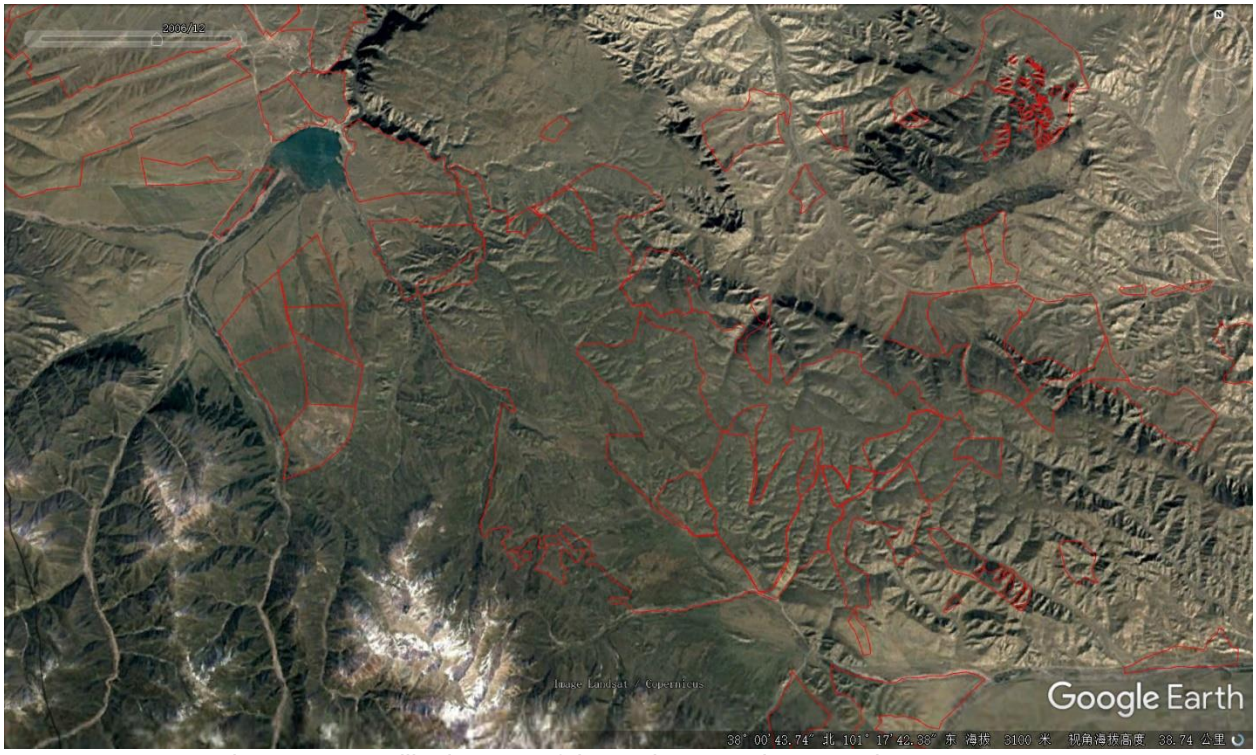


Figure 2-6 Satellite images of the project area in December 2006

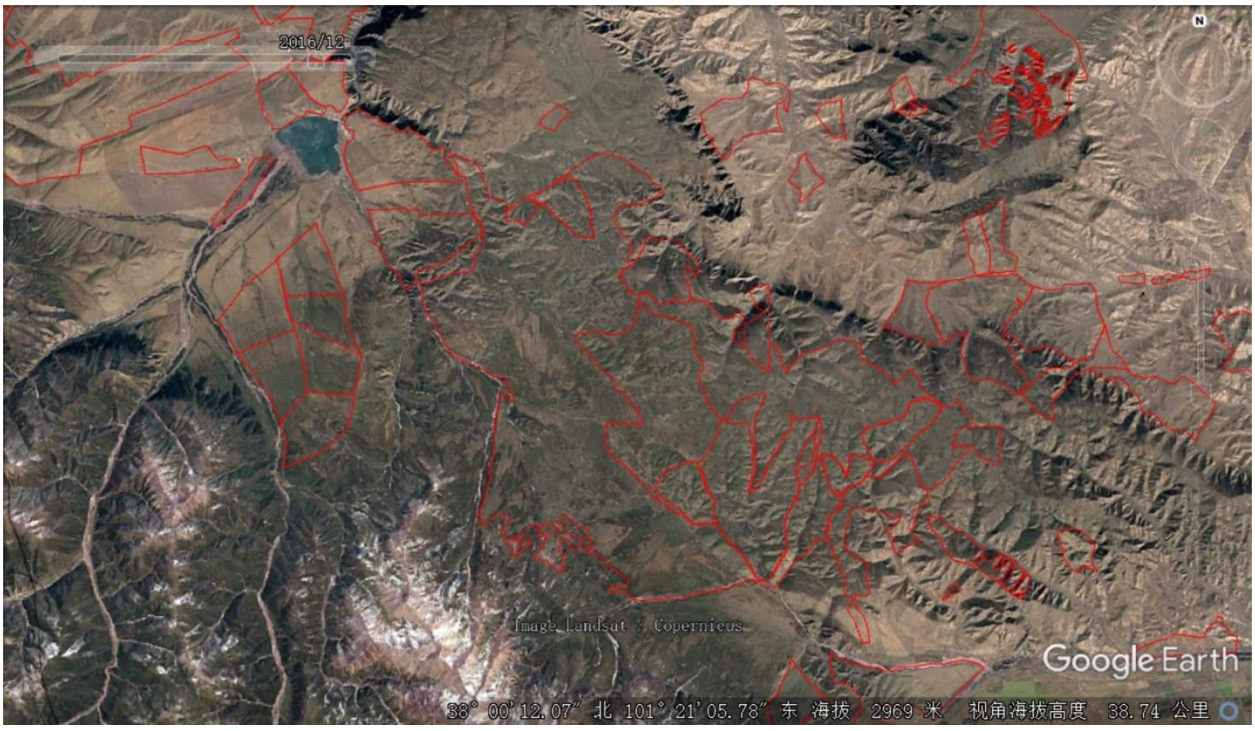


Figure 2-7 Satellite images of the project area in December 2016

Figure 2-8 Degraded grassland in the project area at the start of the project

### 2.2.2 Most-Likely Scenario Justification (G2.1)

The most-likely scenario is the same as baseline scenario, which is the lands would continue degradation without the project, please refer to section 3.1.4 for detailed information.

### 2.2.3 Community and Biodiversity Additionality (G2.2)

China has successively issued and revised a series of laws and administrative regulations related to grassland, such as the Law of the People's Republic of China on Grasslands[20], Regulations of Gansu Province on Grasslands[21], Regulations of the people's Republic of China on the Protection of Wild Plants and Animals[22], the Regulation on Nature Reserve[23], the Regulation on Grassland Fire Control[24], and the Regulation on Forest Diseases and Pests Control[25], etc. And none of the laws and regulations mandate the restoration of degraded grassland.

Due to the dual influence of natural and human factors, the grassland in the Zhangye city has been degraded to varying degrees. With the degradation of grassland, the grass yield per unit area of grassland has decreased. The project is located on undeveloped County of Zhangye city, whose economy is very difficult, and the local finance is very tight. In addition, the investment in restoration of degraded grassland has no economic return for decades, so there is no commercial attraction. However, with the general growth of the national economy, herders will continue to intensify grazing in order to improve their income and the local grassland ecosystem will continue to degenerate.

Meanwhile, under the without-project scenario, the local herders will continue to adopt traditional grazing methods due to lack of rational grazing ways which provides by local Forestry and Grassland Bureau such as the rotational grazing and reseeding grass skills. Due to the technical obstacles faced by herders, the grassland will face continuous degradation.

The project restored degraded grassland by reseeding grass and sustainable grassland management like rest grazing and rotational grazing, the total investment is 313.89 million RMB, which comes from the Finance Bureau of local government. And the sustainable grassland management would require continued funding support, such as 952 local herders were employed as grassland guardians, with an annual salary of 24,000 RMB (3758.4 USD) per person. The

[20] http://www.gov.cn/gongbao/content/2003/content_62420.htm
[21] http://www.gsrdw.gov.cn/html/2006/gsfg_1201/10896.html
[22] http://www.gov.cn/gongbao/content/2019/content_5468858.htm
[23] http://www.forestry.gov.cn/main/3950/20170314/459882.html
[24] http://www.gov.cn/zhengce/zhengceku/2008-12/05/content_2756.htm
[25] http://www.forestry.gov.cn/main/3950/20170314/459886.html

carbon revenue generated from the project could be used to pay the salaries of the guardians, which could reduce the funding difficulty.

Through the above analysis, if the project is implemented without registration as a VCS project, the financial and technical barriers would lead to the failure of the project. Therefore, the community and biodiversity project benefits would not occur in the absence of the project.

The detailed additionality assessment was demonstrated by using the Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (VT0001), please refer to Section 3.1.5 for details.

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

Not applicable

## 2.3 Stakeholder Engagement

### 2.3.1 Stakeholder Access to Project Documents (G3.1)

The full project documentation has been published on VCS and CCB website for public comments, as well as the project summary in Chinese version, and the local communities and other stakeholders can easily download from the website. The project owner will notice local stakeholders every milestone through the project lifetime, including listing, registered, issuance, etc.

The project documentation (PD, MR, PD Summary and MR Summary etc.) has been published on VCS and CCB website for public comments[26], and the local communities and other stakeholders can easily download from the website. The project owner would notice local stakeholders every milestone of the project development, including listing, registered, issuance, etc.

### 2.3.2 Dissemination of Summary Project Documents (G3.1)

Along with the project implementation, the project documentation will be published on VCS and CCB website for all stakeholders to obtain the detailed project information and development progress. Also, the summary of project description in local language and Chinese version have been distributed among local communities during the community monitoring activity and the website address to download all the summary project documents has been provided to communities which has also been published in the public notice boards in each village. In addition, a contact person with phone numbers was published through villager assembly in case any stakeholders want to directly contact the project proponent and raise opinions.

### 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 ,a district and racecourse 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-

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economic and environmental issues from the stakeholders, collect their willingness to participate and take advantage of the demands of the proposed project activity and analysis the potential socioeconomic and environmental impacts of the proposed project activity.

The project owner also held multiple stakeholder meetings to collect the direct feedback and suggestions through the project lifetime, including listing, registered, issuance, etc. The meeting notice is publicized on the village collective bulletin board, and the representatives of village collectives, Zhangye forestry and grass Bureau, Zhangye Finance Bureau and local government were invited to attend the meeting by telephone. During the meeting, questionnaires were distributed to attendees to collect their feedback. In addition, the contents of the meeting were publicized on the village collective bulletin board. Please refer to Section 2.3.7 for details.

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

During the PRA survey and stakeholder meeting, project owner explained the potential costs, risks and benefits to relevant communities and stakeholders by using the Theory of Change and invited them to give their feedback. The analysis based on results chain is quite clear and understandable using a form as followed. According to the analysis, the community benefits of the project include income improvement, job creation, training opportunities, capability establishment and higher ecological aesthetic value, and all the relevant communities are aware of the design concept of the project and have willingness to participate in the project.

Local herders lived by grazing, and the traditional grazing methods were unsustainable, such as overgrazing. The project will change the traditional grazing method of some local herders and improve the growth of forage, by guiding herders to carry out sustainable grazing and sowing the forage grass.

| Benefits | Costs and Risks | Mitigations |
|---|---|---|
| income improvement, job creation, training opportunities, capability establishment, higher ecological aesthetic value | The grazing frequency will be reduced, from annual grazing to semi-annual grazing or rest grazing for 90 days after reseeding or building fences | The local government issued subsidies to the herders in the project area who implemented the rest grazing and rotational grazing. County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. Also, the project provides job opportunities for local herders, which will increase their income in long term |

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

The villager assembly is held once a year, all community group leaders participate in the village assembly, and the contents of the assembly will be conveyed to all community members by the leaders. Therefore, the villager assembly is considered as the most appropriate means for sharing information with local communities. A contact person with phone numbers was published through villager assembly in case any stakeholders wish to participate in any activities related to the project.

The status and process of the project for CCB and VCS validation and verification were published through routine villager assembly and posted on local bulletin boards, also the mobile phone

number of contact person of the project was provided to all the stakeholders so they can directly make a call in case they have any problem about the project.

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

The local stakeholders have been informed timely regarding the project process, especially when the auditor would take the site visit. And a week prior to the visit, the project staff has informed relevant stakeholders in advance about the details of the audit process and arranged a half day for the auditor's interview with stakeholders so that the stakeholders have sufficient time to communicate with the auditor.

### 2.3.7 Stakeholder Consultations (G3.4)

As mentioned above, the stakeholder consultation includes PRA and meetings. During the PRA survey in the 4 counties,1 district of Zhangye city and a state-owned enterprise (Shandan Racecourse) in November 2016, local residents around project area including local women, local herders and grassland guardians were asked to raise their opinions of the project design and their willingness to participate the following implementation. All of them had no opinion on the project design and would like to participate in the implementation and maintenance of the project.

Also, the project proponent held a meeting with the representatives of village collectives, Zhangye Forestry and Grassland Bureau, Zhangye Finance Bureau of local government, and asked their opinions on the project design. All of them had no opinion on the project design.

During the PRA survey from 01-November-2016 to 15-November-2016, a total of 80 questionnaires were distributed to the representatives of the local stakeholders from local government and surrounding villages, and 75 copies were collected with valid answers. The representatives covered different ages, different occupations and different education levels which were summarized as follows.

Table 2-11 The representatives' information

| | | |
|---|---|---|
| | number | 75 |
| Gender | male | 48.00% |
| | female | 52.00% |
| Age | 20-30 | 12.00% |
| | 30-50 | 34.67% |
| | above 50 | 53.33% |
| Education | junior high school and below | 61.33% |
| | Senior middle school | 25.33% |
| | Junior college education and above | 13.33% |

Table 2-12 The survey results

| | | |
|---|---|---|
| 1. Do you know this project will | Yes | 60.00% |

| | | |
|---|---|---|
| bring carbon revenue? | No | 40.00% |
| 2. Do you willing to participate in this project? | Yes | 100.00% |
| | No | 0.00% |
| 3. Do you think this project can bring economic benefits to the local area and promote local sustainable development? | Yes | 46.67% |
| | No | 53.33% |
| 4. How do you want to participate in the project? | Participate in rodent and pest control, grass reseeding, rotational grazing and rest grazing | |
| 5. Do you think the project has slowed down grassland degradation? | Yes | 100.00% |
| | No | 0.00% |
| 6. How will the project affect local herders engaged in grazing around the project area? | Increased employment opportunities, family income, training and education opportunities for residents and improved the living environment. | |
| 7. Do you think the project has increased grassland biodiversity? | Yes | 93.33% |
| | No | 6.67% |

According to the results of the questionnaire, all the local residents wanted to participate in the implementation of the project because they thought the project could slow down grassland degradation (100%) and increase grassland biodiversity (93.33%).

According to the result of the survey, 53.33% of the representatives think that the project does not bring economic benefits and promote local sustainable development to the area. For these representatives of stakeholder, the project proponent carried out an in-depth communication with them. During the conversation, they think the project will affect their grazing time and their income from selling livestock products were reduced. For this part of their concerns, the local project proponent and County Forestry and Grassland Bureau will measure the grass yield of the surrounding grasslands in the project area and guide herders to graze within the acceptable area and ensure the project will not reduce their grazing productivity and the project will not affect herder's grazing time and reduce herder's grazing income.

Meanwhile, the project proponent and local Forestry and Grassland Bureau explained that the project could restore their degraded grassland, and if they agreed to restore the degraded grassland and implemented grazing prohibition of project activities, they would receive corresponding subsidies, and they did not need to participate in the implementation and management of the grassland. According to the Implementation Plan of the new round of grassland ecological protection subsidy and reward policy (2016-2020) in Zhangye City, due to the

sustainable management of grazing, herders in the project area can receive corresponding subsidies. The subsidy standards for sub vary from county to county, ranging from 2.17 RMB/mu to 3.35 RMB/mu.

**2.3.8 Finally, these representatives of stakeholder think the impact of the project activities on them has been mitigated and they all willing to participate in the project.Continued Consultation and Adaptive Management (G3.4)**

The Project Design Report was completed by the Dahua Engineering Management (Group) Co., Ltd, the stakeholders have been consulted before the implementation of the project and they all agreed and supported the project. Through the consultation, most of the stakeholder were willing to participate the project in fence building, grass seeding, grassland sustainable management and fire prevention, therefore the project provided all the job opportunities to local communities, including temporary job (rodent control, grass seeding) and permanent job (grassland guardian).

Throughout the lifetime of the project, the staff of project owner will visit local residents, village collectives, Zhangye forestry and grass Bureau and local government once a year, and communicate the progress and problems of the project with them. This will establish a commitment to communication and consultation to keep stakeholders informed of project activities including restoration, maintenance, monitoring and the CCB validation and verification process. In addition, the project staff in the field will maintain communications with local residents around project area including local women, local herders and grassland guardians through in-person talking. And the project will actively listen to recommendations made by any identified community members, or other stakeholder groups, and adapt and improve methods as necessary.

The project has an adaptive management plan to effectively evolve as the project progresses, and systematically develop existing practices through project monitoring and evaluation. The project will periodically review plans, methods, goals and objectives, to incorporate new lessons learned, available technology, and scientific knowledge. These strategies will be in accordance with project's Standard Operating Procedures (SOPs) and monitoring plans.

**2.3.9 Stakeholder Consultation Channels (G3.5)**

As stated in Section 2.3.3, an investigation team from Grassland Station of Zhangye Forestry and Grassland Bureau conducted a Participatory Rural Appraisal (PRA) in the counties where project located prior to project initiation, during the PRA survey in November 2016, the project owner also held a stakeholder meeting to collect the direct feedback and suggestions. Local residents directly impacted by the project were invited to attend the stakeholders' meeting through their most convenient way: the routine villager assembly, in addition, a contact person with phone numbers was published through villager assembly in case any stakeholders wish to participate in any activities related to the project. Local policy makers and grassland experts were also invited by phone calls. All the stakeholders have been informed directly or through their legitimate representatives.

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

In the project planning phase, stakeholders were fully involved in the land selection, grass species selection, etc., through meeting and PRA methods. As mentioned above in Section 2.3.7, before

the project started, local residents around project area including local women, local herders and grassland guardians were asked to raise their opinions during the PRA survey, and village collectives, Zhangye forestry and grass Bureau and local government were asked to raise their opinions during the stakeholder meeting. Also, 75 valid questionnaires have been collected from the representatives of the local stakeholders of local government and surrounding villages. Stakeholders from different age, gender and culture background has been prudently taken into account during the distribution of the questionnaires, and the feedbacks reflected in the interview and questionnaire has been seriously addressed immediately. Based on stakeholder consultation, all of the representatives of the stakeholders support the implementation of the project.

During the project implementation, the local communities will play as the direct implementers of the project, and the project proponent will play as 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.

### 2.3.11 Anti-Discrimination Assurance (G3.7)

According to Labor Law of the People's Republic of China, it is illegal to discriminate on grounds of race, nation, sex or religion. The project owner will obey the Labor Law of the People's Republic of China and have established the anti-discrimination rules in the implementation of the project, including providing equal job opportunities for any qualified workers regardless their gender, race, nation or religion, no extra requirement for women or minorities, and equal pay for equal work, etc. All the rules have been emphasized during staff training sessions. And there is a grievance and redress procedure which has been described in section 2.3.12 and 2.3.13 of the PD, in case of any discrimination occurred, anyone could report to the project proponent follow the relevant procedure.

### 2.3.12 Feedback and Grievance Redress Procedure (G3.8)

In case of any conflicts and grievances, stakeholders can either appeal through village representatives or directly to the local forestry and grass bureau, which is the most effective ways to solve the problems. They are familiar with the phone numbers of the project staff or the related focal point, or during community meetings. Moreover, the planting and management work will avail community labour which will allow the community villagers to participate in project implementation themselves and find out or seek for solutions to the conflicts and grievances in the projects.

The project owner nominated a specific staff in charge of recording and collecting conflicts and grievances of local communities and individual herders. All of the grassland guardians are coming from local communities whose name and contact number were published through villager assembly. Grassland guardians in each project site will play an important role of treating with ordinary conflicts and grievances, and report to Zhangye Forestry and Grassland Bureau.

Once a grievance case reported to the specific staff, the staff will contact the relevant stakeholders directly and discuss with them for an acceptable solution within one week; if the stakeholder's demand cannot be satisfied in a short time, the specific staff will contact with the head of the village where the stakeholders come from, who will play as a mediation to discuss with both sides together and seek for a further solution, which should be no more than 30 days; for more complicated case which cannot be settled by mediation, the project proponent shall report to local government, and follow the relevant legal procedure of arbitration or courts.

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

All the feedback and grievance received, and the relevant solution shall be recorded and summarized in the project monitoring report in the next verification, and all the project documents has been published on Verra website and the website address to download all the summary project documents has been provided to communities through the public notice boards in each village.

### 2.3.14 Worker Training (G3.9)

There is a Grassland monitoring technical manual provided for each employee which includes technical advice for their work, and all the workers were offered the technical training immediately once they were hired. Such skills and knowledge include are useful for grassland management, such as fire prevention and forage supplementary sowing technology. These technical manuals were distributed to each household in the local villages, including the villagers who haven't participated in the project. The members of local communities were trained equally as long as they lived around the project area and willing to participate the training process, so that the local capacity won't be lost through staff turnover.

Besides the training on technical skills of grass planting, local workers were trained on relevant skills for their future livelihood, such as sustainable grassland management. These skills will benefit the long-term development of the local communities who participate in the project.

There were routine training courses arranged in October 2017 and May 2020 respectively during the implementation of the project by providing fence building and seeding skills and experience for workers.

### 2.3.15 Community Employment Opportunities (G3.10)

The project will mobilize the whole community, including women and least privileged group. All people from the communities will be given an equal opportunity to fill in the work positions if they meet the job requirements. Women and vulnerable people who come from the poorest local households will not only be provided with equal opportunities but also consciously ensure that they can be part of the project.

During the project implementation, about 11,727 local herders (6,039 are women) participated in grass seeding and fence building, of which 952 local herders (493 are women) were employed as guardians. Among the 11,727 jobs opportunities, 10,775 are temporary jobs, which lasted from 2017 to 2019 and 952 are permanent jobs, which lasted through the entire project crediting period. All the employees will be provided related skill training periodically. Local residents who involved in grass planting were compensated 150 RMB (23.49 USD)/day. Grassland Guardian were paid around 24,000 RMB (3758.4USD) /year, higher than the per capita disposable income of all residents in Zhangye city (11，646 RMB (1827.26 USD) /year).

The current cost of the employment came from Zhangye Finance Department. However, the initial fund is not sufficient for the continued maintenance of the grassland, so the project is seeking for the subsidy of carbon credits which could help to mitigate the funding shortage and ensure sustainable management and restoration of the grassland ecosystem.

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

The local people will be under the protection of Labor Law of the People's Republic of China[27] and no forced labour is allowed, and they are free to establish and join any labor organizations as they wish. There will be regular training provided to workers before they start the job, which will clearly indicate their rights and mechanism for grievance appeal, and the worker's rights are guaranteed in the labour contracts for each worker.

### 2.3.17 Occupational Safety Assessment (G3.12)

The project owner has referenced Labor Law of the People's Republic of China and adapted them to meet the local conditions to ensure workers' health and safety. The workers' health and safety policy, including items covering the health insurance scheme for workplace accidents and evacuation plans is made available for workers and implemented by the village committee.

The potential risks of the project mainly include risks such as fire, driving, and unexpected situations in the wild.

To minimize the potential risk, all the workers have been provided new staff training before they start to work. The training includes all necessary risk control measures during the work, as well as the health and safety policy mentioned before.

## 2.4 Management Capacity

### 2.4.1 Project Governance Structures (G4.1)

In order to ensure the development and implementation of the project, the project owner has established a project work group and the expert group. Zhangye City and country Forest and grassland Bureau and Gansu Heihe Electric Power Sales Co.Ltd will play as the expert group, whose responsibility is to guide and coordinate the project's overall implementation and decision-making; Zhangye Academy of Forestry Sciences will establish a project working group (covering aspects of carbon sink, ecology, forestry, community, geographic information, etc.) who will provide technical support for the project development and implementation; the responsibility of local forest bureau is daily supervision and data management during the project implementation.

[27] http://www.mohrss.gov.cn/SYrlzyhshbzb/zcfg/flfg/fl/201605/t20160509_239643.html

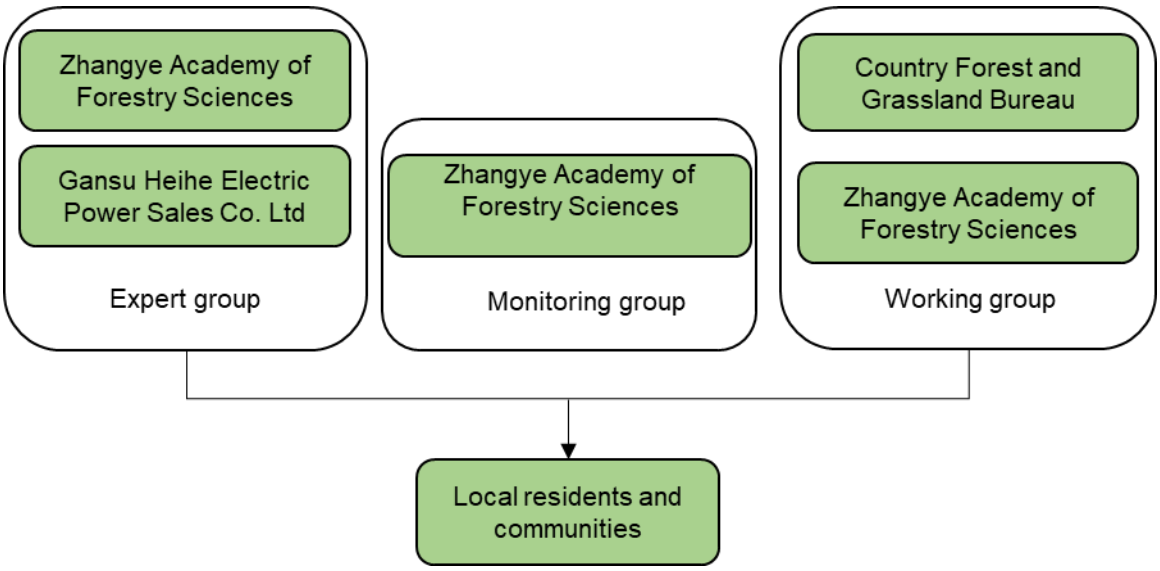


Figure 2-9 The project governance structure

### 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. Table below outlines the skills required per project activity.

Table 2-13 Key skills required to implement the project activities

| Project Activity | Specific measures | Key Skills Required |
|---|---|---|
| Reseeding grass and fence building | Project community division, grass seed and sowing method selection, fence design | Construction capacity, Supplementary sowing techniques, GIS for site selection |
| Carbon stock measurements and monitoring | Soil carbon monitoring, land cover mapping, grazing monitoring, climate monitoring, biodiversity monitoring, community monitoring, and fire monitoring | Soil organic carbon and bulk density test, GIS/ remote sensing, grazing record, diesel and gasoline consumption records, rodent control and fire management |
| Community engagement and development | Stakeholder consultation, livelihood development, and education program | Community organizing, conflict resolution, business management, adult education, livelihoods and social science surveys |
| Biodiversity assessment and monitoring | Sustainable grassland management, biodiversity | Fence building, reseeding grass, rotational grazing, biodiversity survey, field investigation, Infrared camera |

| | | |
|---|---|---|
| | monitoring, endangered animals monitoring | technology, global positioning system (GPS) tracking technology |

### 2.4.3 Management Team Experience (G4.2)

The project proponent Zhangye Academy of Forestry Sciences is in rich experience in sustainable grassland management in Zhangye city, including rodent control, grassland protection and management, technical training, carbon measurement and monitoring and biodiversity assessment.

As mentioned above, Zhangye City Forest Bureau and Gansu Heihe Electric Power Sales Co. Ltd will play as the expert group and working group who is in charge of guiding and coordinating the project's overall implementation and decision-making.

County Forestry and Grassland Bureau is a local government agency who is in rich experience in community engagement, including holding stakeholders' meeting, mediation with local communities and provide guidance for local herders in related to rational grazing. The Forestry and Grassland Bureau is also good at sustainable grassland management, including grass planting, rodent control and technical training.

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

As listed in Table 2-11 in Section 2.4.1, the key skills required by the project include community engagement, biodiversity assessment and carbon measurement and monitoring skills. As described in Section 2.4.3 the project proponent and other stakeholders are experienced in sustainable grassland management and VCS+CCB projects development. Therefore, the project management team has sufficient experience and skills required by the project.

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

Zhangye Forestry and Grassland Bureau and Finance Bureau are government agencies, financially supported by local government, which could guarantee the financial health over the project lifetime. In addition, Zhangye Academy of Forestry Sciences and Heihe Electric Power Sales Co. Ltd. are legally registered government-affiliated institutions and company in China. According to the public information listed in National Enterprise Credit Information Publicity System [28], the project participants don't involve in nor complicit in any form of corruption such as bribery, embezzlement, fraud, favouritism, cronyism, nepotism, extortion, and collusion.

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

As legally registered companies, the project proponent and other involved entities have the obligation to comply with relevant regulations, including anti-corruption law. The annual audit by the government makes sure that it operates with full compliance with China law and regulations.

[28] http://www.gsxt.gov.cn/index.html

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

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

## 2.5 Legal Status and Property Rights

### 2.5.1 Statutory and Customary Property Rights (G5.1)

According to the Article 10 of the Constitution of the People's Republic of China and the Land Management Law of the people's Republic of China[29], All the land must be used in accordance with their legal categories defined in General Land Utilization Plan approved by government. It is strictly forbidden for any individuals or entities to change the using purpose of any land. For instance, the "agricultural land" refers to the land used for agricultural production, including cultivated land, forest land, grassland, land for farmland water conservancy, water surface for breeding, barren lands, etc.

In addition, the land ownership belongs to state or village collective, which is a non-transferable right while the land usage right can be transferred by law, but the tenure of the property is infinite. For example, the land may contract to others by means of bidding, auction, public consultation, etc.

### 2.5.2 Recognition of Property Rights (G5.1)

As described in Section 2.1.19, according to the grassland use certificate, the land of each county (district) of our project is collectively owned by each village, and the grassland of Shandan Racecourse is owned by the state.. Considering the widely dispersed distribution of the project land, it is difficult for any of the landowner to raise enough right and fund and effectively maintain the implementation of the project during such a long period. Therefore, after seriously considered the carbon revenue and thought the revenue could help to mitigate the investment barrier, Zhangye animal husbandry and Veterinary Bureau has organized and managed the project implementation during the early phase and raise initial fund from Zhangye Finance Department for reseeding, fence building and maintenance expenses for the three years. At the same time, in order to develop carbon credits of the project, with support of Zhangye animal husbandry and Veterinary Bureau, the landowners all agreed with Zhangye Academy of Forestry Sciences as the project proponent and authorize they the rights of land usage and to take care of the maintenance and overall management of the grassland during the whole crediting period, including conducting baseline survey, signing consultant agreement for development of carbon credits.

Since the Zhangye animal husbandry and Veterinary Bureau Department has been dismissed in 2019 due to the reform of government function, and some functional departments related to grassland management have been transferred to Zhangye Forestry and Grassland Bureau.

Following which, in order to continue to get the support from Zhangye Forestry and Grass Bureau to ensure the implementation and management of the project, the project proponent Zhangye

[29] http://www.npc.gov.cn/wxzl/gongbao/1988-12/29/content_1481254.htm?from=timeline

Academy of Forestry Sciences also got the approval of Zhangye Forestry and Grass Bureau and confirm the rights of land usage to take care of the maintenance and overall management of the grassland and get carbon credits of the project during the whole crediting period. The project proponent Zhangye Academy of Forestry Sciences is responsible for the research and development, introduction, test demonstration and promotion of new technologies, varieties and products for grassland and artificial grass planting in the city; Responsible for grassland resources investigation, technical training and grassland dynamic monitoring in the city, including rodent control, grassland protection and management, technical training, carbon measurement and monitoring and biodiversity assessment. In addition, the Project Proponent will also be responsible for development of the carbon credits and the carbon revenue will be used for sustainable development and management of the project activities.

Therefore, all property rights involved in the project are recognized, respected, and supported.

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

As described above, the Zhangye Academy of Forestry Sciences has been authorized the rights of grassland management within the project boundary during the project crediting period, so the project will not encroach uninvited on private property, community property or government property.

To make sure all the stakeholders to be aware of the potential impact of the project on their life, an investigation team of the Grassland Station has conducted a Participatory Rural Appraisal (PRA) in the counties where project located in November 2017, in order to obtain basic information, data and information of socio-economic situation on the surrounding area, understand the major socioeconomic and environmental issues from the stakeholders, collect their 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.

Also, a stakeholder meeting was held during the PRA survey and questionnaires were distributed to attendees to collect their feedback. During the meeting, the project owner publicized the Project Design Report and informed stakeholders of the project's impact.

Some herders may be affected by the project, due to sustainable grazing patterns like the rotational and rest grazing. Rotational grazing requires that the grazing time shall be halved, and rest grazing requires that grazing shall not be carried out within 90 days in every year.

To mitigate the impact of project implementation, the project proponent and the County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area in July and August every year, calculates the reasonable grazing quantity according to the carrying capacity standard of Gansu Province, and guides herders to graze within the acceptable area to make sure their grazing productivity could be maintained. So, the project will not reduce the grazing time and quantity, instead of which, the sustainable grazing could improve the grazing productivity in a long term. And the leakage emissions due to grazing displacement are calculated in section 3.2.3.

Through meeting interviews and questionnaire surveys, all stakeholders know the impact of the project and they though that the implementation of the project can restore degraded grasslands and increase grazing areas in long term. And the project provides job opportunities for local herders, which will increase their income. In addition, according to the Implementation Plan of the new round

of grassland ecological protection subsidy and reward policy (2016-2020) in Zhangye City[30], due to the sustainable management of grazing, herders in the project area can receive corresponding subsidies. The subsidy standards for sub vary from county to county, ranging from 2.17 RMB/mu to 3.35 RMB/mu.

In conclusion, the project has received free, prior, and informed consent from relevant property rights holders prior to commencing with project activities.

### 2.5.4 Property Rights Protection (G5.3)

Prior to the project implementation, the project area is mostly degraded grassland with no residents, and Zhangye Forestry and Grassland Bureau has confirmed the right of grassland management to the project proponent during the project crediting period. The County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. In addition, due to the sustainable management, herders in the project area can receive corresponding subsidies. Also, the project provides job opportunities for local herders, which will increase their income in long term.

Therefore, the project will not change the ownership of the project land, lead to involuntary removal or relocation of property rights holders from their lands or territories and does no force rights holder to relocate activities important to their culture or livelihood.

### 2.5.5 Illegal Activity Identification (G5.4)

Currently all project lands are defined as grassland by local government. According to Chinese grassland law[31], activities that destroy the grassland like mining and construction without pre-approval by local authority are strictly prohibited. Prior to the implementation of the project, the project area was degraded due to long-term overgrazing but no mining or construction or other destroying activities exist on the grassland, thus no illegal activities occurred around our project area. Although a series of laws and administrative regulations in China prohibit destruction of grassland, none of them mandate the restoration of degraded grassland like our project activities, See the Section 3.1.4 for details.

Therefore, the project's climate, community and biodiversity impacts will not be affected by the illegal activities. Therefore, the project's climate, community and biodiversity impacts will not be affected by the illegal activities.

### 2.5.6 Ongoing Disputes (G5.5)

At the project start, the local residents lived by grazing, and there were not much other job opportunities offered, and most of the local women has no income. As described above, the implementation of the project will improve grassland landscape, attract tourism resources and increase employment and income. Zhangye City Forest Bureau confirmed Zhangye Academy of Forestry Sciences the rights of lands and grassland management within the project boundary during the project crediting period, thus there is neither ongoing or unresolved conflicts or disputes

[30] Official gazette of Zhangye Municipal People's Government
[31] http://www.forestry.gov.cn/main/3949/20180918/114120127762082.html

over rights to lands, territories and resources nor any disputes that were resolved and recorded during the last twenty years.

### 2.5.7 National and Local Laws (G5.6)

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

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

Parameters for degradation, sandification and salification of rangelands;

Technical regulation of reseeding on sandy grassland;

Technical Specification for Natural Grassland Improvement;

Technical Specification for Artificial Grassland Construction;

Technical Rule for Fences Construction of Rangeland;

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

### 2.5.8 Approvals (G5.7)

The project has been approved by approved by Zhangye animal husbandry and Veterinary Bureau on 27-December-2016.

### 2.5.9 Project Ownership (G5.8)

As described in Section 2.1.19, according to the grassland use certificate, the land of each county (district) of our project is collectively owned by each village, and the grassland of Shandan Racecourse is owned by the state prior to the project initiation. Considering the widely dispersed distribution of the project land, it is difficult for any of the landowner to raise enough right and fund and effectively maintain the implementation of the project during such a long period. Therefore, after seriously considered the carbon revenue and thought the revenue could help to mitigate the investment barrier, Zhangye animal husbandry and Veterinary Bureau has organized and managed the project implementation during the early phase and raise initial fund from Zhangye Finance Department for reseeding, fence building and maintenance expenses for the three years. At the same time, in order to develop carbon credits of the project, with support of Zhangye animal husbandry and Veterinary Bureau, the landowners all agreed with Zhangye Academy of Forestry Sciences as the project proponent and authorize they the rights of land usage and to take care of the maintenance and overall management of the grassland during the whole crediting period, including conducting baseline survey, signing consultant agreement for development of carbon credits.

Since the Zhangye animal husbandry and Veterinary Bureau Department has been dismissed in 2019 due to the reform of government function, and some functional departments related to grassland management have been transferred to Zhangye Forestry and Grassland Bureau. Following which, in order to continue to get the support from Zhangye Forestry and Grass Bureau to ensure the implementation and management of the project, the project proponent Zhangye Academy of Forestry Sciences also got the approval of Zhangye Forestry and Grass Bureau and confirm the rights of land usage to take care of the maintenance and overall management of the grassland and get carbon credits of the project during the whole crediting period. Therefore, the Project Proponent of the project has the unconditional, undisputed and unencumbered ability to claim that the project will generate the project's climate, community and biodiversity benefits.

#### 2.5.10 Management of Double Counting Risk (G5.9)

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

#### 2.5.11 Emissions Trading Programs and Other Binding Limits

The project will not seek to generate or has received any form of environmental credits, and the GHG emission removals generated by the project will not be used for compliance under such programs or mechanisms.

#### 2.5.12 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates.

#### 2.5.13 Participation under Other GHG Programs

The project has not been participated under any other GHG programs.

#### 2.5.14 Projects Rejected by Other GHG Programs

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

#### 2.5.15 Double Counting (G5.9)

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

# 3 CLIMATE

## 3.1 Application of Methodology

### 3.1.1 Title and Reference of Methodology

- VM0026 Sustainable Grassland Management, v1.1
- Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0

- Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM AR Project Activities, v1.0
- Guidelines for sampling and surveys for CDM project activities and programmes of activities, v 4.0
- VMD0033 Estimation of emissions from Market leakage, v1.0
- VMD0040 Leakage from displacement of grazing activities, v1.0

### 3.1.2 Applicability of Methodology

This methodology applies to Agricultural Land Management (ALM) project activities that introduce sustainable grassland management practices such as improving the rotation of grazing animals between grassland areas, limiting the number of grazing animals on degraded grassland, and restoring severely degraded grasslands by replanting with grasses and ensuring appropriate management over the long-term into a grassland landscape.

VM0026/Version 1.1 “Sustainable Grassland Management” are applicable under the following conditions:

| Applicability conditions | Justification / Explanation |
|---|---|
| 1. The project area is grassland at the start of the project. | According to the land cover data of Zhangye city in year 2010, which released by the National Basic Geographic Information Center (Figure 2-5), combined with project area location (Figure 2-2), and the satellite image (Figure 2-6, Figure 2-7), the project area is identified as grassland at the start of the project. |
| 2.The project area is land that is degraded at the start of the project and degradation will continue in the baseline scenario on the basis that degradation drivers or pressures are still present in the baseline scenario. The procedures outlined the latest version of the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities must be used to determine both that the land is degraded at the start of the project and that in the baseline scenario the land will continue to degrade. | Besides, as the described in “Project Design Report”, all the project was degraded grassland. And the project’s aim is to increase carbon sequestration and contribute to local sustainable development by rotational grazing, rest grazing and reseeding grass on the degraded and carrying out sustainable grassland management. The procedures outlined the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in |

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| | Implementing CDM A/R Project Activities (Version 1.0) is described below.<br><br>The presence of one of the following is enough for demonstrating that land is "degraded" and/or "degrading":<br><br>(a) Provide documented evidence that the area has been classified as "degraded" under verifiable local, regional, national or international land classification system or peer-review study, participatory rural appraisal, satellite imagery and/or photographic evidence in the last 10 years. If the documented evidence of degradation is older than ten years then:<br><br>(i) Provide evidence that the natural or anthropogenic degradation drivers and pressures that led to the land becoming "degraded" are still present and/or that there are no insufficient land management interventions to reverse degradation.<br><br>(b) Demonstrate through a comparative study that the candidate lands in the proposed project area have similar or equivalent conditions (e.g. vegetation, soil, climate, topography, altitude, soil class and land use) and socio-economic pressures and drivers of degradation to reference degraded lands elsewhere, verifiably classified and documented as degraded lands. The proof of similarity of lands should be made through verifiable documentation and/or visual field assessment and data sets:<br><br>(c) Demonstrate through direct evidence based on selected indicators of land degradation that the area is "degraded" and/or "degrading" through conducting either a visual assessment of the state and condition of the indicators or a verifiable participatory rural appraisal (PRA). The indicators of degradation should be locally relevant and verifiable. Candidate lands |

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| | shall be declared as “degraded” and/or “degrading” if they show at least one of the following:<br><br>(i) The severity and extent of soil compaction and soil erosion, as determined by the presence of: reductions in topsoil depth (as shown by root exposure, presence of pedestals; exposed sub-soil horizons or armour layers); gully, sheet or rill erosion, landslides, or other forms of mass-movement erosion;<br><br>(ii) Decline in organic matter content and/or recession of vegetation cover as shown by reduction in plant cover or productivity due to overgrazing or other land management practices, thinning of topsoil organic layer, scarcity of topsoil litter and debris (GPS and photo evidence should be provided);<br><br>(iii) Presence of plant species locally known to be related to the condition of degradation of the land or field/lab tests showing nutrient depletion (e.g. reduced growth, leaf loss, dessication, leaf chlorosis), salinity or alkalinity, toxic compounds and heavy metals;<br><br>(iv) A reduction in plant cover or productivity due to overgrazing or other land management practices.<br><br>According to the Parameters for degradation, sandification and salification of rangelands (GB19377— 2003) and Project Design Report, the coverage of project area is reduced 30%-50% compared with original vegetation coverage, was defined as degraded grassland at the start of the project, which met the requirements of item (ii) of Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities (Version 1.0). According to the PRA Report, the grassland in the project area has been degraded for more than ten years due to |

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| | climate change and overgrazing, under the baseline scenario, herders still graze on degraded grassland, while no restoration activities are carried out. So, according to CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities (Version 1.0), the land in the project area is degraded at the start of the project and that in the baseline scenario the land will continue to degrade. |
| 3. The project area is subject to livestock grazing, burning, and/or nitrogen fertilization in the baseline scenario. | According to the PRA Report, Animal husbandry is an important source of income in project area in the baseline scenario, but no burning and nitrogen fertilization. |
| 4. In the baseline scenario, more than 95 percent of animal dung from grazing animals deposited on grassland is allowed to lie as is, and is not managed, and in the project scenario no more than 5 percent of the animal dung from grazing animals within the project area is managed with alternative manure management systems. | In the baseline scenario, there is no<br><br>any restrictions or regulations for the deposition of animal dung in the project area, all animal dung from grazing animals deposited on grassland and is not managed. In the project scenario, the grazing is controlled like rotational grazing requires that the grazing time shall be halved, and rest grazing requires that grazing shall not be carried out within 90 days each year. no animal dung will be managed with alternative manure management systems. |
| 5. The project area must not have been cleared of native ecosystems within the 10 years period prior to the project start date. | According to the Project Design Report and related satellite pictures of the project area, the project area is natural grassland, which is continuously degraded due to overgrazing, and have not been cleared of native ecosystems within the 10 year period prior to the project start date. |
| 6. The project area is located in a region where precipitation is less than evapotranspiration for most of the year and leaching is unlikely to occur. | According to described in Project Design Report, the annual evapotranspiration is greater than annual precipitation in Zhangye generally. What's more, the annual evaporation is 10 times of the annual precipitation in Gao tai country. |

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| 7.If a biogeochemical model is selected for estimation of change in soil carbon stocks, the following conditions must be met:<br><br>The model must comply with the requirements for models as set out in the VCS rules.<br><br>The model must be appropriate for the region within which the project is situated. There must be studies by appropriately qualified experts (eg, scientific journals, university theses, local research studies or work carried out by the project proponent) that demonstrate that the use of the selected biogeochemical model is appropriate for the IPCC climatic regions (see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 3), or the agroecological zone (AEZ) in which the project is situated (see Section 9.3.2). | No biogeochemical model is selected<br><br>In the project the change of soil carbon stock is calculated based on the content of soil organic carbon which is directly monitored from soil samples. |
| 8. Project activities must not include land use change | The project planted grass on the degraded grassland or adopt rotational grazing and rest grazing which would not change the land use. |
| 9. Project activities must not lead to an increase in the use of fossil fuels and fuel wood from non-renewable sources for cooking and heating. | Herders graze around the project area under the guidance of the local forestry and grassland bureau, and use cow dung as fuel, so the project activities will not involve in the use of fossil fuels and fuel wood. |
| 10. Project activities must not occur on wetlands or peatlands. | According to the Project Design Report and related satellite pictures of the project area, the project area is the grassland, not involving wetlands and peatlands. |

Therefore, VM0026/Version 1.1 is applicable for the proposed project.

Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities (Version 3.0) is applicable under the following conditions:

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

The restoration of degraded grassland is encouraged in China, and there is no legal prohibition for the project, therefore the proposed project activity on the land within the project boundary does not lead to violation of any applicable law.

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

The baseline scenario is identified using the methodology “Sustainable Grassland Management” (Version 1.0), which provides for a stepwise approach justifying the determination of the most plausible baseline scenario no new baseline methodologies involved. Please refer to Section 3.1.4 for details.

Therefore, tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities (Version 3.0) is applicable for the proposed project.

Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM AR Project Activities (version 1.0) provides a procedure for the identification of degraded or degrading lands for the purpose of application of A/R CDM methodologies. There is no mandatory applicability requirement.

According to Appendix of 1 Eligible AFOLU Project Categories of the VCS Standard (version 4.1), eligible ALM activities are those that reduce net GHG emissions on croplands and grasslands by increasing carbon stocks in soils and woody biomass and/or decreasing $CO_2$, $N_2O$ and/or $CH_4$ emissions from soils. The project area shall not be cleared of native ecosystems within the 10-year period prior to the project start date. Eligible ALM activities include:

1) Improved Cropland Management (ICM): This category includes practices that demonstrably reduce net GHG emissions of cropland systems by increasing soil carbon stocks, reducing soil $N_2O$ emissions, and/or reducing $CH_4$ emissions.

2) Improved Grassland Management (IGM): This category includes practices that demonstrably reduce net GHG emissions of grassland ecosystems by increasing soil carbon stocks, reducing $N_2O$ emissions and/or reducing $CH_4$ emissions.

3) Cropland and Grassland Land-use Conversions (CGLC): This category includes practices that convert cropland to grassland or grassland to cropland and reduce net GHG emissions by increasing carbon stocks, reducing $N_2O$ emissions, and/or reducing $CH_4$ emissions

The project restored degraded grassland by improving the management like rotational grazing, rest grazing and reseeding of grass. It increases soil carbon stocks, reduce $N_2O$ and $CH_4$ emissions, which met the requirements of Improved Grassland Management (IGM)

So, all the Tool used is the methodology VM0026/Version 1.1 referenced, and it is applicable for the project.

### 3.1.3 Project Boundary

As stated above, Zhangye city defined as the project zone, and the area which adopting planting and fence building are defined as project area, thus the project boundaries are the administrative boundaries of Zhangye, which is illustrated from Figure 2-1 to Figure 2-2 before.

The carbon pools selected for under baseline and project accounting of carbon stock changes are shown in Table 3-1:

Table 3-1 Selected Carbon Pools under Baseline and Project

| Carbon Pools | Included? | Justification/Explanation |
|---|---|---|
| Aboveground woody biomass | Yes | SGM may reduce aboveground woody biomass. |
| Aboveground non-woody biomass | No | The increase of aboveground non-woody biomass resulting from SGM is transient in nature and can be conservatively excluded. |
| Belowground biomass | No | It is a conservative choice to exclude the below-ground biomass. |
| Dead wood | No | None of the applicable SGM practices decrease dead wood. |
| Litter | No | None of the applicable SGM practices decrease the amount of litter. |
| Soil organic carbon | Yes | A major carbon pool affected by grassland management practices that is expected to increase after adoption of SGM practices. |
| Wood products | No | None of the applicable SGM practices increases or decreases wood products. |

The emission sources and GHGs selected for accounting are shown in Table 3-2:

Table 3-2 Emission sources and GHGs selected for accounting

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Use of fertilizers | $CO_2$ | No | Not applicable |
| | | $CH_4$ | No | Not applicable |
| | | $N_2O$ | No | No fertilizer was used in baseline scenario. |
| | Use of N-fixing species | $CO_2$ | No | Not applicable |
| | | $CH_4$ | No | Not applicable |
| | | $N_2O$ | No | Methodological requirements |
| | Burning of biomass | $CO_2$ | No | No burning of biomass occurred in baseline scenario. |
| | | $CH_4$ | No | No burning of biomass occurred in baseline scenario. |
| | | $N_2O$ | NO | No burning of biomass occurred in baseline scenario. |
| | Manure deposition on grassland | $CO_2$ | No | Methodological requirements |
| | | $CH_4$ | Yes | There is manure deposition under the baseline scenario. It is a significant emission source. |
| | | $N_2O$ | Yes | Main gas for this source. Annual precipitation in the project area is less than annual potential evapotranspiration, so indirect $N_2O$ emissions from leaching and runoff can be excluded from the project boundary. |
| | Farming machine | $CO_2$ | No | No farming machinery was used in baseline scenario. |
| | | $CH_4$ | No | No farming machinery was used in baseline scenario. |
| | | $N_2O$ | No | No farming machinery was used in baseline scenario. |
| | Animal respiration / Enteric fermentation | $CO_2$ | No | Methodological requirements |
| | | $CH_4$ | Yes | Grazing exists in the project area under the baseline scenario and $CH_4$ is the main gas for this source |
| | | $N_2O$ | No | Methodological requirements |
| Project | Use of fertilizers | $CO_2$ | No | Not applicable |
| | | $CH_4$ | No | Not applicable |
| | | $N_2O$ | No | No fertilizer was used in project scenario. |
| | Use of N-fixing species | $CO_2$ | No | Not applicable |
| | | $CH_4$ | No | Not applicable |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | $N_2O$ | No | No N-fixing species were planted in the project. |
| | Burning of biomass | $CO_2$ | No | No burning of biomass occurred in project scenario. |
| | | $CH_4$ | No | No burning of biomass occurred in project scenario. |
| | | $N_2O$ | NO | No burning of biomass occurred in project scenario. |
| | Manure deposition on grassland | $CO_2$ | No | Methodological requirements |
| | | $CH_4$ | Yes | There is manure deposition under the project scenario. It is a significant emission source. |
| | | $N_2O$ | Yes | Main gas for this source. Annual precipitation in the project area is less than annual potential evapotranspiration, so indirect $N_2O$ emissions from leaching and runoff can be excluded from the project boundary. |
| | Farming machine | $CO_2$ | Yes | The use of trucks and tractors during the implementation of the project consumes diesel oil and emits $CO_2$. |
| | | $CH_4$ | No | Methodological requirements |
| | | $N_2O$ | No | Methodological requirements |
| | Animal respiration / Enteric fermentation | $CO_2$ | No | Methodological requirements |
| | | $CH_4$ | Yes | Grazing exists in the project area under the project scenario and $CH_4$ is the main gas for this source |
| | | $N_2O$ | No | Methodological requirements |

### 3.1.4 Baseline Scenario

**Step 1. Identification of alternative land use scenarios to the proposed SGM project**

**Sub-step 1a) Identify and list all credible alternative land use scenarios to the proposed SGM project:**

According to “Sustainable Grassland Management” (Version 1.1), the project refers to the VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities for guidance on identification of realistic and credible alternative land uses.

As stated in the following section 3.1.5, the identified land use scenarios shall at least include:

i. Continuation of pre-project land use

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

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

- Legal requirements; or
- Extrapolation of observed similar activities in the geographical area with similar socioeconomic and ecological conditions to the proposed VCS AFOLU project activity occurring in the period beginning ten years prior to the project start date.

For (iii), the lands within the project boundary of the proposed VCS AFOLU project are all with the same legal requirements, there are no legal requirements to carry out similar project activities. And according to the PRA Report and satellite pictures, the project area existed as degraded land more than ten years prior to the project start date. So (iii) is not applicable.

Pre-project land use scenario is degraded grassland ecosystem which is the common situation in Zhangye (See relevant proof process of 3.1.2). It is feasible for the project area taking into account local grassland resources were severely damaged for more than ten years. China has successively issued and revised a series of laws and administrative regulations related to grassland such as Regulations of Gansu Province on grassland prohibit destruction of grassland like mining and construction without pre-approval by local authority . But none of the laws and regulations mandate the restoration of degraded grassland the same as our project activities. Therefore, the degradation of the grassland of the project area would continue in the absence of the project, the restoration measures implemented by the project activities such as reseeding grasses, rest grazing and rotational grazing are not be mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. Thus Scenario (i) remains possible baseline scenario.

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

**Outcome of Sub-step 1a: List of credible alternative land use scenarios that could have occurred on the land within the project boundary of the VCS AFOLU project.**

As described before, the list of credible alternative land use scenarios is Scenario (i) and (ii).

**Sub-step 1b) Check the consistency of credible alternative land use scenarios with enforced mandatory applicable laws and regulations:**

China has successively issued and revised a series of laws and administrative regulations related to grassland, such as the Law of the People's Republic of China on Grasslands[32], Regulations of

[32] http://www.gov.cn/gongbao/content/2003/content_62420.htm

Gansu Province on Grasslands[33], Regulations of the people's Republic of China on the Protection of Wild Plants and Animals[34], the Regulation on Nature Reserve[35], the Regulation on Grassland Fire Control[36], and the Regulation on Forest Diseases and Pests Control[37], etc.

Although these regulations had set overall development goals for grassland 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 regulations mandate the restoration of degraded grassland ecosystem. Thus, the scenario (i) Continuation of pre-project land use is in compliance with mandatory legislation and regulations.

And in China, there is no restrictions, fees or fines for the restoration of degraded grassland as long as the planting area has not been approved for other use. For this project, the project area is located in Zhangye where all the land are approved for the restoration of degraded grassland, therefore the scenario (ii) that project activity on the land within the project boundary performed without being registered as the VCS AFOLU project is also in compliance with mandatory legislation and regulations.

**Outcome of Sub-step 1b:** List of plausible alternative land use scenarios to the VCS AFOLU project activity that are in compliance with mandatory legislation and regulations taking into account their enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Thus Scenario (i) and (ii) remains possible baseline scenarios.

**Step 2: Select the most plausible baseline scenario**

**Sub-step 2a) Barrier analysis:**

The barrier analysis was conducted to identify realistic and credible barriers that prevent implementation of these land use scenarios following the procedures described in Step 3 of the VCS Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities.

**1. Investment barriers**

As the Project Design Report described, the project restored degraded grassland by seeding grass, building fences to implement rotational grazing and rest grazing, the total investment is 299.89 million RMB, which comes from the central and local government. In order to ensure the sustainable development of the project, local herders were employed as grassland guardians, with an annual salary of 24,000 RMB (3,758.4 USD) per person, which needs to be raised by the project proponent. Since the project has no benefits, there is no institutional investment. Therefore, the investment barrier for this project is the lack of access to credit.

**2. Technological barriers**

[33] http://www.gsrdw.gov.cn/html/2006/gsfg_1201/10896.html
[34] http://www.gov.cn/gongbao/content/2019/content_5468858.htm
[35] http://www.forestry.gov.cn/main/3950/20170314/459882.html
[36] http://www.gov.cn/zhengce/zhengceku/2008-12/05/content_2756.htm
[37] http://www.forestry.gov.cn/main/3950/20170314/459886.html

For Scenario (ii), project activity on the land within the project boundary performed without being registered as the VCS AFOLU project, the project owner needs to hire local residents to plant grass, but local residents lack access to high-quality grass seeds and necessary tools, such as trucks, tractors and seeders, etc. They also lack skills in grass planting, fence building, livestock shed construction, fire prevention, and sustainable grassland management. In addition, the lack of organizational instruments also prevents them from overcoming technological barriers. Therefore, the technological barrier for this project is the lack of access to planting materials and equipment for implementing the technology. Upon applying for VCS and CCB project, the carbon revenue is the key to sustainable management of project area. And without applying for VCS, the above-mentioned investment barriers (lack of access to credit) and technological barriers (lack of access to planting materials and equipment for implementing the technology) would not be overcome.

**Sub-step 2b) Eliminate alternative land use scenarios that face a barrier to implementation:**

Scenario (i) does not require extra investment or labor force. Thus, it is not prevented by any of the identified barriers; Scenario (ii) faces the investment and technological barriers (lack of access to credit, planting materials and equipment for implementing the technology) as stated above which should be eliminated of the list.

**Sub-step 2c) Select most plausible baseline scenario (if allowed by barrier analysis):**

As analyzed in Sub- step 2a and 2b, the baseline scenario of the project is Scenario i: continuation of pre-project use (i.e. lands remain degraded grassland ecosystem).

### 3.1.5 Additionality

Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (version 3.0) is applied to demonstrate the additionality.

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

As described in step 1 of section 3.1.4, the methodology has confirmed the possible baseline scenarios.

**Step 2. Investment analysis**

**Sub-step 2a. Determine appropriate analysis method**

The project generates no financial or economic benefits other than VCS related income, then apply the simple cost analysis (Option I).

**Sub-step 2b. – Option I. Apply simple cost analysis**

According to the Project Design Report, the cost of building fence for rotational grazing and rest grazing is about 31.15 RMB / Mu, planting reseeding grass and fence building is about 75 RMB)/Mu, and the estimated cost for subsequent management and protection would reach 22.8 million RMB (3. 57 million USD)/year during the whole lifetime. Since the project is planting grass

on the black soil beach, there is no financial benefits except VCS related income will be produced by the project.

Then proceed to Step 4 (Common practice analysis) based on the tool.

**Step 4. Common practice analysis**

The previous steps shall be complemented with an analysis of the extent to which similar activities have already diffused in the geographical area of the proposed VCS AFOLU project activity. According to the tool, similar activities are defined as that which are of similar scale, take place in a comparable environment, inter alia, with respect to the regulatory framework and are undertaken in the relevant geographical area, subject to further guidance by the underlying methodology. Other registered VCS AFOLU project activities shall not be included in this analysis. Considerations shall be limited to the period beginning 10 years prior to the project start date.

As the framework conditions vary significantly between each province and Autonomous region of China, the investment climate, tariff, land policy, regulations etc. for degraded grassland restoration project are only comparable in the same province or the same autonomous region. The project is located in Zhangye, so the relevant geographical area for common practice analysis is selected to be Gansu Province.

Based on the public and accessible information, and check in http://cdm.ccchina.gov.cn/, http://cdm.unfccc.int/, VCS, GS website, there were no other sustainable management grassland project on a scale similar with the proposed project have been implemented previously in Gansu Province.

Therefore, the project is no identified within the common practice boundary, so step 4 is not satisfied. Thus, the proposed project activity is not the baseline scenario which is additional.

### 3.1.6 Methodology Deviations

Not applicable.

## 3.2 Quantification of GHG Emission Reductions and Removals

### 3.2.1 Baseline Emissions

**1. Baseline $N_2O$ emissions due to fertilizer use**

According to the Baseline Survey Report and Participatory Rural Appraisal (PRA) Report of the project, no nitrogen fertilizer was applied in baseline scenario.

**2. Baseline emissions due to the use of N-fixing species**

According to the methodology (VM0026/Version 1.1), $N_2O$ emissions due to the use of N-fixing species in the baseline are excluded.

**3. Baseline emissions due to burning of biomass**

According to the Baseline Survey Report and Participatory Rural Appraisal (PRA) Report, there was no biomass burning in the project area in baseline scenario.

**4. Baseline $CH_4$ emissions due to enteric fermentation**

Baseline $CH_4$ emissions from enteric fermentation are calculated using the following:

$$BE_{CH_4EF,b} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,b} \times EF_l \times Days_{l,b}}{1000 \times 365} \quad (1)$$

Where:

| | | |
|---|---|---|
| $GWP_{CH_4}$ | = | Global-warming potential for $CH_4$ (t $CO_2$e/t $CH_4$) |
| $P_{l,b}$ | = | Population of grazing livestock type l, in baseline year b (head) |
| $l$ | = | Index of livestock type |
| $EF_l$ | = | Enteric $CH_4$ emission factor per head of livestock type l per year (kg $CH_4$ head*year) |
| $Days_{l,b}$ | = | Grazing days inside the project area for each livestock type l in baseline year b (days) |
| $1000$ | = | Conversion factor for t $CH_4$ to kg $CH_4$ |
| $365$ | = | Conversion factor for years to days |

**5. Baseline $N_2O$ and $CH_4$ emissions due to manure management**

Baseline emissions from manure management include $N_2O$ and $CH_4$ emissions from manure and urine deposited on grassland soil during the grazing season.

$$BE_{GHG_{MD},b} = BE_{N_2O_{MD},b} + BE_{CH_4MD,b} \quad (2)$$

Where:

| | | |
|---|---|---|
| $BE_{N_2O_{MD},b}$ | = | Baseline $N_2O$ emissions from manure and urine deposited on grassland soil in baseline year b (t $CO_2$e) |
| $BE_{CH_4MD,b}$ | = | Baseline $CH_4$ emissions from manure and urine deposited on grassland soil in baseline year b (t $CO_2$e) |

**1) Baseline $N_2O$ emissions from manure management**

$$BE_{N_2O_{MD},b} = GWP_{N_20} \times \left(BE_{D,N_20_{MD},b} + BE_{ID,N_20_{MD},b}\right) \quad (3)$$

Where:

$GWP_{N_20}$ = Global warming potential for $N_2O$ (t $CO_2e$/t $N_2O$)

$BE_{D,N_20_{MD,b}}$ = Direct $N_2O$ emissions from manure and urine deposited on grassland soil during the grazing season in baseline year b (t $N_2O$)

$BE_{ID,N_20_{MD,b}}$ = Indirect $N_2O$ emissions from manure and urine deposited on grassland soil during the grazing season in baseline year b (t $N_2O$)

**2) Baseline direct $N_2O$ emissions from manure and urine deposited on grassland soils**

Direct Baseline direct $N_2O$ emissions from manure and urine deposited on grassland soil are calculated using the following:

$$BE_{D,N_20_{MD,b}} = \sum_{l1=1}^{L1} F_{MD,l1,b} \times EF_{3,PRP,CPP} \times \frac{44}{28} \quad (4)$$

And/or

$$BE_{D,N_20_{MD,b}} = \sum_{l2=1}^{L2} F_{MD,l2,b} \times EF_{3,PRP,SO} \times \frac{44}{28} \quad (5)$$

$F_{MD,l1,b}$ and $F_{MD,l2,b}$ must be calculated using the following equation for livestock type l.

$$F_{MD,l1,b} = \frac{P_{l,b} \times W_{l,b} \times Nex_l \times H_{l,b} \times Days_{l,b} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \quad (6)$$

Where:

$F_{MD,l1,b}$ = Annual amount of nitrogen in cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season in baseline year b, adjusted for volatilization as $NH_3$ and $NO_x$ (t N)

$F_{MD,l2,b}$ = Annual amount of nitrogen in sheep and other animals manure and urine deposited on grassland soil during the grazing season in baseline year b, adjusted for volatilization as $NH_3$ and $NO_x$ (t N

$EF_{3,PRP,CPP}$ = $N_2O$ emission factor for cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season (kg $N_2O$-N/kg N input)

$EF_{3,PRP,SO}$ = $N_2O$ emission factor for sheep and other animals manure and urine deposited on grassland soil during the grazing season (kg $N_2O$-N/kg N input)

$l1$ = Index of livestock cattle, poultry and pigs

$l2$ = Index of livestock sheep and other animals

$P_{l,b}$ = Population of livestock type l in baseline year b (head)

$W_{l,b}$ = Average weight of livestock type l in baseline year b (kg livestock mass/head)

| | | |
|---|---|---|
| $Nex_l$ | = | Nitrogen excretion of livestock type l (kg N deposited /(t livestock mass*day)) |
| $1000a$ | = | Conversion factor for t livestock mass to kg livestock mass |
| $H_{l,b}$ | = | Average grazing hours per day for livestock type l in baseline year b (hour) |
| $24$ | = | Conversion factor for days to hours |
| $Days_{l,b}$ | = | Grazing days for livestock type l inside the project area in baseline year b (days) |
| $1000b$ | = | Conversion factor for t N to kg N |
| $Frac_{GAS,MD}$ | = | Fraction of volatilization from manure and urine deposited by grazing animals as NH3 and NOx (kg N volatilized/kg of N deposited) |
| $l$ | = | Index of grazing livestock types |

**3) Baseline indirect $N_2O$ emissions from manure and urine deposited on grassland soils**

According to the methodology (VM0026/Version 1.1) and the Project Design Report, the annual precipitation of the project area is less than annual potential evapotranspiration, so, indirect $N_2O$ emissions from leaching and runoff can be excluded.

The indirect $N_2O$ emissions from the atmospheric deposition of N volatilized as $NH_3$ and $NO_x$ after urine and manure N is deposited on grassland soils in baseline year b, are calculated using the following:

$$BE_{ID,N_20_{MD},b} = \sum_{l=1}^{L} F_{MD,l,b} \times Frac_{Gas,MD} \times EF_{4,MD} \times \frac{44}{28} \quad (7)$$

Where:

| | | |
|---|---|---|
| $BE_{ID,N_20_{MD},b}$ | = | Indirect $N_2O$ emissions from manure and urine deposited on grassland soil during the grazing season in baseline year b (t $N_2O$) |
| $F_{MD,l,b}$ | = | Annual amount of manure and urine deposited on grassland soil from livestock type l during the grazing season in baseline year b, adjusted for volatilization as $NH_3$ and $NO_x$ (t N) |
| $Frac_{Gas,MD}$ | = | Fraction of volatilization from manure and urine deposited by grazing animals as $NH_3$ and $NO_x$ (kg N volatilized/kg of N deposited) |
| $EF_{4,MD}$ | = | $N_2O$ emission factor for atmospheric deposition of urine and manure N on soils and water surfaces, (kg $N_2O$-N/(kg $NH_3$-N + $NO_x$-N volatilized)) |
| $L$ | = | Index of grazing livestock types |

**4) $CH_4$ emissions from manure management**

Baseline $CH_4$ emissions from manure management are calculated using the following:

$$BE_{CH_4MD,b} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,b} \times H_{l,b} \times Days_{l,b}}{1000 \times 24 \times 365} \quad (8)$$

Where:

| | | |
|---|---|---|
| $P_{l,b}$ | = | Population of grazing livestock type l, in baseline year b, head |
| $EF_{lM}$ | = | $CH_4$ emission factor from manure of livestock type l (kg $CH_4$/(head*year)) |
| $H_{l,b}$ | = | Average grazing hours per day for livestock type l in baseline year b (hour) |
| $Days_{l,b}$ | = | Grazing days for livestock type l inside the project area in baseline year b (days) |
| 1000 | = | Conversion factor for t $CH_4$ to kg $CH_4$ |
| 365 | = | Conversion factor for years to days |
| 24 | = | Conversion factor for days to hours |

**6. Baseline $CO_2$ emissions due to the use of fossil fuels for grassland management**

According to the Participatory Rural Appraisal (PRA) Report and Project Design Report, there was no grassland management in baseline scenario, thus did not involve agricultural machinery.

**7. Baseline emission removals from existing woody perennials**

According to the Baseline Survey Report and Participatory Rural Appraisal (PRA) Report, there were no perennial woody plants in the project area under the baseline scenario.

**8. Baseline emission removals due to changes in soil organic carbon**

According to the methodology, since the applicability conditions limit the project to land that is degraded and is continuing to degrade, it can be conservatively assumed that the changes in SOC in the baseline scenario is 0 $tCO_2e$.

**Baseline emissions and removals**

The emissions and removals in baseline year b are calculated as follows:

$$BE_b = BE_{N_20_{SN},b} + BE_{BBb} + BE_{CH_4EF,b} + BE_{GHG_{MD},b} + BE_{FC,b} - BRWP_b \quad (9)$$

Where:

| | | |
|---|---|---|
| $BE_b$ | = | Baseline emissions and removals in year b (t $CO_2e$) |
| $BE_{N_20_{SN},b}$ | = | Baseline $N_2O$ emissions due to fertilizer use in baseline year b (t $CO_2e$) |
| $BE_{BBb}$ | = | Baseline GHG emissions from biomass burning in baseline year b (t $CO_2e$) |
| $BE_{CH_4EF,b}$ | = | Baseline $CH_4$ emissions from enteric fermentation in baseline year b (t $CO_2e$) |

$BE_{GHG_{MD,b}}$ = Baseline GHG emissions from manure management in baseline year b (t $CO_2e$)

$BE_{FC,b}$ = Baseline $CO_2$ emissions from farming machine fossil fuel consumption in baseline year b, (t $CO_2$)

$BRWP_b$ = Baseline removals from existing woody perennials in baseline year b (t $CO_2$)

As described above, baseline emissions due to enteric fermentation and manure management should be calculated.

$$BE_b = BE_{CH_{4EF,b}} + BE_{GHG_{MD,b}}$$

$$= BE_{CH_{4EF,b}} + BE_{N_2O_{MD,b}} + BE_{CH_{4MD,b}}$$

$$= \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,b} \times EF_l \times Days_{l,b}}{1000 \times 365} + GWP_{N_20} \times \left(\sum_{l1=1}^{L1} \frac{P_{l,b} \times W_{l,b} \times Nex_l \times H_{l,b} \times Days_{l,b} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,CPP} \times \frac{44}{28} + \sum_{l2=1}^{L2} \frac{P_{l,b} \times W_{l,b} \times Nex_l \times H_{l,b} \times Days_{l,b} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,SO} \times \frac{44}{28} + \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,b} \times H_{l,b} \times Days_{l,b}}{1000 \times 24 \times 365}\right) \quad (10)$$

=75,380+7,024+525

=82,929 $tCO_2e$

Therefore, the baseline emissions are 82,929 $tCO_2e$, please refer to ER spreadsheet for detailed calculation.

### 3.2.2 Project Emissions

1. **Project $N_2O$ emissions due to fertilizer use**

According to the Project Design Report of the project, no nitrogen fertilizer was applied in baseline scenario of the project area

**2. Project emissions due to the use of N-fixing species**

According to the Project Design Report, the project reseeding *Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra, and Artemisia sphaerocephala* on the degraded grassland, which did not involve N-fixing species.

**3. Project emissions due to burning of biomass**

According to the records of grassland guardian and Annual statistical yearbook of Zhangye City[38], there is no biomass burning in this project.

**4. Project $CH_4$ emissions due to enteric fermentation**

Project $CH_4$ emissions from enteric fermentation are calculated using the following:

[38] http://www.zhangye.gov.cn/tjj/ztzl/tjsj/

$$PE_{CH_4EF,t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,t} \times EF_l \times Days_{l,t}}{1000 \times 365} \quad (11)$$

Where:

| | | |
|---|---|---|
| $GWP_{CH_4}$ | = | Global-warming potential for $CH_4$ (t $CO_2e$/t $CH_4$) |
| $P_{l,t}$ | = | Population of grazing livestock type l in year t under project (head) |
| $l$ | = | Index of livestock type |
| $EF_l$ | = | Enteric $CH_4$ emission factor per head of livestock type l per year (kg $CH_4$ head*year) |
| $Days_{l,t}$ | = | Grazing days inside the project area for each livestock type l in project year t (days) |
| 1000 | = | Conversion factor for t $CH_4$ to kg $CH_4$ |
| 365 | = | Conversion factor for years to days |

**5. Project $N_2O$ and $CH_4$ emissions due to manure management**

Project emissions from manure management include $N_2O$ and $CH_4$ emissions from manure and urine deposited on grassland soil during the grazing season.

$$PE_{GHG_{MD,t}} = PE_{N_2O_{MD,t}} + PE_{CH_4{MD,t}} \quad (12)$$

Where:

| | | |
|---|---|---|
| $PE_{N_2O_{MD,t}}$ | = | Project $N_2O$ emissions from manure and urine deposited on grassland soil in year t (t $CO_2e$) |
| $PE_{CH_4{MD,t}}$ | = | Project $CH_4$ emissions from manure and urine deposited on grassland soil in year t (t $CO_2e$) |

**1) Project $N_2O$ emissions from manure management**

$$PE_{N_2O_{MD,t}} = GWP_{N_20} \times \left(PE_{D,N_20_{MD,t}} + PE_{ID,N_20_{MD,t}}\right) \quad (13)$$

Where:

| | | |
|---|---|---|
| $GWP_{N_20}$ | = | Global warming potential for $N_2O$ (t $CO_2e$/t $N_2O$) |
| $PE_{D,N_20_{MD,t}}$ | = | Direct $N_2O$ emissions from manure and urine deposited on grassland soil during the grazing season in year t (t $N_2O$) |
| $PE_{ID,N_20_{MD,t}}$ | = | Indirect $N_2O$ emissions from manure and urine deposited on grassland soil during the grazing season in year t (t $N_2O$) |

**2) Project direct $N_2O$ emissions from manure and urine deposited on grassland soils**

Direct Project direct $N_2O$ emissions from manure and urine deposited on grassland soil are calculated using the following:

$$PE_{D,N_2O_{MD},t} = \sum_{l1=1}^{L1} F_{MD,l1,t} \times EF_{3,PRP,CPP} \times \frac{44}{28} \quad (14)$$

And/or

$$PE_{D,N_2O_{MD},t} = \sum_{l2=1}^{L2} F_{MD,l2,t} \times EF_{3,PRP,SO} \times \frac{44}{28} \quad (15)$$

$F_{MD,l1,t}$ and $F_{MD,l2,t}$ must be calculated using the following equation for livestock type l.

$$F_{MD,l1,t} = \frac{P_{l,t} \times W_{l,t} \times Nex_l \times H_{l,t} \times Days_{l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \quad (16)$$

Where:

| | | |
|---|---|---|
| $F_{MD,l1,t}$ | = | Annual amount of nitrogen in cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season in year t, adjusted for volatilization as $NH_3$ and $NO_x$ (t N) |
| $F_{MD,l2,t}$ | = | Annual amount of nitrogen in sheep and other animals' manure and urine deposited on grassland soil during the grazing season in year t, adjusted for volatilization as $NH_3$ and $NO_x$ (t N) |
| $EF_{3,PRP,CPP}$ | = | $N_2O$ emission factor for cattle, poultry and pigs' manure and urine deposited on grassland soil during the grazing season (kg $N_2O$-N/kg N input) |
| $EF_{3,PRP,SO}$ | = | $N_2O$ emission factor for sheep and other animals' manure and urine deposited on grassland soil during the grazing season (kg $N_2O$-N/kg N input) |
| $l1$ | = | Index of livestock cattle, poultry and pigs |
| $l2$ | = | Index of livestock sheep and other animals |
| $P_{l,t}$ | = | Population of livestock type l in year t (head) |
| $W_{l,t}$ | = | Average weight of livestock type l in year t (kg livestock mass/head) |
| $Nex_l$ | = | Nitrogen excretion of livestock type l (kg N deposited /(t livestock mass*day)) |
| $1000a$ | = | Conversion factor for t livestock mass to kg livestock mass |
| $H_{l,b}$ | = | Average grazing hours per day for livestock type l in year t (hour) |
| $24$ | = | Conversion factor for days to hours |
| $Days_{l,t}$ | = | Grazing days for livestock type l inside the project area in year t (days) |

| | | |
|---|---|---|
| $1000b$ | = | Conversion factor for t N to kg N |
| $Frac_{GAS,MD}$ | = | Fraction of volatilization from manure and urine deposited by grazing animals as $NH_3$ and NOx (kg N volatilized/kg of N deposited) |
| $l$ | = | Index of grazing livestock types |

**3) Project indirect $N_2O$ emissions from manure and urine deposited on grassland soils**

According to the methodology (VM0026/Version 1.1) and the Project Design Report, the annual precipitation of the project area is less than annual potential evapotranspiration, so, indirect $N_2O$ emissions from leaching and runoff can be excluded.

The indirect $N_2O$ emissions from the atmospheric deposition of N volatilized as $NH_3$ and $NO_x$ after urine and manure N is deposited on grassland soils in year t under the project, are calculated using the following:

$$PE_{ID,N_20_{MD},t} = \sum_{l=1}^{L} F_{MD,l,t} \times Frac_{Gas,MD} \times EF_{4,MD} \times \frac{44}{28} \quad (17)$$

Where:

| | | |
|---|---|---|
| $PE_{ID,N_20_{MD},t}$ | = | Indirect $N_2O$ emissions from manure and urine deposited on grassland soil during the grazing season in year t (t $N_2O$) |
| $F_{MD,l,t}$ | = | Annual amount of manure and urine deposited on grassland soil from livestock type l during the grazing season in Project year t, adjusted for volatilization as $NH_3$ and $NO_x$ (t N) |
| $Frac_{Gas,MD}$ | = | Fraction of volatilization from manure and urine deposited by grazing animals as $NH_3$ and $NO_x$ (kg N volatilized/kg of N deposited) |
| $EF_{4,MD}$ | = | $N_2O$ emission factor for atmospheric deposition of urine and manure N on soils and water surfaces, (kg $N_2O$-N/(kg $NH_3$-N + $NO_x$-N volatilized)) |
| $L$ | = | Index of grazing livestock types |

**4) $CH_4$ emissions from manure management**

Project $CH_4$ emissions from manure management are calculated using the following:

$$PE_{CH_4MD,t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,t} \times H_{l,t} \times Days_{l,t}}{1000 \times 24 \times 365} \quad (18)$$

Where:

| | | |
|---|---|---|
| $P_{l,t}$ | = | Population of grazing livestock type l, in year t, head |
| $EF_{lM}$ | = | $CH_4$ emission factor from manure of livestock type l (kg $CH_4$/(head*year)) |
| $H_{l,t}$ | = | Average grazing hours per day for livestock type l in year t (hour) |
| $Days_{l,t}$ | = | Grazing days for livestock type l inside the project area in year t (days) |

| | | |
|---|---|---|
| 1000 | = | Conversion factor for t $CH_4$ to kg $CH_4$ |
| 365 | = | Conversion factor for years to days |
| 24 | = | Conversion factor for days to hours |

**6. Project $CO_2$ emissions due to the use of fossil fuels**

According to Project Design Report, project emissions from the use of fossil fuels are larger than baseline emissions although the project construction follows the principle of energy conservation and environmental protection, so the project emissions from the use of fossil fuels must be account.

Project $CO_2$ emissions due to the use of fossil fuels are calculated using the following:

$$PE_{FC,t} = \frac{\sum_{p=1}^{P}\sum_{j=1}^{J} FC_{p,j,k,t} \times EF_{CO_2,k} \times NCV_k}{1000} \quad (19)$$

Where:

| | | |
|---|---|---|
| $PE_{FC,t}$ | = | Fuel consumption by fuel type k, by machine type j, on grassland parcel p, in year t (kg fuel/year) |
| $EF_{CO_2,k}$ | = | $CO_2$ emission factor by fuel type k (t $CO_2$/GJ). |
| $NCV_k$ | = | Thermal value of fuel type k (GJ/t fuel) |
| 1000 | = | Conversion factor for tonnes fuel to kg fuel |
| $k$ | = | Index of fuel type |
| $j$ | = | Index of machine type |
| $P$ | = | Index of grassland parcel |

**7. Project removals from woody perennials**

According to the Project Design Report, the project planted grass on the degraded grassland, and no woody plants were planted. So, the project removals from woody perennials are considered to be 0 $tCO_2e$.

**8. Project removals due to changes in soil organic carbon**

Estimate of project removals due to changes in SOC using a direct measurement approach (Option 2). According to the methodology, for measuring soil organic carbon stock changes, soil sampling must follow a scientifically established method (eg, methods described in Carter and Gregoroch, 2006), or a nationally-approved standard. For the project, the nationally-approved standard *The*

*Technical Specification for Soil Environmental Monitoring* (HJ/T 166-2004)[39] was used for sampling process. *National standard Method for Determination of Soil Organic Matter* (NY/T 1121.6-2006)[40] was used to measure SOC of the soil samples.

Sampling procedures were designed such that the statistical significance of soil carbon stock changes between the baseline carbon stock and the carbon stock in time t can be determined with a 95 percent confidence interval. The Guidelines for sampling and surveys for CDM project activities and programmes of activities was followed to determine the sampling procedure and sample size.

The SOC stock in stratum s, sampling site i, under project in year t are calculated using the following:

$$P_{SOC_{mG,s,i,t}} = SOC_{mG,s,i,t} \times BD_{mG,s,i,t} \times Depth \times \left(1 - FC_{mG,s,i,t}\right) \times 0.1 \qquad (20)$$

Where:

| | | |
|---|---|---|
| $P_{SOC_{mG,s,i,t}}$ | = | SOC stock in the top 30 cm (or greater depth if required) of soil for management practice $mG$, stratum s, sampling site i under project in year t (t C/ha) |
| $SOC_{mG,s,i,t}$ | = | SOC content in the top 30 cm of soil (or greater depth if required) for management practice $mG$, stratum s, sampling site i, under project in year t (g C/kg soil) |
| $BD_{mG,s,i,t}$ | = | Soil bulk density in the top 30 cm of soil (or greater depth if required) for management practice $mG$, stratum s, sampling site i, under project in year t (g soil/cm$^3$) |
| $Depth$ | = | Top soil depth, for calculating grassland SOC stock in the top 30 cm of soil (or greater depth if required) (cm) |
| $FC_{mG,s,i,t}$ | = | Percentage of rocks larger than 2mm, roots, and other dead residues with a diameter in the top 30 cm of soil (or greater depth if required), for management practice $mG$, stratum s, sampling site i under project in year t (percent) |
| 0.1 | = | Conversion factor for SOC to t C/ha |
| $mG$ | = | Index of management practice |
| $s$ | = | Index of stratum |
| $i$ | = | Index of sampling site |

[39] https://www.doc88.com/p-3601441653334.html, Issued by the Ministry of Ecology and Environment of the People's Republic of China in 2004.
[40] Issued by the Ministry of Agriculture of the People's Republic of China in 2006.

Calculate average carbon stock of all monitored sites in management practice $mG$, stratum s, under project using the following:

$$P_{SOC_{mG,s,t}} = \frac{\sum_{i}^{I} P_{SOC_{mG,s,i,t}}}{I} \quad (21)$$

Where:

| | | |
|---|---|---|
| $P_{SOC_{mG,s,t}}$ | = | Average carbon stock in stratum s under project (t C/ha) |
| $P_{SOC_{mG,s,i,t}}$ | = | SOC stock in the top 30 cm (or greater depth if required) of soil for management practice $mG$, stratum s, sampling site i under project in year t (t C/ha) |
| $I$ | = | Monitored sites in stratum s, under project |

The following is used to calculate the difference between the carbon stock for management practice $mG$ under project in year t, and the carbon stock under the baseline scenario, for all strata.

$$P_{mG,t} = \sum_{s=1}^{S}\left(P_{SOC_{mG,s,t}} - SOC_{S,Baseline}\right) \times PA_{mG,s,t} \quad (22)$$

Where:

| | | |
|---|---|---|
| $P_{mG,t}$ | = | Difference in the carbon stock between the project in year t and the baseline scenario (t C) |
| $PA_{mG,s,t}$ | = | Project areas with management practice $mG$ in stratum s in year t (ha) |
| $P_{SOC_{mG,s,t}}$ | = | Average carbon stock in stratum s under project in year t (t C / ha) |
| $SOC_{S,Baseline}$ | = | Baseline SOC stock of stratum s, in the top 30 cm soil layer (or greater depth if required) (t C / ha) |
| $S$ | = | Strata under project |
| $s$ | = | Index of stratum |

The following is applied to calculate average carbon stock of all management practice, under project in year t.

$$P_t = \sum_{mG=1}^{M} P_{mG,t} \quad (23)$$

Where:

| | | |
|---|---|---|
| $P_t$ | = | Carbon stock under project in year t (t C) |
| $M$ | = | Number of management practice |

For the first monitoring of SOC stock, the annual project removals due to changes in SOC stock in year t must be calculated using the following:

$$PR_t = \frac{(P_t)}{n} \times \frac{44}{12} \quad (24)$$

Where：

| | | |
|---|---|---|
| $PR_t$ | = | Project removals due to changes in SOC in year t (t CO2e) |
| $n$ | = | Number of years from the project start date to year t (years) |

For the second and subsequent monitoring of SOC stock, the annual project removals due to changes in SOC stock in year t must be calculated using the following:

$$PR_t = \frac{(P_t - P_{t-f})}{f} \times \frac{44}{12} \quad (25)$$

Where：

| | | |
|---|---|---|
| $PR_t$ | = | Project removals due to changes in SOC in year t (t $CO_2$e) |
| $P_t$ | = | Carbon stock under project in year t (t C) |
| $P_{t-f}$ | = | Carbon stock under project in year t-f (t C) |
| $f$ | = | SOC monitoring frequency (years) |

**9. Uncertainty analysis**

All parameters are selected according to section 9.1 and 9.2 of the methodology (VM0026, Version 1.1), and soil organic carbon data are obtained by laboratory tests. For the project, the project proponent conducted a survey of all grazing agents whose livestock grazed in the project area prior to the project start date. This survey covered a full census of project participants and project nonparticipants whose livestock graze in the project area during the baseline period (covering the one year prior to the project start date) covered by the survey, and collected grazing data in the project area under the baseline scenario, such as the number and days of grazing, etc. Also, the project proponent and the county forestry and grassland bureau recorded all the diesel oil consumed by the project in Project Design Report. So the parameters about grazing and diesel oil consumption are conservative, and the uncertainty is considered to be 0.

As mentioned before, the project use Option 2 (measurement approach) to estimate project removals due to changes in SOC, the measured SOC changes is derived from sample surveys undertaken within the project area, and the sample size is large, therefore a conservative estimate of carbon sequestration by carbon pools in the project scenario should be given by adopting a value that represents the lower bound of the 95 percent confidence interval (sample mean - 1.96 × standard error).

However, for the ex-ante estimation in this PD, the SOC changes in project scenario is based on the literature sources[41], therefore the uncertainty is considered to be zero. And the confidence interval will be adopted in the following verification.

Project net GHG emissions by sources and removals by sinks

Project net GHG emissions by sources and removals by sinks are calculated as follows:

$$PE_t = PE_{N_2O_{SN},t} + PE_{N_2O_{NF},t} + PE_{GHG_{BB},t} + PE_{CH_{4EF},t} + PE_{GHG_{MD},t} + PE_{FC,t} - PRWP_t - PR_t \quad (26)$$

Where：

| | | |
|---|---|---|
| $PE_t$ | = | Project net GHG emissions by sources and removals by sinks in year t (t $CO_2e$) |
| $PE_{N_2O_{SN},t}$ | = | Project $N_2O$ emissions due to fertilizer use in year t (t $CO_2e$) |
| $PE_{N_2O_{NF},t}$ | = | Project $N_2O$ emissions as a result of N-fixing species within the project area in year t (t $CO_2e$) |
| $PE_{GHG_{BB},t}$ | = | Project GHG emissions from biomass burning in year t (t $CO_2e$) |
| $PE_{CH_{4EF},t}$ | = | Project $CH_4$ emissions from enteric fermentation in year t (t $CO_2e$) |
| $PE_{GHG_{MD},t}$ | = | Project GHG emissions from manure management in year t (t $CO_2e$) |
| $PE_{FC,t}$ | = | Project $CO_2$ emissions from farming machine fossil fuel consumption in year t (t $CO_2$) |
| $PRWP_t$ | = | Project average net change in carbon stocks of existing woody biomass in year t (t $CO_2$) |
| $PR_t$ | = | Project removals due to changes in SOC in year t (t $CO_2e$) |

As described above, project emissions due to enteric fermentation, manure management and the use of fossil fuels, and project removals due to changes in soil organic carbon should be calculated.

$$PE_t = PE_{CH_{4EF},t} + PE_{GHG_{MD},t} + PE_{FC,t} - PR_t \quad (27)$$

$$= PE_{CH_{4EF},t} + PE_{N_2O_{MD},t} + PE_{CH_{4_{MD},t}} + PE_{FC,t} - PR_t$$

[41] Zhou Xiaoyan.(2019) Impacts of different restoration years of returning grazing land to grassland on community characteristics and soil nutrients of alpine grassland in Maqu County

$$= \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,t} \times EF_l \times Days_{l,t}}{1000 \times 365} + GWP_{N_2 0} \times \left( \sum_{l1=1}^{L1} \frac{P_{l,t} \times W_{l,t} \times Nex_l \times H_{l,t} \times Days_{l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,CPP} \times \frac{44}{28} + \sum_{l2=1}^{L2} \frac{P_{l,t} \times W_{l,t} \times Nex_l \times H_{l,t} \times Days_{l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,SO} \times \frac{44}{28} + \sum_{l=1}^{L} F_{MD,l,t} \times Frac_{Gas,MD} \times EF_{4,MD} \times \frac{44}{28} \right) + PE_{CH_4MD,t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,t} \times H_{l,t} \times Days_{l,t}}{1000 \times 24 \times 365} + PE_{FC,t} \frac{\sum_{p=1}^{P} \sum_{j=1}^{J} FC_{p,j,k,t} \times EF_{CO_2,k} \times NCV_k}{1000} - \frac{\sum_{mG=1}^{M} \sum_{s=1}^{S} \left( \frac{\sum_{i}^{I} SOC_{mG,s,i,t} \times BD_{mG,s,i,t} \times Depth \times \left(1 - FC_{mG,s,i,t}\right) \times 0.1}{I} - SOC_{S,Baseline} \right) \times PA_{mG,s,t}}{n} \times \frac{44}{12} \quad (28)$$

Project net GHG emissions during the crediting period is summarized in the following table, please refer to ER spreadsheet for detailed calculation.

Table 3-6 The ex-ante estimation of project net GHG emissions removals during the crediting period

| Crediting period | $PE_{CH_4EF,t}$ | $PE_{N_2O_{MD},t}$ | $PE_{CH_4MD,t}$ | $PE_{FC,t}$ | $PR_t$ | $PE_t$ |
|---|---|---|---|---|---|---|
| Year | t $CO_2e$ | t $CO_2e$ | t $CO_2e$ | t $CO_2e$ | t $CO_2e$ | t $CO_2e$ |
| 1 | 2,138 | 314 | 15 | 1,918 | 678,318 | -673,933 |
| 2 | 18,933 | 3,186 | 200 | 1,697 | 678,318 | -654,302 |
| 3 | 36,875 | 3,966 | 255 | 1,171 | 678,318 | -636,051 |
| 4 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 5 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 6 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 7 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 8 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 9 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 10 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 11 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 12 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 13 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 14 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 15 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 16 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 17 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 18 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 19 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 20 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 21 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 22 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 23 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 24 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 25 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 26 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 27 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 28 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 29 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 30 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 31 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 32 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 33 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 34 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 35 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 36 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 37 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 38 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 39 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| 40 | 36,875 | 3,966 | 255 | 0 | 678,318 | -637,222 |
| total | 1,422,321 | 154,208 | 9,905 | 4,786 | 27,132,720 | -25,541,500 |

### 3.2.3 Leakage

Under this methodology, project activities must not involve increase in use of fossil fuels or fuel wood and must not include significantly different manure management practices. Therefore, the only potential sources of leakage in this methodology estimated as follows:

$$LE_t = LE_{M,t} + LE_{GD,t} \quad (29)$$

Where：

| | | |
|---|---|---|
| $LE_t$ | = | Leakage emissions in year t (t $CO_2e$) |
| $LE_{M,t}$ | = | Leakage emissions due to market leakage in year t (t $CO_2e$) |
| $LE_{GD,t}$ | = | Leakage emissions due to grazing displacement in year t (t $CO_2e$) |

Estimation of emissions from market leakage (VMD0033, Version 1.0) is used to calculate the leakage emissions due to grazing displacement.

The module provides methods for estimating whether reductions in the production of commodities (such as wood, animals or agricultural products) resulting from the project activity is likely to result in increased emissions from the production of those products elsewhere, and provides methods for determining the volume of such emissions.

For the project, the main production in the project area is cattle and sheep. Though grazing frequency was strictly managed during the implementation of the project, and the controlled grazing will be allowed depending on the growth situation of the forage, but the County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. According to the annual statistical yearbook of Zhangye City, the annual output of cattle and sheep in Zhangye City has not decreased. The project would not lead to reductions in the production of cattle and sheep, therefore, the market leakage is considered to be 0 $tCO_2e$.

Leakage from displacement of grazing activities to outside the project boundary be assessed and quantified using VCS module VMD0040 Leakage from Displacement of Grazing Activities.

This Module is applicable the following conditions:

- The project area is subject to livestock grazing in the baseline scenario.

According to the PRA Report and Project Design Report, local herders graze in the project area under the baseline scenario. Therefore, This Module is applicable for the proposed project.

The procedure of assessment of grazing displacement are as follows:

**1) Assess whether Grazing Displacement Takes Place**

According to the Baseline Survey Report and Project Design Report, local herders graze in the project area under the baseline scenario, but grazing frequency will be controlled during project implementation. Since the grazing demand of herdsmen will not decline in a short time, there is likely to be displacement of grazing activity, then proceed to the next step.

**2) Survey of Grazing Displacement and Relocation Plans**

This step requires that a survey must be conducted of all grazing agents whose livestock graze in the project area prior to the project start date. The project proponent conducted a survey before the project implementation (ie, covering the five years period prior to the project start date, or if management records for this period are unavailable, at a minimum covering the one year prior to the project start date) according to the requirements of the module for the survey.

According to the average value of the survey, under the baseline scenario, the project participants stocked 106,268 cattle and 425,180 sheep in the project area, grazing for about 138 days every year and 8 hours every day. And project non-participants would not graze in the project area both under the baseline scenario and the project scenario. According to the survey, the alternative grazing location is mainly located in the grass livestock balance area around the project implementation area.

**3) Prepare a Grazing Displacement Management Plan**

A grazing displacement management plan was prepared on the basis of the survey of grazing displacement and relocation plans. The grazing displacement management plan recorded for the years after the project start date, the following data:

- The identity of each grazing agent;
- The number and type of livestock to be relocated;
- The number of days each year which they will graze outside the project area (measured in days, or the whole year if appropriate);
- The location and area in hectares of each land parcel to which grazing will be relocated;
- A unique identifier code (where applicable) for each land parcel to which grazing will be relocated;

- The type of land (grassland, forest land, cropland) of each parcel to which grazing will be relocated, and where appropriate note the status (eg, degradation level) of the lands to which grazing will be relocated; and

- Any planned actions to avoid loss of above- or belowground carbon pools on the land parcels to which grazing will be relocated.

In July and August each year, the County Forestry and Grassland Bureau measured the grass yield of the grassland around the project area, and calculated the reasonable grazing quantity. And the project participants grazed in the designated area under the guidance of the County Forestry and Grassland Bureau and grassland guardians. But the specific land parcels available for use by project participants may change from year to year, based on the actual situation of grassland. And the grazing displacement management plan record the number and type of livestock to be relocated and the type of land (grassland, forest land, cropland) to which grazing is planned to be displaced. In this case, the type of land to which grazing may be displaced must be categorized as unidentified grassland.

According to the grazing displacement survey conducted in 2016, all grazing agents were interviewed, and collected the information of the number and type of livestock to be relocated. Within the scope of project implementation, grazing frequency will be strictly controlled, project participants would receive subsidies. Therefore, the project proponent and the County Forestry and Grassland Bureau will visit all project participants to investigate the project situation and issue subsidies based on this.

**4) Determine whether Lands to which Livestock are Displaced are Identified or Unidentified**

The grazing displacement management plan does not record the geographic location to which livestock under the control of project participants were relocated. Besides, the process of identifying the specific land areas to which livestock will be relocated would be not feasible at reasonable cost (because project non-participants are scattered over wide distances and not contactable at reasonable cost). So, the land to which livestock grazing activity is displaced should be categorized as unidentified.

For unidentified land, assessment procedures mandate the use of conservative assumptions that do not underestimate the effects of grazing displacement on carbon stocks in unidentified lands, and in the case of land that remains unidentified after monitoring begins, conservative assumptions that do not underestimate leakage emissions caused by grazing displacement must also be used.

**5) Define the Type of Land to which Grazing will be Relocated**

Zhangye city covers an area of 4,087,400 square kilometers, and the available grassland area is 2,150,046 ha, accounting for 52.6% of the total area, and the area of forest land and cropland are small. In 2016, the County Forestry and Grassland Bureau designated a grazing area of 1,102,293 hectares, all of the specific land parcels are grassland. And the project participants grazed in the designated area under the guidance of the County Forestry and Grassland Bureau and grassland guardians. But the specific land parcels available for use by project participants may change from year to year, based on the actual situation of grassland, such as grass yield. So, the unidentified lands should be categorized as unidentified grassland.

The procedure of estimation of emissions of grazing displacement are as follows:

According to the above analysis, the alternative grazing areas of the project are mainly unidentified grassland areas.

Estimation of Leakage Emissions due to Displacement of Livestock Grazing to Unidentified Grasslands

**Step 1: Estimate the area of grassland needed to sustain the population of livestock relocated to unidentified grasslands**

$$DMI_{GUI,t} = \sum_{l=1}^{L}\left(\frac{DMI_{day,I}\times P_{GUI,I,t}}{1000}\times DayS_{GUI,l,t}\right) \quad (30)$$

Where：

| | | |
|---|---|---|
| $DMI_{GUI,t}$ | = | Dry matter intake required to sustain the total number of livestock of all types l relocated to unidentified grasslands in year t (t dm) |
| $DMI_{day,I}$ | = | Daily dry matter intake requirement of each type of livestock l (kg dm/(head*day)) |
| $P_{GUI,I,t}$ | = | Population of livestock of each type relocated to unidentified grasslands in year t (head) |
| $DayS_{GUI,I,t}$ | = | Days that the population of each type of relocated livestock of type l graze in unidentified grassland in year t (days) |

The total area of unidentified grassland required to sustain the population of livestock relocated to unidentified grassland is to be calculated as:

$$Area_{GUI,t} = \frac{DMI_{GUI,t}}{ANPP_{GUI,REF}} \quad (31)$$

Where：

| | | |
|---|---|---|
| $Area_{GUI,t}$ | = | Area required to sustain the population of livestock displaced to unidentified grasslands in year t (ha) |
| $DMI_{GUI,t}$ | = | Dry matter intake required to sustain the total number of livestock of all types l relocated to unidentified grasslands in year t (t dm) |
| $ANPP_{GUI,REF}$ | = | Aboveground net primary productivity in the reference region that is the likely location of unidentified grasslands to which livestock are relocated (t dm/ha) |

**Step 2: Assess the risk of soil carbon loss due to overgrazing in unidentified grasslands**

In the project area, the state provides certain subsidies to herdsmen in the area of returning grazing to grassland. In addition, the establishment of artificial feeding grassland and shed has alleviated

the grazing pressure of grassland under certain circumstances. Therefore, the impact of alternative grazing on the productivity of unidentified grassland is limited.

The calculation result of step 1 shows that, the annually average area of unidentified grassland required to sustain the population of livestock relocated to unidentified grassland is 12,086 ha (See the ER table for details). And the grass livestock balance area is 1,102,293 ha in Zhangye, which is much higher than the displacement area (only 1%).

The main goal of grass livestock balance is to establish a reasonable livestock carrying capacity and realize the sustainable development of grassland animal husbandry on the basis of rational utilization of grassland. According to the Management Measures of Grass Livestock Balance Area of Gansu Province [42], in the grass livestock balance area, it is necessary to ensure a reasonable livestock carrying capacity through grassland ecological compensation or forage replanting. Therefore, grassland degradation in other undetermined grass livestock balance areas will not be caused.

So, the grazing displacement will not lead to consumption exceeding 50 percent of available biomass, and leakage due to soil carbon loss does not need to be accounted for.

Step 3: Estimate emissions from livestock displacement to unidentified grasslands

**Step 3a: Estimate methane emissions from enteric fermentation by livestock displaced to unidentified grasslands**

Calculate the leakage emissions due to enteric fermentation by livestock displaced to all unidentified grasslands outside the project area using:

$$LE_{GUI,CH_{4EF},t} = \frac{\sum_{l=1}^{L} P_{GUI,l,t} \times Days_{GUI,l,t} \times GWP_{CH_4} \times EF_l}{1000 \times 365} \quad (32)$$

Where：

| | | |
|---|---|---|
| $LE_{GUI,CH_{4EF},t}$ | = | Leakage emissions in year t from enteric fermentation by livestock displaced to unidentified grasslands (t $CO_2e$) |
| $P_{GUI,l,t}$ | = | Population of grazing livestock type l in year t displaced outside the project area to unidentified grasslands (head) |
| $Days_{GUI,l,t}$ | = | Days in year t that livestock of each type l grazes on unidentified grassland (days) |
| $GWP_{CH_4}$ | = | Global-warming potential of $CH_4$ (t $CO_2e$/t $CH_4$) |
| $EF_l$ | = | Enteric $CH_4$ emission factor per head of livestock type l per year (kg CH4/(ha*year)) |
| $l$ | = | Index of grazing livestock types |

[42] http://www.gsjw.gov.cn/contents/316.html

**Step 3b: Estimate GHG emissions from manure management**

Calculate the $N_2O$ and $CH_4$ leakage emissions due to manure deposition on grassland caused by relocating the livestock to unidentified grasslands outside the project area using:

$$LE_{GUI_{MD},t} = LE_{GUI,N_20_{MD},t} + LE_{GUI,CH_{4MD},t} \quad (33)$$

Where:

| | | |
|---|---|---|
| $LE_{GUI_{MD},t}$ | = | Leakage emissions from manure and urine deposited on unidentified grassland in year t (t $CO_2e$) |
| $LE_{GUI,N_20_{MD},t}$ | = | Leakage emissions from manure and urine deposited on unidentified grassland in year t (t $CO_2e$) |
| $LE_{GUI,CH_{4MD},t}$ | = | Leakage $CH_4$ emissions from manure and urine deposited on unidentified grasslands in year t (t $CO_2e$) |

$LE_{GUI,N_20_{MD},t}$ is calculated as the sum of direct $N_2O$ emissions and indirect $N_2O$ emissions

using:

$$LE_{GUIN_2o_{MD},t} = GWP_{N_20} \times \left(LE_{GUI_D,N_20_{MD},t} + LE_{GUI_{ID},N_20_{MD},t}\right) \quad (34)$$

Where:

| | | |
|---|---|---|
| $LE_{GUIN_2o_{MD},t}$ | = | Leakage $N_2O$ emission from manure and urine deposited on unidentified grasslands in year t (t $CO_2e$) |
| $GWP_{N_20}$ | = | Global-warming potential of $N_2O$ (t $CO_2e$/t $N_2O$) |
| $LE_{GUI_D,N_20_{MD},t}$ | = | Leakage direct $N_2O$ emissions from manure and urine deposited on unidentified grasslands in year t (t $N_2O$) |
| $LE_{GUI_{ID},N_20_{MD},t}$ | = | Leakage indirect $N_2O$ emissions from manure and urine deposited on unidentified grasslands in year t (t $N_2O$) |

Leakage direct $N_2O$ emission from manure and urine deposited on unidentified grasslands $LE_{GUI_D,N_20_{MD},t}$ is calculated using:

$$LE_{GUI_{D,N_20_{MD},t}} = \sum_{l1=1}^{L1} F_{MD,GUI,t,l1} \times EF_{3,PRP,CPP} \times \frac{44}{28} \quad (35)$$

And/or

$$LE_{GUI_{D,N_20_{MD},t}} = \sum_{l2=1}^{L2} F_{MD,GUI,t,l2} \times EF_{3,PRP,SO} \times \frac{44}{28} \quad (36)$$

Where:

$LE_{GUI\,D,N_2O_{MD,t}}$ = Leakage direct $N_2O$ emissions from manure and urine deposited on unidentified grasslands in year t (t $N_2O$)

$F_{MD,GUI,t,l1}$ = Annual amount of nitrogen in cattle, poultry and pig manure and urine deposited on unidentified grasslands in year t, adjusted for volatilization as $NH_3$ and $NO_x$ (t N)

$F_{MD,GUI,t,l2}$ = Annual amount of nitrogen in sheep and other animal manure and urine deposited on unidentified grasslands in year t, adjusted for volatilization as $NH_3$ and $NO_x$ (t N)

$EF_{3,PRP,CPP}$ = $N_2O$ emission factor for cattle (dairy, non-dairy and buffalo), poultry and pigs' manure and urine deposited on grasslands (kg $N_2O$-N/kg N input)

$EF_{3,PRP,SO}$ = $N_2O$ emission factor for sheep and other animals' manure and urine deposited on grasslands (kg $N_2O$-N/kg N input)

$$F_{MD,GUI,t,l} = \frac{P_{GUI,l,t} \times W_l \times Nex_l \times H_{GUI,t} \times Days_{GUI,l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \quad (37)$$

Where:

$F_{MD,GUI,t,l}$ = Annual amount of nitrogen in manure and urine deposited on unidentified grasslands by livestock type l, adjusted for volatilization as $NH_3$ and $NO_x$ (t N)

$P_{GUI,l,t}$ = Population of grazing livestock type l in year t displaced outside the project area to unidentified grasslands (head)

$W_l$ = Average weight of livestock l displaced to unidentified grasslands (kg/head)

$Nex_l$ = Nitrogen excretion from livestock type l (kg N/(t animal mass*day))

$1000a$ = Conversion factor for nitrogen excretion (kg/t livestock mass) to nitrogen excretion (kg/kg livestock mass)

$H_{GUI,t}$ = Average grazing hours per day during grazing season for livestock of each type l displaced to unidentified grassland in year t (hours)

$24$ = Conversion day to hour

$Days_{GUI,l,t}$ = Grazing days in year t for livestock type l displaced to unidentified grasslands (days)

$1000b$ = Conversion factor for kg to t

$Frac_{GAS,MD}$ = Fraction of volatilization from manure and urine deposited by grazing animals as $NH_3$ and $NO_x$ (kg N volatilized/kg of N deposited)

$t$ = Year

$l$ = Index of grazing livestock types

Leakage from indirect $N_2O$ emissions from atmospheric deposition of N volatilized from urine and manure N deposited on unidentified grasslands is calculated using:

$$LE_{GUI_{ID},N_20_{MD},t} = \sum_{l=1}^{L} F_{MD,GUI,t,l} \times Frac_{Gas,MD} \times EF_4 \times \frac{44}{28} \quad (38)$$

Where:

$LE_{GUI_{ID},N_20_{MD},t}$ = Leakage indirect $N_2O$ emissions from manure and urine deposited on unidentified grasslands in year t (t $N_2O$)

$F_{MD,GUI,t,l}$ = Annual amount of nitrogen in manure and urine deposited on unidentified grasslands by livestock type l, adjusted for volatilization as $NH_3$ and $NO_x$ (t N)

$Frac_{Gas,MD}$ = Fraction of volatilization from manure and urine deposited by grazing animals as $NH_3$ and $NO_x$ (kg N volatilized/kg of N deposited)

$EF_4$ = $N_2O$ emission factor for atmospheric deposition of manure N on soils and water surfaces under project activity (kg $N_2O$-N/(kg $NH_3$-N + $NO_x$-N volatilized))

$CH_4$ emission from manure management due to displacement of livestock to unidentified grasslands is calculated using:

$$LE_{GUI,CH_4MD,t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lm} \times P_{GUI,l,t} \times H_{GUI,l,t} \times Days_{GUI,l,t}}{1000 \times 24 \times 365} \quad (39)$$

Where:

$LE_{GUI,CH_4MD,t}$ = Leakage $CH_4$ emissions from manure and urine deposited on unidentified grasslands in year t (t CO2e)

$GWP_{CH_4}$ = Global-warming potential of $CH_4$ (t CO2e/t CH4)

$EF_{lm}$ = $CH_4$ emission factor per head of livestock type l in manure management system m (kg $CH_4$/(head*yr)

$P_{GUI,l,t}$ = Population of livestock type l in year t displaced to unidentified grasslands (head)

| | | |
|---|---|---|
| $H_{GUI,l,t}$ | = | Average grazing hours per day during grazing season for livestock of each type l displaced to unidentified grassland in year t (hours) |
| $Days_{GUI,l,t}$ | = | Grazing days in year t for livestock type l displaced to unidentified grasslands (days) |
| 1000 | = | Conversion factor for kg to t |

**Step 4: Calculate total leakage emissions from relocation of grazing to unidentified grasslands**

Total leakage emissions from relocation of grazing to unidentified grasslands must be calculated as:

$$LE_{GUI,t} = LE_{OGGUI,t} + LE_{GUI,CH_{4EF},t} + LE_{GUI_{MD,t}} \quad (40)$$

Where:

| | | |
|---|---|---|
| $LE_{GUI,t}$ | = | Leakage due to displacement of livestock to unidentified grasslands in year t (t $CO_2e$) |
| $LE_{OGGUI,t}$ | = | Leakage due to soil carbon loss resulting from overgrazing due to displacement of livestock to unidentified grasslands in year t (t $CO_2e$) |
| $LE_{GUI,CH_{4EF},t}$ | = | Leakage due to enteric fermentation by livestock displaced to unidentified grasslands in year t (t $CO_2e$) |
| $LE_{GUI_{MD,t}}$ | = | Leakage due to $N_2O$ and $CH_4$ emissions in manure and urine deposited on grasslands by livestock displaced to unidentified grasslands in year t (t $CO_2e$) |

As described above, project leakage due to grazing displacement would be calculated as follows:

$$LE_t = LE_{GD,t} = LE_{GUI,t} = LE_{GUI,CH_{4EF},t} + LE_{GUI_{MD,t}}$$

$$= LE_{GUI,CH_{4EF},t} + LE_{GUI,N_20_{MD},t} + LE_{GUI,CH_{4MD},t}$$

$$= \frac{\sum_{l=1}^{L} P_{GUI,l,t} \times Days_{GUI,l,t} \times GWP_{CH_4} \times EF_l}{1000 \times 365} + GWP_{N_20} \times \left( \sum_{l1=1}^{L1} \frac{P_{GUI,l,t} \times W_l \times Nex_l \times H_{GUI,t} \times Days_{GUI,l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,CPP} \times \frac{44}{28} + \sum_{l2=1}^{L2} \frac{P_{GUI,l,t} \times W_l \times Nex_l \times H_{GUI,t} \times Days_{GUI,l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,SO} \times \frac{44}{28} + \sum_{l=1}^{L} F_{MD,GUI,t,l} \times Frac_{Gas,MD} \times EF_4 \times \frac{44}{28} \right) + \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lm} \times P_{GUI,l,t} \times H_{GUI,l,t} \times Days_{GUI,l,t}}{1000 \times 24 \times 365} \quad (41)$$

The total leakage emissions during the crediting period is summarized in the following table, please refer to ER spreadsheet for detailed calculation.

Table 3-8 The Estimation of leakage emissions from relocation of grazing during the crediting period

| Crediting period | $LE_{GUI,CH_{4EF},t}$ | $LE_{GUI_{MD,t}}$ | $LE_{GUI,t}$ |
|---|---|---|---|
| Year | t $CO_2e$ | t $CO_2e$ | t $CO_2e$ |
| 1 | 1,241 | 181 | 1,422 |
| 2 | 20,388 | 2,388 | 22,776 |
| 3 | 27,587 | 3,162 | 30,749 |
| 4 | 28,043 | 3,230 | 31,273 |
| 5 | 28,043 | 3,230 | 31,273 |
| 6 | 28,043 | 3,230 | 31,273 |
| 7 | 28,043 | 3,230 | 31,273 |
| 8 | 28,043 | 3,230 | 31,273 |
| 9 | 28,043 | 3,230 | 31,273 |
| 10 | 28,043 | 3,230 | 31,273 |
| 11 | 28,043 | 3,230 | 31,273 |
| 12 | 28,043 | 3,230 | 31,273 |
| 13 | 28,043 | 3,230 | 31,273 |
| 14 | 28,043 | 3,230 | 31,273 |
| 15 | 28,043 | 3,230 | 31,273 |
| 16 | 28,043 | 3,230 | 31,273 |
| 17 | 28,043 | 3,230 | 31,273 |
| 18 | 28,043 | 3,230 | 31,273 |
| 19 | 28,043 | 3,230 | 31,273 |
| 20 | 28,043 | 3,230 | 31,273 |
| 21 | 28,043 | 3,230 | 31,273 |
| 22 | 28,043 | 3,230 | 31,273 |
| 23 | 28,043 | 3,230 | 31,273 |
| 24 | 28,043 | 3,230 | 31,273 |
| 25 | 28,043 | 3,230 | 31,273 |
| 26 | 28,043 | 3,230 | 31,273 |
| 27 | 28,043 | 3,230 | 31,273 |
| 28 | 28,043 | 3,230 | 31,273 |
| 29 | 28,043 | 3,230 | 31,273 |
| 30 | 28,043 | 3,230 | 31,273 |
| 31 | 28,043 | 3,230 | 31,273 |
| 32 | 28,043 | 3,230 | 31,273 |
| 33 | 28,043 | 3,230 | 31,273 |
| 34 | 28,043 | 3,230 | 31,273 |
| 35 | 28,043 | 3,230 | 31,273 |
| 36 | 28,043 | 3,230 | 31,273 |
| 37 | 28,043 | 3,230 | 31,273 |
| 38 | 28,043 | 3,230 | 31,273 |
| 39 | 28,043 | 3,230 | 31,273 |
| 40 | 28,043 | 3,230 | 31,273 |
| total | 1,114,835 | 128,471 | 1,243,306 |

### 3.2.4 Net GHG Emission Reductions and Removals

The amount of emission reductions achieved by the project in project year t must be calculated as follows:

$$ER_t = BE_b - PE_t - LE_t \quad (42)$$

Where:

$ER_t$ = Emission reductions in year t (t $CO_2e$)

$BE_b$ = Baseline emissions and removals in year b (t $CO_2e$)

$PE_t$ = Project emissions and removals in year t (t $CO_2e$)

$LE_t$ = Leakage emissions in year t (t $CO_2e$)

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

Table 3-9 The net GHG emission removals

| Year | Estimated baseline emissions( $tCO_2e$) | Estimated project emissions removals ($tCO_2e$) | Estimated leakage emissions ($tCO_2e$) | Estimated net GHG emission removals ($tCO_2e$) |
|---|---|---|---|---|
| | $BE_b$ | $PE_t$ | $LE_t$ | $ER_t$ |
| 1 | 137,378 | -673,933 | 2,466 | 808,845 |
| 2 | 137,378 | -654,302 | 32,272 | 759,408 |
| 3 | 137,378 | -636,051 | 41,096 | 732,333 |
| 4 | 137,378 | -637,222 | 41,096 | 733,504 |
| 5 | 137,378 | -637,222 | 41,096 | 733,504 |
| 6 | 137,378 | -637,222 | 41,096 | 733,504 |
| 7 | 137,378 | -637,222 | 41,096 | 733,504 |
| 8 | 137,378 | -637,222 | 41,096 | 733,504 |
| 9 | 137,378 | -637,222 | 41,096 | 733,504 |
| 10 | 137,378 | -637,222 | 41,096 | 733,504 |
| 11 | 137,378 | -637,222 | 41,096 | 733,504 |
| 12 | 137,378 | -637,222 | 41,096 | 733,504 |
| 13 | 137,378 | -637,222 | 41,096 | 733,504 |
| 14 | 137,378 | -637,222 | 41,096 | 733,504 |
| 15 | 137,378 | -637,222 | 41,096 | 733,504 |
| 16 | 137,378 | -637,222 | 41,096 | 733,504 |
| 17 | 137,378 | -637,222 | 41,096 | 733,504 |
| 18 | 137,378 | -637,222 | 41,096 | 733,504 |
| 19 | 137,378 | -637,222 | 41,096 | 733,504 |
| 20 | 137,378 | -637,222 | 41,096 | 733,504 |
| 21 | 137,378 | -637,222 | 41,096 | 733,504 |
| 22 | 137,378 | -637,222 | 41,096 | 733,504 |
| 23 | 137,378 | -637,222 | 41,096 | 733,504 |
| 24 | 137,378 | -637,222 | 41,096 | 733,504 |
| 25 | 137,378 | -637,222 | 41,096 | 733,504 |
| 26 | 137,378 | -637,222 | 41,096 | 733,504 |
| 27 | 137,378 | -637,222 | 41,096 | 733,504 |
| 28 | 137,378 | -637,222 | 41,096 | 733,504 |
| 29 | 137,378 | -637,222 | 41,096 | 733,504 |
| 30 | 137,378 | -637,222 | 41,096 | 733,504 |

| | | | | |
|---|---|---|---|---|
| 31 | 137,378 | -637,222 | 41,096 | 733,504 |
| 32 | 137,378 | -637,222 | 41,096 | 733,504 |
| 33 | 137,378 | -637,222 | 41,096 | 733,504 |
| 34 | 137,378 | -637,222 | 41,096 | 733,504 |
| 35 | 137,378 | -637,222 | 41,096 | 733,504 |
| 36 | 137,378 | -637,222 | 41,096 | 733,504 |
| 37 | 137,378 | -637,222 | 41,096 | 733,504 |
| 38 | 137,378 | -637,222 | 41,096 | 733,504 |
| 39 | 137,378 | -637,222 | 41,096 | 733,504 |
| 40 | 137,378 | -637,222 | 41,096 | 733,504 |
| total | 5,495,120 | -25,541,500 | 1,596,377 | 29,440,243 |

## 3.3 Monitoring

### 3.3.1 Data and Parameters Available at Validation

| | |
|---|---|
| Data / Parameter | $GWP_{N_2O}$ |
| Data unit | t CO2e/t N2O |
| Description | Global-warming potential for $N_2O$ |
| Source of data | VCS Standard (Version 4.1) |
| Value applied | 265 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{Nfert}$ |
| Data unit | kg $N_2O$-N/kg N applied |
| Description | $N_2O$ emission factor for synthetic N fertilizer use |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.01 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions |

| | |
|---|---|
| | Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Frac_{Gas,F}$ |
| Data unit | kg N volatilized/kg N applied |
| Description | Fraction of synthetic N fertilizer that volatilizes as $NH_3$ and $NO_x$ |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.1 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{4,SN}$ |
| Data unit | kg $N_2O$-N/(kg $NH_3$-N + $NO_x$-N volatilized) |
| Description | $N_2O$ emission factor for atmospheric deposition of synthetic N on soils and water surfaces |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.01 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{4,MD}$ |
| Data unit | kg $N_2O$-N/(kg $NH_3$-N + $NO_x$-N volatilized) |
| Description | $N_2O$ emission factor for atmospheric deposition of urine and manure N on soils and water surfaces |

| | |
|---|---|
| Source of data | IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.01 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $GWP_{CH_4}$ |
| Data unit | t CO2e/t N2O |
| Description | Global-warming potential for $CH_4$ |
| Source of data | VCS Standard (Version 4.1) |
| Value applied | 28 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_t$ |
| Data unit | kg $CH_4$/ (head * year) |
| Description | Enteric $CH_4$ emission factor per head of livestock type l per year |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | Dairy cattle: 68<br>Cattle: 47<br>Sheep: 5 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{3,PRP,CPP}$ |
| Data unit | kg $N_2O$-N/kg N input |
| Description | $N_2O$ emission factor for cattle (dairy, non-dairy and buffalo), poultry and pigs manure and urine deposited on of applied to grassland |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.02 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{3,PRP,SD}$ |
| Data unit | kg $N_2O$-N/kg N input |
| Description | $N_2O$ emission factor for sheep and other animals' manure and urine deposited on of applied to grassland |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.01 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions |

| | |
|---|---|
| | Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Nex_t$ |
| Data unit | kg N deposited/(t livestock mass * day) |
| Description | Nitrogen excretion of livestock type l |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | Dairy Cattle: 0.47<br>Cattle: 0.34<br>Sheep: 1.17 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $W_{l,b}$ |
| Data unit | kg |
| Description | Average weight of livestock l, in baseline year b |
| Source of data | Local expert judgment. |
| Value applied | Cattle: 300<br>Sheep: 45 |
| Justification of choice of data or description of measurement methods and procedures applied | PRA Report, data from local expert judgement that are specific to the project area. |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Days_{l,b}$ |
| Data unit | Days |

| | |
|---|---|
| Description | Grazing days for livestock type l in baseline year b |
| Source of data | Survey of Grazing Displacement and Relocation Plans |
| Value applied | Baseline scenario:138<br>Project scenario:69 |
| Justification of choice of data or description of measurement methods and procedures applied | According to the Survey of Grazing Displacement, the average grazing days of herdsmen under the baseline scenario are counted. According to the rotational grazing management mode, under the project scenario, the grazing days of herdsmen are expected to be reduced by half.<br>From 1-May-2016 to 19-June-2017, the survey was conducted by the project proponent and the County Forestry and Grassland, Bureau and completed the Grazing Displacement Management Plan. |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $H_{l,b}$ |
| Data unit | Hours |
| Description | Average grazing hours for livestock type l per day during the grazing season in baseline year b |
| Source of data | Survey of Grazing Displacement and Relocation Plans |
| Value applied | 8 |
| Justification of choice of data or description of measurement methods and procedures applied | According to the Survey of Grazing Displacement, the average grazing hours of herders under the baseline scenario are counted. |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Frac_{GAS,MD}$ |
| Data unit | kg N volatilized/kg of N deposited |
| Description | Fraction of volatilization from manure and urine deposited by grazing animals as $NH_3$ and $NO_x$ |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | Dairy Cow: 30% |

| | |
|---|---|
| | Cattle: 45%<br>Sheep/goats: 12% |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{l,M}$ |
| Data unit | kg $CH_4$/ (head * year) |
| Description | $CH_4$ emission factor from manure of livestock type l |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | Dairy Cows: 9<br>Other cattle: 1<br>Sheep:0.10<br>Goats: 0.11 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{CO_2,k}$ |
| Data unit | t $CO_2$/GJ |
| Description | $CO_2$ emission factor by fuel type k |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | Gasoline: 0.0693<br>Diesel: 0.0741 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of baseline emissions<br>Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $NCV_K$ |
| Data unit | GJ/t fuel |
| Description | Thermal value of fuel type k |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | Gasoline: 44.3<br>Diesel: 43.0 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $SOC_{S,Baseline}$ |
| Data unit | t C/ha l |
| Description | Baseline SOC stock in the top 30 cm of soil layer (or greater depth if required) in stratum s |
| Source of data | Laboratory test data |
| Value applied | Please refer ER calculation sheets for details. |
| Justification of choice of data or description of measurement methods and procedures applied | Option 2 was applied to estimate project removals due to changes in SOC, and the procedures of Section 8.2.8 in VM0026 were follow.<br>The$SOC_{S,Baseline}$ was tested in 2016, which less than two years prior to the project start time. From September 16 to September 28, 2016, the organic carbon, bulk density and sand-gravel ratio (percentage of rocks larger than 2mm, roots, and other dead residues with a diameter in the top 30 cm of soil) of 117 soil samples were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August-2015. Soil sampling followed General Guidelines for Sampling and Surveys for Small-Scale CDM Project Activities.<br>The nationally approved standard Method for Determination of Soil Organic Matter (NY/T 1121.6-2006) was used to measure SOC of the soil samples. |
| Purpose of data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $DMI_{day,l}$ |
| Data unit | kg dm/(head*day) |
| Description | Daily dry matter intake requirement of each type of livestock l |
| Source of data | National standards<br>The notice on standardizing and unifying the statistics of grassland carrying capacity data, which was issued by the Qinghai Provincial Department of Agriculture and Animal Husbandry |
| Value applied | Sheep: 1.38<br>Cattle: 5.52 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of data | Calculation of leakage emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $ANPP_{GUI,REF}$ |
| Data unit | t dm/ha |
| Description | Aboveground net primary productivity in the reference region that is the likely location of unidentified grasslands to which livestock are relocated |
| Source of data | Peer-reviewed studies<br>Wang jie.(2017) The Relationship between Biodiversity and Aboveground Biomass with Soil Properties in North Slope of Qilian Mountains Meadow Steppe. (Master's thesis, Northwest Normal University)<br>https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD201901&filename=1017199627.nh |
| Value applied | 1.38 |
| Justification of choice of data or description of measurement methods and procedures applied | Values come from published studies in the project region. |
| Purpose of data | Calculation of leakage emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $H_{GUI,l,t}$ |

| | |
|---|---|
| Data unit | Hours |
| Description | Average grazing hours per day during grazing season for livestock of each type l displaced to unidentified grassland in year t |
| Source of data | A full census survey conducted by the project proponent and county forestry and grassland bureau. |
| Value applied | 8 |
| Justification of choice of data or description of measurement methods and procedures applied | Average value come from a full census survey. |
| Purpose of data | Calculation of leakage emissions |
| Comments | N/A |

### 3.3.2 Data and Parameters Monitored

| | |
|---|---|
| Data / Parameter | $P_{l,t}$ |
| Data unit | Head |
| Description | Population of livestock type l under project in year t |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | The project proponent and the County Forestry and Grassland Bureau visit all the project participants every year to investigate the situation of the project. |
| Frequency of monitoring/recording | Annually |
| Value applied | The ex-ante value comes from Grazing Displacement Management Plan.<br>Please refer ER calculation sheets for details. |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied |

| | |
|---|---|
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $H_{l,t}$ |
| Data unit | Hours |
| Description | Average grazing hours per day of livestock type l during grazing season in year t |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | The project proponent and the County Forestry and Grassland Bureau visit all the project participants every year to investigate the situation of the project. |
| Frequency of monitoring/recording | Annually |
| Value applied | The ex-ante value comes from Grazing Displacement Management Plan.<br>Please refer ER calculation sheets for details. |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Days_{l,t}$ |
| Data unit | Days |
| Description | Grazing days of lives tock l in year t under project |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | The project proponent and the County Forestry and Grassland Bureau visit all the project participants every year to investigate the situation of the project. |
| Frequency of monitoring/recording | Annually |
| Value applied | The ex-ante value comes from Grazing Displacement Management Plan.<br>Please refer ER calculation sheets for details. |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Crosscheck with previous records and reconduct the survey if there is a significant change observed |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $FC_{p,j,k,t}$ |
| Data unit | Kg fuel |
| Description | Fuel consumption by type k, machine type j, parcel grassland p, in year t under project |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | The project proponent recorded the fuel consumption. |

| | |
|---|---|
| Frequency of monitoring/recording | Record fuel consumption just after the application of machine. |
| Value applied | The ex ante value comes from Project Design Report.<br>According to Project Design Report, each 10,000 Mu fence will consume 0.008 tons of diesel oil and each shed will consume 0.058 million kwh of electricity. Combined with the standard conversion coefficient at that time, it will be uniformly converted into tons of diesel oil for the calculation of energy consumption and emission of the project.<br>Please refer ER calculation sheets for details. |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $PA_{mG,s,i,t}$ |
| Data unit | ha |
| Description | Project areas of grassland with management practice mG in stratum s in year t |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | Record the area of grassland with management practice mG in stratum s. |
| Frequency of monitoring/recording | Record the area and management practice just after the management practice has taken place and report annually |
| Value applied | The ex-ante value comes from Project Design Report. Please refer ER calculation sheets for details. |

| | |
|---|---|
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Crosscheck with previous records and satellite images |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $SOC_{mG,s,i,t}$ |
| Data unit | g C/kg soil |
| Description | SOC stock in the top 30 cm of soil (or greater depth if required) for management practice $mG$, stratum s (or greater depth if desired), sampling site i |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards.<br>Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018).<br>The SOC measurement based on the nationally-approved standard Method for Determination of Soil Organic Matter (NY/T 1121.6-2006) was used to. |
| Frequency of monitoring/recording | At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period. |
| Value applied | For ex-ante calculation, the $SOC_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015. And the growth rate of SOC is 1.02%, which comes from previous study. Zhou Xiaoyan. (2019). Impacts of different restoration years of returning grazing land to grassland on community characteristics and soil nutrients of alpine grassland in Maqu County (Master's thesis, Northwest Normal University). Please refer ER calculation sheets for details. |

| | |
|---|---|
| Monitoring equipment | Soil sample, electric furnace, test tube, oil bath pot, wire cage and dropper. |
| QA/QC procedures to be applied | The collection of soil samples for measuring SOC will be carried by suitably trained staff. The measurement of SOC will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998). |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $BD_{mG,s,i,t}$ |
| Data unit | g soil/cm$^3$ |
| Description | Soil bulk density in the top 30 cm of soil (or greater depth if required) for management practice $mG$ , stratum s (or greater depth if desired), sampling site i |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards.<br>Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018).<br>The $BD_{mG,s,i,t}$ measurement based on the nationally approved standard Method for Determination of soil bulk density (NY/T 1121.4-2006). |
| Frequency of monitoring/recording | At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period. |
| Value applied | For ex ante calculation, the $BD_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015.<br>Please refer ER calculation sheets for details. |

| | |
|---|---|
| Monitoring equipment | Ring knife, electronic scale, rubber hammer, oven and dryer. |
| QA/QC procedures to be applied | The collection of soil samples for measuring soil bulk density will be carried by suitably trained staff. The measurement of soil bulk density will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998). |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $FC_{mG,s,i,t}$ |
| Data unit | percent |
| Description | Percentage of rocks with a diameter larger than 2mm, roots, and other dead residues in the top 30 cm of soil (or greater depth if desired), for management practice $mG$, stratum s, sampling site i |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards.<br>Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018).<br>There is no nationally recognized standard for measuring soil $FC_{mG,s,i,t}$, so previous research standard are used.<br>Xie yingge, Li xia. Research progress on determination methods of gravel content in soil[J]. Soils, 2012,44(1):17-22. |
| Frequency of monitoring/recording | At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period. |
| Value applied | For ex ante calculation, the $FC_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015. |

| | |
|---|---|
| | Please refer ER calculation sheets for details. |
| Monitoring equipment | Ring knife, electronic scale and sieve. |
| QA/QC procedures to be applied | The collection of soil samples for measuring $FC_{mG,s,i,t}$ will be carried by suitably trained staff. The measurement of soil bulk density will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998). |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $FC_{mG,s,i,t}$ |
| Data unit | percent |
| Description | Percentage of rocks with a diameter larger than 2mm, roots, and other dead residues in the top 30 cm of soil (or greater depth if desired), for management practice $mG$, stratum s, sampling site i |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards.<br>Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018).<br>There is no nationally recognized standard for measuring soil $FC_{mG,s,i,t}$, so previous research standard are used.<br>Xie yingge, Li xia. Research progress on determination methods of gravel content in soil[J]. Soils, 2012,44(1):17-22. |
| Frequency of monitoring/recording | At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period. |
| Value applied | For ex ante calculation, the $FC_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which |

| | |
|---|---|
| | was registered in Jinan City, Shandong Province in 27-August 2015.<br>Please refer ER calculation sheets for details. |
| Monitoring equipment | Ring knife, electronic scale and sieve. |
| QA/QC procedures to be applied | The collection of soil samples for measuring $FC_{mG,s,i,t}$ will be carried by suitably trained staff. The measurement of soil bulk density will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998). |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Depth$ |
| Data unit | cm |
| Description | Total soil depth, for calculating grassland SOC stock in the top 30 cm of soil (or greater depth if required) |
| Source of data | Project records |
| Description of measurement methods and procedures to be applied | Collect soil samples with soil drill with 30cm scale. |
| Frequency of monitoring/recording | Recorded with each measurement taken |
| Value applied | Due to full depth of affected soil layers is not known, a minimum depth of 30 cm was applied. |
| Monitoring equipment | Soil drill with scale. |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of project emissions |

| | |
|---|---|
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $P_{GUI,l,t}$ |
| Data unit | Head |
| Description | Total population of livestock of each type relocated to unidentified grasslands in year t |
| Source of data | Full census survey |
| Description of measurement methods and procedures to be applied | A full census survey conducted by the project proponent and county forestry and grassland bureau. |
| Frequency of monitoring/recording | Annually |
| Value applied | Please refer ER calculation sheets for details. |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied |
| Purpose of data | Calculation of project leakage |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Days_{GUI,l,t}$ |
| Data unit | days |
| Description | Days that the population of each type of relocated livestock of type l graze in unidentified grassland in year t |
| Source of data | Full census survey |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | A full census survey conducted by the project proponent and county forestry and grassland bureau. |
| Frequency of monitoring/recording | Annually |
| Value applied | 10 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied |
| Purpose of data | Calculation of project leakage |
| Calculation method | N/A |
| Comments | N/A |

### 3.3.3 Monitoring Plan

Describe the process and schedule for obtaining, recording, compiling and analyzing the monitored data and parameters set out in *Section 3.3.2 (Data and Parameters Monitored)* above. Include details on the following:

The methods for measuring, recording, storing, aggregating, collating and reporting data and parameters. Where relevant, include the procedures for calibrating monitoring equipment.

The organizational structure, responsibilities and competencies of the personnel that will be carrying out monitoring activities.

The policies for oversight and accountability of monitoring activities.

The procedures for internal auditing and QA/QC.

The procedures for handling non-conformances with the validated monitoring plan.

Any sampling approaches used, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement and QA/QC procedures.

Where appropriate, include line diagrams to display the GHG data collection and management system.

**1. Operation and management structure**

The project proponent hired local herders and communities (monitoring staff and auditing staff) for daily supervision and data management during the project implementation while office manager oversees the whole working group. A monitoring group has been established by Zhangye Academy

of Forestry Sciences to carry out the monitoring work. The structure of the monitoring group is as follows:

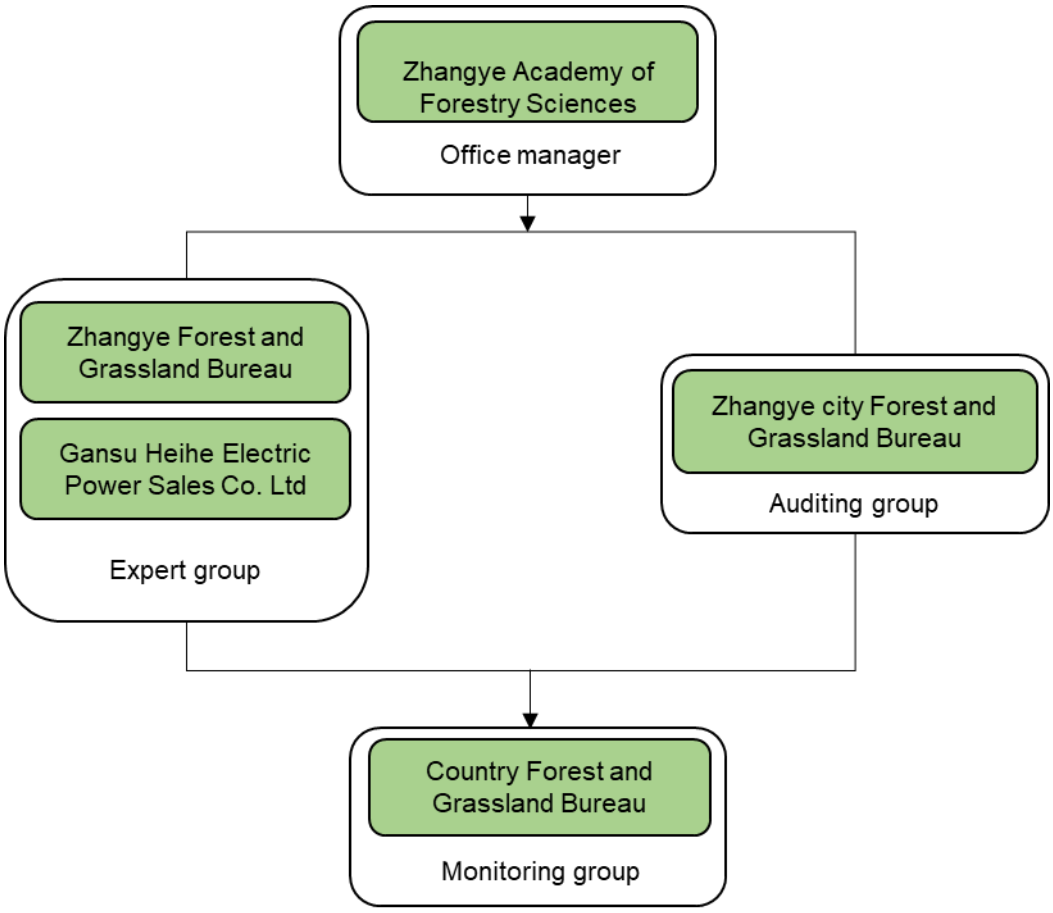


Figure 3-2 Organization structure of the monitoring team

The responsibilities of each role in the team structure are:

- Office manager has the overall management responsibility, especially supervising the implementation of the monitoring plan, and assigning each member of the monitoring team their individual responsibility during the monitoring.

- Expert group provides professional technique related to monitoring activities to make sure all the monitoring activities meet the requirement of VCS and CCB standards.

- Monitoring group conducts the following monitoring process, measures the required parameters of the project as listed in the above Section 3.3.2 particularly, and collects all the original evidence and data and make relevant records.

- Auditing staff performs internal verification of the measurement, reviews all the monitoring records and documents, crosschecks evidence and calculates emission removals during each verification period.

A Grassland monitoring technical manual will be provided to each member of the monitoring team with a specific explanation to make sure they fully understand all the monitoring process and issues concerned.

The monitoring activities will be arranged before each verification and the detailed plan for the certain monitoring activities will be reviewed by the expert group who come from Zhanhye Forestry and Grassland Bureau and Gansu Heihe Electric Power Sales Co. Ltd as well as the draft monitoring results, to make sure the monitoring is implemented in line with monitoring plan. If there are non-conformances founded, expert group will ask the monitoring team to take necessary compensation measures (redo some of the monitoring activities or calculation) until all the non-conformances been corrected. If the registered monitoring plan is unable to be implemented, or the monitoring would permanently deviate from the applied methodologies, the applied standardized baselines, or the other applied methodological regulatory documents, the project participants shall describe the nature and extent of the non-conforming monitoring in a revised monitoring plan and submitted to Verra to request a change of the monitoring plan.

**2. Monitoring process**

**1) Monitor the applicability conditions listed in methodology**

As mentioned in Section 3.1.2, the methodology VM0026/Version 1.1 “Sustainable Grassland Management” is applicable under the following conditions:

- The project area is grassland at the start of the project. The project area is land that is degraded at the start of the project and degradation will continue in the baseline scenario on the basis that degradation drivers or pressures are still present in the baseline scenario. The procedures outlined the latest version of the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities must be used to determine both that the land is degraded at the start of the project and that in the baseline scenario the land will continue to degrade.

- The project area is grassland at the start of the project. The project area is land that is degraded at the start of the project and degradation will continue in the baseline scenario on the basis that degradation drivers or pressures are still present in the baseline scenario. The procedures outlined the latest version of the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities must be used to determine both that the land is degraded at the start of the project and that in the baseline scenario the land will continue to degrade.

- The project area is subject to livestock grazing, burning, and/or nitrogen fertilization in the baseline scenario.

- In the baseline scenario, more than 95 percent of animal dung from grazing animals deposited on grassland is allowed to lie as is, and is not managed, and in the project scenario no more

than 5 percent of the animal dung from grazing animals within the project area is managed with alternative manure management systems.

According to the analysis in Section 3.1.2, all the conditions are applicable at the start of the project activity due to the baseline survey. During the following verification, the project proponent should monitor the possible change of the project boundary, if there is a change to the project boundary, the applicability conditions should be re-assessed for the changed project area.

**Step 1: Monitoring of boundary**

The coordinate of the project boundary should be measured and managed strictly in accordance with regulations and saved in GIS files. Boundary information such as original records, needs to store in both electronic and printed archive in the project owner, 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, monitoring team need to use the GPS or other verifiable methods to verify the project boundary. Determine the actual boundaries of afforestation. 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. Any change in the boundary must be located by GPS or appropriate spatial data (eg satellite imagery).

**Step 2: Monitor the applicability conditions**

The procedures outlined the latest version of the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities (See 3.1.2) will be used to prove that the project area is grassland at the start of the project, which has been classified as “degraded”, such as local, regional, national or international land classification system or peer-review study, participatory rural appraisal, satellite imagery and/or photographic evidence will be collected in the project scenario.

Through questionnaire surveys and interviews confirmed that animal manure treatment both in project scenario.

**Step3: Go through applicability checklist**

If there is any change in the boundary happened, the monitoring team will go through a specific checklist of the applicability conditions, records all relevant results for each monitoring period.

In case any non-conformance of the applicability conditions, the expert group should evaluate the situation and submit the deviation or change to the methodology to Verra for approval.

**2) Monitoring of Project Implementation**

A record of the grazing agents (eg, herder households) involved the project.

- The project proponent and County Forestry and Grassland Bureau should record each household involved in the sustainable grassland management project. Including the current

situation of Grassland: area, type, grassland degradation area and degree, existing livestock species and quantity.

- Each household should be given a unique ID. Their name, location of their land, and date of entering into the agreement and leaving the agreement should be recorded.

A record of the geographic location of the project area for all areas of grassland;

- The geodetic coordinates of the project area (and any stratification inside the area) must be established, recorded and archived. This can be achieved by field survey (eg, using GPS), or by using geo-referenced spatial data (eg, maps, GIS datasets).

A record of grassland management

- The grassland management plan, together with a record of the plan as actually implemented during the project crediting period must be available for validation and verification.

- Subsidies received by each household in the project area due to sustainable management measures.

3) **Recording of Data and Parameters Monitored**

The following parameters must be record and monitored during the project. When applying the equations provided in this methodology (VM0026/Version 1.1) for the ex-ante calculation of net anthropogenic GHG removals by sinks, the project proponent must provide transparent estimations for the parameters that are monitored during the project crediting period. These estimates must be based on measured or existing published data where possible and the project proponent must apply a conservative approach: that is, if different values for a parameter are equally plausible, a value that does not lead to over-estimation of net anthropogenic GHG removals by sinks must be selected.

For the estimate of annual emissions from the use of synthetic fertilizers, the following parameters must be recorded at each application during the project crediting period:

- Mass and type of synthetic N fertilizer applied;

- Nitrogen content of synthetic N fertilizer applied.

For the estimate of annual $CH_4$ emissions from enteric fermentation, population of livestock type l and grazing days of livestock type l must be recorded annually during the project crediting period.

For the estimate of annual $CH_4$ and $N_2O$ emissions from manure deposition during grazing, grazing days of livestock of type l, and average grazing hours per day of livestock type l during the grazing season must be recorded in every grazing season, in each year during the project crediting period.

For the estimate of annual $CO_2$ emissions due to the use of fossil fuels for SGM, the following parameters must be recorded at each time a management practice using machines is adopted and reported annually during the project crediting period:

- Quantity of fuel consumption;
- Fuel type;
- Machine type.

For the estimate of annual $CH_4$ and $N_2O$ emissions due to possible burning of biomass for SGM, the following parameters should be recorded and reported annually at each time during the project crediting period:

- Area burned;
- Aboveground biomass burned, excluding litter and dead wood.

To estimate project removals due to changes in SOC, the following parameters must be monitored at least once every five years during the project crediting period. The soil sampling, handling and storage, processing and measurement, and quality control procedures implemented in soil organic carbon analysis that follow a scientific peer-reviewed or nationally approved standard.

- SOC content;
- Soil bulk density;
- Percentage of rocks with a diameter larger than 2mm, roots and other dead residues;
- Carbonate content.

As mentioned in Section 3.2.2, the project uses direct measurement approach (Option 2) to determine the project removals due to changes in SOC, and the sampling procedures were designed such that the statistical significance of soil carbon stock changes between the baseline carbon stock and the carbon stock in year t can be determined with a 95 percent confidence interval. The Guidelines for sampling and surveys for CDM project activities and programmes of activities was followed to determine the sampling procedure and sample size.

For the estimate of leakage emissions, the monitoring parameters required in the VCS modules VMD0040 Estimation of Leakage Emissions from Displacement of Grazing Activity due to Implementation of Sustainable Grassland Management Activities must be recorded annually during the project crediting period.

- Total population of each type of livestock l displaced to unidentified grasslands
- Number days that livestock of each type l graze on unidentified grasslands
- Area required to sustain the population of livestock displaced to unidentified grasslands
- Aboveground net primary productivity in the unidentified grasslands

4) **Sampling Design and Stratification**

As mentioned above, the project removals due to changes in SOC will be determined by direct measurement approach (Option 2) by using soil sampling procedures according to nationally-approved standard (HJ/T 166-2004).

Due to the heterogeneity of soil carbon, stratification of the project area into relatively homogeneous units can either increase the measuring precision without increasing the cost unduly or reduce the cost without reducing measuring precision because of the lower variance within each homogeneous unit.

According to the methodology (VM0026/Version 1.1), four main requirements was met before the stratified sampling is chosen:

- Population must be stratified in advance of the sampling.

The project area was stratified before sampling.

- Classes must be exhaustive and mutually exclusive (ie, all elements of the population must fall into exactly one class).

For the project, classes were determined by each county within project boundary and the two different soil texture (see Table 3-4 for details), which are exhaustive and mutually exclusive and all elements of the population fell into exactly one class.

- Classes must differ in the attribute or property under study, otherwise there is no gain in precision over simple random sampling.

The grazing situation in the project area of each county is basically the same, but the climate of each county is different, which has a certain impact on the accumulation of soil carbon. Also, different soil textures have a significant impact on soil carbon accumulation, such as, sandy soil has poor water and fertility retention, clay soil has strong water and fertility retention, and loam has moderate water and fertility retention. For the project, based on the county and soil texture, the project ex ante strata are listed in the following table.

- Selection of items to represent each class (ie, the sample drawn from each class) must be random.

The locations of sample sites were set by systematic sampling with a random start. For each strata, using GIS to set a random start plots, and then set the constraint boundary for the rest plots (within the range of the certain strata and the horizontal and vertical distances from the boundary should be no less than 30m)

Table 3-10 The Project ex ante Stratification for carbon calculation

| Strata | Area(ha) | Grassland type | Management practice | Soil texture |
|---|---|---|---|---|
| Strata-1 | 52,009.90 | Desertification Grassland | Rest grazing | Sandy |
| Strata-2 | 26,892.34 | Desertification Grassland | Rest grazing | Sandy loam |
| Strata-3 | 7,443.17 | Desertification Grassland | Reseeding grass | Sandy |
| Strata-4 | 7,803.22 | Desertification Grassland | Reseeding grass | Sandy loam |

| | | | | |
|---|---|---|---|---|
| Strata-5 | 3,374.91 | Desertification Grassland | Rotational grazing | Sandy |
| Strata-6 | 4,383.18 | Desertification Grassland | Rotational grazing | Sandy loam |
| Strata-7 | 11,692.04 | Temperate grassland | Rest grazing | Sandy loam |
| Strata-8 | 12,576.56 | Temperate grassland | Rest grazing | Loam |
| Strata-9 | 14,805.05 | Temperate grassland | Reseeding grass | Sandy loam |
| Strata-10 | 21,153.68 | Temperate grassland | Reseeding grass | Loam |
| Strata-11 | 21,374.62 | Temperate grassland | Rotational grazing | Sandy loam |
| Strata-12 | 26,652.60 | Temperate grassland | Rotational grazing | Loam |
| Strata-13 | 2,083.39 | Meadow grassland | Rest grazing | Sandy loam |
| Strata-14 | 2,194.31 | Meadow grassland | Rest grazing | Loam |
| Strata-15 | 3,034.93 | Meadow grassland | Reseeding grass | Sandy loam |
| Strata-16 | 22,762.37 | Meadow grassland | Reseeding grass | Loam |
| Strata-17 | 3,118.59 | Meadow grassland | Rotational grazing | Sandy loam |
| Strata-18 | 17,704.94 | Meadow grassland | Rotational grazing | Loam |
| Total | 261,059.80 | | | |

**Updating of strata**

The ex-post stratification must be updated due to the following reasons:

- Unexpected disturbances occurring during the project crediting period (eg, due to fire, pests or disease outbreaks), affecting differently various parts of an originally homogeneous stratum;
- Grassland management activities (planting) may be implemented in a way that affects the existing stratification.

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

**Sampling framework**

According to the methodology, Guidelines for sampling and surveys for CDM project activities and programmes of activities (version 4.0) should be followed to determine the sampling procedure and sample size.

According to the Guidelines for sampling and surveys for CDM project activities and programmes of activities (version 4.0), the project proponents may use the sample size calculator available in the CDM website. See Sample Size Calculator Table for detail.

The mean SOC with the project boundary and the standard deviation of SOC in each strata were estimated from a preliminary sample, the project monitoring team has selected 3 preliminary sample sites for each strata and calculated the mean value and standard deviation of the biomass stock in each strata which were used to calculate the final number of sample sites based on the Sample

The calculated sample size was 89 originally by using a precision of 15 percent at the 95 percent confidence level, considering the large area of the project boundary, the actual sample size has been increased into 117, by tripling the individual sample size of each stratum with a minimum

number of 6. For some regions with large variation, the sample size is 9. Please refer to Sample Size Calculator Table for details.

For each strata, using GIS to set a random start sites, and then set the constraint boundary for the rest plots (within the range of the certain strata and the horizontal and vertical distances from the boundary should be no less than 30m).

**5) Monitoring for leakage emission**

For the estimate of leakage emissions, the monitoring parameters required in the VCS modules VMD040 Estimation of Leakage Emissions from Displacement of Grazing Activity due to Implementation of Sustainable Grassland Management Activities were recorded annually during the monitoring period.

**3. 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 at least every five years.

4. Data management

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

5. QA/QC procedures

The following QA/QC procedures will be adopted:

1) Training will be provided to the staff to guarantee the implementation of the monitoring plan, all the relevant staff is obliged to take the training course before the operation starts;

2) The monitoring team will check the monitoring equipment regularly to make sure their normal operation before each monitoring activities;

3) If the validated monitoring plan cannot be conducted during the following monitoring process due to some reason, an updated monitoring plan should be submitted to VVB during the corresponding verification by indicating the relevant deviation of the original plan and the reason for the deviation.

4) All soil samples need to be backed up. If there is a problem with the testing equipment or the data is abnormal, retest the corresponding soil sample.

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

The monitoring plan and results of first verification were published on VCS and CCB website which can be easily download by stakeholders. Also, the summary of project description in local language

was disseminated to local communities through County Forestry and Grassland Bureau, as long as the summary of monitoring reports during this verification. At the same time, public notice boards in each village were used to publicize information regarding how to access to the monitoring plan and results through internet. Technical staff from Zhangye Forestry and Grassland Bureau would also explain the monitoring plan to local residents, especially to illiterate or under-educated herders. Also, a contact person with phone number was published in case any stakeholders want to directly contact the project proponent and raise opinions.

For the following periodical verification, the dissemination of monitoring plan and results is same as the first verification. And the monitoring team will summarize all the comments received from stakeholders and corresponding responses regarding the monitoring plan and results, and published on VCS and CCB website along with the monitoring report for each monitoring period.

## 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)

As mentioned in section 2.1.8 and 2.1.9, there are five main community groups identified which will be affected by this project:

- Local residents around project area
- Village collectives
- Zhangye Forestry and Grassland Bureau
- County Forestry and Grassland Bureau
- Local government

Among those community groups, local residents and village collectives are the most important groups who would be significantly influenced by the implementation of the project.

**Well-being information**

At the project start, grazing was the traditional livelihood for local residents, and there were not much other job opportunities offered. Local women used to stay at home doing housework, and

most of them has no income. The project provided short-term work such as fence building and grass seeding but also the long-term work such as the grassland guardians for local residents around project area. Approximately 952 local herders were employed as grassland guardians, with an annual salary of24,000 RMB (3758.4USD) /year per person, which will increase their household income.

Especially, the implementation of the project has improved women's well-being. Women and men often have very different roles and interests in natural resource management and can contribute complementary skills and knowledge. Generally, women are more involved in subsistence activities like planting, protecting, or caring for seedlings and small trees, as well as in home orchards and public land. There is also evidence that when women receive income, positive welfare outcomes are more likely: gender equity can thus be key to wider poverty and equity impacts. In project, more than half of the local residents directly involved in the project are women. The project provided them with skills training in fence building and sustainable grassland management, which is conducive to increasing family income and improving local ecological environment.

Before the implementation of the project, the grassland here is facing serious degradation. People live in a relatively harsh environment, which does not take advantage of the residents' pursuit of a better life. The project restored the degraded grassland and is beneficial to rebuild local pleasant and beautiful ecological system which has higher ecological aesthetic value of tour and sightseeing which improve their living environment.

Sunan County occupies most of the project zone (63.77%), where the population of the minorities nationality accounting for 98%. In 2016, the minorities population in Sunan County was 22,045, accounting for 56.92% of the total population of Sunan County. Before the implementation of the project, the channels for ethnic minorities here to communicate with the outside world were limited.In project scenario, the local residents employed by the project are mostly belong to ethnic minorities. The implementation of the project requires full communication among stakeholders on a regular basis. At the same time, it also attracts tourists from all parties, which greatly promotes the cultural collision of all ethnic groups and is conducive to the dissemination of ethnic minorities and grassland culture. All these will significantly improve the well-being of local communities.

**Community characteristics**

Zhangye city covers an area of 38,592 square kilometers. Chinese are the main languages in the project zone and Yugu language is used in some area of Sunan county. At the project start, there are 65 towns and 836 village committees in total. The total population of the city is 1.2242 million, of which 56.07% are rural population**.** There are 1,589 health institutions (including 847 village clinics), 9,276 health technicians, and 8395 beds in medical and health institutions, including 7,784 beds in hospitals and health centers, which have a certain level of medical service.

Zhangye has rich cultural landscape, since ancient times, Zhangye has been the important town and throat of merchants on the silk road. It is named Zhangye with the meaning of " Open the arms of the country (Han Dynasty) to connect with the western regions". Ganzhou is the origin of the word "Gan" in Gansu Province. Zhangye is known as "Jiangnan on the frontier fortress" and "Golden Zhangye". It has both the natural beauty of "half city reed" and the historical style of "half city tower shadow". It has two national nature reserves and is rated as a national famous historical and cultural city, an excellent tourist city in China and a pilot city of national ecological civilization demonstration project**.**

In addition, the folk culture of Zhangye also has unique local characteristics, such as Qin opera, folk music shadow play and so on.

**Diversity within the community**

In 2016, the permanent resident population of the city was 1,224,200, and the population of Tibetan, Mongolian, Hui, Turkish and other ethnic minorities dominated by Yugur was 26,000, accounting for 2.15% of the total population. By age, there are 193,500 people aged 0-14, 918,500 people aged 15-64 and 112,100 people aged 65 and over. According to the data of the sixth census in 2010, the male population is 612,594 and the female population is 586,921.

Zhangye has a rural population of 686,400, accounting for 56.07% of the permanent population. The annual per capita disposable income of urban residents was 21,503 RMB(3331 USD) and the per capita consumption expenditure of urban residents was 18,923 RMB (2,931 USD).

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

The community groups of the project including local minorities, local women, local herders, grassland guardians, village collectives and other stakeholders were barely active. Some project land belongs to village collectives, before the implementation of the project, local residents lived by grazing, and most of the female rural workers have to stay at home with no income. And other community groups are far from the project area. So, the interaction between community groups was considered incipient and/or superficial due to the geographic distance and the absence of common activities to be carried out jointly by the communities.

### 4.1.3 High Conservation Values (CM1.2)

No HCVs was identified related to community well-being in the project zone.

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

At the start of the project, local herders lived by grazing, and the grassland will continue to degrade due to overgrazing. So, the local community will stay in the current well-being level with no potential income increase.

In addition, without the implementation of the project, the traditional livelihood of local minorities herding and grazing would be continuously threatened by the degradation of the grassland ecosystem, which will further affect the development of local animal husbandry and tourism. Due to the lack of new economic growth engine, local medical, educational and cultural undertakings cannot develop better. Therefore, the well-being of the community may deteriorate further.

## 4.2 Net Positive Community Impacts

### 4.2.1 Expected Community Impacts (CM2.1)

The project provided job and training opportunities for local residents (including minorty and social vulnerable groups like women), which would enhance their ability, improve their family income, increase the interaction between communities, build community capacity in gender equity and accelerate the cultural collision between ethnic minorities and protect the ecological environment and attract tourism resources.

All of these could guarantee the long-term community benefits

| | |
|---|---|
| Community Group | Local residents around project area |
| Impact(s) | Create 11,727 job opportunities (952 permanent jobs and 10,775 temporary jobs), which is equally offered to local women and men, provide work training; Improved living environment. |
| Type of Benefit/Cost/Risk | Predicted direct benefits |
| Change in Well-being | Approximately 952 local herders were employed as grassland guardians, with an annual salary of 24,000 RMB (3758.4.2USD) /year per person, which will increase their household income. The local government issued subsidies to the herders in the project area who implemented the prohibition of grazing.<br>The project restored the degraded grassland and is beneficial to rebuild local pleasant and beautiful ecological system which has higher ecological aesthetic value of tour and sightseeing which improve their living environment. |

| | |
|---|---|
| Community Group | Female rural workers |
| Impact(s) | Create 11,727 job opportunities, which is equally offered to local women and men;<br>Empower women and build community capacity in gender equity. |
| Type of Benefit/Cost/Risk | Predicted direct benefits |
| Change in Well-being | Before the implementation of the project, women are more involved in subsistence activities like planting, protecting, or caring for seedlings and small trees, as well as in home orchards and public land. There is also evidence that when women receive income, positive welfare outcomes are more likely. In project, more than half of the local residents directly involved in the project are women. The project provided them with skills training in fence building and sustainable grassland management, which is conducive to keep gender equity. |

| | |
|---|---|
| Community Group | Local herders |
| Impact(s) | Provide graze skill training and enhance capabilities of local herders. Get extra subsidies from local government (ranging |

| | |
|---|---|
| | from 2.17 RMB/mu to 3.35 RMB/mu.) and increase their household income.<br>Improve grazing productivity |
| Type of Benefit/Cost/Risk | Predicted direct benefits |
| Change in Well-being | Local herders live by grazing, so the grassland ecosystem will have a great impact on their traditional livelihood. Also overgrazing is the main factor leading to the continued degradation of the grassland ecosystem. The project restored the degraded grassland and guided them to graze reasonably.<br>The project will not change the ownership of the project land, but some herders are affected by the project, due to grazing was managed scientifically after the implementation of the project. However, herders in the project area can receive corresponding subsidies according to the stakeholder consultation. In addition, after the reseeding, controlled grazing will be expected to be increased the productivity significantly due to the restoration of the grassland. |

| | |
|---|---|
| Community Group | Zhangye Forestry and Grassland Bureau<br>County Forestry and Grassland Bureau |
| Impact(s) | Create local job opportunities, and improve the local ecological environment. |
| Type of Benefit/Cost/Risk | Predicted direct benefits |
| Change in Well-being | Improve local economic and environmental situations. |

### 4.2.2 Negative Community Impact Mitigation (CM2.2)

The project restored degraded grassland around Eastern Qilian Mountain by reseeding grass, rodent controlling and grazing management, which can promote grassland productivity and sustainable development of grasslands. Relevant literature in other area of Eastern Qilian Mountain shows that rest grazing can significantly promote grassland biodiversity. Meanwhile, the project improved the coverage of the grasslands and ecological environment, which provide habitats for wild animals.

Also, Zhangye City is located on the Hexi corridor. It is the Silk Road of China, the main road leading to the western regions and the main road and the first stop for the eastward spread of Buddhism. It has rich historical and cultural heritage since ancient times. In Zhangye City, there are beautiful colorful Danxia and MATI Temple grottoes, which attract a large number of tourists every year and greatly promote the spread of silk culture.

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

As summarized in Section 4.2.1, the expected community impacts are all benefit, no potential cost or risk, therefore the net well-being impacts of the project are positive for all identified community groups compared with their anticipated well-being conditions under the without-project land use scenario.

Restored degraded grassland and improve living environment of local residents

The implementation of the project will restore 261,059.80 ha of degraded grassland of Zhangye city, and prevented continued degradation of grassland, which is beneficial to rebuild local pleasant and beautiful ecological system which has higher ecological aesthetic value of tour and sightseeing which improve their living environment.

Promote local employment and improve the living standards of local residents

As described in section 4.1.1, at the project start, grazing was the traditional livelihood for local residents, and there were not much other job opportunities offered. The project provided short-term work such as fence building and grass seeding but also the long-term work such as the grassland guardians for local residents around project area. Approximately 952 local herders were employed as grassland guardians, with an annual salary of 24,000 RMB (3758.4 USD) /year per person, which will increase their household income. In addition, the development of local tourism due to the higher ecological aesthetic value and the government's additional subsidies to residents in the project area can increase their income.

Provide equal employment opportunities for local women, maintain gender equality.

There is evidence that when women receive income, positive welfare outcomes are more likely: gender equity can thus be key to wider poverty and equity impacts. Generally, women are more involved in subsistence activities like planting, protecting, or caring for seedlings and small trees, as well as in home orchards and public land. The project provided them job opportunities, which is equally offered to local women and men. In fact, more than half of the local residents directly involved in the project are women. which makes women gain more professional identity and higher happiness.

Accelerate the exchange and collision of ethnic and carry forward traditional culture.

The local residents employed by the project are mostly belong to ethnic minorities. The implementation of the project requires full communication among stakeholders on a regular basis. At the same time, it also attracts tourists from all parties, which greatly promotes the cultural collision of all ethnic groups and is conducive to the dissemination of ethnic minorities and grassland culture.

Promote technical capability of local herders.

There is a workbook provided for each employee which includes technical advice for their work, and all the workers were offered the technical training immediately once they were hired. Such skills and knowledge include are useful for grassland management, such as fire prevention and

forage supplementary sowing technology. These technical manuals were distributed to each household in the local villages, including the villagers who haven't participated in the project.

Besides the training on technical skills of grass planting, local workers were trained on relevant skills for their future livelihood, such as sustainable grassland management. These skills will benefit the long-term development of the local communities who participate in the project.

#### 4.2.4 High Conservation Values Protected (CM2.4)

No HCVs was 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)

The project 'do no harm' to the well-being of other stakeholders. In contrary, it will provide valued experience of forest management and carbon trading to other stakeholder, which in some way could encourage more followers to engage in similar projects for sustainable development.

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

The project restored degraded grassland, provided sustainable grazing guidance for herders in the project area, and provided a demonstration for other herders outside the project area.

There are no negative well-being impacts on other stakeholders.

#### 4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The project will provide valued experience of sustainable grassland management and carbon trading to other stakeholder, which in some way could encourage more followers to engage in similar projects for sustainable development. So the project activities are not anticipated to result in net negative impacts on the well-being of other stakeholders.

### 4.4 Community Impact Monitoring

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

To in-depth track the social-economic changes resulted from the project activities in the communities and households, and understand issues raised and difficulties encountered during the project implementation, as well as their opinions and comments on the project activities, so as to adjust and improve the project activities in a timely manner, a PRA process will be conducted before every verification, as described below.

**Procedures:**

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

b) Developing SOPs for the field PRA process;

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

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

e) PRA survey: conducting PRA survey following SOPs.

**Methods:**

a) Village meeting: A meeting of herder 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, herder household interview and group interview

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

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

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

c) Questionnaire: Questionnaire forms will be developed and distributed among different stakeholders, including herder households, village committees, forest farms, township governments and Forestry and Grassland Bureau.

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

| | |
|---|---|
| Variable | Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities |
| monitoring methods to be applied | Training records<br>Questionnaire and interview |

| | |
|---|---|
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local residents, local herdes, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the technical improvement resulting from the project |

| | |
|---|---|
| Variable | Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities |
| monitoring methods to be applied | Training records<br>Questionnaire and interview |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local residents, local herders, local women, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the technical improvement resulting from the project |

| | |
|---|---|
| Variable | Total number of people expected to be employed in project activities, expressed as number of full-time employees |
| monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local women, local herders, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the community benefit resulting from the project |

| | |
|---|---|
| Variable | Number of women expected to be employed as a result of project activities, expressed as number of full-time employees |
| monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview |

| | |
|---|---|
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local women, local herders, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the community benefit resulting from the project |

| | |
|---|---|
| Variable | Total number of people expected to have improved livelihoods or income generated as a result of project activities |
| monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview<br>Training records |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local women, local herders, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the change of livelihoods and household income due to the implementation of the project, such as increased job opportunities and improved grazing productivity |

| | |
|---|---|
| Variable | Number of women expected to have improved livelihoods or income generated as a result of project activities |
| monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview<br>Training records |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local women, local herders, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the change of livelihoods and household income due to the implementation of the project, such as increased job opportunities and improved grazing productivity |

| | |
|---|---|
| Variable | Total number of community members whose well-being is expected to improve as a result of project activities |

| | |
|---|---|
| monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview<br>Training records |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local women, local herders, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the change of well-being due to the implementation of the project |

| | |
|---|---|
| Variable | Number of women whose well-being is expected to improve as a result of project activities |
| monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview<br>Training records |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local women, local herders, local minorities, grassland guardians |
| Purpose of monitoring | Evaluate the change of well-being due to the implementation of the project |

| | |
|---|---|
| Variable | Area of grassland restored from degraded grasslands |
| Monitoring methods to be applied | Project records |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Zhangye Forestry and Grassland Bureau<br>County Forestry and Grassland Burea |
| Purpose of monitoring | Evaluate the environmental improvement resulting from the project |

| | |
|---|---|
| Variable | Number of minorities benefiting from project activities |

| | |
|---|---|
| Monitoring methods to be applied | Working contracts and payment records<br>Questionnaire and interview |
| Frequency of monitoring/recording | Before every verification event |
| Affected community groups | Local minorities |
| Purpose of monitoring | Evaluate the conservation of minorities cultural resulting from the project |

### 4.4.2 Monitoring Plan Dissemination (CM4.3)

The community monitoring plan and results of first verification were published on VCS and CCB website which could be easily download by stakeholders. Also, the summary of project description in local language was disseminated to local communities through County Forestry and Grassland Bureau, as long as the summary of monitoring reports during this verification. At the same time, public notice boards were used to publicize information regarding how to access to the community monitoring plan through internet. Technical staff from Zhangye Forestry and Grassland Bureau would explain the community monitoring plan to local herders, especially to illiterate or under-educated herders. Also, a contact person with phone number was published in case any stakeholders want to directly contact the project proponent and raise opinions.

## 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)

Some of project area is located in Qilian Shan mountains, which is an ecological security barrierThe grassland in the project area is an important habitat and breeding place for wild animals (e.g. IUCN threatened species: *Falco cherrug, Aythya nyroca*).

In recent years, due to overgrazing, grassland in project zone has been degraded to varying degrees and even desertification, which has seriously damaged the growth conditions of plants and the habitat on which wild animals depend, resulting in the decline of biodiversity.

According to the Biodiversity survey report of the project conducted before the start of the project, there are 48 species of the vegetation, 31 species of birds, 38 species of mammals in Zhangye City, which has been identified as the project zone. Regarding the animals, there are 2 species of national level I protected species, 19 species of national level II protected species in the project zone. One species is listed in CITES Appendix I, 18 species is listed in CITES Appendix II.

Compared with the results of a survey on biodiversity in Sunan County in 2010[43], the plant diversity of grassland decreased significantly, mainly reflected in the reduction of species and the decline of wild animal population.

Table 5-1 Plant species in the project zone

| Grassland type | Species |
|---|---|
| Temperate meadow grassland | *Artemisia gmelinii, Stipa bungeana, Kobresia humilis, Stipa grandis, Stipa kry lovii, Agropyron cristatum, Leymus dasystachys, Poa sp.*, |

[43] Zhao Z, He Y, Li Q et al. (2010) Investigation on grassland resources in Sunan Yugur Autonomous County. Acta Prataculturae Sinica (06), 231-247

| | |
|---|---|
| | *Koeleria cristata, Melissitus ruthenicus, Carex sp., Potentilla sp., Oxytropis sp., Anaphalis lacteal, Leontopodium nanum, Clematis tangutica, Thalictrum alpinum, Gerani-um sp. Dracocephalum heterophyllum, Thermopsis lanceolata* |
| Temperate grassland | *Stipa kry lovii, Stipa breviflora, Stipa grandis, Agropyron cristatum, Leymus dasystachys, Poa sp., Elymus nutans, Artemisia frigida, Kochia prostrata, Aster tataricus, Allium polyrhizum, Potentilla multicaulis, Orinus kokonorica, Oxyt-ropis glabra,Pe-dicularis kansuensis, Stellera chamaejasme* |
| Temperate desert | *Alhagi sparsifolia, Suaeda glauca, Salsolacollina Pall, Sympegma regelii, Karelinia capsica, Reaumuria soongorica, Kalidium foliatum Allium polyrhizum, Aristida adscensionis, Stipa breviflora* |

Table 5-2 Animal species in the project zone

| No. | Species | national protected level | CITES appendix | IUCN level |
|---|---|---|---|---|
| 1 | Tibetan Snowcock | II | I | LC |
| 2 | Himalayan Snowcock | II | | LC |
| 3 | White-eyed Pochard | | | NT |
| 4 | Red-crested Pochard | | | LC |
| 5 | Great Crested Grebe | | | LC |
| 6 | Black-winged Stilt | | | LC |
| 7 | Kentish Plover | | | LC |
| 8 | Pacific Golden Plover | | | LC |
| 9 | Northern Lapwing | | | NT |
| 10 | Green Sandpiper | | | LC |
| 11 | Spotted Redshank | | | LC |
| 12 | Common Sandpiper | | | LC |
| 13 | Common Greenshank | | | LC |
| 14 | Eurasian Curlew | | | NT |
| 15 | Ruddy Turnstone | | | LC |
| 16 | Temminck's Stint | | | LC |
| 17 | Black-tailed Godwit | | | NT |
| 18 | Common Black-headed Gull | | | LC |
| 19 | Pallas's Gull | | | LC |
| 20 | Common Tern | | | LC |
| 21 | Black Stork | I | II | LC |
| 22 | Northern Harrier | II | II | LC |
| 23 | Steppe Eagle | II | II | LC |
| 24 | Golden Eagle | I | II | LC |
| 25 | Upland Buzzard | II | II | LC |

| | | | | |
|---|---|---|---|---|
| 26 | Common Buzzard | II | II | LC |
| 27 | Long-legged Buzzard | II | II | LC |
| 28 | Himalayan Griffon | II | II | NT |
| 29 | Black-eared Kite | II | II | LC |
| 30 | Lesser Kestrel | II | II | LC |
| 31 | Saker | II | II | EN |
| 32 | Saker Falcon | II | II | LC |
| 33 | Eurasian Hobby | II | II | LC |
| 34 | Chinese Grey Shrike | | | LC |
| 35 | Large-billed Crow | | | LC |
| 36 | Red-billed Chough | | | LC |
| 37 | White-throated Dipper | | | LC |
| 38 | Kessler's Thrush | | | LC |
| 39 | White-capped Water-Redstart | | | LC |
| 40 | Desert Wheatear | | | LC |
| 41 | Black Redstart | | | LC |
| 42 | Daurian Redstart | | | LC |
| 43 | Rufous-breasted Accentor | | | LC |
| 44 | Eurasian Tree Sparrow | | | LC |
| 45 | White-rumped Snowfinch | | | LC |
| 46 | White Wagtail | | | LC |
| 47 | Yellow Wagtail | | | LC |
| 48 | Meadow Pipit | | | NT |
| 49 | Water Pipit | | | LC |
| 50 | Tawny Pipit | | | LC |
| 51 | White-browed Rosefinch | | | LC |
| 52 | Streaked Rosefinch | | | LC |
| 53 | Pallas's Bunting | | | LC |

**Threats to the biodiversity**

The project area is located near the Qilian Mountains. According to previous studies[44], the factors threatening biodiversity mainly include the following aspects:

**Climatic factors**

Project zone is located in the arid area of Northwest China, with obvious continental climate characteristics. With global warming, permafrost melts in a large area, permafrost activation, snow line rise and water conservation function decline. In addition, the increase of temperature is not conducive to vegetation growth and breeding, resulting in the decline of litter yield, the input of soil organic matter and biodiversity.

[44] Wang Xinyuan, Yang Dongwu, Zhang Lili et al. (2020). Causes of grassland degradation and Restoration Countermeasures in Qilian Mountain National Park. Chinese Journal of Cao Xue, 2020 (06): 81-86

**Insect and rodent damage factors**

Serious insect and rodent damage is one of the important factors for grassland degradation in project zone. The main rodents include *Ochotona curzoniae*, *Myospalax fannieri*, *Meriones unguiculatus*, etc. These rodents directly destroy grassland vegetation by gnawing grass leaves and roots, and have the living habits of digging holes, burrowing and accumulating sand and soil, damaging grass roots, burying forage plants and destroying soil structure indirectly inhibited the normal breeding of forage. In addition, rats competed with cattle and sheep for forage, which further exacerbated the contradiction between forage and livestock.

**Cultivation and reclamation**

Due to historical reasons, project zone has opened up wasteland and cultivated land on a large scale to meet the food demand. Within ten years, the agricultural reclamation activities in the zone have stopped, but the negative effects caused by farming and reclamation still exist, mainly including the shallow soil layer caused by reclamation and serious soil and water loss; The destruction of soil physical structure and nutrient loss caused by the destruction of herbaceous plants on the underlying surface, resulting in desertification of grassland.

**Overload overgrazing**

Long term overgrazing is the main cause of grassland degradation and desertification in project zone. Grassland overgrazing is mainly due to two reasons: one is the decline of the absolute amount of grassland suitable for grazing, resulting in a significant reduction in the area of grassland available for livestock grazing; Second, the animal husbandry population has increased, the total amount of livestock has increased, and the grazing intensity has increased. Specifically, the adverse effects of overgrazing on grassland ecosystem mainly include three aspects: first, it reduces the overall productivity of grassland by feeding a large number of plants; Second, selective feeding significantly inhibited the growth of high-quality forages, provided space for the invasion of inedible poisonous weeds and weeds, and the community tended to degenerate; Third, the high-intensity and high-density trampling of livestock leads to the increase of soil compactness, the decrease of porosity, and it is difficult to effectively retain water, which is not conducive to root growth and development. Grassland degradation and destruction lead to the loss of biological habitat and the reduction of animal population.

### 5.1.2 High Conservation Values (B1.2)

No HCVs was identified related to biodiversity in the project zone.

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

As mentioned above, the without-project land use scenario is continuing “degraded” of the current grassland ecosystem due to overgrazing. Without the implementation of the project, the conservation of the local biodiversity would not be achieved under the continued degradation of grassland ecosystem, which would be a serious threat to local climate conditions and ecosystem, especially for the endangered birds species mentioned above.

## 5.2 Net Positive Biodiversity Impacts

### 5.2.1 Expected Biodiversity Changes (B2.1)

| | |
|---|---|
| Biodiversity Element | Grassland productivity of the project area |
| Estimated Change | Positive, the productivity is estimated to be increased |
| Justification of Change | The behaviour of reseeding grass could restore vegetation of the degraded grassland. |

| | |
|---|---|
| Biodiversity Element | Number of grass species of in the project area |
| Estimated Change | Positive, the productivity is estimated to be increased |
| Justification of Change | Six native grass species (see Project Design Report) have been planted in project area which will be maintained under long-term management. |

| | |
|---|---|
| Biodiversity Element | Threats to endangered animals |
| Estimated Change | Identify change |
| Justification of Change | The project prevented the continued degradation of the local grassland ecosystem and increased the natural habitats for the endangered animals, so the threats to endangered animals will be reduced as a result of the project activities. |

### 5.2.2 Mitigation Measures (B2.3)

The main measure of the project is rotational grazing and rest grazing through building grassland fences and planted grass seeds on the degraded grassland. Through scientific and sustainable management of grazing, relevant training about technical skills, scientific and effective management plan, alleviate soil desertification and restore grassland vegetation to improve soil carbon storage and local biodiversity. The management team are experienced with sustainable grassland management as mentioned in Section 2.4.2 and has established an integrated management system for implementation of the project, including rodent control, fire prevention and technical training of employees, which will minimize the intensity and periodicity of required interventions. Also, the implementation of the project has improved the ecological environment of the project zone, increased the biodiversity and provided more habitats for threatened species. In addition, all grass species are native species, and no invasive species will be introduced.

Therefore, implementation of this project will not decrease biodiversity of project sites.

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

As mentioned before, without the project, the project area will continue degraded with much threat to local climate and biodiversity condition. And the main object of the project is to restore the

degraded grassland ecosystem, by planting with mix species of native grass, therefore the net with-project change of biodiversity is positive.

First, there are 6 native species of grass planted in this project and the mix planting of the species will have more positive impacts on biodiversity according to relevant research. In addition, the management measures of rotational grazing and rest grazing will alleviate the grazing pressure, which is conducive to the restoration of grassland vegetation.

Second, through sustainable grassland management, including rodent control, grassland fire prevention and reasonable grazing guidance, the degraded grassland ecosystem is gradually restored. This will make sure the project can bring net biodiversity benefit compared to the with-out project scenario.

Third, the implementation of the project can improve grassland productivity and increase the coverage which is beneficial of water conservation, reduce drought and flood risk, promote soil nutrient cycle, improve local micro-climate and other ecological environment. Therefore, the population of animals will increase due to the restoration of the habitat.

### 5.2.4 High Conservation Values Protected (B2.4)

No HCVs was identified related to biodiversity in the project zone thus no HCVs related to biodiversity are negatively affected by the project.

### 5.2.5 Species Used (B2.5)

*Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra and Artemisia sphaerocephala* were reseeded on the degraded grassland in project area.

### 5.2.6 Invasive Species (B2.5)

All grass species are native species, and no invasive species were and will be introduced into any

area affected by the project.

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

No non-native species will be used in the project zone.

### 5.2.8 GMO Exclusion (B2.7)

No GMOs will be used in the project to generate GHG emissions reductions or removals.

### 5.2.9 Inputs Justification (B2.8)

According to the Project Design Report, there are no chemical fertilizer applied in the project area. In order to alleviate the pressure of grassland forage, artificial feeding grassland is built around the project area, but only farm manure is applied.

| Name | Chemical pesticides |
|---|---|

| | |
|---|---|
| Justification of Use | The chemical pesticides are allowed to be used only if there is a serious disease problem erupted in the project area, and the pesticides will be used in accordance with the National Pesticides Policy. |
| Potential Adverse Effect | Improper pesticide application would be harmful to natural environment, including polluting soil, water and air conditions, as well as the habitat of the wildlife. But for this project, pesticide will be strictly managed by well trained staff to minimize the potential effect. Also, the 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 |

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

#### 5.2.10 Waste Products (B2.9)

The waste products resulting from the project activities may include:

a) Rubbish: Local people will clear off the rubbish, such as plastics, metals, papers and other abandoned items from the project area regularly when they manage the grassland. Project owner will also carry out frequent visit to ensure the waste and waste products are well identified and cleaned.

b) Human waste: There might be some human waste because there is no toilet in the field. However, the amount will be quite small and can be degraded naturally, so there is no particular treatment needed.

### 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)

As described above, there are no potential negative offsite impacts on biodiversity, the net effect of the project on biodiversity is positive.

## 5.4 Biodiversity Impact Monitoring

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

As shown in Figure 3-1, the project owner established a monitoring team to conduct biodiversity monitoring. The responsibilities of each role in the team structure are:

- Office manager has the overall management responsibility, especially supervising the implementation of the monitoring plan, and assigning each member of the monitoring team their individual responsibility during the monitoring.

- Expert group provides professional technique related to monitoring activities to make sure all the monitoring activities meet the requirement of VCS and CCB standards.

- Monitoring group conducts the following monitoring process, measures the required parameters of the project as listed in the above Section 3.3.2 particularly, and collects all the original evidence and data and make relevant records.

- Auditing group performs internal verification of the measurement, reviews all the monitoring records and documents, crosschecks evidence and calculates emission removals during each verification period.

A Grassland monitoring technical manual will be provided to each member of the monitoring team with a specific explanation to make sure they fully understand all the monitoring process and issues concerned.

As analysed in section 2.1.18 and 5.1.1, the risks of fire, rodents, pests and overgrazing might threat the aim of the project and need to be intervened.

Following the guidelines of SBIA Manual, the project chose multiple indicators and Pressure, State, and Response (PSR) indicators for the monitoring of biodiversity, while vegetation and animals were both involved to be monitored and the threaten and risk factors such as fire and disease are included, therefore the monitoring indicators should be considered as reasonable, considering the balance of high-quality data, low costs, regular measurements, and community participation.

According to SBIA-Part 3, three types of monitoring indicators will be chosen, including Pressure, State, and Response (PSR). Since natural systems are extremely complex, and even variables that are carefully chosen to reflect the health of a system will sometimes fluctuate for reasons unrelated to the project. In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit. Usually, the abundance of endangered animals can accurately reflect the status of the local ecosystem. The greater the number of endangered animals, indicating the better the ecological environment in the region. And considering the cost efficiency, the indicators that can be monitored with relative ease and reflect local conditions should be chosen. Therefore, the project chooses “threats to endangered animals” as

indicators to monitor the project's impact on animals which should be appropriate for a sustainable grassland management project.

Also, the indicator "threats to endangered animals" are used to monitor the quantity and quality of grassland in the project area (a state indicator), together with other indicators ("grassland coverage" and "species of vegetation"), therefore the general population of local biodiversity could be reflected by the overall monitoring results of the multiple indicators.

All the original monitoring results will be recorded by auditing group and assessed by the expert group to measure the net biodiversity impact and the effectiveness of the measures taken by the project activities. The detailed monitoring plan for biodiversity is listed in the following table:

Table 5-4 Monitoring indicators for biodiversity

| Indicator type | Description | Monitoring indicator | Unit | Monitoring method | Monitoring frequency |
|---|---|---|---|---|---|
| State variables | The quantity and quality of grassland in the project area | Grassland productivity | ha | Sample plots of the same size are installed in different strata to monitor the coverage. Plot size is set to be a rectangle land with 1m×1m (1m$^2$). Calculate grassland productivity by estimating aboveground biomass in quadrat | Before every verification |
| | | Number of grass species | | Sample plots have been set to monitor the species of vegetation which were the same as the sample plots set for monitoring of climate. Plot size is set to be a rectangle land with 1m*1m (1m$^2$). | Before every verification |
| | | Protected area for endangered animals | ha | Check the Project Design Report, construction record and acceptance report, and visit the project land. Monitor the restored area in the project zone. | Once every year |
| 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 grassland guardians and confirmed by local Forest Bureau | Once every year |
| | | Effected grassland area suffered rodents and pests | ha | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |
| | | Overgrazing | ha | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |
| | | Fertilizer and Chemical pesticides | t | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |

| | | | | | |
|---|---|---|---|---|---|
| Response variables | The frequency or intensity of project interventions relevant to biodiversity | Grassland area under prevention control from fires | ha | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |
| | | Grassland area under prevention control from rodents and pests | ha | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |
| | | Project area of sustainable grassland management | ha | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |
| | | Project area for restoration of degraded grassland | ha | Recorded by grassland guardians and confirmed by local Forest Bureau | Once every year |

### 5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The biodiversity monitoring plan and results of first verification were published on VCS and CCB website which could be easily download by stakeholders. Also, the summary of project description in local language was disseminated to local communities through County Forestry and Grassland Bureau, as long as the summary of monitoring reports during this verification. At the same time, public notice boards were used to publicize information regarding how to access to the biodiversity monitoring plan through internet. Technical staff from Zhangye city Forestry and Grassland Bureau would also explain the biodiversity monitoring plan to local residents, especially to illiterate or under-educated residents. Also, a contact person with phone number was published in case any stakeholders want to directly contact the project proponent and raise opinions.

## 5.5 Optional Criterion: Exceptional Biodiversity Benefits

N/A

### 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.