SFG2020

Environmental and Social Impact Assessment

Executive Summary

For

CH-Second Gansu Cultural and Natural Heritage Protection and Development Project

Gansu Provincial Reform and Development Committee

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1. Introduction

1.1 Background

Located in the west of China, Gansu is one of the poorest provinces in China, due to its structural constraints for industrial and manufacturing based development, i.e. challenging natural environment, with the Gobi desert in the west and sensitive ecosystems of the Loess Plateau and mountainous region in the southeast; isolated location with limited access to the country's strategic markets; and low level and lagging urbanization. Compared with other western provinces, Gansu Province has benefited less from the West Development Program launched by the central government for a decade. And such trend of widening disparity with other provinces thus becomes a major challenge for the Gansu Government.

Gansu provincial government has recognized the potential of its unique assets, i.e. attractive landscapes and historical heritages, and has elaborated strategies and programs emphasizing heritage and sustainable tourism as pillars to drive growth and job creation. The World Bank has assisted cultural and natural heritage conservation and development in Gansu through the recently completed Gansu Cultural and Natural Heritage Protection and Development Project. Gansu provincial government has requested continued support from the Bank to scale up the good practices achieved in this project, and help the province further explore innovative approaches in heritage conservation and sustainable tourism development.

In addition, The Gansu provincial government engaged the Northwest Normal University for the preparation of the Longdongnan Regional Strategic Planning Study for the Cultural and Natural Heritage Conservation and Sustainable Tourism Development (Longdongnan Regional Study). The study provides elements to screen project sites that can be potentially included in the project, analyzing Strengths and Weaknesses, as well as Opportunities and Threats. Sites with higher development potential, benefits in terms of attractiveness for private sector investment, job creation, income generation for local communities, are considered with a higher priority. Additionally, potential sites should already have a complete set of planning tools to expedite implementation, including development and heritage conservation plans at both county and site level, tourism development plan at county level, county master plan and site master plan. This study initially listed seven potential sites for consideration for this project, and the six sub-projects under the proposed project are carefully screened from the list.

This project has been classified into Category A, which requires full assessment and preparation of ESIA and ESMP, collectively known as the EA documentation. An Environment and Social Impact Assessment (ESIA) has been prepared by the Beijing Zhongzi Huayu Environmental Technology Co., Ltd following relevant provisions specified in Chinese EA laws/regulations and technical guidelines, as well as World Bank safeguard policies. In addition, the Social Impact Assessment (SA) report, Resettlement Action Framework[1] and the Ethnic Minority Development Plans have been prepared by the Gansu Yishan Yishui Center for Environmental and Social Development, with the main findings and conclusions incorporated in the ESIA. An Environmental and Social Management Plan (ESMP) was prepared to synthesize recommendations of the EA report and the SA Report. This document is the summary of the EA and SA documentation.

[1] In current stage of project development, it is anticipate that no land acquisition and resettlement is involved. So a Resettlement Action Framework is prepared. .

1.2 Environmental Laws, Regulations, Policies and Applicable Standards

1.2.1 Laws and Regulations

The basis of the EIA Reports includes national and local environmental laws, regulations, policies, the World Bank's environmental and social safeguard policies and IFC's EHS Guidelines, as follows:

- Environmental Protection law of the People's Republic of China, 1989
- The Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, 2000
- The Law of the People's Republic of China on Prevention and Control of Water Pollution, 2008
- The Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise, 1996
- The Law of the People's Republic of China on Environmental Impact Assessment, 2003
- The Solid Waste Pollution Control Law of the People's Republic of China, 2005;
- The Cultural Property Protection Law of the People's Republic of China, updated in 2015;
- Regulations on Natural Reserves, 1994;
- Regulations on Scenic Sites,2006;
- Regulations on Protection and Management of Geo-sites,1995;
- Method for Management of Wetland Parks (pilot), 2010; and
- Technical Specifications for Environmental Impact Assessment;

The summary of the key laws/regulations on the cultural and natural heritage is provided in Table below.

Table 1-1 Summary of the Laws/Regulations regarding Cultural and Natural Heritage

Laws/Regulations	Summary
Environmental Protection law of the People's Republic of China, 1989	• Units constructing project that cause pollution to the environment must observe the state provisions concerning environmental protection for such construction projects. • The environmental impact statement on a construction must assess the pollution the project is likely to produce and its impact on the environment and stipulate the preventive and mitigation measures. • The EIA statement shall, after initial examination by the authorities in charge of construction project, be submitted by specified procedures to the competent department of environmental protection administration for approval. • The department of planning shall not ratify the design plan description of the construction project until after the environmental impact statement on the construction project is approved.
The Law of the People's Republic of China on Environmental Impact Assessment, 2003	• This Law is formulated in order to implement the strategy of sustainable development, prevent the adverse impact on environment brought about by the implementation of plans and construction projects, and promote the harmonized development of economy, society and environment. • Environmental impact assessment should be carried out in accordance with this Law for construction of the projects that produce

	impact on environment within the territory of the People's Republic of China and all other sea areas under the jurisdiction of the People's Republic of China. • The State encourages relevant units, experts and the public to participate in environmental impact assessment in an appropriate way.
The Cultural Property Protection Law of the People's Republic of China, updated in 2015	• For various levels of protected cultural relics, governments at various levels define necessary scope of protection. A buffering construction-control zone can be defined outside the scope of protection. • No other construction projects are allowed within the scope of protection. Necessary construction works within the scope must be approved by the corresponding level of government and the cultural relics authority at one higher level. • Pollution facilities and activities that may affect the safety and environment of the protected relics are forbidden within the scope of protection and outer construction-control zone. • Alternatives for construction projects shall be explored to avoid immovable cultural relics to the extent possible. In case of non-avoidable, in-situ protection shall be pursued to the extent possible, and protection plan must be approved by the relevant cultural relics authority. Ex-situ protection or dismantle must be approved by relevant level of governments. All necessary protection expenses shall be included in the budget of the construction project. • For large scale civil works, construction units shall report cultural relics authorities which will organize archeological survey prior to construction. Expenses for archeological survey, exploration and excavation must be included in the construction budget. • Chance-find procedures: during construction projects or agricultural activities, any one or unit uncovers cultural relics shall stop construction and protect the site, and immediately report to local cultural relics authorities for investigation. In case of important discoveries, the local cultural relics authority must report to authorities at higher levels.
Regulations on Natural Reserves, 1994	• Nature reserves shall be established form area with high ecological and scientific value. • A nature reserve includes Core Zone, Buffer Zone and Experimental Zone, and protective surrounding area if necessary. For the Core Zone where there is well preserved natural ecosystem and concentrated rare and endangered wildlife, no entry is allowed except approved scientific research. For the Buffer Zone which is outside the Core Zone, only scientific research and survey is allowed. For the Experimental Zone, allowed activities include research, teaching,

	study tour, tourism, and taming and reproduction of rare and endangered wildlife. No construction of any production facility is allowed within the Core and Buffer zones. Within the outer Experimental Zone, any production facility that may pollute environment, damage resources or landscape is forbidden, while other construction projects (e.g. roads) must conform to national and local pollution discharge standards.

1.2.2 Safeguard Policies

- OP 4.01 Environmental Assessment;
- OP 4.04 Natural Habitats
- OP 4.11 Physical Cultural Resources;
- OP 4.12 Involuntary Resettlement;
- OP 4.10 Indigenous People

1.2.3 Relevant Planning/Program

There are a number of planning regarding the tourism development at the national, provincial and county levels which provide a reasonable basis for the development of the proposed project, the brief description is presented in table below.

Table 1-2 Relevant Planning and Program

Relevant Planning/Program	Brief Description
Sectoral Restructuring Guidance List, updated in 2013	Encourages the development of tourism based on ecology and forests, cultural property protection and development;
Gansu Provincial 12th Five-year Plan for National Economic and Social Development Plan, 2011	Accelerate the development of tourism based on unique cultural features, by strengthening the protection of cultural heritages and construction of infrastructure in cultural parks and scenic parks;
Gansu Provincial Master Plan for Tourism Development	Accelerate tourism infrastructure development and take more efforts to develop tourism transport with priority being given to roads in national and provincial scenic areas and forest parks.
Gansu Provincial 12th Five-year Plan for Tourism Development	Highlights the construction of infrastructure in scenic areas with focus on roads, water supply and drainage, power supply, sanitation, telecommunication and tourism service facilities.
Tourism Development Plans of each project county	Accelerate the development of tourism resources of local unique features

1.2.4 Applicable Standards

The applicable standards are included in Table 1-3.

Table 1-3 Applicable Standards

Category	Ref.	Name of standard
Environment quality standard	1	• Ambient Air Quality Standard (GB3095-1996)
	2	• Surface Water Quality Standard (GB3838-2002)
	3	• Acoustic Environment Quality Standard (GB3096-2008)

Pollutants discharge standard	4	• Noise Limits on Boundaries of Construction Sites (GB12523-2011)
	5	• Emission Standard for Community Noise (GB22337-2008)
	6	• Integrated Wastewater Discharge Standard (GB18918-2002)
	7	• Integrated Emission Standard for Air Pollutants (GB16297-1996)

1.3 EA Scope

The scope of environmental assessment is shown in Table 1-4.

Table 1-4 Assessment Scope

No.	Environmental Factor	Assessment Scope
1	Soil erosion	Within 200 m from the two sides of roads, and 500 m from the boundary of the sites
2	Vegetation	Within the area of land occupation
3	noise in construction stage	Boundary of construction sites, and 200 m from the boundary of materials stockpiles
4	noise in operation stage	Communities within 200 m from the site boundary
5	Waste gas in construction stage	Within the square area with a side length of 5 km centered at the construction sites
6	Waste gas in construction stage	Within the square area with a side length of 5 km centered at the construction sites
7	Construction wastewater	Within the project area
8	Domestic wastewater in operation phase	

2. Project Description

2.1 Project Development Objective

The objective of the project is to conserve cultural and natural heritage, enhance tourism services, and improve community services in selected project sites in Gansu province.

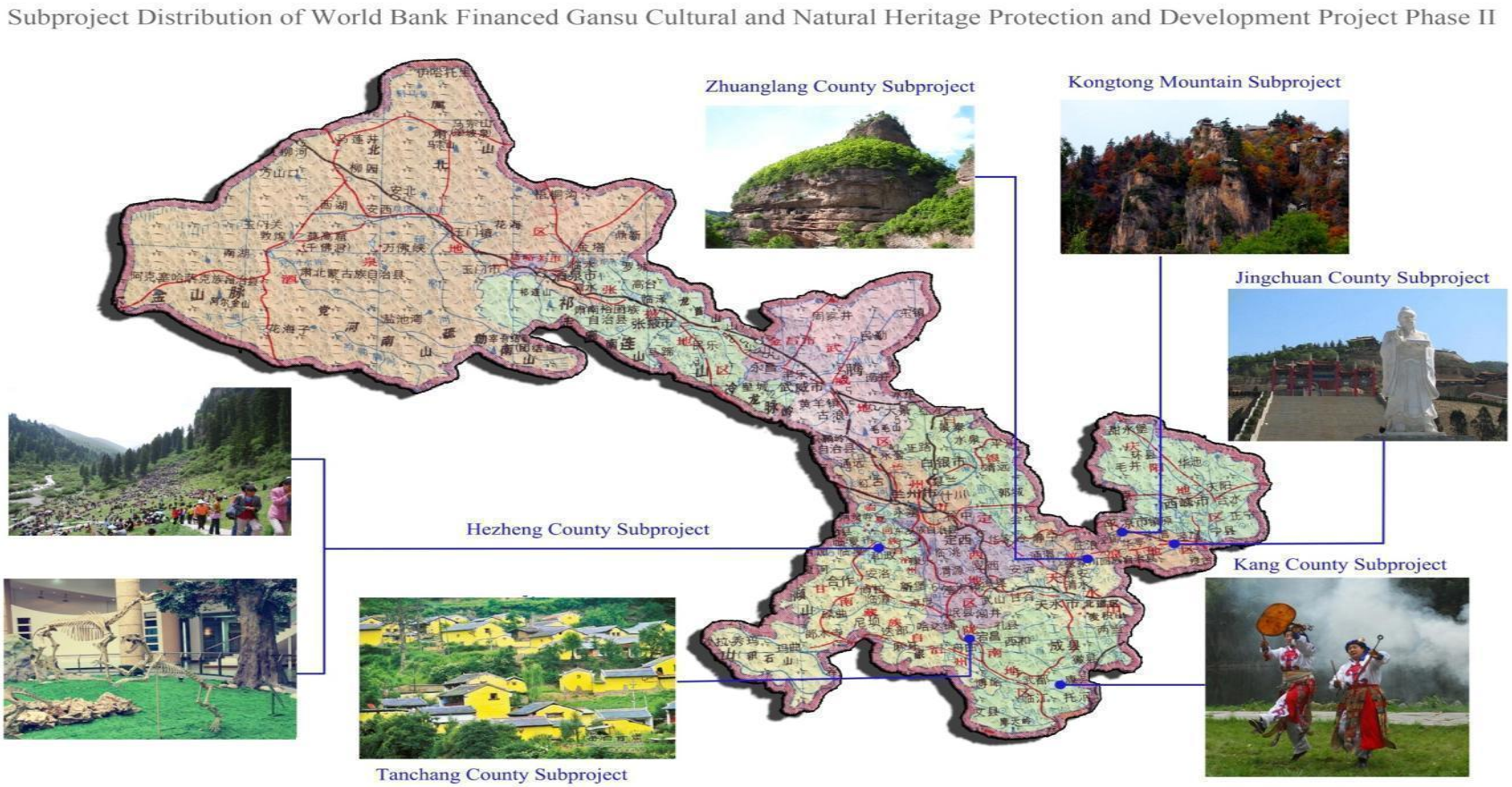
2.2 Composition of Project

This proposed project includes six sub-projects in the selected six counties/districts under the three cities of Pingliang, Longnan and Linxia. Each sub-project consists of the following three components:

- Component 1: heritage site conservation and development. This component targets the Scenic Areas directly, within their boundaries, and provide investment for site management, conservation of assets, enhancing their carrying capacity and tourism access, addressing soil erosion and landslides, creating new pathways to better control visitors flow, appropriate interpretation of the heritage properties, etc.
- Component 2: community service delivery. This component would target settlements outside the Scenic Areas, in identified buffer zones, financing improvement of service delivery, including roads, water supply, solid waste, wastewater and street lighting.
- Component 3: capacity building for project sites, institutional strengthening, and project management support. This component targets skills training to help local communities in the establishment of small business. This component would also include specifics studies for Gansu and the selected projected sites aiming to enhance the technical capacity for tourist destination management and heritage conservation techniques.

For specific activities proposed for conservation of the cultural heritages, please refer to the Annex 1, and the location of these sub-projects refer to the Figure 1-1.

Figure 1-1 Location of the Project



3. Environmental Baseline

3.1 General Setting

Gansu Province is in the west of China, and renown for diversified and beautiful landscapes. Gansu is located in a mountainous region composed with the widely distributed mountains, plateaus, plains, river valleys, and deserts.

The major mountains include Qilian Mountain, Wushaoling, Liupanshan Mountain, Aerjinshan Mountain, and Mazongshan Mountain. Most of them are oriented from the northwest to southeast. The forest resources are centralized in these mountainous areas.

The terrain slopes from the southwest to northeast. Gansu takes a shape of a long and narrow strip, with the length of 1,655 km from the east to west and the width of 530 km from the north to south.

3.2 Climate

As the province of Gansu is in the deep western China and far from the sea, most of Gansu is dry. The climate is dominated by the temperate monsoon. The annual average temperature of the whole province is 0℃-16℃. Temperature largely varies with the fluctutating altitudes. The annual precipitation in the whole province ranges between 36.6 mm to 734.9 mm. which gradually decreases from the southeast to northwest. The period of frost-free days varies largely across the province, where the longest frost free period is in the Longnan valley averaging 280 days, while the shortest is in the Gannan Plateau averaging only around 140 days.

3.3 Hydrology and Water Conservancy

The surface water resource is scare in Gansu Province, which shows a declining trend. The water resources in Gansu are mainly distributed in nine river systems within the basins of the Yellow River, Yangtze River and inland rivers, with an annual runoff of 60.3 billion m3. Among them, there are 78 rivers with runoff of each above 100 million m3. Inland river basins include Shiyang River, Hei River and Shule River systems, with an annual runoff total of 17.45 billion m3 covering an area of 270,000 km2. The river water in Gansu Province enjoys a good quality, classified as Category I or Category II water quality.

3.4 Ecology and Natural Heritages

Gansu Province has a limited forest area. In the whole province, the forest area is only 5.0745 million hectares, with a forest coverage rate of 11.28%. The main tree species include fir, spruce, quercus, populous, armandii pine and birch.

Given the nature and scale of the proposed project, some natural heritages will be involved in the project, and their relation with the proposed project is summarized in Table below:

Table 3-1 Natural/Cultural Heritages and Their Relation with the Project

Sub-project	Heritages	Category of Heritages	Relation with the sub-project
Kongtong Mountain Subproject:	Taitong-Kongtong Mountain National Nature Reserve	National Nature Reserve	Some hike paths and parking lots will be established in the experimental zone of the nature reserve
	Gansu Pingliang Kongtong Mountain National Geo-park	National Geo-park	The hike paths and parking lots will be established in the category-1 zone; the hike paths will pass through category-2 and category-3 zones;

	Gansu Kongtong Mountain Scenic Area	National scenic areas	The sub-project will be built in the scenic area
Hezheng Subproject	Gansu Taizi Mountain National Nature Reserve	National Nature Reserve	The hike paths will be established in the experimental zone
Kang County Subproject	Gansu Giant Salamander Nature Reserve	Provincial nature reserve	The wooden plank roads for patrolling, and the fire fighting access will be located in the buffer zone
	Gansu Hezheng Paleontological Fossil National Geo-park	National Geo-park	The hike paths will be located in the category-3 zone
Zhuanglang Subproject:	Provincial geo-park of Yunya Temple	Provincial geo-park	The fire fighting access, hike paths and ecological parking lots will be located in the category-1, category-2 and level-3 zones
	Yunya Temple Provincial Scenic Area	Provincial Scenic Area	The sub-project will be located within the scenic area
	Yunya Temple National Forest Park	National forest park	The sub-project will be located within the forest park
	Gansu Guan'egou National Forest Park	National forest park	The power cables, the tourist service center, the landslide control works on the hike paths in the Leigu Mountain, and Daheba Zhima River-Eman Tianchi Section landslide disaster control works will be located in category-1 zone
	Meiyuan River National Wetland Park in Kang County	National wetland park	The hike paths on the right bank of Meiyuan River will be located in the reasonable use zone
Tanchang Subproject:	Tanchang Guan'egou National Geo-park	National Geo-park	10 kV power line, the landslide control works on the hike paths in the Leigu Mountain, and Daheba Zhima River-Eman Tianchi Section landslide disaster control works will be located in category-1 zone, other infrastructures will be in the category-3 zone

The basic information for these natural heritages is given in Table below

Table 3-2 Brief Information on the Natural Heritages

Heritages	Brief description
Gansu Taitong-Kongtong Mountain National Nature Reserve	This nature reserve is established to protect the mountain forest ecosystem dominated by the broad-leaved forest in the semi-dry temperate zone. The objects to be protected include the mountain forest ecosystem and the rare fauna and flora resources and their habitats. The nature reserve is under good protection now.
Gansu Taizi Mountain National Nature Reserve	This nature reserve is established to protect the forest ecosystem and the associated wild lives in the transitional zone between the Tibet Plateau and the Loess Plateau. The nature reserve is under good protection now.
Gansu Giant Salamander Nature Reserve	The core area of the nature reserve is comprised with the branches and mountain streams of the Jialingjiang River Basin within the southern Kang County. The primary object for protection is the Giant Salamander. Currently the reserve is well protected from any artificial disturbance and pollution.
Gansu Pingliang Kongtong Mountain National Geo-park	This geo-park is established to protect the Danxia geological sites. Currently most part of the park is under good protection, but there are some parts prone to geo-hazards, i.e. landslide and hill collapse.
Provincial	This geo-park is established on the Danxia landforms which

geo-park of Yunya Temple	represents around 30% of the park in terms of area. Currently this geo-park is under good protection, but there are some parts prone to geo-hazards, i.e. landslide and hill collapse.
Tanchang Guan'egou National Geo-park	This geo-park is established on the geological site formed by the deposit and geotectonic movement. As the Tanchang County is located in the seismic sub-zone with VIII seismic degree, and the complexity of the geological formation, there are risks of landslide and hill collapse in the geo-park.
Gansu Hezheng Paleontological Fossil National Geo-park	This geo-park is established to protect the ocean paleontological fossils of the Late Paleozoic period. The discovered fossils include the indricotherium, platbelodon, hipparion, and equus. Currently this park is under good protection.
Yunya Temple National Forest Park	This park is located in the temperate zone where the broad-leaved forest is gradually succeeded by the grassland. There are plenty of flora and fauna resources. Currently the ecological environment is under good protection.
Gansu Kongtong Mountain Scenic Area	This scenic area is developed on the unique resource of religious buildings, religious ceremony and Kongtong traditional martial art, complemented by the natural scenes. The scenic area is centered on the Huangcheng, Wutai and Xiangshan, where the infrastructures are well developed and maintained. In other parts, such as the Yanzhichuan,Danzhengxia and Taitongshan, the tourism service can not satisfy the demand.
Yunya Temple Provincial Scenic Area	This scenic area is famous for brilliant vegetative cover and the Danxia landscape. It is developed on the Yunya Temple Grottoes protected at national level. Currently the tourism infrastructures are old and lack of maintenance, constraining the further development of the tourism.
Meiyuan River National Wetland Park in Kang County	This wetland park is located in the Yangba Town in the south of Kang County. This park is well planted with the forst coverage rate as high as 83%. The water quality in the wetland is fairly good and meets the Class III of Surface Water Quality Standard (GB 3838-2002).

3.5 Physical Cultural Resources

The sub-projects of Kongtong Mountain, Jingchuan and Tanchang involve some physical cultural resources for conservation and tourism development. The sub-projects of Kongtong Mountain and Jingchuan include the components for conservation of physical cultural properties; the component in the Wanyan Folk Village is only limited to the rehabilitation of the existing infrastructure, and the components in the Luren and Xinping Villages in Tanchang County are limited to the reinforcement and repair of the traditional residential houses, without involving the conservation of cultural properties. The brief information on these cultural properties to be involved in the project are given as follows:

- There are plenty of cultural and natural heritages within the Kongtong Mountain Scenic Area, including the ancient buildings, ancient tomb towers, ancient temples, steles, and ancient trees. The core part of the scenic area is comprised by the Huangcheng Buildings and the Leishengfeng Buildings, as well as associated structures, which are protected at the national level and maintained in good status due to sufficient budget. However, most of the ancient tomb towers and ancient temples are in poor status due to limited budget. There are seven ancient tomb towers listed for protection at municipal level. These seven towers were initially built in the Qing Dynasty but currently are in poor status. The proposed project will carry out the studies on the reinforcement, conservation, testing and monitoring of the towers and the bases.
- The Baili Grottoes in Jingchuan County were carved on the cliffs along the Jing River, consisting of a cluster around six hundred grottoes. Besides the two grottoes protected at the national level, the Luohandong and Hanjiagou grottoes are the largest in size and cultural and historic value in the Baili Grottoes. But the two grottoes are damaged severely, thus have been given the priority for conservation under the project.

- The Wanyan Folk Village is located in Jingchuan County, renown as the largest settlement of descendants of Wanyan Zongbi inside the Shanhaiguan Pass. There are ancestral hall, portrait of Wanyan Zongbi, and the tomb of the last emperor of Jin Dynasty and the tomb of the son of Wanyan Zongbi. In addition there are about ten cultural relics, such as the ancient well, Jiu Cave and the village gate, which witnessed the 800-year history of grave keeping by the descendants of Wanyan Zongbi.
- Yunya Temple Grottoes in Zhuanglang County were initially built in the Beiwei Dynasty and gradually developed into a great grottoes group covering an area in a radius of 5 km.
- The Qiang nationality in Tanchang County traditionally built two-floor residential houses in a unique structure. However, due to the modern cultural influence and artificial damage, there are only 14 traditional residential houses left. The proposed project will reinforce, repair, and provide anti corrosion and drainage to the existing 14 residential houses.

3.6 Socio-economic Status

With a large territory of 430,000 km2 and a total population of 25.82 million, Gansu is one of the least developed provinces in China. In 2013, Gansu had the second lowest per capita GDP (RMB24,296 per capita, slightly higher than Guizhou, which is RMB 22,9220) among all the provinces in China, representing only 59.6% of the national average (RMB 41,908 per capita) . Over 59,9% of Gansu's population still live in rural areas, the highest share among the five provinces in the northwest region, and significantly higher than the national average of 46.3%. Gansu has a total surplus labor of over 6.8 million people in rural areas. The economic growth rate of the province in the last decade (2003-2013) has been the slowest among the five provinces in northwest China.

The socio-economic information on the selected project counties are presented in table below:

Table 3-3 Socio-economic Status of the Project Area

Project city/ county	Area (km2)	GDP (100 million RMB)	Population	Population density (per km2)	Income per capita of urban area (RMB)	Income per capita of rural area (RMB)	Percentage of tourism income in GDP (%)
1.Pingliang City	11325	350.53	208.67	184	19086	5395	16.06
1)Kongtong District	1808	89.85	47.08	260	17853	6691	28.16
2)Jingchuan County	1409.3	51.04	35.87	255	17158	5480	4.3
3)Zhuanglang County	1553	35.57	45.08	290	18752	4596.	9.28
2.Longnan City	27923	262.9	257	92	17001	4023	15
1)Tanchang County	3331	18.9	30.8	92	16990	3234	28.7
2)Kang County	2958	15.29	20.32	67	14958	3278	19.62
3.Linxia prefrecture	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1)Hezheng County	960	11.4055	21.14	220	12525	3394	52.53%

Source: year book of Gansu, 2014

It is clear from the table above that the data on GDP, income per capita in both the urban and rural areas in the project area are lower than the provincial average.

3.7 Environmental Quality Status

Local environmental monitoring stations have been contracted to carry out the environmental quality monitoring program, with results of the monitoring program as follows:

- The acoustic environment quality in the project counties/district is so good that meet the applicable standard, except that the noise level in Hezheng sub-project area fails to meet the standard due to the traffic and community noise;
- The ambient air quality of the project area is fairly good and meet the applicable standards in the Ambient Air Quality Standard;
- The surface water quality within the project area is fairly good and meet the applicable standards in Surface Ambient Water Quality Standard, except that in Tanchang sub-project the surface water quality fails to meet the standard due to the direct discharge of domestic wastewater into the rivers without any treatment;
- The groundwater quality within the project area is good and meet the applicable standards.

4. Analysis of Alternatives

During project development, various alternatives have been developed and compared with technical, economic and environmental criteria, so as to avoid, minimize, reduce or mitigate the adverse impacts.

4.1 With and Without Project Scenario

The scenarios of With and Without Project have been considered and compared. The positive impact to be brought by the scenario of With Project is obviously in improving the conservation of the cultural heritages, the tourism service quality, and the environment, and promoting the socio-economic development, although the With Project will bring the potential risk of conflict with communities, and the change of land use, as well as the environmental impacts in terms of dust, noise and wastewater. It is expected that the benefits of the project will largely overweigh the negative impacts which can be effectively mitigated by carefully designed mitigation measures. Thus the With Project is preferred.

4.2 Alternatives for Sites

4.2.1 Sites for Jingchuan County Museum

Two alternative sites are considered for the component of the Jingchuan County Museum. One alternative is to build a new museum in the new north area, while the other is to use the existing Chenghuang Temple.

Alternative One is considered the preferred because there are no communities in close proximity, there is much longer distance from the concentrated drinking water source, it possesses a larger carrying capacity and better conditions for relics conservation, compared with the Alternative Two.

4.2.2 Sites for Wastewater Treatment Facilities

Two alternative sites for the wastewater treatment facilities under the Zhuanglang sub-project are developed for further comparison: Alternative One is to locate the wastewater treatment facilities within the scenic area, while Alternative Two is to locate the facilities in the tourist service center at Fogoumen which will treat the wastewater and pump the treated wastewater out of the scenic area through pipeline.

Alternative Two is considered the preferred option because it is far from the concentrated drinking water source and can collect the wastewater from the village thus improving the sanitation of the village.

4.3 Alternatives for Type of Toilets

Three alternative types of toilets are considered for comparison: Water flush toilet, dry toilet, and environmental toilet. The environmental toilet is considered the preferred option after comparison because it will consume less water, provide good sanitation condition for reducing the odor, and less area of land occupation.

4.4 Alternatives for Domestic Wastewater Treatment Process

As during the operation phase of the project, small amount of domestic wastewater will be generated in the sub-projects, small wastewater treatment facilities will be used to treat the domestic wastewater. There are two processes widely available in market: AO process and biofilm process. The AO process is preferred because the AO process is easy to operate and requires less cost.

4.5 Other Alternatives

The EA was involved in the project development process in early stage, during which various alternatives were considered to avoid the potential impact due to the project. Following are the alternatives considered in the early stage of the project development:

- Kongtong Mountain sub-project: during the project development, the works on the widening of Xiangyan Road, rehabilitation of the roads in Zhonghe and Gaoling Villages, and the construction of water supply pipeline were proposed for inclusion in the project. The EA found these works are located within the core zone or the buffer zone of the nature reserve which are not in compliance with the national relevant laws and regulations. Thus these works were canceled from the project;
- Zhuanglang County sub-project: in the project development phase the rehabilitation of the hike paths in the Yunya Temple was proposed. The EA found that this work is located within the Class I zone of the concentrated drinking water source in the Zhulinsi Reservoir, which is not in compliance with the relevant laws and regulations. Thus this proposed work is cancelled from the project;
- Kang County sub-project: in the early stage of the feasibility study, the water flush toilet was designed in the scenic area, the EA found that the receiving waters for the wastewater from the toilet is directly associated with the Gansu Giant Salamander Nature Reserve. The relevant laws prohibits the discharge of wastewater into the waters associated with the nature reserve, thus the environmental toilet is suggested by the EA which will not discharge wastewater so as to avoid the adverse impact on the nature reserve. Through consultation, the environmental toilet is adopted for this sub-project; In addition, the EA found that part of the proposed wooden planks for patrolling within the Meiyuan River National Wetland Park in Kang County is located in the restoration zone, which violates the relevant regulations. Thus the EA suggested canceling this part of the wooden planks for patrolling from the project and the advice is adopted through consultation.

5. Environmental Impacts and Mitigation Measures

5.1 Environmental Impacts in Construction Phase

5.1.1 Impact on Natural Heritages

To achieve the PDO of the proposed project, the location of the sub-projects has to be in the boundary of the natural heritages, i.e. nature reserves, scenic areas, forest parks, geo-parks and wetland parks which are also ecological sensitive areas. During the project development, the relevant government organizations and experts were consulted and relevant laws/regulations were reviewed, so as to ensure that the location and the content of the proposed project within the boundary of the natural heritages are in compliance with the legal requirements, and the potential impacts and mitigation measures are

properly considered. The construction activities that are clearly prohibited by the laws/regulations, such as the blasting operation, deep excavation and tree cutting, have been highlighted for prohibition and listed into the ESMP. Thus it is reasonably considered that this project would not cause significant degradation or conversion of the natural habitats.

However, during the construction of the project, adverse impact would be brought to the eco-system in the natural heritages.

Construction of the roads including the firefighting access and hike paths, pipelines and structures, will remove the top soil and the vegetation, and disturb the landform and soil structures, leading to increased exposure to soil erosion and change of land use. However, given the limited size of the project, the combined area of land to be occupied is up to 801.83 mu, which is expected to cause the soil erosion at 584 t during the five-year construction period. Thus the impact on soil erosion is not severe.

The vegetation to be destroyed as a result of the project during the construction phase is ubiquitous species in the project area, and there are no rare or endangered plants observed or recorded in the project area. It is anticipated that the area of vegetation to be destroyed by the project is only a very small percentage of the total area of the project, the impact is only limited to the loss of biomass at small amount, which would cause the exposure of the land to wind leading to air-borne dust. Thus the proposed project will not cause significant impact on the integrity of the regional eco-system resulting in conversion or degradation of the eco-system in the project area. After the completion of the construction, the vegetation will restore gradually.

In addition, the construction activity including the operation of equipment and movement of vehicles, would cause adverse impact on the wild animals. As a result, the wild animals would be forced to leave for other habitats remote from the project. The key wild animals to be protected in the project area are birds and beasts that are quite sensitive to the human activities. But the birds and beasts are capable of moving to other suitable habitats that are widely distributed in the region. Additionally, the potential poaching by the construction staff may be another concern. Given the small size of the project, the construction impact on the wild animals will be limited to a small area, thus the bio-diversity and population of the wild animals in the project area would not be significantly affected. The mitigation measures for carefully scheduling the construction activity and control of the construction strength and staff behavior have been designed that would further mitigate such adverse impact on wild animals in an efficient and effective manner.

5.1.2 Impact on Ambient Air

During the construction phase, the air quality will be affected by the air-borne dust, asphalt smoke, tail gas of equipment and paint odor. The impact scope by these air pollutants is expected to be localized and would disappear after the construction is completed.

5.1.3 Impact on Acoustic Environment

Operation of the construction equipment will cause noise that affects the communities in close proximity. It is estimated that the noise level on the boundaries of the construction sites will not meet the Noise Limits on Boundaries of Construction Sites (GB12523-2011); within the distance of 300 m from the site boundary, the noise level can not meet the Class I of Acoustic Environment Quality Standard (GB3096-2008). Effective mitigation measures, i.e. carefully scheduling to avoid the night and noise reduction techniques, have been designed to mitigate the noise impact to the acceptable level. In addition, such noise impact is temporary and will disappear

immediately after the construction is completed.

5.1.4 Impact on Ambient Water

The project will generate construction and domestic wastewater that would affect the ambient water quality. The construction wastewater is mainly generated from the leakage from the equipment and vehicles, surface run-off from the material stockpiling yards, and equipment washing. The construction wastewater will be collected by peripheral ditch and treated by sediment tanks, and reused for dust reduction or washing of equipment and vehicles, thus the construction wastewater will only cause minor impact.

The residential houses will be rent to accommodate the construction staff, the domestic wastewater will be collected to the local septic tanks before being applied to agriculture. In the Kongtong Mountain sub-project, the wastewater will be delivered to the municipal sewers in the Kongtong Town by tankers from the septic tank, for further treatment in the Tianyu Municipal WWTP. The septic tanks will be emptied biannually and the solid waste will be composted by farmers or transported to local sanitary landfills for disposal.

5.1.5 Solid Waste

The solid waste to be generated during the construction of the project include the surplus soil, the construction solid waste and the domestic solid waste. It is estimated that the total earth work of the project is 36485 t while the demand for backfilling or site grading is 25831 t, thus the surplus soil is 10654 t requiring proper disposal. Given that the spoil disposal sites are banned in the ecological sensitive areas, the surplus soil should be transported to other areas where the surplus soil can be used by other projects or disposed of in the construction solid waste landfill. The construction solid waste is estimated at 635 t, and needs to be collected and transported to the construction solid waste landfills for disposal in timely manner. The domestic solid waste will be only 48 t, and will be transported to local sanitary landfill for disposal.

5.1.6 Impact on Physical Cultural Resources

In construction stage, the project will generate wastewater, air-borne dust, noise and vibration, solid waste and visual impacts that would adversely affect the physical cultural resources in close proximity. In addition, the works of repair and reinforcement of the physical cultural resources would cause impacts on them.

Wastewater

As the workers' camps and the construction sites will not be established within the protection area of the physical cultural resources, the wastewater to be generated from the construction activities would not cause impact on the PCRs. During the repair and reinforcement of the PCRs, the domestic waste will then be collected by the environmental toilets on site, and the construction wastewater will be collected to the settlement tanks before being used for dust reduction or municipal irrigation. Thus the wastewater from the project in construction phase would not cause significant impact on the PCRs.

Air-borne dust

The air-borne dust would be adhered by the fine pollutants that are detrimental to the PCRs. The air-borne dust would cause the color of the PCRs changed or faded, or cause the strength of the PCRs fragile. In addition the air-born dust is usually the good carrier for the bacteria and mold, which will form a strong layer on the PCRs when the humidity is desirable. Although the construction period is short, the air-borne dust impact on the sensitive PCRs would be significant; measures should be designed and implemented to effectively segregate the PCRs from the air-borne dust. The activities that could cause large amount of air-borne dust should be prohibited from the protection area and the construction control zone of the PCRs; the roads should be

cleaned regularly and sprayed with water; the materials should be covered or enclosed during transportation by vehicles. With the effective mitigation measures, the impact of air-borne dust on the PCRs could be mitigated to an acceptable level.

Noise and vibration

During the construction phase, the major source for noise and vibration is the excavation, transportation, filling and mixing. Given the status of the PCRS which are poorly maintained, the PCRS are particularly vulnerable to the vibration.

Under the Kongtong Mountain sub-project, the ancient buildings and towers will be repaired and conserved, under the Jingchuan sub-project, the fresco will be repaired and conserved. The equipment to be used under these sub-projects is only limited to the light-duty and hand-hold which could generate vibration of minor strength, thus little impact on the PCRs.

For the other components under the project, the heavy or medium duty equipment will be prohibited, and the construction sites are established far from the PCRs, thus the vibration impact on the PCRs is not significant.

Solid waste

During the repair and conservation of the PCRS, solid waste will be generated. The domestic solid waste will be collected by bins and transported to local sanitary landfill for disposal; the construction solid waste will be used for the road payment with the remaining to be transported to the construction solid waste landfill for disposal. Thus the impact of solid waste in construction phase is minor to the PCRs.

5.1.7 Social Impact

The construction of the project will cause adverse social impacts during the construction phase as following:

- Loss of tourism income during the conservation of the PCRs: such loss of income is expected to be temporary and can be compensated for by greatly increase income when the tourist flow increase after the project is completed;
- The fossils would be damaged during the transportation: the transportation of the construction materials can be carefully arranged to avoid the fossil area and the heavy trucks will be prohibited throughout the construction stage so as to minimize the vibration impact on the fossils;
- The aesthetics of the scenic areas will be affected by the noise and dust: such impact is temporary and the scope of the impact is only limited to a very small area compared with the large area of the scenic spots. In addition, the equipment with low noise will be used rather than the heavy equipment, and the dust will be reduced by water spray;
- Communities and tourists will be exposed to the safety risk due to the increased traffic of construction fleet: the route of the transportation fleet will be carefully selected so as to avoid the densely populated area or the hot tourism areas; in addition, the traffic safety requirements provided in the EHS Guideline General have been included in the ESIA and the ESMP.
- The change to identified location of civil works during project implementation potentially may cause additional land demanding for involuntary resettlement.
- Influx of migrant workers during the project construction period and increasing influx of tourists may have some impact on local social security, cultural shocks to ethnic minorities, and even epidemic disease expansion.

5.2 Environmental and social Impacts in Operation Phase

5.2.1 Social Impact

The proposed project will produce major social benefits as intended for conservation of the cultural and natural heritage, enhance tourism services and improve community services. The six project counties/districts are the poverty counties in Gansu. Through the project the six counties/districts will be benefited from:

- improved opportunity for employment and increase of income, thus reducing the pressure to the natural resources: as a result of the project development, the tourism resource in the project area will be developed in an sustainable level, which will boost the economic development resulting in growth of employment and income. The traditional use of local natural resource, such as grazing, will disappear or be reduced due to the provision of employment opportunity by the project;
- accelerated poverty reduction. It is estimated that 7381 people will be directly lifted out of poverty while 110,715 people will be indirectly lifted out of poverty;
- improved sanitation conditions for the communities: the project will construct the sanitation facilities in the project area, which will improve the sanitation conditions and reduce the morbidity rate of the locality;
- promoted development of vulnerable groups: as a result of the project, the vulnerable groups, such as women and old people, will participate in the project to provide the service to the tourists;
- Improved conservation of cultural and natural heritages: the project will repair and promote the conservation of the physical cultural properties in an sustainable manner; and
- stimulated tourism sector and improved public awareness for environmental protection.
- Negative impacts may be induced with the development of the scenic spots attracting more and more tourists, the influx of the external culture and tourism consumers may increase the price of local goods, and affect business moral standards. The issues of value system, cultural shocks and moral degradation may arise.
-

During the consultation, the vulnerable groups, particularly the women and old people have been consulted for specific advices and concerns, which have been considered in the design of the project.

5.2.2 Impact on Eco-system

As a result of the tourism development in the natural heritages, more tourists will enter the environment once was essentially seldom disturbed by people. The flux of tourists would change the soil structure by hardening the ground near the hike paths, thus affecting the eco-system supported by the soil. The wild animals will also be disturbed by the intensive activities of the tourism in the project area. The wild animals would flee to the deep forest.

In addition, the bad conduct of the tourists, i.e. collection or damage of vegetation, poaching, and littering, would directly affect the eco-system. The flux of tourists would also increase the risk of fire that would threaten the eco-system. More vehicles will enter the tourism areas, resulting in increase emission, which would damage the local vegetation.

When the project becomes operational, the land use in the project area will be changed. The woodland, cultivated land, disused land and construction land will be reduced, while the land for the tourism services and facilities will be increased. Given the small size of the project, the land use in the project area will not be significantly altered.

The tourists flow is expected to fluctuate in the peak season and low season. If the tourists flow exceeds the designed carrying capacity of the tourism sites, the ecosystem of the project area will be damaged.

Such impact by the tourists has been highlighted in the screening and mitigation measure development, which include the codes of good behavior for tourists and public awareness promotion program designed as an integral part of the project. In addition, the carrying capacity of the natural heritages and the number of tourists will be closely monitored so as to avoid the overburden on the environment by the tourists. Thus with the mitigation measures the impact of tourists on the eco-system can be mitigated effectively.

5.2.3 Impact of Wastewater

Operation of the tourist service center and the flux of tourists into the heritages would generated domestic wastewater. Environmental toilets will be provided and the wastewater will be pipelined to the wastewater treatment facilities to be constructed under the project. The wastewater in the Chanchang sub-project will be collected into the septic tank before discharged into the municipal sewer through the pipeline to be constructed under the sub-project. Thus the impact of wastewater in operation phase can be effectively mitigated.

The surface run-off on the roads to be built by the project is expected to be very weak in strength, and will not affect the water quality in the rivers.

5.2.4 Impact on Ambient Air

During the collection and transportation of the domestic solid waste, the organic matter will decay releasing bad odor. The operation of the domestic wastewater treatment stations on site of the sub-projects would cause odor, however these stations are underground and would not cause discharge of odor. The environmental toilets to be used under the project will not release the odor since the foams will be created to seal the odor.

The movement of vehicles will also generate emission and dust. As the vehicle flow is expected to be low on the roads, it is estimated that the air quality will be remained to the Class I of the Ambient Air Quality Standard. Thus the vehicle traffic will not cause significant impact on the ambient air quality.

5.2.5 Impact on Acoustic Quality

It is expected that the traffic flow on the project roads is quite low and will disappear in night. Based on the data obtained from similar projects, the noise level on the berm will meet the applicable standard. It is thus expected that the traffic noise will not degrade the acoustic environment quality in the project area.

The operation of the equipment, i.e. the pumps, blowers, power generators, would cause noise with the intensity ranging between 65 dB(A) to 100dB(A). With adoption of noise barrier, and vibration and noise reduction devices, the impact of noise on the environment can be mitigated to an acceptable level.

In addition, the activities of the tourists would be a noise source in operation phase. It is estimated that the noise intensity of such source is between 60 B(A) to 70 dB(A), and the impact can be mitigated by strengthened management of the tourists.

5.2.6 Impact of Solid Waste

During the operation of the project, solid wastes include the domestic solid waste generated by the tourists and the sludge generated in the wastewater treatment stations.

It is estimated that the total amount of domestic solid waste is 556.68

t/a, which will be collected and transported to the local sanitary landfill for disposal in timely manner. The sludge to be generated from the wastewater treatment stations is estimated at 1.64 t/a which will be dewatered on site before being transported to the local sanitary landfill for disposal. Thus the impact of solid waste is expected to be minor.

5.2.7 Impact on Physical Cultural Heritages

The project will attract a great number of tourists, which would increase the income of the heritage management. As a result, the financial limits can be largely resolved that will increase the budget for the conservation of the heritages.

However the tourists will cause the impacts of solid waste, wastewater, and vehicular emission, as well as bad behaviors. Mitigation measures have been designed to control the quantity of the tourists to below the carrying capacity, and to schedule the reasonable routes, to strengthen the tourists' awareness for protection of cultural heritage, and propaganda of good behavior, thus the adverse impact on the physical cultural heritages would be effectively mitigated.

5.2.8 Impact on Local Community

The local communities will be widely involved in the tourist service as a result of the project. The communication with the outside will be enhanced for the local communities and their income will be increased by providing the tourist service. However the behavior, waste, and noise to be generated by the tourists will bother the local communities. The tourists will be diverted to the communities with better service facilities, so as to reduce the pressure on the service capacity on certain communities. The propaganda of good behavior will be promoted to the tourists to reduce the conflicts with the local communities. Enabling environment with basic service facilities will be improved for project communities (30 villages) and 31 community organizations will be established with project support. Training will be provided for community residents on the project, tourism service skills, standards, regulations and tourism-oriented product development.

5.2.9 Cumulative Impact

The VECs identified for further assessment of cumulative impact include the water pollutants and solid waste to be generated from the project. The total amount of wastewater, the load of COD and NH3-N is estimated respectively at 445,800 t/a, COD 156.03 t/a and NH3-N 11.17 t/a. the wastewater will be collected and conveyed to ,local wastewater treatment plants which are capable of accommodating the pollution loads and the wastewater flow. Totally 1,841.22 t/a of solid waste will be generated by the project and the solid waste will be collected and transported to local sanitary landfills for disposal.

5.2.10 Induced Impact

The project during the operation stage is expected to introduce the large influx of tourists that will place heavy pressure on the capacity of local capacity on wastewater and solid waste management. As an integral part of the project, the sanitation facilities for wastewater collection and treatment, as well as solid waste collection have been incorporated into the project. The increased amount of wastewater and solid waste thus can be effectively mitigated.

5.3 Mitigation Measures

For details of the generic environmental codes of practice please see the Annex 2 and mitigation measures for natural and cultural heritages please see Annex 3 and Annex 4 respectively. In addition, the Physical Cultural Resource Management Plan has been developed in line with the OP 4.11 Physical Cultural Resources, and incorporated into the ESMP.

6. Mitigation measures for social impacts

A RPF and two EMDPs have been prepared to address the social risks and impacts based on the social assessment. Selection of civil work sites have avoided damage to local village buildings and special design of scenic facilities such as tourist information centre, cultural exhibition centre, museum, will be consistent with ethnic minority culture and styles. Therefore, impacts on buildings and landscape will be insignificant, and, to some extent, even enhanced. Construction camps will adopt closed management approach, as commonly adopted in China, and workers will receive sensitivity training to respect and value ethnic minority cultures and customs. Therefore, cultural conflict impacts from construction workers can be managed, and the negative impact will be mitigated. The EMDP and SA action plan recommend actions to mitigate the adverse impacts and enhance positive impacts on affected ethnic minority communities. Main measures include that project activities shall be fairly offered to all the 7 ethnic communities in a culturally appropriate way and promote benefits and participation of ethnic minority people (both men and women) in the project. Arrangement for community development budget and support to establishing 31 tourism service-driven community organizations. Priorities will be given to the ethnic and vulnerable people in project villages in terms of jobs, livelihood development or restoration and other economic opportunities resulting from the project. In particular, project resources of technical expert advisory services, incubating of community organizations and budgets will be provided, including those for ethnic intangible cultural heritage protection and promotion via development of local performing arts and tourism-oriented souvenirs.

6.1 Land Acquisition and Resettlement

By project appraisal, through optimization of design and selection of location, the project civil works will be constructed on existing land in scenic areas which are already state owned land or ready-for-use collective land for village level infrastructure. However, some of the specific locations of land to be used for the project may be adjusted during project implementation, such as new paths and small bridges, small scale of local cultural exhibition centre, and tourism facilities. In the current stage of the project development, it is anticipated that the project may experience very limited changes to the current design in relation to land use. A Resettlement policy Framework is prepared to provide guidance on dealing with the issues of land acquisition and resettlement if it occurs in the implementation stage of the project, so as to ensure the OP 4.12 Involuntary Resettlement is properly considered and complied with.

6.2 Ethnic minority

The proposed project will significantly promote the social and economic development of 7 ethnic minority villages with about 6900 ethnic people in Hezheng and Tanchang counties. To address the impacts on ethnic minority people, two separate Ethnic Minority Development Plans (EMDP) have been prepared for these two counties. The project will provide convenient accessibility to and from outside their villages and scenic areas, stimulating tourism, improving infrastructure and creating employment opportunities and income generation. There is broad support from all ethnic minority areas for the project, as the project is seen as a unique and indeed rare opportunity for much needed economic development.

7. Public Consultation and Information Disclosure

7.1 Public Consultation

In accordance with the requirements of the China's EA Law and the World

Bank, two rounds of public consultation were conducted by the EA and SA teams respectively. The first round focused on screening to define public concerns, to assist identification of key environmental and social issues and to draw public response and comments on the initially developed mitigation measures for the potential adverse impacts identified before EA TOR finalization. The second round was designed to ensure public awareness of the EA and SA effort as well as EMDP preparation in ethnic minority areas, and final project definition and mitigation by presenting a draft EA report, SA, EMDP and RPF to the public through information disclosure procedures. Details of the two rounds of public consultation undertaken are presented in Table 7-1.

Table 7-1 Implementation of the Public Consultation

Round	Timing	Participants	Method	Organizer
1	Oct. to Nov. 2015	Representatives of communities and villages in the project affected area; experts and relevant departments regarding the physical cultural resources and natural habitats	Questionnaires and public meeting	EA and SA Consultants
2	Jan. to Feb. 2016	Representatives of communities and villages in the project affected area; experts and relevant departments regarding the physical cultural resources and natural habitats	Questionnaires and public meeting	

During the consultation, all of the stakeholders are supportive of the proposed project.

7.2 Information Disclosure

Information on the project EA, SA, EMDP and RPF have been disclosed to the public throughout the public consultation. An advertisement has been placed on the Gansu legislation Daily on Jan. 20, 2015 during the second round consultation to invite the public to express their concerns about the project, and to inform the public the place to assess to the draft ESIA report and EMDP which have been placed in the affected villages and communities that are easily accessible to the affected people since Jan. 2016.

8. Environmental and Social Management Plan

8.1 Institutional Arrangement

The duties and responsibilities for institutions for environmental and social management have been identified for stages of design, construction and operation respectively. These institutions will be involved in the environmental management, supervision and monitoring.

- The Provincial PMO will take the ultimate responsibility for environmental protection and management. The Gansu PMO is the implementing agency being responsible for day to day environmental management during the construction phase and operation phase. Its responsibilities will include engagement of professional supervision and monitoring services, allocation of budget for environmental management, response to environmental monitoring reports and the taking of appropriate mitigation actions. They will also handle any environmental events which may occur during construction and operation;
- PMO of each project county/district will jointly responsible for the environmental management of the project within the county.
- EPBs will be responsible for enforcement of environmental regulations and standards and review of environmental

monitoring reports;
- Forestry Bureau will be responsible for review and approval of the design documents for the works associated with the nature reserve, forest park and wetland park;
- Urban Construction Bureau will be responsible for review and approval of the design documents for the works associated with the scenic spots;
- Land Resource Bureau will be responsible for review and approval of the design documents for the works associated with the physical cultural heritages;
- Cultural Bureau will be responsible for review and approval of the design documents for the works associated with the nature reserve, forest park and wetland park
- Environmental Supervisor will be responsible for review of environmental protection schemes submitted by construction bidders and corresponding expenses involved in environmental protection; review of construction contract, and supervision over the owner to write environmental protection contents, related costs and corresponding penalties in the construction contract; reporting current situation of construction environment management to relevant departments in a timely manner, and put forward rational suggestions specific to problems found; preventing the behaviors causing environmental pollution or future trouble including the behavior of violating environmental laws & regulations, and giving penalties for the behavior generating great impact on environment;
- Contractors will be responsible for implementing the mitigation measures for construction phase.

8.2 Training Plan

A training program has been developed for the PMO staff, environmental and social supervisors, contractors and monitoring units with the contents focusing on the responsibilities of the relevant organizations, environmental regulations, mitigation measures, supervision, reporting system and grievance redress mechanism.

8.3 Environmental and Social Monitoring Plan

An environmental and Social monitoring plan has been developed for both the construction and operation phases and incorporated into the ESMP as shown in Annex 5 and social instruments of SA, EMDP and RPF, so as to further ensure the proper implementation of mitigation measures.

8.4 Environmental and Social Supervision Scheme

ESMP implementation will be managed by Gansu PMO. An environmental and social management unit will be established in the PMO with dedicated safeguards staff. Civil work contractors and supervision companies will be required to assign qualified environmental and social staff to their team to ensure effective implementation of the ESMP. PMO, under assistance of on-site environmental supervisors, social expert, local EPB and relevant authorities, and external monitoring institution, will supervise the implementation of ESMP. To improve local capacity, the ESMP proposes capacity training activities for civil work contractors, PMOs, environmental and social supervisors, and monitoring institutions etc.. The ESMP also specifies monitoring plan, and budget for the ESMP implementation. A set of environmental compliance checklists for the contractors and supervisors have been developed for construction period including checking the implementation of all of the mitigation measures, and correction of environmental practice and environmental acceptance for checking the implementation of the monitoring plan, mitigation measures and reporting system.

8.5 Physical Cultural Resource Management Plan

As per to the requirements of the relevant laws and regulations, the specific plan for repair and conservation of the physical cultural properties need to be prepared by the certified institute and submitted to the local cultural department for review. Based on the OP 4.11 of the Bank and the relevant domestic requirements, the Physical Cultural Resource Management Plan has been prepared by the EA team. The plan covers the measures including the enhancement of the bases, drainage, fire fighting, measures for mitigating the dust, noise, vibration, wastewater and solid waste, and the management measures for control of the tourist flow. In addition the Chance Find procedure has been incorporated into the plan. The procedure for final examination and acceptance of the works on conservation and repair of the physical cultural properties has been described.

8.6 Social Management Plan

Regarding the institutional arrangement, the provincial PMO will take the lead in overall coordination of social instrument implementation and the county/district PMO will take charge of daily management in support of township government, such as coordination, supervision and monitoring of the social issues; while the PMO at each county/district will be set up to prepare the monitoring report, organize the training of local people, and manage the contracts.

Community development plan has been prepared under the social management plan which include the establishment of community organizations with hands-on incubating support, capacity building, implementation of community development components, and preparation and implementation of ethnical minorities. In addition, some key studies on community participatory approach and co-management mechanism of cultural heritage reservation have been determined and included in the plan.

8.7 Reporting and Grievance Redress Mechanism

The requirements for environmental and social supervision and monitoring, as well as the reporting system has been clearly specified. A mechanism has been established for grievance redress for affected people and environment. Grievances can be filed both orally and in writing. Starting at village and neighborhood committee level, the grievances can be elevated to PMOs at county/district, city and provincial levels if they are not satisfied with the resolution at the lower level. The affected people could also file their cases in court if they are not happy with the resolution by the project authority. All grievances and their resolution will be recorded. This mechanism has been disclosed to the local population and will be further disseminated through the Resettlement Information Booklet. The grievance Redress mechanism will be maintained throughout the project life-cycle to deal with any public concerns in environmental and social management.

8.8 Cost Estimate for Implementation of ESMP

The total cost estimate for implementing the EMP is 33.15 million RMB including 5.55 million RMB for mitigation measures for the cultural and natural heritages, and 2.40 million RMB for training and public awareness promotion. The budget for the environmental monitoring plan is 1.10 thousand RMB. The total budget for implementing social development activities in the 6 scenic spots is 12,449,600 RMB, of which the budget for community development amount to 9,549,600 RMB, the budget for monitoring and evaluation fee for community development projects RMB 1,800,000, the budget for monitoring and evaluation fee for ethnic minority community development projects RMB300,000, and the budget for community co-management research and demonstration fee RMB 800,000. More details are in the EMDP and SA action plans.

Annex 1 Specific Activities for Conservation of Cultural Heritages

Sub-project	Name of cultural relics	Level of protection	Content of works
Kongtong Mountain Subproject	Lingfeng Tower	Municipal/County-Level Cultural Relic Protection Sites	(1)surface drainage would be rearranged; (2) the structural parts would be supplied and all mortar joints would be repaired; (3) a sand road would be built; (4) the original grey brick fences would be removed and newly built; (5) an archaeological survey would be made around the tower; (6) the tower foundation of lime-soil compaction piles would be dealt with; (7) all original components are restored; and (8) setting up the display board.
	Lingmi Tower	The municipal cultural relic protection sites	
	Ordinary Tower	The municipal cultural relic protection sites	
	Yinxiang Tower	The municipal cultural relic protection sites	
	Huairui Monk Tower	Municipal/County-Level Cultural Relic Protection Sites	
	Dache Tower	Not confirmed	
	Yingxueshanren Tower	The municipal cultural relic protection sites	
	Xiangshan Temple	Not confirmed	
	Jingle Palace	Not confirmed	
	Taiqing Palace	Not confirmed	
	Mituo Temple	Not confirmed	
	Lianhua Temple	Not confirmed	
	Wangmu Palace	Not confirmed	
	Wendao Palace	Not confirmed	
	Lingkong Tower	National cultural relic protection sites	--
	Mozhen Temple	National cultural relic protection sites	--

Sub-project	Name of cultural relics	Level of protection	Content of works
	12 Marshals Hall	National cultural relic protection sites	--
	Taibai Building	National cultural relic protection sites	--
	Lingguan Cave	National cultural relic protection sites	--
	Offering Hall	National cultural relic protection sites	--
	Zhenwu Hall	National cultural relic protection sites	--
	Yuhuang Hall	National cultural relic protection sites	--
	Tianshi Hall	National cultural relic protection sites	--
	Yaowang Hall	National cultural relic protection sites	--
	Laojun Building	National cultural relic protection sites	--
	Tianxian Palace	National cultural relic protection sites	--
	Sangong Hall	National cultural relic protection sites	--
	Yuhuang Building	National cultural relic protection sites	--
	Sanxing Hall	National cultural relic protection sites	--
	Leizu Hall	National cultural relic protection sites	--
	Daocheng Monk Tower	Municipal/County-Level Cultural Relic Protection Sites	--
	Kongdong Mountain Zhongtai Site	Not confirmed	--
Jingchuan County	Arhat Cave	County-Level Cultural Relic Protection Sites	(1) dangerous rock control; (2) decay prevention and control; (3) water disaster control; (4) preventive measures for man-made

Sub-project	Name of cultural relics	Level of protection	Content of works
Subproject	Hanjia Gully Stone Cave	County-Level Cultural Relic Protection Sites	damage; and (5) preventive protection measures for wall painting and relievo;
	Chenghuang Temple	Provincial cultural relic protection Sites	(1) repair warehouse; (2) restore damaged wall; (3) building stele pavilion; (4) building environmental toilets; (5) grey brick flooring; and (6) improving drainage facilities;
	Wangmu Palace Stone Cave	National cultural relic protection sites	(1) building tourist toilets; (2) increasing waste treatment facilities; (3) improving water supply and drainage system and environmental facilities;
	South Shiku Temple	National cultural relic protection sites	--
	Zhangba Temple Stone Cave	County-Level Cultural Relic Protection Sites	--
	Taishan Temple Stone Cave	County-Level Cultural Relic Protection Sites	--
	Jiangjiaping Stone Caves	County-Level Cultural Relic Protection Sites	--
	Fenghuang Gully Stone Cave	Not confirmed	--
Zhuanglang County Subproject	Da Temple Stone Cave	Not confirmed	(1) dangerous rock control; (2) decay prevention and control; (3) water disaster control; (4) preventive measures for man-made damage; and (5) collapse prevention and control;
	Hongya Temple Stone Cave	Not confirmed	
	Zhulin Temple Stone Cave	Not confirmed	
	Jinwa Temple Stone Cave	Not confirmed	
	Yunya Temple Stone Cave	National cultural relic protection sites	--
	Xi Temple Stone Cave	Not confirmed	--
	Chaoyang Temple Stone Cave	Not confirmed	--
	Fogou Temple Stone Cave	Not confirmed	--

Annex 2 Generic Environmental Code of Practice

Potential Impacts	Mitigation/Control Measures	Estimated Cost (RMB 10,000)	Implemented by	Supervisor
Design Stage				
--	1. Incorporation of EMP into bidding documents; 2. Incorporation of EMP into contracts with contractors, construction supervisors and environmental supervisors to facilitate EMP implementation.	-	Project owner	-
--	1. Recommended site of Kang County Yangba Folk Culture Display Center: Zhuangke village; 2. Recommended site of Jingchuan County Museum: Dayun Temple Scenic Area, Jingchuan County, Pingliang City; 3. Recommended toilet alternative: environmentally-friendly toilet; 4. Recommended alternative for Zhuanglang County Subproject domestic garbage disposal: transported to existing landfill for disposal; 5. Recommended alternative for wastewater treatment for Kongtong Mountain Subproject and Jingchuan County Subproject: buried integrated AO treatment equipment.	-	Project owner	-
Construction Stage				
Eco-environment	1. Efforts would be taken to rationally arrange construction sites, select appropriate construction periods and minimize earth-rock excavation during rainy seasons or on rainy days; 2. Depending on topographical conditions of construction sites, earth-based drainage ditches may need to be set up around the sites and earth-based sedimentation tanks may need to be set up at outlets of these ditches to slow down water flow and allow for sand settlement in sedimentation tanks; 3. Efforts shall be taken to combine key water and soil conservation measures with surface protection measures, and combine engineering measures with botanical measures. Priority shall be given to implementing engineering measures as they can immediately play an effective role. Botanical measures are supplementary measures for water and soil conservation, which can play a role in ensuring long-term water and soil conservation and in greening and beautifying the environment in the project areas; 4. Measures shall be taken to strengthen public communication and education, ban illegal and arbitrary felling of trees and vegetation; rational water and soil conservation measures shall be taken and land occupation be minimized during construction; if rare and endangered plants, famous and ancient trees and unique local plants are found during construction, relevant authorities shall be kept informed of and on-site protection measures shall be taken immediately; upon construction completion, temporary facilities shall be demolished in a timely manner, hardened soil shall be loosened and consolidated to allow for restoration of trees and grass, and cultivated land shall be returned to farmers; 5. Measures shall be taken to strengthen public communication and education, ban hunting and killing of wild animals and reduce disturbances of noice to animals. If rare wild animals are found during construction, relevant authorities shall be kept informed of and on-site protection measures shall be taken immediately; 6. Vegetation restoration measures are key plant protection measures. Vegetation shall be restored according to local climatic features. During vegetation restoration, attention shall be paid to the following technical processes: mellow soil from permanent occupation of forestland and temporary land occupation shall be stored to provide good-quality soil for vegetation restoration; top soil from permanent occupation of forestland shall be	1200	Construction units and project owner	County EPBs, housing and rural-urban development bureaus, forestry bureaus, animal water bureaus, township sanitation administration offices

Potential Impacts	Mitigation/Control Measures	Estimated Cost (RMB 10,000)	Implemented by	Supervisor
	collected and stored and laid in other areas with poor soil fertility to allow for tree planting; top mellow soil from temporary land occupation shall also be stored so that the original site can be covered up with the soil and crops and trees adapting to local conditions can be planted after construction completion; 7. Ecological environment shall be monitored or investigated during construction and operation periods. During construction, efforts shall focus on fire risk monitoring of construction sites; during construction, construction units shall also need to strengthen survey of key plants and famous and ancient trees. If key protected plants and trees are found during construction, relevant authorities shall be kept informed of and corresponding protection measures shall be taken immediately. Construction activities that may lead to forest fire shall be strictly managed and education of construction workers shall be strengthened so that they do not use fire in mountainous areas; 8. Grass, shrubs and other plants adapting to local natural conditions shall be selected to restore vegetation on excavated slopes and to reduce maintenance afterwards. Slopes at key sections shall be selected for artistic processing through plant landscaping to demonstrate unique local cultural features. In addition, slope top shall be cut into a circular arc so that it can naturally integrate with mountains. A one-size-fits-all approach shall be avoided for slope cutting.			
Ambient air	1. Adopt advanced construction techniques. Adopt the wet crushing method in sandstone and concrete system. Provide dust collection equipment, control vehicle speed, exhaust, and coal emission. Spraying water on the road in construction areas. The construction team shall use clean energy such as liquefied gas and electricity. Strengthen plantation and construction worker protection, to minimize the environmental and air impacts; 2. During the engineering period, the washing platform shall be installed in the entrance for vehicles shipping materials and waste soil. The equipment shall meet the following requirements: The spill-proof device shall be installed around the platform to prevent wastewater from spilling over. The wastewater collection pits and settlement basin shall be set up. Before the vehicle leaves the site, the vehicle body and tire shall be washed and the sludge shall be removed. For vehicles shipping materials and waste soil, the height of materials and waste soil shall not exceed the outer edge of the vehicle. The loading compartment shall be covered by the cloth or use sealed compartment; 3. No concrete and asphalt mixing station shall be set up at the construction site.	120	Construction units and project owner	County EPBs, housing and rural-urban development bureaus, township sanitation administration offices
Solid waste	**I. Earthwork:** 1. If the site needs to be excavated at the beginning of construction period, the construction team shall fully use natural elevation difference of landform, avoiding digging deep pits; 2. The earthwork dug out shall be used for leveling land. Rockwork shall be used as foundation rocks for irrigation and side gully works. The earthwork and rockwork shall not be placed randomly; 3. The temporary storage yard shall be arranged reasonably, and shall be placed far away from the sensitive points (farmer households) (in particular downwind direction. The earthwork shall be crushed and covered by cloth. Wall and drainage facilities shall also be established around the earth piles; 4. Earth drainage ditch shall be set up around temporary soil storage sites. settlement basin shall be set up at the exit of drainage ditch to precipitate	60	Construction units and project owner with assistance from project villages	County EPBs, township sanitation administration offices, health bureaus

Potential Impacts	Mitigation/Control Measures	Estimated Cost (RMB 10,000)	Implemented by	Supervisor
	out sludge in slow flow. **II. Construction waste:** 1. Classify and recycle recyclable waste (waste iron, waste steel and package materials would be sold to salvage station and wast bricks would be used as road foundation); 2. Building waste that could not be recycled shall be piled at the designated places. The loading compartment shall be sealed during the shipping; 3. Water and wind-proof measures shall be taken for temporary piling building waste; 4. Garbage cans shall be placed for collecting household garbage. An employee shall be appointed to clean, collect and sort out garbage everyday and deliver to nearby landfill sites for disposal.			
Water environment	1. Wastewater generated from sand processing system: sand sedimentation pool + flocculating settling pond, wastewater after treatment shall be used for mixing concrete and spaying for dust prevention and shall not be discharged to areas outside the construction site; 2. The construction team shall use environmentally-friendly toilets or dry toilets in nearby villages. Domestic sewage shall not be discharged to areas outside the construction site.	120	Construction units and project owner with assistance from project villages	County EPBs, township sanitation administration offices, water bureaus
	1. Observe the subsidence of surrounding surface and building. In case of any abnormalities found, stop to drain groundwater and construction immediately; 2. Keep the operation section clean during the construction process, avoid sewage and pollutants from entering excavation trench to cause sewage seepage; 3. If fuel needs to be stored onsite, the warehouse shall go through anti-seepage treatment, preventing oil leakage to pollute water body; 4. The storage room for household garbage shall adopt anti-seepage measures; 5. The infrastructure construction shall select in the non-flood period to reduce the impacts of construction on groundwater depth.	30		
Acoustic environment	1. No-horn sign shall be set up in sensitive spots and measures shall be adopted to reduce noise, such as using low-noise equipment, control noise source, transmission and traffic noise and preparing noise-proof earplugs for workers, and reasonably arranging construction schedule. 2. According to Emission Standards of Ambient Noise at Construction Site Boundary (GB12523-2011), reasonably arrange the construction schedule and do not arrange construction or arrange low-noise construction at night. The machines with loud noise (e.g. pile engine) shall not work at night (22:00-6:00). If close to the sensitive points, do not arrange construction or arrange low-noise construction at night. Also adopt de-noise measures to minimize the impacts of noise on residents. If the continuous construction is needed, the construction enterprise shall seek the approval of related authorities and communicate with residents in advance.	60	Construction units	County EPBs, housing and rural-urban development bureaus, township sanitation administration offices
Operation Phase				
Reoccurrence of landslides, sector collapse and mud-rock flow	Measures shall be taken to monitoring of spots with hidden risks of geological disasters, enhance geological disaster waning capacity and prevent geological disasters from taking place.	Included in total project investment	Scenic area administration committees	County governments, county land resources bureaus
People get drowned when they swim in water storage tanks	Measures shall be taken to heighten walls of water tanks and place glass fragments on the top of these walls to prevent people and animals from entering the tanks; build stairs within the tanks to facilitate their maintenance and rescue efforts	20	Scenic area administration committees	County governments, county EPBs,

Potential Impacts	Mitigation/Control Measures	Estimated Cost (RMB 10,000)	Implemented by	Supervisor
or water tanks for firefighting operations and animals get drowned after falling into these tanks.	in case of accidents; strengthen management and public communication and set up waning signs to prevent accidents from happening.			township sanitation administration offices
Surface water and groundwater are polluted due to broken pipes.	Markers and warning signs shall be set up at sections where the pipeline crosses the river; public commutation about protection of pipeline and relevant facilities shall be strengthened; sewage collection facilities such as accident tanks shall be set up near main spots where the pipeline crosses the river; a special emergency preparedness plan shall be developed and adequate emergency repair facilities and rescue facilities shall be provided.	20	Scenic area administration committees	County EPBs, urban development bureaus
Impacts of waste gas and odorous pollutants on ambient air	1. Vehicle exhaust: measures shall be taken to strengthen traffic management and reduce vehicle idling to reduce generation of vehicle exhaust; 2. Oil smoke from restaurants: restaurants are banned in scenic areas; 3. Odor control: set up garbage dumps and transfer stations; arrange designated staff to do cleaning and spray disinfectants and transport garbage in a timely manner to reduce odor from garbage; strengthen sanitation management of public toilets, reduce storage and use sealing covers to reduce impacts of odor on regional environment.	80	Scenic area administration committees	County EPBs, township sanitation administration offices, health bureaus, industrial and commercial administration bureaus
Impacts of sewage discharge on surface water	1. For Jingchuan County 50-km Stone Cave Corridor Heritage Protection Subproject, Zhuanglang County Yunya Temple Heritage Protection Subproject (Zhuanglang County Comprehensive Tourism Service Center) and Tanchang County Guan'e Gully Heritage Protection Subproject, domestic sewage would be discharged to the sewage pipelines after septic tank treatment process, which are connected to municipal pipelines. Kongtong Mountain Subproject and Hezheng County Subproject would build sewage treatment facilities to treat domestic sewage and discharge sewage up to standard. Zhuanglang County Yunya Temple Heritage Protection Subproject (others) would be provided with environmental toilets, which do not generate sewage. 2. Dining: No dining in the scenic areas.	Included in total project investment	Scenic area administration committees	County EPBs, township sanitation administration offices
Impacts of noise from tourists, equipment and vehicles	1.The impacts of social life noise shall be mitigated by strengthening scenic area administration and reminding tourists; 2. Vehicle noise: Horn shall be prohibited when vehicles enter/exit to/from parking lots. Minimize the frequency of boosting and idle speed of motor vehicles; 3. Equipment noise: Low-noise equipment shall be used in water pump room, fan room and power distribution room to reduce noise and prevent noise pollution.	110	Scenic area administration committees	County EPBs, township sanitation administration offices, industrial and commercial administration bureaus

Potential Impacts	Mitigation/Control Measures	Estimated Cost (RMB 10,000)	Implemented by	Supervisor
Solid waste	1. Domestic garbage: domestic garbage shall be collected at garbage collection spots, transported to garbage transfer stations and finally to municipal garbage landfills for processing; arrange designated staff to clean garbage collections spots and transfer stations, spray disinfectants and transport the garbage to landfills; cartridges and used batteries that could be included in office garbage shall be mixed with domestic garbage and shall be collected separately to avoid pollution of heavy metals to soil and groundwater; 2. Faeces: faeces from environmentally-friendly toilets shall be transported on a periodic basis to domestic garbage dump sites for processing.	50	Scenic area administration committees	County EPBs, township sanitation administration offices, health bureaus, sanitation departments, industrial and commercial administration bureaus
Surface water pollution due to road surface runoff	1. Strengthen maintenance and management of side ditches, road embankments and protection slopes to ensure unblocked drainage of water; 2. Arrange designated staff to clean road surface and bridge roads; 3. Rationally plan for flow directions of road surface runoff and strictly ban the runoff to be discharged directly into sensitive water bodies such as drinking water source sites, fish ponds and aquaculture areas.	100 (cost for drainage design is included in total project investment)	County transportation bureaus, township transportation administration stations, scenic area administration committees	County EPBs, township sanitation administration offices, water bureaus, transportation bureaus
Vehicle exhaust gas and road dust	1. Increase greening along both sides of roads to increase exhaust absorption and reduce spread of dust and exhaust; 2. Arrange designated staff to clean road surface and bridge roads and spray water to control dust.	80	County transportation bureaus, township transportation administration stations	County EPBs, township sanitation administration offices, water bureaus, transportation bureaus
Traffic noise pollution	1. Set up no-horn signs and green belts to reduce noise impacts; 2. Monitor sensitive spots on a periodic basis and take corresponding noise control measures according to monitoring results.	100	County transportation bureaus, township transportation administration stations	County EPBs, township sanitation administration offices, water bureaus, transportation bureaus
Environmental impacts due to traffic accidents, transportation of dangerous goods and other environmental risks	1.Passage of dangerous goods transportation vehicles is forbidden; 2. Safety awareness and ethics education of drivers shall be strengthened to reduce incidence of traffic accidents; 3. Consecutive crash bearers shall be set up on both sides of the bridge road to prevent vehicles from falling into the river; 4. Speed limit signs, no-overtake signs and other warning signs shall be set up at easy-to-notice places on both sides of the bridge to remind drivers and	80	County transportation bureaus, township transportation administration stations	County governments, County EPBs, township sanitation administration offices, water bureaus, transportation bureaus

Potential Impacts	Mitigation/Control Measures	Estimated Cost (RMB 10,000)	Implemented by	Supervisor
	passengers to pay attention to safety; 5. Relevant warning signs shall be set up at road sections with more and sharp curves to remind drivers to slow down at these sections; 6. The Law of People's Republic of China on Road Traffic Safety shall be strictly implemented and an emergency preparedness plan developed for road transportation. The plan shall include roles and responsibilities of commanding agencies, selection of emergency preparedness techniques and emergency processing steps, provision of equipment and appliances, assurance and dispatch of human and physical resources, and mechanisms for dynamic monitoring of accidents.			

Annex 3 Environmental Codes of Practice for Natural Heritages

Potential Impacts			Mitigation Measures	Estimated Cost (RMB10,000)	Implemented by	Supervisor
Destructions to vegetation and impacts on habitats of rare animals.	Nature reserves	Common measures	1. Public communication and education campaigns shall be conducted for construction workers before construction initiation to strengthen protection of nature reserves. Illegal hunting of wild animals and destructions to the ecological environment shall be strictly banned; 2. Workers shall be required to strictly follow construction drawings during construction to avoid expansion of construction scope. Construction boundaries shall be clearly defined and workers are banned to enter non-construction areas. Construction processes and design of construction spots shall be optimized to minimize surface disturbances and destructions to vegetation; 3. Smoking, arbitrary use of stoves and other behavior that may lead to fire are strictly banned when construction activities take place in forestland; 4. Setup of quarries, mixing grounds and construction camps in nature reserves is strictly banned, urination or littering in nature reserves is strictly banned and contact with water bodies during construction is also strictly banned.	45	Construction units and project owner	County EPBs, forestry bureaus, land resources bureaus and water bureaus
		Gansu Chinese Giant Salamander Nature Reserve	1. The Chinese giant Salamander lives in and seldom goes out of caves during daytime. After completion of daytime construction activities, workers shall be banned to enter the construction sites; 2. The Kang County Subproject would involve the Chinese Giant Salamander Nature Reserve. During construction, protection walls shall be built to prevent solid waste to enter into the Yangba and Taiping rivers; discharge of wastewater into these rivers is strictly banned during construction;			
		Gansu Taitong-Kongtong National Nature Reserve	1. Given the large size of and large amount of protected animals in Kongtong Mountain Nature Reserve, talented professionals in wild animal protection and management shall be introduced as quickly as possible to strengthen administration of the reserve; 2. In terms of technical measures for protection, special attention shall be paid to fire and epidemics prevention. Pest forecast and control must be carried out for protected species, mainly adopting biological control measures with use of pesticides as supplementary measures. Main natural enemy species selected shall be those in local areas or nearby areas.			
		Gansu Taizi Mountain National Nature Reserve	1. For the Taizi Mountain Nature Reserve, spruce, larch, polar, mountain wouldow and other trees shall be transplanted and other vegetation species shall be compensated. 2. Local vegetation species shall be selected for vegetation restoration, such as arbor trees, shrubs, rattan and grass plants, which could effectively contribute to vegetation restoration;			

Potential Impacts		Mitigation Measures	Estimated Cost (RMB10,000)	Implemented by	Supervisor
	Geo-park	1. Any blasting operation shall be prohibited in the scenic area to avoid geological relics in the park from being damage. 2. During construction, construction drawings should be strictly followed to avoid the expansion of construction scope. Boundary markers shall be set up, strictly dividing the boundary of construction sites. Construction workers shall not enter non-construction areas. Optimize the design of road route and tourist trails, as well as construction sequence and sites, to minimize the disturbed earth surface and destructions to vegetation. 3. In the process of transporting materials and construction, workers shall avoid destructions to protected plants in the geopark.	60		
	National Wetland Park	1. Management of construction wastewater shall be strengthened and no construction wastewater shall be discharged into to the Meiyuan River (Yangba River); 2. No quarries, mixing sites, construction camps and living camps shall be set up in the wetland park. Neither urination nor defecation is allowed in the wetland park; 3. Before the construction, the workers shall receive training on how to protect the wetland park; 4. Do not contract any water body during the construction.	15		
	National Forest Park	1. Construction components mainly include repairs of ancient buildings and tourist trails. During construction, construction workers shall be careful and avoid from destroying key nationally and provincially protected plants; 2. Project construction shall strictly follow the construction drawings and shall not expand the construction scope. Boundary markers shall be set up, strictly dividing the boundary of construction areas. Construction workers shall not enter non-construction areas. Optimize the design of road route and tourist trails, as well as construction sequence and sites, to minimize the disturbed earth surface and destruction to vegetation. 3. Pay attention to fire protection during construction in forest. Construction workers shall receive fire safety education. Smoking, using the stove without the approval and other actions that may cause fire shall be prohibited; 4. Strengthen legal education during construction, raise the awareness of workers on environmental protection and construction workers shall not capture any frog, snake and bird to minimize the impacts of construction on local terrestrial animals. Effective measures shall be taken to control rats. During construction, the park administration shall strengthen patrol by dispatching a certain number of employees. Illegal entering into the forest shall be stopped. Illegal poaching, deforestation and fruit picking activities shall be punished.	30	Construction units and project owner	County EPBs and forestry bureaus,

Potential Impacts		Mitigation Measures	Estimated Cost (RMB10,000)	Implemented by	Supervisor
	Drinking water source protection areas	1. Before construction, workers shall receive training on how to protect the protected areas. Any destruction to eco-environment shall be strictly forbidden; 2. Project construction shall strictly follow construction drawings and shall not expand the construction scope. Boundary of construction areas shall be strictly divided and construction workers shall not enter non-construction areas. The design of construction sequence and sites shall be optimized to minimize the disturbed earth surface and destruction to vegetation; 3. No quarries, mixing sites, construction camps and living camps shall be set up in groundwater protection areas. Neither urination nor defecation is allowed in these areas; 4. Sewage and other hazardous materials shall not be discharged to seepage pits and wells. Digging wells or exploiting groundwater shall be prohibited in drinking water protection areas.	45	Construction units and project owner	County EPBs and water bureaus

Annex 4 Cultural Relics Protection Measures

Stage	Key Negative Impacts		Mitigation/Control Measures	Estimated Cost (10,000 Yuan)	Implemented by	Supervisor
Construction	Domestic sewage and wastewater from production	Arbitrary discharge of production wastewater with higher concentration of pollutants would pollute water in rivers and groundwater, and lower groundwater table.	1. Wastewater from sand and gravel processing systems: sand sedimentation pool + flocculating settling pond, treated wastewater is used for concrete mixing and sprayed to control construction dust and shall not be discharged to areas outside the construction site; 2. Construction workers use environmentally-friendly toilets or use existing dry toilets in nearby villages and domestic wastewater would not be discharged to areas outside the construction site.	200	Construction units and project owner	City and county EPBs, housing and rural-urban development bureaus, forestry bureaus, water bureaus, township sanitation administration offices
	Construction dust and waste gas	Dust generated by sand and gravel processing, concrete mixing, materials transportation, exhaust discharged by vehicles, road dust, waste gas emitted by painting operations, and domestic energy use by construction workers would have some adverse impacts on ambient air.	A series of measures would be taken, including strengthening vehicle management, cleaning mud and dust on a periodic basis, maintaining clean pavements, spraying water on a regular basis, carrying out covered-up or sealed transportation, and using environmentally-friendly paint.	50	Construction units and project owner	City and county EPBs, housing and rural-urban development bureaus, township sanitation administration offices
	Noise	Noise from construction machinery, transportation vehicles, sand and gravel processing and other construction activities would have some adverse impacts on acoustic environment in nearby villages.	Use of large construction machinery would be banned, construction equipment with lower levels of vibration and noise would be selected, effective measures would be taken to mitigate vibration, and combination of manual operations and small construction machinery would be encouraged.	100	Construction units and project owner	City and county EPBs, housing and rural-urban development bureaus, township sanitation administration offices
	Solid waste	Domestic garbage generates disgusting odor, can easily get rotten, breeds flies, mosquitoes and other pests and bacteria, damages environmental beauty, and even releases poisonous gasses. Construction spoil, waste materials and domestic garbage, if treated improperly, would result in soil erosion, enter into rivers and block river ways and pollute water bodies.	Domestic garbage would collected and disposed of by construction units; construction waste should be re-used for building road base; construction waste that cannot be re-used should be placed at a designated place, covered up and removed on a periodic basis.	50	Construction units and project owner	City and county EPBs, housing and rural-urban development bureaus, township sanitation administration offices, health bureaus
	Landscape	During construction, earth-rock excavation, land leveling, piling up of spoil and other activities may damage vegetation.	Impacts of construction activities on landscape would be temporary. Construction management shall be strengthened, construction workers shall be trained and educated on cultural heritage protection to enhance their protection awareness and avoid destructions to cultural heritage.	30	Construction units and project owner	City and county EPBs, housing and rural-urban development bureaus, township sanitation administration offices

Annex 5 Environmental Monitoring Plan

Environmental Monitoring Plan during Construction

Subproject	Monitoring Item	Monitoring Factor	Monitoring Point	Monitoring Duration and Frequency	Estimated Cost (10,000 Yuan)	
					Unit Cost	Total
Kongtong Mountain Heritage Protection	Acoustic environment	Leq(A)	Xigou Village, Xiangshan Taoist Temple	Monitor when necessary	1.2	18.6
	Ambient air	TSP	Xigou Village, Jingle Palace		11	
	Surface water environment	pH, SS, petroleum	Tanzheng Lake, Yanzhi River		2.4	
	Ecological environment	Water and soil conservation, survival of animals and plants	Kongtong Mountain National Nature Reserve		4	
Jingchuan County 50-km Stone Cave Corridor Heritage Protection	Acoustic environment	Leq(A)	Wanyan Village, Arhat Cave		1.2	17.4
	Ambient air	TSP	Wanyan Village, Arhat Cave		11	
	Surface water environment	pH, SS, petroleum	Jing River		1.2	
	Ecological environment	Water and soil conservation, survival of animals and plants	50-km Stone Cave Corridor Scenic Area		4	
Zhuanglang County Yunya Temple Heritage Protection	Acoustic environment	Leq(A)	Shiqiao Village, Dianyan Firefighting Access		1.2	19.8
	Ambient air	TSP	Shiqiao Village, Dianyan Firefighting Access		11	
	Surface water environment	pH, SS, petroleum	Shuiluonan Village, Zhulinsi Reservoir, Yunya River		3.6	
	Ecological environment	Water and soil conservation, survival of animals and plants	Yunya Temple National Forest Park		4	
Tanchang County Guan'e Gully Heritage Protection	Acoustic environment	Leq(A)	Guan'e Village, Xinping Village		1.2	18.6
	Ambient air	TSP	Guan'e Village, Xinping Village		11	
	Surface water environment	pH, SS, petroleum	Guan'e Gully, Ming Lake		2.4	
	Ecological environment	Water and soil conservation, survival of animals and plants	Guan'e Gully National Forest Park		4	
Kang County Yangba Heritage Protection	Acoustic environment	Leq(A)	Yangba Village, Laojiangba		1.2	17.4
	Ambient air	TSP	angba Village, Laojiangba		11	
	Surface water environment	pH, SS, petroleum	Yangba River		1.2	
	Ecological environment	Water and soil conservation, survival of animals and plants	Gansu Chinese Giant Salamander Nature Reserve		4	

Subproject	Monitoring Item	Monitoring Factor	Monitoring Point	Monitoring Duration and Frequency	Estimated Cost (10,000 Yuan)	
					Unit Cost	Total
Hezheng County Heritage Protection	Acoustic environment	Leq(A)	Diaotan Village, Songming Rock Scenic Area		1.2	18.6
	Ambient air	TSP	Diaotan Village, Songming Rock Scenic Area		11	
	Surface water environment	pH, SS, petroleum	Xiaoxia River, Nancha River		2.4	
	Ecological environment	Water and soil conservation, survival of animals and plants	Songming Rock Scenic Area		4	

Environmental Monitoring Plan during Operation

Subproject	Monitoring Item	Monitoring Factor	Monitoring Point	Monitoring Duration and Frequency	Estimated Unit Cost (Yuan/Time)
Kongtong Mountain Heritage Protection	Acoustic environment	Leq(A)	Xigou Village, Xiangshan Taoist Temple	Monitor when necessary	300
	Ambient air	PM_{10}, $PM_{2.5}$, NO_2, SO_2	Xigou Village, Jingle Palace		11000
	Surface water environment	pH, SS, COD, petroleum	Tanzheng Lake, Yanzhi River		1200
	Ecological environment	Water and soil conservation, survival of animals and plants	Kongtong Mountain National Nature Reserve		1000
Jingchuan County 50-km Stone Cave Corridor Heritage Protection	Acoustic environment	Leq(A)	Wanyan Village, Arhat Cave		300
	Ambient air	PM_{10}, $PM_{2.5}$, NO_2, SO_2	Wanyan Village, Arhat Cave		11000
	Surface water environment	pH, SS, COD, petroleum	Jing River		600
	Ecological environment	Water and soil conservation, survival of animals and plants	50-km Stone Cave Corridor Scenic Area		1000
Zhuanglang County Yunya Temple Heritage Protection	Acoustic environment	Leq(A)	Shiqiao Village, Dianyan Firefighting Access		300
	Ambient air	PM_{10}, $PM_{2.5}$, NO_2, SO_2	Shiqiao Village, Dianyan Firefighting Access		11000
	Surface water environment	pH, SS, COD, petroleum	Shuiluonan Village, Zhulinsi Reservoir, Yunya River		1800
	Ecological environment	Water and soil conservation, survival of animals and plants	Yunya Temple National Forest Park		1000
Tanchang County Guan'e Gully Heritage Protection	Acoustic environment	Leq(A)	Guan'e Village, Xinping Village		300
	Ambient air	PM_{10}, $PM_{2.5}$, NO_2, SO_2	Guan'e Village, Xinping Village		11000
	Surface water environment	pH, SS, COD, petroleum	Guan'e Gully, Ming Lake		1200

Subproject	Monitoring Item	Monitoring Factor	Monitoring Point	Monitoring Duration and Frequency	Estimated Unit Cost (Yuan/Time)
	Ecological environment	Water and soil conservation, survival of animals and plants	Guan'e Gully National Forest Park		1000
Kang County Yangba Heritage Protection	Acoustic environment	Leq(A)	Yangba Village, Laojiangba		300
	Ambient air	PM_{10}, $PM_{2.5}$, NO_2, SO_2	angba Village, Laojiangba		11000
	Surface water environment	pH, SS, COD, petroleum	Yangba River		600
	Ecological environment	Water and soil conservation, survival of animals and plants	Gansu Chinese Giant Salamander Nature Reserve		1000
Hezheng County Heritage Protection	Acoustic environment	Leq(A)	Diaotan Village, Songming Rock Scenic Area		300
	Ambient air	PM_{10}, $PM_{2.5}$, NO_2, SO_2	Diaotan Village, Songming Rock Scenic Area		11000
	Surface water environment	pH, SS, COD, petroleum	Xiaoxia River, Nancha River		1200
	Ecological environment	Water and soil conservation, survival of animals and plants	Songming Rock Scenic Area		1000